

LOTUS™



User's Manual



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For the
Hewlett-Packard
Portable PLUS™

Release 1A

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1-2-3's Compatibility with Available Hardware and Software

Lotus Development Corporation does not warrant that its 1-2-3 software package will function properly in every hardware software environment. Lotus warrants only that 1-2-3 functions properly when used in combination with the hardware and software described in this User's Manual.

In particular, 1-2-3 may not be operable in combination with print-spooling programs or with modified versions of the operating system. 1-2-3 can drive a wide variety of printers, but may not be usable with particular printers supplied by independent manufacturers.

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1. Getting Started

In this introductory section of the manual, we give you a few short instructions for using 1-2-3 on your HP Portable PLUS™ computer. You will find that gaining access to 1-2-3 is extremely easy on the Portable PLUS™: Since the software for the 1-2-3 system comes in the form of two software modules for the Portable PLUS, you don't have to fool with loading, installing, or configuring... Instead, you can simply select the 1-2-3 option on the main P.A.M. (Personal Applications Manager) screen, as explained below under "Starting a 1-2-3 Session".*

We suggest that you familiarize yourself with the computer before using 1-2-3. But the section that follows is self-contained: All you need to know to get started with 1-2-3 is explained here. In addition, we describe the 1-2-3 Electronic Tutorial.

The 1-2-3 Package

This 1-2-3 package consists of two software modules ("ROM's") and four other parts. The modules contain the 1-2-3 system. The other parts of your 1-2-3 package are:

- **The 1-2-3 User's Manual.**
- **The 1-2-3 Utilities Disk.** This contains additional 1-2-3 "utilities", which are not built into the software modules. These include the Tutor lessons, the PrintGraph program (chapter 20), and the Translate program (appendix E).
- **A keyboard template.** This fits over the function keys in the top row to remind you of their meaning during a 1-2-3 session.
- **The Quick Reference Guide.** This is a handy booklet that summarizes 1-2-3 operating procedures.

Making Back-Up Copies. We recommend that you make back-up copies of the 1-2-3 Utilities disk in case it is damaged or destroyed. (Refer to *Using the Portable PLUS* for information on DISKCOPY.)

* P.A.M. is the *interface* between you and the computer: it shows you options (*menus*), from which you pick the application you want to run—like 1-2-3. You do not have to memorize and type in commands—instead, you just press the [F]-key in the top row that corresponds to the item on the screen you want to pick. P.A.M. is further described in chapter 1 of *Using the Portable PLUS*.



Starting a 1-2-3 Session

Before you start your first session, the 1-2-3 software modules must be properly installed in your Portable PLUS. For information on how to do this, refer to the *Software Module Installation Instructions* that came in the box with 1-2-3. Once the modules are installed, you're ready to do the following:

1. Press any key (except **[Shift]**, **[CTRL]**, or **[Extend char]**) to turn the computer on. The P.A.M. (Personal Applications Manager) screen appears.
2. Check the amount of memory remaining on Drive A (the internal disk) by entering the File Manager (press **[F2]**) and reading the upper right corner. There should be 10,000 to 20,000 bytes available for an *average* worksheet. (Refer to "Memory Configuration" on page 2-13 for more information.) Then return to the main P.A.M. screen (press **[F8]**).
3. Select the 1-2-3 option: Move the cursor (use the **[Tab]** key or the arrow keys) to the 1-2-3 label, and
4. Press **[Select]** or **[F1/Start Applic]**. (The **[F1]** key corresponds to the label **Start Applic** on the screen.) That's it!

The 1-2-3 logo appears. Press any key to clear the screen, and you're ready to go!

Ending a 1-2-3 Session

The **/Quit** command ends a 1-2-3 session. You must be in 1-2-3's *Ready Mode* to issue this command.

1. If necessary, press **[ESC]** one or more times to cancel what you're currently doing and return to Ready Mode. Watch for the *READY* indicator to appear in the upper right corner of the screen.
2. Press the **/** (slash) key to display the 1-2-3 command menu.

3. Press **▶** enough times to move the menu pointer (highlight) to "Quit". Then press **[Return]**.
4. Press **▶** once to move the pointer to "Yes". Then press **[Return]**. The 1-2-3 session ends and the P.A.M. screen returns.

An average worksheet will need 10,000 to 20,000 bytes of storage. This storage can be on the electronic disk (Drive A) or on diskettes. If you don't have enough space on the electronic disc for the workfiles you want to store, you will need to prepare data diskettes (as explained below) or add an HP 82981A 128K Memory Drawer.

Preparing Data Diskettes

You store your 1-2-3 work on the internal, electronic disk (Drive A) or on external floppy disks (If you have a single-disk drive, it is Drive C. If you have a double-disk drive, they are Drives C and D.) Before you begin working with 1-2-3 in earnest, you should have an adequate supply of data disks (at least one-half dozen). And just purchasing the disks isn't quite enough—you must prepare (*format*) a diskette before you can use it.

Prepare new, *blank* disks using the Personal Applications Manager (P.A.M.):

1. Place the blank disk (label-side up) into drive C (or D).
2. Press **[F2/File Manager]**, the key that corresponds to **File Manager** on the screen. This calls up the File Manager screen.
3. Press **[F5/Format]**. This calls up the Format screen.
4. The screen will prompt you to enter the letter of the drive holding your blank disk (probably C). Press **[Return]** when done. The screen will then prompt you to enter a disk label of up to 11 characters if you wish. (Press **[Return]** when done.)
5. Press **[F1/Start]** to begin formatting the disk. You will see the message *Formatting disc. Please wait..*
6. When the formatting is complete, the above message disappears.
7. Press **[F6/Start Over]** to format another disk, or press **[F8]** twice to return to the main P.A.M. screen.

For more information, refer to *Using the Portable PLUS*, chapter 8, under "Preparing a Disc for Use".*

The 1-2-3 Electronic Tutorial

We think that 1-2-3 scores just as many points for ease of use as it does for computing power. But with any new program, it is useful and encouraging to have a helping hand.

* Don't be disconcerted by the different spellings of "disk" and "disc". The Lotus Development Corporation uses "disk" while the Hewlett-Packard Company uses "disc". Both forms are correct.



To meet this need, we have supplied you with an electronic teacher. Tutor is a program that knows the ins and outs of 1-2-3 and knows how to teach them.

Tutor is a watchful instructor. It sits beside you as you use 1-2-3, guiding you every step of the way.

Do I Really Need to Be Tutored?

We feel that there is something for everyone in these Tutor lessons. If you're an experienced spreadsheet user, you'll probably want to browse quickly through Lesson A, which introduces the spreadsheet concept to those unfamiliar with it. (By the way, with 1-2-3 it's called a "worksheet".) You'll also want to read the "Note to Experienced Electronic Spreadsheet Users" at the end of this chapter.

Don't skip Lessons B-D, though. They cover material that is unique to 1-2-3. In addition, these lessons cover areas in which 1-2-3's approach differs from that of other programs.

Lessons E and F introduce information management and graphing, two areas in which 1-2-3 has pioneered all-in-one integration with worksheet analysis.

A topic-by-topic outline of the Tutor lessons appears on page 1-6 under "The Tutor Lessons".

Starting and Ending the Tutorial

Note: To run the Tutorial, you need to have an external disk drive connected to your computer, and main memory must be set to at least 192K bytes (refer to "Memory Configuration" on page 2-13 for information on setting main memory).

Starting the 1-2-3 Electronic Tutorial is simple:

1. Make sure the 1-2-3 Utilities Disk is *not* write protected, then place it in Drive C (or D).
2. With the main P.A.M. screen on, press the [F4/Reread Discs] key on the P.A.M. screen.
3. Use the cursor keys to position the pointer over the indicator, *TUTOR*, that has appeared on the screen.
4. Press the [Select] key or [F1/Start Applic].

Do not remove the 1-2-3 Utilities disk during a tutorial session!

The Tutor Menu

Tutor begins by displaying a menu of lessons:

- To select a lesson from the menu, type the corresponding letter.
- To end the Tutor session, press the [ESC] key.

Tutor returns to this menu whenever a lesson ends, either on its own or by your command.

How Tutor Works

A Tutor lesson looks like a 1-2-3 work session. That's because it *is* a 1-2-3 work session—not a simulation, not a demonstration. Tutor uses the lower part of the screen to display instructions, including the keys you should press.

Not only does Tutor tell you exactly what keys to press, it makes sure that you press them. If you press a wrong key at any time, Tutor simply *beeps*—you cannot proceed unless you do exactly as prompted (Exception: See “Speed Typing” below).

If you press the right key, Tutor passes it on to 1-2-3, and you see the effect immediately on the screen. This means that you must focus your attention in several places during a Tutor session:

The lower right part of the screen: To read Tutor's instructions.

The keyboard: To press the right keys.

The top part of the screen: To view the effects of your keystrokes on 1-2-3. These effects show up both in the worksheet and in the control panel (Figure 2-4, page 2-6).

It may take a little while to get used to dividing your attention like this. Don't worry. Tutor is infinitely patient, and is more than happy to help you through the lessons as many times as you wish.

Speed Typing

One of the goals of the Tutor lessons is to have you get the feel of how 1-2-3 uses the keyboard. For that reason, we hope you'll go through the lessons keystroke by keystroke.

If, however, you want to pass quickly through a lesson, here's a convenient way to do it:

No matter what key Tutor is telling you to press, pressing **[Space]**, the space bar, has the same effect as pressing that key.

Moving Page by Page

Each lesson is divided into pages (screens). At the end of each page, Tutor displays this highlighted prompt:

[Space]=Continue **[Next]**=Next page **[Prev]**=Previous page **[ESC]**=Quit

At this point you have several choices:

- Press **[Space]** to proceed to the beginning of the next page.
- Press **[Next]** (that is, **[Extend char]- ▼**) to jump forward to the end of the next page. In effect, Tutor automatically presses the keys for you on the next page.
- Press **[Prev]** (that is, **[Extend char]- ▲**) to jump backward to the end of the previous page. This may take a few moments, since Tutor must retrace its steps.



- Press [ESC] to end the lesson. The lesson menu returns. You can choose another lesson at this point, or press [ESC] again to end the Tutor session. (The [ESC] key is located in the lower left corner of the keyboard.)

The Tutor Lessons

We present in this section an outline of the topics presented in each of the Tutor lessons. You'll find this section a useful reference as you learn 1-2-3 skills. For instance, if you've grown a bit "rusty" after a long lay-off, you might use the outline to decide which lessons to review.

In many cases, you'll find the same topics listed more than once. Tutor repeatedly emphasizes and reinforces the aspects of 1-2-3 usage that are most important and most commonly used.

There are six tutorial lessons, lettered A through F.

Lesson A: Getting Started

- The Keyboard: [Return], [ESC], pointer-movement keys, [Backspace], [-Char], [Caps].
- The 1-2-3 Worksheet: window, cells, cell pointer, control panel, mode indicators.
- Moving the cell pointer.
- Typing cell entries, numbers and labels.
- Label alignments.
- Fixing typing errors with [Backspace] and [ESC].
- Numeric formats, label formats, column-widths.
- Formulas: entered by typing and by "pointing".
- Automatic recalculation of formulas.
- Saving a worksheet with a 1-2-3 command.

Lesson B: The Loan-Analysis Worksheet I

- Formula recalculation.
- Correcting entries: Edit Mode, [Backspace], [-Char].
- Using the on-line Help facility.
- Setting column-widths, individually and globally.
- Formulas and "@ functions".
- Global numeric display formats; numeric formats for individual cells.
- Saving and retrieving worksheets from disk storage.

Lesson C: The Loan-Analysis Worksheet II

- Entering formulas: Relative and absolute cell addresses.
- Making many copies at once with the /Copy command.
- Copying formulas with the /Copy command.
- Storing worksheets on disk.

Lesson D: The Loan-Analysis Worksheet III

- Using the /Move command to transfer cell entries.
- Using the /Worksheet Insert and Delete commands to add and eliminate rows.
- Entering “repeating” labels.
- Making copies of ranges (labels and formulas).
- Using the /Data Fill command to enter a series of numbers.
- Using the @SUM function.
- Titles and Split-Window (the /Worksheet Titles and /Worksheet window commands).
- Building a table of results with the /Data Table command.

Lesson E: Using a 1-2-3 Database

- Records, fields, and field names.
- The [Prev], [Next] and [Select] keys.
- The /Data Sort command; Primary and Secondary sort keys.
- The /Print File command.
- The /Data Query command.
- Input range, Criterion range, Output range.
- Defining selection criteria: exact matches, approximate matches, numeric comparisons, compound conditions (AND, OR).
- The Find and Extract operations.

Lesson F: 1-2-3 Graphing

- Graph types: Bar, Stacked-Bar, Pie, Line, XY.
- Data ranges; multiple ranges in one graph; resetting (cancelling) ranges.
- Using the X-range as axis labels and pie-slice labels.
- Titles and legends.
- Printing graphs.
- Graph names.



The 1-2-3 User's Manual

This manual is a reference tool, designed to be used in conjunction with the 1-2-3 Electronic Tutorial and the on-line Help facility. We recommend that you not try to read it all at one sitting. Instead, after working through the Tutorial, read the sections of particular interest to further acquaint yourself with the basics of 1-2-3. (For some, the "Note to Experienced Spreadsheet Users" on page 1-9 is a logical place to start.)

When you have a problem or want to learn more about some aspect of 1-2-3 usage, there is a variety of ways to find the information you want in the manual:

1. Skim the **Table of Contents**. This is a good way to get a quick overview of the content and structure of the manual.
2. The **Alphabetical Index**, at the back of the manual, provides a complete listing of page references for each topic.
3. The **Functional Index**, preceding the Alphabetical Index, indicates the 1-2-3 command that best performs the given operation.
4. The **Glossary** lists the meaning of the special terms used in this manual.
5. Most of 1-2-3's **Help screens** include page cross-references to this manual.
6. Use the **1-2-3 Quick Reference** for a quick reminder of a particular 1-2-3 procedure.

The User's Manual comprises several major sections:

Getting Started will help you through the process of setting up 1-2-3 on your computer and the "getting to know you" stage.

The World of 1-2-3 introduces you to 1-2-3 concepts and terminology.

Basic Skills teaches the fundamental tasks to be mastered in using 1-2-3: how to enter information, how to use menus, how to get help, and how to issue commands, and more.

The **Command Skills** chapters describe the *1-2-3 commands* in detail. Each chapter includes a narrative overview and a command-by-command how-to-do-it section.

@ Functions describes the uses of 1-2-3's rich set of *@ functions*, which provide computational power and convenience.

Printing 1-2-3 Graphs (chapter 20) explains how to produce printed copies of the graphs you define with 1-2-3.

The **Appendices** provide additional information in several areas: *configuring* to perform standard procedures automatically; issuing printer-control codes; an error message reference; command trees; and translating programs.

Several **Indexes** provide fast access to important 1-2-3 information.

Typographical Conventions

We use a few simple typographical conventions in this User's Manual:

- When a special term is introduced, it is printed in **boldface**. When a special term is used subsequently, it is often *italicized*.



This symbol means "Caution". We use it to call your attention to the fact that making a mistake at this particular point could cause a significant data loss.



This symbol is used to call your attention to other important points.

A Note to Experienced Electronic Spreadsheet Users

If you're used to other spreadsheet programs (e.g. VisiCalc), be prepared for some pleasant surprises. 1-2-3 not only significantly expands the "spreadsheet" capability you're already familiar with, it also adds graphing and information management facilities.

Other sections of this manual describe all the features and capabilities of 1-2-3. In this section, we provide a glance at some of the major differences and features that separate 1-2-3 from the crowd.

Major Differences

When a 1-2-3 session begins, the screen will probably look familiar, but the resemblance ends there. When you type the / (slash) key to begin a command, 1-2-3 displays a "menu" of command keywords, not just a series of single letters. You can select any command by "moving" the highlight to your choice, using ► and ◀, then pressing **[Return]**. Or you can just type the first letter of the command keyword.

A short description of each command is displayed on the line below the menu. Some of the commands that directly affect worksheet operation may have familiar names, but their implementation differs. 1-2-3 distinguishes between *global* operations affecting the entire worksheet and range operations affecting a single cell or group of cells.

1-2-3 Commands

Operations involving deletion or insertion of columns or rows, erasing the worksheet, setting column widths, etc., are grouped under the /Worksheet command. Operations that affect an individual cell or range of cells are grouped under the /Range command.



The /Copy command allows you to copy a single cell or range of cells to a target cell or range of cells. /Copy replaces the Replicate function found in many spreadsheet programs. In other programs, replication typically requires formula references to cells to be specified as “relative” or “no change” at the time of replication. In 1-2-3, this information is specified in the formula itself, rather than at the time of copying. Copying is not restricted to a single row or column, and 1-2-3’s expandable pointer lets you “highlight” the area of the worksheet you are defining for the copy.

The /Move command is fundamentally different. It lets you “pick up” a group of cell entries in the worksheet and “put it down” at another location. All formulas are automatically adjusted. And because of expandable pointer highlighting, you can see the block of entries you are moving.

The table below shows the major VisiCalc commands and their 1-2-3 equivalents. See page Appendix D for a complete 1-2-3 command list.

VisiCalc		1-2-3	
/B	Blank cell.	/RE	Erase a range of cells.
/C	Clear spreadsheet.	/WE	Erase worksheet.
/D	Delete row or column.	/WD	Delete one or more rows or columns.
/E	Edit cell entry.	[F2/Edit]	Edit cell entry.
/GF	Global format.	/WGF	Global numeric format.
/F	Format a cell.	/RF	Format one or more cells.
/G	Set global parameters.	/WG	Set global parameters.
/I	Insert row or column.	/WI	Insert one or more rows or columns.
/M	Move a column or row.	/M	Move a range of cells (not directly equivalent).
/P	Print to printer.	/P	Print to printer or file.
/R	Replicate one or more cells.	/C	Copy one or more cells.
/S	Storage commands.	/F	File commands.
/T	Titles.	/WT	Titles.
/V	Program version.	...	Displayed at startup only.
/W	Split screen.	/WW	Split screen.
/-	Repeating label.	...	Label-prefix character “\”.

Additional 1-2-3 Features

Graphing Facilities. 1-2-3 allows you to make line, bar, pie, stacked-bar, and scatter charts using data from the worksheet. The graph data and formats are saved along with the worksheet. Graph images are stored as separate *graph files*. New graphs can be made each time you change the worksheet by using the dedicated [F10/Graph] ([Shift]-[F2]) function key.

Database Facilities. From within the worksheet, data records are entered using the familiar column/row format. (1-2-3 allows up to 2047 records and 256 fields, subject to the limitations of main memory.) There are commands to manipulate records, including the ability to search for and extract records that meet your defined criteria. In addition, you may sort, build data tables, calculate distributions, and perform other statistical analyses of the records in the database. Data contained in the database can be used in worksheet calculations, in graphing, or both.

Natural Recalculation Order. Automatically eliminates all forward references.

On-line Help Facility. 1-2-3 gives you assistance when you need it most. If you can't remember what a command does, if you're stuck for what to do next, or if you simply don't like reading reference manuals, you can press the dedicated [F1/Help] function key, and receive instant help on the current problem. Help can be invoked at virtually any time, even during data entry. Not only do you get help on the current command, but you can access related topics and even an index of all Help topics by simply pointing at the name of the item you need help with.

Dedicated Function Keys. Frequently used 1-2-3 operations (Graph, Calc, GoTo, etc.) can be executed with a single keystroke. A template showing these special functions is provided to fit over the function keys, [F1] through [F8]. Shifted versions of [F1], [F2], and [F4] are called [F9], [F10], and [F12].

Extended Mathematical Functions. 1-2-3 extends the mathematical capability usually found in spreadsheet programs. Besides the familiar array of mathematical and logical operators, 1-2-3 provides additional functions such as future value, payment, and date functions. Statistical functions such as standard deviation and variance are also included. A complete summary of these functions will be found in Chapter 19, "1-2-3 Function Reference".

Printer Control. 1-2-3 allows extensive formatting of a worksheet before it goes to the printer. You may print selected portions of a worksheet and add headings, footings, margins, borders, titles, and even the date and page numbers to make your printed worksheet into a final report.

Macro Capability. 1-2-3 further extends your ability to manipulate the worksheet by allowing you to create command macros using the "Typing Alternative". This powerful feature allows you to "tie" a series of frequently used keystrokes to a letter key. And 1-2-3 will save the macro along with the worksheet so that it's ready to use the next time you need it.

Importing and Exporting Files. 1-2-3 can import and export standard ASCII text files, making it easy to exchange data with other programs.

We've barely scratched the surface of 1-2-3's capabilities. Since you're already an experienced spreadsheet user, you might want to jump right in and get started, but we hope you'll also use the 1-2-3 Electronic Tutorial. The new world of 1-2-3 is at your fingertips.





2. The World of 1-2-3

1-2-3 turns your computer's memory into a giant *worksheet*. The worksheet is similar to a financial ledger sheet—it's ruled into rows and columns. Each of the spaces in the worksheet (called *cells*) can store a piece of information: a number, letters, words, or an instruction to calculate a value.

This chapter introduces your computer system and 1-2-3 itself. We've organized it around what you can see—the physical equipment (*hardware*) that makes up your Portable PLUS computer (Figure 2-1). Consult the *Using the Portable PLUS* for details on setting up and operating your system.

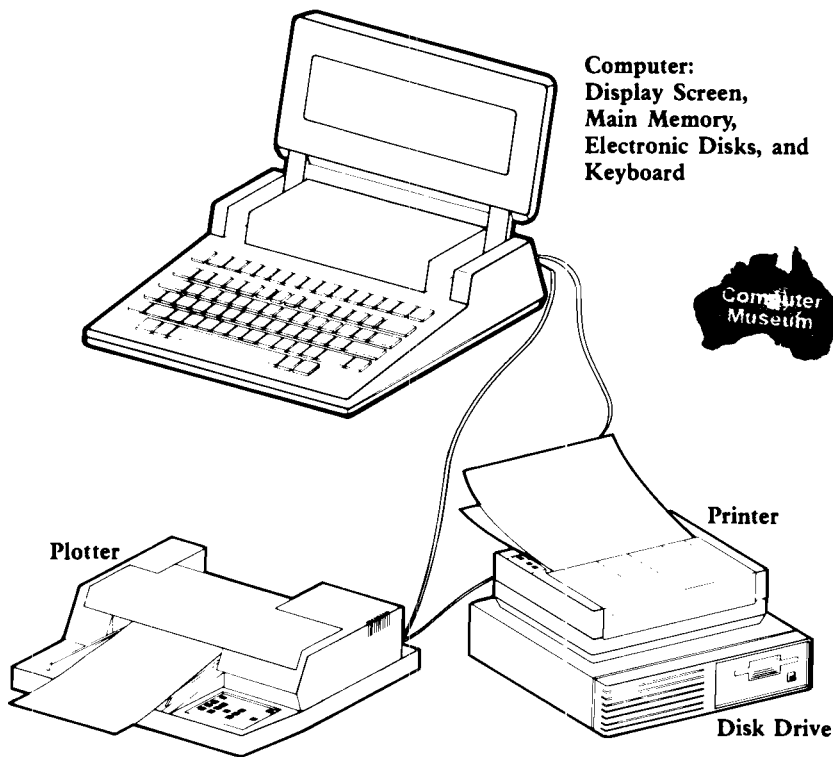


Figure 2-1. Your HP Portable PLUS System Hardware

The Keyboard

Each key on the keyboard is "auto-repeating": If you hold a key down, the character is typed repeatedly.

The keyboard includes several major parts (Figure 2-2).

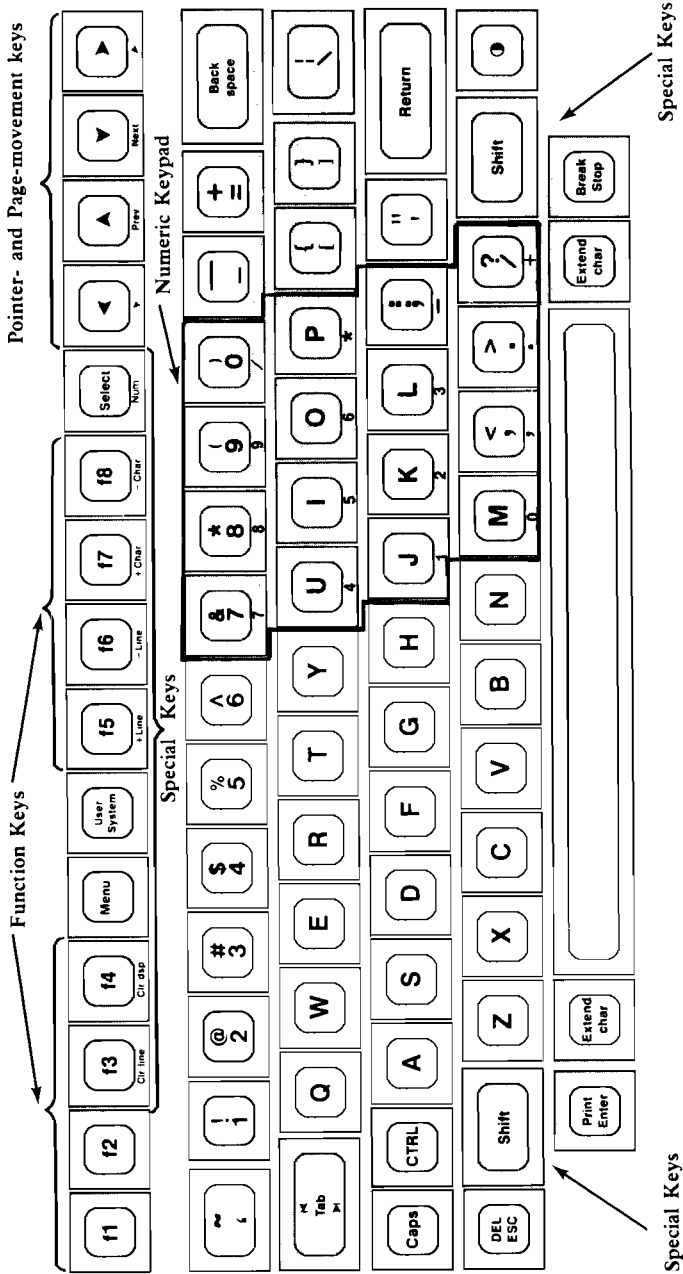


Figure 2-2. The Keyboard

Typewriter Keys

The typewriter keys act like those on a regular typewriter. The letter keys are in their usual places. To produce an uppercase letter, hold down the **[Shift]** key and press the letter key. (In many 1-2-3 situations, uppercase and lowercase letters are equivalent.) Holding down **[Shift]** and pressing a number or punctuation key on the typewriter keypad produces the key's upper symbol.

Instead of a shift lock, there is a **[Caps]** key, which affects only the letters—you must still use **[Shift]** to type the upper symbols on non-letter keys. When **[Caps]** is on, the CAPS indicator shows. Holding down **[Shift]** and typing a letter at this point produces a lowercase letter.

Another kind of shift function is the **[Shift]-[CTRL]** function. If you find yourself repeating the same sequence of keystrokes over and over, you can “name” that sequence with a letter. Then, if you hold down **[Shift]-[CTRL]** together and press that letter, the entire sequence will be entered automatically (Chapter 9, “Using Keyboard Macros”).


Like many typewriters, your keyboard has a Tab key. In many situations, pressing **[Tab]** shifts 1-2-3's attention to the right. (The exact meaning depends on the context.) *Unlike* most typewriters, you can also tab backwards (“backtab”) with your keyboard: Hold down **[Shift]** and press **[Tab]**. This shifts 1-2-3's attention to the left.


But there are some differences between your keyboard and a typewriter's:

- You cannot use the lowercase letter l (“el”) as a substitute for the number 1. 1-2-3 always distinguishes them.
- 1-2-3 uses the standard signs for addition (+) and subtraction (−). But 1-2-3 uses an asterisk (*) to indicate multiplication, not “×”; and the sign for division is a slash (/) rather than “÷”.

Pointer-Movement Keys

In many situations you use the pointer-movement keys in the upper right corner of the keyboard to direct 1-2-3's attention: to a particular cell in the worksheet, to a particular menu choice, etc. Notice that there are two functions (symbols) printed on each of these four keys. The functions printed on top (◀, ▲, ▼, ▶) are the primary functions, representing left, up, down, and right movement. The functions printed on the sloping front face (↵, [Prev], [Next]) are extended-character functions. To access them, press and hold **[Extend char]** while pressing ↵ (Home), **[Prev]** (Previous screen), or **[Next]** (Next screen). These are just like shifted functions, but using **[Extend char]** instead of **[Shift]**. These functions are covered more specifically in Chapter 4, “Moving Around the Worksheet”.)

Through the rest of this manual, these extended-character functions will be represented simply as , [Prev], and [Next]. Keep in mind, however, that—as indicated by their placement on the front of their keys—you must press [Extend char] to access them.

While you are using 1-2-3, the  function does not work. However, you can effect a “home-down” movement by pressing [Select] first. Refer to page 4-6, “The [Select] Key”.)

Function Keys

Function keys [f1] through [f8] at the top of the keyboard perform various 1-2-3 operations. Function keys [f9], [f10], [f12] are accessed as [Shift]-[f1], [Shift]-[f2], and [Shift]-[f4]. These keys are described where appropriate throughout this manual. Place the plastic 1-2-3 *template* over the function keys to help remind you of each key’s meaning.

Function	Keystroke(s)
[f1/Help]	[f1]
[f2/Edit]	[f2]
[f3/Name]	[f3]
[f4/Abs]	[f4]
[f5/Go To]	[f5]
[f6/Window]	[f6]
[f7/Query]	[f7]
[f8/Table]	[f8]
[f9/Calc]	[Shift]-[f1]
[f10/Graph]	[Shift]-[f2]
[f12/Scroll Lock]	[Shift]-[f4]

Special Keys

We have already introduced several of the special keys (Figure 2-3) that appear on your keyboard, but not on the typewriter keyboard.

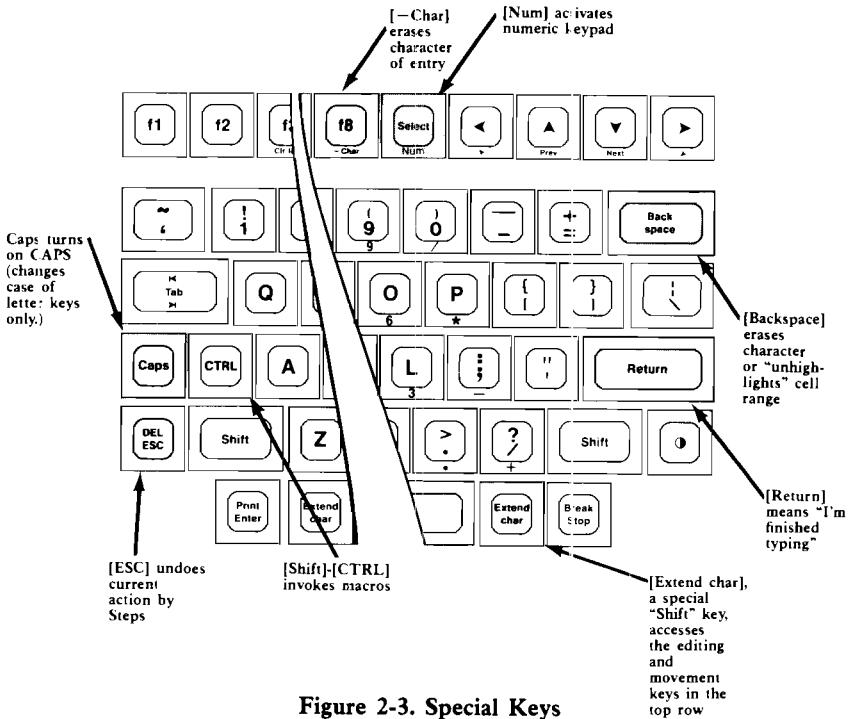


Figure 2-3. Special Keys

[Shift]. Changes the meaning of the typewriter keys and the pointer-movement keys.

[Shift]-[CTRL]. When you hold down **[Shift]-[CTRL]** together and press a letter key, it invokes a keyboard macro.

[Tab]. Performs rightward movement, depending on the context.

[Shift]-[Tab] (Back tab). Performs leftward movement, depending on the context.

There are several other special keys that we haven't introduced yet:

[Backspace]. In typing situations, means "erase the last character I typed". In pointing situations, means "go back to where I began".

[-Char]. In typing situations, means "erase the character I'm pointing at". Press **[Extend char]** and **[-Char]** simultaneously.

[Num]. Alternately activates and deactivates numeric keypad. Press **[Extend Char]** and **[Num]** simultaneously.

[Break]. When you hold down **[Shift]** and press **[Break]** at the same time, this interrupts a current 1-2-3 operation and returns you to Ready Mode. In effect, it cancels a command sequence, erases an entry midstream, or halts a print job during printing.

[Print]. When you hold down **[Shift]** and press **[Print]** at the same time, the contents of the display screen are sent to the printer.

We've saved two other special keys for last, since they are very important for 1-2-3:

[Return]. The **[Return]** key performs a function similar to that of the carriage return on typewriters and on many other computers. Pressing **[Return]** tells 1-2-3, "I'm finished. Proceed." You use it when you have finished typing an entry, when you have moved the electronic menu pointer to your choice, etc.

[ESC]. The **[ESC]** key is the opposite of **[Return]**. It tells 1-2-3, "Go back a step." The exact meaning of this depends on the context. (See also pages 5-8 and 6-7.)

Some of the keys on the keyboard are not functional in 1-2-3. They are: **[Menu]**, **[User System]**, **[+Line]**, **[-Line]**, **[+Char]**, and **▲**.

Extended Roman Characters

The computer's extended Roman character set—normally accessible through the **[Extend char]** key—is *not* recognized by the 1-2-3 programs.

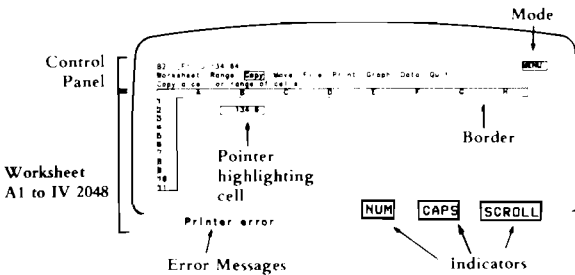


Figure 2-4. The Display Screen

The Display Screen

During a 1-2-3 session, the display screen typically is divided into three sections (Figure 2-4). At the top is the *control panel*. Most of the rest of the screen is usually taken up by a section of the *worksheet*. Separating the two is a *border* showing the column letters and row numbers of the section of the worksheet you are viewing.

1-2-3 uses the last line of the screen to display *error messages* and reverse-video *indicators* that signal various program conditions.

The Worksheet

Think of the worksheet as a piece of ruled paper spread out in front of you. Each entry you type is placed in a *cell*—each with its own *cell address* that describes its column-row location (e.g. A23). This would be a huge piece of paper: If each cell in the worksheet were 1/4 inch high and 1 inch wide, the entire worksheet would be more than 21 feet wide and twice as high!

You focus 1-2-3's attention on a particular cell or range of cells (see below) with a rectangular highlight, the **cell pointer**.

Since the entire worksheet is too large to fit on the display screen, you can see only a section (*page*) of it at a time. Think of it as looking through a *window* onto a small portion of the worksheet. However, you can move this window to different parts of the worksheet quickly and easily (Figure 2-5).

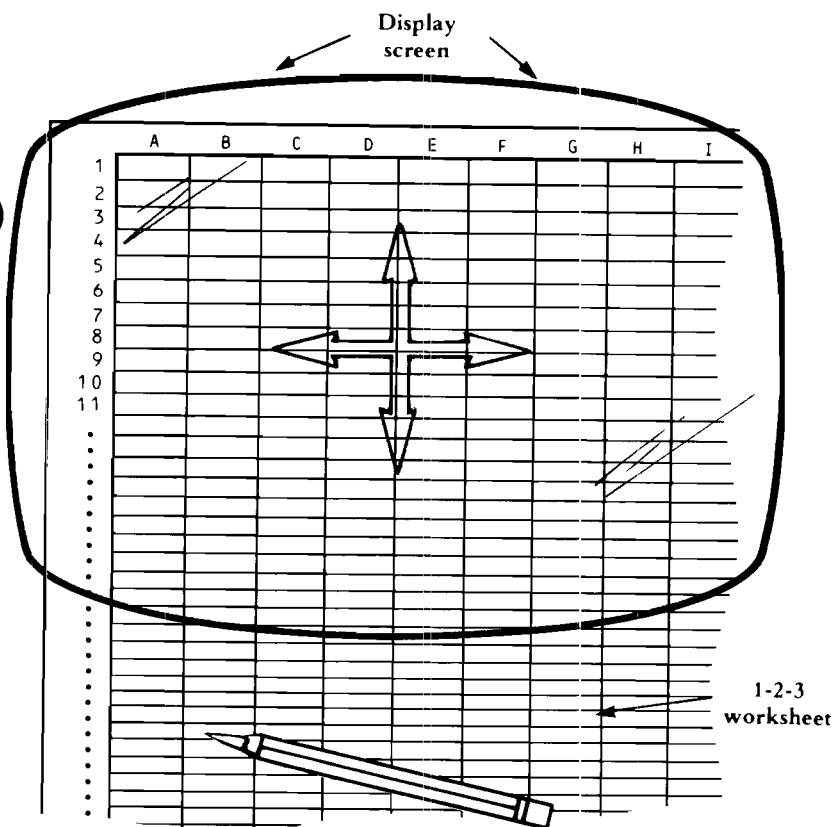


Figure 2-5. The Window

Ranges

One or more cells that form a rectangular block is called a **range** (Figure 2-6). In many situations, you specify a range for 1-2-3 to process. You can specify a range in several ways: by the addresses of its corner cells, by highlighting the entire range with the cell pointer, or by naming it with a **range name**. (For details, see Chapter 7, “Indicating Cell Ranges”.)

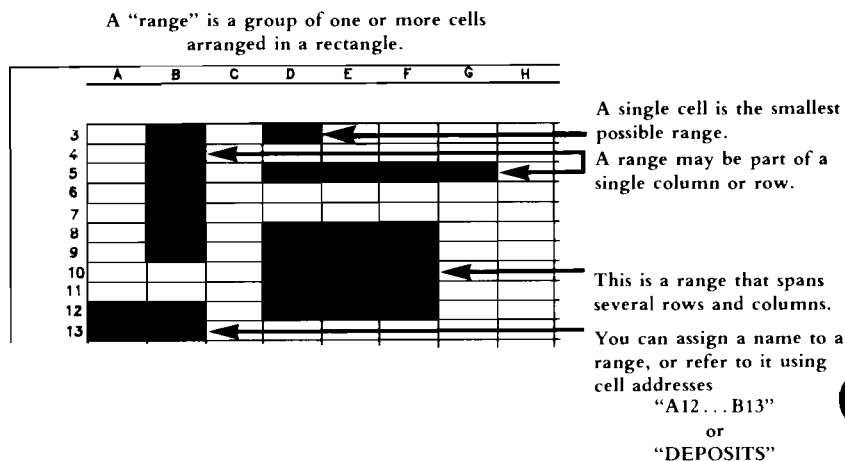


Figure 2-6. Ranges

In many cases, 1-2-3 “remembers” a range you specified, and offers to reuse it the next time you are in a similar situation. This makes it easy to perform a set of similar tasks quickly.

Cell Entries

You can enter a label, number, or formula into any cell. A **label** entry is a series of characters, up to 240 of them. 1-2-3 can store a **number** entry (as a result of calculations) as large as 10^{308} and as small as 10^{-308} . However, 1-2-3 only *displays* numbers in the range from 10^{99} to 10^{-99} . Numbers that can be stored, but are too large to be displayed, are shown as asterisks (****) in the cell.

Formulas. A formula is an instruction for 1-2-3 to calculate a number. You use formulas to define the interrelationships among the cells in the worksheet—how one cell’s value “depends” on another’s, or many others’. Whenever a cell entry changes, 1-2-3 can automatically **recalculate** the values of all the formulas in the worksheet. You see immediately how a change in one number affects one or more other numbers. This is the essence of “what-if” analysis.

Usually, only the current numeric value of a formula is displayed on the screen (Figure 2-7).

A label is a string of characters for 1-2-3 to display. Although it doesn't appear on screen, labels actually start with a positioning prefix (see page 5-6)

Cell address: the column letter and row number of the cell (e.g. B6)

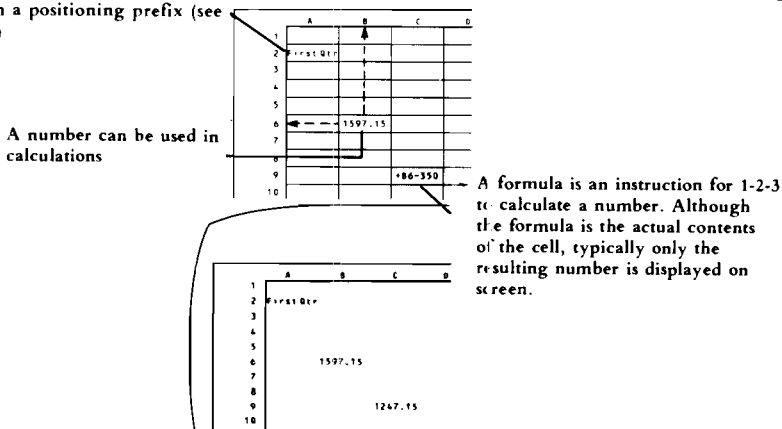


Figure 2-7. Cell Entries

Display Formats and Label Alignments

You can control the way in which 1-2-3 displays numbers and formula values in the worksheet's cells. 1-2-3 lets you control each cell's **numeric display format** independently of the cell's entry (page 10-13).

Labels can be left-aligned, right-aligned, or centered in their cells. It's easy to change a label's alignment, even after you've entered it.

Column Widths

Each cell in the worksheet can store up to 240 characters. But you probably wouldn't want 1-2-3 to display the entire capacity of each cell. You can control the display **column width** of each column—the number of characters that appears on the screen (page 10-15).

Cell Protection

1-2-3 has a facility that allows you to control which cells of the worksheet can be changed. This **cell protection** scheme (page 10-7) allows you to prevent accidental erasure or overwriting of formulas and other entries that "make the worksheet work".

Titles and Split Screen

1-2-3 has two facilities for helping you cope with one unavoidable problem: The worksheet is much too large to be displayed all at once on the screen. The **Titles** facility (page 10-9) allows you to “freeze” certain rows and/or columns on screen. The **Split Screen** facility (page 10-10) allows you to see two parts of the worksheet at the same time, each in its own window. It’s as if two TV cameras were pointing at the same worksheet and sending their images to two different display screens (Figure 2-8).

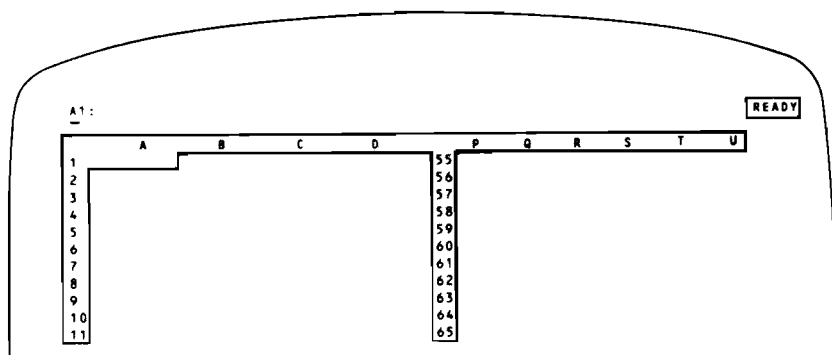


Figure 2-8. The Split Screen Shows the Two Work Areas at Once

The Border Area

The horizontal, highlighted border area above the worksheet window contains letters identifying each column: A-Z, then AA-AZ, then BA-BZ, and so on to IV, for a total of 256 columns. The vertical, highlighted border at the left edge of the screen contains row numbers: 1-2048.

As you move the cell pointer around the worksheet, the border always indicates where you are.

The Control Panel

The control panel has three lines (Figure 2-9):

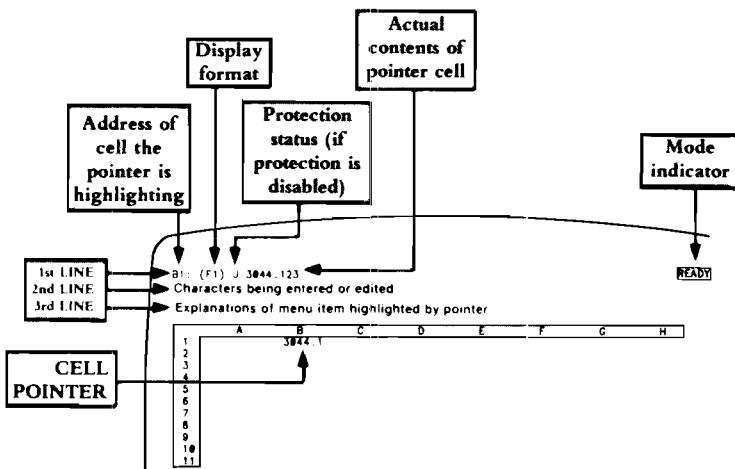


Figure 2-9. The Control Panel

Line 1. Contains information concerning the **pointer location**, the cell which the cell pointer is currently highlighting. This information includes the cell address, the protection status (page 10-23), the numeric display format (page 10-13), and the cell's contents. At the far right of this line, 1-2-3 displays a reverse-video **mode indicator**. This is important, since 1-2-3 responds differently to keystrokes in different modes.

Line 2. The "input line". It displays the characters of cell entries as you type and edit them. 1-2-3 uses it to display **prompts**—instructions to make particular entries. Your responses to these prompts also appear on this line. In addition, 1-2-3 uses this line to display **menus**, lists of command words or names for you to choose from.

Line 3. When you are issuing a 1-2-3 **command** (page 6-1), this line displays **long prompts**—one-line summaries of the 1-2-3 commands currently being offered. As you move the menu pointer (highlight) among the various command words, line 3 changes so as always to display the explanatory text for the currently highlighted word.

The Printer

We've equipped 1-2-3 and its companion program, PrintGraph (page 20-1), with the ability to run many different types of character and graphics printers.

The HP Portable PLUS works well with the HP ThinkJet printer, which has full character and graphics capabilities. Your HP dealer can give you a list of other printers supported by 1-2-3.

For a quick copy of just what you see on the screen (and no more), simply press [Print].

What other kinds of printouts can you get? By using printing commands (chapter 15) and a character printer, you can obtain a copy of:

- Part or all of the electronic worksheet.
- A cell-by-cell report of the entries stored in any part of the worksheet, or the entire worksheet.

You can print out a worksheet at any time during a 1-2-3 session. Alternatively, you can store the information to be printed in a **print file**, for printing or editing later. Refer to Chapter 15, "Print Commands", for instructions about printing worksheets.

To make a printed or plotted version of the 1-2-3 graphs you create and save, you use the PrintGraph program.* For this purpose, your system must include a *graphics printer* or a *plotter*. You can print or plot any graph that you've defined and saved in a **graph file**, using 1-2-3's /Graph command (chapter 16).

Main Memory and Disk Storage

There are two parts of memory in the Portable PLUS with which you should become well acquainted: the *main memory* and the *electronic-disk memory*.

- *Main memory* is work space. This is where 1-2-3 maintains your current **worksheet**—the worksheet currently in the display. However, when you end a 1-2-3 session, main memory is erased. Therefore, you should *save (store)* the current worksheet on a *disk* before ending a 1-2-3 session.
- *Electronic-disk memory* (Drive A) is storage space. This is the most convenient place for you to store worksheets because it is *inside* the computer, so you don't have to handle disks or a disk drive. Since the computer is battery-powered and never shuts off (only the display does), worksheets stored here are not lost.

* You can make a rough copy of a graph on the screen *without* PrintGraph just by pressing [Print].

To make a permanent record of your worksheet, you must save it in a **worksheet file** and store that file on a disk. With most computers, if you want to permanently save your files, you must do so on a disk in an *external* disk drive. With the Portable PLUS, however, things are much easier: you can safely and permanently save your files on the *internal, electronic disk* in Drive A. Naturally, if you want to store more than will fit on Drive A, you will need an external disk drive, and the disks to go in it.

When you retrieve a stored file to work on it, you are actually fetching an exact copy of it. The original stays safely on the disk, from where it can be retrieved again later or replaced with an updated file.

Memory Configuration

Together, main memory and Drive A's electronic-disk memory comprise *random-access memory* (RAM). RAM is that part of memory that you have access to: you can store files in it and delete files from it. In the Portable PLUS, you can change the distribution of RAM between main memory and the electronic disk; that is, you can give more memory to main and less to electronic disk or vice-versa. There is more information on this topic in chapter 4 of the *Using the Portable PLUS*. Keep the following guidelines in mind to be sure that there will be enough room in memory to save your worksheet:

1. Keep your main memory as low as possible to maximize the room for storage in Drive A. Check your system configuration by pressing **[f6/System Config]** from the main P.A.M. menu. The first line, reading *Main Memory/Edisc* (that is, main/electronic disk), shows your memory configuration. Press **[f3]** or **[f4]** to change the values.
2. Setting Main Memory to 80 provides the most room for storage. That means 80 thousand bytes are dedicated to work space. The rest of memory is then assigned to the electronic disk, which is storage space. This is the default system configuration (that is, the configuration that the computer has when new or reset).
3. You might need to expand the size of main memory to work on very large worksheet files or to run large programs like PrintGraph. (At least 120K main memory is required to run PrintGraph, and to print large graphs, you may need more than that.)
4. *Know how much memory you have remaining in Drive A* (the electronic disc) before starting to work on a worksheet. The upper right corner of the File Manager screen (press **[f2]** from the main P.A.M. screen) tells how many bytes of disk memory remain on Drive A. An average worksheet will need around 10,000 to 20,000 bytes. If you aren't sure there will be enough room on Drive A to store your next worksheet, then do one of the following *before* starting a new worksheet:

- Change the system configuration to enlarge the size of Drive A (*Edisc*), if possible.
 - Have an external disk drive and disk available for storing your new worksheet. If you don't have an external disk drive, you should store your incomplete worksheet periodically on Drive A so that you store progressively larger versions of your worksheet. If and when you find the worksheet too large to store on Drive A, you will at least have a substantial portion of it already stored.
 - Add an HP 82981A 128K Memory Drawer to increase total available memory.
5. Once you start a 1-2-3 session you cannot exit it to adjust the system configuration without either storing or losing the current worksheet. If there is not enough room on Drive A to store a worksheet, you must store it on an external disk or pare down its size until it does fit on Drive A.

Typical Disk Configuration

The Portable PLUS has two internal, electronic disks: Drive A and Drive B. Drive A is available to you for long-term storage of data such as 1-2-3 worksheet files—without using diskettes! (Drive B is a read-only memory disk that is *not* available to you for storing files.) If you also have your own peripheral disk drive, then you have one or more external disk drives—drive C, drive D, etc. If you use data disks in an external disk drive to store worksheet files, print files, and graph files, they are typically placed in drive C. Since you can switch disks in the external drives at almost any time (*not while the light is on!*), your permanent data-storage capacity is virtually unlimited.

Data Security

Saving your work is a vital part of using 1-2-3, and every other computer program, too. Save regularly while you are creating a worksheet to avoid the loss of data that occurs because of human error or other mishaps. Since the Portable PLUS has its own battery power source, you are protected from data losses that occur in other computers when there are interruptions in an external power supply.

To protect yourself against a disk being damaged, lost, or simply wearing out, it is important to make an extra copy of every disk you use. You should also copy any important files you have on Drive A onto a disk. For extra safety, make extra copies of all important diskettes and store them in a secure place, perhaps a fireproof safe, separately from your day-to-day diskette library.

Having presented this brief overview of the world of 1-2-3, we hope you're ready to move forward with confidence. When you have questions, return to this section for a refresher, or consult the several other methods of finding information in this manual: the Table of Contents, the Glossary, and the Indexes.

3. Using the Help Facility

The 1-2-3 Help facility is a reference manual that's always open to the right page. At virtually any time while using 1-2-3, you can press the [F1/Help] key—between commands, in the middle of typing a command or entry, whenever you need it. After getting help, the session continues exactly where you left off.

When you press [F1/Help], 1-2-3 temporarily suspends the session, remembering exactly where you are. It clears the worksheet from the display screen, but leaves the control panel as a reminder of where you paused. Then it displays a screenful of information tailored to your current situation.

The Help screens are interconnected and cross-referenced. Each Help screen includes a menu of further help topics, usually at the bottom of the screen. You can get further help on any or all of these topics before returning to the worksheet. Some of the Help facility's features make it particularly useful:

- Most 1-2-3 commands involve several steps. Each step has its own Help screen, which includes the further-help topic Next Step.
- At each Help screen, you can go to the Help Index, which provides access to the entire set of Help screens (more than 200 in all).
- Many Help screens list pages in this manual where you can find further information on the topics.

Getting Further Help

When 1-2-3 is displaying a Help screen, it displays a *HELP* indicator in the upper right corner of the control panel. Once in this **Help Mode**, you can either return to the worksheet or continue getting help.

To Get Further Help. The topics are connected in both the left-right and up-down senses (Figure 3-1). Use these pointer-movement keys to highlight the Help topic of your choice:

Key	Function
▶	Next topic to right
◀	Next topic to left
▲	Topic above
▼	Topic below
↖	First topic
[Select]	Last topic



Then press **[Return]** to display the Help screen for the topic you selected.

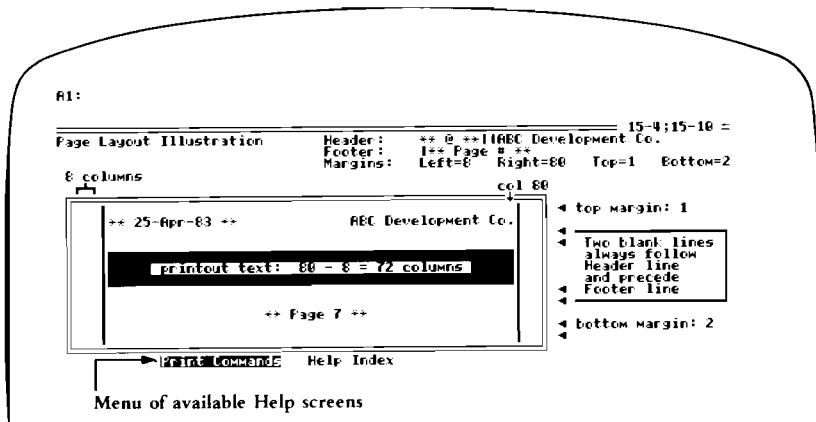


Figure 3-1. A 1-2-3 Help Screen

To View Previous Help Screens Again. Press **[Backspace]** one or more times. 1-2-3 remembers up to 15 previous screens. But you can't use **[Backspace]** to retrieve a Help screen you viewed during a prior Help pause. If you press **[F1/Help]** again, 1-2-3 returns to the first Help screen you viewed during the current Help break.

Returning to the Worksheet

To end a Help pause, press **[ESC]**. 1-2-3 redisplay the worksheet and lets you continue exactly where you left off.

Basic Skills Contents



4. Moving Around the Worksheet

Moving

5. Creating Cell Entries

Entries

6. Using 1-2-3 Commands

Commands

7. Indicating Cell Ranges

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Formulas

9. Creating Keyboard Macros —
1-2-3's Typing Alternative

Macros



4. Moving Around the Worksheet

The 1-2-3 worksheet is a collection of **cells**, organized into rows and columns. Each cell can store a single piece of information—number, formula, or label. The computer's display screen is a **window** into the worksheet. At any particular moment, you can see part of the worksheet, but not all of it.

A reverse-video bar always highlights one of the cells in the window, indicating which cell is the current focus of 1-2-3's attention. Using this bar—the **cell pointer**—is probably the most important new skill to master in learning to use 1-2-3 (Figure 4-1). That's because you typically fill in the worksheet by repeatedly performing the following actions:

1. Moving the cell pointer to a particular cell.
2. Typing an entry or issuing a command that affects the cell.

This description, however, doesn't tell the whole story. Many 1-2-3 commands process an entire group of cells—a **range**—all at once. In such situations, you can indicate the range by expanding the cell pointer to highlight all the cells at once. For the time being, we'll concentrate on mastering the art of pointing to a single cell. (See "Expanding the Cell Pointer" in Chapter 7.)

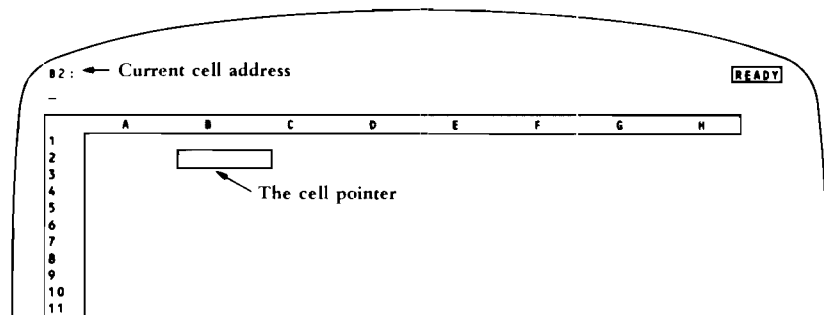


Figure 4-1. The Current Cell and the Cell Pointer

Moving One Cell at a Time

The arrow keys on the pointer-movement keypad move the cell pointer one cell at a time (Figure 4-2). The keyboard's *auto-repeat* feature works nicely with these keys. Give it a try by holding an arrow key down for a few seconds.

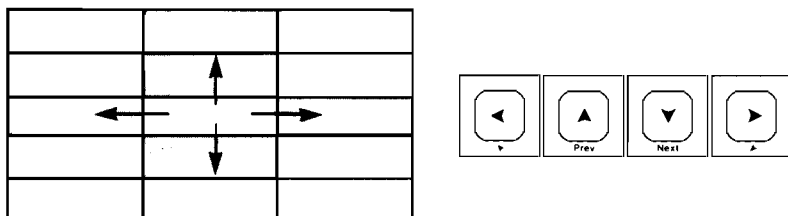


Figure 4-2. Using the Arrow Keys

Don't worry about the edges of the display screen. If you try to move the cell pointer off the worksheet (e.g., above row 1), the program simply *beeps* at you, to say "You can't do that".

Moving the Window Adjusts Your View to the Worksheet. On the other hand, you can move the pointer downward if you're at row 20 the last visible row (Figure 4-3). The pointer moves to row 21 and the display screen changes accordingly.

Does the worksheet move up, or does the screen move down? In reality, the display screen acts as a movable **window**, through which you can see part of the worksheet. The worksheet itself remains stationary.

You can never make the cell pointer disappear—whenever the cell pointer moves in a way that would take it offscreen, 1-2-3 automatically adjusts the window. In particular, when you make the pointer "push against the side of the window", the window moves.

It's also possible to do the opposite—move the window with the arrow keys, pulling the cell pointer along with it ("The Scroll Lock Facility", page 4-5).

Moving Directly to the Destination Cell

Moving one cell at a time is easy, but it's not the fastest way to move the cell pointer a great distance. You can move the cell pointer to any cell "in a single bound" just by pressing [**f5/GoTo**] and entering the cell's address (Figure 4-4).

If your destination is offscreen, 1-2-3 automatically adjusts the window to place your destination cell in the upper left corner of the screen. 1-2-3 accepts a range name instead of a cell address in an [**f5/GoTo**] operation (Chapter 11, "Range Commands"). 1-2-3 "goes to" the cell in the upper left corner of the range.

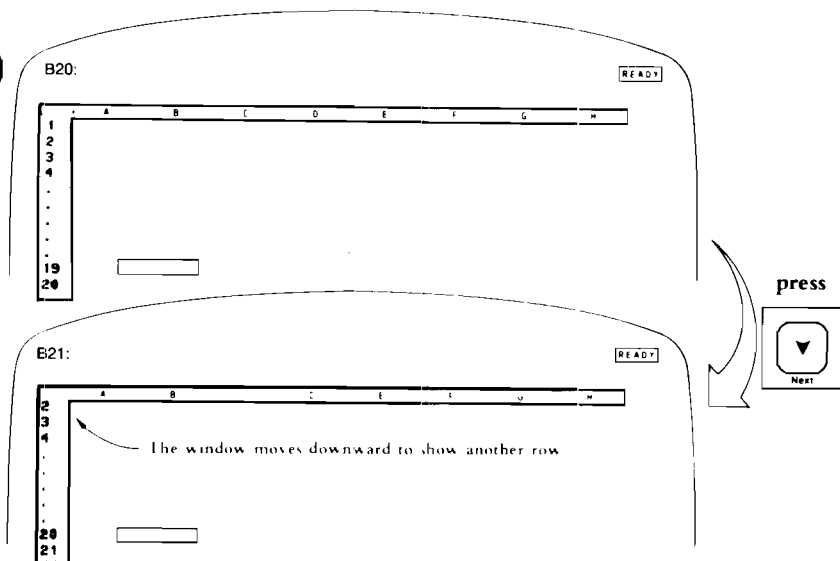


Figure 4-3. Scrolling the Window

The Key. is a special version of [F5/GoTo]. When you press this key in Ready Mode, the cell pointer returns to the cell in the upper left corner of the worksheet. If necessary, 1-2-3 adjusts the window to include this cell. Typically, this is cell A1, but not always: If you've expanded the worksheet's border using /Worksheet Titles (page 10-9) to include the first few row(s) and/or column(s), the upper left corner might be cell A5, cell D1, cell C10, etc.

You can also use in combination with [Select] to move the pointer to the lower right corner of the "active" area of the worksheet. (For details, see "Moving to the End of the Active Area", page 4-8.)

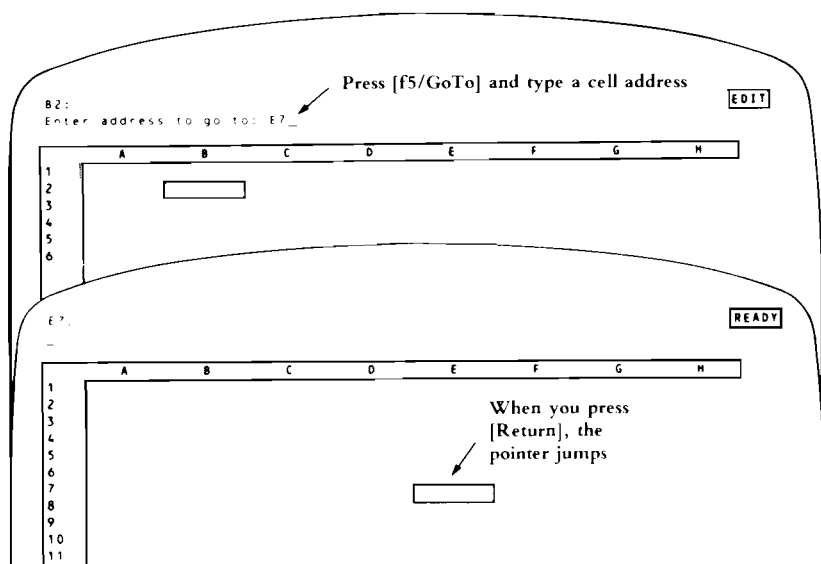


Figure 4-4. Using the [F5/GoTo] Key

Moving the Window by Pages

You can think of the entire worksheet as being divided into *screenfuls* or *pages*. Typically, pages are 20 rows high and several columns wide. The *Titles* and *Split-Window* facilities alter the effective size of the window (page 10-9). Chapter 10 describes in detail how these two /Worksheet command options allow you to change what you see on your window screen. In addition, the last pages of this chapter explain the features of moving your cell pointer during Split Screen or Titles.

Just as the arrow keys allow you to move the pointer cell-by-cell, several window-movement keys allow you to move the window around the worksheet page-by-page (Figure 4-5):

Key	Function
[Tab]	Moves one page to the right (equivalent: [CTRL ►])
[BackTab]	Moves one page to the left (equivalent: [CTRL ◀])
[Next]	Moves one page down (press [Extend char ▼])
[Prev]	Moves one page up (press [Extend char ▲])

Note what happens to the cell pointer during this movement: With [Prev] and [Next], it moves to the same relative position on the new page; with [Tab] and [BackTab], it moves to the first column of the next page, staying in the same row.

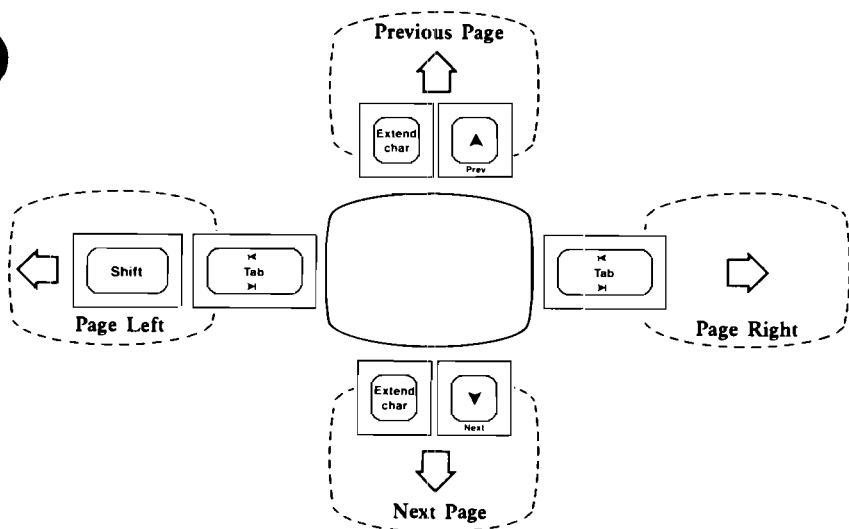


Figure 4-5. Moving by Pages

The Scroll Lock Facility

We saw above that when you move the cell pointer with the arrow keys, it sometimes pushes the window in the direction of movement. Sometimes, though, you'll want to move the window just a bit—without necessarily moving the cell pointer. That's where the *Scroll Lock* facility comes in.

We will refer to function key [f12], as the [f12/Scroll Lock] key. (Remember that [f12/Scroll Lock] represents the keystrokes [Shift]-[f4].) Pressing [f12/Scroll Lock] turns *on* the Scroll Lock facility. A *SCROLL* indicator appears in the lower right corner of the screen to confirm this. Pressing the key again turns Scroll Lock *off*, erasing the indicator at the same time.

What does this key do? Figure 4-6 shows how the meaning of ▼ is affected by pressing [f12/Scroll Lock].

Notice how the cell pointer creeps toward the top of the screen when you use ▼ in conjunction with [f12/Scroll Lock]. Eventually, the pointer will hit the top of the screen. If you keep moving the window with ▼, the pointer will get “pulled along”.

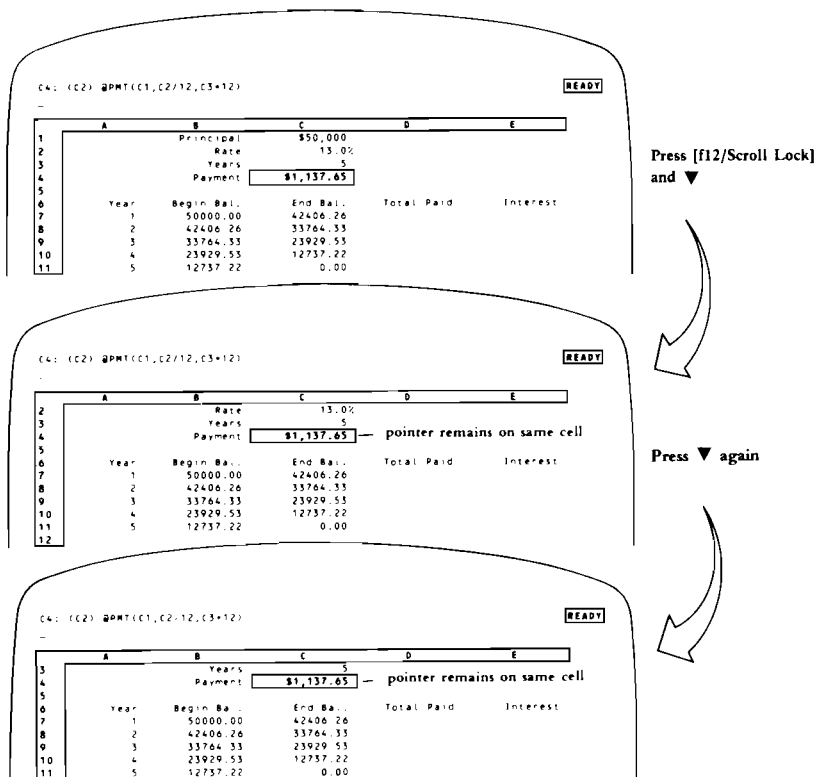


Figure 4-6. Using [f12/Scroll Lock]

Scroll Lock OFF. The arrow keys move the cell pointer. At the edge of the window, moving the cell pointer “pushes” the window in the direction of movement.

Scroll Lock ON. The arrow keys move the window. When the pointer is at the edge of the window, moving the window “pulls” the cell pointer in the direction of movement.

The [Select] Key

The [Select] key allows pointer movement that **uses the contents** of the worksheet as a travel guide. When you use [Select] in conjunction with any of the arrow keys, the pointer moves in the direction of the arrow to the next boundary between empty space (i.e. empty cells) and filled space (cells containing entries).

Figure 4-7 shows how pressing [Select] ▼ would move the cell pointer in a particular worksheet.

The [Select] key can be used with any arrow key to direct the movement of the cell pointer.

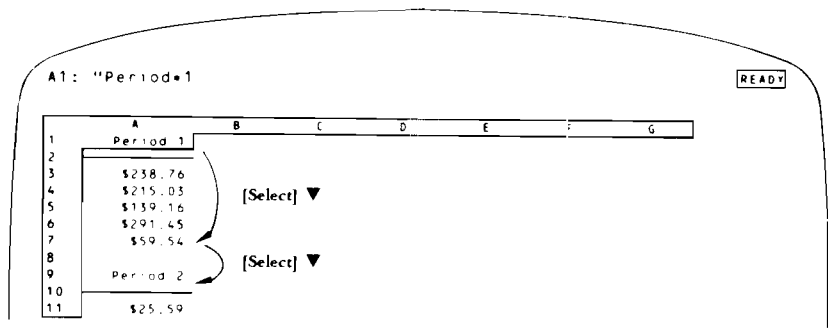


Figure 4-7. Using [Select] with an Arrow Key (▼)

The [Select]-Arrow Key Combinations

When you press [Select] in Ready or Point Mode, an *END* indicator appears in the lower right corner of the screen. If the next key you press is an arrow key, then:

- If the pointer is on an empty cell, it moves in the arrow's direction to the first non-empty cell (or to the edge of the worksheet).
- If the pointer is on a non-empty cell, it moves in the arrow's direction to the last non-empty cell before an empty cell (or to the edge of the worksheet).

But, if the next key you press after [Select] is NOT an arrow key:

- Pressing [Select] then ▼ moves the pointer to the lower right corner of the worksheet's active area. For a more complete explanation of "active area", please see the next section and Figure 4-8.
- If you press any other key after [Select], 1-2-3 remembers the [Select] and keeps displaying the *END* indicator to help you remember. You can type an entry, issue a command, and generally proceed with your work. But the next time you press an arrow key to move the cell pointer, 1-2-3 will perform a [Select]-type jump rather than move a single cell.

Note. It is recommended that you NOT use the [Select] key facility in this way. Even with the *END* indicator to help, you might forget having pressed [Select] and wind up with an unexpected result.

- Pressing [Select] twice in a row is a special case. The second [Select] means "never mind"—it cancels the first one.

Moving to the End of the Active Area

At any time, you are using only part of the entire 256-column, 2048-row worksheet. Figure 4-8 shows what 1-2-3 considers to be the lower right corner of the worksheet's active area:

The **active area** of a worksheet is the rectangle with its upper left corner at cell A1 and its lower right corner at the intersection of the last column and the last row in which you've made an entry (page 5-1), set a display format (page 11-2), or altered the protection status (page 11-6).

There are many situations in which you might want to move the cell pointer to the end of the active area: printing the entire worksheet, splitting a worksheet into screen-size pages, etc.

1-2-3 allows you to do just that. In Ready or Point Mode, pressing [Select] then ▼ moves the cell pointer to the lower right corner of the active area of the worksheet.

In general a larger active area requires more main memory to store it. It's possible to exhaust the computer's main memory, even if you haven't filled all the cells in the worksheet. In such situations, 1-2-3 *beeps* and displays a "Memory Full" error message. To avoid this, try to keep the active area compact. (See the /Worksheet Status command.)

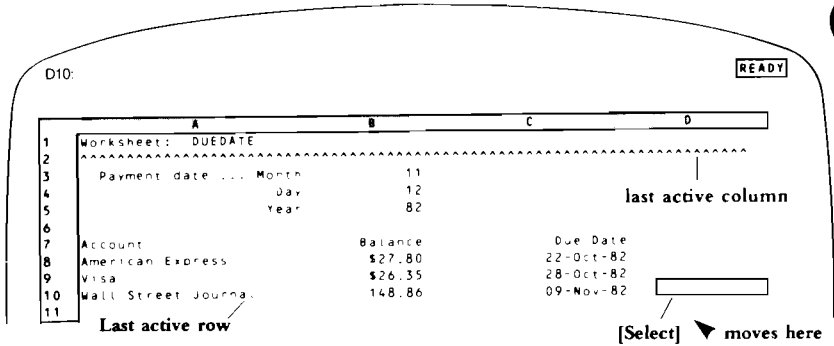


Figure 4-8. Moving to the End of the "Active Area"

Moving the Cell Pointer with Special Windows (Titles, Split Screen)

The **Titles** facility expands the border around the upper left corner of the worksheet to include the first rows and/or columns (Chapter 10, “Worksheet Commands”). In Ready Mode, this border is impenetrable: Trying to move the cell pointer there with the arrow keys just causes a *beep*. Since the border is enlarged, the effective size of the window into the worksheet is reduced.

But 1-2-3 *does* let you move the pointer into the Titles area when you are in Point Mode—while typing a formula or pointing to cells during a command. In these situations, duplicate copies of the Titles cells will appear on the screen.

The **Split Screen** facility allows the display screen to provide two independent windows into the worksheet (Chapter 10). The arrow keys and window-movement keys all work the way you’d expect them to—it’s just that each window is now smaller.

If you are using the Split Screen option, press the [F6/Window] key to move the cell pointer from one window to the other. In fact, your [F6/Window] function is active only when the screen is split.



5. Creating Cell Entries

One of the principal 1-2-3 skills is filling in the cells of the worksheet with entries: numbers, formulas, and labels. This chapter will explore the various ways you can enter your own particular information into worksheet cells.

There are three basic ways to make an entry into a cell:

1. Type it yourself.
2. /Copy or /Move an existing entry from another cell in the worksheet.
3. Retrieve data from a disk file—one created with 1-2-3 itself or one created with another program.

This chapter presents an overview of these three methods.

In the illustrations of this manual, your cursor position—where the next character you type will appear—is indicated by an underline or underscore. On your screen, your cursor position is identified by a blinking underscore. Though this may seem elementary to point out, it is a significant point to be aware of: You will need to move the cursor very specifically to make changes in the middle of any entry (refer to “Edit Mode” in Chapter 5, page 5-8).

Typing Entries

To type an entry into a particular cell, move the cell pointer there. (That is, make your cell the current cell.) Then, type the entry, ending with **[Return]**. As you type, each letter appears on the second line of the control panel, above the worksheet (Figure 5-1).

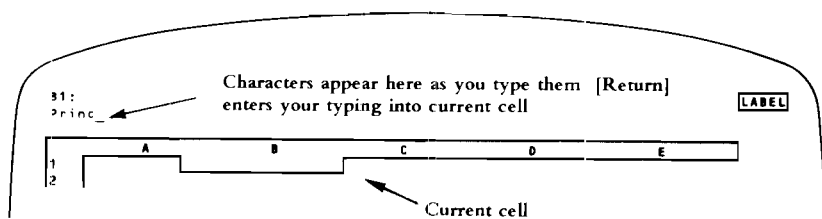


Figure 5.1. Typing a Cell Entry

To tell 1-2-3 that you're finished typing an entry, press **[Return]**. When you do so, 1-2-3 stores the entry in the current cell. If something already was stored in the cell, the new entry replaces it. There's no way to recover the old entry.

After you complete an entry, the second line of the control panel is cleared, and 1-2-3 displays the entry on the first line (Figure 5-2).

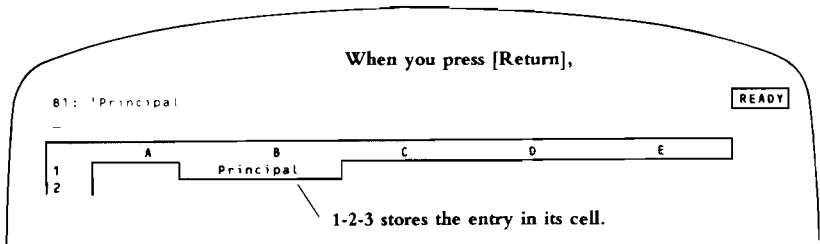


Figure 5-2. Completing an Entry with [Return]

Long Entries. A cell entry can be up to 240 characters long, quite a few more than 1-2-3 can display on the second line of the control panel. If you fill this line, the characters begin to scroll off to the left as you continue typing, allowing you to see the additional characters. As the screen scrolls right, you temporarily lose sight of the line until you press [Return].

Completing an Entry with the Pointer-Movement Keys

Chances are that after you finish one entry, you'll want to move the pointer to another cell, perhaps to type another entry. To speed up this process a bit, you can finish an entry by pressing any of the keys that move the cell pointer, instead of pressing [Return].

Any one of these pointer-movement keystrokes has the effect of two: (1) it records the entry in the current cell; and, (2) it moves the pointer to another cell (Figure 5-3).

Key	Result
▶	Moves one cell right
◀	Moves one cell left
▲	Moves one cell up
▼	Moves one cell down
[Tab]	Moves one page right
[BackTab]	Moves one page left
[Prev]	Moves one page up
[Next]	Moves one page down
[Select]	With an arrow key, moves in that direction to next boundary between empty and filled space

Note. Pressing the [Tab] key alone invokes the [Tab] (forward tab) function. Holding down [Shift] and pressing [Tab] invokes the back tab function [BackTab].

Press **▼** to complete entry

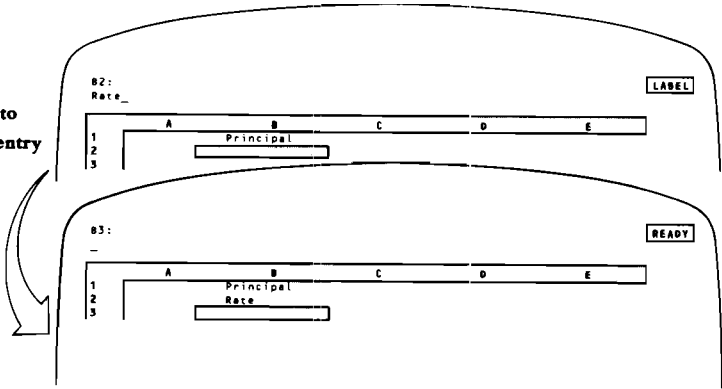


Figure 5-3. Using a Pointer-Movement Key to Complete an Entry

After You Press the [Return] Key

When you complete a cell entry by pressing [Return] or a pointer-movement key, the following things occur:

- 1-2-3 checks the entry for errors. If there aren't any, 1-2-3 stores the entry in the current cell. If it finds an error, 1-2-3 beeps at you, places the cursor at the location of the problem (or at the end, if it isn't sure where the problem is), and switches to Edit mode. (For a discussion of entry errors, see "Rules for Entering Numbers", page 5-4, and Chapter 8, "Writing Formulas".)
- If you have left 1-2-3 in its initial Recalculation setting of *Automatic*, 1-2-3 recalculates every formula in the worksheet. The order in which it does so is determined by the Recalculation order setting. It is also possible to have 1-2-3 perform several recalculation cycles at once. (For a discussion of recalculation options and capabilities, see page 10-6.)
- 1-2-3 updates the display screen, incorporating the new entry, its effect upon the rest of the worksheet, and the results of the pointer-movement key (if you pressed one).
- 1-2-3 returns to Ready mode, displaying the *READY* indicator in the upper right corner of the screen.

When you make a cell entry during a /Range Input command or when using a keyboard macro, things work a bit differently. See pages 9-8 and 11-17 for details.

Types of Entries

You can create three types of entry: numbers, formulas, and labels. 1-2-3 can tell how to interpret your entry by the first character you type: a number, a symbol for an arithmetic or logical operation, or a label prefix.

Entering Numbers and Formulas

If you start an entry with one of these characters, 1-2-3 assumes that you're entering a number or formula:

0 1 2 3 4 5 6 7 8 9 + - . (@ # \$

1-2-3 announces this assumption as soon as you type the first character, by changing the *READY* indicator in the upper right corner to *VALUE*.

It's easy to see why 1-2-3 would think that you're making a numeric entry with the first few of these characters: They are the basic building blocks of numbers and simple arithmetic expressions. The characters @ and # are used to form more sophisticated formulas, those involving *functions* and *logical conditions*. \$ is used for a similar purpose—to create *absolute cell addresses* in formulas. (For details regarding these topics, see Chapter 8, "Writing Formulas".)

Rules for Entering Numbers

There are a few rules you must follow when entering numbers. If an entry doesn't follow these rules, 1-2-3 won't accept it. Instead, when you press [Return], 1-2-3 will *beep* and automatically place you in Edit Mode (page 5-8), with the cursor at the location of the problem. *Here are the rules for entering numbers:*

1. A number may begin with a digit (0..9), a plus or minus sign, a period, or \$.
2. A number may end with % to indicate percent. This character has the same effect as /100—it divides the preceding number by 100.
3. A number may have at most one decimal point (the period character).
4. You may not use any commas or spaces when entering a number. But you can have 1-2-3 display numbers using commas and other *formatting* characters (Chapter 10, "Worksheet Commands").
5. You may end a number with a power-of-10 scaling factor known as **scientific format**. For instance:

6.02E23

integer between -99 and 99

"e" or "E"

positive or negative number

Rules for Entering Formulas. The rules for specifying calculations based on cell entries are more involved. (For details, see Chapter 8, "Writing Formulas".)

Two Special Numbers—NA and ERR

Naturally, you'll want the worksheets you construct to faithfully reflect the interrelationships between cells. Suppose you write a formula that makes the value of cell A15 depend on the value of cell A9. Any of these situations might arise:

- You don't know a value for cell A9—the value is “not available”.
- Cell A9 contains a formula that defines an impossible calculation (e.g. divide a number by zero).
- Cell A9 is mistakenly obliterated by a 1-2-3 command: /Move or /Worksheet Delete.

1-2-3 handles these situations by using two special numbers:

NA. You can enter @NA into any cell instead of a number. 1-2-3 displays the cell's value as NA, meaning **not available**. When it recalculates formulas, 1-2-3 ripples this lack of data throughout the worksheet: Any cell whose value depends on an NA cell also has the value NA. Exception: See the @COUNT function, page 19-7.

ERR. The @ERR function is similar to @NA. 1-2-3 displays the cell's value as ERR, meaning error. And the ERR value ripples throughout the worksheet when 1-2-3 recalculates formulas. Exception: See the @COUNT function, page 19-7.

You can use @ERR entries to build worksheets that are smart enough to alert the user when he enters a value that you decide is “illegal”. And 1-2-3 itself sometimes makes the value of a cell ERR: Whenever a cell contains a formula that defines an impossible calculation, 1-2-3 displays ERR there.

Figure 5-4 provides an example in which both these situations occur. (Cell B6 contains an @HLOOKUP function, described on page 19-10.)

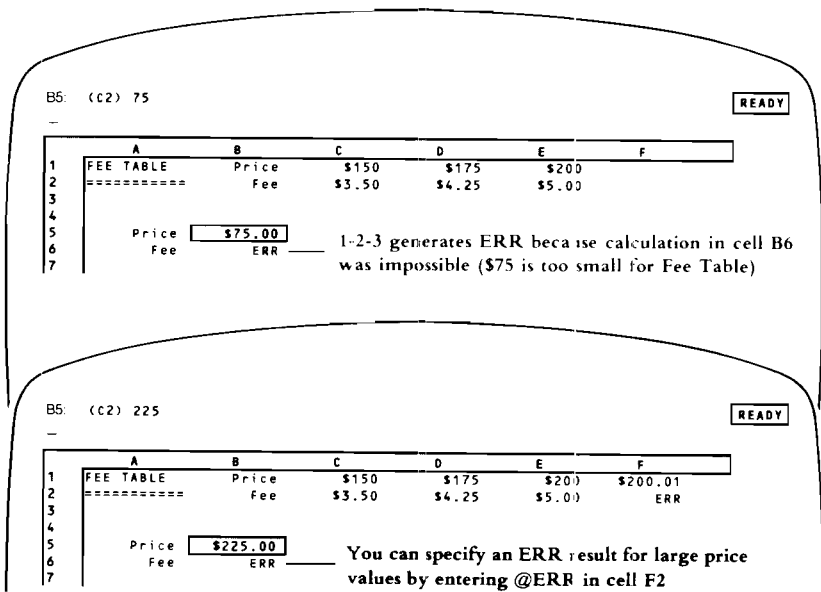


Figure 5-4. The Special Number ERR

Entering Labels

If the first character you type is not among those number-indicators listed in the previous section, 1-2-3 assumes that you mean to enter a label. It announces this as soon as you type the first character, by changing the *READY* indicator to *LABEL*.

(Exceptions: The slash character (/) starts a 1-2-3 command. Function keys [f1/Help] through [f10/Graph] and [f12/Scroll Lock] invoke 1-2-3 functions.)

Label-Prefix Characters

A few of the characters you can use to start a label are special. First, they tell 1-2-3 that the entry being typed is a label, not a number or formula. In addition, these **label-prefix** characters specify how 1-2-3 is to display the label text in the cell—left-aligned, right-aligned, centered, or repeated (Figure 5-5):

Prefix character	Label alignment
' (apostrophe)	left-aligned
" (double-quote)	right-aligned
^ (caret)	centered
\ (backslash)	repeating

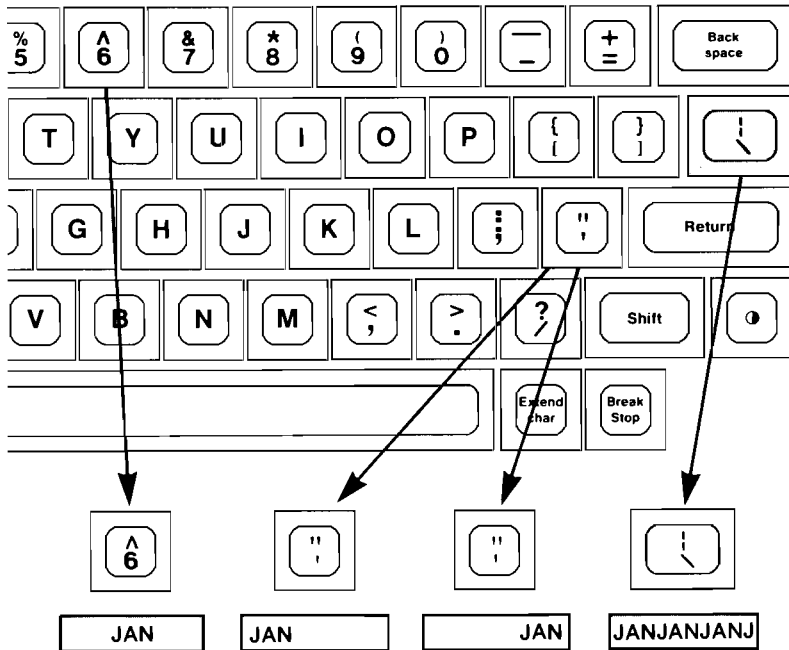


Figure 5-5. Label-Prefix Characters

Must you start a label with a prefix character? In most cases, the answer is No. Since 1-2-3 often assumes from your first keystroke that you're typing a label, you need not enter a prefix. In this case, 1-2-3 automatically places a prefix-character at the beginning of your label when you press [Return]. (For details, see the /Worksheet Global Label-Prefix command, page 10-14.)

You will want to start a label with a prefix-character in two situations:

1. **To force a particular label alignment.** For instance, if left-aligned labels are the current standard, you can force a label to be right-aligned by starting it with a double-quote:

"MONTHLY RATE

2. **To prevent 1-2-3 from assuming the entry is numeric.** Label-prefix characters can help 1-2-3 to correctly interpret a label entry when its first character is a number, such as:

78 HIGHLAND AVENUE.

Be sure to start the entry with a label-prefix character. (If you try to make an entry like this without a prefix, 1-2-3 will *beep* and place you in Edit Mode.)

At first, you may find these label-prefix characters a bit tricky. **Is the prefix really part of the label?** Well, yes and no:

YES. 1-2-3 stores the prefix character you type as part of the cell entry. Once a label has been entered, you can see its prefix character by moving the cell pointer to the cell. (The current contents of the cell at the pointer location are displayed on the first line of the control panel.) 1-2-3 uses this character to align the label each time it displays the cell.

NO. The prefix character itself does not appear on the screen when 1-2-3 displays the cell.

Value Mode and Label Mode

After you complete an entry, 1-2-3 must draw the distinction between a value and a label—one is an instruction to calculate, and the other merely a string of characters to be displayed. Therefore, 1-2-3 must know whether you are entering a numeric value (Value Mode) or a label (Label Mode).

But why distinguish the entries while you're typing them? The answer is that 1-2-3 allows you to do "something extra" when you're entering a number or formula—using the cell pointer to indicate the cells to be used in a formula, rather than typing their addresses. (*Pointing* is described in Chapter 8, "Writing Formulas".)

Fixing Mistakes—Changing Your Mind

One of the great advantages of 1-2-3 is the ease with which it allows you to change your mind. You can change an entry while you're in the middle of typing it. Or you can return to it later, to revise or replace it. The same facilities are also handy on those rare occasions when you make a mistake.

These pages describe the various ways you can change entries, proceeding from the simple to the sophisticated.

The [Backspace] Key

The [Backspace] key, located two rows above [Return], works very much like the backspace key on a typewriter. In Value or Label Mode, pressing [Backspace] erases the last character you typed.

Cancellation—[ESC]

Whenever you're typing an entry—in Value or Label Mode—you can cancel the entire entry and return to Ready Mode just by pressing [ESC]. However, you must do this before pressing [Return] or a pointer-movement key.

If you're entering a formula and are in Point Mode when you decide to cancel, you may have to press [ESC] two or more times.

As a shortcut, you can issue a *Break*—simply press [Break]. A *Break* is the closest thing 1-2-3 has to a “panic button”: it cancels whatever you're doing and returns you to Ready Mode.

Replacement—[Return] Again

The easiest way to change a short entry after it has been entered is to replace it with another. Just move the cell pointer to the cell, then type another entry, ending with [Return]. The cell's original contents are lost, so make sure you're replacing the right cell's contents and not losing something valuable.

Erasure

Use the /Range Erase command to erase the contents of one or more cells. Erasing is *not* the same as replacing with a few [Space Bar] characters. A cell that has been erased contains no characters at all.

These methods have the virtue of simplicity, but there is also a way to change an entry character-by-character, rather than simply starting over again: Edit Mode.

Edit Mode

Sometimes, it's necessary to make a change to an entry other than erasing the last character you typed.

For instance:

- You are typing the label “Forth Quarter Profits—1982” and remember that the first word has a “u”.
- In reviewing a worksheet you’ve already created, you decide to replace “C3” with “C15” in the formula:

+D4*C3*@HLOOKUP(A7,D6..G14,3)

To allow this sort of change, 1-2-3 has an **Edit Mode**. You can invoke Edit Mode while you’re typing an entry. Or you can move the cell pointer to any cell that requires a change and revise the entry previously made there.

Entering Edit Mode. To enter Edit Mode while you’re typing an entry or while you’re roaming about the worksheet, press the [F2/Edit] key. The indicator in the upper right corner changes to *EDIT*.

Sometimes, 1-2-3 *automatically* places you in Edit Mode: if you enter a number or formula that it can’t understand, 1-2-3 *beeps* and permits you to edit the entry. For instance, this occurs when you type a label that starts with a digit, but you forget to type a label-prefix character.

In Edit Mode, 1-2-3 places a copy of the cell’s number, label, or formula on the second line of the control panel. It places the cursor at the end of the entry. You can change the entry by moving the cursor, deleting characters, and inserting characters.

Moving the Cursor.

In Edit Mode, these keys have different meanings than in Ready Mode:

Key	Function in Edit Mode
◀	Moves cursor 1 character to left
▶	Moves cursor 1 character to right
[BackTab]	Moves cursor 5 characters to left (see Note below)
[Tab]	Moves cursor 5 characters to right (see Note below)
▼	Moves cursor to first character
[Select]	Moves cursor to last character

Note. Pressing the [Tab] key alone invokes the [Tab] (forward tab) function. Holding down [Shift] and pressing [Tab] invokes the [BackTab] (back tab) function.

Deleting. 1-2-3 has two different ways to delete individual characters: [Backspace] works right-to-left while [–Char] and [DEL] work left-to-right.

Key	Function
[Backspace]	Deletes character preceding cursor and close space
[–Char]	Deletes character at cursor and close space. (Equivalent: [DEL])

The keyboard’s auto-repeat feature is particularly useful with these editing keys. When you hold a key down, it acts once, pauses for a short time, then repeatedly acts until you release the key.

Inserting. Just type new characters to be inserted at the cursor position. 1-2-3 always inserts new characters in Edit Mode. There's no way to "overstrike" or "replace" characters.

The [F9/Calc] Key. In Ready Mode, pressing [F9/Calc] causes 1-2-3 to perform a recalculation pass on all formulas in the worksheet. But you can also use [F9/Calc] in Edit Mode, when you are editing a formula. It converts the formula into a number—the formula's current value. No general recalculation takes place. (Remember that [F9/Calc] represents the keystrokes [Shift]-[F1].)

Be careful—there's no way to convert the number back into the formula!

Getting Out of Edit Mode

When you are finished editing any entry, you can press [Return] to store the revised entry in the cell. 1-2-3 treats it exactly like any other new entry.

If you want to get fancy, there are some alternatives. The vertical-movement keys—▲, ▼, [Prev], [Next]—all store the edited entry and move the pointer, as described above. Be careful, though—the other pointer-movement keys have different meanings in Edit Mode than in Label and Value Modes.

If you invoked Edit Mode from Value or Label Mode, you can return to your previous mode by pressing [F2/Edit] again. Use [F2/Edit] while making a single entry to switch back and forth between Edit Mode and Value or Label Mode.

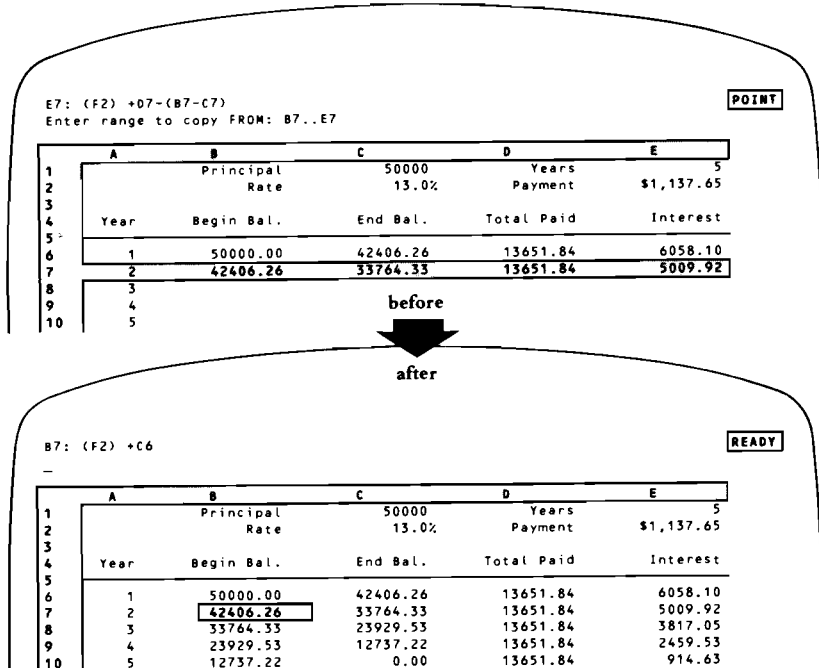


Figure 5-6. Creating New Entries with the /Copy Command

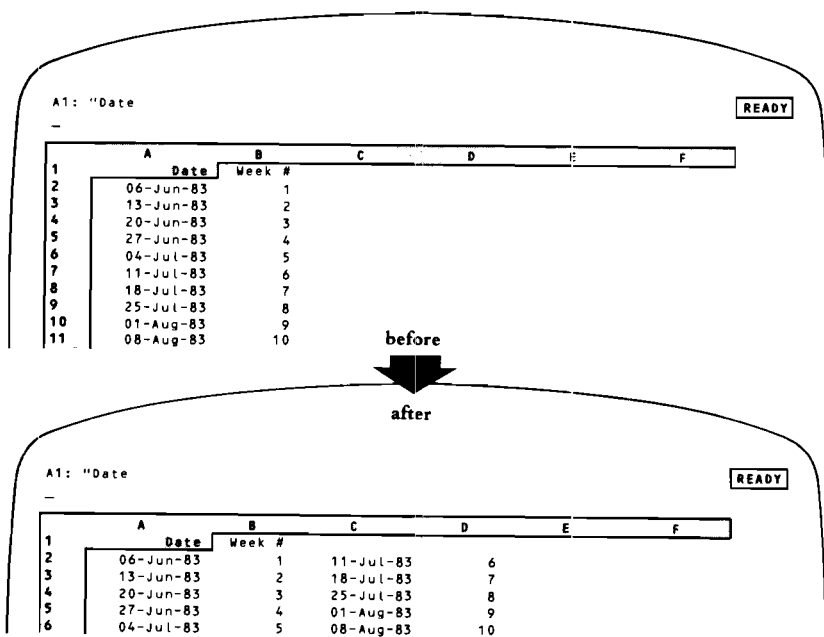


Figure 5-7. Transferring Entries with the `/Move` Command

Transferring Entries from Other Cells

Two of 1-2-3's most powerful commands—`/Copy` and `/Move`—transfer entries from cell to cell. The `/Copy` command saves you the trouble of typing the same thing over and over again. It's particularly useful in building worksheets that use similar formulas in many different cells. For instance, `/Copy` can quickly create a five-year projection (Figure 5-6).

The `/Move` command helps you to redesign a worksheet without having to retype formulas. A few `/Moves` alone—no formula retyping—can quickly transform the appearance of a worksheet (Figure 5-7).

Retrieving Entries from Files

Storage in the computer's main memory is temporary: Your work disappears when you end a 1-2-3 session or when you shut off the machine. To provide for long-term storage, 1-2-3 has a flexible and sophisticated system for using data stored in disk files.

You can load data from disk storage into a worksheet as numeric (number and formula) entries and/or as label entries. The most common usage is to reload a worksheet that you created previously and stored (/File Save and /File Retrieve). But you can also perform more sophisticated data retrieval operations, such as combining worksheets (/File Combine), loading partial worksheets (/File Combine again), and importing data produced by other programs (/File Import).

(For details on using 1-2-3 to process information in files, see Chapter 14, "File Commands".)

6. Using 1-2-3 Commands

During every 1-2-3 session, you issue **commands**. For instance the way to end a 1-2-3 session is to issue the /Quit command. Other 1-2-3 commands perform such function as:

- Copying, moving, and deleting data from the worksheet.
- Transferring data between the worksheet and disk storage.
- Printing reports.
- Drawing graphs.
- Processing 1-2-3 databases.

Complete details concerning the individual 1-2-3 commands appear in Chapters 10 through 18 of this manual. In this chapter, we discuss command-issuing techniques in general.

1-2-3 commands are easy to use because they are interactive: a particular entry by you evokes a corresponding response from 1-2-3's command structure. A command may have one or more steps. At each step, 1-2-3 tells you what to enter next: a number, a range, a filename, etc. Messages from 1-2-3, called **prompts**, appear on the second and third lines of the control panel. Here are some typical messages from 1-2-3:

Second Line Prompts Tell You What to Do

Enter range to copy FROM;
 Enter name of file to retrieve:
 Enter Sort order (A or D):

Third Line Prompts Offer Menu Choice Explanations

Copy a cell or range of cells
 Cancel graph settings
 Percent format (x.xx%)
 End 1-2-3 session (Have you saved your work?)

After you've entered all the specifications, 1-2-3 executes the command and (usually) returns to Ready Mode. Let's take a closer look at each of the steps involved in using a 1-2-3 command:

1. Selecting a command
2. Responding to prompts
3. Executing a command

Selecting a Command

Each 1-2-3 command has a name, consisting of one or more **command keywords**. For example:

- /Copy
- /Range Erase
- /Worksheet Column-Width Set
- /Quit
- /Graph Options Titles

1-2-3's commands are organized into a multi-level menu system. You build up a command name by selecting one keyword at a time from menus that 1-2-3 displays in the control panel. The only thing that 1-2-3 doesn't automatically tell you is how to start:

To start a command, press / when you're in Ready Mode.

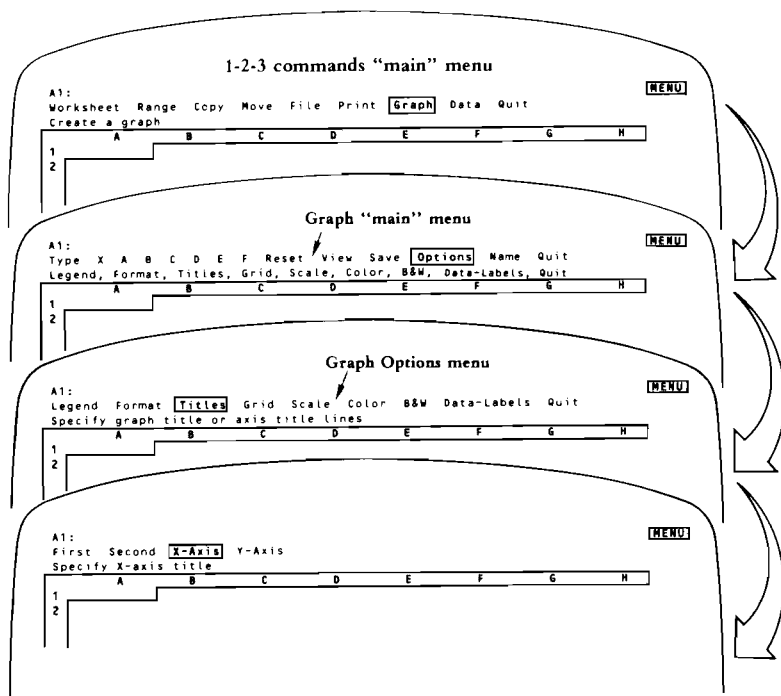


Figure 6-1. Selecting a 1-2-3 Command

Thereafter, 1-2-3 displays menus of keywords to keep you informed of the choices (Figure 6-1). You can select a keyword from each menu in either of two ways:

Move the menu pointer (highlight) to a command keyword in the displayed menu, then press [Return]. Use the pointer-movement keys—1-2-3 knows to move the **menu pointer**, not the cell pointer. As you move the pointer among the keywords, an explanatory prompt for each one appears on the line below. (Page 6-8.)

Type the keyword's first letter. Type in uppercase or lowercase—they're equivalent in 1-2-3 commands. The location of the pointer when you do this is irrelevant. There's no possible ambiguity—1-2-3's command menus are constructed so that each command keyword in a given menu begins with a different letter.

Typing is the faster of the two methods. After a few 1-2-3 sessions, you'll begin to think of the commands you use most often in terms of their code letters:

/Worksheet Insert Column is the /WIC command

/Graph Options Legend is the /GOL command

Feel free to mix methods—i.e. you can select one keyword by pointing, the next by typing, the next by pointing, and so on.

Responding to Prompts

After you select a command, 1-2-3 prompts you to supply additional information. Sometimes you supply this information through additional menu choices. In these cases, the additional information menus and keyword menus blend together—and, in fact, there's no particular need to distinguish among them.

In other cases, 1-2-3 prompts you to enter information on the second line of the control panel—such as a filename, a range specification, a label for a graph you're constructing, or a number. Here are some general notes regarding this process:

Filenames and Graph Names. Whenever 1-2-3 prompts you to enter a filename, it helps you by displaying a menu that lists all files of the appropriate type that are stored in the *current directory*. You can select one of these names by pointing to it. Or you can enter any filename by typing it.

Similarly, 1-2-3 prompts you with a list of existing graph names when you are creating, deleting, or using a particular graph name (page 16-13).

Range Names. When 1-2-3 prompts you to indicate a range, pressing [f3/Name] displays a menu of the currently defined range names. You can select one of these names by pointing to it. Alternatively, you can specify any range by typing its name, or by typing the cell addresses of two diagonally opposite corners (Chapter 7, "Indicating Cell Ranges").

Typing New Entries. In many cases, 1-2-3 prompts you to type a new entry (Figure 6-2). Note that 1-2-3 automatically goes into Edit Mode so that you can use the pointer-movement keys to revise your response as you're typing it.

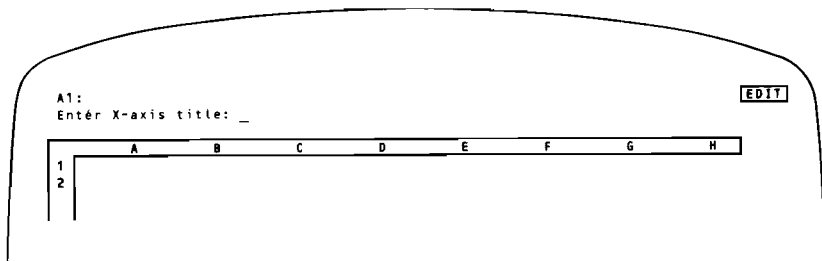


Figure 6-2. Command Prompt—Typing a New Entry

Revising Entries. In other cases, 1-2-3 both displays a prompt and starts you out with some text—a default value or an entry that you previously made at the same prompt (Figure 6-3). The idea is that it's probably easier for you to accept or revise an existing entry than to type a new one from scratch.

- To accept the entry, just press **[Return]**.
- You are in Edit Mode, so you can revise the entry using the pointer-movement keys, **[-Char]**, and **[Backspace]**.
- If you'd rather type a new entry, press **[ESC]** once to clear the text from the prompt line, then start typing. (This is the way Edit Mode always works.)

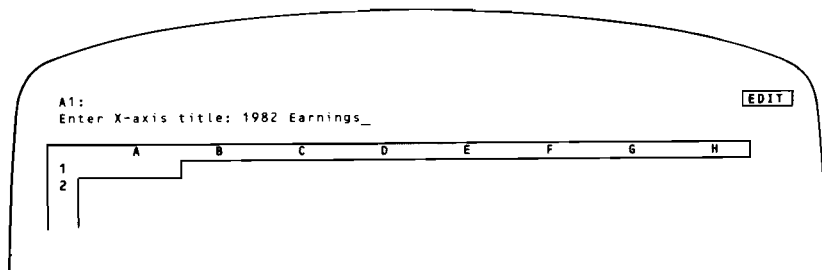


Figure 6-3. Command Prompt—Revising an Existing Text

Exception: In some cases, 1-2-3 displays an existing or default value, but you can't revise it. Your choices are to press **[Return]** to accept the value or to type a new value to replace it (Figure 6-4).

Executing a Command

When you've supplied 1-2-3 with all the information it needs, it executes the command. After command execution, a formula recalculation pass may take place. If the current recalculation method is *Automatic* and the command has changed the contents of any cell, then 1-2-3 recalculates every formula in the "new" worksheet—the worksheet as affected by the command—at least once. (For a discussion of how 1-2-3 recalculates formulas, see page 10-5.)

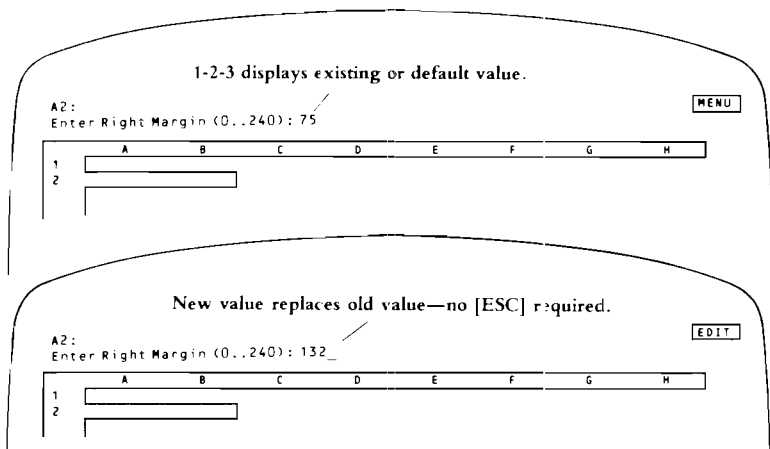


Figure 6-4. Command Prompt—Replacing an Existing Entry

After Command Execution

After 1-2-3 executes a command, it usually returns to Ready Mode. You can then enter another command, move the cell pointer, or type an entry.

Sticky Menus. In some cases, however, 1-2-3 anticipates that you'll want to issue several related commands in succession. For this reason, it does not return to Ready Mode, but “sticks” in the menu of related commands (Figure 6-5).

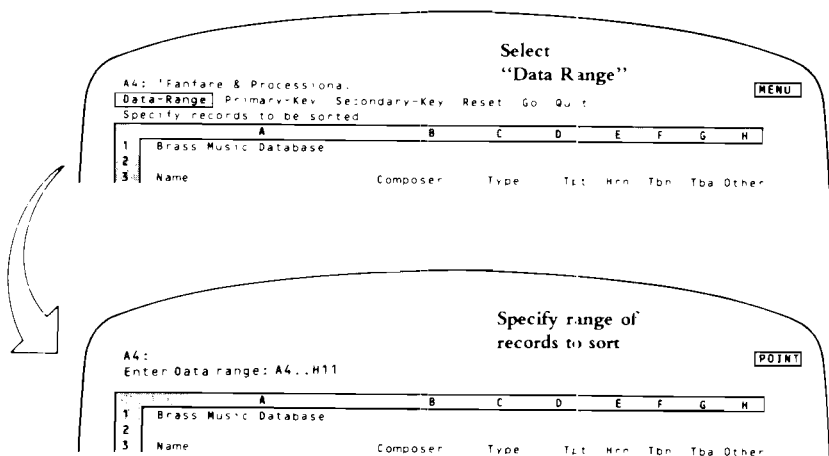


Figure 6-5. Sticky Menus (continued on next page)

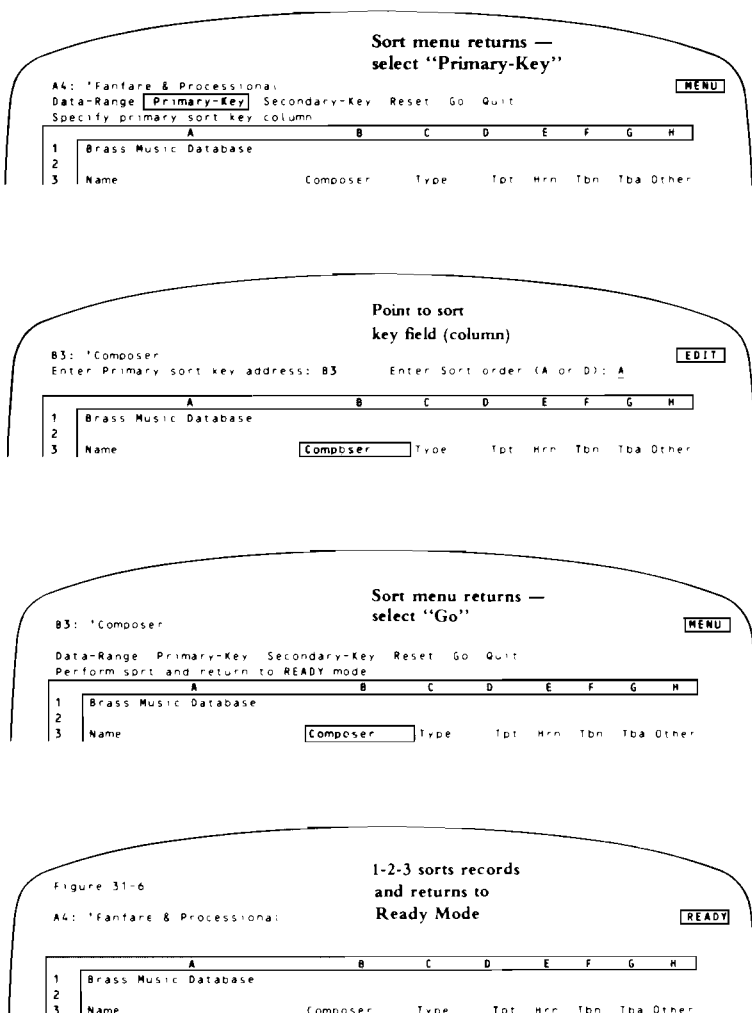


Figure 6-5. Sticky Menus (continued)

These “sticky” menus all have Quit options to provide a path back to Ready Mode. In some cases, several such menu stand between you and Ready Mode, requiring several Quits. As an alternative to Quit, you can return to Ready Mode by *undoing* the command, as explained in the next section.

Undoing Commands

What happens if you issue the wrong command by mistake? If you catch yourself before 1-2-3 has executed the command, then it's simple:

[ESC]. Each time you press [ESC] while you are entering a command, 1-2-3 backs up one step (Figure 6-6).

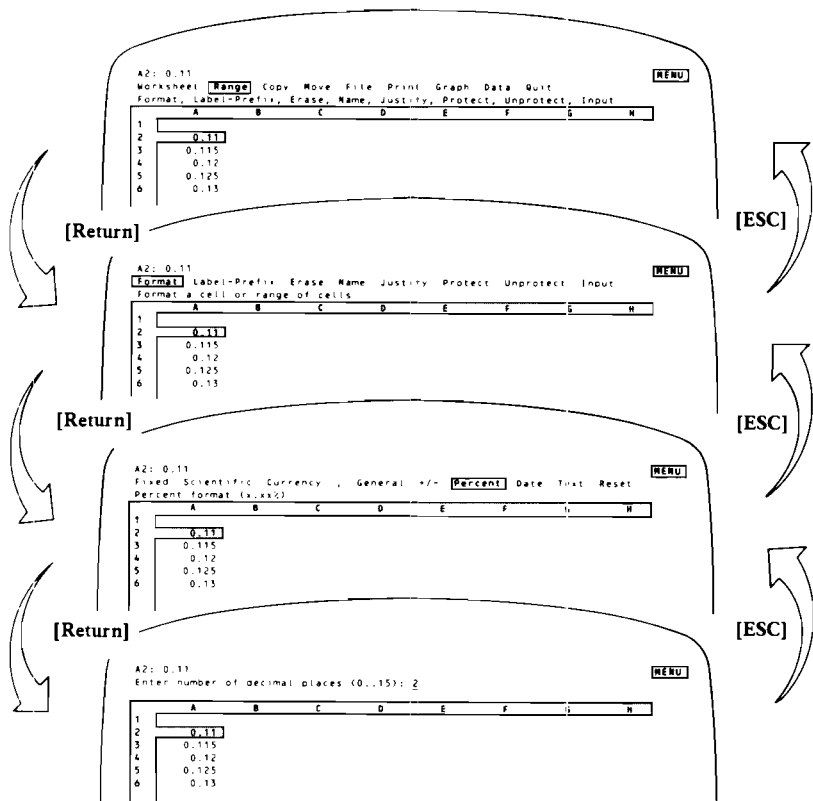


Figure 6-6. Undoing a Command Selection

[Break]. Issuing a *Break*—pressing [Break] (that is, holding down [Shift], then pressing [Stop])—cancels a command and returns you to Ready Mode. A *Break* is like pressing [ESC] enough times to undo whatever you started.

But how do you undo a command that you've already executed? This is a bit tougher, since it depends on how much damage you've done. See the "Command Skills" section of this manual to determine the best way to proceed.

Using Menus

One of the cardinal principles of the computer world is:

The more characters you type, the greater your chances of making a mistake.

And one of the main questions asked by users of computer programs is:

What do I do next?

In recognition of both these points, 1-2-3 often uses **menus** to communicate with you. A menu is simply a list displayed in the control panel that informs you of your options and lets you select one of them. Menus play a role in several 1-2-3 command situations (Figure 6-7). (Your Personal Applications Manager, or P.A.M., is also "menu-driven".)

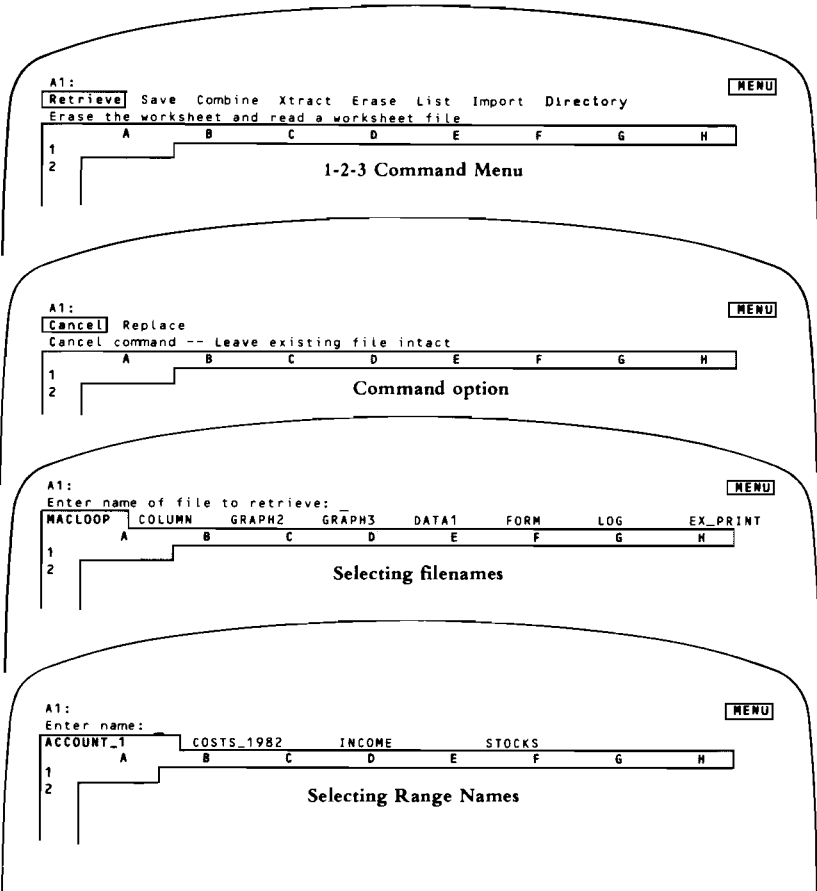


Figure 6-7. Types of Menus

In some cases, the list of options is complete. When 1-2-3 shows you a list of command keywords, for example, that's all there is. You must select one of these keywords in order to proceed with the command.

In other cases, the menu is not restrictive. For example, when you issue the /File Save command, 1-2-3 displays a menu of currently existing worksheet files. You may choose one of these files, or you may type a completely new filename.

What's in a Menu?

A menu is a list of words. In the simplest cases (e.g. command keyword menus), the entire list fits on a single line, and the menu has a simple "ring" structure—the first and last entries are "next to" each other (Figure 6-8).

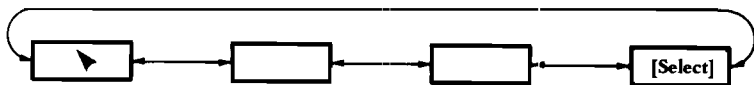


Figure 6-8. One-Line Menu

Multiple-Line Menus

When there are more items in the menu than can fit in a single line, the list has a two-dimensional structure—there's an up-down sense in addition to a left-right sense (Figure 6-9). Note that the first and last entries are still "next to" each other, even if they are several lines distant. And the several lines are linked together, again producing a "ring" structure.

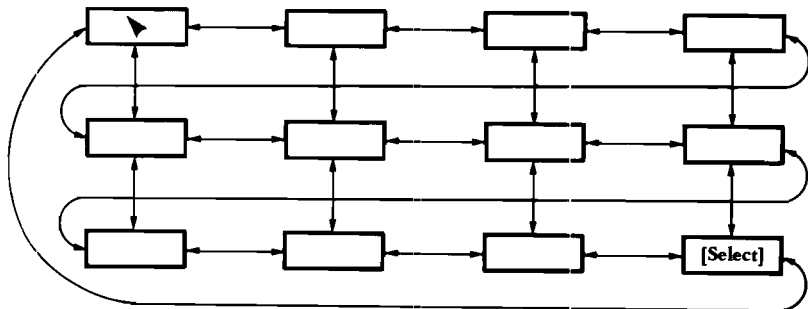


Figure 6-9. Multiple-Line Menu

Selecting Menu Choices

There are two ways to select an item from a menu: by pointing and by typing.

Pointing to Menu Choices

When 1-2-3 displays a menu, it changes the mode indicator in the upper right corner to *MENU*. In **Menu Mode**:

Move the **menu pointer** to highlight a menu item, then press **[Return]** to select the item.

The arrow keys move the pointer to the next item in a particular direction. **▼** and **[Select]** jump to the menu's first and last items, which may be on different lines.

Holding down **▶** or **◀** makes the pointer visit every item on the menu, moving between the end of one line and the beginning of the next. **▲** and **▼** work *only* with multiple-line menus.

Typing Menu Choices

As an alternative to pointing to your choice, you can type it. Here are two important points:

- When selecting a command keyword by typing, just press the first letter (uppercase or lowercase). 1-2-3 immediately goes to the next step of the command.
- When creating a new filename, range name, or graph name, you must type it in its entirety, ending with **[Return]**. After all, there's no way for 1-2-3 to display a name that you haven't used yet.

As soon as you begin typing a name, 1-2-3 realizes that you're not using the "pointing" method. Accordingly, it erases the menu and places you in Edit Mode, changing the indicator in the upper right corner to *EDIT*. This means that while you're typing, you can use the pointer-movement keys to revise the name as you're typing it.

Returning to Menu Mode

What if you start typing a filename, range name, or graph name, then decide to point to a menu choice after all? No problem—just press **[ESC]** twice:

1. The first **[ESC]** erases what you've typed so far. (You could start typing a name again at this point.)
2. The second **[ESC]** returns you to Menu Mode. The menu reappears and the pointer-movement keys will move the menu highlight.

That's a lot of flexibility. The example in Figure 6-10 should make it clear how everything fits together.

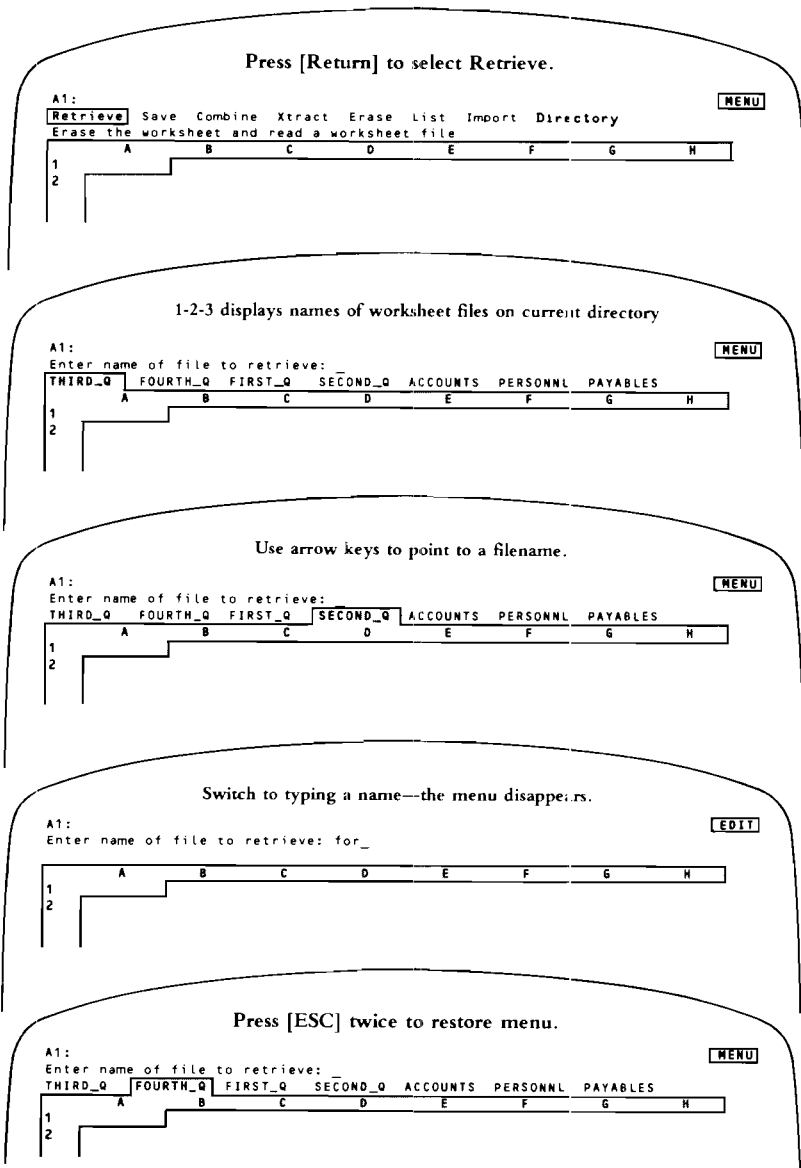


Figure 6-10. Returning to Menu Mode

Range Name Menus

In many situations, 1-2-3 prompts you to indicate a range of cells to be processed. In such cases, you can press the **[F3/Name]** key to display a menu of currently defined *range names*, then select a name (page 7-13).

7. Indicating Cell Ranges

A range is a group of one or more cells in a rectangular block. Figure 7-1 illustrates what constitutes a range and, conversely, what does not constitute a range.

Since a range is a rectangle, you can identify it by naming the cells in two diagonally opposite corners. The order in which the appropriate corner cells are presented does not matter. These four phrases all describe the same range:

from cell B5 to cell E9 from cell E9 to cell B5
from cell B9 to cell E5 from cell E5 to cell B9

In many different situations, you specify a range of cells for 1-2-3 to process as a unit. Ranges can be included in commands as well as in functions. Functions, more specifically, are invoked in order to process multiple-cell ranges. In writing commands, sometimes 1-2-3 prompts you to indicate a range. For example:

- In the /Data Fill command, you indicate a range of cells to be filled with numbers.
- In the /Move command, you indicate the range of cell entries to be relocated to another part of the worksheet.
- In the /Print command, you indicate a range of cells to be printed.

You may also specify ranges as arguments to some of 1-2-3's @ functions. In such cases, the program doesn't prompt you to indicate a range—you must be aware of the correct way to use the function. The two examples of @ functions which follow indicate ranges in parentheses, with dots separating the corner cell references. Think of an @ function with its range designation in parenthesis as telling 1-2-3: "at the specified range or cell location(s), do this function, or operation, for me."

@SUM(B10..B17)
@HLOOKUP(G25,K25..P35,3)

Functions and their arguments are explained in the "Functions" section of Chapter 8 (page 8-22) and in Chapter 19 "1-2-3 Function Reference". A complete description of each @ function is presented in the latter chapter.

Three Ways to Indicate Ranges

The examples above show you only one way of entering ranges. Just as you have many command and @ function processes to choose from, you also have a choice of how to tell 1-2-3 what constitutes a range:

1. You can type the cell addresses of two diagonally opposite corners in your range.
2. You can expand the cell pointer to highlight the entire range.
3. You can assign a specific name to your range.

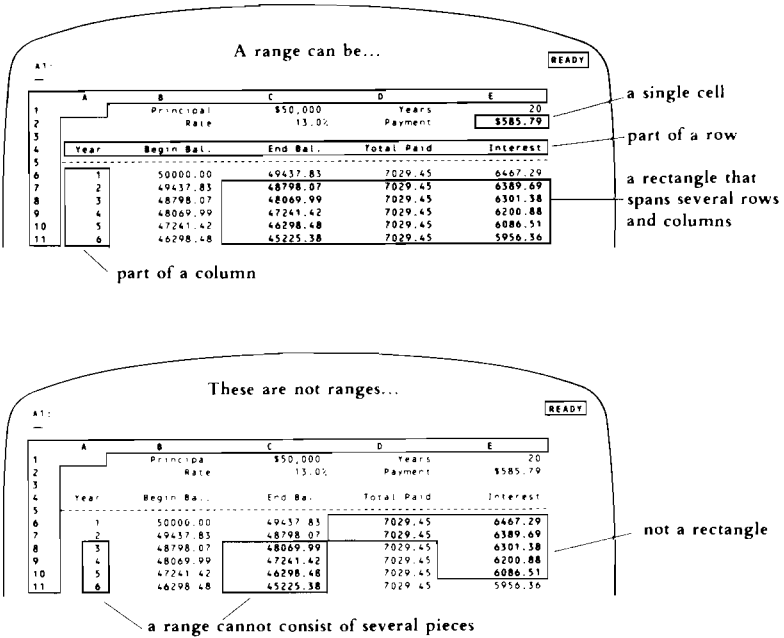


Figure 7-1. Ranges and Non-Ranges

Typing Cell Addresses

You can specify a range by typing the address of any two diagonally opposite corners (e.g., A14..C11). You must use at least one period to separate the two addresses; more than one is fine. 1-2-3 always edits your entry down to exactly two periods. Spaces, however, are forbidden in range specifications.

If you are typing a range specification in response to a 1-2-3 prompt, be sure to press [Return] when you're finished:

Enter Data range: A5..F150 [Return]

Enter range to format: G11..A20 [Return]

If you are indicating the range in the middle of a formula, don't press [Return] right away—you've got to finish the formula first! For example:

```
@max(12.5,F101..H110,D50)[Return]
+ 100 - @sum(B4..B16)/12[Return]
```

Single-Cell Ranges

In many situations calling for a range, you can use a single cell address. That's because a single cell is a range—the smallest possible one. Some commands and functions, however, require you to indicate a range consisting of more than one cell.

Conversely, there are many situations in which 1-2-3 expects the address of a single cell, but will also accept a range. This flexibility is of particular use when you use range names to identify individual cells.

Typing Absolute Ranges

Range specifications in formulas can be *relative*, *absolute*, or *mixed*, just like individual cell addresses. (For a complete explanation of these terms, see Chapter 8, "Writing Formulas".) You indicate these choices by selectively including the \$ character when typing range specifications. This chart shows the meanings of similar range specifications in a formula:

Range	Meaning in a formula typed in cell G11
G5..G8	FROM: the cell 6 rows above this one TO: the cell 3 rows above this one
\$G\$5..\$G\$8	FROM: cell G5 TO: cell G8
\$G5..G\$8	FROM: the cell 6 rows above in column G TO: the cell in row 8 of this column
\$G\$5..G8	FROM: cell G5 TO: the cell 3 rows above this one

Note. It's never necessary to use an absolute range specification while issuing a 1-2-3 command. 1-2-3 distinguishes between absolute and relative ranges only in *formulas*.

Expanding the Cell Pointer

In Ready Mode, the cell pointer highlights a single cell in the worksheet. But when you are entering a formula or responding to certain 1-2-3 prompts, you can expand the pointer to highlight an entire range.

The same keys that move the cell pointer also cause it to expand, but only after one corner of the pointer has been *anchored*. We'll take a closer look using two examples, then explain the general rules.

B6: (F2) +C1

READY

	A	B	C	D	E
4	Year	Begin Bal.	End Bal.	Total Paid	Interest
5					
6	1	50000.00	42406.26	13651.84	6058.10
7	2	42406.26	33764.33	13651.84	5009.92
8	3	33764.33	23929.53	13651.84	3817.05
9	4	23929.53	12737.22	13651.84	2459.53
10	5	12737.22	0.00	13651.84	914.63
11					

Move pointer to B6 and invoke /Range Format command. Select the "Comma,2" format. 1-2-3 prompts for a range and anchors one corner of pointer.

B6: (F2) +C1

Enter range to format: B6..B6

POINT

	A	B	C	D	E
4	Year	Begin Bal.	End Bal.	Total Paid	Interest
5					
6	1	50000.00	42406.26	13651.84	6058.10
7	2	42406.26	33764.33	13651.84	5009.92
8	3	33764.33	23929.53	13651.84	3817.05
9	4	23929.53	12737.22	13651.84	2459.53
10	5	12737.22	0.00	13651.84	914.63
11					

Use ► and ▼ to expand pointer.

E10: (F2) +D10-(B10-C10)

Enter range to format: B6..E10

POINT

	A	B	C	D	E
4	Year	Begin Bal.	End Bal.	Total Paid	Interest
5					
6	1	50000.00	42406.26	13651.84	6058.10
7	2	42406.26	33764.33	13651.84	5009.92
8	3	33764.33	23929.53	13651.84	3817.05
9	4	23929.53	12737.22	13651.84	2459.53
10	5	12737.22	0.00	13651.84	914.63
11					

Press [Return] to execute the command. 1-2-3 redisplay the range with commas inserted.

B6: (,2) +C1

READY

	A	B	C	D	E
4	Year	Begin Bal.	End Bal.	Total Paid	Interest
5					
6	1	50,000.00	42,406.26	13,651.84	6,058.10
7	2	42,406.26	33,764.33	13,651.84	5,009.92
8	3	33,764.33	23,929.53	13,651.84	3,817.05
9	4	23,929.53	12,737.22	13,651.84	2,459.53
10	5	12,737.22	0.00	13,651.84	914.63
11					

Figure 7-2. Indicating a Range in a 1-2-3 Command

Example 1: Indicating the range B6..E10 in the /Range Format command (see Figure 7-2).

1. Move the cell pointer to cell B6.
2. Type /RF to invoke the /Range Format command. After “Comma,2” format is selected, 1-2-3 makes cell B6 one corner of the range to be formatted, and automatically anchors the cell pointer there. To show this, 1-2-3 displays a prompt in the second line of the control panel:

Enter range to format:B6..B6

A blinking cursor appears in the middle of cell B6, indicating that the pointer's *free corner* is also located there.

3. Using ► and ▼, expand the cell pointer so that it covers the entire range from cell B6 to cell E10. Note how the cursor always indicates the free corner of the expanded pointer.
4. Press [Return] to finish the command. 1-2-3 obliges by formatting all 20 cells in the range.

Example 2: Entering the formula @SUM(D10..D6) in cell D12 (see Figure 7-3 on page 7-6).

1. Move the pointer to cell D12 and start typing the formula:

@SUM(

2. Use ▲ to move the cell pointer to cell D10. 1-2-3 displays each of the addresses D11 and D10 in the formula as you pass through each of these cells.

@SUM(D10

3. Press “.”. This locks the address D10 into the formula and *anchors* one corner of the cell pointer on cell D10. 1-2-3 confirms this by displaying in the control panel:

@SUM(D10..D10

(Do you see how the use of “.” here parallels its use when you type cell addresses?)

4. Press ▲ again. This time, it expands the cell pointer upward. Each time you press ▲, it expands the pointer another row. Stop at cell D6.
5. Finish the formula by typing the) character then pressing [Return]. Note that when you type the) character, two things occur: (1) the cell pointer returns to D12 (the formula cell), and (2) the character) itself is entered into the formula.

Pointing to Ranges: The Whole Story

The expanded cell pointer always covers the rectangle determined by the *anchor cell* and the *free cell*:

Move the pointer to the cell D12 and start typing: @SUM(
 Use ▲ to move pointer to one end of the range: D10.
 Then press ". " to anchor one corner of pointer.

D10: (,2) +\$E\$2*12
 @SUM(D10

POINT

	A	B	C	D	E
4	Year	Begin Bal.	End Bal.	Total Paid	Interest
5					
6	1	50,000.00	42,406.26	13,651.84	6,058.10
7	2	42,406.26	33,764.33	13,651.84	5,009.92
8	3	33,764.33	23,929.53	13,651.84	3,817.05
9	4	23,929.53	12,737.22	13,651.84	2,459.53
10	5	12,737.22	0.00	13,651.84	914.63
11					
12					

D10: (,2) +\$E\$2*12
 @SUM(D10..D10

POINT

	A	B	C	D	E
4	Year	Begin Bal.	End Bal.	Total Paid	Interest
5					
6	1	50,000.00	42,406.26	13,651.84	6,058.10
7	2	42,406.26	33,764.33	13,651.84	5,009.92
8	3	33,764.33	23,929.53	13,651.84	3,817.05
9	4	23,929.53	12,737.22	13,651.84	2,459.53
10	5	12,737.22	0.00	13,651.84	914.63
11					
12					

Use ▲ to expand pointer

D6: (,2) +\$E\$2*12
 @SUM(D10..D6

POINT

	A	B	C	D	E
4	Year	Begin Bal.	End Bal.	Total Paid	Interest
5					
6	1	50,000.00	42,406.26	13,651.84	6,058.10
7	2	42,406.26	33,764.33	13,651.84	5,009.92
8	3	33,764.33	23,929.53	13,651.84	3,817.05
9	4	23,929.53	12,737.22	13,651.84	2,459.53
10	5	12,737.22	0.00	13,651.84	914.63
11					
12					

Type ")" to "lock in" the range. Pointer returns to cell D12.
 Then press [Return] to finish the formula.

D12: (C2) @SUM(D10..D6)

READY

	A	B	C	D	E
4	Year	Begin Bal.	End Bal.	Total Paid	Interest
5					
6	1	50,000.00	42,406.26	13,651.84	6,058.10
7	2	42,406.26	33,764.33	13,651.84	5,009.92
8	3	33,764.33	23,929.53	13,651.84	3,817.05
9	4	23,929.53	12,737.22	13,651.84	2,459.53
10	5	12,737.22	0.00	13,651.84	914.63
11					
12				\$68,259.22	

Figure 7-3. Indicating a Range in a Formula

Anchor Cell. One corner of the pointer is anchored to a particular cell, which we call the **anchor cell**.

Free Cell. The corner diagonally opposite the anchored corner is free to move anywhere in the worksheet. The location of this “free” corner is called the **free cell**. As you move the free corner around the worksheet, 1-2-3 adjusts the window, if necessary, to keep this corner onscreen. 1-2-3 displays a blinking cursor in the middle of the free cell to remind you where it is (Figure 7-4).

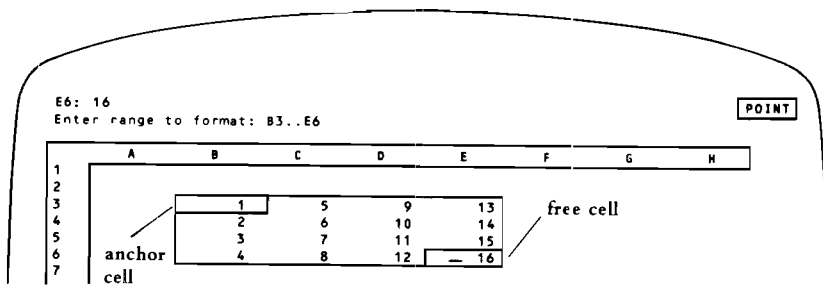


Figure 7-4. Free Cell and Anchor Cell

You move the free corner just as you move the cell pointer: in Ready Mode, by using the pointer-movement keys (Figure 7-5):

Key	Function
▶	Move one cell right
◀	Move one cell left
▲	Move one cell up
▼	Move one cell down
[Tab]	Move one page right (see Note below)
[BackTab]	Move one page left (see Note below)
[Prev]	Move one page up
[Next]	Move one page down
▼	Move to upper left corner of worksheet
[Select]	Move to lower right corner of active area

Note. Pressing the [Tab] key alone invokes the [Tab] (forward tab) function. Holding down [Shift] and pressing [Tab] invokes the [BackTab] (back tab) function. [CTRL] ▶ is equivalent to [Tab]. [CTRL] ◀ is equivalent to [BackTab].

Anchoring and Unanchoring the Cell Pointer

When it prompts you to enter a range, 1-2-3 often anchors the cell pointer on the current cell automatically. There are many situations, though, in which you have to do your own anchoring (and unanchoring). Your tools are the Period key, the [ESC] key and the [Backspace] key.

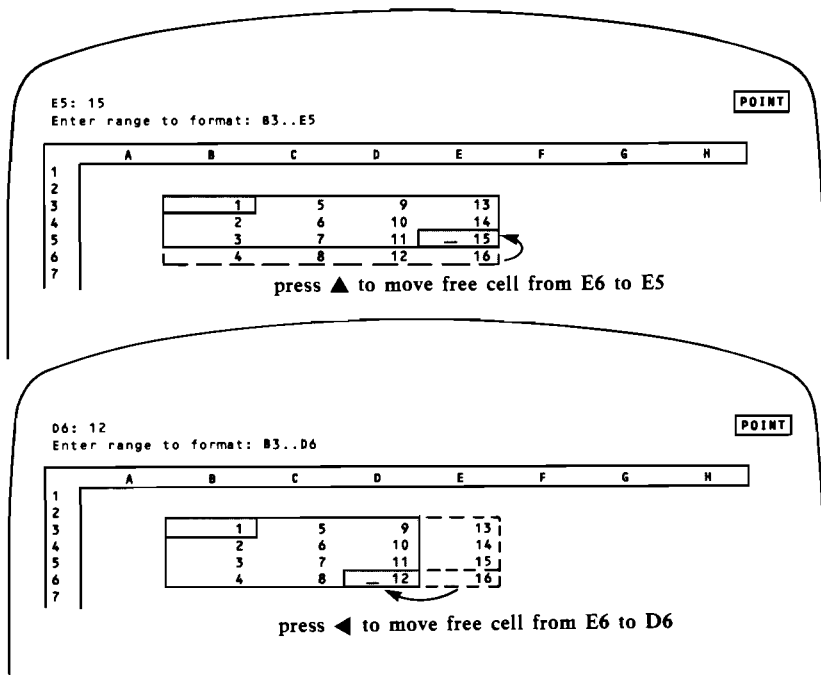


Figure 7-5. Expanding the Cell Pointer

The Period Key “.”. *If the pointer is not already anchored:* Pressing “.” anchors one corner of the cell pointer to the current cell. The free corner is also on this cell for the moment, so that the current cell is the entire range. 1-2-3 shows this by displaying the one-cell range in the control panel (Figure 7-6).

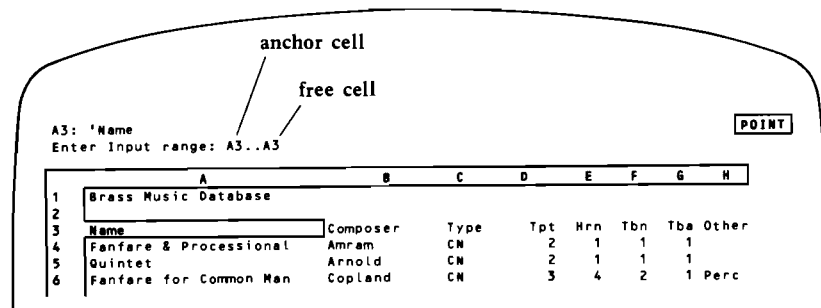


Figure 7-6. Anchoring the Cell Pointer

If the pointer is already anchored: Pressing “.” moves the anchor to the next corner of the expanded pointer, usually in the clockwise direction. (The direction depends on how you’ve expanded the pointer previously.)

As a result, the free corner indicated by the blinking cursor also moves to be diagonally opposite the new anchor. (1-2-3 may readjust the window at this point, in order to keep the free corner onscreen.)

Note. This doesn’t change the range the expanded pointer indicates. It only reassigns the free cell and anchor cell (Figure 7-7).

The [ESC] Key. *If the pointer is not already anchored:* Pressing [ESC] when 1-2-3 is prompting you to indicate a range returns you to the previous command step. In a formula, pressing [ESC] returns the cell pointer to the current cell and erases the cell address from the end of the formula.

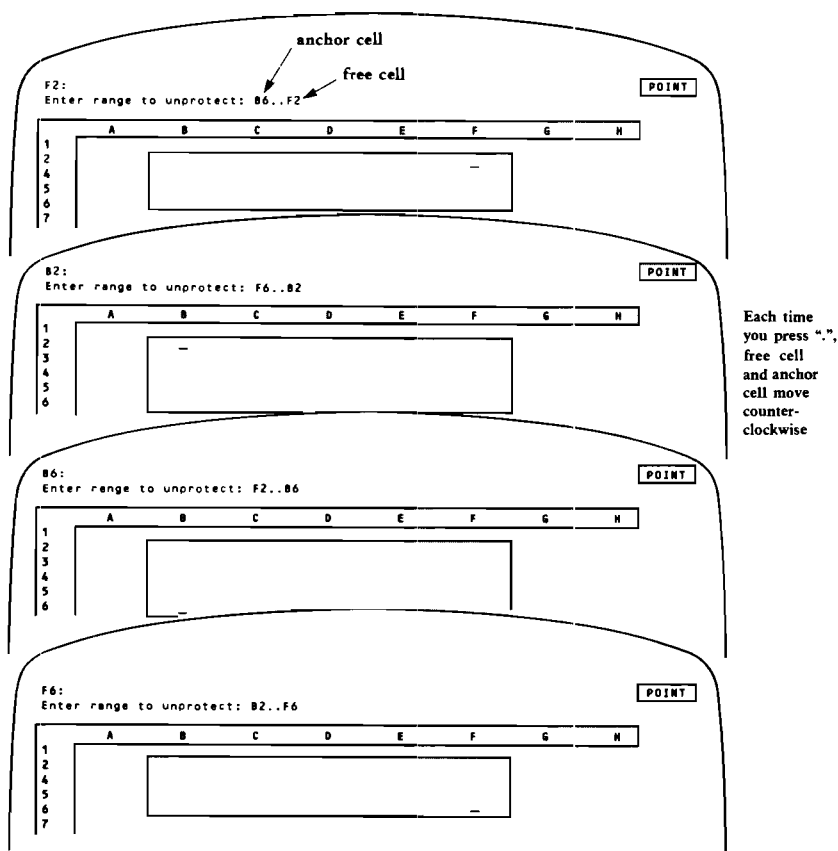
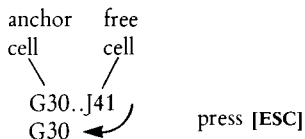
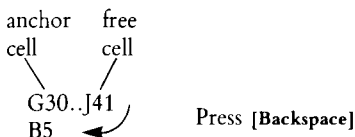


Figure 7-7. “Riding the Range”

If the pointer is already anchored: Pressing [ESC] once has a double effect: (1) It shrinks the expanded pointer so that it covers only the anchored cell, and (2) It removes the anchor. This allows you to relocate the pointer, then re-anchor it, using the pointer-movement keys and the “.” key:



The Backspace Key, [Backspace]. Whether or not the pointer is anchored: Pressing [Backspace] cancels the range specification and returns the cell pointer, unanchored, to the current cell—where the pointer was located when you began the command or formula. As with [ESC], 1-2-3 remains in Point Mode, so you can begin the anchoring and expanding process anew.



This is particularly useful when you want to point to a range that begins at the current cell, but 1-2-3 offers to reuse another, previously specified range. Pressing [Backspace] effectively tells 1-2-3 to “forget” the previous range specification.

Pointing to Absolute Ranges

We’ve already described how to type \$ characters in a range specification in order to indicate a range with *absolute* or *mixed* cell addresses (“Typing Absolute Ranges”, page 7-3). The [f4/Abs] allows you to do this while you’re indicating a range by pointing (Figure 7-8).

Pointing to Mixed Ranges. You can enter a range specification consisting of mixed addresses by typing \$ or by repeatedly pressing [f4/Abs] when “pointing” cell addresses into a formula:

@SUM(C50..C65	press [f4/Abs]
@SUM(\$C\$50..\$C\$65	press [f4/Abs]
@SUM(\$C50..\$C65	press [f4/Abs]
@SUM(C\$50..C\$65	press [f4/Abs]

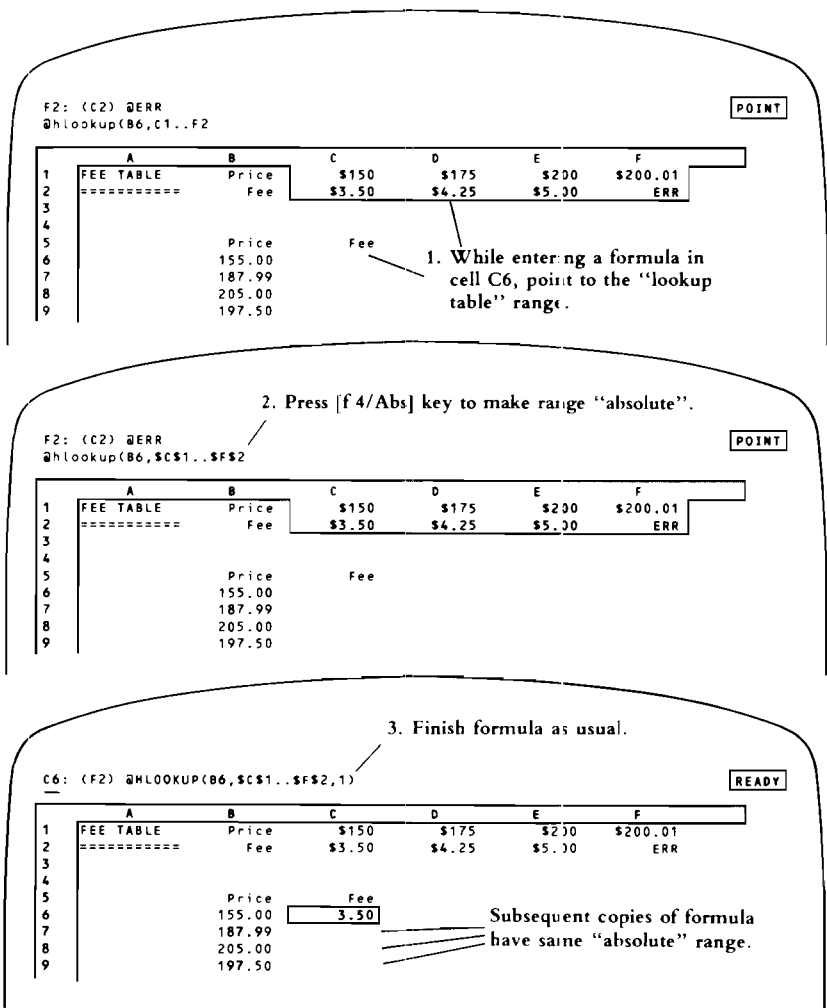


Figure 7-8. Pointing to an Absolute Range

Using Range Names

1-2-3's column-row address system is simple enough, but it gives you no clue about what information a cell contains. Cell B47 might be storing something as important as the projected cash flow for an entire year, or as unimportant as a series of dashes.

A similar situation holds for ranges of cells. The formula @SUM(E6..E23) makes sense, but not quite as much sense as @SUM(DEPOSITS). And wouldn't it be more convenient to type "REGION5" to get a printout of your Region 5 salespeople instead of having to remember that their records are stored in range H30..Q70? Better yet, how about selecting "REGION5" from a menu that 1-2-3 displays?

We hope you're convinced that there is a substantial advantage in the ability to assign names to individual cells and to cell ranges.

1-2-3 allows you to attach a name up to 15 characters long to any range—from a single cell to a large part of the worksheet. In situations where you might type cell addresses or expand the cell pointer to indicate the range, you can simply use the name instead (Figure 7-9).

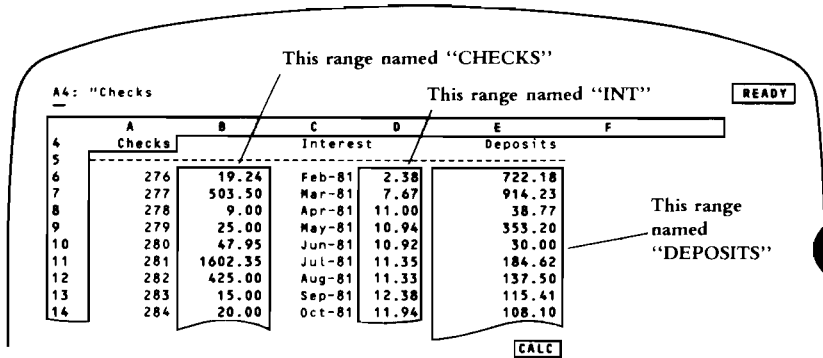


Figure 7-9. Range Names

Range names are created (assigned), edited, and deleted with /Range Name commands (page 11-2). In this discussion, we'll assume that the names have already been created.

For instance, suppose you assign the name DEPOSITS to the range E6..E22. In the /Range Format command, you could indicate the range by naming it at 1-2-3's prompt:

Enter range to format: DEPOSITS[Return] is equivalent to
 Enter range to format: E6..E22[Return]

There's another consideration when you use a range name in a formula. If you precede a range name with \$, it makes the addresses *absolute* (Chapter 8, "Writing Formulas"):

@SUM(DEPOSITS) is equivalent to @SUM(E6..E23)

@SUM(\$DEPOSITS) is equivalent to @SUM(\$E\$6..\$E\$23)

If you /Copy the second formula to another cell, it will still process the cells in range E6..E23.

(By the way, starting a range name with \$ when 1-2-3 prompts you to indicate a range isn't really necessary. Absolute and relative addresses come into play only when formulas are copied. But starting a range name with \$ at a command prompt doesn't do any harm, either.)

Changing Range Name Definitions

When you change the definition of a range name, 1-2-3 automatically adjusts all specifications for which you've used this name. For instance, if you expand the range named DEPOSITS to include 10 additional rows, 1-2-3 will automatically adjust the meaning of formulas such as @SUM(DEPOSITS). And if you've specified DEPOSITS as a print range, issuing a /Print Printer Go command will automatically print the extra rows.

(For details regarding this process and the way 1-2-3 remembers ranges, see "Command Ranges and Range Names" on page 7-14.)

Selecting Range Names from a Menu

As an extra convenience, 1-2-3 maintains a list of all currently defined range names. Whenever the program prompts you to indicate a range, pressing [F3/Name] displays this list as a menu (Figure 7-10). You can indicate one of these names either by typing it or by highlighting it with the menu pointer, and then pressing [Return] to select it. You must specify a range name that has already been created with a /Range Name command (page 11-2).

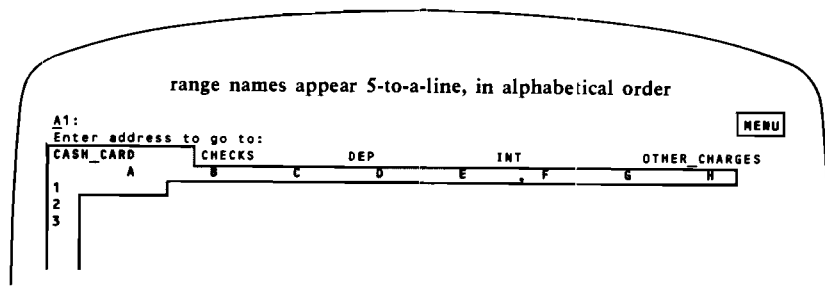


Figure 7-10. Range Name Menu

1-2-3 Remembers Command Ranges

Many 1-2-3 commands require you to indicate a range to be processed. Chances are that if you issue a command several times during a session, you'll want to use the same range again and again. 1-2-3 helps you by remembering the **command ranges** you indicate with most commands. The next time you issue the same command, 1-2-3 expands the cell pointer to cover the range, and displays the cell addresses that define the range (upper left and lower right corners) in the control panel.

At this point, you can:

1. **Accept the current definition.** Press [Return] to leave the range specification unchanged.
2. **Modify or replace the definition.** Use the pointer-movement keys to change the highlighted range, then press [Return]. To specify a completely new range, press [Backspace] to return the pointer to the current cell, or press [ESC] to reduce the expanded pointer to its anchor cell.
3. **Enter a new definition.** Type cell addresses, type a range name, or select a range name from the range-name menu (press [F3/Name] to display the menu).

Note. 1-2-3 does not change or replace a range specification until you press [Return]. If you interrupt a command with [Break] or several [ESC]s, 1-2-3 continues to remember the old range specification.

You can get 1-2-3 to forget certain command ranges by issuing the appropriate *reset* command (e.g. /Data Query Reset). The /Worksheet Erase command clears 1-2-3's range memory along with everything else.

Command Ranges and Range Names— How 1-2-3 Remembers Them

Knowing how 1-2-3 remembers ranges that you name or use in commands will help you to understand how it adjusts to changes you enter subsequent to your initial reference of the range.

1-2-3 records the definitions of all remembered ranges—command ranges and range names—in the same way: A remembered range is the addresses of its upper left and lower right corner cells. After you've attached a range name to a cell range, a reference to the range by name is equivalent to a reference by these two diagonally opposite cell addresses.

Direct Changes to Range Names

You can use the /Range Name Create command to assign a different cell range to an existing range name. When this change takes place, 1-2-3 transforms references to the *original* range into references to the *new* range. Some examples follow.

- **Synonyms.** Other range names assigned to the original range.
- **Formulas.** References to the original range in formulas.
- **Commands.** Remembered command ranges (e.g. /Data Fill) using the original range.

The references are modified whether they were originally made by cell addresses or by name.

Using /Range Name Delete or /Range Name Reset to eliminate a range name does not cancel references to the range. Instead, the range name simply ceases to be associated with the range. /Range Name Labels is equivalent to /Range Name Delete followed by /Range Name Create.

Example 1. You create the range name DEPOSITS, assigning it to the range E6..E23. In addition, you specify this range—either by name or by cell addresses—in several situations: (1) You assign the range name DEPS to the cell range E6..E23; (2) You type “DEPOSITS” at the /Data Sort Data-Range prompt; (3) You enter the formula @COUNT(E6..E23) in cell N1.

Subsequently, you use the /Range Name Create command to change the definition of DEPOSITS to B1..C50. 1-2-3 automatically:

1. Changes the definition of DEPS to B1..C50.
2. Changes the /Data Sort Data-Range to B1..C50.
3. Changes the formula in cell N1 to @COUNT(B1..C50). 1-2-3 continues to display this formula on the first line of the control panel as “@COUNT(DEPOSITS)”.

Later still, you use the /Range Name Delete command to cancel the range name DEPOSITS:

1. The definition of DEPS remains the same: B1..C50.
2. The /Data Sort Data-Range remains B1..C50, but no longer is associated with the name “DEPOSITS”.
3. The formula in cell N1 remains @COUNT(B1..C50). The formula is no longer displayed as “@COUNT(DEPOSITS)” but as “@COUNT(DEPS)”.

Exception: If you redefine a range name from a single cell to a multiple-cell range, 1-2-3 does not alter formulas involving the original definition.

Example 2. You define the range name ONECELL to be A77, and enter the formula +ONECELL + 14 in another cell. The formula has the meaning + A77 + 14. Later, you use the /Range Name Create command to change the definition of ONECELL to A77..A82.

Result: 1-2-3 removes the range name from the formula. The formula remains + A77 + 14, and is no longer displayed in the control panel as “+ ONECELL + 14”.

Implicit Changes to Range Names

When a command moves or obliterates the upper left or lower right corner cell of a remembered range, it can change the definition of that remembered range name implicitly. Those specific commands which can render this implicit change in definition are:

- /Move
- /Worksheet Insert
- /Worksheet Delete

Moving Cell Entries

If the upper left or lower right corner cell of a named range moves, the definition of the range name changes accordingly. As a result, 1-2-3 also makes the three types of change listed above: to synonyms, to formulas, and to remembered command ranges.

Example 3. As in Example 1, you create the range name DEPOSITS, assigning it to the range E6..E23. And (1) You assign the range name DEPS to the same range; (2) You enter DEPOSITS as the /Data Sort Data-Range; (3) You enter the formula @COUNT(E6..E23) in cell N1.

Then you issue a /Move command that affects the lower right corner cell, E23, of the DEPOSITS range: FROM range B22..E25; TO cell F22. This moves E23 to I23. 1-2-3 automatically:

1. Changes the definition of DEPOSITS and DEPS to E6..I23.
2. Changes the /Data Sort Data-Range to E6..I23.
3. Changes the formula in cell N1 to @COUNT(E6..I23). 1-2-3 continues to display this formula on the first line of the control panel as "@COUNT(DEPOSITS)".

Obliterating Cell Entries

If a corner cell of a remembered range is obliterated by a /Worksheet Delete command or by being the destination of a /Move, the remembered range is cancelled.

Example 4. Suppose that in the Example 3 situation, you issue a /Worksheet Delete Column command instead of a /Move command. The Delete command eliminates column E from the worksheet. 1-2-3 automatically:

1. Cancels the definitions of DEPOSITS and DEPS.
2. Cancels the /Data Sort Data-Range specification.
3. Moves the formula in cell N1 to cell M1 and changes it to @COUNT(ERR). Any cells whose values depended on N1 will be changed to reference M1, and will display ERR, as will cell M1.

Direct Changes to Command Ranges

In the previous sections, we've discussed the way in which changes to a range name affect a command specification referring to that range. The opposite case does not hold true: Changes to a command specification do not alter range names.

Example 5. You specify the /Data Sort Data-Range to be DEPOSITS, whose definition is E6..E23. In a subsequent /Data Sort command, you modify the Data-Range to be K1..K50. The definition of DEPOSITS does not change, but this range name ceases to be associated with the Data-Range.

Indirect Changes to Command Ranges

The /Move, /Worksheet Insert, and /Worksheet Delete commands change the definitions of command ranges in the same way that they change range name definitions:

Moving Cell Entries. You specify the range A1..E15 as the /Data Fill range. Then you issue a command that moves cell E15 to K20. As a result, 1-2-3 modifies its /Data Fill range definition to A1..K20.

Obliterating Cell Entries. You specify the range A1..E15 as the /Data Fill range. Then you issue a command that obliterates cell E15. As a result, 1-2-3 cancels the /Data Fill range definition.



8. Writing Formulas

1-2-3's single most powerful capability is **formula calculation**. In this chapter, we will examine your options for creating, entering and changing formulas.

A **formula** is an instruction for 1-2-3 to calculate a number. You can enter a formula in any cell on your electronic spreadsheet. By definition, a formula will contain numbers (that you want 1-2-3 to process) and operators (that tell 1-2-3 what you want it to do with your numbers). Numbers can be single cell addresses or ranges, specified by cell address or name; they can be identified by typing or by pointing. Your operators can be mathematical or logical. There are many choices—and many powerful capabilities—at your fingertips in 1-2-3!!

Let's explore the formula concept by taking an example. We suggest that you work through this example using 1-2-3 as you read this section.

Enter some numbers in the worksheet, perhaps to represent quarterly revenue figures (Figure 8-1).

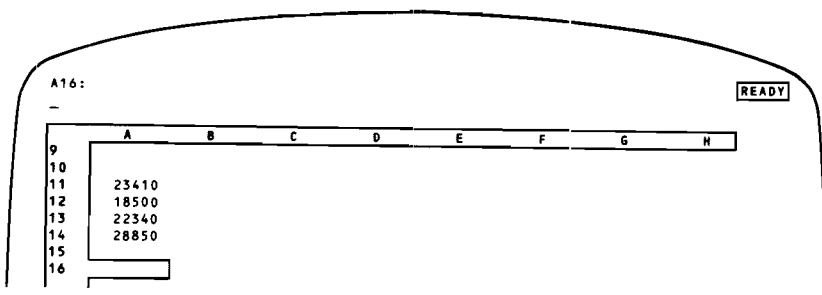


Figure 8-1. A Column of Figures to be Added

A First Try. To have the worksheet also show the sum of these figures, you can enter a formula in cell A16. An obvious candidate for the formula is:

(1) $23410 + 18500 + 22340 + 28850$ [Return]

When you press [Return], the answer 93100 appears in cell A16.

There are two lessons to be learned from this first formula:

- A formula is like other entries in many ways. As you type the characters, they appear on line 2 of the control panel. And you press [Return] to signal 1-2-3 that you're finished.
- Like a number, a formula may not contain any space characters.

But there's got to be a better way! After all, we've already entered the revenue figures once, in cells A11 through A14. Why should we have to enter the numbers again in order to get 1-2-3 to add them up?



A Second Try. We don't have to enter them again. Instead of telling 1-2-3 which numbers to add up, we can tell it where to find the numbers:

(2) + A11 + A12 + A13 + A14[Return]

Here's the general rule (Figure 8-2):

If you include one or more cell addresses in a formula, 1-2-3 automatically uses the numbers stored at those addresses whenever it calculates the formula. *Any changes to numbers in the referenced cells are automatically reflected in formula cells.*

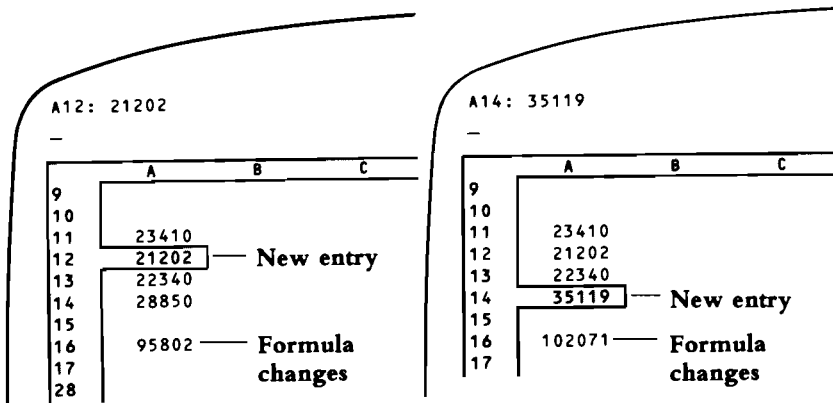


Figure 8-2. "What if" a Number Changes?

Formula (2) illustrates another important point:

- A formula, like a number, must begin with one of these characters:

0 1 2 3 4 5 6 7 8 9 . + - (@ # \$

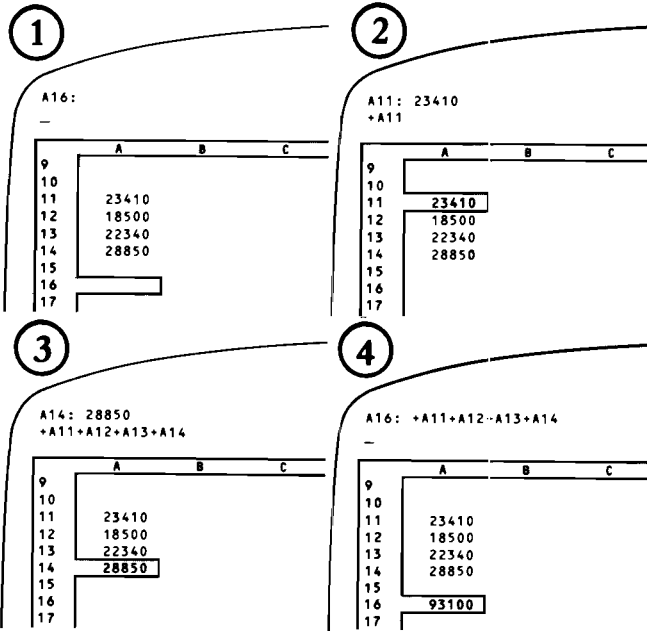
In this case, starting the formula with the letter *A* would have made 1-2-3 think we were typing a label. So 1-2-3 users have found it a good general practice to begin formulas with the + character.

Entering Cell Addresses—Typing and Pointing

In both formulas so far, we told 1-2-3 which items to add by typing numbers in the first case and typing cell addresses in the second. Since 1-2-3 is a visually-oriented program, it also allows you to use the cell pointer to indicate the items to be added. We could construct formula (2) by **pointing** (Figure 8-3):

- Instead of typing a cell address (e.g. A13), you can use pointer-movement keys to show 1-2-3 the cell to be used in a calculation. For instance, typing ▲▲▲ while entering this formula would move the pointer to cell A13.

Press “+” then move pointer to first value to be added.



When you press “+” again, pointer returns to A16. Move it to the next cell to be added. And so on, and so on ...

Press [Return] to complete the formula

Figure 8-3. Entering a Formula by “Pointing”

Relative Cell Addresses

The formula constructed in Figure 8-3 by a combination of pointing and typing is equivalent to the one entered by typing alone. The “feeling” is different, though. The process of pointing to cells indicates the positional relationships between the **formula cell** and the **referenced cells**—the cells whose values are used in the formula.

Positional relationships of cells in a worksheet are important for you to understand because 1-2-3’s memory of formula input is positional. In fact, 1-2-3 remembers a formula according to the positional relationships it forms to its referenced cells.

For instance, 1-2-3 does *not* record the formula in cell A16 as:

“the sum of the values in cells A11, A12, A13, and A14”

Rather, it records the formula as:

“the sum of: the value five cells above this one,
 the value four cells above this one,
 the value three cells above this one, and
 the value two cells above this one”

You might like to think of the formula as a “machine” that calculates a number when placed over a cell (Figure 8-4).

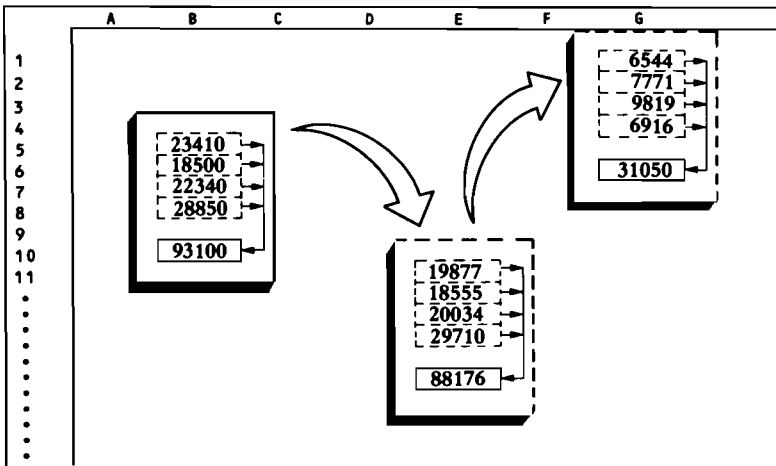


Figure 8-4. A Relative Address “Machine”

Every formula, unless otherwise specified, involves **relative** cell addresses. Instead of remembering a cell address as a letter-number combination, 1-2-3 records the position of each *referenced* cell *relative* to the *formula* cell. Including “A11” in cell A16’s formula really incorporates the value of “the cell five rows above this one”. This is true whether you type “A11” into the formula or point to it.

This *relative* way of representing formulas has a big payoff: You can use the very same formula at different locations in the worksheet, e.g. to add different columns of numbers. In practice, you enter the formula just once, then use the /Copy command to copy it to other cells (page 12-4). In the example above, we could enter the formula once, in cell A16, then make copies in cells B16 and C16 with a /Copy command (Figure 8-5).

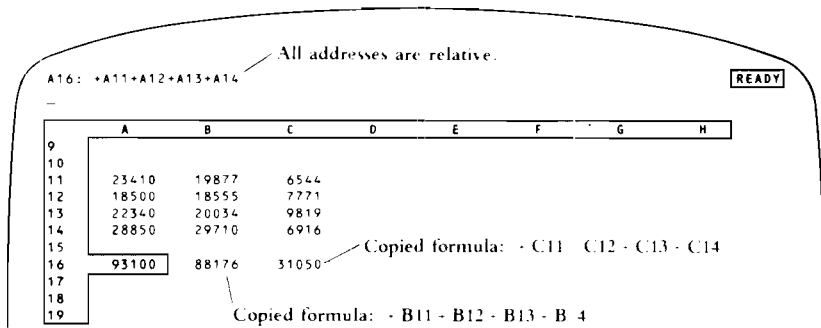


Figure 8-5. Copying a Formula with Relative Addresses

Figure 8-6 illustrates another example in which the very same formula can be used to perform similar calculations in several cells.

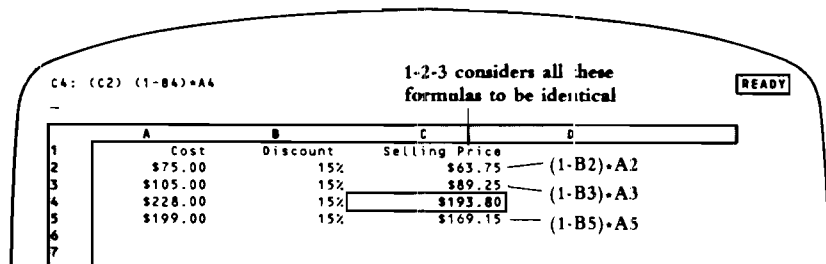


Figure 8-6. More Relative Address Formulas

In this example, the formulas in column C convert the Cost values in column A to Selling Price values, using the Discount factors in column B. All the column C formulas are exactly the same, if we view them as using *relative* cell addresses:

“Subtract the value of the cell one column to the left from 100%, then multiply by the value of the cell two columns to the left.”

So once again, 1-2-3 allows us to use the very same formula in several different places, to perform several related calculations.

Absolute Cell Addresses

There are situations in which you will need to override 1-2-3's inclination to think of cell addresses as *relative*. As an example, let's examine part of a loan-analysis worksheet (Figure 8-7). (This situation occurs in the 1-2-3 Electronic Tutorial.)

	A	B	C	D	E
1		Principal	\$50,000		
2		Rate	13.0%		
3		Years	5		
4		Payment	\$1,137.65		
5					
6	Year	Begin Bal.	End Bal.	Total Paid	Interest
7	1	50000.00	42406.26		
8	2	42406.26	33764.33		
9	3	33764.33	23929.53		
10	4	23929.53	12737.22		
11	5	12737.22	0.00		

Figure 8-7. Loan Analysis Worksheet

Cell C4 contains the monthly payment due on a loan. We wish to show the yearly total for each of five years, in cells D7, D8, D9, D10, and D11. Since we're in a hurry, we would like to enter a formula just once, in cell D7, then make copies in cells D8 through D11.

The obvious candidate for the formula in cell D7 is "+C4*12". (Note again that we start with + to distinguish the entry from a label.) But the first part of Figure 8-8 shows what happens if we try to copy this formula to cells D8 through D11.

What we really want for cell D7 is a formula that refers to cell C4 in an *absolute* way rather than a *relative* way. That is, we want a formula in which the "C4" remains "C4", even when we copy the formula to another cell in another location.

1-2-3 uses the dollar sign \$ to distinguish **absolute** cell addresses from relative cell addresses in formulas. In our example:

Relative. If the formula +C4*12 is entered in cell D7, "C4" really means "the value one column to the left and three rows up".

Absolute. In *any* formula, "\$C\$4" means "the value of cell C4", no matter where the formula is copied to.

Why *two* dollar signs? Because a cell address with single dollar sign—\$C4 or C\$4—also has a meaning: It indicates a *mixed* cell address—half relative, half absolute.

Example: Formulas That Include Both Relative and Absolute Addresses

Figure 8-9 shows a modification of the Cost-Discount-Selling Price example above.

D11: (F2) +C8*12 "12 times the value 1 column left and 3 rows up" READY

	A	B	C	D	E
1		Principal	\$50,000		
2		Rate	13.0%		
3		Years	5		
4		Payment	\$1,137.65		
5					
6	Year	Begin Bal.	End Bal.	Total Paid	Interest
7	1	50000.00	42406.26	13651.84	
8	2	42406.26	33764.33	0.00	
9	3	33764.33	23929.53	0.00	
10	4	23929.53	12737.22	508875.07	
11	5	12737.22	0.00	405171.94	

D11: (F2) +\$C\$4*12 "12 times the value of cell C4" READY

	A	B	C	D	E
1		Principal	\$50,000		
2		Rate	13.0%		
3		Years	5		
4		Payment	\$1,137.65		
5					
6	Year	Begin Bal.	End Bal.	Total Paid	Interest
7	1	50000.00	42406.26	13651.84	
8	2	42406.26	33764.33	13651.84	
9	3	33764.33	23929.53	13651.84	
10	4	23929.53	12737.22	13651.84	
11	5	12737.22	0.00	13651.84	

Figure 8-8. Oops—an “Absolute” Address Is Needed

C5: (C2) (1-\$A\$2)*B5 READY

	A	B	C
1	Discount	Cost	Selling Price
2	15%	\$75.00	\$63.75
3		\$105.00	\$89.25
4		\$228.00	\$193.80
5		\$199.00	\$169.15
6			

→ All these formulas are the same

Figure 8-9. A Formula with Both Absolute and Relative Addresses

Since the same discount factor, 15%, is used to convert all the values, why repeat it? Instead we place 15% in a single cell. The same formula can be used in column C to perform all four selling-price conversions:

“Subtract the value in cell A2 from 100%, then multiply by the value one column to the left.”

We can type this formula just once, let's say in cell C5:

$$(1 - \$A\$2) * B5$$

Then, we can copy this formula to cells C4, C3, and C2.

Indicating an Absolute Cell Address by Pointing

The dollar signs (\$) that turn a relative address into an absolute address are ordinary characters. If you are entering a formula by typing (Value Mode or Edit Mode), just press the \$ key ([Shift]-4).

If you are *pointing* a cell address into a formula (Point Mode), don't try to type a \$ character. Instead, use the [F4/Abs] key (Figure 8-10). Pressing [F4/Abs] several times in a row cycles a cell address through all its forms—relative, absolute, and mixed:

C4 → \$C\$4 → C\$4 → \$C4 → C4 → etc.

Press [F4/Abs] in Point Mode

C4: (C2) @PMT(C1,C2/12,C3+12)
+C4 — Relative address

	A	B	C	D
1		Principal	\$50,000	
2		Rate	13.0%	
3		Years	5	
4		Payment	\$1,137.65	
5				
6	Year	Begin Bal.	End Bal.	Total Paid
7	1	50000.00	42406.26	
8	2	42406.26	33764.33	
9	3	33764.33	23929.53	
10	4	23929.53	12737.22	
11	5	12737.22	0.00	

C4: (C2) @PMT(C1,C2/12,C3+12)
+\$C\$4 — Absolute address

	A	B	C	D
1		Principal	\$50,000	
2		Rate	13.0%	
3		Years	5	
4		Payment	\$1,137.65	
5				
6	Year	Begin Bal.	End Bal.	Total Paid
7	1	50000.00	42406.26	
8	2	42406.26	33764.33	
9	3	33764.33	23929.53	
10	4	23929.53	12737.22	
11	5	12737.22	0.00	

Figure 8-10. Using the [F4/Abs] Key to Make an Address Absolute

We suggest that you postpone using mixed addresses until you're quite comfortable with using relative and absolute addresses. Then read "Mixed Cell Addresses" (page 8-14). For now, just note that you can press [F4/Abs] repeatedly to switch between absolute and relative addresses.

Specifying Ranges in Formulas

Ranges are specified in formulas just as they are at 1-2-3 command prompts: by typing cell addresses, by pointing, or by typing a range name. (For details, see Chapter 7, "Indicating Cell Ranges".)

1-2-3 formulas can calculate with entire ranges of values as well as individual values. However, ranges of values can't be processed with the ordinary arithmetic operations. Instead, 1-2-3 processes ranges using special @ functions (Page 8-22 and Chapter 19). For example, you can't add or subtract two ranges, each involving many cells, in the same way you would two individual cells/values. The table which follows offers some examples of @ functions and provides their meanings:

@ FUNCTION	PROCESS DESCRIPTION
@SUM(B10..D30)	Sums the values of all cells in the range B10..D30
@VLOOKUP(B3,F10..H30,1)	Performs a table-lookup using the range F10..H30
@MAX(100,C15,TOTALS)	Finds the maximum of 100, the value in cell C15, and all the values in the range named "TOTALS"

Single-Cell vs. Multiple-Cell Ranges

You *can* do ordinary arithmetic with range names that apply to single cells. If "EXPENSE" is assigned to cell D32 and "REVENUE" to cell H32, you can use the formula "EXPENSE-REVENUE". (The /Range Name Labels command makes it particularly easy to define names for single cells. See page 11-14.)

However, you *can't* do ordinary arithmetic with multiple-cell ranges. You can't subtract two ranges of several cells each, whether your ranges are specified by name or cell address. For example, if "EXPENSE" = B10..D30 and "REVENUES" = F10..H30, 1-2-3 won't accept the formula REVENUES-EXPENSES. Likewise, B10..D30-F10..H30 can't be done! Just remember to use @ functions when you calculate with multiple-cell ranges.

+ B10/12	Legal
+ B10..B20/12	Illegal
1stQ*2.5	Legal if "1stQ" names a single cell; illegal if "1stQ" names a multiple-cell range
@SUM(1stQ,2ndQ)	Always legal , since the @SUM function accepts any type of argument

Absolute Ranges in Formulas

You can use the [F4/Abs] key to make a range named in a formula **absolute**. Just as a cell address in a formula can be *relative* or *absolute*, so can a range specification. When typing cell addresses, precede each column letter and row number with “\$”.

In either case, the result looks like this:

\$D\$35..\$F\$50

As with individual cell addresses, this feature comes into play only when you copy a formula:

A12: @SUM(A1..A10)

A12: @SUM(\$A\$1..\$A\$10)

Copy to C12: @SUM(C1..C10)

Copy to C12: @SUM(\$A\$1..\$A\$10)

Copy to D112: @SUM(D101..D110)

Copy to D112: @SUM(\$A\$1..\$A\$10)

Absolute Range Names. If you use a range name in a formula, 1-2-3 takes it to be a relative specification. To make it absolute, precede the range name with “\$”:

if @SUM(EXPENSES) = @SUM(B10..D30),

then @SUM(\$EXPENSES) = @SUM(\$B\$10..\$D\$30)

(For a continuation of this discussion on a rather advanced level, see “Mixed Range References” on page 8-16.)

Revising Formulas

A formula is similar to a label or number in that it is an entry, stored in one of the worksheet’s cells. As with these other types of entries, you can (1) **Revise** a formula as you’re typing it, or (2) **Return** to a previously entered formula and invoke Edit Mode to change it.

1-2-3’s entry-correction facilities work with all types of entries, including formulas (page 5-8). There’s an extra wrinkle, though, due to the fact that you can *point* cell addresses into a formula.

As you’re entering a formula, the mode indicator in the upperright corner of the screen can change between *VALUE*, *EDIT*, and *POINT*:

- You are in **Value Mode** when you begin a formula and whenever you’re typing letters, numbers, and symbols.
- You switch to **Edit Mode** if you press [F2/Edit] or if 1-2-3 finds your formula to be incorrect when you press [Return].
- You are in **Point Mode** when you’re using the pointer-movement keys to show 1-2-3 which cells and ranges to use in the calculation.

Let’s take a look at the editing facilities on a mode-by-mode basis.

Value Mode

In Value Mode, you can use these editing keys:

Key	Function
[Backspace]	Delete the character preceding the cursor. (In most cases, this is the last character you typed.)
[ESC]	Cancel the entire entry and return to Ready mode.

Edit Mode

1-2-3 goes to Edit Mode if you press [F2/Edit] while you're entering a formula. It also goes to Edit Mode automatically if it finds an error in a formula when you press [Return]. In Edit Mode, you can use these editing keys:

Key	Function
[Backspace]	Delete character preceding cursor
[~Char]	Delete character at the cursor
[ESC]	Delete entire entry, staying in Edit mode
◀/▶	Move cursor to left/right 1 character
[BackTab]/[Tab]	Move cursor to left/right 5 characters (see Note below)
▼ / [Select]	Move cursor to the first/last character

Note. Pressing the [Tab] key alone invokes the [Tab] (forward tab) function. Holding down [Shift] and pressing [Tab] invokes the [BackTab] (back tab) function.

Point Mode

When you are using pointer-movement keys to indicate an individual cell address or cell range in a formula, only two correction keys are available: [ESC] and [Backspace]. Their effect depends on when you use them.

If you're pointing to a single cell:

- Pressing [ESC] erases the cell address from the formula and returns the cell pointer to the formula cell. 1-2-3 returns to Value Mode.
- Pressing [Backspace] returns the cell pointer to the formula cell, and changes the address to the cell formula's. 1-2-3 remains in Point Mode.

If you're expanding the cell pointer to indicate a cell range (Figure 8-11):

- Pressing [ESC] erases the cell address of the *free cell* from the formula, shrinks the expanded cell pointer down to the *anchor cell* only, and removes the "anchor". 1-2-3 remains in Point Mode.
- Pressing [Backspace] reduces the range specification to the formula cell, unanchored. 1-2-3 remains in Point Mode.

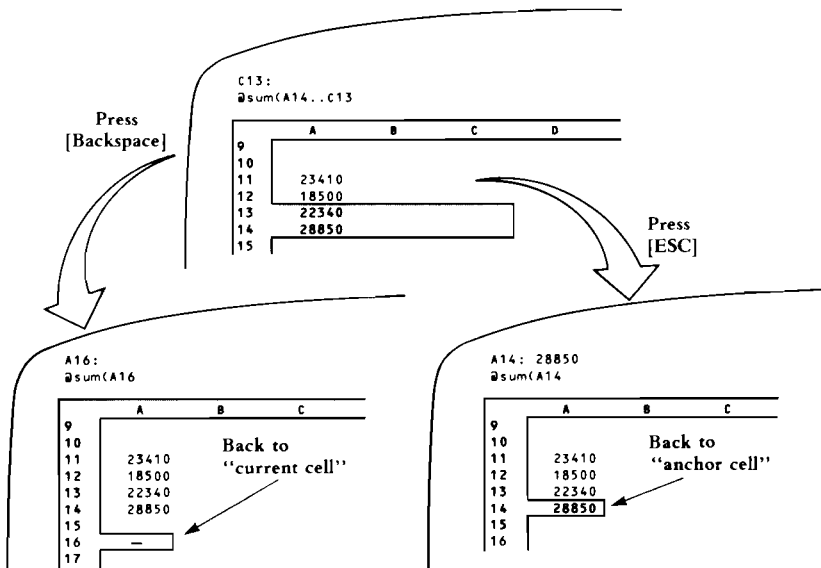


Figure 8-11. [ESC] and [Backspace] Correct Pointing Errors—Expanded Pointer

The [f9/Calc] Key

Pressing [f9/Calc] in Ready Mode causes 1-2-3 to perform a recalculation pass on all formulas in the worksheet (page 10-5). But you can also use [f9/Calc] when entering a formula (Value Mode) or when editing a formula (Edit Mode). [f9/Calc] converts the formula into a number—the formula's current value. No other recalculation takes place. (Remember that [f9/Calc] represents the keystrokes [Shift]-[f1].)

This use of [f9/Calc] is handy in a variety of situations:

Quick-Reference and Calculator. To find the current value of a cell that's "far away" or to perform a quick calculation. For example, to find the value of cell AC106: (1) Type "+ AC106"; (2) Press [f9/Calc] to see the value; (3) Press [ESC] to clean up.

Similarly, you could calculate the value $56.7 \times \sin 37$ without having to store any values in the worksheet.

Saving Calculation Time. Why make 1-2-3 calculate a formula during each recalculation pass if its value never changes? Instead, convert the formula into a number, once and for all. For example, to enter the value "ten times π ": (1) Type the formula "`10*@PI`"; (2) Press [f9/Calc] to convert this formula to the number 31.415926536; (3) Press [Return] to enter the number.

Automatic (Implicit) Changes to Formulas

You can change formulas indirectly by using commands which affect the entries in a formula. As a result of another command, a formula can be altered. There are command situations in which another action you take changes one or more formulas:

- /Worksheet Delete Columns
- /Move
- /Worksheet Delete Rows
- /Range Name Create

/Worksheet Delete Columns and /Worksheet Delete Rows (Figure 8-12)

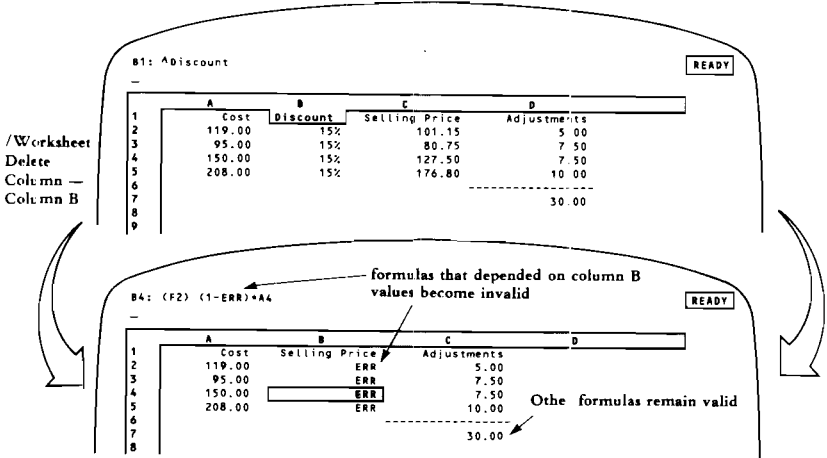


Figure 8-12. Be Careful when Deleting Rows or Columns

Formulas that refer to a deleted cell are rendered invalid: 1-2-3 replaces the deleted cell's address in the formula with *ERR*, causing the entire formula to have the value *ERR*.

Cells beyond the deleted area are implicitly moved by the Delete command. Formulas that refer to these cells are automatically adjusted.

(Similarly, the /Worksheet Delete commands can invalidate and adjust range specifications. See page 10-12.)

/Move (Figure 8-13)

You should feel free to /Move cells; but be sure to pick an unused area of the worksheet as the destination for the /Moved cells. 1-2-3 will do the housekeeping for you:

- Formulas that refer to a /Moved cell are automatically adjusted: 1-2-3 substitutes the *To* cell address for the *From* address in each formula.
- However, formulas that refer to a cell that is the destination of a /Move are rendered invalid: 1-2-3 replaces the cell's address in the formula with *ERR*, causing the entire formula to have the value *ERR*.

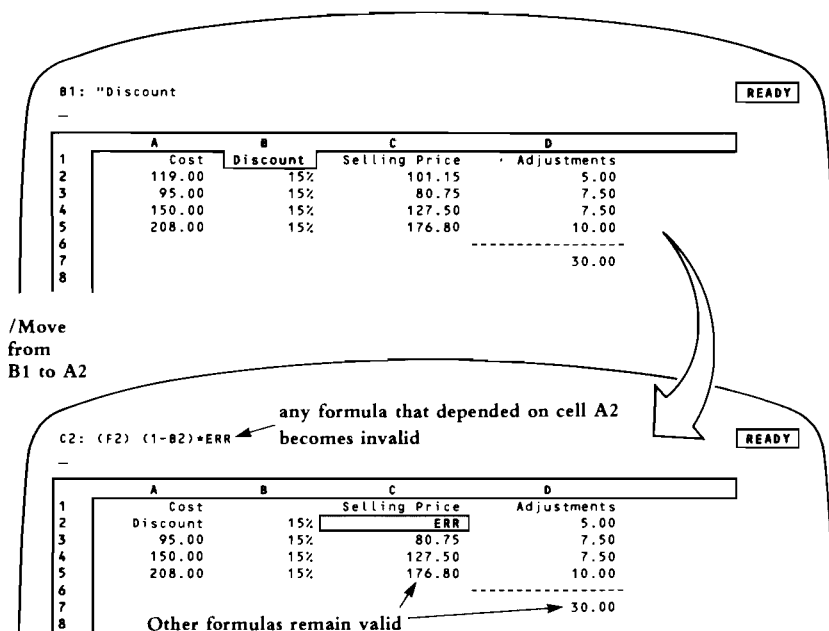


Figure 8-13. Be Careful when Moving Cell Entries

- If a formula contains a range name whose definition involves a /Moved cell, the /Move changes the definition of the named range. As a result, the calculation involving the named range is implicitly changed. (See “Command Ranges and Range Names”, page 7-14.)

/Range Name Create

A range name occurs in a formula, and you use the /Range Name Create command to alter the range name definition. (This is similar to the /Move situation we just described—in both cases, the named range is redefined.) When you change the definition of the range, 1-2-3 automatically changes the formula accordingly. You’ll see the difference (if any) after the next recalculation of the worksheet. (See “Command Ranges and Range Names”, page 7-14.)

Advanced Topic: Mixed Cell Addresses

Mixed cell addresses, combined with the flexibility of the /Copy command, can reduce your formula-writing chores significantly.

Mixed cell addresses—half-relative, half-absolute—are a solution to a problem.

Suppose we wish to produce a 25-year mortgage payment table, given a variety of principal amounts, and a variety of interest rates (Figure 8-14). Each of the 20 cells inside the table will have a @PMT function as its entry. Here's the challenge: Can we type just *one* such formula, then /Copy it to the 19 other cells?

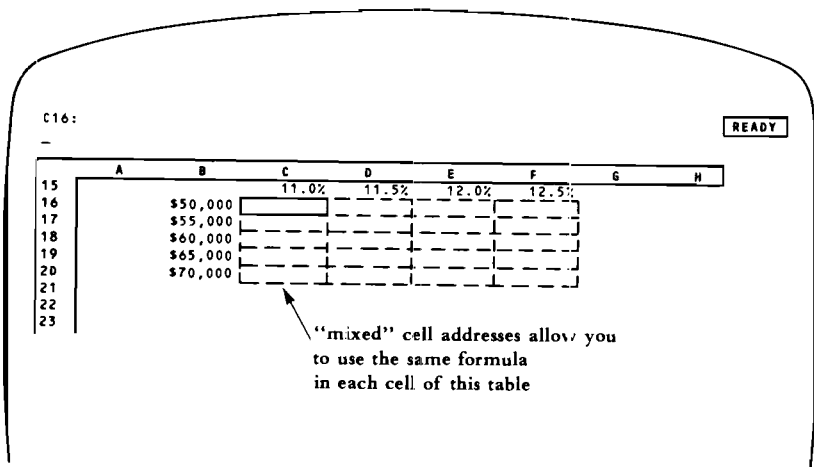


Figure 8-14. Building a Mixed Cell Addresses Table

For each cell, the Principal amount to be used in the formula is: "the value in column B of this row". If we try typing a formula in cell C16 using an *absolute* or *relative* address, it doesn't quite work:

C16: @PMT(B16,...

↑
"the cell to my left"

C16: @PMT(\$B\$16,...

↑
"column B, row 16"

What we want is half of each—and 1-2-3 allows us to get exactly what we want:

\$B
↑
"column B"

16
↑
"this row"

\$B16
↑
"the value in column B of this row"

The situation with the interest rate values is a precise mirror image. We want to represent "the value in row 15 of this column" as a cell address. For a formula in cell C16, this translates to:

C
↑
"this column"

\$15
↑
"row 15"

C\$15
↑
"the value in row 15 of this column"

Here's the complete formula, using two different mixed cell addresses:

```
@PMT($B16,C$15/12,300)
```

To complete the table, we need only issue a single /Copy command:

```
/Copy FROM: C16 TO: C16..F20
```

(By the way, the /Data Table command (page 17-16) provides an alternate, and somewhat simpler, method of performing the same calculations. The difference is that /Data Table uses a single formula to calculate 20 values, while we have just created 20 formulas, each calculating a single value. Both strategies have their advantages.)

Mixed Range References

Just as you can use a mixed cell address in a formula, you can use a range specification involving one or more mixed addresses. Moreover, the two corners of a range specification need not be the same type of address. All these formulas are legal, and all have the same original meaning:

```
@SUM(A1..A10)      @SUM($A$1..A10)
@SUM($A1..$A10)    @SUM($A$1..$A$10)
@SUM(A$1..A$10)    @SUM($A1..A10)...etc.
```

The differences among such formulas appear only when you /Copy them to other cells. Some of them turn out to be meaningful, clever, and terrific. Others are mere curiosities. You can do the investigating—we'll just start you off with the general rule and some examples.

When copying a range specification in a formula, 1-2-3 processes the cell addresses of the two corners independently.

Example 1. If cell A12 contains the formula @SUM(\$A1..\$A10), then . . .

A copy in B12 would be @SUM(\$A1..\$A10).

A copy in D112 would be @SUM(\$A101..\$A110).

Example 2. The formula @SUM(\$A\$1..A1), entered in cell B1, calculates a running total: It says "Sum the values in the rectangle whose corners are cell A1 and the cell to my left".

A copy of this formula in B12 would be @SUM(\$A\$1..A12).

A copy of this formula in B85 would be @SUM(\$A\$1..A85).

Using Operators in Formulas

We've discussed the fact that you can indicate numbers for 1-2-3 to process in a formula either by typing or by pointing to cells. Now, let's concentrate on the other half of the story—telling 1-2-3 what to do with the numbers.

In the examples above, addition was the only arithmetic we did. As usual, the character "+" indicates addition. 1-2-3 uses the familiar "+" and "-" characters to

indicate the arithmetic operations. But it uses “*” instead of “×” for multiplication and “/” instead of “÷” for division.

Since these characters indicate arithmetic operations, we call them **operators**:

<u>Operator</u>	<u>Meaning</u>
+	addition
-	subtraction
*	multiplication
/	division

Note that slash “/” allows you to indicate division on one line instead of three:

“Three-fourths” is $3/4$ not $\frac{3}{4}$

Figure 8-15 shows a worksheet that uses some simple formulas. We suggest that you examine and verify each formula.

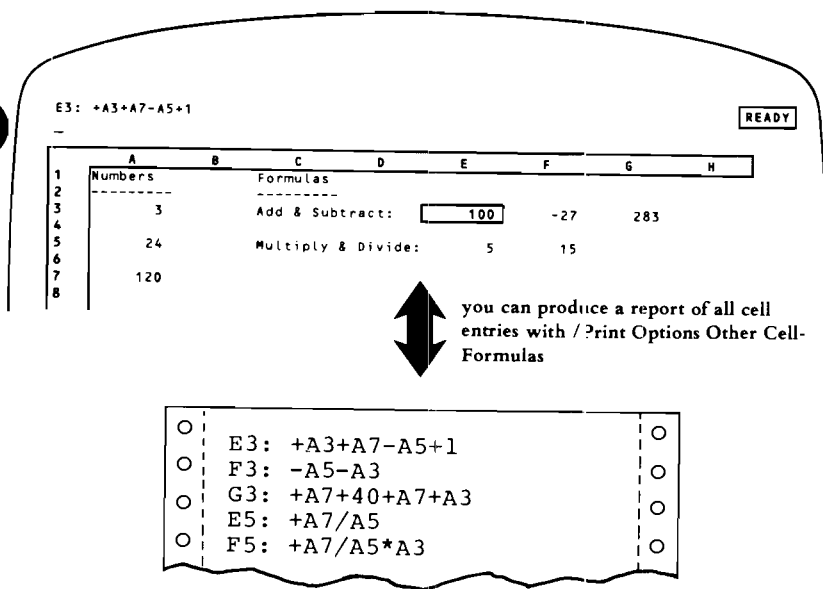


Figure 8-15. Simple Formulas

Order of Operations: Parentheses and Precedence

In the Figure 8-15 formulas, the operations are performed from left to right. There are two ways to indicate that operations are to be performed in another order: using parentheses and taking advantage of *operator precedence*.

Parentheses. Using parentheses (like those enclosing this phrase) says “do this section of the formula first”:

+ D7 - (B7 - C7) Take the difference between the values in B7 and C7. Subtract this result from the value in D7.

+ F50/(1 + A3) Add 1 to value in cell A3, and divide this result into the value in cell F50.

Feel free to use parentheses within parentheses. This technique is called “nesting parentheses”.

Precedence (Order of Operations). The other way to alter the order in which 1-2-3 performs arithmetic operations is by using *precedence*. You may recall this idea from high-school algebra:

Multiplication and division are performed before addition and subtraction.

Examples:

+ G5 + A7*100 Multiply the value in A7 by 100. Add the result to the value in G5.

1 + 1/4 The number “one and a quarter”.

There’s more to order of operations than this one statement, because there are additional operators in the world of 1-2-3. We’ll discuss two more arithmetic operators now, and defer the discussion of “logical operators” to later in this chapter (page 8-20).

(If the “precedence” discussion that follows gets to be a little too much, just remember that you can always use parentheses to force calculations to be performed in a particular order.)

Negatives and Exponents

1-2-3 can handle negative numbers—numbers less than zero—just as well as positive numbers. You indicate a negative number in a formula by starting it with a hyphen (-), the same character used to indicate subtraction:

- 3 “minus 3”
 - 50%[Return] “minus 50 percent”

You can also precede a cell address with “-” to indicate its value as negative:

- F13 has the value - 34.7 if cell F13 contains 34.7
 - F13 has the value 150 if cell F13 contains - 150

1-2-3 can tell the difference between a “-” that indicates subtraction and a “-” that indicates the negative of a value:

+ A15 - 450 “-” means subtraction
 - C35*F1 “-” means negative
 + X100 - - 45 First “-” means subtraction; second “-” means negative

1-2-3 also allows you to precede any number or cell address with “+”. It doesn’t affect the value at all, but include extra “+” characters if they help you keep things straight:

@IF(C6 > 75, -D9, +D9) is equivalent to @IF(C6 > 75, -D9,D9)

As with “-”, 1-2-3 can distinguish the difference between a “+” that indicates addition and a “+” that indicates a positive value (or, “not-the-negative”).

+ A15 + 450	First “+” means not-the-negative; second “+” indicates addition
999 + + G23	First “+” indicates addition; second “+” means not-the-negative

The examples which involve two -’s or two +’s in a row may be a bit confusing, but they illustrate precedence: 1-2-3 performs the “take the negative”(negative value) and “not the negative”(positive value) operations before the “subtract” and “add” operations. Here are the precedence rules for the operators we’ve met so far:

Unless parentheses are used to override:

- “Take the negative” (negative value) and “not the negative” (positive value) take precedence over “multiply” and “divide”.
- “Multiply” and “divide” take precedence over “add” and “subtract”.

Powers. The operation “raise to the power”, also called “exponentiation”, is performed before any other arithmetic operation. The (^) character (on the “6” key) indicates this operation:

+ B35^5	The value in cell B35 raised to the fifth power.
18*B35^5	Raise the value in cell B35 to the fifth power, then multiply by 18 (multiplication has lower precedence than exponentiation).

Precedence Numbers

So far we’ve examined more than a half dozen operators. And “logical” operators are described in the next section. It’s pretty clear that we need some concise way to indicate which operations have priority over which. We’ll adopt the method traditional in mathematical circles: each operator will be assigned a precedence number. With the exception of operations within parentheses, the larger precedence numbered operations will be performed first in sequence.

The operations we’ve examined so far have the precedence numbers listed in the following chart. The actual numbers don’t have a specific meaning. What’s important is that “negative” has a larger number than “divisor,” “multiplication” has a larger number than “addition”, etc. REMEMBER...

Operations with larger precedence numbers are performed first, unless overridden by parentheses. Operations of equal precedence are performed left to right.

Operator	Meaning	Precedence
^	Exponentiation	7
+	Positive (not-negative)	6
-	Negative	6
*	Multiplication	5
/	Division	5
+	Addition	4
-	Subtraction	4

Examples (REFER TO THE PRECEDENCE NUMBERS IN THE CHART):

- + A4 + 100 * A1 Multiply the value in A1 by 100. Then add the value in A4.
- A1/12 + C7/12 Add 1/12th the value in A1 to 1/12th the value in C7.
- B25 * C1^3 Raise the value in C1 to the third power. Then multiply by the value in B25.

Note: We've left some room at the bottom for operators with lower precedence. All logical operators have lower precedence than the arithmetic operators. A complete table of operator precedence numbers appears at the end of this chapter.

Logical Operators and Formulas

True/False Statements

The formulas we've examined so far do arithmetic: They combine numbers using arithmetic operators, and produce numerical answers. You can also use another type of formula, in which numbers are combined into a statement that is either *TRUE* or *FALSE*. Such formulas are called logical formulas or conditions; the operators that combine the numbers are called *logical operators*.

Here are some examples of formulas that are *TRUE/FALSE* statements:

- + SALES = 45 The value in the cell named "SALES" is 45.
- + BALANCE > = 16.3 The value in the cell named "BALANCE" is greater than or equal to 16.3.
- + Yr2 < > Yr1 Yr2's value does not equal Yr1's value.

Each of these statements has a *TRUE/FALSE* value. Now we know what we mean by *TRUE* and *FALSE*. But it's useful to keep in mind exactly what 1-2-3 means:

- If 1-2-3 calculates a statement to be *TRUE*, it assigns the statement the value 1. Conversely, any nonzero number is equivalent to *TRUE*.
- If 1-2-3 calculates a statement to be *FALSE*, it assigns the statement the value 0. Conversely, the number 0 is equivalent to *FALSE*.

In many situations, you won't need to recall this—it will be sufficient to think in terms of *TRUE* and *FALSE* only. But don't forget that these logical values are really numbers.

As the examples above imply, one use of logical formulas is as record-selection criteria for use in /Data Query operations (page 17-6). Another major application is using a condition to control a cell's value. For example, you might use an @ function (see page 8-22) to "raise a red flag" if a projected expenses figure exceeds a projected revenue figure:

@IF(EXPNS > REV,6,0)

(Set the display format of the cell to "+ / -". If the condition is true, six plus signs will appear in the cell. If it's false, a single dot will be displayed.)

1-2-3 recognizes the following operators for making simple logical statements:

Operator	Meaning	Precedence
=	equal	3
<	less than	3
<=	less than or equal	3
>	greater than	3
>=	greater than or equal	3
<>	not equal	3

More Logical Operators—Compound Statements

In some situations, several conditions may apply at once:

- Select records whose credit code is either 3 or 7.
- Select records whose balances are greater than \$500 and are more than 60 days overdue.

You can build up compound conditions using several additional logical operators.

Operator	Meaning	Precedence
#NOT#	logical not	2
#AND#	logical and	1
#OR#	logical or	1

Note. These operators have lower precedence than the simple logical operators listed above. Each of them begins and ends with the character "#".

#NOT#(code = 4) The credit code stored in the cell named "code" is not 4.

+ code = 3#OR#code = 7 The credit code stored in the cell named "code" has the value 3 or the value 7. (The formula "+ code = 3#OR#7" does *not* have this meaning, since the operation #OR# is performed after the operation =.)

+ E12 > 500#AND#G12 > 60 The value in cell E12 exceeds 500 and the value in cell G12 exceeds 60.

@ Functions

You can specify a number in a 1-2-3 formula directly, by typing its digits (e.g. 14.57). Or you can specify a number indirectly, using a cell address (e.g. H37) or range name (e.g. TOTAL). When you use a cell address or range name, you're telling 1-2-3:

"Go off to another cell (e.g. H37), get the number stored there, and plug it into the formula here."

There's yet another way to specify a number in a formula: using an @ function, (or just *function*). Using a function tells 1-2-3:

"Here are some numbers. Go off and do some figuring. Then take the answer you get and use it in the formula here."

In a sense, a function is a formula within a formula. This makes 1-2-3 a very powerful tool, but greater sophistication means a greater possibility of confusion. So let's take it slowly, proceeding in question and answer fashion.

What does a function look like? 1-2-3 needs to know what particular "figuring" to do, and what particular numbers to use. Here are some examples:

@SUM(1,2,3,4,5)

@AVG(A1,A2,A3,A4,A5)

@MAX(A1..A5)

@COUNT(DATA__VALUES)

These examples illustrate several important facts about functions:

- Each function begins with a name, starting with the character "@". Uppercase and lowercase letters are equivalent in function names.
- Following the function name, you indicate the numbers for 1-2-3 to combine to produce the function's result or value. These numbers are called the **arguments** to the function. The entire set of arguments is enclosed in parentheses; individual arguments are separated by commas.
- Some functions allow you to specify a cell range as an argument. 1-2-3 then uses all the numbers stored in the range to calculate the function's value. Each function has its own rules about processing a range of values, and if so, what it does with the values.

Where can I use a function? Anywhere that you could use a number in a cell entry, either alone or as part of a formula. For example, if the sum of the numbers in cells A12..A25 is 176.99, then:

Alone: @SUM(A12..A25) is equivalent to the number 176.99

In a formula: 3*@SUM(A12..A25) is equivalent to the formula 3*176.99

What 1-2-3 functions can I use? A complete list of 1-2-3 functions appears in Chapter 19, “1-2-3 Function Reference”. A function listing also appears in the *1-2-3 Quick Reference*.

Functions Inside Functions

Consider these two facts:

1. You can use a function instead of a number anywhere in a cell entry.
2. Many of the arguments to be specified in a function are numbers.

Taken together, these facts imply that you can use one function inside another function. It can get as complex as your courage allows:

```
@IF(F13 > 20,100,55)
```

Substitute the function @MAX(A1..A5) for 20

Substitute the function @HLOOKUP(B1,B5..B10,1) for 55

```
@IF(F13 > @MAX(A1..A5),100,@HLOOKUP(B1,B5..B10,1))
```

Substitute the function @ABS(A17) for B1

```
@IF(F13 > @MAX(A1..A5),100,@HLOOKUP(@ABS(A17),B5..B10,1))
```

You'll probably give up before 1-2-3 does. But it *is* possible to create a formula that is so complex that 1-2-3 can't understand it. In this case, 1-2-3 displays the error message “Formula too long”. Break the formula into two or more parts, entering them in two or more cells.

Advanced Topic: Calendar Arithmetic

We'd like you to note especially a group of @ functions that allow you to do calendar arithmetic. With calendar arithmetic, you don't type dates as label entries, e.g. “5-8-83”. Instead, you (with 1-2-3's help) use *serial numbers* to represent dates:

Serial Number	Date
1	January 1, 1900
2	January 2, 1900
.	.
367	January 1, 1901
.	.
36526	January 1, 2000
.	.
72686	January 1, 2099
73050	December 31, 2099

This strategy makes it easy for you to use 1-2-3's calculation ability in carrying out many date-related analyses:

- Tickler files
- Weekly schedules
- Gantt charts
- Day-by-day and month-by-month planning

Of course, you're free to ignore 1-2-3's date-calculation capability. For some purposes, the label "5-8-83" is a perfectly adequate indicator of the date May 8, 1983. But entering dates as numbers rather than labels has several advantages:

Consistency and Flexibility. 1-2-3 has three different numeric display formats that make date serial numbers really look like dates:

08-May-83 08-May May-83

1-2-3 takes care of making entire sets of dates look consistent. ("Is it supposed to be 5-8-83 or 5/8/83 or 08/05/83 or . . .") And you can switch back and forth among these display formats without having to reenter the dates.

Calculations. There is no way for 1-2-3 to know that there are 482 days between 5-8-83 and 9-1-84. But if these dates are represented by numbers (30444 and 30926), then the answer is a simple subtraction: $30926 - 30444 = 482$. You can quickly construct a complete calendar, using a few simple formulas.

In the /Data Query command, you can search for a particular date whether it is represented as a number or a label. But you can specify conditions such as "before today" and "all Tuesdays from March to September of next year" only if you use calendar arithmetic.

Let's take a look at 1-2-3 facilities for performing calendar arithmetic. There are two sets of tools: *@ functions* and *numeric display formats*.

The Date Functions

Two of the @ functions answer the question "What is the serial number" for a particular date?

Function	Description
@DATE(year,month,day)	Calculates the number (1-73049) corresponding to a particular day between January 1, 1900 and December 31, 2099.
@TODAY	Calculates the number corresponding to the date entered when you started your computer.

Several other @ functions perform an opposite operation: They allow you to reconstruct a date from its particular serial number:

- @YEAR(serial#) Calculates the number of years since 1900 (0-199) for the date with the given serial number.
- @MONTH(serial#) Calculates the month (1-12) for the date with the given serial number.
- @DAY(serial#) Calculates the day-of-month (1-31) for the date with the given serial number.

Numeric Display Formats

The /Worksheet Global Format and /Range Format commands offer a host of numeric display formats—ways in which 1-2-3 can display numeric values. Three of these formats are gathered under the format choice Date:

Format	Appearance of the number
D1	08-May-83
D2	08-May
D3	May-83

This all means that in order to have 1-2-3 display a date, you must do three things:

1. Enter the date's serial number. For instance, @DATE(83,11,4) calculates the serial number of November 4, 1983.
2. Assign one of the Date display formats to the cell in which the serial number is stored.
3. Be sure the column-width of the cell is adequate for the display format you select.

You need not perform these tasks in a particular order, since numeric formats and column-widths are independent of cell contents. For instance, if you intend to enter dates in column F of the worksheet, we suggest that you assign a Date format to the cells in column F before making any entries therein.

If you don't assign a Date format to the cell, you'll see the date's serial number in whatever numeric format applies to the cell (e.g. 30426, \$30426.00, or 3.0426E4).

Performing Calendar Arithmetic Calculations

Here are some tips for performing calculations with date serial numbers.

- Calculate the number of days between two dates by subtracting serial numbers: *later date* - *earlier date*.
- To generate a calendar, use such formulas as:
 - + A15 + 1 to generate the next day's date
 - + A15 + 7 to generate the date of the same day next week

Don't use "plus 31" or "plus 365" formulas to go from month to month and from year to year. Months and years are not all the same length!

- Given the number of days between two dates, calculate the number of weeks by dividing by 7. Use the `@INT` or `@ROUND` function to convert the result to a whole number.
- When the exact number of days in an interval is critical, decide whether the interval should include both the starting and ending dates, just one of those dates, or neither. A straightforward subtraction includes one of the end dates.
- Bankers often simplify things by assuming that months have 30 days and years 360 days. To calculate in this manner, don't compute an interval in days. Instead, use the `@YEAR` and `@MONTH` functions to calculate the interval in years and months. Then multiply by the 360 and 30 factors to obtain the days-equivalent.
- Feel free to use dates in logical expressions. The expression `@TODAY<@DATE(85,4,15)` is *TRUE* (has the value 1) before April 15, 1985. After that, it is *FALSE* (has the value 0).

Summary of Operator Precedence Numbers

Operator	Meaning	Precedence
^	Exponentiation	7
-	Negative	6
+	Positive	6
*	Multiplication	5
/	Division	5
+	Addition	4
-	Subtraction	4
=	Equal	3
<	Less than	3
< =	Less than or equal	3
>	Greater than	3
> =	Greater than or equal	3
< >	Not equal	3
#NOT#	Logical Not	2
#AND#	Logical And	1
#OR#	Logical Or	1

9. Creating Keyboard Macros—1-2-3's Typing Alternative

1-2-3 has a facility that allows you to store sequences of keystrokes for future use—during the same session or during a later one. The keystrokes might invoke one or more formatting commands, type entries, create a graph, etc.

A stored sequence of keystrokes is often called a **keyboard macro**. We'll also use the shortened form, **macro**.

You “attach” each macro to one of the letter keys: A,B,C, . . . , Z. When you hold down the [CTRL] [Shift] keys and type the letter, 1-2-3 automatically types all the keystrokes stored in the sequence, just as if you had typed them again yourself.

Since this facility allows you to save keystrokes, some people call it the *Typing Alternative*. Others call it the *macro facility*.

There are many situations in which you'll find the Typing Alternative useful:

- You need to type the same label many times in a worksheet. For instance, “Revenues”, “1st Quarter”, or your company name.
- You need to perform a certain procedure, involving several commands and/or entries in a particular order. For instance, a macro might produce a printed report consisting of several sections of the worksheet, each with its own margins, character size, line spacing, etc.
- In a worksheet that you're developing for use by non-technical personnel, you wish to use some of 1-2-3's more sophisticated functions. But you can't afford the time to train the personnel in the program's advanced features.

Let's take a closer look at one of these situations. We strongly suggest that you work through the example on the next few pages. Execute this macro sequence, one keystroke at a time to make sure each keystroke is appropriate, complete and in correct order to the other keystrokes.

A Simple Example

Suppose that one of your 1-2-3 worksheets provides the data for several types of report. For each report, you wish to adjust the widths of columns A and B, in order to produce the best visual effect.

Thus, before printing the report, you must issue the appropriate 1-2-3 commands to set column widths. You can have a keyboard macro handle this task.

- **Do it yourself.** Perform the procedure once manually writing down each keystroke as you execute it:

Keystrokes	Result
[f5/GoTo]A1[Return]	Move the pointer to cell A1.
/WCS25[Return]	Use the /Worksheet Column-Width Set command to set the width of column A to 25 characters.
▶	Move the pointer one cell to the right, to cell B1.
/WCS12[Return]	Use the /Worksheet Column-Width Set command to set the width of column B to 12 characters.

- **Enter the macro.** Go to a cell that is out of the way—e.g. cell X1—. Record all of the keystrokes as a label entry, including a tilde (~) for each [Return]:

```
'{goto}A1~/WCS25~{right}/WCS12~[Return]
```

- **Attach the keystroke sequence to a letter key:**

```
/Range Name Create  
Enter name: \C[Return]  
Enter range: X1[Return]
```

This “attaches” the keystroke sequence stored in cell X1 to the C key.

- **Use the macro.** First, reset the widths of columns A and B: Go to cell A1 and issue the command /Worksheet Column-Width Reset. Go to cell B1 and issue the same command.

Now, hold down the [CTRL] and [Shift] keys, then press C. These keystrokes call your macro into action, invoking the typing alternative named “C”. 1-2-3 instantly types the stored key strokes, changing the column-widths back to 25 and 12.

Having worked through an example, let’s examine the macro facility more closely.

Creating and Naming a Macro

We suggest that you always go through a “dry run” before using the Typing Alternative: Type the entries and/or commands, noting exactly which keys you press. Don’t forget to note [Return] and [Space Bar]! When you’re satisfied that you know precisely which keystrokes are to be saved, find some out-of-the-way cells, in an empty part of the worksheet. Then:

1. Enter the macro as one or more labels (e.g. preceded by a label-prefix).
2. Assign a special macro range name to the cell in which the keystroke sequence begins.

Each of these steps will be described in detail on the following pages. A general discussion of using (invoking) macros, your 1-2-3 typing alternative, will follow to the end of the chapter.

Step 1. Enter the macro as one or more labels.

Even if the keystrokes will perform commands or enter numbers/formulas, you must *define* the sequence in label form. In practice, this means that you'll need to begin many macro entries with a label-prefix character (page 5-6). Figure 9-1 shows three labels that can act as keystroke sequences.

(1) + {up} + {up}{up} + {up}{up}{up} ~
 (2) /wcs10 ~ {right}/wcs10 ~ {right}/wcs10 ~ {left}{left}
 (3) Lotus Development Corporation ~

Figure 9-1. Three Simple Macros

Macro 1 in Figure 9-1 enters a formula that sums the three cells above the current cell. To enter this macro as a label, you must begin it with an apostrophe (') or another label-prefix:

You type: ' + {up} + {up}{up} + {up}{up}{up} ~ [Return]

What appears in cell: + {up} + {up}{up} + {up}{up}{up} ~

The general rule is:

What you see in the worksheet is what 1-2-3 uses to do Alternative Typing.

Macro 2 issues the /Worksheet Column-Width Set command several times. This macro sets the display width of three consecutive columns to 10 and returns the pointer to its original position. As above, to enter this macro as a label, you must begin it with an apostrophe or any other label-prefix.

Macro 3 enters a label in the current cell.

These examples illustrate how you indicate the keyboard's special keys in a macro:

- Keys with multiple-character names are indicated by enclosing the name in braces, e.g. {Home}, {ESC}.
- The arrow pointer-movement keys are similarly indicated by name using any combination of upper and lower case you wish, e.g. {left}, {RIGHT}, {Up}, {DOWN}.
- Because we expect you'll be using [Return] a great deal, we've assigned it a single-character name, tilde (~).

Figure 9-2 is a complete listing of the special keystroke indicators you can use in macros. 1-2-3 always interprets the characters {, }, and ~ as having their special meanings in a macro. Don't use these characters with the Typing Alternative for any other purpose.

To indicate this key	Type this in a macro	To indicate this key	Type this in a macro
[Return]	~	[f2/Edit]	{Edit}
▲	{Up}	[f3/Name]	{Name}
▼	{Down}	[f4/Abs]	{Abs}
◀	{Left}	[f5/GoTo]	{GoTo}
▶	{Right}	[f6/Window]	{Window}
▼	{Home}	[f7/Query]	{Query}
[Select]	{End}	[f8/Table]	{Table}
[Prev]	{PgUp}	[f9/Calc]	{Calc}
[Next]	{PgDn}	[f10/Graph]	{Graph}
[DEL] or [-Char]	{Del}	Pause for manual input until user presses [Return]	{?}
[Backspace]	{Bs}	(Interactive Macros, page 9-8)	
[ESC]	{Esc}		

Figure 9-2. Special Key Indicators

Multiple-Cell Macros. We said above that you can use “one or more labels” to store keystrokes. Here’s how. For readability, you can split up a long keystroke sequence into a column of labels. 1-2-3 doesn’t care exactly which keystrokes are stored in which cells. It simply continues to read downward until it reaches a non-label cell (empty, number, or formula). (You can modify this strictly downward procedure using the special commands /XG, /XC, and /XM. See page 9-10.)

We suggest that you take advantage of this flexibility to divide long macros into modest-sized pieces. Use the cells to the right of the macro sequence to remind yourself what each piece accomplishes. When you do this, be certain that your comments are not in the same cell as the macro. Figure 9-3 contains two versions of the same macro, illustrating both the use of explanatory text and the fact that 1-2-3 doesn’t care exactly which keystrokes are stored in which cells.



Caution. 1-2-3 pays attention to *all* characters in a macro. This includes “invisible” ones, such as [Space], that lie beyond the last visible character in an entry.

Step 2. Assign a special macro range name to the cell in which the keystroke sequence begins.

Using the /Range Name command, assign a name consisting of a backslash (\) and then a letter to the starting cell of the keystroke sequence:

\A \B \C... \Z

This makes the cell into a named range. For many purposes, you can use this range name like any other (with [f5/GoTo], with /Range Erase, etc.). But in addition, 1-2-3 “attaches” the macro beginning in that cell to the corresponding letter key.

Version one	
Jan-Jun{right}	First label
Jul-Dec{left}	Second label
{down}	Down a row
0{right}0~	Enter zeros
/rfc2~{left}~	Format: Currency,2
{left}{up}	Back to beginning cell
Version two	
Jan-Jun{right}Jul-Dec{left}	Labels
{down}0{right}0~	Numbers
/rfc2~{left}~	Format: C2
{left}{up}	Return

Figure 9-3. Multiple-Cell Macros

Auto-Execute Macro. You can assign one additional macro name with the /Range Name command: \0 (zero). This is a special name, indicating an *auto-execute* macro.

If a worksheet you've created includes a macro named \0, 1-2-3 automatically *invokes* (starts) the macro whenever you load the worksheet (/File Retrieve command). This 1-2-3 feature is useful in combination with the auto-loading worksheets (page 14-6).

Invoking a Macro

After you've attached a keystroke sequence to a letter key, you can have 1-2-3 type it automatically at any time* by pressing

[CTRL] [Shift]-letter

That is, hold down the [CTRL] and [Shift] keys and press the letter key that identifies that particular macro. This process is called "invoking a macro". The simplest usage is in Ready Mode—having 1-2-3 automatically type one or more complete entries and/or issue one or more complete commands. For example, refer to Figure 9-1:

- Assign the cell containing Macro 1 the range name \X. Then, pressing [CTRL] [Shift]-X in Ready Mode enters the formula in the current cell.
- Assign the cell containing Macro 3 the range name \Y. Then, pressing [CTRL] [Shift]-Y in Ready Mode enters the label "Lotus Development Corporation" in the current cell.

However, you're not restricted to using the Typing Alternative in Ready Mode. The macro \Y could be invoked at a command prompt to enter the same sequence of characters (e.g., at the /Graph Options Titles First prompt or at the /Print Options Footer prompt).

*Exception: Pressing [CTRL] [Shift]-letter when a macro is active and pausing for keyboard input has no effect. See "Interactive Macros", page 9-8, and the /XM command description, page 9-12.

It is even possible to (1) start an entry or command manually, (2) use the Typing Alternative to continue, and (3) finish the label manually. Note the difference between these two macros:

Macro \P: Revenues ~ Macro \Q: Revenues

Pressing [CTRL] [Shift]-P types the word “Revenues” and finishes the entry. (Remember, “~” means [Return].) But pressing [CTRL] [Shift]-Q doesn't type [Return]. That means you can press [CTRL] [Shift]-Q to insert the word “Revenues” in the middle of a label, a graph legend, a page footer, etc.

A Two-Macro Procedure. Similarly, you might begin a procedure with a macro, continue it manually, then finish it with a macro. The two macros in Figure 9-4 start and end a procedure that prints a form letter using information from a data record. The 1-2-3 user follows this procedure:

1. Moves the cell pointer to a particular data record.
2. Invokes macro “A” by pressing [CTRL] [Shift], then A.
3. Types a “# of days” entry.
4. Invokes macro “B” to finish the job.

Auto-Execute Macro. After the worksheet is loaded, you cannot invoke the auto-execute macro, \0, by holding down [CTRL] [Shift] and pressing 0. To be able to use an auto-execute macro while you're working, assign it a second macro name (e.g., \H), in addition to \0.

The CMD Indicator

In many cases, you'll want 1-2-3 to run through the entire macro more or less instantaneously. But in other cases, you may want a pause in the middle, e.g. to specify a range to be printed. You can indicate pauses for keyboard input in a macro using the {?} facility (page 9-8) and the /XM command (page 9-12).

Whenever it pauses during a macro, 1-2-3 displays a *CMD* indicator next to the mode indicator in the upper right corner of the screen.

For a more technical discussion of [CTRL][Shift]-letter, see page 9-14.

Single-Step Execution

During the design and testing phase of writing macros, you'll sometimes find that 1-2-3 is *too* fast. To help you diagnose problems in your procedures, 1-2-3 has a **single-step mode**, in which 1-2-3 pauses after each keystroke of a macro instead of typing the entire sequence at once.

At any time, you may hold down the [CTRL] key and press [F1/Help]. This causes a *STEP* indicator to appear in the lower right corner of the screen. Then, press [CTRL]-[Shift] and the letter attached to the macro; to step through the macro, press any key. To stop stepping through, press [CTRL]-[F1/Help].

The database — several additional fields are in columns M, N, etc.

	G	N	E	J	K	L
1	Name	Company	Address	City	State	Zip
2	F. Reinhardt	ABC Medical	453 Hunter Lane	Barton	VA	12222
3	T. Fountain	Musnum Music	1 Goodwin Place	Upsta e	NY	99667
4	R. Ford	Smart Art Shop	1001 Knight St.	Rosof	TX	09909
5	J. Schwarz	Peninsula Review	Apple Court	Wryo	OH	88512

```

A1:
-
1  A      B      C      D      E
2  _____ 26-May-83
3
4  ←----- Name, Company, Address go here
5
6
7  Dear Sirs:
8
9  Account #: ←----- Account # goes here
10
11
  
```

```

A1:
-
12  A      B      C      D      E
13  _____
14  Please be advised that your account is seriously overdue.
15  If you do not pay the full balance of your account within
16  days, we will take legal action. ←----- # of days goes here
17
18  Thank you.
  
```

```

Macro \A
/c~b2~{right}      Copy "Name"
/c~b3~{right}      Copy "Company"
/c~b4~{right}      Copy "Address"
/c{right}{right}~b5~
{right}{right}{right}
Move to "Account #"
/c~c9~
{home}{goto}b14 z `
Move to "# of days"

Macro \B
{up}{up}           Move to top of paragraph
/rjb12.e15~       Justify paragraph
/pprb1.e17~gq     Print it
  
```

Figure 9-4. A Two-Macro Procedure

Whenever a macro is executing while the *STEP* indicator is on, processing occurs one step at a time: a single keystroke or a single /X command (page 9-9). Inbetween keystrokes, 1-2-3 pauses for you to press any key. At such times, *SST* is displayed in the upper right corner of the screen instead of *CMD*.

The key you press to advance a single step is not interpreted by 1-2-3—it simply resumes macro execution. Exception: Pressing [CTRL]-[f]/[Help] during a pause turns the *STEP* indicator off; then pressing any key completes macro execution.

Interrupting Macro Execution

You can interrupt the execution of a keyboard macro and return immediately to Ready Mode. While a macro is reading keystrokes, issue a *break* by pressing [Break] (a shifted function). Control returns immediately to Ready Mode.

Similarly, you can press [Break] to interrupt a macro during a pause for keyboard input. 1-2-3 displays a *CMD* or *SST* indicator in the upper right corner during such pauses.

Advanced Topic: Interactive Macros

The two-macro procedure above illustrates one way to implement a partly automatic, partly manual procedure. But 1-2-3 offers an even better way to get the job done. The Typing Alternative facility can be *interactive*: 1-2-3 can pause one or more times for manual input while it is processing a macro.

Whenever 1-2-3 encounters `{?}` in executing a macro, it pauses for keyboard input. The user may type any number of keys: 1-2-3 will interpret them in the current context. When the user presses [Return], 1-2-3 resumes the macro just after the "`{?}`".

The [Return] pressed by the user only causes the macro to resume execution. The [Return] is not acted upon by 1-2-3 as part of the keystroke sequence. This means that you'll often find it necessary to include this sequence in a macro:

```
{?}~
```

The `{?}` accepts keyboard input, and the `~` finishes off the entry with [Return].

Other sequences are equally useful:

- | | |
|-------------------------|--|
| <code>{?}{Right}</code> | 1-2-3 accepts keyboard input, then automatically presses the
▶ key. |
| <code>{?}{PgDn}</code> | 1-2-3 accepts keyboard input, then automatically presses
[Next]. |

Example. Figure 9-5 shows how to paste together the pair of form-printing macros illustrated in Figure 9-4 above.

<code>/c~b2~{right}</code>	Copy "Name"
<code>/c~b3~{right}</code>	Copy "Company"
<code>/c~b4~{right}</code>	Copy "Address"
<code>/c{right}{right}~b5~</code>	Copy "City-State-Zip"
<code>{right}{right}{right}</code>	Move to "Account #"
<code>/c~c9~</code>	Copy "Account #"
<code>{home}{goto}b14~</code>	Move to "# of days"
<code>'{?}~</code>	Start entry, pause, then finish entry
<code>{up}{up}</code>	Move to top of paragraph
<code>/rjb12..e15~</code>	Justify paragraph
<code>/pprb1.e17 ~ gq</code>	Print it

Figure 9-5. An Interactive Macro

In addition to the {?} facility, 1-2-3 offers several other tools for constructing interactive macros. See the descriptions of the Pause-for-Keyboard-Input commands on page 9-12.

Advanced Topic: Programming Capabilities

1-2-3's Typing Alternative facility incorporates an additional feature that opens an entirely new range of possibilities. Instead of merely typing keystrokes that you've stored previously, 1-2-3 can *make decisions* regarding what to do next. These decisions can be based on values in the worksheet or on actions taken by the user during macro execution.

For instance, you can have a macro:

- [F5/GoTo] different locations in the worksheet, depending on the value of a certain cell.
- Print mailing labels using the information in a database, stopping automatically when it gets to the last record.
- Display a menu *that you define* in the control panel, allowing the user to select one of the menu choices. The macro then takes an action based on the user's choice.

We think we can legitimately claim that this facility gives the 1-2-3 user a true programming capability. But the same caution goes for 1-2-3 programming as for all other kinds of computer programming:

Allowing the computer to make decisions means there is a possibility it will make a decision you didn't anticipate.

The /X Commands

Now that we've issued the appropriate warnings, let's take a look at how to use the extra power. It's localized in an extra set of 1-2-3 commands, the /X commands. /X is "invisible"—1-2-3 won't recognize it if you try to type it. You can use the /X commands only in a macro.

The /X commands differ from other 1-2-3 commands in a fundamental way: Most commands affect the worksheet's entries; the /X commands affect the way in which 1-2-3 "reads" the keystrokes of a keyboard macro.

Here's a summary listing of the /X commands:

Programming

Command	Function
/XIcondition ~ . . .	If-Then
/XGlocation ~	GoTo
/XClocation ~	Call subroutine (GoTo, then return)
/XR	Return from subroutine
/XQ	Quit macro execution

Pause for Keyboard Input

Command	Function
/XMlocation ~	Process a user-defined menu
/XLmessage ~ location ~	Display a message in the control panel, accept a label entry (/XL) or number entry (/XN) from the keyboard, and place this entry in a cell.
/XNmessage ~ location ~	

/X Programming Commands

The /X programming commands supply the basic tools of a programming language: an “If” statement, both “GoTo” and “Subroutine Call-and-Return” facilities, and a “Quit” (END) statement.

For variables, you have the worksheet's cells. It is strongly suggested that you use the range name facility, which allows you to have variables with meaningful names. (Figure 9-6 illustrates a macro that uses the variables NUMBER and COUNTER.)

/XIcondition ~ . . . *If-Then*

If the condition is *TRUE* (i.e. has a non-zero value), continue reading keystrokes in the same cell. If the condition is *FALSE* (i.e. zero), continue reading keystrokes in the cell below. Be sure to follow the *condition* in the /XI command with a tilde character.

/XGlocation ~ *GoTo*

Continue reading keystrokes at *location*. You may specify a cell address, a range, or a range name as the location. 1-2-3 immediately abandons the current cell and continues reading keystrokes at the specified cell (or the upper left corner of the specified range).

Caution. Don't get this programming “goto” confused with the [F5/GoTo] key. The /XG command only determines where 1-2-3 will look next for macro keystrokes. This is unrelated to the worksheet's current cell and [F5/GoTo].

*/XC*location ~
/XR

Call Subroutine
 Return from Subroutine

Similar to */XG* (Goto). Continue reading keystrokes at *location*. When a */XR* command is encountered, return to reading keystrokes at the point just beyond the */XC*location ~ command.

An error occurs if an */XR* command is encountered, but no */XC* command has been issued. Subroutines may be nested up to 16 levels.

/XQ

Quit

1-2-3 erases the CMD indicator from the upper right corner of the screen and returns you to Ready Mode.

Example. Figure 9-6 shows a macro that converts a column of formulas into their current values. For each cell, this takes two keystrokes: [F2/Edit], then [F9/Calc]. This is followed by ▼ (move to the next entry to be converted) and [F9/Calc] (increment COUNTER).

You can use the */XG* command to jump a few cells upward in the same column. The effect is to make 1-2-3 process the same cells—type the same keystrokes over and over again, going cell-by-cell down the column. This could go on forever—an “infinite loop”. But the */XI* command breaks out of the loop when all the formulas have been converted.

<i>/wgrm</i>	Set Recalc to Manual
<i>/rnc</i> NUMBER ~ b1 ~	Create “NUMBER” variable
<i>/rnc</i> COUNTER ~ b2 ~	Create “COUNTER” variable
<i>/rnc</i> COLUMN ~ {bs}.{end}{down} ~	Name the formulas COLUMN
{goto}NUMBER ~	Initialize NUMBER
@count(COLUMN){calc} ~	
{down} + COUNTER + 1 ~	Initialize COUNTER
{goto}COLUMN ~	Move to top of COLUMN
{edit}{calc}{down}{calc} ~	Convert and increment
<i>/xi</i> COUNTER < = NUMBER ~ <i>/xg</i> LOOP ~	Branch on condition
<i>/wgra</i>	Endgame: Automatic Recalc
{home}{goto}COUNTER ~ Done! ~	Done message
{goto}COLUMN ~	Return to starting point
<i>/xq</i>	End macro

Figure 9-6. A “Looping” Macro

Pause-for-Keyboard-Input Commands

/XLmessage ~ location ~

Get label entry from keyboard

1-2-3 displays the *message* string (which may be up to 39 characters long) on line 2 of the control panel, and then pauses. The user can type any string of characters (up to 240). When the user presses **[Return]**, 1-2-3 stores the string of characters as a label in the specified *location*. If a range is specified as the location, only its upper left corner cell gets the entry. Each label is assigned the apostrophe (left-align) label-prefix.

/XNmessage ~ location ~

Get number entry from keyboard

1-2-3 displays the *message* string (which may be up to 39 characters long) on line 2 of the control panel, and then pauses. The user can type any number or formula—even range names and @ functions are allowed. When the user presses **[Return]**, 1-2-3 finds the numeric value of the entry and stores it in the *specified* location. If a range is specified as the location, only its upper left corner cell gets the entry.

If the user types an entry that 1-2-3 cannot interpret as a numeric value, 1-2-3 displays an error message and allows the user to try again. (The error condition must be cleared first, with **[Return]** or **[ESC]**.)

Note that 1-2-3 does not recalculate the worksheet after it performs an */XL* or */XN* command. You may wish to include {**CALC**} steps in your macro after using these commands.

/XMlocation ~

Process a Menu

1-2-3 allows the user to make a menu choice, and branches according to the user's choice. 1-2-3 constructs the menu from the menu range whose upper left corner is location. As above, location may be a cell address, range, or range name.

A menu range can be up to eight columns wide and is two rows deep (Figure 9-7).

1st Row. A consecutive set of entries, with any text you wish.

During execution of the */XM* command, the entries in this row are displayed as a set of menu choices on line 2 of the control panel. Be sure to follow these guidelines in creating these entries:

- Do not place more than eight consecutive entries across this row.
- The cell to the right of the final menu item must be empty.
- No empty cells are allowed between menu items.
- Keep the total number of characters small, to prevent overflowing the screen.
- Avoid creating menu entries that begin with the same character. This will limit users' ability to select choices by typing a character. 1-2-3 automatically converts a lowercase letter to uppercase at the beginning of a menu entry. Thus, don't try to use *case* to distinguish choices.

2nd Row. Each entry in this row is the “long prompt” for the menu choice above it. /XM-type menus work the same way as standard 1-2-3 menus. Whenever the user highlights a particular menu choice, line 3 of the control panel displays the choice’s explanatory phrase.

Here is an outline of /XM command execution:

1. 1-2-3 pauses in reading macro keystrokes (similar to the {?} facility).
2. In the control panel, 1-2-3 displays a “moving-pointer” menu that looks just like 1-2-3’s command menus. The menu choices themselves are drawn from the first row of the menu range. The corresponding explanatory phrases come from the second row of the menu range.
3. The user makes a menu choice in the same way as with a 1-2-3 command menu:
 - Moving the menu pointer with **▶**, **◀**, **▼**, and/or **[Select]**, then pressing **[Return]**; or
 - Typing the first character of the menu choice. (If two menu choices begin with the same character, the one on the left is selected.)
4. 1-2-3 continues reading keystrokes just below the menu range, in the column of the selected menu choice. That is, the macro continues two cells below the choice selected by the user (Figure 9-7).

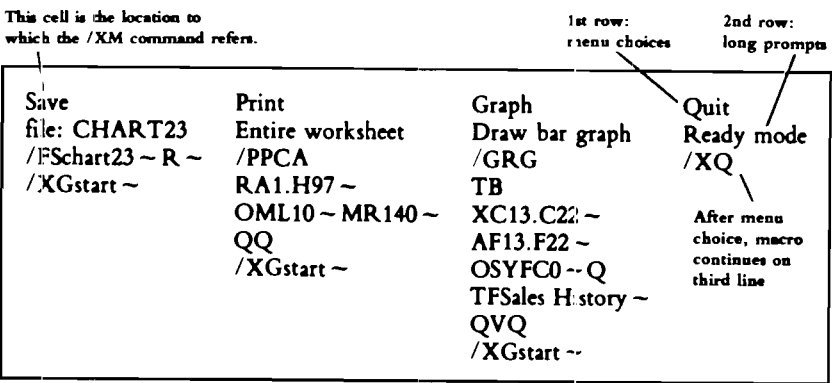


Figure 9-7. A User-Defined Menu

Note these differences between /XM menus and 1-2-3 command menus:

- /XM menu choices need not start with different characters. If the user presses a character to make a choice, 1-2-3 selects the first menu item, reading left-to-right, that begins with that character.
- Pressing **[ESC]** at a /XM menu doesn’t “back up one step”—1-2-3 just continues reading keystrokes in the cell containing the /XM command.

Advanced Topic: Macro Implementation Details

After you've done some simple work in using the Typing Alternative, you'll probably want to reread this section thoroughly. We present here some additional detail regarding the way macros work. The detail is not for its own sake—a greater understanding will help you in revising macros and in using macros to type aligned labels (right-aligned, centered, etc.).

When you invoke a macro, [CTRL] [Shift]-E for example, here's what happens:

1. 1-2-3 looks up \E in its range name table. If there is no range with this name, 1-2-3 just *beeps*.
2. The first cell is either the single cell assigned the name \E, or the upper left corner of the range to which \E is assigned.
3. 1-2-3 “types” the keystrokes stored in this first cell, then goes to the cell below it, looking for more keystrokes to type.
4. 1-2-3 continues downward in this manner until one of the following happens:
 - It arrives at a non-label cell, or reads a /XQ command. In these cases, macro execution terminates.
 - It reads a /XG, /XC, or /XR command, which instructs it to continue reading keystrokes elsewhere in the worksheet.

Ignoring the Label-Prefix. With each entry it types, 1-2-3 ignores the label-prefix character, paying attention only to the subsequent characters. Think of it this way:

What you see of a label in the worksheet is what 1-2-3 uses to do Alternative Typing.

Here are some examples to illustrate this point:

Cell entry as displayed in the control panel	Effect in a macro
'Revenues	Revenues
'/WGRM	/Worksheet Global Recalculation Manual
' + A4/100 ~	+ A4/100[Return] (a formula)

What does all this detail mean? There are important implications for two aspects of using the Typing Alternative: revising an existing macro and entering labels with macros.

Revising an Existing Macro

To do automatic typing, 1-2-3 doesn't remember keystrokes directly. Rather, it remembers the cell range in which the keystrokes are stored. If you change the contents of the range named "\E", you've effectively revised the macro invoked by [CTRL] [Shift]-E.

Thus:

To revise a keystroke sequence, don't use the /Range Name command. Just revise the entries in the named range itself.

Using Macros to Enter Labels

When 1-2-3 interprets a label as a keystroke sequence, it ignores the label-prefix character. Thus, if the purpose of the sequence is to type a label, you may need to include a second label-prefix character. We admit this is a bit complex. But just remember the rule mentioned above:

What you see of a label in the worksheet is what 1-2-3 uses to do Alternative Typing.

For example:

' "Expenses ~ [Return]	actual cell entry
"Expenses ~	how cell appears in worksheet

What you see in the worksheet—and what 1-2-3 gets when you invoke the macro—is a word preceded by a double-quote. Thus, the result is a right-aligned label.

Let's look at another case:

'Expenses ~ [Return]	actual cell entry
Expenses ~	how cell appears in worksheet

When you invoke the macro, 1-2-3 views this entry as a label that begins with "E". It automatically adds the global label-prefix character, as set with the /Worksheet Global Label-Prefix command.



Command Skills Contents

10. Worksheet Commands

11. Range Commands

12. Copy Command

13. Move Command

14. File Commands

15. Print Commands

16. Graph Commands

17. Data Commands

18. Quit Command

Worksheet

Range

Copy

Move

File

Print

Graph

Data

Quit



10. Worksheet Commands

The /Worksheet commands control various overall aspects of 1-2-3 usage. They can manipulate worksheet display or they can change a specific work area by inserting or deleting new, empty cells or ranges.

/Worksheet Commands Have Timely Applications

At the Beginning of a Session: Certain /Worksheet commands are useful at the start of a 1-2-3 session because they can determine the overall appearance of the worksheet by specifying column widths and overall display formats. Others determine the way in which 1-2-3 calculates the formulas you enter into the worksheet.

During a Session: Still other /Worksheet commands are most useful in the middle of a session. They can make large-scale changes to the worksheet's contents, such as erasing the entire worksheet (as in "Oops—better start over") or inserting empty rows and columns. They can also change the way 1-2-3 uses the display screen, allowing you to view two widely separated parts of the worksheet at the same time.

How 1-2-3 Displays Cell Entries

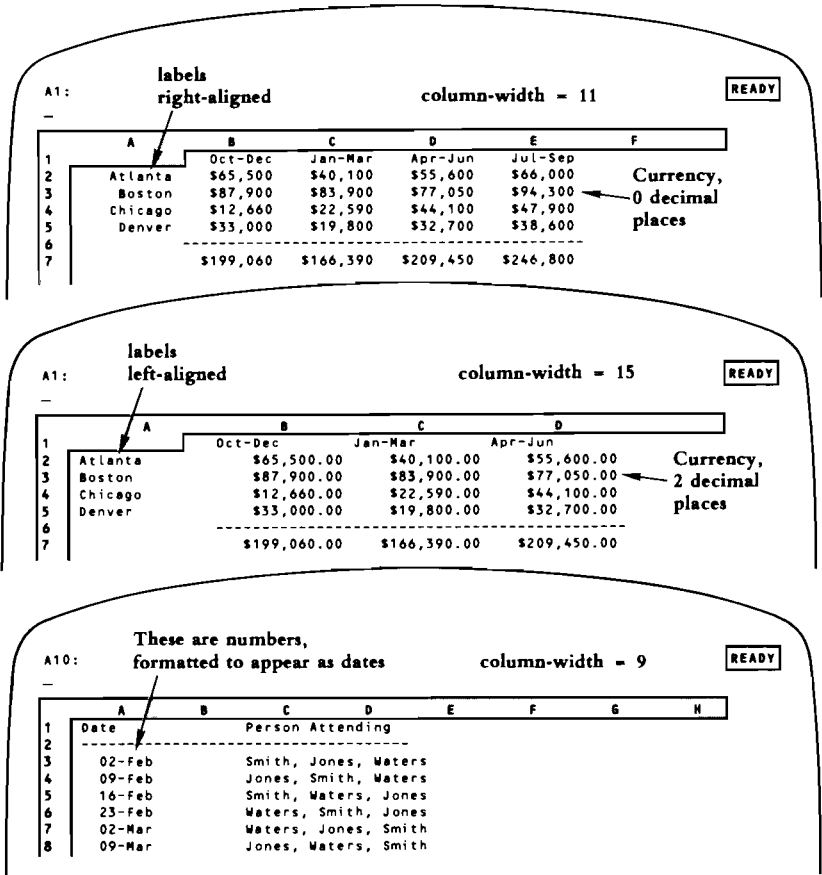
Commands in the /Worksheet Global menu of commands can control these overall aspects of worksheet appearance:

- Display format for numbers and formulas.
- Alignment of labels, (determined by a prefix character).
- Column widths.

1-2-3 Worksheets and Default Display Settings

You need not issue /Worksheet Global commands when you start filling in a new worksheet. When 1-2-3 begins execution, and whenever you issue a /Worksheet Erase command, the initial global settings listed in the table below are automatically established. These are called 1-2-3's *default* settings. In each instance, you can superimpose a different setting over a default value to satisfy a particular requirement of a specific worksheet. Any changes you make in this manner are stored along with the cell entries in the *worksheet files* you create with /File Save and /File Xtract.

Global Setting	Initial Value	Other Possible Values
Numeric Display Format	General	Fixed, Currency, Comma, Percent, Scientific, Date, + / -, Text
Label Alignment	Left-Aligned	Right-Aligned, Centered
Column-Width	9 characters	1..72 characters



A1: labels right-aligned column-width = 11 READY

	A	B	C	D	E	F
1		Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	
2	Atlanta	\$65,500	\$40,100	\$55,600	\$66,000	
3	Boston	\$87,900	\$83,900	\$77,050	\$94,300	
4	Chicago	\$12,660	\$22,590	\$44,100	\$47,900	
5	Denver	\$33,000	\$19,800	\$32,700	\$38,600	
6						
7		\$199,060	\$166,390	\$209,450	\$246,800	

Currency, 0 decimal places

A1: labels left-aligned column-width = 15 READY

	A	B	C	D
1		Oct-Dec	Jan-Mar	Apr-Jun
2	Atlanta	\$65,500.00	\$40,100.00	\$55,600.00
3	Boston	\$87,900.00	\$83,900.00	\$77,050.00
4	Chicago	\$12,660.00	\$22,590.00	\$44,100.00
5	Denver	\$33,000.00	\$19,800.00	\$32,700.00
6				
7		\$199,060.00	\$166,390.00	\$209,450.00

Currency, 2 decimal places

A10: These are numbers, formatted to appear as dates column-width = 9 READY

	A	B	C	D	E	F	G	H
1	Date		Person Attending					
2								
3	02-Feb		Smith, Jones, Waters					
4	09-Feb		Jones, Smith, Waters					
5	16-Feb		Smith, Waters, Jones					
6	23-Feb		Waters, Smith, Jones					
7	02-Mar		Waters, Jones, Smith					
8	09-Mar		Jones, Waters, Smith					

- The global label alignment can be overridden for particular cells by typing *Label-Prefix characters* and issuing */Range Label-Prefix* commands (also presented in Chapter 11, page 11-10).
- The global column-width setting can be overridden for particular columns with */Worksheet Column-Width* commands (page 10-19).

For example, you might override the global settings in certain parts of the worksheet in Figure 10-1 to produce the different illustrations in Figure 10-2.

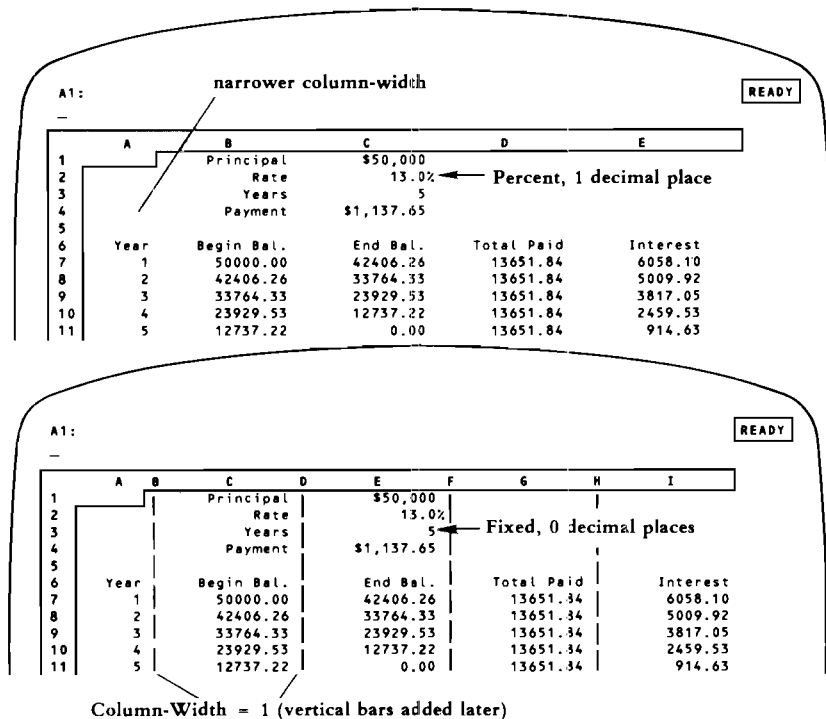


Figure 10-2. Overriding Global Settings

A few additional points are important to an understanding of how these */Worksheet Global* commands work:

Numeric Display vs. Label Display. The ways in which 1-2-3 displays numbers and labels are independent. Setting the numeric format of a cell has no effect on the way 1-2-3 displays a *label*—whether it's already there or you enter it later. Accordingly, two different */Worksheet Global* commands handle these two independent formats:

- ***/Worksheet Global Format:*** Specifies numeric formats
- ***/Worksheet Global Label-Prefix:*** Specifies label formats



(Numeric and label formats are described in the command summaries in this chapter.)

Numbers—Appearances, not Values. The `/Worksheet` commands determine only the way in which 1-2-3 shows numbers *on the display screen*. These commands *don't* change the values stored in the cells.

Example: 1-2-3 calculates an amount to be 518.628.

1. You set the display format to dollars-and-cents (1-2-3 calls this format “Currency, 2 decimal places”). The cell now appears as “\$518.63”. 1-2-3 appears to have rounded off the number to the nearest penny, but it still knows the true value.
2. You then set the format to “Currency, 4 decimal places”, causing the cell to appear as “\$518.6280”.

No matter how many decimal places of a number are displayed, 1-2-3 always remembers the number at maximum precision, about 15 decimal places. You *can* have 1-2-3 do true rounding, using the `@ROUND` function (Chapter 19, “1-2-3 Function Reference”).

Labels—Appearances and Values. The situation with labels is different from that with numbers. 1-2-3 stores the formatting information concerning labels (left-aligned, right-aligned, centered, or repeating) as part of the label itself, in the *label-prefix character*.

Using a `/Worksheet Global Label-Prefix` command establishes a standard prefix character—1-2-3 automatically places this character in front of any label that you enter without a prefix. Subsequently changing the standard prefix does *not* change these existing labels. Use a `/Range Label-Prefix` command to change their prefix characters and, hence, their alignment (page 11-10). Or use Edit Mode to change the label-prefixes of individual cells (page 5-8).

More Standards—/Worksheet Global Default Commands

The `/Worksheet Global Default` commands control the way in which 1-2-3 is configured to use printers and disks. These commands are similar to the other `/Worksheet Global` commands in that they allow you to make yet another kind of display format specification.

You'll want 1-2-3 to handle many aspects of printing automatically *most of the time*, so that you don't have to make numerous decisions at every turn. But there *will* be some situations in which you'll want to abandon the standard procedures—temporarily—and give special instructions.

1-2-3 allows you this flexibility with its system of **default** settings. In everyday life, the term *default* describes what occurs when you don't do anything to change a situation. Your “factory installed” default settings in 1-2-3 will control your worksheet appearance unless you do something specific to change them (`/Worksheet Global Default`) or to override them (`/Worksheet Global` or `/Worksheet` command).

With 1-2-3, default settings determine what happens when you don't issue an overriding command. A group of reasonable default settings are factory-installed in 1-2-3. But you can substitute your own default settings with /Worksheet Global Default commands.

Moreover, you can "burn in" the default settings you make with these commands: each time 1-2-3 starts, it adopts your settings, rather than those supplied by Lotus. We've separated the /Worksheet Global Default commands from the other /Worksheet Global settings, because only the default settings can be "burned in".

(For details concerning usage of the /Worksheet Global Default commands, see Appendix A, "Configuring 1-2-3".)

Processing of Entries and Formulas

In this section, we discuss what happens when you make a change to a cell in the worksheet. This involves a discussion of how 1-2-3 handles the formulas that make cell values depend on one another. And it involves an explanation of the cell protection facility that prevents you (or somebody else) from making changes to the wrong cells.

Formula Processing—/Worksheet Recalculation

One of 1-2-3's main jobs is to recalculate all of the worksheet's formulas from time to time. Changes you've made ripple through the worksheet to show precisely how some values depend on others.

When 1-2-3 begins execution, and whenever you issue a /Worksheet Erase command, the following settings are established:

Automatic Recalculation. 1-2-3 will recalculate all formulas automatically whenever you enter a new value or edit an existing value. Entering values with a /Copy, /Move, or /File command also causes a recalculation.

Natural Recalculation Order. In performing formula recalculation, 1-2-3 respects the interrelationships among all cells. It does not recalculate a formula until it has already processed all other formulas it depends on.

For instance, if cell H15 depends on the values of formulas in cells A5, C25, and J100, 1-2-3 evaluates the three cells' formulas before recalculating the formula in H15. If A5, C25, or J100 are in turn dependent on other formulas, then the other formulas are recalculated first.

The formulas in a worksheet thus have a *natural order*. 1-2-3's standard practice is to observe this order.

Circular References

Although 1-2-3 is very clever about keeping track of the interrelationships among cell formulas, it can't prevent you from devising some paradoxical situations. For instance, Figure 10-3 shows three formulas whose values depend on each other.

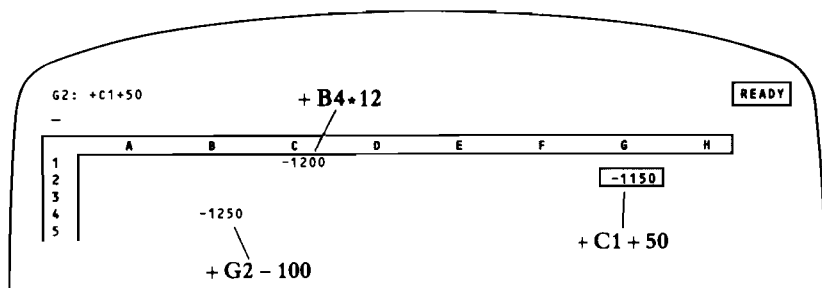


Figure 10-3. Circular References

This situation is called a **circular reference**. The value of cell B4 depends indirectly on itself. In general, this is not a desirable situation. You can, however, use a self-dependent cell as a counter of the number of times 1-2-3 performs a recalculation. See the example in Chapter 9, "Using Keyboard Macros".

Whenever 1-2-3 detects a circular reference in a worksheet using *Natural* order, it displays a *CIRC* indicator at the lower right corner of the screen. If this comes as a surprise, use a printout of all formulas (/Print Printer Options Other Cell-Formulas command, page 15-16) to analyze the worksheet.

Changing the Recalculation Procedure

There are a number of situations in which you might want to alter the recalculation procedure from *Natural* and *Automatic*:

- You need to change several input values at once. It isn't necessary for 1-2-3 to recalculate formulas until you've entered all the values.
- The interrelationships among the cells include circular references, so that more than one recalculation pass is required to allow calculated values to converge to the desired result.

The /Worksheet Recalculation commands afford you the necessary flexibility in the recalculations process:

- Set the order in which 1-2-3 processes formulas to *Natural Columnwise*, or *Rowwise*. . . Both the alternatives to *Natural* process formulas in order of their position in the worksheet, starting with cell A1.

- Set the frequency with which 1-2-3 performs recalculations to Automatic (every time a value changes) or Manual (recalculation occurs whenever you press [F9/Calc] in Ready Mode).
- Set the Iteration count—the number of times 1-2-3 cycles through the entire set of formulas when it performs a recalculation.

If recalculation is Manual, 1-2-3 displays a *CALC* indicator at the bottom of the screen whenever a cell value has changed since the last recalculation. This indicator is a reminder to press [F9/Calc] before trusting the worksheet's values.

Cell Protection

1-2-3's cell protection facility allows you to identify particularly sensitive areas of your worksheet and "save them from harm."

The "standard" way to use a 1-2-3 worksheet is to type labels and numbers into some cells (*input*), and let 1-2-3 show calculated values in other cells (*output*). When you create a small worksheet for yourself, you probably won't need any help to keep things straight. You will know which cells contain critical data or values and take care not to destroy or change them inadvertently.

But when you start building more sophisticated worksheets, and especially when you create worksheets for others to use, you'll quickly discover the need to prevent accidental modification of certain cells.

1-2-3 has the answer in the concept of a **protected cell**, a cell whose contents may not be replaced or edited. You can organize a worksheet so that it consists of:

1. Unprotected cells (input cells) in which the user types labels and/or numbers.
2. Protected cells (output cells) in which 1-2-3 shows the results of its calculations.

You'll also want to protect other entries that the user should not change—instructions, horizontal and vertical lines, labels, formulas that perform intermediate calculations, etc.

Controlling Cell Protection with On/Off Commands

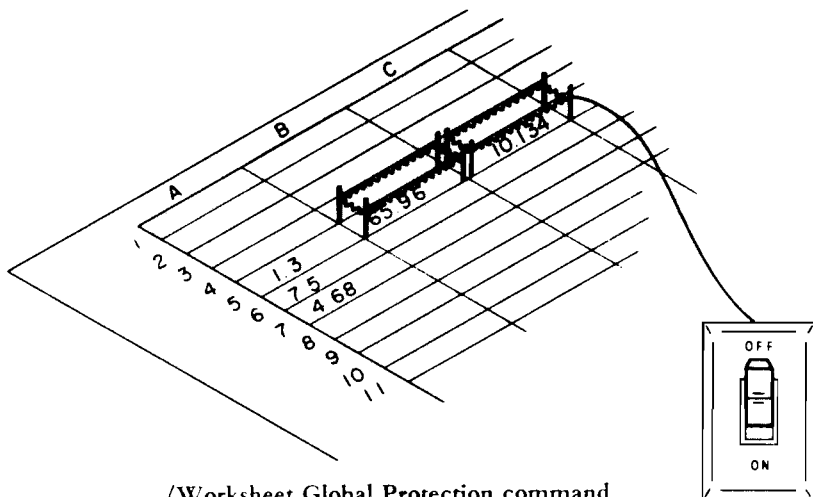
It may help you to think of the protection facility as a set of "factory-installed" electric fences around individual cells. Unless the "power" is turned on, however, these fences don't work, and changes may be made to any cell (Figure 10-4).

The **/Worksheet Global Protection** command turns the protection power *on* (Enable) and *off* (Disable). If you never enable protection, it's as if the protection facility didn't exist.

The **/Range Unprotect** and **/Range Protect** commands dismantle and re-erect these fences, respectively, allowing you to make certain cell contents changeable (input cells), even when protection is enabled.



Initially, all cells have protection fences,
but the protection "power" is off.



`/Worksheet Global Protection` command

Figure 10-4. Protection Fences

You'll probably want to implement cell protection only after you've finished creating a worksheet. During the creation process, almost everything is subject to change as you create output cells, rearrange the worksheet, etc. A general procedure for using the protection facility is presented in Chapter 11, page 11-7.

The protection facility prevents changes to cells, but it doesn't prevent you from moving the cell pointer to protected areas of the worksheet. To impose this even greater restriction, use the **/Range Input** command (Chapter 11, page 11-17).

Status of Global and Default Settings

Five overall aspects of the worksheet are controlled with `/Worksheet Global` commands:

- Global numeric display format (`/Worksheet Global Format` or `/WGF`)
- Global label-prefix (`/Worksheet Global Label-Prefix` or `/WGL`)
- Global column-width (`/Worksheet Global Column-Width` or `/WGC`)
- Recalculation procedure (`Worksheet Global Recalculation` or `/WGR`)
- Cell protection (`/Worksheet Global Protect and Unprotect` (`/WGP` and `/WGU`))

To help you keep track of these settings, the `/Worksheet Status` command reports the current settings. It also shows you how much of the computer's main memory is available to allow expansion of the worksheet (Figure 10-5).

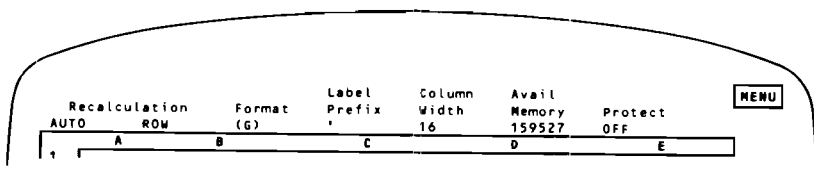


Figure 10-5. Worksheet Status Display

Altering the “Window” into the Worksheet

Two /Worksheet commands allow you to control what part of your worksheet you see on the screen at one glance:

- /Worksheet Titles
- /Worksheet Window

The entire 1-2-3 worksheet is far too large to be shown in its entirety on the computer’s display screen. Therefore, at any one time you can see just part of the worksheet—the display screen is a **window** into the worksheet.

The standard window shows a portion of the worksheet that is 11 rows high and one or more columns wide, depending on the display widths you’ve set for the columns.

Sometimes, though, the limitation imposed by the size of the display screen can be inconvenient:

- You wish to see how a result in cell D55 changes when different values are entered in cell B12. Since these cells are separated by more than 40 rows, you can’t see them both at once.
- When you move the cell pointer to the right to see sales projections for October in column L, the labels in column A disappear off the left edge of the screen.

1-2-3 handles these problems and similar ones by offering two additional methods for using the display screen as a window into the worksheet: *titles* and *split screen*. These additional methods may be used separately or together.

Titles

In a standard worksheet, the column letters **A**, **B**, **C**, etc. and the row numbers form a border around the top and left edges of the worksheet. The border is “frozen” in place—you can’t move the cell pointer there. The **Titles** facility allows you to expand this border to include several rows and/or several columns of the worksheet.

Thus, the border can be expanded to include column headings a bit more meaningful than **A** or **B**, and row headings more informative than **14** or **75** (See Figure 10-6).



181: 'Various percussion' READY

	A	C	D	E	F	G	H	I	J
2									
3	Serial	Composer	Type	Tpt	Hrn	Tbn	Tba	Other	
78	73	Joplin	S	2	1	1	1		
79	74	Joplin	S	2	1	1	1		
80	75	Sousa	S	2	1	1	1		
81	76	Webster	S	2	1	1	1	Various	percussion
82									
83									

column A and rows 2 and 3 have become part of fixed border

Figure 10-6. Worksheet Titles Can Freeze Rows and Columns

Split Screen

1-2-3 allows you to split the screen either horizontally or vertically. Instead of showing a single block of 20 rows, the screen can display one block of 10 rows and another block of 9 rows (one row goes to column letters). Or a block of 13 rows and a block of 6 rows. In fact, you can split the screen anywhere you wish, to produce blocks of varying sizes.

Similarly, you can split the screen vertically, so that some columns appear in the left-hand window and others appear in the right-hand window. Figure 10-7 shows the results of horizontal and vertical splits.

It's important to keep in mind that there still is just one worksheet. There's only one cell B3, there's only one row 45, etc. The two windows simply allow you to view two different parts of this single worksheet at the same time. (You can also view the *same* part of the worksheet in the two windows. There are some situations in which this is quite handy.)

The two windows are somewhat independent. Within each, you can move the cell pointer to any part of the worksheet. Each window can have its own global display formats and global/individual column widths. It might be helpful to think of two different TV cameras, each focusing on part of the worksheet. Since each camera has its own lenses, each produces its own version of a portion of the worksheet.

When you first split the screen, the two parts are **Synchronized**. If you cause one of the windows to move, e.g. [F5/GoTo] a distant cell, the other window automatically moves comparably, keeping the same rows or columns in view.

Should you desire complete independence of the two windows, you can prevent this automatic synchronization, using /Worksheet Window Unsync. The /Worksheet Window Sync command reactivates this facility.

To move the cell pointer between windows, use the [F6/Window] key, in Ready Mode or Point Mode.

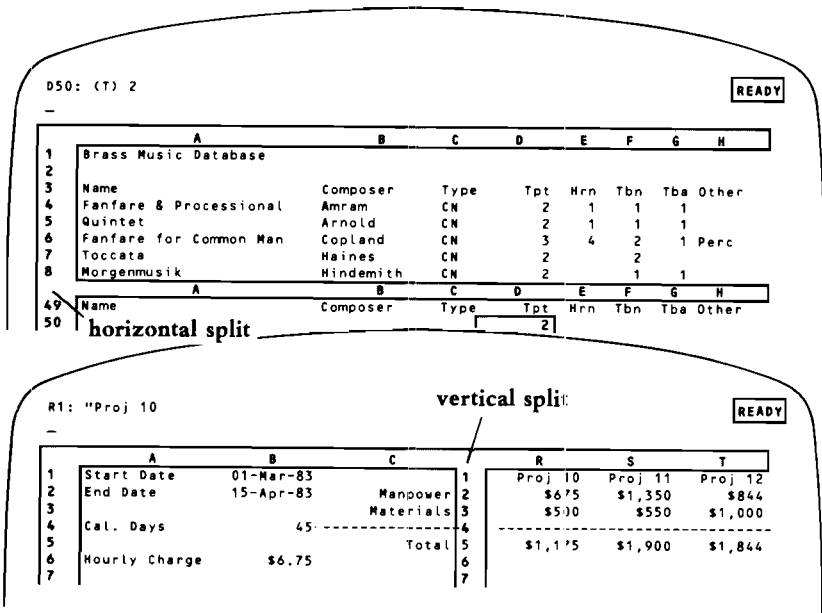


Figure 10-7. Split Screen

Large-Scale Editing

You can make major changes to a worksheet with several /Worksheet commands:

- /Worksheet Erase
- /Worksheet Insert Rows and /Worksheet Insert Columns
- /Worksheet Delete Rows and /Worksheet Delete Columns

/Worksheet Erase

This command allows you to start afresh. It's almost like shutting off the computer, then turning it back on and starting 1-2-3 again. Any information currently in the worksheet is lost (so make sure you've first issued a /File command to store it). All cell formats are lost, and all /Worksheet Global settings commands return to their start-up values. /Worksheet Global Default settings, however, are not affected by this command.

If you mess up a worksheet, just clean the slate with this command. If you have an earlier version of the worksheet stored in a worksheet file, you can "fall back" to it using /File Retrieve (page 14-7) and try again.

(By the way, this is a relatively safe "panic button". When you issue a /Worksheet Erase command, 1-2-3 requires you to confirm it before wiping the slate clean.)

/Worksheet Insert Rows and /Worksheet Insert Columns

These commands create one or more new rows or columns in the worksheet. The newly created cells are unformatted.



All rows or columns beyond the insert location are moved toward the end of the worksheet, so that no information is lost.

These commands are helpful, particularly in conjunction with /Copy and /Move, should you decide to redesign the layout of a worksheet (Figure 10-8).

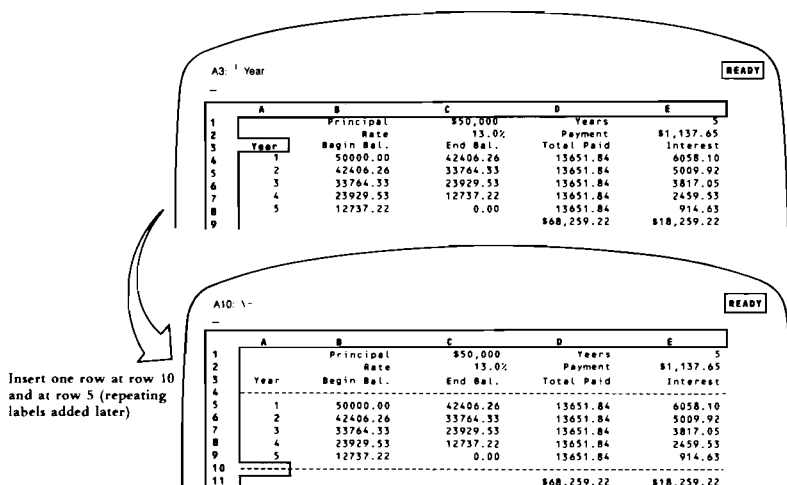


Figure 10-8. Inserting Rows

/Worksheet Delete Rows and /Worksheet Delete Columns

These commands remove one or more complete rows or columns from the worksheet. All entries following the deleted entries are moved toward the beginning to fill in the space. *These commands can be quite dangerous.* Any cell left in the worksheet whose formula depends on a deleted cell will be rendered invalid (Figure 10-9).

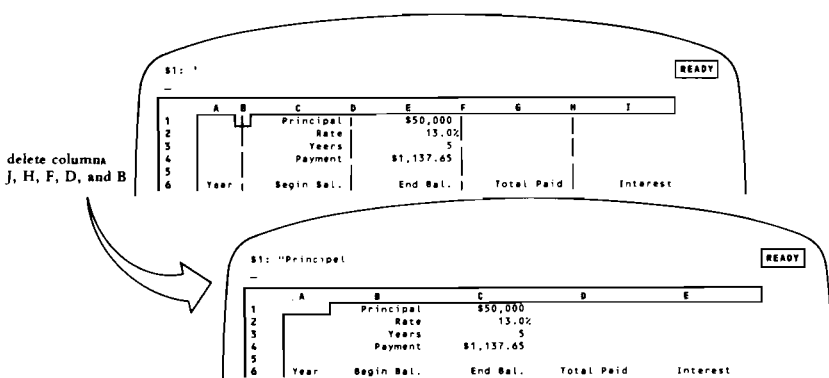


Figure 10-9. Deleting Columns

/Worksheet Global Format

/WGF

Set the standard numeric display format for numbers and formula values.

Procedure

Choose a format: Fixed, Scientific, Currency, , (comma), General (the initial format), + / - , Percent, Date, or Text.

Fixed, Scientific, Currency, , (comma), and Percent formats:

Specify the number of decimal places to be displayed. Press [Return] alone to accept the default value, 2. Otherwise, enter any number between 0 and 15.

- Date formats:

Choose D1 (Day-Month-Year), D2 (Day-Month), or D3 (Month-Year).

Results

- All cells not specifically formatted with the /Range Format command (page 11-9) are redisplayed in the new global format.
- If a value's display does not fit within its cell's column-width, the cell on the screen is filled with asterisks. But 1-2-3 remembers its value to full precision (about 15 decimal digits).

Format	Description	Examples
General	Trailing zeros suppressed after decimal point. This is the initial display format. Very large and very small numbers are displayed in scientific (exponent) format.	12.427 - 4.25 1.003E + 12
Fixed	Fixed number of decimal places (0-15).	12 - 125.00
Scientific	Exponent notation to the base 10. Fixed number of decimal places (0-15) in the mantissa, followed by a two-digit exponent of 10 (-99 to +99).	- 4.3E + 00 1.246E + 22 - 6.24E - 04
Currency	Preceded by \$; commas separate three-digit groups; negative values enclosed in parentheses. Fixed number of decimal places (0-15).	\$12.43 (\$4.200) \$8,999
, (comma)	Currency format without dollar signs.	12.43 (4.200) 8,999



+ / -	Horizontal bar graph. The number of symbols is the integer part of the value. + for positive values; - for negative values; . for zero.	+ + + - - -
Percent	Followed by %. Fixed number of decimal places (0-15). 1-2-3 automatically moves the decimal point so that the displayed value accurately represents the actual value.	1242.7% - 425.00%
Text	Formulas are shown as they were typed; range names are used instead of cell addresses, where applicable; numbers are displayed in General format.	+ C22/4 + PRINC*RATE 12.427
Date	D1: Day-Month-Year D2: Day-Month D3: Month-Year	15-Jan-84 05-Mar-2015 15-Jan 05-Mar Jan-84 Mar-2015

In these formats, a positive number (rounded off to an integer) is considered to be the “serial number” of a particular date (from 1 = 01-Jan-1900 to 73049 = 31-Dec-2099). You can generate these serial numbers with the functions @DATE and @TODAY (page 19-3).

Notes

1. You can check the current global format with /Worksheet Status.
2. With *Split Screen*, you can set the global format separately for each window. This allows you to view the same part of a worksheet two different ways at the same time (e.g. formula values in one window, formula texts in the other).

/Worksheet Global Label-Prefix

/WGL

Set the standard alignment of label entries in their cells.

Procedure

Choose a label alignment: Left (the initial alignment), Right, or Center.

<u>Alignment</u>	<u>Prefix</u>	<u>Effect on Label</u>
Left	'	Left-aligned
Right	''	Right-aligned
Center	^	Centered

Result

Later in the session, whenever you type a label without a prefix, 1-2-3 will assign it the global label-prefix you've specified with this command. Changing the global label-prefix only affects labels you type *after* the change. Existing labels are not changed.

Notes

1. /Worksheet Status displays the current global label-prefix.
2. A prefix is part of the label: 1-2-3 displays it in the control panel when the cell pointer is on a label cell, but the prefix does not appear in the cell itself.
3. In addition to the three alignments shown above, individual labels may be entered with a backslash (\) prefix, which repeats the label across the entire column. This is useful for creating lines and borders.

\Repeating → RepeatingRepeatingRepeatingRep

4. There are two ways to change the alignment of an existing label:
 - Edit the label to change the label-prefix.
 - Use /Range Label-Prefix (page 11-10). Unlike /Worksheet Global Label-Prefix, this command changes the appearance of labels *already* in the worksheet.
5. If your label begins with a number or another character that would make 1-2-3 think it's a numeric value, then you must explicitly type a prefix, to let 1-2-3 know it's a label. Likewise, use a label-prefix when you begin a label with a slash (/), so that 1-2-3 doesn't think that you want to issue a command. This situation often occurs when you're creating a keyboard macro.
6. If a label is as long as or longer than its cell's column-width (*long label*), 1-2-3 always displays it left-aligned. If possible, the label overflows into empty cells to the right. Nevertheless, the global label-prefix is assigned to such long labels. If you increase the column-width so that the label fits within the cell, the label-prefix will determine the alignment.

Worksheet Global Column-Width

/WGC

Set the standard column-width (1-72 characters).

Procedure

1-2-3 displays the current global column-width setting. Use ◀ and ▶ to increase and decrease the width. The screen will show the effect of each change. When the column-width is as you want it, press [Return]. Alternatively, type a number then press [Return].



Result

All columns whose widths have not been individually set (/Worksheet Column-Width Set) or that have been reinitialized (/Worksheet Column-Width Reset) now have the new global column-width.

Notes

1. You can check the current global column width with /Worksheet Status.
2. If you use *Split Screen*, each window can have its own global column-width. This command affects only the window in which the cell pointer is currently located.

Worksheet Global Recalculation

/WGR

Control when, in what order, and how many times formulas are processed during a recalculation pass.

Procedure

Choose one of the following:

Recalculation Method. Automatic or Manual.

Recalculation Order. Natural, Columnwise, or Rowwise.

Iteration. 1-2-3 prompts you to enter the number of calculation cycles per recalculation pass. Enter a number between 1 and 50.

Results

Automatic. 1-2-3 recalculates all the formulas in the worksheet every time you change the contents of any cell.

Manual. You must press [F9/Calc] to make 1-2-3 recalculate all formulas. The *CALC* indicator will appear in the lower right corner of the screen if any cell entries have changed since the last recalculation.

Each recalculation is performed in the currently selected *order*:

Natural. Before recalculating a particular formula, 1-2-3 always recalculates all other formulas on whose values it depends.

Columnwise. 1-2-3 starts at the top of column A and works to the bottom. Then, it processes column B, then column C, etc.

Rowwise. 1-2-3 starts at the beginning of row 1 and works to the right. Then, it processes row 2, then row 3, etc.

Iteration. Determines the number of calculation cycles performed during each recalculation pass. (If the order is Natural and there are no circular references in formulas, then only one cycle is performed.)

Notes

1. For most purposes, the default recalculation order, Natural is best. Change to Columnwise or Rowwise with a worksheet in which you explicitly control the recalculation order.
2. With the initial settings (Automatic, Natural), the worksheet is continuously updated. Therefore, these settings are usually best for worksheets that will be used by others. If recalculation takes a noticeable length of time because the worksheet is large or complex, a change from Automatic to Manual will alleviate this problem.
3. The Manual setting is best if you wish to change more than one value before reviewing the calculated results. Press the [F9/Calc] key when you wish to recalculate formulas.
4. /Worksheet Status displays the current recalculation settings.
5. Recalculation settings are stored in the *worksheet files* created with /File Save and /File Xtract.

Worksheet Global Protection

/WGP

Allow/Disallow changes to cells that have been "protected".

Procedure

Before issuing this command, "unprotect" (/Range Unprotect, page 11-12) those cells in which you want users to be able to enter or edit entries.

Choose Enable to turn on protection, or Disable to turn it off.

Results

- While protection is enabled, you can only change the contents of cells that have had their protection removed with /Range Unprotect. You may use /Range Unprotect and /Range Protect while protection is enabled.
- When protection is enabled, you cannot delete columns or rows (/Worksheet Delete) that include protected cells.

Notes

1. You can check the current setting of protection with /Worksheet Status.
2. You *can* erase the entire worksheet (/Worksheet Erase) while protection is enabled.



3. Don't use the /Range Justify command while cell protection is enabled: you may get *Protected Cell* errors when this command rearranges the cell entries (implicit /Move commands).

Worksheet Global Default

/WGD

Define default printing and data-storage procedures.

A complete description of /Worksheet Global Default appears in Appendix A, "Configuring 1-2-3".

Worksheet Insert

/WI

Insert empty rows or columns into the worksheet.

Procedure

1. Choose Column to insert one or more consecutive columns, or Row to insert one or more consecutive rows.
2. To insert one row or column at the current location, press [Return]. Otherwise, expand the cell pointer or otherwise specify a range.

Results

- Empty rows or columns are inserted in the worksheet. These columns use the global column-width and numeric display format. Their cells all have protection flags set. If you are inserting columns, the number of columns inserted is equal to the width of the range you specified. If you are inserting rows, the number of rows inserted is equal to the height of this range.
- All the contents of the worksheet are preserved, but are moved to the right or downward to make room for the new rows or columns.
- All formulas are changed so that they continue to refer to the same cells as before.
- If you insert rows or columns into a range that is used in a formula, specified as a command range, or assigned a range name, the size of the "remembered" range is increased (page 7-14).

Notes

1. If the insertion would shift data off the edge of the worksheet, 1-2-3 displays a "Worksheet full" error message and leaves the worksheet unchanged.
2. If a formula depends on a cell in the last columns or rows, an insertion may invalidate the formula (ERR).

Worksheet Delete

/WD

Delete rows or columns from the worksheet.

Procedure

1. Choose Column to delete one or more consecutive columns, or Row to delete one or more consecutive rows.
2. To delete one row or column at the current location, press **[Return]**. Otherwise, expand the cell pointer or otherwise specify a range.

Results



The contents of the deleted rows or columns are lost. Entire rows or columns are deleted, not just the cells in the specified range.

Cell entries to the right of the deleted columns (or below the deleted rows) are shifted to fill in the empty space.



Formulas that referred to deleted cells, or to ranges with deleted endpoints, will have the value *ERR* (pages 5-4, 7-16).

- Formulas, command ranges, and range name definitions are changed so that they continue to indicate the same entries as before (page 7-16).
- Deletions inside ranges, not including any endpoint, merely shorten the range.

- Notes**
1. A potential problem with deletions is that they remove entire rows/columns, including cells that are not on the screen. When working with an extensive worksheet, it is usually better to use */Move* to rearrange sections of the worksheet.
 2. Deleting columns or rows from the worksheet recovers some of the computer's memory used by the deleted cells. You can recover additional memory by saving the worksheet (*/File Save*), then retrieving it (*/File Retrieve*).

/Worksheet Column-Width

/WC

Change the display width of the current column.

Use this command to make the appearance of the worksheet fit your application. You can adjust column widths to fix the situation of values being too wide to fit in their column. 1-2-3 shows such values as asterisks.

Procedure

Before issuing this command, be sure to place the cell pointer in the target column.

1. Choose Set to specify a new column width, or Reset to return the column to the current global column width.



2. *Set only*: Indicate the new column width by pointing with ◀ and ▶ or by typing the new value. End by pressing [Return]. (Pointing is usually more convenient, because you can view the changes to the worksheet as you point.)

Results

Reset. The column assumes the current global column width (/Worksheet Global Column-Width, initially nine characters). The screen readjusts to show as many columns as possible.

Set. The column is redisplayed at the new column width. The screen readjusts to show as many columns as possible.

With *Split Screen*, changing the column-width affects only the window containing the cell pointer.

Notes

1. **Placing blank columns between blocks of data.** This practice enhances the visual presentation and lets you use the [Select] key (page 4-6) to move around the worksheet efficiently. These columns can be made as narrow as necessary, to allow the display or printing of more data at one time.
2. **Writing Outlines.** Since *long labels* can extend to the right beyond their columns, 1-2-3 is ideal for writing outlines. Just create a number of narrow columns on the left side of the sheet, and represent sublevels by indenting labels one or more columns.

Worksheet Erase

/WE



Erase the entire worksheet and reinitialize worksheet settings.

Procedure

Choose Yes to erase the worksheet, or No to cancel the command.

Results



All data in the worksheet is lost, unless it has previously been saved (/File Save). All main memory space occupied by the worksheet is freed for reuse.

- The recalculation settings return to Natural, Automatic. The global numeric display format returns to General. The global label-prefix returns to ' (apostrophe): left-align. The global column-width returns to 9.
- All remembered ranges, including range names, are cancelled.
- The default printer and disk settings (/Worksheet Global Default) do *not* return to their startup values.

Note

To switch worksheets during a session, it is not necessary to erase the current worksheet. /File Retrieve automatically erases the current worksheet before reading in a worksheet stored in a disk file.

Worksheet Titles/WT

“Freeze” rows or columns along the top or left edge of the screen.

Procedure

Before issuing this command, position the cell pointer as indicated below. (*Split Screen*): Titles are allowed in either or both windows. Be sure the pointer is in the proper window.

Horizontal: Place the pointer in the row below the row(s) to be frozen onscreen.

Vertical: Place the pointer in the column to the right of the column(s) to be frozen onscreen.

Both: Do both of the above. Think of this as placing the pointer in the cell that will be the upper left corner of the reduced window (the area that will continue to scroll while Titles are in effect).

Set Titles by choosing Horizontal, Vertical, or Both. Or choose Clear to remove all existing Titles in the current window.

Results

Horizontal. The rows on the screen above the cell pointer are “frozen”. When you subsequently move the cell pointer so that the row scrolls vertically, these rows stay in place, serving as column titles. The titles *do* scroll horizontally, along with the columns below.

Vertical. The columns on the screen to the left of the cell pointer are “frozen”. When you subsequently scroll horizontally, these columns stay in place, serving as row titles. The titles *do* scroll vertically, along with the rows to the right.

Both. The rows above and columns to the left of the cell pointer are “frozen”. The column titles scroll up and down, along with the rows to the right. The row titles scroll side-to-side, along with the columns below.

Clear. Title columns and rows are “unfrozen”. The entire window scrolls as a unit.

Notes

1. With *Split Screen*, you can set different Titles in each window.

2. You usually cannot move the cell pointer into the Titles area using the pointer-movement keys. However, you can move into the Titles area when you're in Point mode: specifying a cell or range by pointing. In this case, 1-2-3 may display two copies of some of the Titles rows or columns.
3. Titles are used most often for long rows and/or columns of similar data, where you want to retain the row and/or column headings while scrolling through the entire data area. When you just want to be able to see two distant parts of the worksheet at the same time, *Split Screen* (/Worksheet Window) may be more appropriate.

Worksheet Window

/WW

Control Split Screen—the division of the screen into two horizontal or vertical windows.

Procedure (when there is a single window)

Before issuing this command, move the cell pointer to the column or row where the split is to be made.

Choose Horizontal or Vertical split screen.

Results

- Two windows appear, each with its own row and column designations along its top and left borders. The column or row location of the cell pointer when you issued the command becomes the first column or row of the second window.
- The cell pointer remains in the first window, in the column or row next to the split.
- Both windows start with the same individual column widths and global settings. Thereafter, you can control these settings independently for each window.

Procedure (when Split Screen is in effect)

Choose Clear to return to one window, or choose Synchronize or Unsynchronize to control how the two windows scroll.

Results

Clear. The second window disappears. The first window, with its column-widths, display formats, etc., expands to fill the screen.

Synchronized (initial setting). When one window scrolls *in the direction of the split*, so does the other. The effect is to keep the same columns or rows onscreen in both windows.

Unsynchronized. Scrolling in one window does not affect the other window. The columns (horizontal split) or rows (vertical split) can “slip past” each other.

Notes

1. To move the pointer between windows, use the [F6/Window] key.
2. Windows can be most useful when you want to see the effects of changing some entries on other entries that are far away. Put a window around the result cells and then use the other window to scroll around the rest of the sheet, changing the entries of interest.
3. With synchronized windows, you can scroll so that the same cells can be shown in the two windows, perhaps to view them using different numeric display formats (e.g. Text format vs. Currency format).

Worksheet Status

/WS

Display available memory and current global settings in the control panel.

Procedure

After viewing the information, clear the control panel and return to Ready Mode by pressing any key. Pressing that key has no other effect.

Result

Here is a typical /Worksheet Status display:

			Label	Column	Avail				MENU
	Recalculation	Format	Prefix	Width	Memory	Protect			
AUTO	NATURAL	(G)	'	9	223149	OFF			
A	B	C	D	E	F	G	H		

Notes

1. The amount of memory used is affected both by the contents of cells and by the number of rows and columns you use. To conserve memory, keep all entries in a rectangle whose lower right corner is as close to cell A1 as possible.
2. If you rearrange a worksheet into a more compact rectangle, you must save it (/File Save) and then retrieve it (/File Retrieve) to regain the freed memory. If you erase cells (/Range Erase), be sure to cancel the cells' numeric display formats (/Range Format Reset) and restore their protection (/Range Protect).
3. There is no simple relationship between the amount of main memory a worksheet occupies (as reflected in the /Worksheet Status *Available Memory* statistic) and the size of its worksheet file.



11. Range Commands

Using 1-2-3, you often need to indicate a range of cells to be processed. Some examples: You can print a range or store it in a disk file; the *information management* facility involves ranges that store data records and ranges that contain selection criteria. 1-2-3 has a host of functions that process all the values in a range (e.g., @SUM, @COUNT). And when you're using 1-2-3 as a text processor, a column range of labels acts as a paragraph.

Since 1-2-3 is range-oriented, it has a group of /Range commands that process cell ranges. Some of these commands treat an entire range of cells as a single unit. For example:

- Assigning a *range name* to a cell range.
- Processing a range as a fill-in-the-blanks form.
- Readjusting the labels in a column range to a new "paragraph width".

Other /Range commands do the same thing to each individual cell in a range. For example:

- Setting the numeric or label display format.
- Erasing cell contents.
- Prevent or allowing cell contents to be changed.

As always, 1-2-3 allows you to indicate the range to be processed in a variety of ways:

1. Expanding the cell pointer to cover the range.
2. Typing the cell addresses of two opposite corners.
3. Typing a *range name*, or selecting one from a menu that 1-2-3 displays.

(For details, see Chapter 7, "Indicating Cell Ranges".)

Cleaning Up: /Range Erase

This command erases the entries from a range of cells. It erases *only* each cell's entry, not the "flags" and "fences" that indicate its numeric display format and protection status (see pages 11-2 and 11-6). Unlike the /Worksheet Insert and /Worksheet Delete commands, /Range Erase does not move any of the remaining information in the worksheet or cause any adjustment in existing formulas or remembered range definitions.

Numeric Formatting: /Range Format

The /Worksheet Global Format command establishes the standard format in which 1-2-3 displays numbers in the worksheet. All cells display numeric values according to the current global format setting, except those cells for which you provide an “override” with a /Range Format command. (Numeric display formats are explained, along with numerous examples, in the Worksheet and Range command summaries.)

Think of these /Range Format commands as hoisting particular “flags” above the cells in a range. These flags tell 1-2-3 how to display the cells’ contents (if the contents are numeric). If 1-2-3 finds no flag, it displays the cell’s contents using the standard setting, as established with /Worksheet Global Format.

In some cases, you may format a cell range with /Range Format, then decide that these cells should use the standard format after all. For this purpose, use the command /Range Format Reset. Imagine that this command lowers the numeric format flags in all of the range’s cells.

Label Alignment

Just as the global numeric format does not affect the display of labels, the “flag” work performed by /Range Format commands does not affect any labels currently in the range, or ones that you subsequently enter.

In fact, there is no independent flag that controls label alignment. Instead, a label’s format—left-aligned, right-aligned, centered, or repeating—is determined by the label-prefix character that begins the label itself. If you *don’t* type a label-prefix, 1-2-3 automatically uses the global label-prefix. (See the /Worksheet Global Label-Prefix command summary.)

Once a label has been entered, you can realign it by editing its label-prefix character (page 5-6). To realign all the labels in a range, use a /Range Label-Prefix command (Figure 11-1).

This command affects *previously entered labels only*. Labels that you subsequently enter are *not* affected by /Range Label-Prefix commands you issued in the past.

Range Names

1-2-3 maintains a list of **range names** as part of each worksheet. Each name, up to 15 characters long, can identify a range of any size. For example:

INT__RATE	might identify a single cell, F46
ALL__PRINT	might identify the entire active area of the worksheet, A1..X200

B1: 'Principal labels left-aligned ('')

READY

	A	B	C	D	E
1		Principal	\$50,000		
2		Rate	13.0%		
3		Years	5		
4		Payment	\$1,137.65		

B1: "Principal labels right-aligned ("")

READY

	A	B	C	D	E
1		Principal	\$50,000		
2		Rate	13.0%		
3		Years	5		
4		Payment	\$1,137.65		

Figure 11-1. Changing Label Alignment

(Although it's permissible, we suggest that you don't leave a blank space or use the characters + - * / ^ in a range name. This will avoid confusion with formulas, commands, and other types of entries. Also, don't use range names that look like cell addresses—e.g. R12.)

Range names are included in the *worksheet files* created by the /File Save and /File Xtract commands (Chapter 14, "File Commands"). When you retrieve a worksheet from disk storage with the /File Retrieve command, the names are activated too.

(The /File Combine command does not retrieve range names. This prevents a conflict between range names in the two worksheets—the one you're currently using and the one you specify to combine.)

The following commands allow you to maintain a list of range names for the worksheet currently in use:

- **/Range Name Create.** Assigns a range name to a range of cells, or revises the definition (the addresses of the range's endpoints) of a name already in use.
- **/Range Name Delete.** Deletes an individual range name.
- **/Range Name Reset.** Deletes all range names.

There's one more /Range Name command, included in 1-2-3 as a convenience feature. One of the most common uses of labels in a worksheet is to identify the contents of neighboring cells. Figure 11-2 illustrates a situation in which it would make

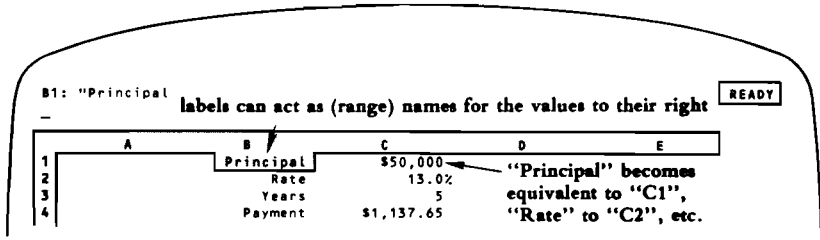


Figure 11-2. Using Label Entries as Range Names

sense to have each of these labels be a *range name* for the single cell next to it. This would allow you to use the names in formulas, instead of the cell addresses. For example: `@PMT(Principal,Rate/12,Years*12)`. (See Chapter 8, “Writing Formulas”.)

1-2-3 has a command that allows you to do just that, and saves you the trouble of typing the same thing twice—once as a label and once as a range name:

- **/Range Name Labels.** Makes each of a range’s labels into a range name for a single cell: the cell immediately to its right, to its left, above it, or below it.

Using Range Names

You can use a range name in any situation that calls for a cell range to be indicated. You can also use a range name which identifies a single-cell range in any situation that calls for a cell address to be indicated. This allows you to think in words, rather than in terms of columns and rows. Here are some examples:

A range name as a response to a command prompt:

Enter Print Range: ALLRECORDS
Enter Fill Range: INPUTNUMBERS

A range name in a cell formula:

@SUM(RECEIVABLES)
@AVG(CASHFLOWS)
@IF(PRINCIPAL/PAYMENT < CUTOFF,@ERR,0)

(For more details concerning the use of range names in formulas, see Chapter 8, “Writing Formulas”.)

Using Range Names to Respond to 1-2-3’s Prompts—Range Name Menus

In many situations, 1-2-3 prompts you to indicate a range to be processed. Whenever this occurs, pressing [F3/Name] displays a menu of existing range names in the control panel. If you’ve created more than five names, this menu will extend to several lines, which appear one at a time (page 6-9).

To select one of these range names, point to it or type the range name, ending with [Return].

Label Justification

1-2-3 allows you to enter labels up to 240 characters long. If a label is too long to be displayed in a cell, 1-2-3 displays as much of the label as it can, borrowing space from blank cells to the right.

These *long labels* are useful as lines of instructional text, as overall titles, etc. A column of consecutive long labels looks like a paragraph (Figure 11-3).

The /Range Justify command treats an unbroken column of labels as a paragraph, rearranging the words to fit any width you specify. (A "paragraph" ends when the column of consecutive labels is interrupted by a non-label cell.)

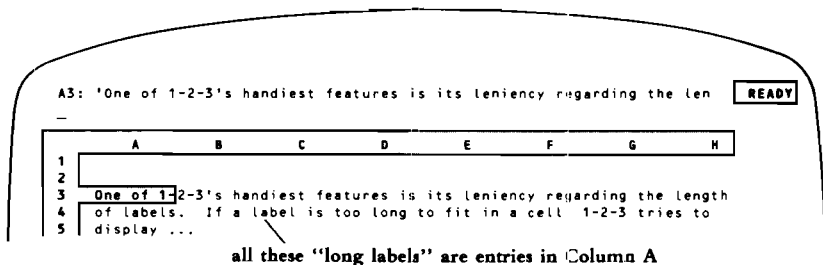


Figure 11-3. A Column of Labels is a "Paragraph"

For instance, a single command can convert the paragraph illustrated above into either of the layouts shown in Figure 11-4.

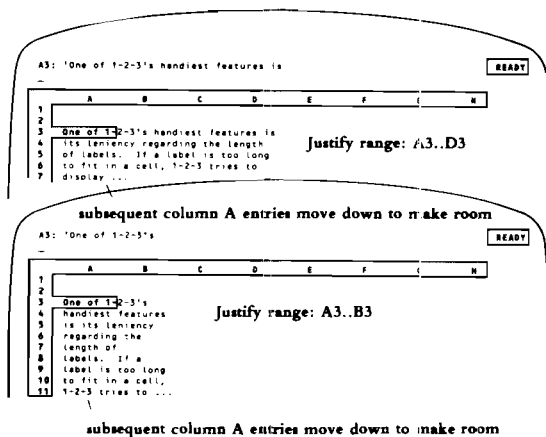


Figure 11-4. /Range Justify: Adjusting Paragraph Width

These illustrations show that when a paragraph is rejustified, the number of rows it occupies may change. In such cases, 1-2-3 automatically moves the cell entries located below the paragraph, either downward or upward. This feature both preserves the spacing between paragraphs and ensures that no information will be overwritten by a Justify operation.

However, there may be situations in which you wish to prevent 1-2-3 from moving the contents of cells below the paragraph. For instance, entries below may be part of a table. Accordingly, 1-2-3 allows you to limit the range of entries that may be reformatted and shifted during a Justify operation (Figure 11-5).

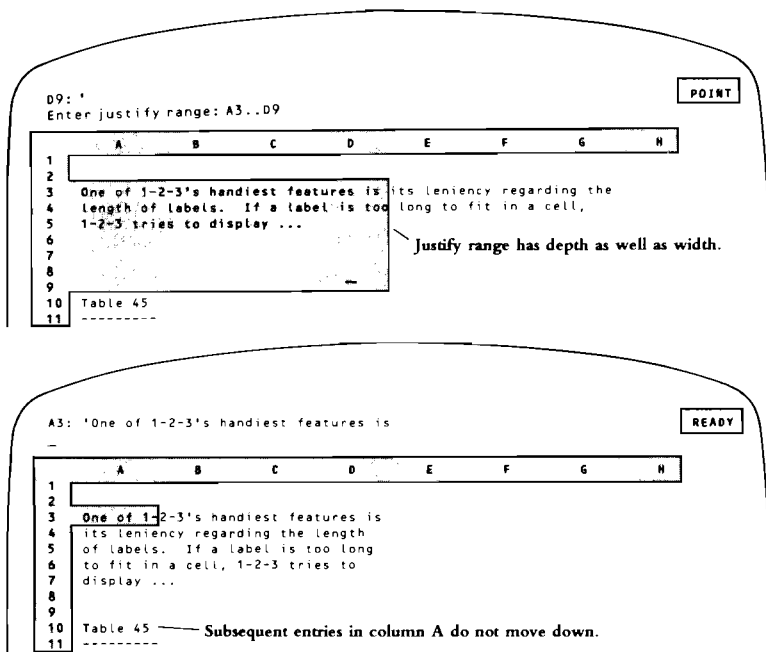


Figure 11-5. /Range Justify: Limiting Vertical Readjustment

Cell Protection

As with cell display formats, the 1-2-3 cell protection facility involves both /Worksheet and /Range commands. If you're not familiar with the general concept of cell protection, consult the explanation in Chapter 10, "Worksheet Commands".

In a new worksheet, every cell is surrounded by an electronic “protection fence”. However, since you need to make cell entries to construct a worksheet, 1-2-3 starts with the “power” to these fences turned *off*. To remove a range’s fences entirely, permitting changes even when the protection power is *on*, use the /Range Unprotect command.

Using the Protection Facility: General Rules

Here is the general procedure for using the protection facility:

1. Make sure the power to the protection fences is turned *off* (/Worksheet Global Protection Disable). You can check the current protection status using the /Worksheet Status command.
2. Create or modify the worksheet—type entries, use /Copy and /Move, retrieve entries from disk storage, etc.
3. Use the /Range Unprotect command to remove the protection fence from cells in which entries will be later made or changed by the worksheet user.
4. Turn on the power to the protection fences (/Worksheet Global Protection Enable). You can protect and unprotect cells, even when the power is *on*.
5. Save the worksheet in a disk file using /File Save or /File Xtract.

Each cell’s protection status is saved in the *worksheet files* created by /File Save or /File Xtract. Thus, if a cell is (un)protected when you store a worksheet, it will be (un)protected when you retrieve the worksheet with /File Retrieve.

Changing Your Mind. If you decide that a range of cells you’ve /Range Unprotected should be protected after all, you can re-erect the protection fences for a range of cells with the /Range Protect command. Cells may be unprotected and reprotected as many times as desired.

Creating Data Entry Forms

The /Range Input command extends the cell protection facility concept a step further. Not only can you prevent worksheet users from changing cell entries, you can prevent them even from moving the pointer to the protected cells.

This feature allows you to create data-entry forms (“fill-in-the-blanks”) with 1-2-3. Typically, large computer database management systems are organized around series of such forms. Forms are easy to use, because (1) they make the display screen look like a traditional paper form, and (2) the data-entry operator is prevented from entering data in the wrong places.

A 1-2-3 data-entry form is illustrated in Figure 11-6. We’ve indicated in color the cells that the operator is restricted to filling in.

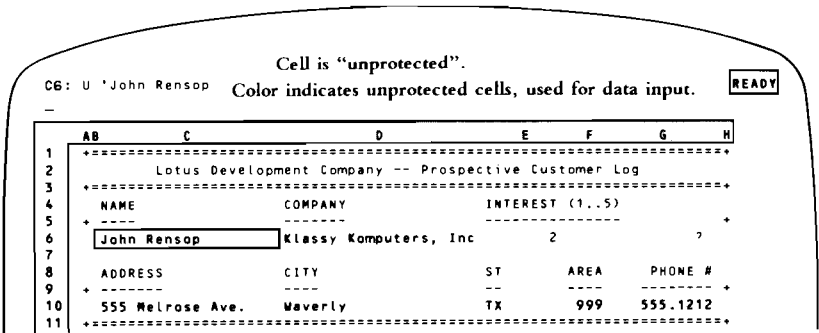


Figure 11-6. /Range Input: A Data Entry Form

Restricting the user to the "proper" cells is accomplished through a combination of the cell protection facility and the /Range Input command:

During the execution of a /Range Input command, you can make one or more entries or changes to appropriate cells. But 1-2-3 lets you move the cell pointer only to the cells in the specified range whose protection "fences" have been removed with /Range Unprotect.

Using Forms Entry: General Rules

Here is the general procedure for implementing forms entry:

1. Install cell protection in the worksheet, as outlined in the previous section.
2. Use a /Range Input command to enter or update a series of cell entries.
3. Use 1-2-3's Typing Alternative (keyboard macro) facility to store the filled-in cells as a record in a database, located elsewhere in the worksheet.

Similarly, you can use a data-entry form as the means to perform other database functions: finding a record, deleting a record, etc. (The concept of a database and examples of its uses are presented in Chapter 17, "Data Commands".)

/Range Format**/RF**

Set the numeric display format for a cell range.

Procedure

1. Choose a format: Fixed, Scientific, Currency, , (comma), General (the initial format), + / - , Percent, Date, or Text.
 - **Fixed, Scientific, Currency, , (comma), and Percent formats:**
Specify the number of decimal places to be displayed. Press [Return] alone to accept the default value, 2. Otherwise, enter any number between 0 and 15.
 - **Date formats:**
Choose D1 (Day-Month-Year), D2 (Day-Month), or D3 (Month-Year).
2. Specify a range.

Results

- Numbers and formula values already or subsequently entered in the specified range will be displayed in the format you have chosen.
- If a value's display will not fit within its column's width, the cell on the screen is filled with asterisks. However, 1-2-3 remembers its value.

Format	Description	Examples
General	Trailing zeros suppressed after decimal point. This is the initial display format. Very large and very small numbers are displayed in scientific (exponent) format.	12.427 - 4.25 1.003E + 12
Fixed	Fixed number of decimal places (0-15).	12 - 125.00
Scientific	Exponent notation to the base 10. Fixed number of decimal places (0-15) in the mantissa, followed by a two-digit exponent of 10 (- 99 to + 99).	- 4.3E + 00 1.246E + 22 - 6.24E - 04
Currency	Preceded by \$; commas separate three-digit groups; negative values enclosed in parentheses. Fixed number of decimal places (0-15).	\$12.43 (\$4.200) \$8,999
, (comma)	Currency format without dollar signs.	12.43 (4.200) 8,999
+ / -	Horizontal bar graph. The number of symbols is the integer part of the value. + for positive values; - for negative values; . for zero.	+ + + - - -

Percent	Followed by %. Fixed number of decimal places (0-15). 1-2-3 automatically moves the decimal point so that the displayed value accurately represents the actual value.	1242.7% - 425.00%
Text	Formulas are shown as they were typed; range names are used instead of cell addresses, where applicable; numbers are displayed in General format.	+ C22/4 + PRINC*RATE 12.427
Date	D1: Day-Month-Year D2: Day-Month D3: Month-Year	15-Jan-84 05-Mar-2015 15-Jan 05-Mar Jan-84 Mar-2015

In these formats, a positive number (rounded off to an integer) is considered to be the “serial number” of a particular date (from 1 = 01-Jan-1900 to 73049 = 31-Dec-2099). You can generate these serial numbers with the functions @DATE and @TODAY (page 19-3).

Notes

1. /Range Format commands can be used to change the appearance of numbers and formula values in a range, to change the number of decimal places displayed in numbers and formula values, or to display numbers that do not fit in a column under the current format, and are therefore shown as asterisks (see the /Worksheet Column-Width and /Worksheet Global Column-Width command summaries).
2. 1-2-3 remembers values with their full precision (about 15 decimal places) no matter what the format is.
3. Ranges that have been formatted with /Range Format are not affected by changes in the global numeric format (/Worksheet Global Format).
4. The formats provided with /Range Format are retained by the cells even if the contents are /Range Erased. If you wish to contract the worksheet before issuing /File Save, be sure to use both /Range Erase and /Range Format Reset on the cells.
5. If the range is /Moved, the formats stay with the moved range; the area from which the range was moved returns to global format.
6. When you /Copy formatted cells, the copies take on the format of the original.

/Range Label-Prefix

/RL

Change the alignment of all labels in a cell range.

Procedure

1. Choose Left, Right, or Center alignment.

Alignment	Prefix	Effect on Label
Left	'	Left-aligned (initial global label-prefix)
Right	''	Right-aligned
Center	^	Centered

2. Specify a range.

Results

- Labels in the specified range are assigned the corresponding label-prefix. The screen is redrawn to show the new label alignments, but no recalculation pass takes place. Non-label cells in the range are not affected.
- Labels subsequently entered in the range are not affected by this command. If you don't enter a prefix yourself, 1-2-3 assigns them the global label-prefix (/Worksheet Global Label-Prefix).

Notes

1. A label-prefix is part of the label. It is displayed in the control panel when the cell pointer is on a label, and it may be edited. But it does not appear on the worksheet display.
2. In addition to the three alignments shown above, individual labels may be entered with a backslash (\) prefix, which repeats the label across the entire column. This is useful for creating lines and borders:
`\Repeating → RepeatingRepeatingRepeatingRep`
3. To change the alignment of a single label, you can also edit the label to change the prefix.
4. If a label is as long as or longer than its cell's column-width (*long label*), 1-2-3 always displays it left-aligned. If possible, the label overflows into empty cells to the right. Nevertheless, the global label-prefix is assigned to such long labels. If you increase the column-width so that the label fits within the cell, the label-prefix will determine the alignment.

/Range Erase

/RE

Erase all cell entries in a range.

Procedure

Specify a range.



Results



Be sure that you no longer need the data to be erased. To be safe, you may want to save it before erasing it (/File Save).

- The cells in the indicated range become empty but they retain their numeric display formats and their protection status.
- For calculation purposes, each erased cell now has a zero value.
- If cell protection is enabled (/Worksheet Global Protection), and any cell in the range is protected, an error occurs and the command is terminated.

Note

If you /Range Erase, /Range Format Reset, and /Range Protect cells at the bottom or right edge of the worksheet, you don't regain full use of the memory allocated to that area until you save the worksheet (/File Save) and then retrieve it (/File Retrieve).

/Range Protect and /Range Unprotect /RP and /RU

Remove or restore the “protected” status of a cell range.

Procedure

Specify a range whose cells are to be unprotected or protected.

Results

- **Protection enabled:** You may change entries in unprotected cells, but not in protected cells. **Protection disabled:** You may change the entry in any cell.
- When the cell pointer is on an unprotected cell, a “U” appears on the first line of the control panel to indicate that it is unprotected.
- When the /Range Input command is in effect, the cell pointer can be moved only to unprotected cells in the specified range.

Notes

1. Use these commands after you've created a worksheet, to control data-entry locations and prevent cells from being accidentally modified.
2. Initially, all cells are protected, but cell protection is disabled. The /Worksheet Global Protection command turns the cell protection facility on and off.
3. Unprotected cells may be reprotected with /Range Protect.
4. Whether or not a cell is protected doesn't matter unless: (1) Cell protection is enabled or (2) The cells are in a /Range Input range.

/Range Name Create

/RNC

Assign a name to a range, or change the range assigned to a name.

Procedure

To create a new name:

1. Enter a new name (1-15 characters). As with filenames, uppercase or lowercase letters are equivalent. (1-2-3 always displays the name with uppercase letters.)
2. Specify a range.

To check or modify the definition of an existing range name:

1. Choose a range name from the menu on line 3, or type the name. 1-2-3 automatically highlights the range currently assigned to the name, displaying its upper left and lower right corner addresses in the control panel. (You can "cancel" this definition by pressing [Backspace], which returns the pointer to the current cell.)
- 2a. Modify the range specification with pointer-movement keys, or specify an entirely new range. Or:
- 2b. Press [Return] alone to accept the current definition.

Result

When you modify a range name definition, formulas that referred to that range, either by name or by cell addresses, are updated to reflect the change.

Notes

1. Use a range name to identify a frequently used range, to view or change the definition of a range name, or to name a cell so it can be used as the start of a keyboard macro.
2. The /Range Name Create command is particularly useful for documenting formulas. Each cell referenced in a formula can be appropriately labeled and named. The formulas will then appear with names rather than cell addresses. These more readable formulas appear on the first line of the control panel when the cell pointer is on their cells. They can be displayed in the worksheet using the Text numeric display format. They can also be printed using the Cell-Formulas option of the /Print command.
3. Once created, you can use a range name wherever a range may be specified. In commands, you can do this by pressing the [F3/Name] key and selecting the range name from the menu 1-2-3 displays in the control panel.
4. 1-2-3 allows single-cell ranges. If you refer to a cell frequently, give it a range name. If the cell has an appropriate label next to it, consider using /Range Name Labels to name it.

5. Keyboard macros use range names that start with a backslash (\) followed by a letter (A..Z,0). 1-2-3 uses the range name to only find the location of the first instruction(s). (See Chapter 9, "Using Keyboard Macros".)
6. Don't use range names that look like cell addresses (e.g., P12, AM40, B03). 1-2-3 always treats such ambiguous names as cell addresses.
7. There are few other restrictions on range names; they may contain spaces and symbols. However, range names are used in formulas. To avoid confusion it is a good idea to use only A..Z, 0...9 and the underscore in range names.
8. Two or more different names may be assigned to the same range. When you modify the definition of one name, the other's is automatically modified. Deleting one range name does *not* delete the other name.

/Range Name Delete

/RND

Cancel a range name definition.

Procedure

Choose the range name to be deleted, either by using the menu pointer or by typing the name.

Results

- The deleted name no longer appears on the range name menu, and the range can no longer be referred to by that name. The contents of cells in the range are unaffected.
- Formulas that referred to the range by name still refer to the same cells. The corner cell addresses appear in these formulas now, rather than the range name.

Note

To cancel all range names, use /Range Name Reset.

/Range Name Labels

/RNL

Create single-cell named ranges, using labels in adjacent cells as range names.

Procedure

1. Choose a direction: Right, Down, Left, or Up.
2. Specify the range that includes the labels to be used as range names.

Results

- Each label in the specified range becomes the range name for the adjacent cell in the indicated direction. Only the first 15 characters of the label are used for the name.
- Non-label cells in the specified range are ignored.



If a label duplicates an existing range name, the existing range name is first deleted, then reassigned to the cell next to the label. No warning is given of this change. Formulas that referred to the old named range continue to refer to the same range, but by range endpoint cell addresses, not by name.

- The range names created in this fashion exist until you change the range they refer to (Create or Labels) or delete them (Delete or Reset). Subsequently erasing or editing the label has no effect on the range name definition.

Notes

1. Be sure the labels are uniformly above, below, to the left, or to the right of the cells to be named.
2. There is no way to undo in one step the assignment of a group of labels as range names. You can delete names individually (/Range Name Delete), or you can cancel all range names at once (/Range Name Reset).
3. The /Range Name Labels command is particularly useful for documenting formulas. Each cell referenced in a formula can be appropriately labeled and named. The formulas will then appear with names rather than cell addresses. The more readable formulas appear on the first line of the control panel when the cell pointer is on their cells. They can be displayed in the worksheet using the Text numeric display format. They can also be printed using the Cell-Formulas option of the /Print command.
4. /Range Name Labels is usually used with labels in a single column or row, but this is not necessary. As long as the appropriate labels are adjacent to cells in the same direction, the label range can be of any size. Only cells next to labels will be given names.

/Range Name Reset

/RNR

Delete all range names.

Procedure

The cancellation takes effect as soon as you select /Range Name Reset. There is no confirmation step.

Results

- All range names in the current worksheet are cancelled.
- The contents of cells in the formerly-named ranges are unaffected.
- Formulas that referred to named ranges now refer to the same ranges, but by the addresses of the upper left and lower right corner cells, not by name.

Notes

1. To cancel range names individually, use /Range Name Delete.
2. Keyboard macros cannot be used until they are again given \A...\Z,\0 names with /Range Name Create or /Range Name Labels.

/Range Justify

/RJ

Rearrange words in a single “paragraph” of consecutive labels to a specified width.

Procedure

When issuing this command manually (i.e. not in a macro), first place the cell pointer at the upper left corner of the “paragraph” to be justified.

Specify a range one or more columns wide and one or more rows deep. The total width of the range may not exceed 240 characters.

Results

In order to describe the effect of /Range Justify, we need to define some terms:

Justify Range: The cell range you specify in this command. *Important:* If you indicate a range that is one row deep, 1-2-3 considers the *justify range* to extend down to the bottom of the worksheet, row 2048.

Paragraph: A consecutive set of label entries in the first column of the justify range, starting at the upper left corner cell. The paragraph ends with (1) an empty cell, (2) a cell with a non-label entry, or (3) the bottom of the justify range.

Paragraph Width: The width of the justify range you specify (maximum: 240 characters).

To justify, 1-2-3 rearranges the words in the paragraph to make each label as close to the new paragraph width as possible. All the labels are assigned the ' (apostrophe) label-prefix, making them left-aligned.

- Justification affects the contents of cells *in the first column only* of the specified range, not subsequent columns.
- Cell entries above the paragraph are unaffected. Cell entries below the paragraph in the same column may or may not be moved:

Movement of Subsequent Entries. Cell entries within the justify range below the paragraph are “candidates” for being moved:

If a justified paragraph requires the same number of rows as before, no other entries are affected.

If a justified paragraph requires more (or fewer) rows than before, 1-2-3 shifts down (or up) the cell entries below the paragraph that are within the justify range. The effect is to preserve “inter-paragraph spacing”. No entries outside the range are affected.

If the shifting-down operation would push an entry below the bottom of the justify range, an error occurs.

Notes

1. Use this command to reformat a paragraph in which you've inserted or deleted words in a line (i.e. in a label).
2. Use this command to keep *long labels* from overflowing into cells to their right.
3. /Range Justify cannot justify or combine the labels in different columns.
4. Text from 1-2-3 can be stored in a *print file* for export to a word processing program. A word processing document may be loaded into the worksheet with /File Import.
5. As explained above, when a justified paragraph changes size, other cell entries may shift up or down—an implicit /Move command. One side-effect of the shift is that range names for cells within the justify range may be invalidated. If the cell protection facility is enabled, an error may result from the implicit /Move.
6. Don't use the /Range Justify command while cell protection is enabled: You may get Protected cell errors when this command rearranges the cell entries (implicit /Move commands).

/Range Input

/RI

Limit the movement of the cell pointer to the unprotected cells in a range.

Procedure

Before issuing this command, use /Range Unprotect to identify the cells in which data will be entered. It is not necessary to turn cell protection on or off for execution of /Range Input.

Specify a range.

Results

- The upper left corner of the specified range is placed at the upper left corner of the window. The cell pointer is placed at the top-left unprotected cell in the range.



- The ◀, ▶, ▲, ▼, ↘, and [Select] keys move the cell pointer among the unprotected cells in the range.
- While /Range Input is in effect, you can make and edit as many cell entries as you like. Of the function keys, only [F1/Help], [F2/Edit], and [F9/Calc] are active. You *can't* issue 1-2-3 commands. Formula recalculation takes place according to the current /Worksheet Global Recalculation settings.
- The /Range Input command ends when you press [ESC] or [Return] when the entry line—line 2 of the control panel—is empty. (That is, pressing one of these keys “an extra time” ends the command.) The window and cell pointer are returned to their position when the command was issued.
- If the /Range Input command is part of a keyboard macro, control returns to the macro when /Range Input ends.
- If there are no Unprotected cells in the specified range, 1-2-3 *beeps* and displays an error message.

Note

/Range Input allows the implementation of form-oriented data entry, for use by people not familiar with 1-2-3. It is particularly powerful when used along with the keyboard macro facility (page 9-1).

12. Copy Command

/Copy can help you extend your analyses to similar problems without rekeying and manually adjusting dependent variables. Here are some examples showing how you can make /Copy work for you:

- After you enter formulas to calculate a 1983 sales projection, you can use /Copy to produce projections for 1984, 1985, 1986, etc.
- After you enter formulas to analyze equipment orders for Region A, you can use /Copy to produce the same analysis for Region B, Region C, Region D, etc.

Copying formulas is the most sophisticated use of the /Copy command. While the procedure for executing a /Copy operation is straightforward, the planning that must precede the /Copy might take a little more time. Select your destination carefully: the contents of destination cells are automatically overwritten by the /Copy. In addition, 1-2-3 knows to adjust formulas that are relocated without your specific instruction. You need only understand how these adjustments "look" and how they affect your output values. But, more on this later. Let's begin the discussion of /Copy at its most basic level.

Using the /Copy Command

Follow this procedure to /Copy one or more cell entries:

1. Select the /Copy command.
2. Indicate a FROM cell or range—the cells whose entries you wish to copy.
3. Indicate a TO cell or range.

Some examples should make this clear. We'll start with the simple and proceed to the sophisticated in Figures 12-1 through 12-3.

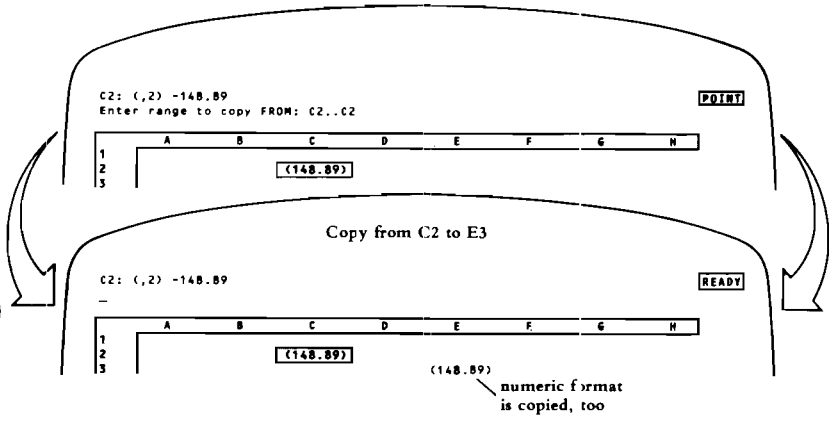


Figure 12-1. Making One Copy of an Entry

Copy from cell B2 to range C2..E2

B2: \-
Enter range to copy FROM: B2..B2 POINT

	A	B	C	D	E	F
1		Period 1	Period 2	Period 3	Period 4	
2						
3						

B2: \- READY

	A	B	C	D	E	F
1		Period 1	Period 2	Period 3	Period 4	
2						
3						

Figure 12-2. Copying an Entry TO a Range

Copy from range A1..E1 to cell B2

A1: \x READY

	A	B	C	D	E	F	G	H
1	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX			
2								
3								

A1: \x READY

	A	B	C	D	E	F	G	H
1	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX			
2								
3								

Copy from range A1..F2 to cell A3

A1: \x READY

	A	B	C	D	E	F	G	H
1	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX			
2	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX		
3	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX			
4								
5								

Figure 12-3. Copying FROM a Range of Entries

We haven't exhausted all the possibilities, but these examples should convey the general rule:

Starting at each cell of the *TO* range, 1-2-3 attempts to place a copy of the entire *FROM* range. Both cell contents and cell formats are copied.

1-2-3 keeps copies of the *FROM* range from overlapping one another when copied (but see Caution #2 below). If you indicate a *TO* range that would cause overlapping, 1-2-3 reduces the range so that no overlapping occurs. You can take advantage of this procedure when copying to a *named range* (Chapter 11, "Range Commands"). No matter what the shape of the named range, 1-2-3 makes sure no two copies of the *FROM* range overlap.



Some Cautions

1. /Copy overwrites the previous contents of cells. There is no way to recover the contents. Formulas that refer to these cells are still valid (this *isn't* the case with /Move), but the formulas' values may change.
2. Don't indicate a *TO* range that *itself* overlaps the *FROM* range. The result can be surprising (Figure 12-4):

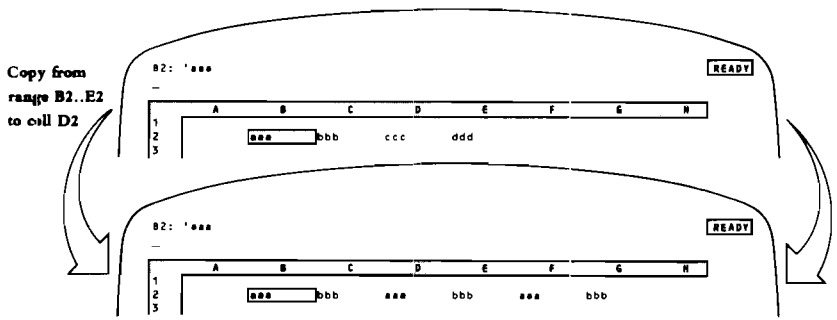


Figure 12-4. Oops—Overlapping FROM and TO Ranges

Actually, this restriction is a bit too severe. You won't run into problems if the *FROM* and *TO* ranges share the same upper left corner cell. For instance, /Copying from A5..D5 to A5..A10 won't cause any problems.

3. If a copied entry would fall outside the worksheet (e.g. below row 2048), a "Worksheet Full" error occurs.

Copying Formulas

So far, we've shown examples of 1-2-3 making *exact copies* of each cell's contents—a number or label. When dealing with formulas, though, you rarely want 1-2-3 to perform exactly the same calculation at several different places in the worksheet. It's much more likely that you'll want 1-2-3 to help you enter a set of *similar*, but not identical, calculations.

Your /Copy command will put your designated cells at a new location in your worksheet. To understand how this migration affects formula calculations that come along in the move, you will want to look at 1-2-3's unique point of view concerning formulas and locations. The results of a 1-2-3 /Copy depend upon whether the cell addresses are relative or absolute. (You can refer to Chapter 8 for a complete discussion of "Writing Formulas.") The procedures that follow are only an outline.

When 1-2-3 copies a formula, it treats absolute and relative addresses differently:

- An **absolute cell address is exactly the same** in the copied formula as in the original formula.
- A **relative cell address is different** in the copied formula from the original formula (unless you /Copy a cell to itself).
- In copying a range specification, 1-2-3 adjusts each of the two cell addresses independently.
- If a formula to be copied includes a range name (e.g. RECEIPTS), 1-2-3 acts as if you specified the range with relative cell addresses. But if you precede the range name with "\$" (e.g. \$RECEIPTS), 1-2-3 uses absolute cell addresses instead. However, to see if a range name in a formula is absolute, relative, or mixed (i.e. to see the \$ symbol), you must [f2/Edit] the formula.

Example 1. If cell F20 contains the formula: + \$B\$5*@SUM(E10..F18), . . . then copying FROM cell F20 would produce the following formulas in these TO cells:

H20: + \$B\$5*@SUM(G10..H18)

F120: + \$B\$5*@SUM(E110..F118)

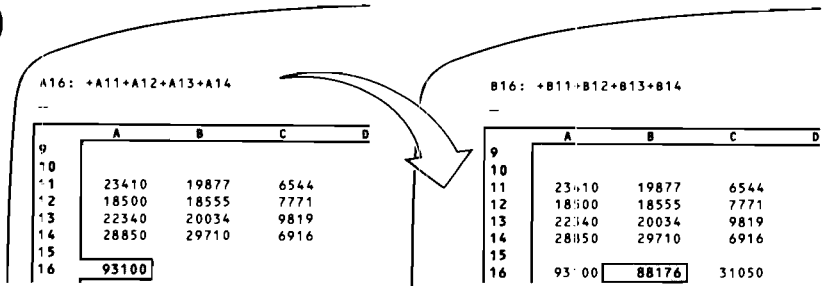
J40: + \$B\$5*@SUM(I30..J38)

In each case, 1-2-3 interprets the formula as saying: "Calculate the sum of the values in the range that starts one column left/ten rows up, and ends this column/two rows up. Then multiply by the value in cell B5".

Be careful in selecting the TO range. It's possible that at a given destination, a relative cell address such as "10 rows up/1 column left" won't have a sensible meaning. See what happens if this formula is copied to cell A1:

A1: + \$B\$5*@SUM(IV2039..A2047)

Example 2. (Figure 12-5)



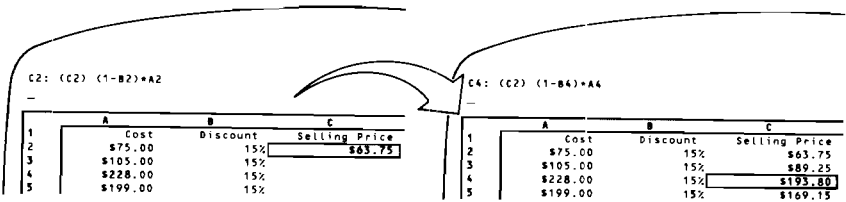
Copy from cell A16 to range B16..C16

Figure 12-5. Example 2: Copying a Formula—Relative Cell Addresses

Example 2. If a cell contains a relative address:

1. Formula typed in cell A16: $+A11 + A12 + A13 + A14$
2. /Copy command specs: FROM range: A16
TO range: B16..C16
3. Resulting formulas in TO range: B16: $+B11 + B12 + B13 + B14$
C16: $+C11 + C12 + C13 + C14$

Example 3. (Figure 12-6)



Copy from cell C2 to range C3..C5

Figure 12-6. Example 3: Copying a Formula—Relative Cell Addresses

Example 3: Yet another relative cell example:

1. Formula typed in cell C2: $(1 - B2) * A2$
2. /Copy command specs: FROM range: C2
TO range: C3..C5

Copy

3. Resulting formulas in TO range: C3: $(1 - B3) * A3$
 C4: $(1 - B4) * A4$
 C5: $(1 - B5) * A5$

Example 4. (Figure 12-7)

Copy from
cell C2 to
range C3..C5

C2: $(C2) (1 - \$A\$2) * B2$ READY

	A	B	C	D
1	Discount		Cost	Selling Price
2		15%	\$75.00	\$63.75
3			\$105.00	
4			\$228.00	
5			\$199.00	

C5: $(C2) (1 - \$A\$2) * B5$ READY

	A	B	C	D
1	Discount		Cost	Selling Price
2		15%	\$75.00	\$63.75
3			\$105.00	\$89.25
4			\$228.00	\$193.80
5			\$199.00	\$169.15

Figure 12-7. Example 4: Copying a Formula—Absolute and Relative Addresses

Example 4. If a formula contains both relative and cell addresses:

1. Formula typed in cell C2: $(1 - \$A\$2) * B2$
2. Resulting formulas when copied: C3: $(1 - \$A\$2) * B3$
 C4: $(1 - \$A\$2) * B4$
 C5: $(1 - \$A\$2) * B5$

Example 5. (Figure 12-8) If a formula to be copied contains an absolute range:

1. Formula typed in cell C65: $@VLOOKUP(A65, \$A\$5.. \$F\$60, B65)$
2. Resulting formulas when copied:
 C66: $@VLOOKUP(A66, \$A\$5.. \$F\$60, B66)$
 C67: $@VLOOKUP(A67, \$A\$5.. \$F\$60, B67)$

(Don't worry if you aren't familiar with the @VLOOKUP function. Just examine the way the cell addresses are adjusted in the copied formulas.)

Copy from
cell C65 to
range C66..C67

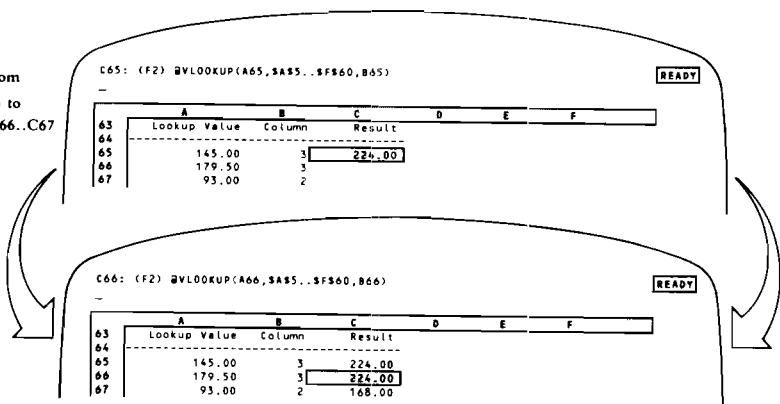


Figure 12-8. Example 5: Copying a Formula—Absolute Range

Example 6. This is the same as Example 5, but with a range name used to indicate the range A5..F60. Since the same range is to be used in all copies of the formula, we precede the range name with “\$” to make it *absolute*.

1. Formula typed in cell C65: @VLOOKUP(A65,\$DATARECS,B65)
2. Resulting formulas when copied:

C66: @VLOOKUP(A66,\$DATARECS,B66)
C67: @VLOOKUP(A67,\$DATARECS,B67)

Example 7. An additional example demonstrates how 1-2-3 handles the two corner cells in a range specification independently. As a consequence, a copied range reference in a formula may have a different shape than the original!

1. Formula typed in cell C15: @SUM(\$A\$10..C14)
“Find the sum of all values in the rectangular range whose corners are cell A10 and the cell above this one.”
2. Resulting formulas when copied:
 - H15: @SUM(\$A\$10..H14) a rectangle
 - A25: @SUM(\$A\$10..A24) a column
 - J11: @SUM(\$A\$10..J10) a row
 - A11: @SUM(\$A\$10..A10) a single cell!

Copying Mixed Addresses

1-2-3 handles *mixed* cell address—part absolute, part relative—similarly:

- The absolute part (column letter or row number) of a mixed cell address is the same in the copied formula as in the original formula.
- The relative part (column letter or row number) of a mixed cell address is different in the copied formula than in the original formula (unless you /Copy a cell to itself).

Example 8. We can create running totals in Column B for a set of numbers in Column A. In words, each formula might be:

“Add all numbers starting in row 1 of the column to the left, and ending in this row of the column to the left.”

In cell B1, this formula would be written @SUM(A\$1..A1). When copied, the result is:

B2:@SUM(A\$1.A2)

B3:@SUM(A\$1.A3)

B4:@SUM(A\$1.A4)

B5:@SUM(A\$1.A5)

Another mixed-address example is illustrated in Figure 8-14.

13. Move Command

The /Move command transfers a range of cells from one part of the worksheet to another, while maintaining all functional relationships among the cells.

This command is a powerful tool for redesigning a worksheet. It allows you to postpone decisions regarding the final visual design of a worksheet, so that you can concentrate on building the formulas. You can change your mind without having to pay the penalty of retyping all your formulas.

In the /Move command, 1-2-3 offers you automatic adjustment of those changes **implied** but not explicitly stated in your command statement. The move itself is a change you expressly requested—but 1-2-3 also knows that calculations and formulas dependent on the moved range must also be changed to reflect the /Move.

For example, you might do a first pass on a loan-analysis worksheet (Figure 13-1).

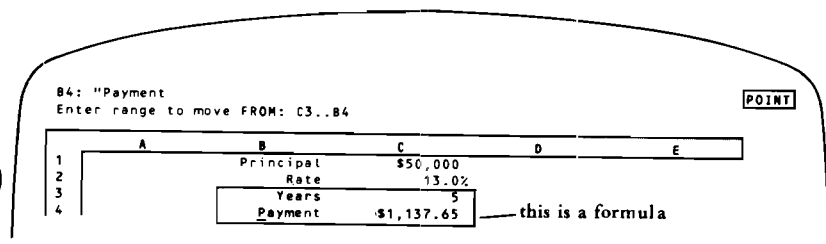


Figure 13-1. Moving Cell Entries—Before

(Look familiar? This is the same worksheet we built in the 1-2-3 Tutorial.)

At this stage, the formulas in the year-by-year table depend on the values in the “input cells” in rows 1–4. But then, you decide to compact the first few rows, in order to bring more of the table onto the screen. Will moving the input cells disrupt the formulas in the table (Figure 13-2)?

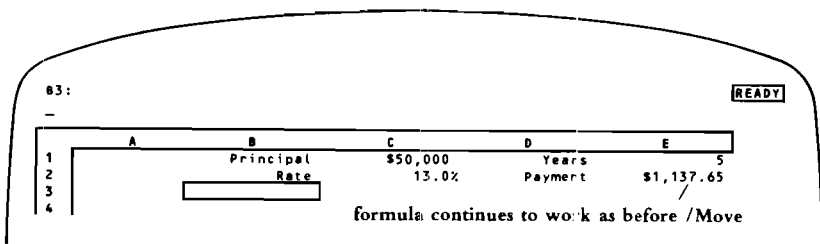


Figure 13-2. Moving Cell Entries—After

Absolutely not. 1-2-3 automatically adjusts all formulas in the worksheet to reflect the move. It's just as if you had created the input cells in their new locations, instead of in their original locations.

Some Explanations and Some Cautions

The /Move command is a powerful tool. But you must use it with care—the *explicit* changes you make with /Move can make *implicit* changes that, perhaps, you did not intend. For a full understanding of these changes, it is important to distinguish between the entries stored in the cells and the cells themselves.

The whole idea of the /Move command is to transfer cell entries between *FROM* and *TO* cells. Formulas that depend on the transferred entries will continue to do the same work. In such formulas 1-2-3 replaces the old address of an entry with its new address:

1. Before: J30 contains the formula + B10*66
2. /Move: FROM: B10 TO: C34
3. After: J30 contains the formula + C34*66

But what about formulas that depended on the contents of the *TO* cell(s)? Unfortunately, the /Move operation has *destroyed* the previous contents of the *TO* cell(s). As a result, such formulas are invalidated:

1. Before: J30 contains the formula + B10*66
2. /Move: FROM: X10 TO: B10
3. After: J30 contains the formula + ERR*66 and displays the value *ERR*.

Figure 13-3 shows another example of a /Move invalidating a formula.

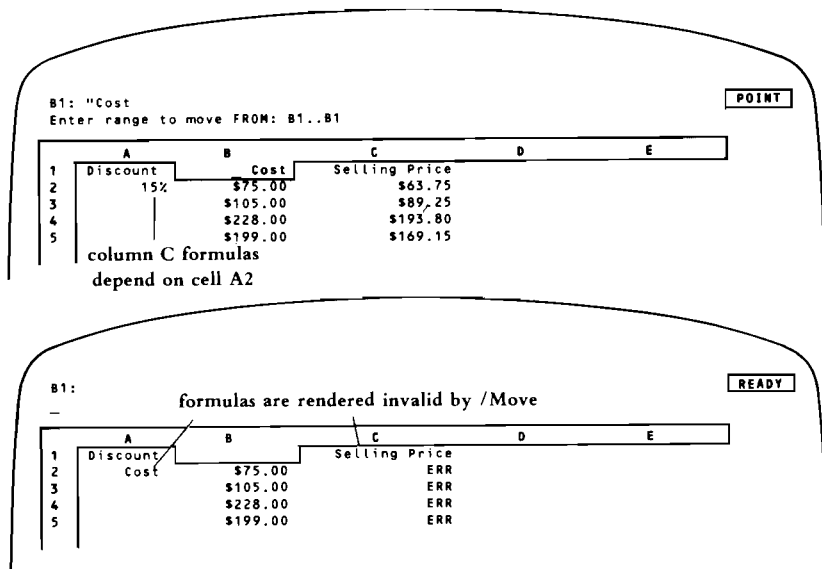


Figure 13-3. /Move Destroys Destination Cells

When moving entries, be sure to pick an unused or unneeded area of the worksheet as the entries' new home.

Named Ranges. If a cell is the upper left or lower right corner of a named range, moving the cell changes the range name definition (the location of its endpoints). Moving any other cell in a named range effectively removes it from the range, but does not alter the range name definition (Figure 13-4).

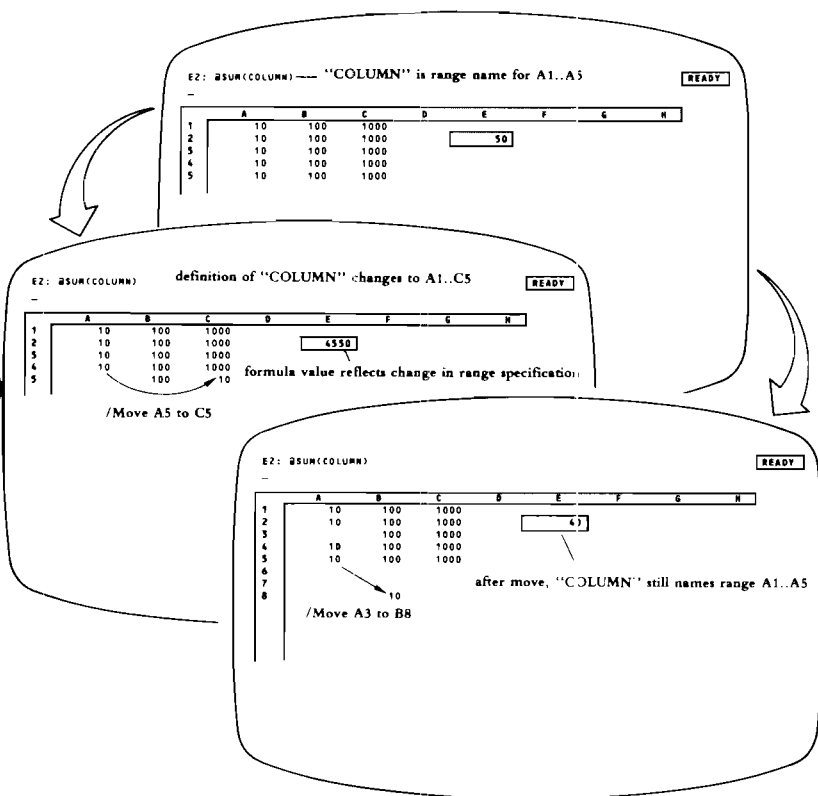


Figure 13-4. Effect of /Move on a Named Range

Command Ranges. Other ranges that 1-2-3 remembers (named or unnamed) are affected similarly. These include the Fill range (/Data Fill), the X-range (/Graph X-range), etc. (See "Command Ranges and Range Names—How 1-2-3 Remembers Them", page 7-14.)



14. File Commands

1-2-3 has a set of commands that allow you to store information on a disk.

Why is this necessary? There are two basic reasons:

- All information in the worksheet is lost when you end a 1-2-3 session. Thus, you need some way to store your work between sessions.
- 1-2-3 processes one worksheet at a time. Thus, you need a place to store worksheets when you're not using them.

In addition, there are many benefits in 1-2-3's ability to "talk" to disks:

- Disks are interchangeable—you may remove a diskette from a drive and insert another one during a 1-2-3 session. The more diskettes, the more storage capacity—so the total amount of data that you can store is unlimited.
- The disk acts as a library of information. You can combine data from a stored worksheet with the one you're currently using. Or you might excerpt part of a worksheet and store it separately. 1-2-3 can store data to be used by another program, and it can process data that other programs have stored on a disk.

Files and Filenames

It's the job of a program called the **operating system** to organize and manage the storage of information on your Portable PLUS disks. Your *MS-DOS* operating system stores information in **files**:

- Each 1-2-3 worksheet you create is stored in its own **worksheet file**.
- The 1-2-3 program itself is stored in a file.
- Word processing programs typically store each document in its own file.

For each file you create with 1-2-3, you must select a **filename** to identify it. With MS-DOS, you may choose to organize the files on a disk into several distinct directories. To keep things straight, MS-DOS insists that all files in each directory of a disk must have different filenames. In different directories, though, two files may have the same name.

(Filenames within a single directory and among different directories are like children from one or several families: two children in the same family can't have the name "John", but two children in different families may both be named "John".)

The filenames you select to store 1-2-3 data may be up to eight characters long, but may not include spaces or any other characters except A...Z, 0...9, and _.



Legal Names	Illegal Names	Why Illegal
ACCTSREC	ACCOUNTSRECEIVABLE	Too long (filename will be truncated to eight characters)
CHECKS	CHK BOOK	Spaces not allowed as part of filename

Uppercase and lowercase letters are equivalent in filenames.

1-2-3 automatically appends a *filename extension* to each file you create. If you do not use a *disk prefix*, 1-2-3 uses the *current directory* to store or retrieve the data (page 14-6).

How 1-2-3 Uses Files

Think of the main memory in the Portable PLUS as being your workspace, where you create, change, and use worksheets one-at-a-time. The disk is a permanent storage area, where many worksheets (and other data) can be stored, each in its own file.

1-2-3 allows you to either (1) create a file on a disk to save data currently in the worksheet, or (2) retrieve data from a file that already exists. (These functions are called *output* and *input*, respectively.) You can perform only one of these functions at a time, so 1-2-3 has a different file command for each:

- **/File Save.** Creates a file (you supply a filename) that stores all data currently in the worksheet. This includes all entries, display formats, column widths, range names, graph and print settings, and whatever other customization you've done to the worksheet. It even saves the current position of the cell pointer. (A variation of this is the /File Xtract command—page 14-10.)



If your currently displayed worksheet is an updated version of a previous worksheet, your /File Save command will overwrite, and thus, cancel, the old version on disk. Read the section "Overwriting Files" (page 14-4) for additional discussion of abort and backup options.

- **/File Retrieve.** Restores a worksheet to main memory (and the display screen) exactly as you stored it with a /File Save or /File Xtract command. (A variation of this is the /File Combine command—page 14-8.)

Partial Worksheets: Storing, Retrieving, Combining

The /File Retrieve and /File Save commands are your basic tools for processing files. But 1-2-3 allows you much more flexibility, should you need it, in both *input* and *output* functions.

There may arise situations in which you wish to store only *part* of a worksheet in a file. Figure 14-1 shows one example.

E47: (F2) 815.95141794
 Enter xtract file name: loantabl Enter xtract range: A41..E47 **POINT**

	A	B	C	D	E
39	Table of Loan Payments -- 20 Year Term				
40					
41	*E2	\$40,000	\$50,000	\$60,000	\$70,000
42	11.0%	392.05	490.06	588.07	686.08
43	11.5%	406.59	508.23	609.88	711.53
44	12.0%	421.29	526.61	631.93	737.26
45	12.5%	436.14	545.18	654.21	763.25
46	13.0%	451.13	563.92	676.70	789.48
47	13.5%	466.26	582.82	699.39	815.95

Figure 14-1. Storing Part of a Worksheet

On the *input* side, it is quite likely that you'll want to combine the data from two or more worksheets, or that you'll want to consolidate several small worksheets into one large one.

There are counterparts to the /File Retrieve and /File Save commands that allow you to do these tasks, and more:

- **/File Xtract.** Creates a file (you supply a filename) that stores all data currently in a particular cell range (you indicate the range). As with Save, 1-2-3 saves display formats, column widths, etc. in addition to cell contents.
- **/File Combine.** Combines part or all of a stored worksheet with the worksheet you're currently using. The stored worksheet is an overlay, placed on the current worksheet at any location you specify. 1-2-3 offers you several ways to combine the new data with the old when using this command. You can choose to:
 1. **Copy.** Entries from the worksheet file replace entries in the current worksheet.
 2. **Add.** 1-2-3 adds numeric values from the worksheet file to the cells they overlay. Only blank cells and number cells in the current worksheet are affected. Label and formula cells remain unaffected.
 3. **Subtract.** Analogous to *Add*. Incoming values are subtracted from values in the current worksheet.

Foreign Correspondence—Passing Data Between 1-2-3 and Other Programs

Though 1-2-3 is a very powerful and flexible program, it does not pretend to be all things to all people. In fact, you are encouraged to use other computer programs.

You'll be able to pass information back and forth between 1-2-3 and these other programs.

For instance:

- You can include summary figures produced by a BASIC general ledger program in a 1-2-3 worksheet to provide base figures for a financial projection.
- You can include a memo produced by a word processing program in the worksheet (and revise it once it's there).

The following commands handle 1-2-3's "foreign correspondence"—passing data to and from other programs:

- **/File Import.** Copies numbers and/or labels from a file, and enters them into the worksheet, starting at the cell pointer location. It's just as if you typed them in yourself.

/File Import differs from */File Retrieve* and */File Combine* in the same way */Print File* differs from */File Save* and */File Xtract*: *Retrieve* and *Combine* process *worksheet files* created by 1-2-3 while *Import* processes a standard-format, non-worksheet file.

- **/Print File.** Stores data in a text file, for use by other programs. (Note that this is not a */File* command, but a */Print* command.) It creates a file containing exactly what appears in the worksheet—either in the entire worksheet or in a cell range.

When the 1-2-3 session is over, you can use the MS-DOS command "Type" to print a copy (hence the command name *Print File*). Or you can use the file as data to be processed by an accounting program, statistical program, word processing program, etc.

/Print File does not perform the same function as */File Save* or */File Xtract*. It does not save any of the formulas or other calculation aspects of the worksheet, but only its appearance on the screen.

Overwriting Files

No matter how careful you try to be, there comes the time when you instruct 1-2-3 to create a file with a name that you've already used. In fact, in "updating" situations, you'll do this on purpose—retrieve a worksheet from storage, make a change to it, and tell 1-2-3 to store it again under the same name.

Stored disk files are erased or overwritten when you use a filename for a current display that already exists in the same disk directory. Whenever you try to create a file with a name already in use, 1-2-3 informs you of the situation (Figure 14-2).

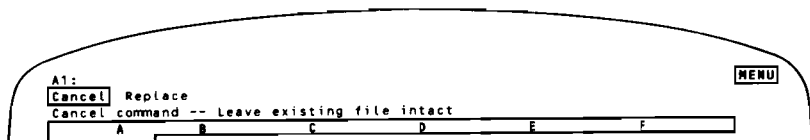


Figure 14-2. Overwriting Files—1-2-3 Makes It Your Choice

If you choose to replace the file, the data in the existing file will be lost. (1-2-3 does not automatically create a “backup” copy.) If you’re updating a worksheet, as described above, this is probably what you want.

But if you don’t want to lose the data currently stored under the filename, choose to cancel the storage operation. Then reinvoke the storage command, using a different filename.

To create a backup copy of your data disk, use the DISKCOPY command in MS-DOS. (If you want to get from a 1-2-3 session to the P.A.M. screen, you must “Quit” the 1-2-3 session *after* saving important work. See chapter 18.) Refer to *Using the Portable PLUS* for more information on DISKCOPY.

Keeping Track of Your Files

The file-overwriting situation described above is one example of a general condition. Once you’ve been using 1-2-3 for a while, you’ll notice that it is very easy to create a large number of files. Keeping track of them all becomes a significant chore. 1-2-3 helps you out in several ways.

File Types and Filename Extensions

You may be storing several types of files on the same disk. At the very least, you’ll probably use a single disk to store both *worksheet files* (processed by /File Retrieve, Save, Combine, and Xtract) and *print files* (processed by /File Import and /Print File). To help you distinguish these two types, 1-2-3 always adds three extra characters—a **filename extension**—to a filename as it creates a file.

- Worksheet files get the filename extension “.WKS”
- Print files (known also as text files) get the filename extension “.PRN”.

There is a third type of file that 1-2-3 creates: “pictures” of graphs drawn with the Graph Save command:

- Graph (or picture) files get the filename extension “.PIC”. You need not remember these extensions while you’re using 1-2-3. When appropriate, it asks you to select a file type.

Filename Menus

Whenever you wish to save or retrieve data from disk storage, you must supply 1-2-3 with a filename. When the moment of decision comes, 1-2-3 always displays a menu of filenames—the names of the files you’ve already created. (It uses filename extensions to restrict the menu to files of the correct type.) You can select one of these names by pointing to it, or you can type a name (“Using Menus”, page 6-8).

Current Directory

1-2-3 allows you to store files on any disk in any of your disk drives, including the electronic disk (Drive A). For details concerning the configuration, including how to change it, see Appendix A, “Configuring 1-2-3”.

With your MS-DOS 2.11 operating system, you may divide each disk's storage space into separate areas, called **subdirectories**. (See chapter 5 in *Using the Portable PLUS* for details.) At any one moment, one group of files—one directory—is the **current directory**. 1-2-3 always uses the current directory—and only the current directory—when it produces a menu of filenames of a /File List display.

You can change the current assignment with a 1-2-3 command:

- **/File Directory.** With MS-DOS, makes current one of the directories in a disk's “directory tree”: B:\ACCTFLS, C:\PERSONAL, B:\REVENUE\MAY, etc..

If you wish to create or use a file that is *not* in the current directory, it is easiest to issue a File Directory command first. But in many cases, you can use another directory by typing a **disk prefix** before the filename, e.g. B:ACCT1; C:RECVBL.

Automatic Loading of Worksheets

When 1-2-3 begins execution, it automatically searches the *current directory* for a worksheet named AUTO123. If such a file exists, 1-2-3 automatically /File Retrieves it. Which directory is to be *current* when 1-2-3 starts execution is determined by the setting in the 1-2-3 configuration file, 123.CNF (/Worksheet Global Default Directory command, page A-3).

Filename Listing

1-2-3 has a command that blanks the display screen and produces a list of filenames:

- **/File List.** Displays a list of the names of all files of a particular type (*worksheet*, *print*, or *graph*) in the current directory. Press any key to restore the worksheet display.

File Deletion

1-2-3 has a command that deletes a file from disk storage. This is equivalent to the MS-DOS command “Erase”. Once you've deleted a file, you can reuse the filename, but the file's old contents are lost.

- **/File Erase.** Deletes one or more files of a particular type (*worksheet*, *print*, or *graph*) on the disk.

/File Retrieve

/FR

Load a worksheet from disk storage.

Procedure

Specify the filename under which the worksheet is stored by pointing to its name, or by typing its name.

If you don't use a disk prefix ("C:ACCTS" means current directory of disk C, file ACCTS), 1-2-3 looks for the file in the *current directory* (/File Directory, /Worksheet Global Default Directory).

Results



The current worksheet is first erased.

- The worksheet is retrieved from the specified *worksheet file* (extension .WKS). The file itself is unaffected. The worksheet appears exactly as it did when it was stored with /File Save (formats, column widths, titles, pointer location, etc).

Notes



1. Do not use this command when the current worksheet contains valuable information until you first save it.
2. Be careful when retrieving a worksheet from a file created with /File Xtract rather than /File Save. In general, data from Xtracted files should be reloaded with /File Combine, rather than /File Retrieve.
3. This command only processes worksheet files created by 1-2-3. To process files created by other programs, use /File Import.
4. At the beginning of a session, 1-2-3 automatically retrieves worksheet AUTO123 stored in the current directory, if the worksheet exists.

/File Save

/FS

Save the current worksheet and all settings in a worksheet file (extension .WKS).

Before beginning work, be sure you have an adequate disk supply. All disks must be *formatted* using the FORMAT utility program in the P.A.M. File Manager (refer to *Using the Portable PLUS*, Chapter 8).

Procedure

1. Specify a filename under which the worksheet is to be stored: point to an existing name in the menu, or type a new or existing name.

If you don't use a *disk prefix* ("C:ACCTS" means current directory of disk C, file ACCTS), 1-2-3 stores the file in the *current directory* (/File Directory, /Worksheet Global Default Directory).

2. (If a file with the specified name already exists) Choose to Replace the existing file's contents with the current worksheet, or to Cancel the command.



Choosing to Replace immediately erases the file's former contents. There is no way to recover this information. If you are updating a file, this may be exactly what you wish to do. Otherwise, Cancel the command.

Result

1-2-3 saves the worksheet along with all settings (global settings, named ranges, graph and print settings, split screen, etc.).

Notes

1. Use this command frequently. Frequent storage is insurance against human error—mistakes of judgment or typing—that can cause serious data loss.
2. Use this command to save your worksheet temporarily, so you can examine another worksheet and then return to where you left off.
3. If you try to save a worksheet on a disk with inadequate available memory space, a "Disk Full" error message appears. Press [ESC], insert another data disk, and try again.
4. To save a worksheet that contains more information than one disk can hold, you must Xtract portions of it onto separate disks. To retrieve it, use Combine.
5. There is no simple relationship between the amount of main memory a worksheet occupies (as reflected in the /Worksheet Status *Available Memory* statistic) and the size of its worksheet file.

/File Combine

/FC

Incorporate all or part of a worksheet file into the current worksheet at the current cell.

Procedure

Before issuing this command, be sure that the cell pointer is at the location where the stored information is to be incorporated.

1. Select a method of combining: Copy, Add, Subtract.
2. Choose to incorporate an Entire-File or just one Named-Range from the file.
3. (Named-Range only): Type the name of the range to be extracted from the worksheet file. 1-2-3 does *not* display a menu of these names.
4. Specify the name of the worksheet file whose data is to be combined: Point to an existing name in the menu, or type a new or existing name.

If you don't use a disk prefix, 1-2-3 looks for the file in the *current directory* (/File Directory, /Worksheet Global Default Directory).

Results

- The incoming data is combined into the current worksheet (see details below). The upper left corner entry of the incoming data is incorporated at the current pointer location. All other incoming entries fall in corresponding cells to the right and below.

Copy. Each entry in the file replaces an entry in the current worksheet.

Add. 1-2-3 uses only the file's numeric data (numbers and formula values, but not labels and empty cells).

If an incoming value overlays a number cell, the values are added.

If an incoming value overlays an empty cell, the cell takes the value.

If an incoming value overlays a label or formula cell, the incoming value is discarded and the original retained.

Subtract. Essentially similar to *Add*. Note that a positive number subtracted from an empty cell produces a negative result.

- Only cell entries are incorporated. No worksheet settings, print settings, range names, etc. are brought into the current worksheet.

Notes



1. Position the cell pointer carefully before executing this command. Using Combine carelessly can invalidate the entire worksheet. If you have any doubts, save the current worksheet (/File Save) before using /File Combine.
2. This command is especially useful for combining data or worksheets from several different sources, or to accumulate similar sets of data.

/File Xtract

/FX

Save a range of cells, along with all settings, in a worksheet file (extension .WKS).

Procedure

1. Choose to save Formulas or only the current Values of formulas.
2. Specify a filename under which the range and settings are to be stored. Point to an existing name in the menu, or type a new or existing name. If you don't use a disk prefix, 1-2-3 stores the file in the *current directory* (/File Directory, /Worksheet Global Default Directory).
3. (If a file with the specified name already exists) Choose to Replace the existing file's contents with the current worksheet, or to Cancel the command.



Choosing to Replace immediately erases the file's former contents. There is no way to recover this information. If you are updating a file, this may be exactly what you wish to do. Otherwise, Cancel the command.

4. Specify the range to be Xtracted.

Result

1-2-3 saves the range along with all settings (global settings, named ranges, graph and print settings, split screen, etc.).

Notes

1. /File Extract is useful when you want to split a large worksheet into smaller parts or to Xtract part of one worksheet for use in another (see also /File Combine).
2. The Values option is useful when Xtracting the results of a calculation that will not change in future use of the worksheet.
3. There are potential inconsistencies in extracting a range. Formulas may refer to cells that are not included in the Xtract range. Similarly, worksheet settings (e.g. range names) can refer to unextracted cells. To eliminate the latter problem, don't process an Xtract-created file with /File Retrieve. Such files should normally be processed only with /File Combine.

/File Erase

/FE

Erase one or more 1-2-3 data files from disk storage.

Procedure

1. Select the type of file(s) to be erased: Worksheet (.WKS), Print (.PRN), or Graph (.PIC).

2. Specify the filename by pointing to its name in the menu, or by typing its name. You may use MS-DOS *global filename characters* in the name specification.

If you don't use a disk prefix, 1-2-3 looks for the file(s) on the *current directory* (/File Directory, /Worksheet Global Default Directory).

3. Choose Yes to confirm the Erase order, or choose No to cancel the command.

Results



1-2-3 erases the selected file(s). All information in the files is permanently lost.

- If you type in a *pattern name* (aka filename template, generic name, wildcard, etc.) that uses MS-DOS global filename characters, all files matching it are erased. The global filename characters are:

? Matches any single character in its position in the filename. H?T matches HIT, HOT, and HUT but not HUM.

* Matches all remaining characters up to the end of the filename. C* matches CAT, CATCHER, and CONFERENCE but not ACROSS.

Notes

1. To erase files that are not stored on the current disk, either change the current disk (/File Directory) or use a *disk prefix* with the filename, e.g. C:ACCTS (current directory of disk C, file ACCTS).



2. Entering * alone as the filename specifies the erasure of all files of the selected type on the current disk.

/File List

/FL

Display all filenames of a given type stored in the current directory; display available file-storage capacity.

Procedure

1. Select the type of files you want to check: Worksheet (.WKS), Print (.PRN), or Graph (.PIC).
2. To clear the listing and return to Ready Mode, press any key. (Pressing the key has no other effect.)

Result

1-2-3 temporarily replaces the worksheet display with a list of all names of the selected file type. It also displays the remaining amount of memory storage space (in kilobytes) in the current directory.

File

Notes

1. If there are no files of a given type on the disk, 1-2-3 *beeps* and an error message appears. Press **[Return]** or **[ESC]** to return to Ready Mode.
2. Use /File Directory to determine whether a particular filename is already in use, or to ensure that adequate memory space is available on a disk before saving a worksheet.

/File Import

/FI

Superimpose the contents of a print file (extension .PRN) on the worksheet at the current pointer location.

Procedure

Before issuing this command, position the pointer to the upper left corner of the region that the imported data is to occupy.

1. Select an Import format: Text or Numbers.
2. Specify the name of the print file to be imported: Point to its name, or type its name.

If you don't use a disk prefix, 1-2-3 looks for the file in the *current directory* (/File Directory, /Worksheet Global Default Directory).

Results

Text. For each line in the print file, 1-2-3 creates a separate left-aligned label containing the text in that line, and then moves down one row. The result is a single column of labels.

Numbers. 1-2-3 searches the print file for both numbers and any series of characters enclosed in double-quotes ("..."). All other file contents are ignored.

- For each number, 1-2-3 creates a number entry.
- For each double-quoted label, 1-2-3 creates a left-aligned label.
- Successive numbers and labels from the same line of the print file are placed in successive columns of the same row of the current worksheet. Data from the next print file line is placed in the next row of the worksheet, continuing until the print file has been completely read.

Notes



1. When Importing either Text or Numbers, the new data replaces any existing cell entries. Blank lines in the incoming file cause a row in the current worksheet to be skipped: the contents of those worksheet rows are not affected.

2. Using this command, data can be imported from most programs which generate standard text files. Be sure that these incoming files have the file-name extension .PRN—1-2-3 requires all print files to have this extension. Use the MS-DOS RENAME command or P.A.M.'s File Manager to rename a file.
3. Some word processors generate document files containing special characters that lie outside the standard ASCII character range: 32-127 (decimal). 1-2-3 does not process codes in the range 128-255—it always strips off the high-order bit of each character's ASCII code. Codes below 32 *can* be included in an import file. They appear in cell entries as graphic characters.

Most word processors allow you to convert their document files to standard text files. The latter may be more suitable for use with 1-2-3.

/File Directory

/FD

Set the current directory.

Procedure

The current directory assignment is display. To retain it, press **[Return]** alone.

MS-DOS: To change the current directory, type a full or partial pathname. Partial pathnames are interpreted as starting at the current directory. For details concerning pathnames and "tree" directory structures, see the MS-DOS manual.

Result

When you select one of the other /File commands that requests a filename, 1-2-3 will automatically present a menu of all the files of the appropriate type (*Worksheet*, *Print*, or *Graph*) in the current directory. If you type a filename without a disk prefix (see below), 1-2-3 uses the current directory to store or retrieve the data.

Notes

1. In many cases, you have direct access to files that are not in the current directory. If you start to type the filename with a *disk prefix*, 1-2-3 uses the directory on the specified disk that was most recently made current. For instance, typing C:ACCT1 specifies that a file named ACCT1 is to be used, located in the directory on disk C that was most recently the current directory.
2. The /Worksheet Global Default Directory command specifies a particular directory to be current at the start of a 1-2-3 session.



15. Print Commands

Your options in /Print are numerous and varied—1-2-3 offers you creative flexibility to suit your working needs. Whether timing or formatting is your primary concern when you are at the printing stage of your work, /Print commands can expedite the necessary 1-2-3 operation.

Print It Now vs. Print It Later

If a printer is connected to your HP Portable PLUS, you can obtain hardcopy of your work at any time during a 1-2-3 session. Simply tell 1-2-3 of your intention by executing a /Print Printer command. *Be sure that you have turned on your printer before trying to print a file.**

Remember that you can always get a quick copy of *just what is on the screen* by executing [Print]. To get a more selective print-out, use the /Print Printer commands described in this chapter.

However, if a printer is not part of your Portable PLUS hardware system, you will need to create a print file to temporarily store the print output until a printer is available. This print file on disk becomes like a *softcopy* of your work that is awaiting an opportunity to be printed on paper.

To allow you to print either now or later, the /Print command always starts with a choice. Your screen display will offer you:

/Print Printer. Print output is sent directly to the printer.

/Print File. Print output is stored in a print file for printing (or other processing) after the 1-2-3 session. 1-2-3 always adds the filename extension *.PRN* to print filenames. When you choose /Print File, 1-2-3 will show you a list of your existing print files; the name for your current print file can either be a new name that you enter or it can be one of the filenames listed. If you store current print output in an existing filename, 1-2-3 lets you know this action would overwrite that file's contents.

What to Print (and How Many)

After you've chosen the destination of the print output (to a printer or file), 1-2-3 displays a /Print menu offering *eight choices* to begin designing your printout:

Range Line Page Options Clear Align Go Quit

* If you have made any changes to the System Configuration (as explained in chapter 4 of *Using the Portable PLUS*) regarding the printer, be sure to turn on the printer *before starting* 1-2-3. (Or, if you already started 1-2-3 before turning on the printer, *reset* the computer by holding down [Shift]-[CTRL]-[Break] simultaneously.) Otherwise, the computer will use the *default* configuration values for the printer instead of any different ones you have set.

In fact, if you'd like a set of print options to become your installation standard, you can store these options, always retaining the choice to override them on a worksheet-by-worksheet basis. It is your option to make formatting specifications for a particular printout. 1-2-3 can be as flexible as your needs require.

Your route through this /Print menu is circular until you choose /Quit—after you invoke any of the other seven commands and respond to prompts, this /Print Main menu returns to allow you to select and perform another command. Choosing Quit at this menu ends the /Print command and returns you to Ready Mode.

During a /Print command, you can specify several **print ranges**—cell ranges to be printed—one at a time. With /Print File, *all* the ranges are appended together in a single print file (Figure 15-1). If you wish, you can use different formatting options for different ranges. Here's the general procedure:

1. (Optional) Specify one or more Options. We explain these in the next section.
2. Indicate a print range (perhaps the whole worksheet) with the Range menu choice.
3. Select Align to tell 1-2-3 you are at the top of the page. (This is only required if you reload or adjust the paper position manually.)
4. Select Go to send the contents of the print range to the printer or print file.
5. Select Quit to end the /Print command. Otherwise, keep going.
6. You'll probably want some separation between the last range you printed and the next one. Use one or both of these form-adjustment functions:

Line. Advances the printer one line.

Page. Advances the printer to the top of the next page. (If you've specified an optional "footer", 1-2-3 prints it at the bottom of the current page.)

7. Return to step 1 or 2.

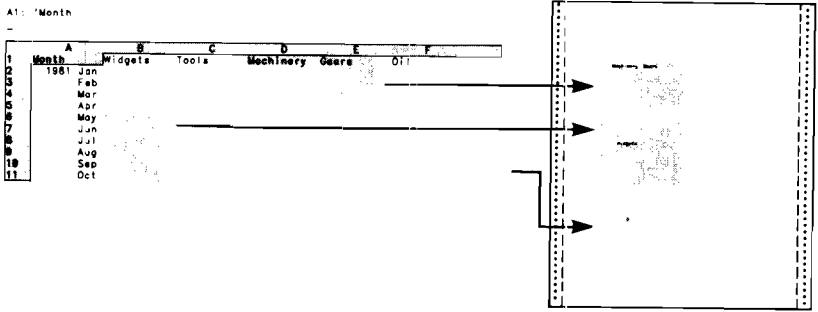


Figure 15-1. A Print Job with Several Parts

Print Options

The **Options** selection on the /Print menu allows you to control the appearance of the printout and to add extra text (Figure 15-2). At least six other choices can be accessed in the /Print Options submenu:

Printer Control. You can send a **setup string** directly to the printer hardware. Typically, you send a string of “control characters” in order to invoke such functions as changing the typeface, changing the type size, etc. (See Appendix B, “Printer Control Codes”).

Page Format. Left, right, top, and bottom margins; page length.

Extra Text. Page headers and page footers (you can have 1-2-3 include a page number and/or the current date in these).

Range Borders. The /Print command ignores titles (and split screen, too) that you have established in the worksheet. But the Borders option allows you to temporarily establish title rows and/or columns, for use just during printing. The borders are printed along the top and/or side of each page of each print range you output (Figure 15-3).

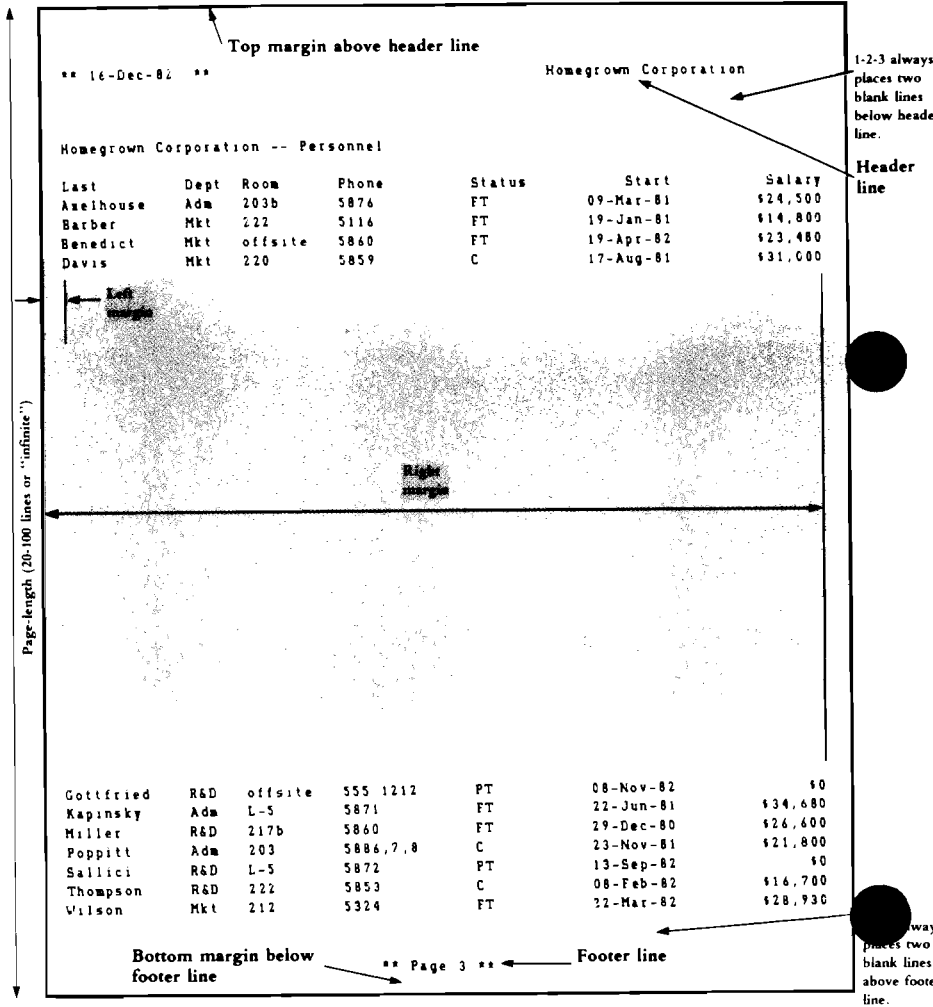


Figure 15-2. Page Layout Options

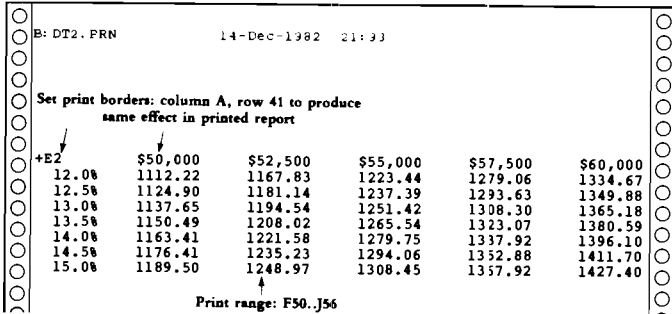
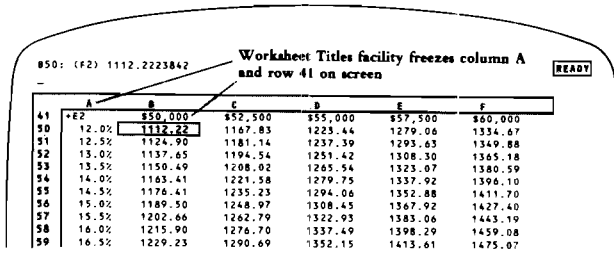


Figure 15-3. Print Borders

Format Suppression. For a particular printout, you can have 1-2-3 omit all vertical formatting (headers, footers, page length), effectively producing an “infinite” page length. This is useful when preparing data for use by other programs.

Worksheet Documentation. With the Cell-Formulas option, you can turn the printout into a one-cell-per-line listing of all entries—numbers, formulas, and labels—in the print range. In this listing, there is no attempt to position the entries as they appear in the worksheet (Figure 15-4).

Note. There may be more than one way to accomplish a particular printing effect. For instance, you can always set the print margins using the left-margin option. In addition, you may be able to set the left margin by sending control characters directly to the printer in a setup string. We recommend that you not mix these methods. In general, it should be easier to use 1-2-3’s commands than printer control characters.

Year	Principal Rate	50000 13.0%	Years Payment	5 \$1,137.65
Year	Begin Bal.	End Bal.	Total Paid	Interest
1	50000.00	42406.26	13651.84	6058.10
2	42406.26	33764.33	13651.84	5009.92
3	33764.33	23929.53	13651.84	3817.05
4	23929.53	12737.22	13651.84	2459.53
5	12737.22	0.00	13651.84	914.63
			\$68,259.22	\$18,259.22

```

B1: *Principal
C1: 50000
D1: *Years
E1: 5
B2: *Rate
C2: (F1) 0.13
D2: *Payment
E2: (C2) @PMT(C1,C2/12,E1*12)
A4: *Year
B4: *Begin Bal.
C4: *End Bal.
    
```

Figure 15-4. As-Displayed vs. Cell-Formulas

Remembering and Clearing Print Specifications

As you enter print specifications, 1-2-3 automatically remembers them for future use. If you specify a print range of F4..K55, then 1-2-3 will repropose the same range the next time you select Range from the /Print menu.

1-2-3 stores print settings in the worksheet files it creates with /File Save and /File Xtract. In this way, it can remember your print settings between sessions, not only within a single session.

Occasionally, 1-2-3's tenacious memory may get in your way. So 1-2-3 has a /Print Clear command that makes it forget. You can choose to cancel *all* print settings at once, or just some of them—Range, Border, or Format (which includes margins, page length, and setup string).

When you cancel a print setting, 1-2-3 returns to using the *default* setting. This is the value it read from the *configuration file* at the beginning of the session (unless you subsequently revised the default setting—see Appendix A, "Configuring 1-2-3").

Print

/Print Printer and /Print File

/PP and /PF

Create a print job, sending it directly to the printer or to a print file.

Procedure

1. Choose Printer or File:

Printer. When you select Go, 1-2-3 will print the contents of the specified Range and return to the main /Print menu, allowing you to continue printing or Quit.

File. When you select Go, the same characters that would be sent to the printer are stored in a *print file* (extension .PRN).

- When you choose /Print File, 1-2-3 prompts you for a filename. Specify a filename under which the print output is to be stored: Point to an existing name in the menu, or type a new or existing name.

If you don't use a *disk prefix* (e.g. C:RECPRI) means the current directory of disk C, file RECPRI), 1-2-3 stores the file in the *current directory* (/File Directory, /Worksheet Global Default Directory).

- *If a print file with the specified name already exists:* Choose to Replace the existing file's contents with the new print output, or to Cancel the /Print command. (To *append* several print jobs together in one file, you must specify all the print ranges during a single /Print command—see page 15-2.)



Choosing to Replace immediately erases the file's former contents. There is no way to recover this information. If you are updating a file, this may be exactly what you wish to do. Otherwise, Cancel the command.

2. The main /Print menu appears:

Range Line Page Options Clear Align Go Quit

This is a "sticky" menu: To return to Ready Mode, choose Quit or press [ESC]. To produce a print job, you must specify a *print range* (menu choice: Range) then tell 1-2-3 to send the output to the disk or printer (menu choice: Go). All other print settings are optional.

/Print Range

/PPR, /PFR

Specify a cell range to be printed.

Procedure

1-2-3 "remembers" (page 7-14) the most recently used print range, if any. When you issue the command, 1-2-3 offers to reuse this range: It highlights the range and shows the addresses of its upper left and lower right corner cells in the control panel.



1. Press [Return] alone to reuse the same print range. You can press [Backspace] to cancel this remembered range and return the pointer to the current cell. Otherwise, revise the range specification or enter a new one.
2. The main /Print menu returns. If you're ready to print, choose Go. Then, you can (1) Choose Range again to specify another print range, and/or (2) Change optional print settings. In this way, you can append several print tasks into one large job.

Result

When you choose Go, 1-2-3 sends an image of the range to the printer or print file. It uses the default print settings (page 10-4), except for those you've overridden with /Print Options commands.

Notes

1. You may not get the results you want if your print range is too wide for the current margin settings. A column of the print range can "spill over" the right margin in two ways:
 - The column itself fits within the margins, but a long label in the column "spills over" the right margin. 1-2-3 handles this situation by truncating (cutting off) the entry at the margin.
 - The display width of the column (*column width*—page 10-19) makes it "spill over". In this case, 1-2-3 places the overflow column, and subsequent columns, on a new page.

Example:

Page-Length = 20 Left Margin = 0 Right Margin = 30

Narrow print line causes column to spill over to another page.

page 1	1	19	37	page 3
	2	20	38	
	3	21	A "long label" will be truncated if it extends beyond the right margin.	
	4	22		
	5	23	41	
	6	24	42	
	7	25	43	
	8	26	44	
	9	27	45	
	10	28	46	
page 2	11	29	47	page 4
	12	30	48	
	13	31	49	
	14	32	50	
	15	33	51	
	16	34	52	
	17	35	53	
	18	36	54	

These characters will be lost.

Short page length causes print range with many lines to span page breaks.

2. To cancel a print range specification, use /Print Clear All or /Print Clear Range.

/Print Line**/PPL, /PFL**

Advance the printer to the beginning of the next line.

Results

- The printer advances to the beginning of the next line, and 1-2-3 remains in the main /Print menu. You may issue this command many times in succession.
- If you reach the bottom of a print page (as defined by the Page-Length, Margins Top, and Margins Bottom settings), 1-2-3 prints the Footer text (if any) and advances to the top of the next page.

/Print Page**/PPP, /PFP**

Advance the printer to the top of the next page.

Results

- The printer advances to the top of the next page, as defined by the Page-Length, Margins Top, and Margins Bottom settings. The Footer text (if any) is placed at the bottom of the current page. 1-2-3 remains in the main /Print menu.
- In an unformatted print job (/Print Options Other Unformatted), Page still advances multiple lines, using the current Page-Length setting (even though the page-length is “infinite”).

Notes

1. Issue a Page before exiting the /Print command with Quit. This ensures that (1) The Footer text (if any) will appear at the bottom of the final page, and (2) The next print job will begin at the top of a new page. (1-2-3 does *not* automatically advance to the top of a page with each /Print command.)
2. Use /Print Align to set 1-2-3's line and page number counter back to 1.

/Print Go**/PPG, /PFG**

Output the specified print range.

Results

1. 1-2-3 “prints” the *setup string*, typically a set of non-printing control characters (page 15-14).
2. 1-2-3 prints the currently defined print range, along with Border rows and/or columns (if any). See page 15-8 for a discussion of how 1-2-3 handles a print range that is too wide for the current margin settings.

Interrupting a Print Job. To interrupt direct printing, execute **[Break]**. The printer may continue printing for a while, until it has cleared its *buffer* (internal memory). After you interrupt a print job, (1) Switch the printer off, then on again; (2) Align the paper manually or with **/Print Line**; (3) Use **/Print Align** to reset 1-2-3's line and page counters to 1.

If your printer is *off-line* when you send data to it, 1-2-3 may get "stuck" in Wait Mode. Even interrupting does not have an immediate effect in such cases. Switch the printer *on-line* to allow the interrupt order to take effect.

Notes

1. Be sure that you have turned on your printer before trying to print a file.
2. If 1-2-3 finds that your printer is not ready or is not functioning properly (it tries repeatedly to send the output), it *beeps* and displays a "Printer Error" message. Press **[ESC]** to clear the error message and continue working. No data is lost. Often, you need only switch your print *on-line*, then choose **Go** again.
3. When storing short print jobs in a print file, you may notice that the disk drive light does not go on. Don't worry—1-2-3 will catch up when you finish the **/Print** command with **Quit**.

/Print Options Header and Footer /PPOH and /PPOF /PFOH and /PFOF

Include an additional text line at the top and/or bottom of each page.

A 1-2-3 print page (Figure 15-2) begins with the top margin (0-10 lines), the Header line (possibly empty, but always there), and two blank lines. The next line of the print job follows thereafter. The print page ends similarly: The last line of the print job is followed by two blank lines, the Footer line, and the bottom margin (0-10 lines).

Procedure

1-2-3 displays the current definition, if any, of the header or footer. Edit or replace the text, making sure that the new text fits within the left and right margins. The **/Print Options** menu returns.

Page Number. Whenever it finds the character # in a header or footer line, 1-2-3 substitutes the current page number. At the start of a 1-2-3 session, the line and page-number counter is set to 1. This number increases each time a print page is completed. The /Print Align command resets the page number to 1.

Current Date. Whenever it finds the character @ in a header or footer line, 1-2-3 substitutes the current date (e.g. 08-Nov-85).

Formatted Headers and Footers. You can use | characters to separate a header or footer line into three parts:

1. Flush against the left margin.
2. Centered between the margins.
3. Flush against the right margin.

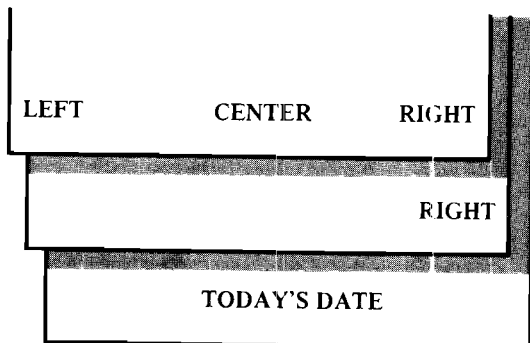


Figure 15-5. Placement of Headers and Footers.

Examples:

Text	Description	Appearance
ABC Company	1 part, flush left	ABC Company
| ABC Company	1 part, centered	ABC Company
|| ABC Company	1 part, flush right	ABC Company
p. # MEMO ** @ **	3-part	p. 15 MEMO **23-Feb-85**
	on page 15 of print job	on February 23, 1985

Result

When you choose Go to print a range, the header or footer text will be included if the output spans a page break (see Note 2 following).

Notes

1. To cancel a header or footer, edit the text down to zero characters (using [Backspace] or [ESC]). The /Print Clear All command cancels the header and footer settings along with all other print settings.
2. In an unformatted (“infinite page length”) print job (/Print Options Other Unformatted), 1-2-3 does not print headers and footers. If you switch back to formatted printing, the header and footer texts will reappear.
3. The footer is printed when you issue a Line or Page advance that crosses a page break.

/Print Options Margins

/PPOM, /PFOM

Set the left, right, top, or bottom margin of the print page.

A 1-2-3 print page (Figure 15-2) begins with the top margin (0-10 lines), the Header line (possibly empty, but always there), and two blank lines. The next line of the print job follows thereafter. The print page ends similarly: The last line of the print job is followed by two blank lines, the Footer line, and the bottom margin (0-10 lines).

Procedure

1. Choose a margin to set: Left, Right, Top, or Bottom.
2. 1-2-3 displays the current margin setting. To use it, press [Return] or [ESC]. To change it, enter a new number (the existing one disappears automatically when you begin typing).

Margin	Possible Settings
Left	0-240
Right	0-240
Top	0-10
Bottom	0-10

Result

The new margin setting remains in effect until you (1) End the 1-2-3 session, (2) Retrieve a worksheet, or (3) Issue a /Print Clear All or /Print Clear Format command. In the final case, the default printer configuration (page A-4) is reinstated.

Notes

1. See page 15-8 for a discussion of print ranges that do not fit within the left and right margin settings.
2. At the beginning of a session, 1-2-3 reads the *default printer configuration* from file 123.CNF on the internal, electronic disk (Drive A). The /Print Options Margins commands override the default margin settings stored in this file.

(See Appendix A, "Configuring 1-2-3". The Lotus-supplied configuration file is designed for an 8.5" × 11" page, printed at six lines per inch, with a 72-character print line.)

3. Use /Print Options Other Unformatted to specify an "infinite" page length: 1-2-3 will ignore the top and bottom margin settings. This allows you to ignore the paper perforations.
4. If your printer automatically skips over paper perforations, set the top and bottom margins to 0 and reduce the Page-Length setting.

/Print Options Borders

/PPOB, /PFOB

Specify rows to be included at the top of each page of a print range, or columns to be included at the left of each print range.

This is the printing counterpart to the Titles facility, which "freezes" rows and/or columns on the display screen. For an illustration, see Figure 15-3.

Procedure

1. Choose Columns or Rows:

Columns. Each time you choose Go to print a range, 1-2-3 will "attach" entries from the columns you specify as a left border.

Rows. Each time you choose Go to print a range, 1-2-3 will "attach" entries from the rows you specify as a top border. If the range spans one or more page breaks, an extra set of top-border rows will start each additional print page (after the header line).

1-2-3 "remembers" (page 7-14) the most recently used column-border and row-border ranges, if any. When you choose Columns or Rows, 1-2-3 offers to reuse the same border range: It highlights the range and shows the addresses of its upper left and lower right corner cells in the control panel.

2. Press [Return] alone to reuse the same border range. You can press [Backspace] to cancel this remembered range and return the pointer to the current cell. Otherwise, revise the range specification or enter a new one.

For a row-border, only the vertical dimension is significant (A1..A4, B1..B4, and A1..H4 all are equivalent row-border ranges). Similarly, only the horizontal dimension of a column-border is significant.



Be careful! If no row or column border has been defined, pressing [Return] alone sets a single-row or single-column border at the pointer location. If you change your mind about setting a border, press [ESC], not [Return].



Notes

1. Use print borders to produce column headings at the top and/or row headings at the left edge of every page of a multi-page printout.
2. Use print borders to “paste” together in a print job rows or columns that are non-adjacent.
3. In an unformatted print job (/Print Options Other Unformatted), there are no page breaks. Thus, a row-border is always printed once at the beginning of a range, no matter how many rows the range occupies.
4. Be careful not to duplicate headings by including them in both a border range and the print range.
5. To cancel border specifications, use /Print Clear All or /Print Clear Borders. “Unexpanding” the highlighted range with [Backspace] or [ESC], then pressing [Return] is not enough!

/Print Options Setup

/PPOS, /PFOS

Define a sequence of printer-control characters to be output just before each print range.

Procedure

1-2-3 displays the current *setup string* definition, if any, and switches to Edit Mode. To leave the string unmodified, press [Return] alone. Otherwise, edit or replace the string. The setup string may be up to 39 characters long.

Control Codes. Indicate non-printing characters by their ASCII codes, in this form:

`\nnn` 3-digit decimal ASCII code

A commonly used non-printing character is the Escape character, whose code is 027.

Examples (for HP ThinkJet and HP 82905B printers):

To turn on compressed print:

`\027\038\107\050\083` (Escape & k2S)

To turn off compressed print:

`\027\038\107\048\083` (Escape & k0S)

Results

- Each time you choose Go to print a range, 1-2-3 will first send the setup string to the printer.

- The new setup string remains in effect until you (1) End the 1-2-3 session, (2) Retrieve a worksheet, or (3) Issue a /Print Clear All or /Print Clear Format command. In the final case, the default printer configuration (page A-1) is reinstated.

Notes

1. Each printer has its own control codes. Consult your printer's User Manual for details. Translate your printer's codes into 1-2-3's "\nnn" format. Be sure to express the number in *decimal*, not *octal* or *hex*. (See Appendix B, "Printer Control Codes".)
2. To include a backslash itself in the setup string, type two in a row: \\.
3. At the beginning of a session, 1-2-3 reads the *default printer configuration* from the file 123.CNF on the electronic disk. The /Print Options Setup command overrides the default setup string stored in this file. (See Appendix A, "Configuring 1-2-3".)
4. If you select compressed print, you may want to change the right margin as well (/Print Options Margins Right). If you change the line spacing, change the page length as well (/Print Option Page-length).
5. With most printers, you must issue another setup string or power down the printer to "undo" a particular print format. Merely cancelling the setup string is not enough.

/Print Options Page-Length

/PPOP, /PFOP

Set the total number of lines per print page.

A 1-2-3 print page (Figure 15-2) begins with the top margin (0-10 lines), the Header line (possibly empty, but always there), and two blank lines. The next line of the print job follows thereafter. The print page ends similarly: The last line of the print job is followed by two blank lines, the Footer line, and the bottom margin (0-10 lines).

Procedure

1-2-3 displays the current page-length setting. To use it, press [Return] or [ESC]. To change it, enter a new number between 20 and 100 (the existing one disappears automatically when you begin typing).

Results

- When printing, 1-2-3 computes the positions of page breaks, headers, and footers based on the Page-Length setting.
- The new page length remains in effect until you (1) End the 1-2-3 session, (2) Retrieve a worksheet, or (3) Issue a /Print Clear All or /Print Clear Format command. In the final case, the default printer configuration (page A-1) is reinstated.

Note

/Print Clear All also returns printing to As-Displayed.

Notes

1. At the beginning of a session, 1-2-3 reads the *default printer configuration* from the file 123.CNF. The /Print Options Page-Length command overrides the default setting stored in this file.
(See Appendix A, "Configuring 1-2-3". The Lotus-supplied configuration file is designed for an 8.5" × 11" page, printed at six lines per inch, with a 72-character print line.)
2. The /Print Options Other Unformatted command specifies an "infinite" page length, suspending the Page-Length setting. Issuing a /Print Options Other Formatted command reinstates the setting.

/Print Options Other As-Displayed	/PPOOA, /PFOOA
/Print Options Other Cell-Formulas	/PPOOC, /PFOOC

Specify or cancel the alternative printing format: one-cell-per-line report of cell entries (including formula texts).

Results

Cell-Formulas. The contents of the cells in the print range will be printed one cell per line. Each line contains exactly what appears on Line 1 of the control panel when the pointer is on the cell:

- Cell address.
- Numeric display format.
- "U" unprotected flag (if the cell is currently unprotected).
- Complete text of the cell's entry (in particular, texts of formulas, not their values).

Blank cells in the print range are ignored.

As-Displayed (default setting). Returns printing to normal: The Range is printed as it appears on the screen.

Note

/Print Clear All also returns printing to As-Displayed.

/Print Options Other Unformatted
/PPOOU,
/PFOOU
/Print Options Other Formatted
/PPOOF,
/PFOOF

Specify or cancel an “infinite” page-length setting.

Results

Unformatted. The next time you choose Go to print a range, 1-2-3 will suspend the Page-Length setting, adopting an “infinite” page length:

- Print output will include no page breaks.
- The header and footer (if any) will never be printed.
- If they have been specified, border rows will be printed once for each print range, at the beginning of the range.
- If the print range is too wide for the margin settings, the overflow columns will follow the initial columns immediately.

Formatted (default setting). The next time you choose Go to print a range, the Page-Length setting will be restored. Printing of headers and footers, and border-rows will revert to normal.

Notes

1. Use /Print Options Other Unformatted to prepare a print file for use with another program (e.g. a word processor).
2. /Print Clear All returns printing to Formatted.

/Print Clear
/PPC, /PFC

Cancel some or all print settings; restore default printer configuration.

Procedure

Choose All, Range, Borders, or Format. The main /Print menu returns.

Results

Range. Cancels the print range setting (/Print Range).

Borders. Cancels the print border settings—both row and column borders.



Format. Reinstates the default settings for all four margins, the page length, and the setup string. These are the settings read from the configuration file, 123.CNF, and specified with the /Worksheet Global Default Printer commands.

All. Clears the Range, Borders, and Format, all at once. In addition, printing is restored to Formatted (rather than Unformatted) and As-Displayed (rather than Cell-Formulas).

Note

This command is especially useful in keyboard macros, to clear any pre-existing print settings.

/Print Align

/PPA, /PFA

Reset the line number and page number counters to 1.

Before issuing this command, be sure that the paper in your printer is aligned to the top of a page. With continuous-feed paper, align the print head with the perforations.

Exception: If your printer automatically skips over perforations, align the paper to the point where the header line should appear.

Result

When you continue printing, 1-2-3 will include margins, page-breaks, headers, and footers in their proper locations.

Notes

1. 1-2-3 automatically assumes it is at the top of a print page just once—at the start of the 1-2-3 session. Use this command if you manually align the paper during a session.
2. 1-2-3 loses track of the page position if you use the printer's "Form Feed" control when the printer isn't already at the top of a page. Instead, use the /Print Page command to advance the page.

16. Graph Commands

1-2-3's /Graph command is a powerful and flexible tool for creating visual representations of data. 1-2-3 can turn rows or columns of numbers into several kinds of graphs (Figure 16-1).

Here is a partial list of the features that 1-2-3 puts at your fingertips in the /Graph command menus or with the [f10/Graph] (a customized graph awaits your creation!). (Remember that [f10/Graph] represents the keystrokes [Shift]-[f2].)

Color Graphing. 1-2-3 draws graphs in black on your computer's video display. If you have a plotter with color capability, you will be able to execute your graphs in up to seven colors using PrintGraph program.

Multiple Data Sets. You can represent up to six sets of data in the same graph, either with contrasting cross-hatching, or with symbols.

Graph Labeling. 1-2-3 includes a comprehensive facility for adding labels, titles, and legends to graphs.

Automatic Scaling. 1-2-3 can automatically choose optimal numeric scales so that the graph "fits" the data. This prevents lines and bars from being cramped into a corner of the graph or disappearing off the graph completely. You can also set scales manually to produce particular visual effects. And you can choose any of 1-2-3's numeric display formats for the scale values (fixed, currency, scientific, etc.).

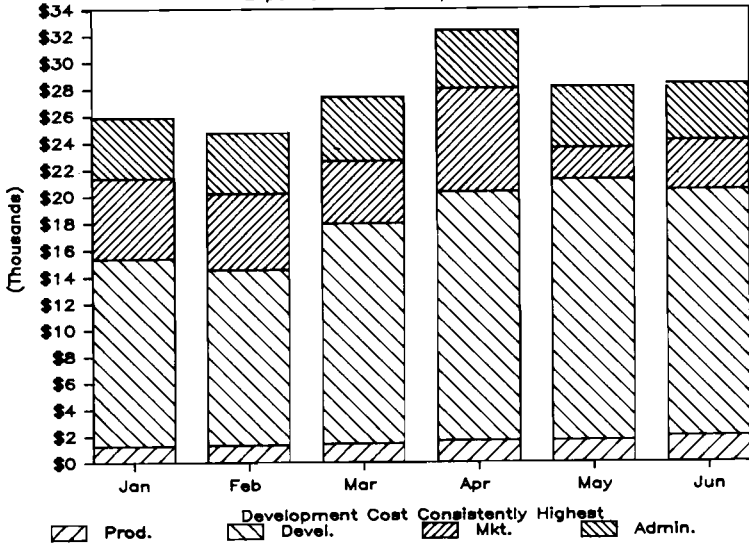
"What-if" Graphing. Changing some of the data that goes into a graph does not invalidate your graph settings. In Ready mode, you can redraw the most recent graph simply by pressing [f10/Graph].

Storage of Graph Settings. You instruct 1-2-3 how to draw a graph using /Graph commands to enter specifications. During the session, 1-2-3 automatically remembers the graph settings you enter. And it saves the settings in the worksheet files you create with /File Save and /File Xtract.

In addition, you can save graph settings under **Graph Names**. A single command retrieves the settings and redraws the graph. Using named graphs allows you to switch instantly between graphs, perhaps to view related sets of data, or to try different ways of representing the same data.

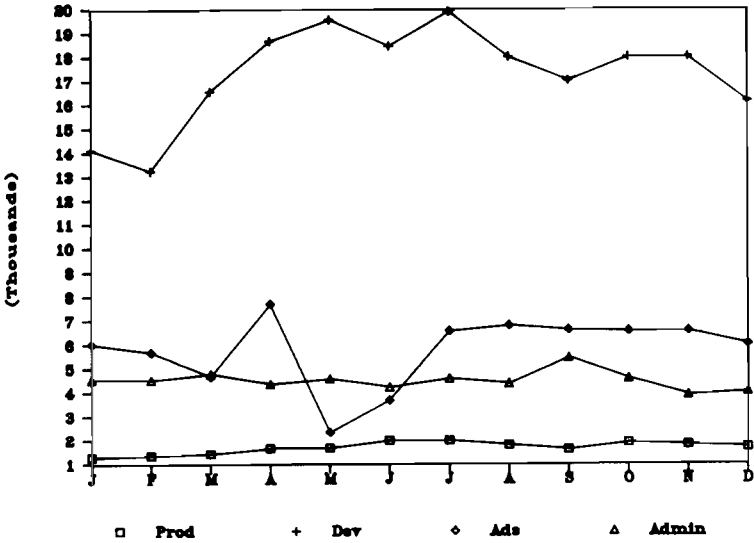
Homegrown Corporation

Expenses of Main Departments, 1982



Costs of Four Departments

The Year of 1981

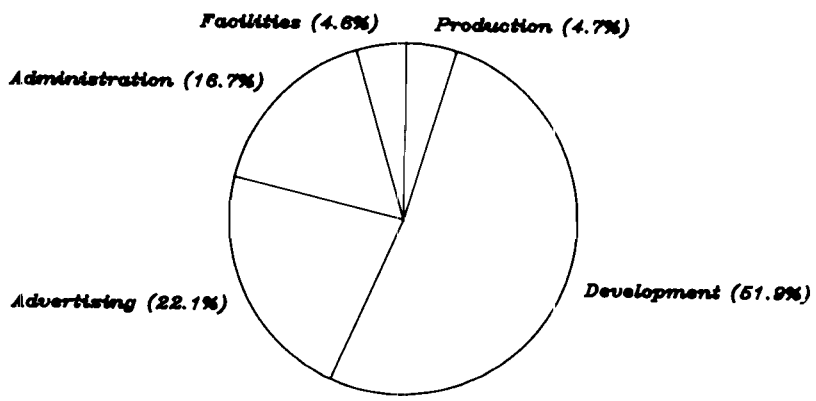


Graph

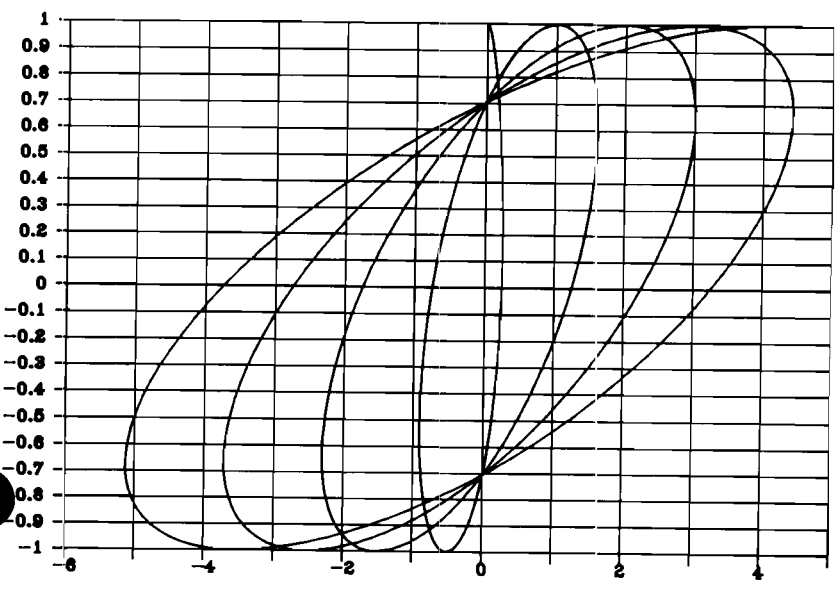
Figure 16-1. 1-2-3 Graph Types

Acme Hitech, Inc.

Departmental Corporate Costs, 1982



Spiraling Form



Graph

Figure 16-1. 1-2-3 Graph Types (continued)

Graph Printing. You can store any of the images 1-2-3 creates in a **graph file** (“picture” file). You can preview and print the graphs you’ve created using the PrintGraph program and an appropriate printer or plotter. PrintGraph introduces a new level of flexibility: high-resolution output, enlargements, reductions, rotations, additional or different colors, and more.

On your computer, [Print] allows you to print 1-2-3 graphics display or graphics memory on the HP ThinkJet and 82905B printers. Graphics memory of a 1-2-3 worksheet includes any previously viewed graph of that worksheet.

With such a large arsenal of features available, making full use of the /Graph command can be quite involved. But making a straightforward graph is easy. We’ll start with a simple situation to demonstrate just how easy it is to draw a graph. Then, step-by-step, we’ll show how the various /Graph command features are used to embellish the graph. Let’s begin with an overview of the graphing process.

How to Define a Graph

To define a graph, you issue /Graph commands that specify the various aspects of the picture to be drawn. Certain information is essential:

1. The type of graph you want to draw: Line, Bar, Stacked-Bar, Pie, or XY. (We’ll explain these graph types below.)
2. The cell range(s) in which the data values to be graphed are stored. Note that the graph definition involves the *location*, not the current contents, of those cells. For instance:

B10..B25	Part of a column, indicated either by pointing or by typing cell addresses.
RECEIPTS	Named range.

All other specification are optional: labels, manual selection of scales, grid lines, etc.

To aid the process of entering several settings at once, 1-2-3 remains in the /Graph menu (sometimes in a submenu) after you issue a /Graph command. To return to Ready mode, select Quit at this menu.

At any point during entry of graph settings, you can select /Graph View. If 1-2-3 has enough information, it draws the graph—1-2-3 first erases the worksheet from the screen and then draws the graph. To return to using the /Graph command menu after viewing a graph, press any key. 1-2-3 erases the graph and restores the worksheet.

The [f10/Graph] Key

Pressing [f10/Graph] performs a Graph View when you’re in Ready Mode. That is, pressing [f10/Graph] draws a graph according to the most recently entered settings. Recall that the settings include range specifications, *not* the particular data stored in the cells. Thus, you can use [f10/Graph] to do *what if* graphing analyses:

1. Define and draw a graph to represent certain ranges of values.
2. Modify entries within the ranges.
3. Recalculate.
4. Press [F10/Graph] to view a graph that incorporates the modified values.

Starting Simple

What is the quickest way to draw a graph—no frills, no options, just a straightforward graph? Consider the worksheet shown in Figure 16-2.

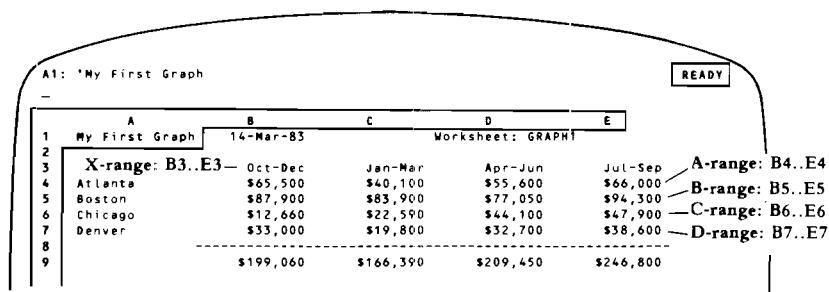


Figure 16-2. A Worksheet of Values to be Graphed

Here's how to graph the sales performance of the Atlanta office during the four sales periods:

1. Select the /Graph command. The /Graph main menu appears:

Type X A B C D E F Reset View Save Options Name Quit

2. Select Type from this menu. 1-2-3 offers a choice of five graph types—select Bar.
3. The /Graph main menu returns. Choose to specify an A range of data values.
4. Indicate the cell range that contains the four sales figures to be graphed: B4..E4.
5. Once again, the /Graph main menu reappears. Select View to have 1-2-3 draw the graph (Figure 16-3).

Multiple Sets of Data

Representing several sets of data on the same graph is easy. 1-2-3 can show up to six ranges at once—in addition to an A range of data values, you can specify B, C, D, E, and F ranges. Figure 16-4 shows how the graph would look with all four cities represented.

unless you override it, 1-2-3 automatically determines optional numeric scale

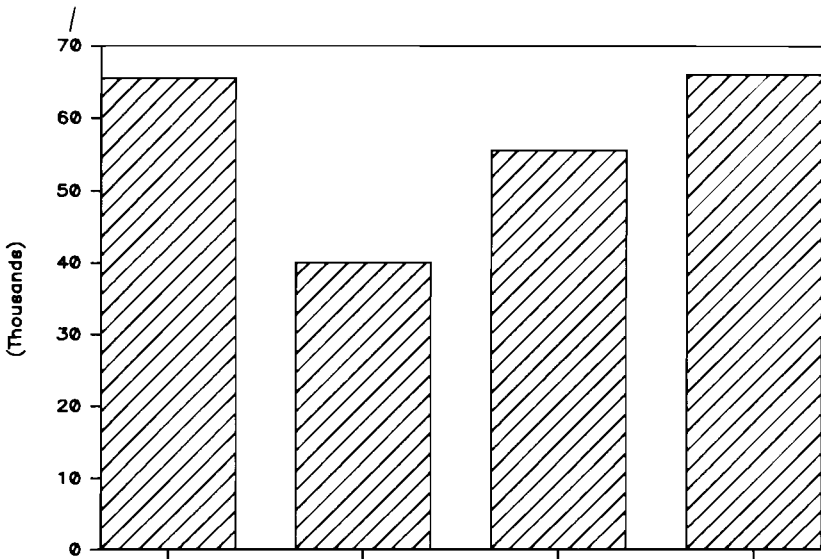


Figure 16-3. A Bar Graph—One Data Range

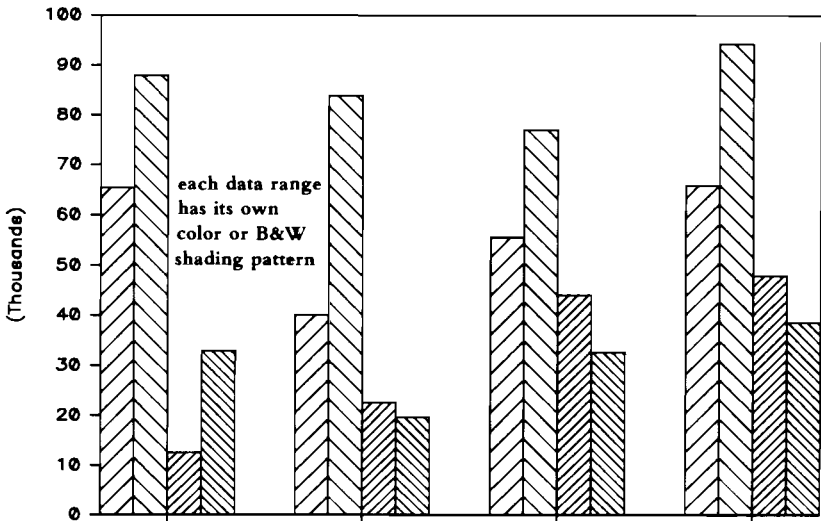


Figure 16-4. A Bar Graph—Four Data Ranges

B & W and Color

1-2-3 for the HP Portable PLUS draws graphs in black and white, using a different cross-hatching pattern for each of the data ranges. Therefore, using the /Graph Options Color command will produce a solid, not multicolored tint block. You *can* use colors when *printing* the graph if you have a color printer or plotter (Chapter 20, "Printing 1-2-3 Graphs").

Switching Types of Graph

The Stacked-Bar type of graph arranges the bars for the A—F data ranges on top of each other instead of side-by-side. Changing graph types is easy: (1) Select Type at the /Graph main menu, then Stacked-Bar; (2) Select View again (Figure 16-5).

1-2-3 automatically rescales Y-axis

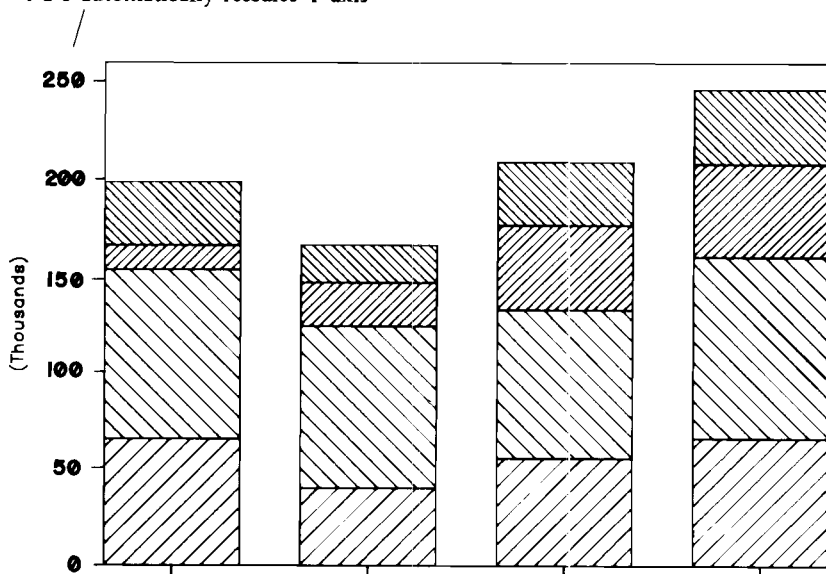


Figure 16-5. Switching the Graph Type—Stacked-Bar

In our example, this type of graph shows implicitly the total sales figure for each sales period.

Adding Labels

1-2-3 can add labels to graphs in several different ways. In bar graphs, an **X** range of entries in the worksheet serves as labels. 1-2-3 places these entries along the horizontal axis, so that each entry labels one bar (or set of bars if you have multiple data ranges).

In our example, we could define the **X** data range to be B3..E3, then View the graph again (Figure 16-6).

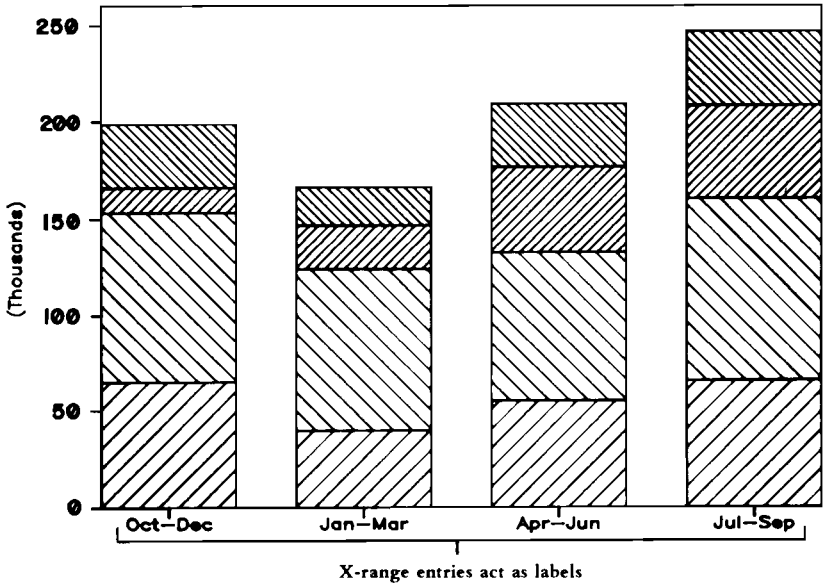


Figure 16-6. Adding X-axis Labels

Titles. 1-2-3 can center a two-line graph title at the top of the screen. It can also place a label on both the horizontal and vertical axes. You can enter and revise these titles, each up to 39 characters long, with the /Graph Options Titles command. And you can choose to type the title text directly at the command prompt, or to indicate a cell address in the worksheet where the title text is stored (Figure 16-7).

Legends. With several ranges on the graph, it would be handy to have legends to remind us which crosshatching pattern represents which city. The /Graph Options Legends command handles this task. Legends, like titles, can be typed directly at the command prompt or stored in a cell (Figure 16-8).

Due to display limitations, it is suggested that you keep legends as short as possible.

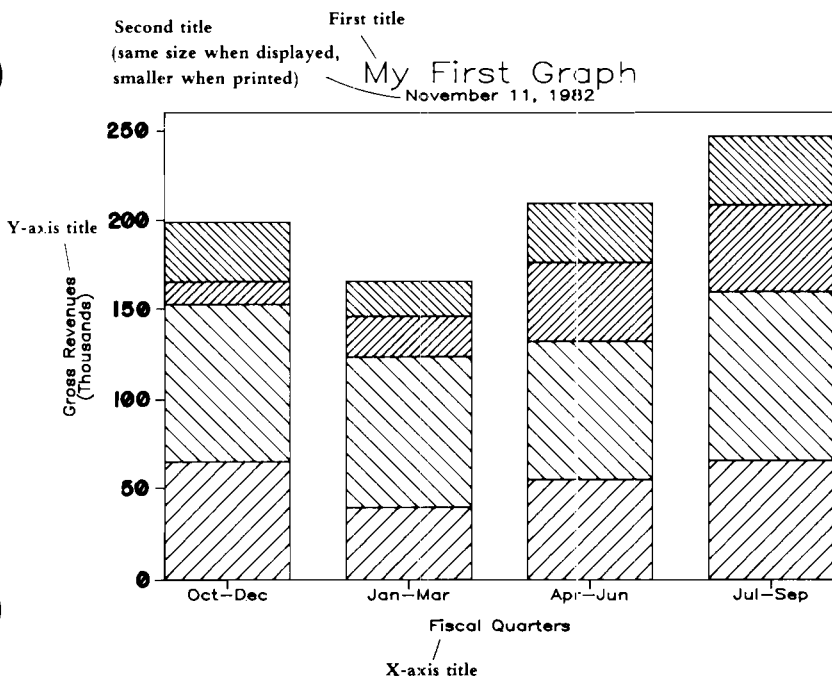


Figure 16-7. Adding Graph Titles

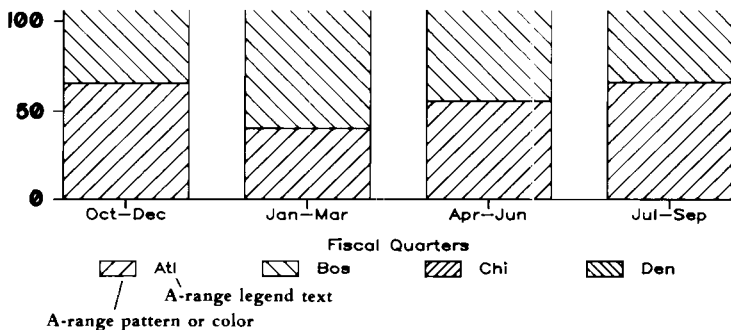


Figure 16-8. Adding Legends

Printing Graphs

Now that we've created a feature-loaded graph, how about getting a printout? If you have either an HP ThinkJet printer or an HP 82905B impact printer, you can press **[Print]** (**[Shift]-[Enter]**) to print an exact image of your current graph.

If you do not have one of these printers and want to take advantage of the many features of the PrintGraph program, use the `/Graph Save` command to store the currently displayed image in a *graph file*. After you've ended the 1-2-3 session, you can use the PrintGraph program to produce a printout of one or more graphs. This is an extra step, but PrintGraph more than compensates by extending the graphing capability in many ways. Your PrintGraph program offers you:

- Image resolution greater than that available on graphics video monitors.
- A variety of type fonts.
- Image enlargement, reduction, and rotation.
- Up to seven colors depending on your printer or plotter.
- Batch graph printing, for unattended operation.

Chapter 20 details these capabilities for you and explains how to use them to your best advantage.

Though you could add even more features to your earlier bar graph, it would be useful to explore other graphs 1-2-3 can put at your fingertips. In addition to *Bar* and *Stacked-Bar* graphs, 1-2-3 can draw *Pie Charts* and *Line* and *XY* graphs.

Pie Charts

The graph we drew above (Figure 16-3) represents a single range of numeric values as a set of vertical bars. *Pie charts* are an alternative way of picturing a single set of data. Compare the graph in Figure 16-9 with the one in Figure 16-3.

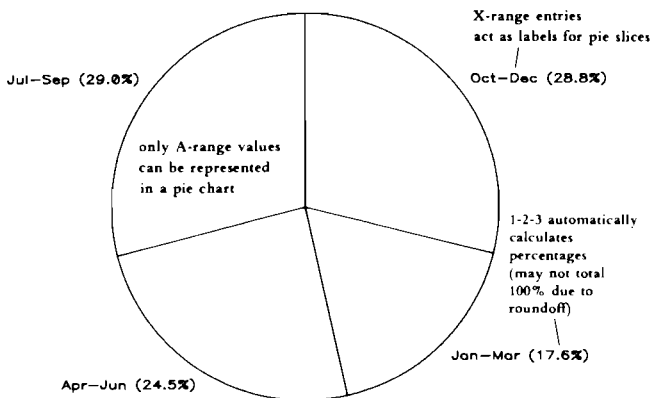


Figure 16-9. A Pie Chart

Like bar graphs, pie charts can use a range of **X** values as labels. With a pie chart, there is no horizontal axis—1-2-3 places these labels next to the corresponding pie slices.

Unlike bar graphs, a pie chart can represent only a single value range. There's no way to draw two pies at once, or to have “two-flavored” pie slices.

Line Graphs

Another way to picture our sales data is with a *Line graph*. Instead of representing each value as the height of a bar, 1-2-3 represents it with a single symbol (Figure 16-10).

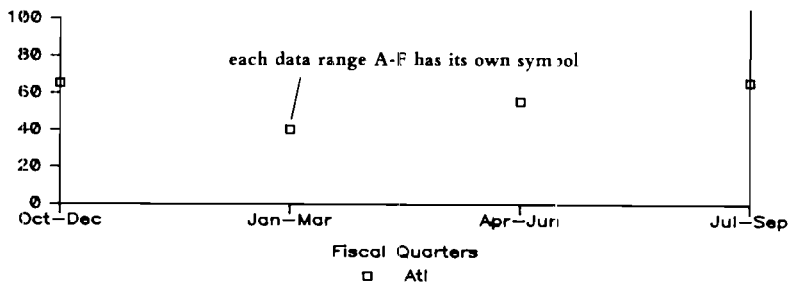


Figure 16-10. A Line Graph—Formatted with Symbols Only

We admit that this doesn't look especially like a line graph. Displaying “symbols-only” is one of four options with a line graph. Figure 16-11 illustrates the other three.

Each data range has its own graphing symbol, just as it has its own shading pattern in a bar graph. In the final case, no symbols appear at all. This final setting is normally only used in conjunction with a range of **data-labels**, specified with /Graph Options Data-Labels. Using data-labels resembles using an **X** range to provide labels. But instead of appearing along the horizontal axis, data-labels appear on the graph where the graphing symbols would (or do) appear. *Data-labels* may be used as an alternative to lines and symbols, or in conjunction with them.

Like bar graphs, line graphs allow you to:

- Display up to six data ranges at once.
- Define an **X** range to supply labels along the horizontal axis.



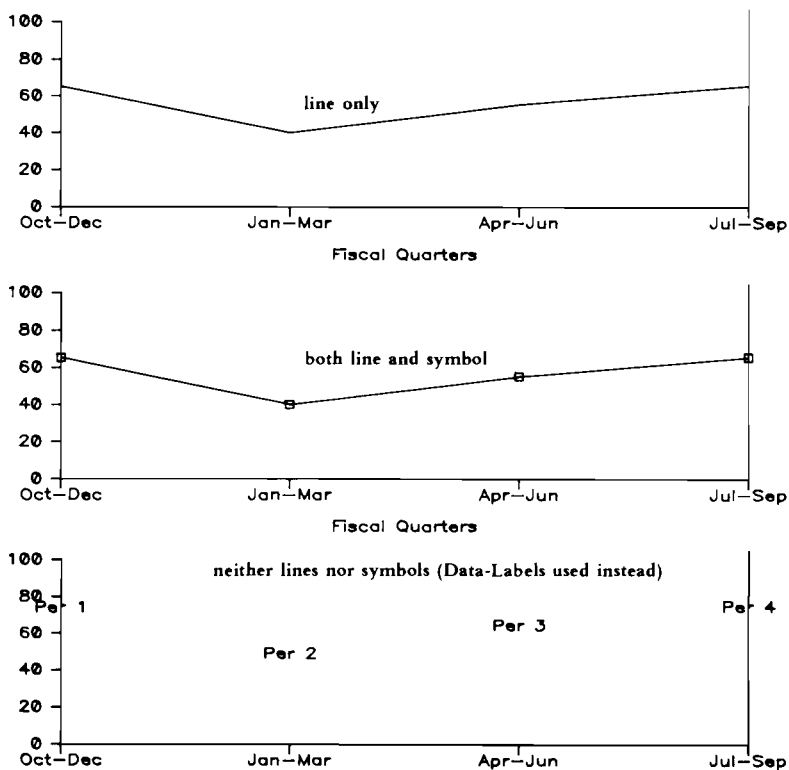


Figure 16-11. Additional Format Options

XY Graphs

1-2-3 can draw one more type of graph, called **XY**. We've saved it for last because it is different from all the other types in a fundamental way.

Bar graphs and line graphs represent a set of numeric values as vertical distances. There is only one numeric scale in these graphs, along the vertical axis. The horizontal axis does not indicate any numeric quantity. In fact, horizontal positioning may be completely irrelevant. For instance, the two graphs in Figure 16-12 convey exactly the same information.

In pie charts, this "one-dimensional" quality is even more apparent. Each quantity in the range is represented as a distance around the outside of a circle.

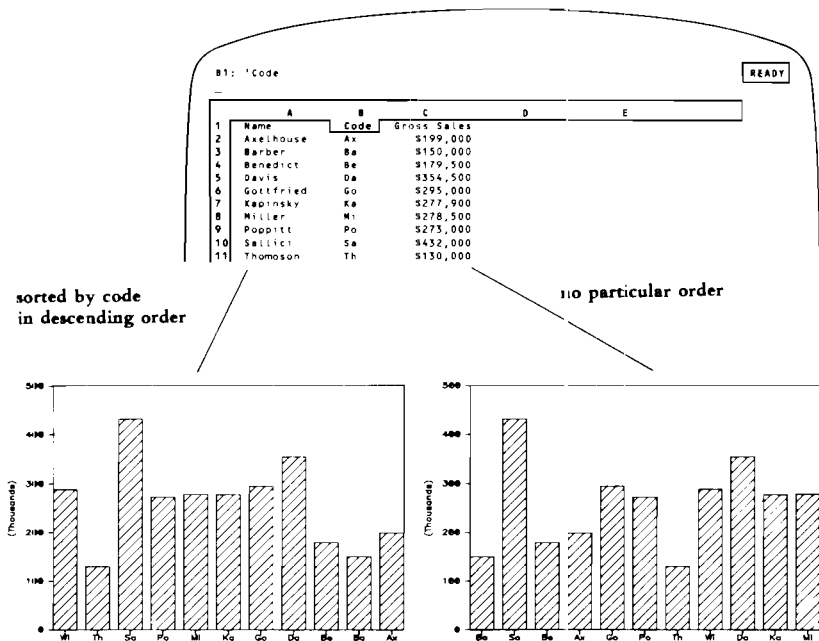


Figure 16-12. Two Bar Graphs of the Same Data

XY graphs, on the other hand, are “two dimensional”. The graph does not represent a group of single values as vertical distances. Instead, it represents *pairs* of values as the combination of a horizontal (X) distance *and* a vertical (Y) distance. The horizontal axis is no longer for-labels-only. Now, it’s a numeric scale, just like the vertical axis.

Example: Suppose we added each salesperson’s salary to the worksheet pictured above. We can draw an XY graph showing each salesperson’s salary paired with his/her billings. As we did before, we define the set of sales figures to be the **A** range. But this time, the **X** range is also a set of numbers—the salaries—not just a set of labels. 1-2-3 pairs each **X** value with the corresponding **A** value, and draws a symbol for each pair (Figure 16-13).

Named Graphs

If you save a worksheet with /File Save or /File Xtract, 1-2-3 stores the graph settings, too. At a later time, redrawing the graph requires just a /File Retrieve and pressing [F10/Graph].

But what if you want to define several different graphs using a single worksheet’s data? For instance, you might want to define a series of line graphs, each of which plots one sales office’s performance against total sales.

A15: READY

	A	B	C	D	E
1	Name	Code	Gross Sales	Salary	
2	Barber	Ba	\$150,000	\$20,000	
3	Sallieci	Sa	\$432,000	\$21,000	
4	Benedict	Be	\$179,500	\$23,400	
5	Axelhouse	Ax	\$199,000	\$24,500	
6	Gottfried	Go	\$295,000	\$25,750	
7	Poppitt	Po	\$273,000	\$28,000	
8	Thompson	Th	\$130,000	\$28,400	
9	Wilson	Wi	\$288,700	\$28,930	
10	Davis	Da	\$354,500	\$31,000	
11	Kaplinsky	Ka	\$277,000	\$34,000	

A-range Data-Labels A-range X-range

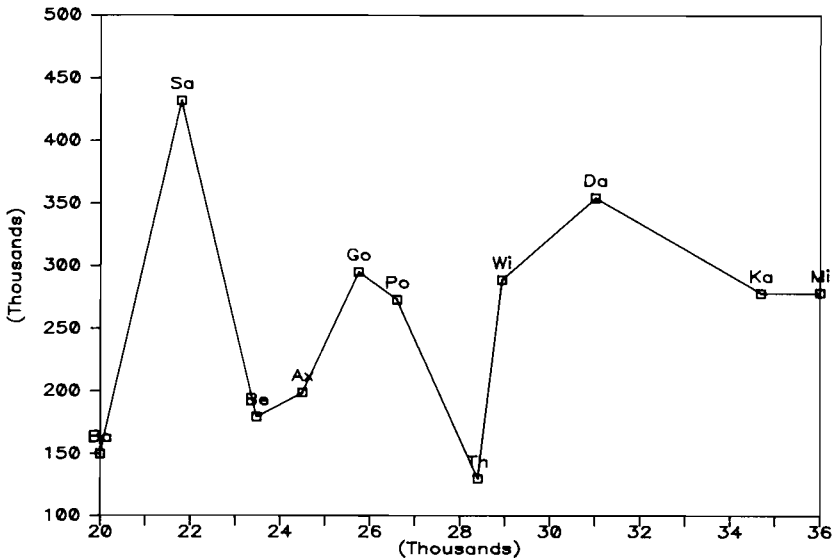


Figure 16-13. An XY Graph

Graph

We'd like to be able to switch back and forth among these graphs easily. But 1-2-3 can maintain only one group of current graph settings. The solution is **named graphs**.

The /Graph Name Create command assigns a name up to 15 characters to the current group of graph settings. The idea is to assign different names to different groups of settings. Issuing a /Graph Name Use command reinstates a named group of settings and automatically redraws the graph. You can modify the settings, then save them again under the same graph name.

1-2-3 records all graph names in the worksheet files created with /File Save and /File Xtract.

Making 1-2-3 Forget

/Graph Name, /Graph Save, and /File Save all represent 1-2-3's ability to remember graph settings. But sometimes you'll want to wipe the slate clean—have 1-2-3 forget graph settings. The /Graph Reset Graph command cancels all graph settings currently in effect. It *does not*, however, affect the settings stored under **Graph Name**.

You can also cancel data range settings individually. However, when you cancel a B-range setting, for instance, 1-2-3 does *not* automatically cancel the related legend and format settings. Instead, it holds them in reserve until you've redefined a **B** range.

When you reset a range, a related Data-Labels setting *is* cancelled.

/Graph Name Delete and /Graph Name Reset cancel graph name specifications, one at a time or all at once.

The /Worksheet Erase command cancels all graph settings, including graph names.

/Graph Type

/GT

Select the type of graph to be drawn.

Procedure

Select a graph type: Line, Bar, Stacked-Bar, Pie, XY. The graph main menu returns.

Result

When you select View or when you press [f10/Graph] in Ready Mode, 1-2-3 will draw the selected type of graph.

Notes

1. Don't use a Stacked-Bar or Pie graph if the data includes both positive and negative values. The display is potentially confusing.
2. To change an existing graph into another type, just select the new type and View it again.
3. After returning to Ready Mode, you can enter new data into the specified graph ranges and then draw a graph updated with the new information. Just press the [f10/Graph] key.
4. You cannot overlay two types of graph, e.g. Line over Bar.
5. 1-2-3 automatically labels each slice of a pie chart with the percentage it represents of the entire pie (e.g. 14.6%). Since these numbers are rounded off, the total may not be 100% exactly.

/Graph X

/GX

Define an X range of numeric values (XY graph) or optional labels (all other types).

Procedure

Specify a range. If the range is more than one column wide, 1-2-3 considers the values to be one long sequence, in column-by-column order.

1-2-3 "remembers" (page 7-14) the most recently used X range, if any. When you issue the command, 1-2-3 offers to reuse this range: It highlights the range and shows the addresses of its upper left and lower right corner cells in the control panel.

Press [Return] alone to reuse the same range for graphing. You can press [Backspace] to cancel this remembered range and return the pointer to the current cell. Otherwise, revise the range specification or enter a new one.

Line, Bar, and Stacked-Bar graphs: The range may contain any entries: labels, numbers, formulas, and empty cells. The entries act as horizontal axis labels—1-2-3 “pastes” the entries, evenly spaced, along the X axis. Each entry is centered under the set of bars or data points for the corresponding set of A-F range values.

You can prevent X-axis labels from overprinting each other by specifying a *skip factor* (/Graph Options Scale Skip): Only selected entries from the X range are placed along the horizontal axis.

Pie charts: The range may contain any entries: labels, numbers, formulas, and empty cells. The entries are “pasted” outside the circle, as labels for the pie-slices. The first X-range entry labels the slice representing the first A-range value, etc.

XY graphs: Data points are plotted in the XY plane (Cartesian coordinates). Each A-F range value is paired with the corresponding X-range value.

/Graph A B C D E F

/GA.../GF

Define up to six ranges of values to be graphed.

Procedure

Specify a range. If the range is more than one column wide, 1-2-3 considers the values to be one long sequence, in column-by-column order.

1-2-3 “remembers” (page 7-14) each of the most recently used ranges, if any.

When you issue the command, 1-2-3 offers to reuse this range: It highlights the range and shows the addresses of its upper left and lower right corner cells in the control panel.

Press [Return] alone to reuse the same range for graphing. You can press [Backspace] to cancel this remembered range and return the pointer to the current cell. Otherwise, revise the range specification or enter a new one.

Results

Pie charts: 1-2-3 will create a “slice” for each value in the A range. For graphing purposes only, negative values are considered to be positive. Empty cells and label cells have zero values, producing slices with no width. The B-F ranges are ignored.

Bar and Stacked-Bar graphs: Each range’s values are represented by a series of bars, which are spaced evenly from left to right. Each range’s bars have black and green crosshatching patterns.

Line graphs: Each range’s values are represented by a series of points, which are spaced evenly from left to right.

XY graphs: Each range’s values are paired with the corresponding X-range values, then plotted on the XY plane.

In XY and Line graphs, each range has its own shape of point (square, triangle, etc.). You can specify whether or not the points are to be connected with /Graph Options Format.

Notes

1. At least one graph range is required for all graphs.
2. To cancel one or all of the graph range settings, use /Graph Reset.
3. After returning to Ready Mode, you can revise the entries in the specified graph ranges and then draw a graph updated with the new information. Just press the [F10/Graph] key.

/Graph Reset

/GR

Cancel individual range settings or all graph settings.

Procedure

- 1a. Choose Graph to cancel all graph settings. The Graph main menu returns.
or
- 1b. Choose one of the graph range letters (X, A, B, C, D, E, F). You remain in the /Graph Reset menu, making it easy to cancel another individual range.

Results

Graph: All current graph settings are cancelled. Graph settings that you've stored as *named graphs* are unaffected.

X, A-F: The particular graph range specification is cancelled. When you next View a graph, this range will not be represented. The Data-Labels range (page 16-21) associated with the particular range is also cancelled. But associated Legend and Format settings (pages 16-19, 16-20) are *not* cancelled: They will be reused if you specify the graph range anew.

Notes

1. Reset the X range to keep 1-2-3 from using its entries as labels in Bar, Stacked-Bar, Line, and Pie graphs.
2. In many situations, you'll want to define several graphs for a single worksheet. With each graph use /Graph Name to store the current graph settings under a name. Then, reset the graph and/or enter new specifications.

/Graph View

/GB

Display a graph using the current graph settings.

The worksheet disappears and the graph appears. To restore the worksheet to the screen, press any key. The key you press has no other effect.

Note

When you are altering graph settings, the easiest way to redraw a graph is with View. When you are revising cell entries, the easiest way to redraw a graph is by pressing [F10/Graph] in Ready Mode. (Since graph ranges are defined by cell *locations* rather than cell *contents*, you can revise entries and immediately redraw the graph. The new data is automatically incorporated.)

/Graph Save

/GS

Store the image of the currently-defined graph in a graph (picture) file (extension .PIC).

The PrintGraph program uses this file to produce a printed version of the graph.

Procedure

1. Specify the filename under which the graph image is to be stored: Point to its name or type its name.

If you don't use a disk prefix ("C:NEW__GRPH" means current directory on disk C, file NEW__GRPH), 1-2-3 creates a graph file in the *current directory* (/File Directory, /Worksheet Global Default Directory).

2. If a file with the specified name already exists, choose to Replace the existing file's contents with the new image, or to Cancel the command.



Choosing to Replace immediately erases the file's former contents. There is no way to recover this information. If you are updating a file, this may be exactly what you wish to do. Otherwise, Cancel the command.

Result

The graph image is stored in the specified file.

This command does not save graph settings. To store settings, use the /File Save and /Graph Name Create commands.

/Graph Options Legend

/GOL

Define legends that explain the colors, crosshatching, or symbols used in a graph.

Procedure

1. Select a graph range: A, B, C, D, E, or F. 1-2-3 displays the most recently entered legend for that range, if any, and switches to Edit Mode.
2. Reconfirm the legend by pressing [Return] alone, or revise/replace the legend.

You can enter a legend up to 19 characters long directly. Alternatively, you can instruct 1-2-3 to use a cell's contents as the legend:

`\cell-address` or `\range-name`

In the latter case, 1-2-3 uses the contents of the range's upper left corner cell as the legend. Be careful if you use a cell address: 1-2-3 will not adjust the address if the cell is subsequently relocated by /Move, /Worksheet Insert, or /Worksheet Delete.

3. The /Graph Options menu returns.

Result

The next time 1-2-3 draws the graph, the legend text will appear at the bottom of the screen, next to an indicator.

Bar and Stacked-Bar graph: The indicator shows the crosshatching pattern used for the range's bars.

Line and XY graphs: The indicator shows the symbol used to plot the range's data points.

Pie charts: Legends are ignored, since there is only one graph range.

Notes

1. Due to display limitations, keep legends as short as possible.
2. Be careful when specifying lengthy titles and legends. In some cases, the screen shows more characters than the printer can print. Thus, you may lose characters on the hardcopy printed image.
3. If you reset a graph range (page 16-18), 1-2-3 remembers the associated legend specification. It will "reactivate" the legend if you define this range anew.

/Graph Options Format

/GOF

Specify the way in which 1-2-3 draws and connects data points in Line and XY graphs.

Procedure

- 1a. Choose a particular range: A, B, C, D, E, F
or
- 1b. Choose Graph to set the format for all ranges at once (you can subsequently override this "standard" format for individual ranges)
or
- 1c. Choose Quit to return to the /Graph Options menu.

2. Select a format option:

Line. For each range, the data-point locations will be connected with straight lines. No symbols will be plotted at the data points.

Symbols. For each range, a distinctive symbol (square, triangle etc.) will be plotted at each data point.

Both. Data points will be represented by symbols connected with lines.

Neither. Neither lines nor symbols will be drawn. Use Data-Labels (see below) to indicate the data-point locations.

3. The Format submenu returns, making it easy to assign additional formats.

Result

The next time 1-2-3 draws a graph, the range(s) you specified will be assigned the newly-chosen formats. 1-2-3 uses these symbols in Line and XY graphs:

A: B: + C: D: E: X F:

Notes

1. If you choose the Neither format, you *must* specify Data-Labels in order to make the data points visible.



2. If you reset a graph range (page 16-18), 1-2-3 remembers the associated format specification. It will “reactivate” the format if you define this range anew.

/Graph Options Data-Labels

/GOD

Specify a range whose entries will be pasted onto the graph at the data-point locations.

Procedure

1. Choose the graph range to be labeled: A, B, C, D, E, F; or choose Quit to return to the /Graph Options menu.

2. Specify the cell range that will provide the data-labels.

1-2-3 “remembers” (page 7-14) the most recently used data-labels ranges, if any. When you choose a range letter (A-F), 1-2-3 highlights the data-labels range currently assigned to it, showing the addresses of its upper left and lower right corner cells in the control panel.

Press [Return] alone to reuse the same data-labels range. You can press [Backspace] to cancel this remembered range and return the pointer to the current cell. Otherwise, revise the range specification or enter a new one.

3. Choose a data-label alignment: Centered, Left, Above, Right, Below. (For instance, *Above* means that the data-label will be “pasted” on the graph just above the corresponding data point.)

- The Data-Labels submenu returns, making it easy to assign additional data-labels.

Results

- The next time 1-2-3 draws a graph, the entries in the data-labels range will be placed on the graph, exactly as they appear in the worksheet. Each data-label will be placed near (above, below, centered, etc.) the data point for the corresponding value of the graph range (A-F).
- Bar and Stacked-Bar graphs:* The alignment specification is ignored: 1-2-3 always centers data-labels above positive bars and below negative bars.
- Pie charts:* Data-label ranges are ignored.

Note

If you reset a graph range, 1-2-3 also cancels the corresponding data-labels range.

/Graph Options Titles

/GOT

Specify a title for the entire graph and/or for the horizontal and vertical axes.

Procedure

- Choose a type of title:

First. Appears centered at the top of the graph.

Second. Appears centered just below the *First* title.

X-Axis. Appears centered below the horizontal axis.

Y-Axis. Appears in “sideways” type to the left of the vertical axis.

When you make this choice, 1-2-3 displays the most recently entered title, if any, and switches to Edit Mode.

- Reconfirm the title by pressing [Return] alone, or revise/replace the title.

You can enter a title up to 39 characters long directly. Alternatively, you can instruct 1-2-3 to use a cell's contents as the title:

`\cell-address` or `\range-name`

In the latter case, 1-2-3 uses the contents of the range's upper left corner cell as the title. Be careful if you use a cell address: 1-2-3 will not adjust the address if cell is subsequently relocated by /Move, /Worksheet Insert, or /Worksheet Delete.

- 1-2-3 returns to the /Graph Options menu. To specify another title, choose Titles again.

Result

The next time 1-2-3 draws a graph, it will include the title(s) you've specified.

Notes

1. When you print a graph using the PrintGraph program (page 20-1), the First title always appears quite a bit larger than the Second title. You can optionally specify different type styles for the two titles.
2. First and Second titles are independent of the names you use with /Graph Name and /Graph Save.
3. Be careful when specifying lengthy titles and legends. In some cases, the screen shows more characters than the printer can print. Thus, you may lose characters from the printed image.

/Graph Options Grid

/GOG

Specify inclusion or exclusion of a grid-line overlay.

Procedure

1. Choose one of the following options:

Horizontal. Starting at each Y-axis scale number, 1-2-3 will draw a horizontal line across the entire graph.

Vertical. At each “tick mark” along the X-axis scale, 1-2-3 will draw a vertical line from top to bottom.

Both. Both horizontal and vertical grid lines will be drawn.

Clear. Neither horizontal nor vertical grid lines will be drawn.

2. The /Graph Options menu returns.

Result

Non-Pie graphs: The new grid-line specifications will be reflected the next time 1-2-3 draws a graph.

Pie charts: This setting is ignored.

/Graph Options Scale

/GOS

Determine the way in which numeric X-axis and Y-axis scales will be constructed and displayed.

Procedure

1. Select Y-axis, X-axis, or Skip. (X-axis numeric scaling applies only to XY graphs. The Skip factor applies only to Bar, Stacked-Bar, and Line graphs.)

If you select Skip, enter a skip factor.

The next time 1-2-3 draws a graph, it will use only some of the X-range entries as labels for the horizontal-axis “tick marks”. Example: If you enter a skip factor of 10, 1-2-3 will use the 1st, 11th, 21st, . . . X-range values only.

If you select *Y-axis* or *X-axis*, the *Scale* menu appears:

Automatic Manual Lower Upper Format Quit

This is a “sticky” menu: 1-2-3 returns here until you choose Quit. This allows you to specify several scale settings for the axis.

Automatic (default setting). Each time it draws a graph, 1-2-3 will determine optimal lower and upper scale values for the *Y-axis* and, if appropriate, for the *X-axis*. These values will make the graph fill the screen to the greatest possible extent.

Manual. You specify the lower and upper scale values. After you choose *Manual*:

1. Choose *Lower* and enter a number to indicate the smallest value to appear on the *Y-axis* scale.
2. Choose *Upper* and indicate the largest scale value.

(1-2-3 remembers the *Lower* and *Upper* settings and offers to reuse them when you reissue this command. You need not reenter a setting if you don’t wish to change it. But you *must* enter both settings the first time you specify manual scaling.)

When 1-2-3 draws a graph with scales set manually, it may round off your lower and upper settings a bit. It is possible that some data points may “fall off” the graph. 1-2-3 does *not* inform you if this occurs.

Bar and Stacked-Bar graphs: When it draws a graph, 1-2-3 ignores a positive lower limit or a negative upper limit for the *Y-axis* scales. This ensures that the *Y-axis* scale includes zero.

Format. Specify a numeric display format for the scale numbers: *Fixed*, *Scientific*, *Currency*, *,* (comma), *General*, *+ / -*, *Percent*, *Date* (*D1*, *D2*, or *D3*), or *Text*.

The next time 1-2-3 draws a graph, the scale numbers for the chosen axis will be displayed in the chosen format.

Notes

1. Use manual scaling to “zero in” on an area of interest or to enforce uniform scaling in a set of similar graphs.
2. *X-axis* scale settings are ignored in all types of graph except *XY*. In non-*XY* graphs, the horizontal scale has no numeric meaning.
3. All scale settings are ignored for *Pie* graphs.
4. Setting a graph scale format does not affect the way the graphed values appear in the worksheet.
5. With manual scaling, if a data range includes values that vary widely (e.g. 10, 20, 30, 1000000, 2000000), bars representing the large values may not be displayed at all.

/Graph Options Color
/GOC
/Graph Options B&W
/GOB

Using the `/Graph Options Color` command will have no effect on the way 1-2-3 draws a graph. You can use colors when printing the graph if you have a color printer or plotter (Chapter 20, "Printing 1-2-3 Graphs").

Bars appear with contrasting crosshatch patterns. All titles, scale numbers, axes, grid lines, and symbols appear in black.

Range	Crosshatching
A	
B	
C	
D	
E	
F	

Notes.

1. With the PrintGraph program and a color printer, you can print each graph range in its own color, even if you were using B&W when you saved the graph (`/Graph Save`).
2. On your display screen, selecting color produces solid black for all ranges.

/Graph Name Create
/GNC

Store the current graph settings under a graph name.

Procedure

Enter a graph name (up to 15 characters): Point to an existing name in the menu, or type a new or existing name. Uppercase and lowercase letters are equivalent.

Results

- 1-2-3 stores the current graph settings under the specified name. When you save the worksheet (/File Save), all graph names are stored, as well. To reinstate graph settings stored under a name, issue the /Graph Name Use command.



If you use an existing name, 1-2-3 immediately replaces the old definition with the current graph settings. There is no confirmation step.

Notes

1. Use this command to create several graphs in a single worksheet. /Graph Name Use allows you to switch quickly among several named graphs.
2. /File Retrieve retrieves graph name definitions from a worksheet file. /File Combine does not.
3. /Graph Reset Graph does not cancel graph names. /Worksheet Erase does.
4. This command does not save a graph image for printing. Use /Graph Save for this purpose.

/Graph Name Use

/GNU

Reinstate the graph settings stored under a graph name and draw the graph.

Procedure

Enter a graph name (up to 15 characters): Point to a name in the menu, or type an existing name. Uppercase and lowercase letters are equivalent.

Result

1-2-3 resets (cancels) all current graph settings, restores the settings stored under the specified graph name, and performs a /Graph View.

Note



Because a graph definition involves graph *range* specifications rather than actual data values, you can reuse a named graph even if cell entries have changed.

/Graph Name Delete

/GND

Cancel one graph name.

Procedure

Enter a graph name (up to 15 characters): Point to a name in the menu, or type an existing name. Uppercase and lowercase letters are equivalent.

Result

The specified graph name is immediately erased from memory. There is no confirmation step. The graph settings currently in effect are *not* cancelled.

Note

To delete all graph names, use /Graph Name Reset.

/Graph Name Reset**/GNR**

Cancel all graph names.

Result

All graph names are immediately erased from memory. There is no confirmation step. The graph settings currently in effect are *not* cancelled.

Note

/Graph Reset Graph does not cancel graph names. /Worksheet Erase does.



17. Data Commands

1-2-3's /Data commands create and process information in tabular form—numbers, formulas, letters, words, and phrases. Some of these commands are extensions of 1-2-3's calculation ability, enhancing its speed and flexibility. These commands can reduce to a single step what might otherwise require many steps.

In addition to enhancing 1-2-3's already impressive ability to calculate, the /Data commands open up an entirely new area of information processing—*database management*. 1-2-3 becomes a tool for record keeping as well as for financial planning and numeric analysis.

By helping you to organize information neatly into rows and columns, the /Data commands also make it easy for you to use the /Graph command. In this way, you can display data and the results of calculations in a simple, dramatic manner.

Database Management

You will find that a database is an enormously useful tool. Records of all types: sales, personnel, checks, addresses, parts, telephone numbers, computer disks—almost anything of which you have more than three—can be usefully organized in a database.

What makes a database so useful is that you can put your finger on just the information you need, in the form you want it. You could print a list of all salespeople with over \$100,000 in December sales. Or find out which parts are almost out of stock. Or print separate lists of private and business telephone numbers. Or prepare a graph of average sales per salesperson per month in each of six stores. Or print the names of all your friends with birthdays next month.

Most database management systems (computer jargon: *DBMS*) require you to learn procedures that are entirely different from those you use in calculation programs. But 1-2-3's data-management capability is fully integrated: data records are stored in the same simple columns-and-rows structure as all other entries. The /Data commands that process databases are invoked in the same way and have much the same "flavor" as other 1-2-3 commands.

Let's run through some basic definitions of the various aspects of a database.

A **1-2-3 database** is a cell range consisting of one or more columns and at least two rows. The first row contains *field names* (page 17-3). Each subsequent row of the database is a **record**—of information to be processed as a unit. Typically, a record consists of the name of some item of interest (customer, machine part, sales prospect, etc.) along with all additional data that apply to the item. Figure 17-1 contains typical examples of records.

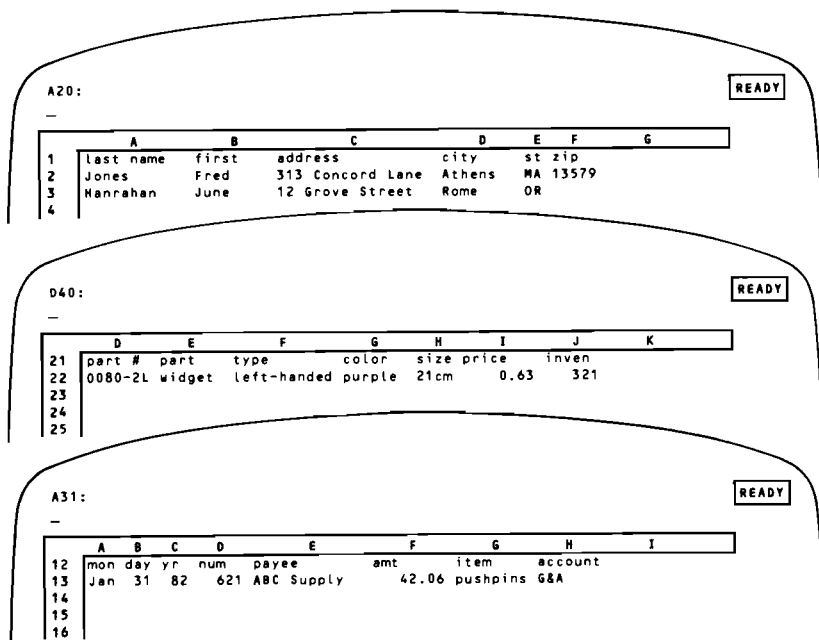


Figure 17-1. Examples of Records

Note that each record in these examples consists of several pieces of information. Each piece is stored as a cell entry. To keep things organized and neat, the same type of information is stored in the same column for each record. For instance, column F in the first example stores each customer's ZIP code.

Each column in a database is called a **field**. (Sometimes, we'll use this term to indicate the entire column, and sometimes we'll use it to indicate an entry in a particular row. The meaning should be clear from the context.) A 1-2-3 worksheet has a total of 256 columns, and you can use all of them to create your database. But the maximum width of Criterion and Output ranges used with the /Data commands is 32 fields (pages 17-29 and 17-30).

This terminology makes it easier to describe the contents of a database. For instance, we can make the following statements about the examples illustrated above:

- The *zip* field in Mr. Jones' record is "13579".
- The *zip* field in Ms. Hanrahan's record is blank.
- The *amt* field for check number 621 is \$42.06.

It does not matter what order the records are in; you'll be able to rearrange them later, very easily.

Field Names

In each example, the top row of the database was occupied by labels that identify the contents of each column. Not only are these labels useful, they're a requirement:

- The first row of a database to be processed by the /Data Query command must consist of labels. These labels act as the database's **field names**. In any one database, no two fields may have the same name.

You will be using these field names to tell 1-2-3 just which fields of which records you want to look at, or print, or plot, or base calculations on. And that is what makes a database so useful—you can specify the particular information you need and access only that stated information. 1-2-3 is an especially valuable working ally because it gets you that information fast.

Note. Be careful not to precede or follow a field name with a blank space. 1-2-3 knows when [Space Bar] characters are present and includes them as part of a field name, sometimes with unintended results, even though they are invisible on the screen.

A Database Is a Collection of Entries

Your reaction to the last few paragraphs may well have been “So what? We've made a bunch of definitions, but there doesn't seem to be anything special about a database. It's just a particular way of using the worksheet's column-row structure to store information”.

Absolutely right. And that's why 1-2-3's database capability is so easy to use. Up until the time that you use the /Data commands to process a database, it's just a collection of cell entries. That means that you can use all of 1-2-3's power and flexibility in creating and revising data records.

1-2-3 Makes Database Maintenance Easy

Some of the tasks that are most cumbersome (if not impossible) for other database-management programs are simple for 1-2-3:

Adding another field to the database. With 1-2-3, you just use another column. The /Worksheet Insert Column command allows you to place new columns wherever you wish.

Adding another record to the database. Use the /Worksheet Insert Row command.

Rearranging the fields in a database. Use the /Worksheet Insert Column and /Move commands.

Assigning a group of records the same value in a certain field. Use the /Copy command.

Updating the contents of a field. Move the cell pointer to the incorrect entry and revise it using Edit Mode, or type new information to replace the incorrect entry.

Determining field widths. This task is particularly tricky if the number of characters to be stored is not the same as the number of characters to appear in reports. In 1-2-3, each cell can store up to 240 characters. You can use the /Worksheet Column-Width command to determine how much of the actual contents of each cell appears in the worksheet and, therefore, in printouts. And you can change that setting as often as you want.

Determining the formats for numbers and the alignment of labels in their cells. Use the /Range Format and /Range Label-Prefix commands.

Printing selected fields. Specify an appropriate /Print Range. To print nonadjacent fields, use /Print Options Borders Columns.

Printing the field names along the top of each page of the printed database. Use /Print Options Borders Rows.

Keeping field names on the screen while scrolling through the database. Use /Worksheet Titles Horizontal.

The /Data Commands for Database Management

But what about the common database-management operations that aren't ordinary 1-2-3 commands? These include:

- Searching for a particular record.
- Sorting records alphabetically, chronologically, or by some other criterion.
- Locating all records that satisfy certain conditions.

That's where the /Data commands come in. In a consistent, easy-to-learn manner, 1-2-3 integrates a powerful database-management capability with its calculation, graphing, and worksheet-management capacities.

/Data Sort

One thing you want to be able to do with a database is change the order of the records. (In fact, it is often useful to change the order of rows of entries in other kinds of ranges as well.) For instance, an address list may be in alphabetical order but you want to change it to zip code order. Your personnel list may also be organized alphabetically, but sometimes you want a list in order of salary, or hiring date.

Before you do any sorting at all, you have to tell 1-2-3 where the database is.

1. When you select the /Data Sort command, you will see a Menu.
2. Select Data-Range and specify the database, *not including the field names*.

The field that determines the order of the records is called the **key**. If your key is *hiring date*, you may want to see the last employee hired at the top of the list, or you may want to have the list sorted so that the first employee hired is at the top. When you specify a key, 1-2-3 asks you if you want the values of the key field in Ascending (smallest first) or Descending (largest first) order.

What about putting your personnel list in order by department? You can do it, of course, but many records have the same entries in the *Department* field. What you really want is to sort the list by *Department*, and within each department, sort the personnel alphabetically, by *Name*. 1-2-3 lets you do this by letting you specify both a Primary and Secondary key. In this case, the *Department* is the Primary key and the *last name* is the Secondary key (Figure 17-2).

	A	B	C	D	E	F	G	H
1	Homegrown Corporation -- Personnel							
2								
3	Name	Phone	Floor	Office	Dept	Status	Start	Salary
4	Axelhouse	5876	2	11	Adm	FT	09-Mar-81	24,500
5	Kapinsky	5871	2	21	Adm	FT	22-Jun-81	34,680
6	Poppitt	5886,7	4	17	Adm	C	23-Nov-81	21,800
7	Barber	5116	4	14	Mkt	FT	19-Jan-81	14,800
8	Benedict	5860	2	3	Mkt	FT	19-Apr-82	23,480
9	Davis	5859	3	12	Mkt	C	17-Aug-81	31,000
10	Wilson	5324	2	14	Mkt	FT	22-Mar-82	28,930
11	Gottfried	555.12	2	18	R&D	PT	08-Nov-82	0

Figure 17-2. A Database Sorted by Name within Department

3. Select Primary-Key and specify the *column* of the primary key field. Then tell 1-2-3 whether you want the records to be sorted in Ascending or Descending order of the values in this column.
4. The Secondary-Key is optional. It is used to break “ties” that occur when two or more records have the same entry in the Primary-Key field. If you want one, select Secondary-Key, specify the *column* and the order, Ascending or Descending. The order does *not* have to be the same for both keys.
5. Select Go to tell 1-2-3 to go ahead and rearrange the records according to your specifications.

Note. Any [Space Bar] character at the beginning or end of a cell entry may affect the order of sorted labels. For example: “A [Space Bar]” comes after “A” in sort order.

After the sort is done, 1-2-3 returns to Ready Mode. 1-2-3 remembers all your specifications, so the next time you sort the same database, just select the specifications you want to change before you select Go. To make 1-2-3 “forget” all your specifications, select Reset.

Remember: /Data Sort works on any range in any worksheet.

/Data Query

The /Data Query operations *select* records from a database, using *selection criteria* that you specify. There are four Query operations:

Find. 1-2-3 highlights each selected record.

Extract. 1-2-3 copies each selected record to another part of the worksheet. You can make partial copies, too (selected fields only).

Unique. 1-2-3 *Extracts* records, making sure no two copies are the same.

Delete. 1-2-3 removes selected records from the worksheet, closing up the blank space.

The selection conditions you specify may be simple:

- Select all records whose *Last Name* field is “Smith”.
- Select all records whose *Last Name* field begins with “Mc”.
- Select all records whose *Credit Limit* field is 5000.
- Create a list of all states in which there are customers.

Or the conditions may be complex:

- Copy the names and addresses of all accounts in which the *Balance* field exceeds the *Credit Limit* field and whose *Dunning Letter* field is not “Yes”.
- Select all records in which the *Late Payments* field exceeds 3 or the *Balance* field exceeds the value entered in cell C2.
- Select all records meeting either of the previous two conditions.
- Select all records in which the *Daily Gross* field is less than that in the previous record.
- Delete all records of customers who have not ordered since January 1, 1981, and whose last order was less than \$350.00, except for those of Frederick J. Pennywhistle, Freetown, VT.

In addition, you can obtain information such as the sums, averages, even the standard deviations of fields in the database, for a particular field in those records that fit the conditions.

To do all this, you must prepare two or three special ranges *before* issuing the /Data Query command: the Input, Criterion, and optional Output ranges (Figure 17-3). These three ranges are described below: first the Input range, then the Criterion range (this description will take several pages), and then the optional Output range.

The Input Range

When using the /Data Query commands, the database itself, including the field names at the top, is called the Input range. In Figure 17-3, the fields are: *Name*, *Phone*, *Floor*, *Office*, and *Dept*.

G19: READY

	A	B	C	D	E	F	G
1	Homegrown Corporation -- Personnel						
2							
3	Name	Phone	Floor	Office	Dept		
4	Axelhouse	5876	2	11	Adm	Floor Dept	
5	Kepinsky	5871	2	21	Adm	Mkt	
6	Poppitt	5886,7,8	4	17	Adm		
7	Barber	5116	4	14	Mkt		
8	Benedict	5860	2	3	Mkt		
9	Devis	5859	3	12	Mkt		
10							
11	Name	Phone	Office				

Labels in the diagram:
 - **Input range:** points to the data rows 4-9 of the main table.
 - **Criterion range:** points to the 'Floor Dept' and 'Mkt' cells in rows 4 and 5 of the main table.
 - **Output range:** points to the header row 11 of the main table.

Figure 17-3. /Data Query Ranges

The Criterion Range and Criteria

The Criterion range is required. It tells 1-2-3 which records to select. It consists of two or more rows; the first row contains some or all of the Input range field names. The following rows contain the Criteria.

In Figure 17-3, the Criterion range consists of two rows in two columns. In the first row are two of the five database field names, *Floor* and *Dept*. Under *Dept* is one of the possible *Dept* entries, "Mkt" (short for Marketing); the cell under *Floor* is blank.

Mkt is a *criterion*, an entry that tells 1-2-3 which records to select. This one tells it to select only those records which have the label "Mkt" in the *Dept* field.

Imagine that records have to pass through a "gateway" before they're allowed to be selected. The criterion is the rule that 1-2-3 (the gatekeeper) uses to decide whether a record is allowed to pass.

Empty cells in the Criterion range are open gates; an empty row allows all records to be accepted: be aware of the number of rows you include when you initially specify the location of your Criterion range. If a record can “pass through the gates” in *any* row, it is selected. It need not be able to pass through all the rows of the Criterion range. (See “More Than One Criterion”, page 17-10.)

- Other than blank cells, there are three types of criteria: label-matches, number matches, and formulas.

Matching Criteria: Label-Matches and Number-Matches

You enter a number or label in the Criterion range, below any field name. During a Query operation, 1-2-3 will examine the field in the database with the same field name. The record is allowed to pass if the value in the appropriate database field matches the criterion.

Label-Match Criteria

In our example, the label “Mkt” is compared with the label in the *Dept* field of every record. Only those records with “Mkt” in the *Dept* field are allowed to pass.

Note. Trailing blank spaces in either data records or criteria can prevent entries that appear identical from matching.

Actually, with label criteria, the labels need not match exactly if you include any of these three special characters, ?, *, and ~. When any of these appear in the label in the Criterion range, you are instructing the gatekeeper that you want it to pass more than one specific label.

? matches *any* single character, so “h?t” matches “hat”, “hot”, and “hut”, but not “huts”. You can use more than one ? in a label: “h??d” matches “hood” and “head”, but not “heel”.

* matches all characters to the end of the label, so “cat*” matches “cat”, “catsup”, and “catechism”, but not “cutthroat”.

~ The tilde character at the beginning of a label instructs 1-2-3 to accept any label *except* the one following the tilde. (Empty cells, however, are never selected by any label-match criterion.)

Examples: ~**Smith** selects all records with a non-empty Name entry other than Smith. ~**S*** selects all records with a non-empty Name entry that do not begin with S.

Number-Match Criteria

Number criteria are used in a similar manner. A record is selected if the number, or value of the formula, in the appropriate field of the Input range is *equal* to the criterion value. Input range cells in the database that are blank or contain labels are considered to have a value of zero.

Formula Criteria (Numeric Comparisons)

The last type of criterion, a formula, is rather different from labels and numbers. When you select the desired /Data Query command the criterion formula is recalculated once for each record, each time substituting a value from a specified field in the record. If the formula is *TRUE*, meaning it has a numeric value other than zero, the record is accepted.

Follow this rule in creating formula criteria:

Write the formula as a test of the *first record* (second row) of the database. Be sure that:

- Cell addresses that refer to database fields are relative (e.g. C2 or NAME).
- Cell addresses that refer to reference values outside the database are absolute (e.g. \$K\$21 or \$NAME).

A formula criterion works because of its cell addresses, not because of its position: it doesn't matter in which column of the Criterion range you put the formula. Note that you cannot use the seven database statistical functions inside the Criterion range.

620: READY

	A	B	C	D	E	F	G
1	Homegrown Corporation -- Personnel						
2							
3	Name	Phone	Floor	Office	Dept	Floor Dept	Criterion
4	Axelhouse	5876	2	11	Adm	+C4>3	range
5	Kepinsky	5871	2	21	Adm		

Figure 17-4. A Formula Criterion

The criterion in the example selects records of people in offices above the third floor. It does not matter which column it appears in; its function as a criterion is defined by the relative address + C4 to the *Floor* field in the first record of the database (i.e. the second row of the Input range).

The formula is evaluated once for each record in the database. 1-2-3 sequentially replaces + C4 in the formula with the *Floor* field's cell address in each record. So, for the second record, + C5 is used in the formula, and so on down to the bottom of the database. A particular record is selected if the formula is valued *TRUE* (non-zero).

You can make it easier to write and read criterion formulas if you first use the /Range Name Labels Down command to make each field name the range name of the cell just below it in the first row of the database. Give all cells in the Criterion range the numeric display format Text.

Formulas can refer to more than one field, as shown in Figure 17-5. This formula selects records of people whose salary increased more than 10% between 1981 and 1982.



Formulas can even include references to more than one record in the same database, as shown in Figure 17-6. This formula selects records of days in which the value of the stock dropped more than 0.5 points.

Note. The second cell reference in the formula is to the record above the one being “tested”. When 1-2-3 evaluates the formula for the first record, this reference will refer to a field name cell. Labels have a value of zero, so the first record will not be selected. In this case, this is what you want. In general, when writing criteria formulas that refer to cells in more than one record, be careful of what happens at the top and bottom of the database.

F20: READY

	A	B	C	D	E	F	G	H
1	Homegrown Corporation -- Personnel							
2								
3	Name	Phone	Dept	SalB2	SalB1	Dept SalB2 (SALB2>(1.1*SALB1))		
4	Axelhouse	5876	Adm	24,500	24,000			
5	Kapinsky	5871	Adm	34,680	33,180			
6	Popplitt	5886,7,8	Adm	21,800	18,800			
7	Barber	5116	Mkt	14,800	14,800			
8	Benedict	5860	Mkt	23,480	22,980			
9	Davis	5859	Mkt	31,000	27,500			
10	Wilson	5324	Mkt	28,930	24,430			
11	Gottfried	555.1212	R&D	0	0			

/ Criterion range

Figure 17-5. Formula Criterion—More Than One Field

More Than One Criterion. We’ve already covered quite a lot. But 1-2-3 can do much more. To answer questions like, “What are the names of all the right-handed outfielders batting over .280 in Boston, New York, and Philadelphia?”, 1-2-3 has to be able to use more than one criterion at a time. And it can!

There are two ways in which multiple criteria are used:

1. A record can be selected only if it fits *all* the criteria, e.g. both Criterion A and Criterion B, or
2. A record can be selected if it fits *any one* of the criteria, e.g. either Criterion A or Criterion B.

You tell 1-2-3 how to combine your criteria by where you put them in the Criterion range:

- Criteria in the *same row* are combined with “and”. For a record to pass, it must fit both Criterion A *and* Criterion B.
- Criteria in *different rows* are combined with “or”. For a record to pass, it must fit either Criterion A *or* Criterion B.

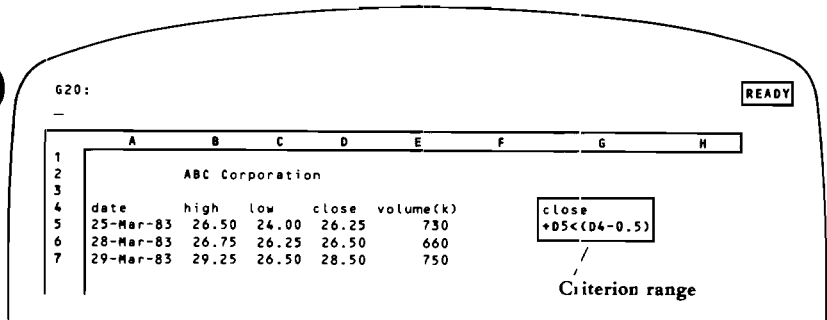


Figure 17-6. Formula Criterion—More Than One Record

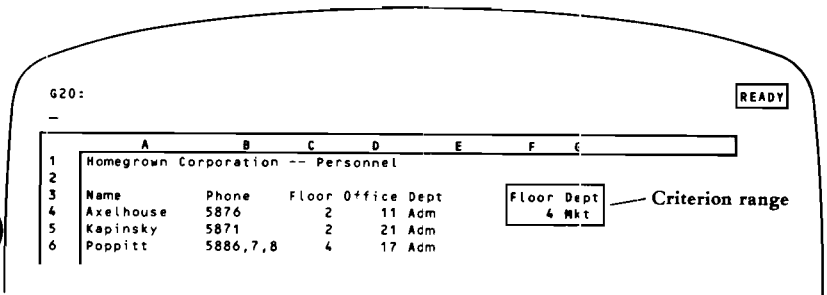


Figure 17-7. "And"—Two Criteria in the Same Row

Using our "gate" analogy, we can think of each row in the Criterion range as a narrow chute with a number of gates. A record gets through any one chute only if it passes gate "A" and gate "B" and gate "C", etc. But to get through, it can go through the first chute (row) or the second chute or the third chute, etc.

Figure 17-7 shows a Criterion range that could be used to produce a list of personnel who are on the fourth floor and are in the Marketing Department.

And Figure 17-8 would give you a list of everybody on the fourth floor plus everyone in Marketing regardless of their floor: to be selected, a record must indicate the fourth floor or the Marketing Department.

Lastly, to get a list of people in the Marketing Department on the second and fourth floors use the Criterion range shown in Figure 17-9. Note: that the label "Mkt" is repeated in both rows, guaranteeing that only Marketing Department personnel will be listed. This Criterion range means: "To be selected, a record must be of a person on the second floor and in marketing, or of a person on the fourth floor and in marketing".

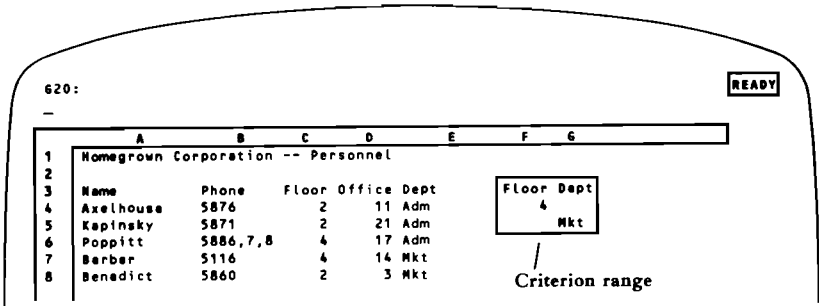


Figure 17-8. "Or"—Two Criteria in Different Rows

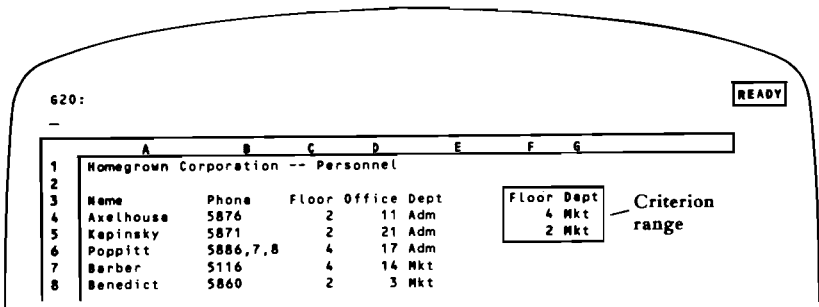


Figure 17-9. Four Criteria at Once

By now it should be apparent that the number of possible criterion combinations is limitless. With a little experimentation, you will be able to specify just those records you need.

The Output Range

The third /Data Query range—the Output range—is required only if you intend to make copies of the data records (Extract and Unique).

The first row of the Output range contains the field names of the database fields you want to be copied. These must be *identical* to the corresponding field names in the Input range, but may be in any order. The rest of the Output range should be empty or expandable, since 1-2-3 is going to copy data into it. In our continuing example: If you place only the *Name* and *Phone* field names in the Output range, 1-2-3 will make copies of *those fields only*.

You have the option of specifying an Output range that is just one row deep—the row of field names. By doing this, you tell 1-2-3 to use the entire area below the field names, down to the bottom of the worksheet, to copy the output records. 1-2-3 erases all but the top (field names) row of the Output range before making copies, so make sure there is nothing you need below a one-row Output range.

Summing Up the /Data Query Ranges

To recapitulate, *before* using /Data Query:

1. Prepare an Input range... your database with field names at the top of each column.
2. Prepare a Criterion range... with some or all of the database field names in the top row and criteria (labels, numbers or formulas) in the remaining row(s).
3. If you are using the /Data Query Extract or Unique commands to create copies of some or all fields of some of your records, prepare an Output range with the names of the fields you want copied in the top row.

We've finally described all the ranges you have to prepare before actually using /Data Query, and you may be wondering if it's all worth it. The /Data Query commands can be used time and again. Once you have specified the ranges, 1-2-3 remembers them, and you don't have to think about them again until you want to change their positions. You can change their contents without having to re-specify them. In fact, that is how these commands are usually used. The range specifications, like the data itself, are part of the worksheet. By simply changing criteria, you can quickly Find or Delete, Extract or Uniquely extract, the records you need.

The Query Operations

Having defined an Input range (database), a Criterion range (selection criteria), and perhaps an Output range (area to receive copies)—now you're ready to perform any of the four Query operations: Find, Extract, Unique, and Delete.

Find

The Find operation simply points out selected records to you. When you select Find, the cell pointer moves to highlight the first record that satisfies the selection criteria. Thereafter, ▲ and ▼ move the pointer among all the selected records. ▼ and [Select] move the cell pointer to the first and last records in the database, respectively, whether or not they satisfy the criteria. If the database is too wide to fit on the display screen, you can use ◀ and ▶ to scroll back and forth among the fields.

Use Find for quick access to a few records, to look up a telephone number or a catalog number. For instance, you could create a database of a company telephone list, including name, department, and position. When someone calls and asks for a person, either by name or by position, write that information into the Criterion range, and use /Data Query Find. The appropriate record is highlighted. Once the ranges have been specified, and the command used once, you can return to Ready Mode to perform other work, then enter new names or titles into the Criterion range and instantly repeat the operation by pressing [F7/Query] (page 17-14).

Extract

The Extract function makes copies of specified fields of all records that satisfy the selection criteria. The copies are placed in a separate location that you specify, the Output range.

Use Extract to copy just the information you need to a specified area of the worksheet, often for printing. You could print telephone lists by floor, or by department. Or a list of files to be pulled in the file room.

Unique

The Unique function is a variant of Extract. It weeds out duplicate copies, guaranteeing that no two of the copied records in the Output range are identical.

Performing a Unique operation with a blank criterion row can be useful. An empty Criterion range row causes all records to be selected. But the Unique operation weeds out duplicates: If you specify a one-field Output range, the result is a list of all existing values in that field.

Example: For a Name-Address database, you specify a Criterion range that consists of the field name *State* and an empty cell below it. Specify an Output range that consists of the field name *State* only. When you issue a /Data Query Unique command, 1-2-3 produces a list of all State entries in the database.

Delete

The Delete function removes from the database all records that satisfy the selection criteria. Remaining records move upward to fill in the resulting empty space. To ensure that no information is accidentally lost, 1-2-3 asks you to confirm your order to Delete records.

This is a database-maintenance function. You might use this to purge a database of long-inactive accounts.

The [f7/Query] Key

The keyboard has a special function key to help you make repeated use of 1-2-3's database-management abilities: to use the same /Data Query command over and over, after changing criteria or data, with just the press of a single key.

If you press [f7/Query] in Ready Mode, 1-2-3 repeats the most recent Query operation—Find, Extract, Unique, or Delete—using the same database (Input range), the same Criterion range, and the same Output range (if any).

To make 1-2-3 “forget” the Query ranges, and the last Query command, select /Data Query Reset.

The Database Statistical Functions

Perhaps the biggest payoff of 1-2-3's database-management capability is its *synergy*—cooperative action—with other aspects of the program. All of the powerful features that you've used in other contexts can be applied to databases, too: formulas that define relationships among cells, automatic recalculation of these formulas, data transfer using /Copy and /Move, etc.

Since calculation is one of 1-2-3's strong points, you might expect the program to offer some facilities for numeric analysis of a database. You'd be right—there are database counterparts to 1-2-3's statistics functions: @SUM, @AVG, etc. They have the same names as these functions, with the addition of the letter "D" after the "@". Like their cousins, these database functions are actually a type of formula, but they are designed to use values selected from a database.

Each of these functions uses a set of selection criteria to select records from a database (much like the Query operations). Using only *one field* of the selected records, the function performs a statistical operation.

These functions have the form:

@functionname (Input range,offset,Criterion range)

- *Input range* and *Criterion range* have exactly the same meanings here as in the /Data Query commands: They specify the database to be analyzed (don't forget the field names row!) and the selection criteria with which to test the data records.

Specify these ranges either with range names or with cell addresses. If you intend to copy the formula you're entering, you'll want to make these ranges *absolute* (e.g. \$DATARECS or \$F\$10..\$J\$150).

- The *offset* tells 1-2-3 which field (column) in the database to use in its calculation. To determine the offset, count the columns in the Input range starting with zero for the first column; the next column is 1, etc. The number of the column (field) of interest is its offset. The contents of cells in this column, for records selected by the criteria in the Criterion range, are used by the function in its calculations.

The Database Statistical Functions are:

@DCOUNT: Counts the non-blank cells in the offset field of the selected records.

@DSUM, @DAVG, @DVAR, @DSTD, @DMAX, @DMIN: Using the values in the offset field of the selected records, finds the sum, average, variance, standard deviation, largest value, or smallest value.

Example: Using a database of sales transactions (Figure 17-10), you could obtain the total sales, number of sales, and largest sale for any salesperson. The transaction *amount* field is in column 2 of the database (recall that the first column is numbered "0"). Type the name of the salesperson in the row of the Criterion range below the field name *Name*, recalculate the worksheet if necessary, and the resulting values of the formulas give you the numbers you want.

total sales = @DSUM(DB,2,CRIT)
 number of sales = @DCOUNT(DB,2,CRIT)
 largest sale = @DMAX(DB,2,CRIT)

You can see that these functions are powerful tools. A logical use for database functions is creation of tables, e.g. a list of all the sales people, with figures like the ones shown above (total sales, number of sales, largest sale) across from each name, under appropriate column headings. Using the commands discussed so far that would be possible but tedious. However, relief is just around the corner (in the next section, actually).

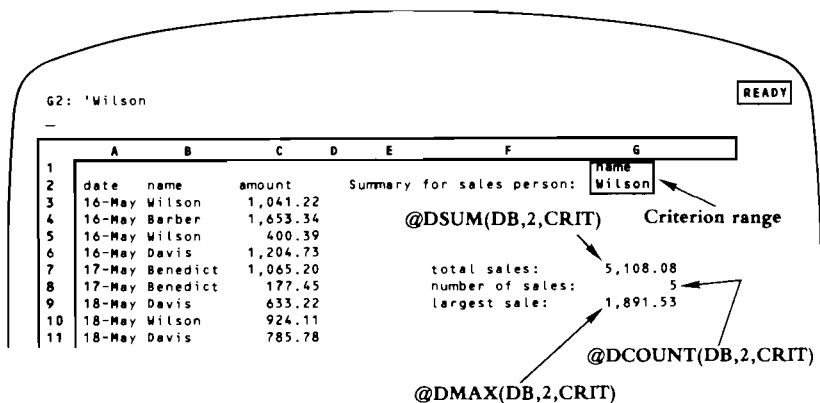


Figure 17-10. Using Database Statistical Functions to Construct a Table

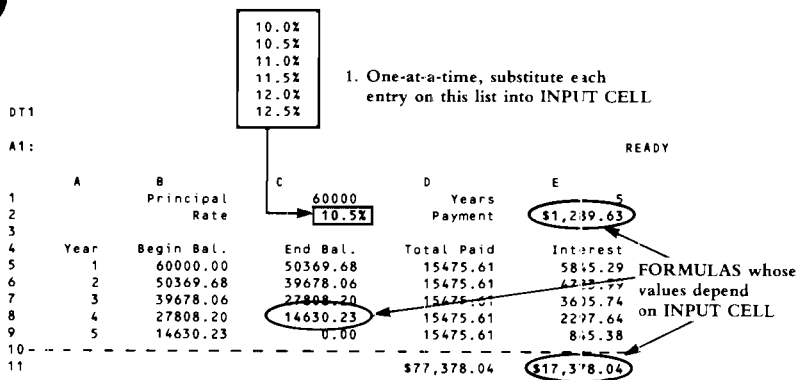
/Data Table

One of 1-2-3's main strengths is that it allows you to try out different values and see what happens. More precisely, you can change the entry in an *Input* cell and see how formulas in various *Output* cells change in value. For instance, you can find out how your projected bottom line changes if you sell 500 units next month, or 750, or 1000.

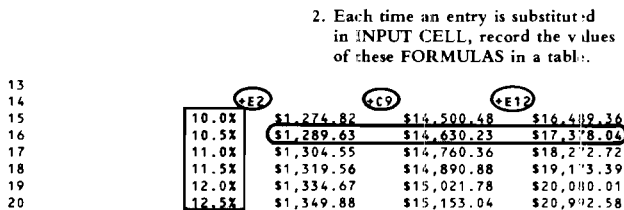
The /Data Table commands allow you to automate and organize this "what if" process. /Data Table 1 tries out a list of entries in one *Input cell*. /Data Table 2 uses two *Input cells*—it tries out pairs of entries taken from two separate lists. In both cases, 1-2-3 creates a table that records specific results of the "tryouts": the values of formulas that refer to the *Input cell(s)*.

/Data Table 1

This diagram illustrates the single Input cell concept:



And here is how you make this concept a reality with the /Data Table 1 command:



Note. If the worksheet already includes a formula which depends on the input cell, there's no need to enter it again in the top row of the data table. Just enter a reference to the formula. For example:

The input cell is D14. Cell H50 contains a formula which depends on the input cell: + A1 + D14*50. You needn't enter "+ A1 + D14*50" in the table; enter "+ H50" instead.

Example: We would like to construct a **sensitivity analysis** table, showing the degree to which the Revenue and Profit projections are *sensitive* to changes in the projected inflation rate.

X4: 'PROJECTION FOR SINGLE REGION/TYPE' READY

	X	Y	Z	AA	AB
4	PROJECTION FOR SINGLE REGION/TYPE				
5					
6	Inflation:	5.0%	12.0%	9.0%	5.0%
7	-----				
8		1982	1983	1984	1985
9	-----				
10		Projected Revenues calculated			
11	Revenues	19,414,967	21,744,763	23,701,791	24,886,881
12	-----				
13	Expenses	15,798,929	18,874,454	20,022,088	20,251,699
14	-----				
15	Prof (Loss)				
16		\$3,616,038	\$2,870,309	\$3,679,703	\$4,635,182

Projected Profits calculation

C59: READY

	C	D	E	F	G	H	I
59				Revenues	Profits	Profit Rate	
60	-----						
61			+Z11	+Z16	+Z16/Z11	← formulas	
62	Inflation	8.0%	20,968,164	3,417,811	16.3%		
63	Rate for	8.5%	21,065,239	3,352,006	15.9%		
64	1983	9.0%	21,162,314	3,285,449	15.5%	← results	
65		9.5%	21,259,388	3,218,140	15.1%		
66		10.0%	21,356,463	3,150,078	14.8%		

entries to be substituted in Input cell

For our present purposes, we need not be concerned with the details of the Revenue and Profit calculations. We need only know that:

- You enter a 1983 projected inflation rate in cell Z6.
- 1-2-3 calculations for both the Revenues projection (cell Z11) and the Profits projection (cell Z16) for 1983 depend on the inflation rate—that is, on cell Z6.

To construct the data table, we enter a variety of interest rates in cells E62..E66. Then we enter formulas in cells F61..H61: In F61, we “bring down” the Revenues projection with the formula +Z11; in G61, we “bring down” the Profits projection with the formula +Z16. The ratio of Profits to Revenues is not calculated elsewhere in the worksheet. So we can enter a “new” formula in cell H61: +Z16/Z11.

Finally, we perform the /Data Table 1 command, specifying E61..H66 as the Table range and Z6 as the Input cell.

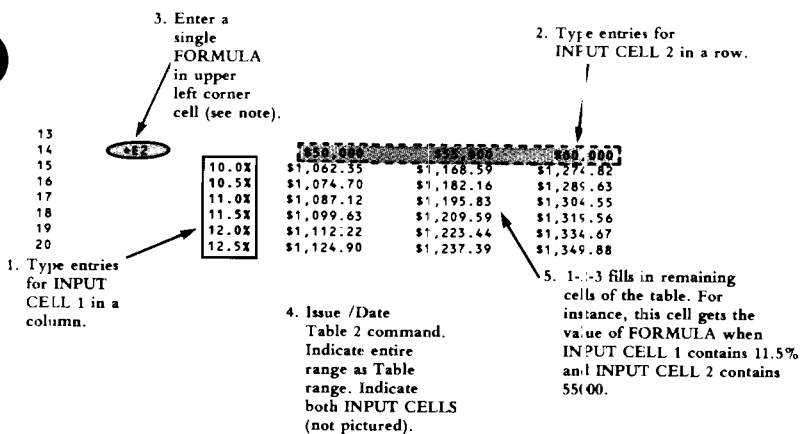
/Data Table 2

This command is a natural extension of /Data Table 1. Instead of trying out a single list of entries /Data Table 2 processes two lists. It tries out all possible pairs—one entry from each list—in two Input cells, and tabulates the effect on a single formula. Here's an illustration of the /Data Table 2 implementation:

DT2

READY

1	A	B	C	D	E
2		Principal	30000	Years	5
3		Rate	10.5%	Payment	\$1,289.63
4	Year	Begin Bal.	End Bal.	Total Paid	Interest
5	1	60000.00	50369.68	15475.61	5845.29
6	2	50369.68	39678.06	15475.61	4783.99
7	3	39678.06	27808.20	15475.61	3605.74
8	4	27808.20	14630.23	15475.61	2297.64
9	5	14630.23	0.00	15475.61	845.38
10					
11				\$77,378.04	\$17,378.04



Note. As with /Data Table 1, there's no need to re-enter a formula that already exists in the worksheet. Just enter a reference to the formula.

Example: Input cell 1 is B6. Input cell 2 is H10. Cell F25 contains a formula which depends on both input cells: $35 + (1 - B6) * H10$. You needn't enter "+ 35 + (1 - B6) * H10" in the table; enter "+ F25" instead.

You can use /Data Table 2 to perform a sensitivity analysis, just as in the Revenues/Profits example above. But let's look at another application: creating a table of database statistics. For this purpose, you enter a database statistical function in the Table range's upper left corner cell.

Example (Figure 17-11): A sales personnel database includes the fields Month, Day, Name, and Amount. A Criterion range has been created that has two match-entry cells: (1) a Name match-entry can be typed in cell G2; (2) a Month match-entry can be typed in cell F2.

We can use the `@DSUM` function to create a table that shows sales totals on a by-salesperson-by-month basis:

formula in cell F7: `@DSUM(A2..D150,3,F1..G2)`

Table range: F7..I11

Input cell 1: G2

Input cell 2: F2

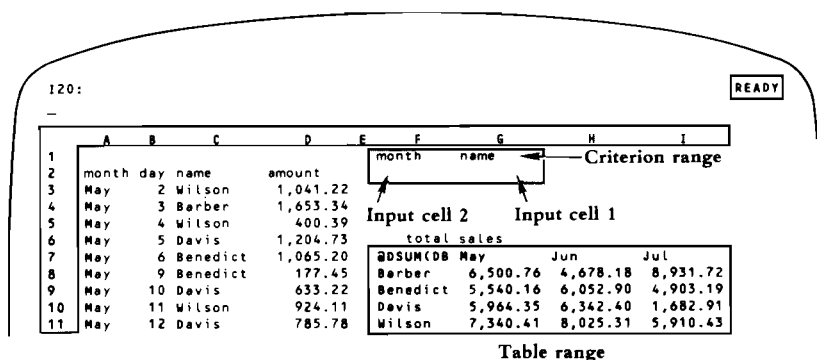


Figure 17-11. Using Database Statistical Functions with /Data Table 2

The [F8/Table] Key

There are times when you want to recompute the same table more than once. One example is in adjusting the range of values for a "sensitivity" analysis; you may find that your original values provided graph lines that were too close together. Or you might want to do database statistical analyses with additional criterion entries (e.g. a table of sales by salesperson by month for each of several merchandise categories).

1-2-3 remembers the Table range and Input cell(s) for the last /Data Table command. When you select /Data Table 1 or 2, the last chosen Table range will be highlighted; to use it again, press [Return]. Similarly, you can use the same Input cell(s) again by pressing [Return].

If you have already used a /Data Table command, and want to repeat it using exactly the same Table range and Input cell(s) as last time, just press [F8/Table]; the entire table will be recalculated. And here is the bonus: Because the only things 1-2-3 remembers are the range and cell *addresses*, you can change the entries in those ranges and any other cells in the worksheet, and the [F8/Table] key will still work.

To make sure this doesn't happen accidentally, you can tell 1-2-3 to "forget" the /Data Table ranges, by selecting /Data Table Reset.

Summing Up the Database Commands

The key to using a database is understanding *records* (rows) and *fields* (columns). Each record contains a group of entries to be kept together: e.g. name with address, part number with price. Corresponding information is entered into the same field (column) of each record.

/Data Sort allows you to rearrange the order of these records, while keeping the data in each record together. Remember that the Data range for a Sort does *not* include the field names.

/Data Query adds the idea of criteria: rules for choosing some records and rejecting others. In the Criterion range, these criteria can be combined so that you can put your finger on just the information you want. The /Data Query commands let you highlight selected records, to copy just those fields you want, to get lists of all values in a field or in a combination of fields, or to delete selected records.

The database statistical functions let you summarize numbers in a database, obtaining counts, sums, averages, minimums, maximums, variances, and standard deviations for values in a specified field of just those records that interest you.

/Data Table lets you perform "sensitivity analyses", tabulating the effects of *what if* trials, and preparing those tables for graphing. In addition, you can create tables of the statistics generated by the database statistical functions.

The remaining commands, Distribution and Fill, are general-purpose commands. While they can be used in a database application, they can also be used for a variety of other purposes.

/Data Distribution

/Data Distribution allows you to summarize a large group of numbers, by producing a *frequency distribution* of the numbers.

Before you issue the command, first enter a series of ascending values in a column. These define a series of *intervals* or *bins*, which you will specify as a **Bin range**. They can be located anywhere in the worksheet, as long as the column segment to the right of the Bin range and extending one row below it is available. This will be the **Results** column.

After you select the command, specify the **Values range**: the range of numbers or formulas that you want counted. At the Bin range prompt, specify the column of values you have entered—*not* including the results area.

1-2-3 counts the number of entries in the Values range that are smaller than, or equal to, the smallest bin value, and puts that number to the right of the top bin value. It then counts how many entries are greater than the first bin value and less than, or equal to, the second bin value and places that number in the next row of the results column. This process continues for each bin value. To complete the count, 1-2-3 puts the number of entries larger than the last bin value in the bottom of the results column, one row below the bin range.

As with the other /Data commands, 1-2-3 remembers the last Values range and Bin range you specified, so that you can repeat the command, with the same range positions, even after changing entries, by typing /DD[Return][Return].

/Data Fill

The /Data Fill command enters a sequence of numbers into a range of cells, using a **Start** value, a **Step** value (positive or negative), and a **Stop** value you specify.

This makes it easy to create the *Bin* range for use in a /Data Distribution command, or the *Table* range in a /Data Table command. There are a multitude of other uses, too, including numbering a list of entries, generating a range of labels or values to be used in a graph, etc.

/Data Fill**/DF**

Fill a range with a sequence of numbers.

Procedure

1-2-3 “remembers” (page 7-14) the most recently used /Data Fill range, if any. When you issue the command, 1-2-3 offers to reuse this range. It highlights the range and shows the addresses of its upper left and lower right corner cells in the control panel.

1. Press **[Return]** alone to reuse the same Fill range. You can press **[Backspace]** to cancel this remembered range and return the pointer to the current cell. Otherwise, revise the range specification or enter a new one.
2. Press **[Return]** alone to accept the Start value 1-2-3 offers (initially 0), or enter a new value, positive or negative.
3. Press **[Return]** alone to accept the Step value 1-2-3 offers (initially 1), or enter a new value, positive or negative.
4. Press **[Return]** alone to accept the Stop value 1-2-3 offers (initially 2047), or enter a new value, positive or negative.

Results

1-2-3 first erases the previous contents of the entire Fill range.

The Start value is placed in the upper left corner of the Fill range. 1-2-3 goes down each column in the range, adding the Step to the previous value, until the range is filled or the Stop value is reached, whichever comes first.

Notes

1. The values put into the range are numbers, not formulas. They do not change when the worksheet's formulas are recalculated or when they are copied elsewhere.
2. You can use this command to provide “serial numbers” for the records of a database: You can always restore the records to their original order by sorting (/Data Sort) on the serial-number column.
3. You can use this command to provide a set of “input” values for an XY graph (page 16-12) or for a *data table*.

/Data Table 1**/DT1**

Construct a “sensitivity analysis” table by varying the entry in one cell of the worksheet.

Before issuing this command, you must prepare the *Table range* (see page 17-16):

A. Go to an unused range in the worksheet. You will specify this range to be the *Table range*. Leave the upper left corner cell empty.

B. Place *input entries*—entries to be substituted in the *Input cell*—in the first column of the *Table range*, starting in the second row. You can use any entries here—labels, numbers, or formulas.

C. Place the formulas whose values are to be tabulated across the top row of the *Table range*, starting in the second column. Often, a simple reference to an existing formula in another cell is sufficient. (For example, to tabulate the changing values of the formula in cell C12, enter “+ C12” in the top row of the *Table range*.)

Procedure

1-2-3 “remembers” (page 7-14) the most recently used /Data Table range, if any. When you issue the command, 1-2-3 offers to reuse this range: It highlights the range and shows the addresses of its upper left and lower right corner cells in the control panel.

1. Press [Return] alone to reuse the same *Table range*. You can press [Backspace] to cancel this remembered range and return the pointer to the current cell. Otherwise, revise the range specification or enter a new one.
2. Specify the *Input cell*, the cell of the worksheet in which the input entries are to be substituted one by one.

Results

1. 1-2-3 saves the current value of the *Input cell*.
2. For each *input entry*, 1-2-3:
 - Copies the entry to the *Input cell*.
 - Recalculates the entire worksheet, including the formulas in the first row of the *Table range*.
 - Copies the values of these *Table range* formulas into the appropriate row of the *Table range*.
3. 1-2-3 restores the original value of the *Input cell* and recalculates the worksheet an additional time, to restore its original state.

Notes

1. This command can be used to explore and record how the value of one or more formulas vary as a result of changes in a single *Input cell*. This automated “what if” procedure is often called a *sensitivity analysis*.
2. To graph the results of a /Data Table 1 command, create an XY graph whose X range is the *input entries* column and whose other ranges are other columns of the *Table range*.

3. If an input entry is a formula, only its current value is copied to the Input cell.
4. By making the Input cell part of a Criterion range (page 17-7) and by using database statistical functions (page 17-15) in the formulas row, you can perform sophisticated statistical analyses with a minimum of keystrokes. (See Figures 17-10 and 17-11.)
5. Since many recalculations are involved in this command, it requires a bit more time than some other 1-2-3 commands.
6. If cell protection is Enabled, both the Input cell(s) and the entire Table range (not just the cells that 1-2-3 fills in) must be /Range Unprotected.

/Data Table 2

/DT2

Construct a “sensitivity analysis” table by varying the entries in two cells of the worksheet.

Before issuing this command, you must prepare the *Table range* (see page 17-16 for a full discussion):

A. Go to an unused range in the worksheet. You will specify this range to be the *Table range*.

B. Place the *input entries*—entries to be substituted in *Input cell 1*—in the first column of the Table range, starting in the second row. Place the *input entries*—entries to be substituted in *Input cell 2*—in the first row of the Table range, starting in the second column. Input entries can be labels, numbers, or formulas.

C. Place the formula whose value is to be tabulated in the upper left corner cell of the Table range. Often, a simple reference to an existing formula in another cell is sufficient. (For example, to tabulate the changing values of the formula in cell C12, enter “+C12” in the upper left corner cell.)

Procedure

1-2-3 “remembers” (page 7-14) the most recently used /Data Table range, if any. When you issue the command, 1-2-3 offers to reuse this range: It highlights the range and shows the addresses of its upper left and lower right corner cells in the control panel.

1. Press [Return] alone to reuse the same Table range. You can press [Backspace] to cancel this remembered range and return the pointer to the current cell. Otherwise, revise the range specification or enter a new one.
2. Specify *Input cell 1*, the cell of the worksheet in which the *column* of input entries is to be substituted one entry at a time.

3. Specify *Input cell 2*, the cell of the worksheet in which the *row* of input entries is to be substituted one entry at a time.

Results

1. 1-2-3 saves the current value of both Input cells.
2. For each pair of *input entries*, one from the first column, one from the first row, 1-2-3:
 - Copies the column entry to Input cell 1.
 - Copies the row entry to Input cell 2.
 - Recalculates the entire worksheet, including the formula in the upper left corner of the Table range.
 - Copies the value of this Table range formula into the appropriate cell of the Table range.
3. 1-2-3 restores the original values of the Input cells and recalculates the worksheet an additional time, to restore its original state.

Notes

1. This command can be used to explore and record how the value of a formula varies as a result of changes in two Input cells. This automated “what if” procedure is often called a *sensitivity analysis*.
2. If an input entry is a formula, only its current value is copied to its Input cell.
3. By making the Input cells part of a Criterion range (page 17-7), and by using a database statistical function (page 17-15) as the formula, you can perform sophisticated statistical analyses with a minimum of keystrokes. (See Figures 17-10 and 17-11.)
4. Since many recalculations are involved in this command, it requires a bit more time than some other 1-2-3 commands.
5. If cell protection is Enabled, both the Input cell(s) and the entire Table range (not just the cells that 1-2-3 fills in) must be /Range Unprotected.

/Data Sort

/DS

Sort a range of data records (rows) on one or two sort keys.

Procedure

When you issue this command, 1-2-3 displays the Sort menu:

Data-Range Primary-Key Secondary-Key Go Reset Quit

This is a “sticky menu”: To return to Ready Mode, choose either Go or Quit. With the other choices, you enter sort specifications, then the sort menu returns.

Note. 1-2-3 “remembers” all sort specifications. Thus, you may *not* need to reenter one or more of the specifications the next time you want to sort the same records.

When you select Data-Range, Primary-Key, or Secondary-Key, 1-2-3 offers to reuse the most recently entered specification: It highlights the range (sometimes, just a single cell), displaying the addresses of its upper left and lower right corner cells in the control panel.

Press [Return] alone to reuse the same specification. You can press [Backspace] to cancel this remembered range or cell and return the pointer to the current cell. Otherwise, revise the specification or enter a new one.

Procedure

Choose a sort specification. Before ordering 1-2-3 to perform the sort (Go), you must specify a Data-Range and a Primary-Key column. The Secondary-Key specification is optional. Choose Reset to cancel all sort specifications.

Data-Range. The range whose rows (records) will be sorted.



Do not include a database’s field names row in the sort Data-Range. You *do* include this row in a /Data Query Input range.



Be *sure* to include all the columns of your data records in the Data-Range. If you leave out a few columns, they won’t be sorted, causing the records to be split apart, perhaps irretrievably.

Primary-Key. The column (field) by which the rows (records) are to be sorted.

When you select Go, 1-2-3 rearranges the rows so that the entries in this column are in the specified order.

1-2-3 prompts you to enter **A** (ascending) or **D** (descending) to specify the sort order. It offers the most-recently specified choice—to reaccept it, press [Return] alone.

1-2-3 Sort Order

Ascending: top-to-bottom Descending: bottom-to-top

- Blank cells
- Label cells in ASCII order (page B-3). The label-prefixes are ignored.
- Numbers and formula values in numeric order.

Secondary-Key (optional). The field (column) that determines the order of records whose Primary-Key values are the same. Specify the Secondary-Key column and choose Ascending/Descending order in the same manner as for the Primary-Key.

Reset. Cancels all /Data Sort specifications.

Go. Performs the sort according to the current Data-Range, Primary-Key, and Secondary-Key specifications, and returns to Ready mode.

- If you have not specified a Data-Range and a Primary-Key, 1-2-3 *beeps* and returns to the Sort menu.
- The order of records whose Primary-Key and Secondary-Key values *both* are the same is not predictable.
- If a formula entry moves in a /Data Sort Go operation, its cell addresses are adjusted just as they would be in a /Copy operation (page 12-4): *relative* addresses change and *absolute* addresses don't. In general, this produces the desired result if formulas use relative addresses to process values *within the same data record only*. Avoid formulas that use values in other data records.

Quit. Returns to Ready mode without sorting the records. 1-2-3 *does* remember any sort specifications you entered.

Notes

1. /Data Sort is particularly useful in finding duplicate labels in a column list or duplicate records in a database.
2. With a little extra work, there *is* a way to restore a database to its original order once it has been sorted: When you create the database, use /Data Fill to enter an additional column (field) of consecutive "serial numbers". You'll always be able to return to the original order, by using this field as the Primary-Key.

/Data Query

/DQ

Locate, copy, or delete records in a database, based on simple or complex selection criteria.

Preliminaries

Before you issue this command, you must prepare several ranges:

Find, Delete operations: Input and Criterion ranges.

Extract, Unique operations: Input, Criterion, and Output ranges.

Preparing the Input Range

The Input range is the database itself. The first row contains labels that act as *field names*. No two field names should be the same. For the purpose of the /Data Query commands, uppercase and lowercase letters are equivalent in field names. Each subsequent row is one *data record*. Database entries are just the same as ordinary cell entries. (In fact, they are *treated* as ordinary entries in most respects. Only the /Data Query command treats them specially.)

Preparing the Criterion Range

The first row contains some or all of the field names from the Input range, in any order. One of more subsequent rows contain the criteria, the rules by which 1-2-3 will select records.

Rules for Creating Selection Criteria

Groups of Selection Criteria—AND vs. OR

During performance of a /Data Query operation, each record is tested against the selection criteria stored in the Criterion range:

A record is *selected* if it passes every test in at least one Criterion range row.

A record need not succeed in “running the gauntlet” of every row. It must only succeed in passing the tests in a single row. (If a row contains no criteria, all records “pass”.)

Think of the several criteria in a row as being connected by *AND*. If a row has three criteria, then a record “passes” through that row if it passes Criterion 1 *AND* Criterion 2 *AND* Criterion 3.

If you create a Criterion range with more than one row of criteria, think of the several rows as being connected by *OR*. If a Criterion range has three criterion rows, then a record is selected if it “passes” Criterion Row 1 *OR* Criterion Row 2 *OR* Criterion Row 3.

Individual Criteria

To test for an exact match—label entry or number entry:

Be sure the field name of the match value is in the first row of the Criterion range. Enter the match value below the field name.

Examples:

Name	←	field name
Jones	←	exact-match entry
Limit	←	field name
500	←	exact-match entry

To test for an approximate match—label entry:

1-2-3 allows you to define *approximate matches* of label entries by using three special characters:


- ? Matches any single character. “h?t” matches “hat”, “hot”, and “hut”, but not “huts”.
- * matches all characters to the end of the label, so “cat*” matches “cat”, “catsup”, and “catechism”, but not “cutthroat”.

~ The tilde character at the beginning of a label-match entry instructs 1-2-3 to accept any label except the one following the tilde. *Empty cells, however, are never selected by any label-match criterion.*

Examples:

~Smith selects all records with a non-empty Name entry other than Smith.

S* selects all records with a non-empty Name entry that begin with the letter S.

 *Label-Match:* [Space Bar] characters always count in an exact or approximate label-match. Extra [Space Bar] characters at the beginning or end of an Input range or Criterion range entry may prevent a match. However, an empty Criterion range cell defines the easiest test—all records “pass”.

Number-Match: The entry “0” matches any cell with a zero value. This includes empty cells and label cells. An empty entry is a test that all records “pass”.

To perform a numeric comparison—number entry or formula entry:

You must enter a *logical formula* in the Criterion range, not a label or number. Unlike label and number match entries, a formula need not be entered in any particular column of the Criterion range—you identify which fields are to be tested in the formula itself.

The most important rules for creating logical formulas for the Criterion range are:

1. Write the formula to “test” the first record (second row) of the database.
2. Use relative addresses to refer to record values.
3. Use absolute addresses to refer to values outside the database.

When you select the Query Command, 1-2-3 changes the reference to sequentially apply the cell in the same column (field) of each record in the Input range. If the value of the formula is *TRUE* (not zero), the record fits the criterion.

For example, you want to select the records in which the field in column Q has a value greater than 100. The field names in the Input range are in row 1, so the first record is in row 2. The criterion formula, in any column of the Criterion range, would be: $+Q2 > 100$. When you select the Query command, 1-2-3 will test this formula. If it is *TRUE*, the record would be selected. It would then check the second record by evaluating $+Q3 > 100$, and so on.

If you want to select the Input range records for which the value in column R is not equal to that in column Q, the criterion is: $+R2 < > Q2$.

To select records for which the value in column R is less than the value in column Q of the previous record, the criterion is: $+R2 < Q1$. The first record will be selected if the value in R2 is negative.

Preparing the Output Range

The Output range is an area of the worksheet to which 1-2-3 copies selected records in a /Data Query Extract or Unique operation. You need not define this range for Find and Delete operations.

The first row contains some or all of the field names from the Input range, in any order. These names determine which fields are to be copied from the selected records.

Each subsequent row is a “slot” for one (partial) record copy. If you specify an Output range that consists only of the field names row, 1-2-3 automatically extends the range down to the bottom of the worksheet (row 2048).

/Data Query Procedure

When you issue the /Data Query command, 1-2-3 displays the Query menu:

Input Criterion Output Find Extract Unique Delete Reset Quit

This is a “sticky menu”: To return to Ready Mode, choose Quit. With the other choices, you enter query specifications, then the Query menu returns.

Note. 1-2-3 “remembers” all query specifications. Thus, you may *not* need to reenter one or more of the specifications the next time you want to query the same records.

When you select Input, Criterion, or Output, 1-2-3 offers to reuse the most-recently specified range: It highlights the range, displaying the addresses of its upper left and lower right corner cells in the control panel.


Press [Return] alone to reuse the same range. You can press [Backspace] to cancel this remembered range or cell and return the pointer to the current cell. Otherwise, revise the specification or enter a new one.

1. Specify an Input range.
 2. Specify a Criterion range.
 3. (Extract, Unique operations only)
Specify an Output range.
 4. Choose a Query operation to perform. To process the database, choose Find, Extract, Unique, or Delete. To cancel the specifications made in steps 1-3, choose Reset. To return to Ready mode without cancelling the specifications, choose Quit.
- } unless you wish to reuse the most-recently specified range of that type

Description of Data Query Operations

Find. 1-2-3 highlights, one by one, the records in the database that satisfy the criteria stored in the Criterion range. 1-2-3 expands the pointer to cover the first such record and places you in Find mode:

- ▼ and ▲ move the highlight to the next and previous selected record. If there are no more such records in that direction, 1-2-3 *beeps*.
- ► and ◀ move the blinking cursor side-to-side within the record. This is useful with databases that are too wide to fit on the display screen.

-  moves the highlight to the database's first record, whether or not it satisfies the criteria. Similarly, [Select] moves the highlight to the last record in the database.
- Press [Return] or [ESC] to end the Find operation. The Query menu returns.



Extract. The Output range, except for its first row, is erased. 1-2-3 copies from the selected records those fields whose names are specified in the Output range. Formula entries: Only the values are copied, not the formulas themselves.

If more records satisfy the criteria than there are “slots” in the Output range, 1-2-3 beeps and displays the error message “Output range full”. You can avoid this problem by specifying a one-row Output range, which 1-2-3 automatically extends down to the bottom of the worksheet (row 2048).

Unique. An Extract in which 1-2-3 makes sure that no two Output range copies are identical. This is especially useful when you are copying only certain fields from the selected records. In such cases, Extract can produce identical Output range copies from different Input range data records.

Delete. The data records that satisfy the criteria are removed, and the Input range definition is shortened accordingly. As a safety precaution, 1-2-3 prompts you to confirm the deletion order (Delete), or to rescind it (Cancel).

Reset. The range specifications for the Input, Criterion and Output ranges are cancelled.

Quit. 1-2-3 returns to Ready Mode, but remembers the Query range specifications you've made.

Notes

1. Use /Data Query to find all records in a database meeting certain conditions, to create a new database containing a subset of the fields and/or records in another database, or to eliminate unwanted records from a database.
2. It is often convenient to use *Split Screen* (/Worksheet Window) when performing a /Data Query. Display the Criterion range in one window and either the Input range or the Output range in the other window.
3. It is often convenient to “freeze” the field names on the screen (/Worksheet Titles) when scrolling through a database.
4. You can use /Range Name Labels Down to provide range names for the fields in the first record (second row) of a database. (*Don't* thereafter issue the same command for the Criterion or Output range. You can't make the

same range name apply to more than one location.) Naming these cells makes it easier to write numeric comparison formulas that refer to the cells.

5. The database statistical functions (@DCOUNT, @DSUM, @DAVG, @DMIN, @DMAX, @DVAR, @DSTD) generate statistics on records selected from a database. These functions require an Input range and Criterion range, just as the /Data Query commands do. See page 17-15 for details.

/Data Distribution

/DD

Analyze a range of numbers or formulas by counting how many values fall into a group of specified intervals.

Procedure

Before issuing this command, you must prepare a *Bin range*. This range must be a single column, containing numbers or formulas whose values increase from top to bottom. Be sure that:

- A. There is an empty column to the right of the Bin range; This is the “results column”, in which 1-2-3 will record the “counts” that make up the frequency distribution.
- B. The cell below the results column is empty.

Procedure

1. Specify a *Values range*, wherein the values to be analyzed are stored.
2. Specify the *Bin range* you’ve constructed.

Note. 1-2-3 “remembers” the most recently entered Value and Bin ranges. Thus, you may *not* need to reenter these specifications the next time you want to calculate a frequency distribution.

When prompting you to specify these ranges, 1-2-3 offers to reuse the most recently entered specification. It highlights the range, displaying the addresses of its upper left and lower right corner cells in the control panel.

Press [Return] alone to reuse the same specification. You can press [Backspace] to cancel this remembered range or cell and return the pointer to the current cell. Otherwise, revise the specification or enter a new one.

Results

1-2-3 counts how many values in the Values range fall into each interval defined by the Bin range. The counts are put into the results column to the right of the Bin range:

- The first cell in the results column contains the count of the number of values in the Values range less than or equal to the first value in the Bin range.
- Each successive cell in the results column contains the count of values greater than the previous bin value, and less than or equal to the bin value to its left.
- The last cell, in the row below the end of the Bin range, contains the count of values greater than the last (and greatest) value in the Bin range.



The previous contents of the results range and the cell below it are lost.

Notes

1. To produce a histogram corresponding to the frequency distribution, create a Bar graph with the frequency counts as the A range. To label the bars, make the Bin range the X range of the graph.
2. If the entries in the Value or Bin range are changed, the frequency count is not updated automatically. To do so, issue the /Data Distribution command again, using the same ranges: /DD[Return][Return].
3. /Data Fill provides a convenient facility for creating Bin ranges with equal intervals.
4. The @MAX and @MIN functions can help you to determine appropriate upper and lower limits for the Bin ranges.
5. Empty cells and label cells in the Value range are equivalent to “0” number entries.

18. Quit Command

The `/Quit` command ends a 1-2-3 work session. Ending a 1-2-3 session is *not* like ending a session with certain other computer programs:

1-2-3 does not automatically save your work when you end a session.

That means it is entirely possible for you to work diligently for hours, then have it all disappear with a few careless keystrokes. 1-2-3 tries to prevent this from happening—it requires you to confirm the `/Quit` command at this menu by responding to a prompt for **No** or **Yes**.

- Selecting *No* cancels the `/Quit` command and returns you to Ready Mode.
- Selecting *Yes* ends the session without further delay. Control returns to P.A.M. or the MS-DOS command prompt, whichever you were using when you started the 1-2-3 session.

What to Do Before Ending a Session

There are several ways in which you can save your work at any time during a 1-2-3 session. In fact, we strongly suggest that you save your work often (for instance, every 15 minutes) to soften the effects of such disasters as issuing an erroneous command that destroys your work.



If you have any work to save, be sure to perform one or more of these data-storage procedures before issuing a `/Quit` command:

1. **`/File Save` command.** This command stores your entire worksheet, exactly as it currently stands, in a *worksheet file*.
2. **`/File Xtract` command.** This command stores any range you specify, exactly as it currently stands, in a *worksheet file*. Only the range you specify will be saved. The rest of the worksheet is *not* saved.

These two commands, and *only* these two commands, allow you to continue using a worksheet at a later time, picking it up exactly as you left it. The `/File Retrieve` command pulls a stored worksheet out of its worksheet file and restores it to the display screen.

(See Chapter 14, “File Commands” for additional details regarding these commands.)

3. **`/Print` commands.** In certain situations, you may not want to preserve your work as a 1-2-3 worksheet file. Perhaps you just want to compose a quick memo. Or you may be preparing data for use by another program, or for printing at a later date. In such cases, you may find a `/Print` command satisfies your needs. The `/Print Printer` command sends a “snapshot” of any specified range directly to your computer’s printer. The `/Print File` command performs the same function, but stores its output in a *print file* instead of sending it to the printer.





19. 1-2-3 Function Reference

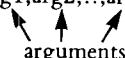
This chapter is a reference to 1-2-3's “@ functions”. Most of the text is in outline format to facilitate ready access when you need to implement an @ function in a worksheet sequence.

An @ **function** is like a “built-in” formula. By definition, it has a numeric or logical value (or *ERR* or *NA*) which depends on, or is derived from, its **arguments**. These arguments are part of the @ function *and* are integral to determining its ultimate value (or output). Arguments can be numbers, cell or range references, or even other functions.

Each @ function has a particular name which is usually an abbreviation of its function or a mnemonic (prefix or acronym) combined with an abbreviation. The subsequent pages contain lists of the @ functions categorized by the generic functions they perform. Each generic grouping has its own special way of accepting and recognizing arguments.

Entering an @ Function

Type the function name in any combination of uppercase and lowercase letters, followed by its arguments. The function name always begins with an @ sign; the arguments are always enclosed in parentheses immediately succeeding the function name. Each argument is separated by commas. The only spaces allowed in a function are those within a range name:

@functionname(arg1,arg2,...,argN)

 arguments





Arguments Can Be a Single Value or a Range

Depending on the function, an argument can be either a *single value* or a *range*. But, for a function to work, there must be the correct number of arguments, in the correct order, and of the correct type—*single value* or a *range*. The outlines on the following pages will illustrate the requirements.

- Where a function requires a **single value** argument, you may use any of the following:
 - number
 - cell address
 - function
 - range name that names a single cell
 - formula
- Where a function requires a *range* argument, you may use any of the following:
 - cell address..cell address (separate with one or more periods)
 - range name (in some cases, a multiple-cell range is required)

You can specify cell and range references either by pointing or by typing.

Note. Some functions, such as @ERR, do not take an argument. With these functions, don't use any parentheses at all—e.g. @ERR() is *not* valid. Other functions may take a variety of arguments, as indicated below.

In this reference, some functions are shown with the argument *list*. In this case, the argument can be a single cell, a range, or a list of cells and ranges, with the entries separated by commas.

Empty Cells

Cells with label entries are the same as zeros. An empty cell counts as a zero if specified individually (e.g., B14). An empty cell is ignored altogether if specified as part of a range (e.g. B14..B21).

See the “@ Functions” section (page 8-22) for an introduction to using 1-2-3's @ functions.

Function Summary

The @ functions are listed by category in this section. An alphabetical cross-reference summary begins immediately following this section.

Mathematical Functions

Argument requirements: x , y , and n must be single values

@ABS(x)	absolute value
@ACOS(x)	arc cosine
@ASIN(x)	arc sine
@ATAN(x)	2-quadrant arc tangent
@ATAN2(x,y)	4-quadrant arc tangent of y/x
@COS(x)	cosine
@EXP(x)	exponential
@INT(x)	integer part
@LN(x)	log base e
@LOG(x)	log base 10
@MOD(x,y)	x modulo y
@PI	the number $\pi = 3.14159\dots$
@RAND	random number between 0 and 1
@ROUND(x,n)	round a number to n digits
@SIN(x)	sine
@SQRT(x)	square root
@TAN(x)	tangent

Logical Functions

Argument requirements: x , *true-value*, *false-value*, and *cond* must be single values

@FALSE	the value 0 (<i>FALSE</i>)
@TRUE	the value 1 (<i>TRUE</i>)
@ISNA(x)	the value 1 (<i>TRUE</i>) if expression x has the value <i>NA</i>
@ISERR(x)	the value 1 (<i>TRUE</i>) if expression x has the value <i>ERR</i>
@IF(<i>cond</i> , <i>true-value</i> , <i>false-value</i>)	<i>true-value</i> if <i>cond</i> is <i>TRUE</i> ; <i>false-value</i> if <i>cond</i> is <i>FALSE</i>



Special Functions

Argument requirements:

x, *row#*, *col#*, *v0*, *v1*, *v2*, . . . must be single values
range must be a multiple-cell range

@NA	the value <i>NA</i> (not available)
@ERR	the value <i>ERR</i> (error)
@CHOOSE(<i>x</i> , <i>v0</i> , <i>v1</i> ,... <i>vn</i>)	select argument value
@HLOOKUP(<i>x</i> , <i>range</i> , <i>row#</i>)	horizontal table lookup
@VLOOKUP(<i>x</i> , <i>range</i> , <i>col#</i>)	vertical table lookup

Financial Functions

Argument requirements:

x, *pmt*, *int*, *term*, *prn*, and *guess* must be single values
range must be a multiple-cell range

@IRR(<i>guess</i> , <i>range</i>)	internal rate of return
@NPV(<i>x</i> , <i>range</i>)	net present value
@FV(<i>pmt</i> , <i>int</i> , <i>term</i>)	future value
@PV(<i>pmt</i> , <i>int</i> , <i>term</i>)	present value
@PMT(<i>prn</i> , <i>int</i> , <i>term</i>)	mortgage payment

Date Functions

Argument requirements:

year, *month*, and *day* must be single values
serial number must be a single value

@DATE(<i>year</i> , <i>month</i> , <i>day</i>)	serial number of date 1=01-Jan-1900 to 73049=31-Dec-2099
@TODAY	today's date
@DAY(<i>serial number</i>)	day number
@MONTH(<i>serial number</i>)	month number
@YEAR(<i>serial number</i>)	year number

Statistical Functions

Argument requirements: Any number of arguments, of any type, may be included in the list.

@COUNT(<i>list</i>)	number of items in list
@SUM(<i>list</i>)	sum of all items in list
@AVG(<i>list</i>)	average of all items in list
@MIN(<i>list</i>)	minimum of all items in list
@MAX(<i>list</i>)	maximum of all items in list
@STD(<i>list</i>)	standard deviation of all items in list
@VAR(<i>list</i>)	variance of all items in list

Database Statistical Functions

These functions operate on the values in particular fields of records selected from a database.

Argument requirements:

input must be a valid Input range (/Data Query Input)

criterion must be a valid Criterion range (/Data Query Criterion)

offset must be a single value

@DCOUNT(<i>input,offset,criterion</i>)	number of items in field
@DSUM(<i>input,offset,criterion</i>)	sum of items in field
@DAVG(<i>input,offset,criterion</i>)	average of items in field
@DMIN(<i>input,offset,criterion</i>)	minimum of items in field
@DMAX(<i>input,offset,criterion</i>)	maximum of items in field
@DSTD(<i>input,offset,criterion</i>)	standard deviation of items in field
@DVAR(<i>input,offset,criterion</i>)	variance of items in field

Alphabetical Function Reference

@ABS(*x*) Absolute value of *x*

@ABS(1.258) → 1.258

@ABS(-6.2) → 6.2

@ABS(DIFF_FACTOR) → absolute value of the value DIFF_FACTOR (valid only if the range name is assigned to a single cell).

@ACOS(*x*) (Arc cosine) The angle, in radians, whose cosine is *x*

@ASIN(*x*) (Arc sine) The angle, in radians, whose sine is *x*

If the value *x* is not between -1 and +1, the value is *ERR*. The @ACOS value is always between 0 and π . The @ASIN value is always between $-\pi/2$ and $+\pi/2$.

@ACOS(-.3) → 1.8754889 (radians)

@ASIN(.5)*180/@PI = 30 (additional calculations convert to degrees)

@ACOS(B1) → ERR if B1 contains 4.5.

@ATAN(*x*) (Arc tangent) The angle, in radians, whose tangent is *x*

There is no restriction on the value of *x*. The function value is always between $-\pi/2$ and $+\pi/2$.

@ATAN(1) → 0.7853 (radians)

@ATAN(B1) → angle whose tangent is the value in cell B1.



@ATAN2(x,y) (Arc tangent) The angle, in radians, whose tangent is the value y/x

This function differs from **@ATAN(x)** in that its result can be any value between $-\pi$ and $+\pi$:

value of x	value of y	value of @ATAN2(x,y)
positive	positive	between 0 and $\pi/2$
negative	positive	between $\pi/2$ and π
negative	negative	between $-\pi$ and $-\pi/2$
positive	negative	between $-\pi/2$ and 0

If $x = 0$ and $y = 0$, the value is *ERR*.

x	y	value of @ATAN2(x,y)
1.5	2	0.9273
-1.5	2	2.2143
-1.5	-2	-2.2143
1.5	-2	-0.9273

@AVG(list) Average of all cell values in the list

If there are no values to be averaged, the result is *ERR*. For instance, **@AVG(B10..F29)** \rightarrow *ERR* if the range B10..F29 contains only empty cells.

Note. **@AVG(list)** \rightarrow **@SUM(list)/@COUNT(list)**

@AVG(2,7,4,22) \rightarrow 8.75

@AVG(B1,4,B5..B75,OTHER_RANGE) \rightarrow average of a single cell, a number, and the values in two ranges. **OTHER_RANGE** may name a single cell or a multiple-cell range.

@CHOOSE(x,v0,v1,...,vn) Use the value x to select one of the values $v0, v1, v2, \dots, vn$

If the selector value, x , is not a whole number, 1-2-3 ignores its fractional part, using just its integer part. The value x selects one value from the list $v0, v1, v2, \dots$ as follows:

- If $x = 0$, then **@CHOOSE** \rightarrow $v0$.
- If $x = 1$, then **@CHOOSE** \rightarrow $v1$.
- If $x = 2$, then **@CHOOSE** \rightarrow $v2$.
- If $x < 0$ or $x > n$, then **@CHOOSE** \rightarrow *ERR*.

(That is, an error occurs if the selector value is less than zero or is larger than the number of items to be selected.)

@CHOOSE(H20,12,B1,LAST__VALUE)

The result is 12 if H20 contains 0.

The result is the value in cell B1 if H20 contains 1.3.

The result is the value in the cell named LAST__VALUE if H20 contains 2.95.

Note. You may use **@CHOOSE** as an alternative to creating an **@HLOOKUP** (or **@VLOOKUP**) table whose lookup row (or column) has the entries 0,1,2,3,....

Since **FALSE** = 0 and **TRUE** = 1, these two functions have virtually the same meaning:

@CHOOSE(x,false-value,true-value)

@IF(x,true-value,false-value)

@COS(x)

Cosine of x (x in radians)

To convert the value x , in degrees, to radians, use this formula:

$x * @PI / 180$

@COS(@PI) → -1

@COS(60*@PI/180) → 0.5

@COUNT(list)

Number of cell entries in a list

A *single value* (number, cell address, one-cell range name, etc.) on the argument list counts 1—irrespective of the actual value. Note these special cases:

- **@COUNT(0)** → 1
- **@COUNT(@ERR)** and **@COUNT(@NA)** → 1 (These are the only cases in which the “ripple-through-the-worksheet” effect of *NA* and *ERR* is halted.)
- **@COUNT(H54)** → 1 even if cell H54 is empty
- If the argument list includes a range specification, then 1-2-3 counts all non-empty cells within the range. If A3 is the only blank cell in the range A1..A4, then:

@COUNT(A1..A4) → 3

@COUNT(A3) → 1

@DATE(year,month,day)

“Serial number” of a particular date

Each date has a particular *serial number*:

Jan 1, 1900 = 1 Dec 31, 1999 = 36525

Jan 2, 1900 = 2 Jan 1, 2000 = 36526

Jan 1, 1901 = 367 Dec 31, 2099 = 73049



The year argument must have a value between 0 (standing for 1900) and 199 (standing for 2099).

1-2-3 checks to make sure the month and day argument values are reasonable:

- @DATE(83,14,8) → *ERR*, since there is no 14th month.
- @DATE(83,4,31) → *ERR*, since April (the 4th month) has only 30 days.

In most cases, you will want to display the serial number of a date in a special Date numeric display format. (See the command summaries of the /Worksheet Global Format and /Range Format commands.)

@DATE(82,9,27) → 30221 or 27-Sep-82 (Date format).

@DATE(B3,B1,B2) → serial number of the date whose month is the value in cell B1, whose day is in B2, and whose year is in B3.

@DAY(*serial number*) Day of the month (1-31) of a given date

The date argument must be the *serial number* of the desired date, as produced by the @DATE or @TODAY function.

@DAY(@DATE(85,3,27)) → 27

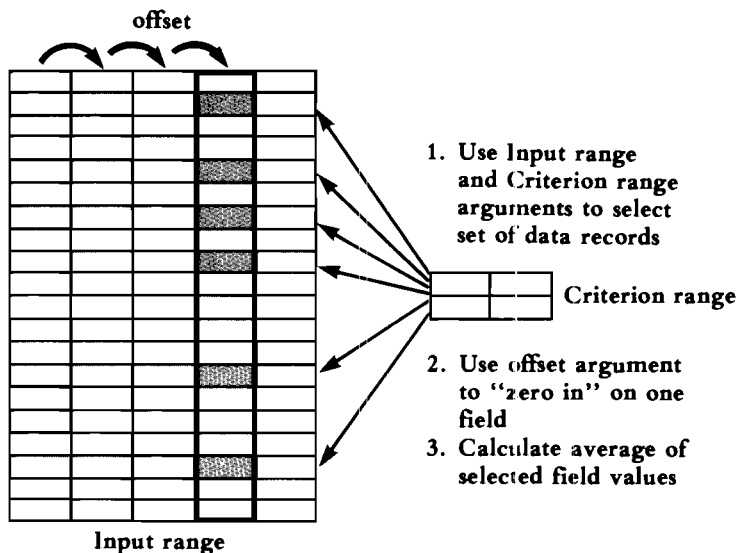
@DAY(B4) → the day (1-31) of the date whose serial number is in cell B4.

@DAVG(<i>input,offset,criterion</i>)	@DSTD(<i>input,offset,criterion</i>)
@DCOUNT(<i>input,offset,criterion</i>)	@DSUM(<i>input,offset,criterion</i>)
@DMAX(<i>input,offset,criterion</i>)	@DVAR(<i>input,offset,criterion</i>)
@DMIN(<i>input,offset,criterion</i>)	

These functions are database counterparts to the statistical functions @AVG, @COUNT, etc. The @AVG operation, for instance, finds the average value of a list of arguments. The @DAVG function selects certain records from a database. Then, it “zeroes in” on one field (column) of the selected records and calculates the average value.

All the database statistical functions work in this same way:

1. 1-2-3 uses the criteria stored in a Criterion range (*criterion* argument) to select certain records from a database (*input* argument). In specifying these ranges as arguments to the function, you type cell addresses or range names just as you would in a /Data Query command.
2. Using the *offset* argument, 1-2-3 focuses its attention on a certain field (column) of the selected records. If *offset* = 0, 1-2-3 uses the leftmost column; if *offset* = 1, it uses the second column; etc.
3. 1-2-3 performs the statistical operation (average, sum, maximum, etc.) on the single column of selected values. For details on these statistical operations, consult the descriptions of @AVG, @COUNT, @MAX, etc. in this chapter.



Consider the database (Input range) and the two Criterion ranges pictured here:

	A	B	C	D	E	F
1	Item	Quantity	Type		Type	Item
2	1001	2	nut		nut	+ A2 > 1001
3	1002	4	bolt			
4	1003	0	nut			
5	1004	17	bolt			

- @DAVG(DATAB,0,CRIT_1) → @AVG(1001,1003) → 1002

The label-match criterion "nut" causes the records in rows 2 and 4 to be selected. The average of the values in column 0 (*Item* field) of the selected records is 1002.

- @DAVG(DATAB,1,CRIT_1) → @AVG(2,0) → 1

The same records are selected. The average of the *Quantity* field items is 1.

- @DMAX(DATAB,1,CRIT_2) → @MAX(4,0,17) → 17

The formula criterion in cell F2 causes the records in rows 3-5 to be selected. In these records, the largest *Quantity* field value is 17.



@ERR The value *ERR* (error)

Use this function to force 1-2-3 to display *ERR* in the worksheet. All cells whose values depend on an *ERR* cell also become *ERR* cells. Exception: See @COUNT.

@IF(B14 > 3.2,@ERR,B14)

If the value in cell B14 exceeds 3.2, *ERR* is displayed in the cell.

@EXP(x) The number *e* raised to the *x* power

If the argument *x* is very large (approximately 230), the value is *ERR*, displayed as *****

@EXP(1.258) → 3.5183776

@FALSE The value 0

1-2-3 regards the value 0 to be equivalent to the logical condition *FALSE*. You can use a *FALSE* value as a selector with an @CHOOSE or @IF function.

@IF(B50,75,99.50)

If cell B50 contains @FALSE, then the value of this @IF function is 99.50.

@FV(pmt,int,term) Future value of an annuity

Yields the future value of an ordinary annuity (series of payments). It uses *pmt* as the per-period payment, *int* as the per-period interest rate, and *term* as the number of periods. 1-2-3 assumes a single payment is made at the *end* of each period. (With an *annuity due*, payments are made at the beginnings of periods.)

The formula used is:

$$\text{@FV result} = \text{pmt} * \frac{(1 + \text{int})^{\text{term}} - 1}{\text{int}}$$

@FV(1000,14.5%,5) → 6675.9352

Yields the value at the end of five years of a series of five yearly \$1000 investments. The yearly interest rate is 14.5%, compounded yearly for 5 years.

Note that the number of payments and the compounding period are assumed to be the same.

@HLOOKUP(x,range,row#) Horizontal table lookup

Arguments:

range (lookup-range). A range specification that identifies the lookup table itself. The top row (row 0) of the table is the **lookup row**, the set of values with which 1-2-3 compares the selector value. These values must be in ascending order, with no repeats. Subsequent rows contain the potential results of a lookup operation.

x (selector value) During a lookup, 1-2-3 compares this value with those in the lookup row. This process selects a particular column of the table. There need not be an exact match, however. See “How 1-2-3 Does a Lookup” below.

row# Indicates which value in the selected column is the final result of the @HLOOKUP function.

How 1-2-3 Does a Lookup

- 1-2-3 locates the first value in the lookup row that *exceeds* the selector value, *x*. Then, it backs up to the *previous column*. If the selector value is greater than all entries in the lookup row, the last column is selected.
- 1-2-3 uses the *row#* argument to count down the selected column: the lookup row is 0, the next row is 1, etc. The numeric value of the cell reached in this way is the result of the @HLOOKUP function.

Errors. If the first cell in the lookup row exceeds the selector value, the result is *ERR*. If *row#* is negative or exceeds the number of rows in the lookup range, the result is *ERR*.

Examples:

"TAX_TABLE"		Income	Status	Tax		
		\$6,089	2	\$381		
	Over	\$6,000	\$6,050	\$6,100	\$6,150	\$6,200
1	Single	599	618	617	626	634
2	Joint	373	381	389	397	405
3	Separate	709	719	730	740	750
4	Head	547	555	563	571	579

@HLOOKUP(INCOME,TAX_TABLE,STATUS) → 381 if INCOME = 6089 and STATUS = 2 (as shown above).

@HLOOKUP(INCOME,TAX_TABLE,STATUS) → 709 if INCOME = 6011 and STATUS = 3.

@HLOOKUP(INCOME,TAX_TABLE,STATUS) → ERR if INCOME < 6000.

@IF(*x*,*true-value*,*false-value*) Use a “truth-test” to choose between two values

The “truth-test” is performed on the argument *x*. If *x* is non-zero (*TRUE*), then the result is the *true-value* argument. If *x* is zero (*FALSE*), then the result is the *false-value* argument.

@IF(B1 > B2,1000, - 55)

1-2-3 evaluates the logical formula “B1 > B2” to *TRUE* (i.e. 1) or *FALSE* (i.e. 0), depending on whether the value in cell B1 exceeds that in cell B2. If the condition is *TRUE*, then the result of the @IF function is 1000. If the condition is *FALSE*, then the result of the @IF function is - 55.



@INT(x) Integer part of *x*

@INT(1.258) → 1

@INT(-1.258) → -1

@INT(H5/100) → The number of “hundreds” contained in the value stored in cell H5

@IRR(guess,range) Internal rate of return

Yields an approximate internal rate of return for a series of cash payments made at regular intervals. You must “prime the pump” with a guess at the correct answer.

Internal rate of return is defined as the interest rate that makes the net present value of the series of cash flows zero. 1-2-3 uses an iterative scheme to calculate the internal rate of return.

The result is *ERR* if 1-2-3 cannot approximate the answer to within .0000001 after 20 iterations.

In some cases, 1-2-3’s calculation scheme produces different results with different guesses. In most cases, you should choose a *guess* value between 0 and 1.

@IRR(14%,A2..A6) → .102212 if the range A2..A6 contains the values -1000, 500, 400, 200, and 100.

If the “400” cash flow were changed to “-200”, using @IRR would be inappropriate, since there would be no unique result.

@ISERR(x) Tests whether or not a cell has the value *ERR*

@ISERR yields *TRUE* (i.e. 1) if the argument *x* is @ERR or refers to a formula whose current value is *ERR*. Otherwise, the result is *FALSE* (i.e. 0).

@ISERR(B1) → *TRUE* (1) if the formula in cell B1 currently is displayed as *ERR*.

@ISNA(x) Tests whether or not a cell has the value *NA*

Yields *TRUE* (i.e. 1) if the argument *x* is @NA or refers to a formula whose current value is *NA*. Otherwise, the result is *FALSE* (i.e. 0).

@ISNA(B1) → *TRUE* (1) if the formula in cell B1 currently is displayed as *NA*.

@LN(<i>x</i>)	Natural logarithm (base <i>e</i>) of <i>x</i>
@LOG(<i>x</i>)	Common logarithm (base 10) of <i>x</i>

If *x* is zero or negative, the result is *ERR*.

@LN(1.258) → 0.2295236

@LOG(1.258) → 0.09968064

@LN(@EXP(J7)) → the value in cell J7; @LN and @EXP are *inverse* functions.

@MAX(<i>list</i>)	Maximum of the values in a list
@MIN(<i>list</i>)	Minimum of the values in a list

If there are no entries in the list, the function returns the result *ERR*. If a range is included in the list, empty cells in the range are ignored.

With these cell entries: H1: 56 H2: 14 H3: empty H4: -20

@MAX(H1..H4) → 56

@MIN(H1..H4) → -20

@MIN(H1..H3) → 14 (not 0)

@MIN(H1..H2,H3) → 0

@MOD(<i>x</i> , <i>y</i>)	Integer remainder when <i>x</i> is divided by <i>y</i>
-----------------------------	--

1-2-3 calculates this as: $x - (y * @INT(x/y))$. If *y* = 0, the result is *ERR*.

@MOD(15,7) → 1

@MONTH(<i>serial number</i>)	Month of the year (1-12) of a given date
--------------------------------	--

The serial number argument must be the *serial number* of the desired date, as produced by the @DATE or @TODAY function.

@MONTH(@TODAY) → 9 in September. @MONTH(@TODAY + 90) → The month in which the due date falls for today's purchase, assuming 90-day terms.

@NA	The value <i>NA</i> (not available)
-----	-------------------------------------

@IF(B14 > 3.2,@NA,B14)

This formula "filters" a cell value. If B14's value exceeds the cutoff point, 3.2, then the current cell and all others depending on it will be displayed as *NA*. Exception: see @COUNT.



@NPV(x,range)

Net present value

Yields the net present value of a series of future cash flows. The first cash flow is assumed to be made at the *end* of the first period. Subsequent cash flows occur at the end of the 2nd, 3rd, 4th, etc. periods. 1-2-3 uses *x* as the per-period interest rate. The *range* must be in a single column or single row.

If $V_1 \dots V_n$ are the values in the range, then:
$$NPV = \sum_{i=1}^n \frac{V_i}{(1+x)^i}$$

Here's how to find the net present value of an initial flow, occurring now, followed by a series of future flows, starting one period from now:

- If: INITIAL = single cash flow now
- SERIES = range of future flows (receipts or payments)
- RATE = per-period interest rate

Then: The net present value of the entire set of cash flows is:

INITIAL + @NPV(RATE,SERIES)

Example: An initial payment of \$1000 is followed by four receipts of \$400 each. At 10.5% interest, the four positive flows yield an @NPV value of \$1254.343. Balancing this result with the initial \$1000 payment, the overall net present value is \$254.343.

@PI

The value π (3.141592653589794)

Note that @PI does not take an argument. Use @PI to convert a value, *x*, in degrees to radians for use with @COS, @SIN, and @TAN:

$x * @PI / 180$

@PI → 3.141592...

@SIN(30 * @PI / 180) → 0.5 (the sine of 30 degrees is 0.5)

@PMT(prn,int,term)

Per-period mortgage payment

Yields the mortgage payment for a given principal (*prn*), per-payment interest rate (*int*), and number of payments (*term*). The formula used is:

@PMT result =
$$pmt * \frac{int}{1 - (1 + int)^{-term}}$$

@PMT(50000,14.5%/12,25*12) → 621.0815

This is the payment on a \$50,000 25-year mortgage, with a 14.5% annual interest rate. Note the use of "/12" to produce the *per-payment* interest rate and "*12" to convert years to the number of payments.



@PV(pmt,int,term)

Present value

Yields the present value of an ordinary annuity (series of payments). 1-2-3 uses *pmt* as the per-period payment, *int* as the per-period interest rate, and *term* as the number of periods. 1-2-3 assumes a single payment is made at the *end* of each period. (With an *annuity due*, payments are made at the beginnings of periods.)

The formula used is:

$$\text{@PV result} = \text{pmt} * \frac{1 - (1 + \text{int})^{-\text{term}}}{\text{int}}$$

@PV(1000,14.5%,5)

Yields the present value of a series of \$1000 payments, invested at 14.5% and compounded yearly for 5 years.

@RAND

Random number between 0 and 1

Note that @RAND does not take an argument. Each time 1-2-3 recalculates the worksheet, the value of this function changes. If you want to generate a set of random numbers just once, convert the formulas to values. (Use the [F9/Calc] key or a /File Xtract-/File Combine routine.)

50*@RAND → a random number between 0 and 50

@ROUND(x,n)

The value *x* rounded to *n* digits

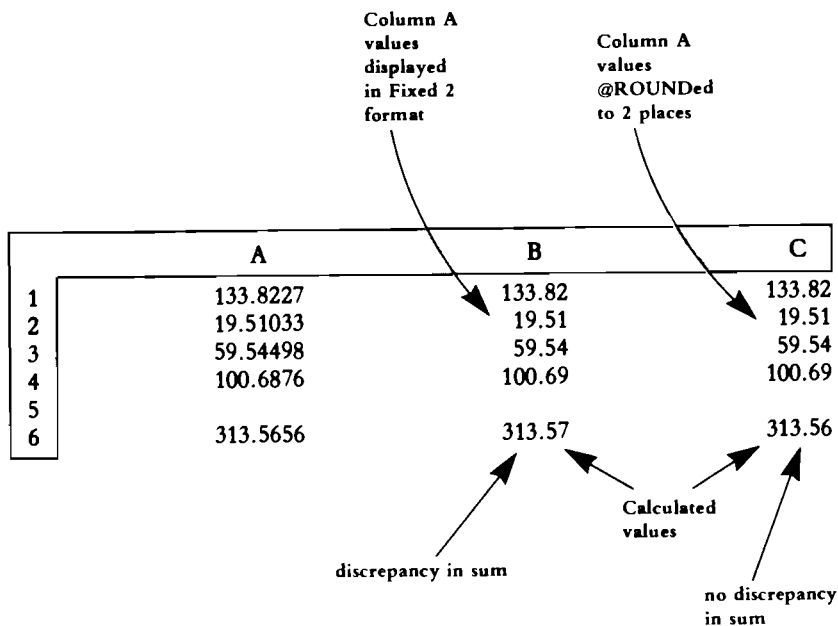
1-2-3 rounds the value *x* to the number of digits specified by *n*. (*n* is truncated to an integer and must be in the range from -15 to +15, inclusive.)

If *n* is zero, then *x* is rounded to an integer. If *n* is positive, then *x* is rounded to a number of decimal places. If *n* is negative, then *x* is rounded to the nearest 10, or the nearest 100, or the nearest 1000, etc.

Value in Cell H12	Value of @ROUND(7145.258,H12)
-3	7000
-2	7100
-1	7150
0	7145
1	7145.3
2	7145.26
3	7145.258



Use the @ROUND function to ensure accurate currency calculations. A typical worksheet calculates currency amounts that include fractions of a penny (or dollar or millions of dollars). When a column of such numbers is totaled and formatted without fractional amounts (e.g. Currency 2 format), discrepancies may appear. Solve this problem by using @ROUND to round off the fractional values before totaling them.



@SIN(x)

The sine of x (x in radians)

To convert a value x , in degrees, to radians, use this formula:

$$x * @PI / 180$$

$$@SIN(1.258) \rightarrow .95147680$$

$$@SIN(90 * @PI / 180) \rightarrow 1 \text{ (the sine of 90 degrees is 1)}$$

@SQRT(x)

Square root of x

If x is negative, the result is *ERR*.

$$@SQRT(2) \rightarrow 1.4142$$

@STD(list) Standard deviation of a list of values

1-2-3 calculates the *population standard deviation* value (“unbiased”) by taking the square root of the population variance (@VAR value—page 19-18). If @COUNT(list) is zero, the result is *ERR*. Empty cells in the range are ignored. Label cells count as zeros.

To use the *sample* standard deviation, you need to do a bit more calculating:

If cell G10 contains @COUNT(B1..C20) and G11 contains @STD(B1..C20), then this formula calculates the sample standard deviation:

@SQRT(G10/(G10 - 1))*G11

@STD(A1..A4) → 6.159076 if the range A1..A4 contains the values 45.60, 33.01, 41.00, and 49.57.

@SUM(list) Sum of a list of values

Label cells count as zeros. Empty cells are ignored.

@SUM(17,A10,A20,B1..C50) → the sum of 102 cell values and the number 17.

@TAN(x) Tangent of x (x in radians)

If $x = \pi/2 + \pi * n$ ($n =$ any integer), the result is *ERR*. These “forbidden” numbers are the radian equivalents of 90°, 270°, 450°, etc.

@TAN(45*@PI/180) → 1

@TODAY The *serial number* of today's date

“Today” is the day you enter at MS-DOS's prompt when you start the computer. Always be sure to enter the proper date and time.

The serial number may be used with the @YEAR, @MONTH, and @DAY functions. You may also perform operations with serial numbers as you would with any other integers. Assign cells with serial-number entries one of the three Date numeric display formats (page 8-25).

@TODAY → 30507 on July 10, 1983.

@TRUE The Value 1

1-2-3 regards the value 1 to be equivalent to the logical condition *TRUE*. You can use a *TRUE* value as a selector with an @CHOOSE or @IF function.

@IF(B50,75,99.50)

If cell B50 contains @TRUE, the value of this @IF function is 75.



@VAR(list) Variance of a list of values

1-2-3 calculates the *population variance* value (“unbiased”). If @COUNT(list) is zero, the result is *ERR*. Empty cells in the range are ignored.

To use the *sample variance*, you need to do a bit more calculating:

If cell G10 contains @COUNT(B1..C20) and G11 contains @VAR(B1..C20), then this formula calculates the sample variance:

$$+ G10/(G10 - 1)*G11$$

@VAR(A1..A4) → 37.93422 if the range A1..A4 contains the values 45.60, 33.01, 41.00, and 49.57.

@VLOOKUP(x,range,col#) Vertical table lookup

Arguments:

range (lookup-range) A range specification that identifies the lookup table itself. The first column of the table is the **lookup column**, the set of values with which 1-2-3 compares the selector value. These values must be in ascending order, with no repeats. Subsequent columns contain the potential results of a lookup operation.

x (selector value) During a lookup, 1-2-3 compares this value with those in the lookup column. This process selects a particular row of the table. There need not be an exact match, however. See “How 1-2-3 Does a Lookup” below.

col# Indicates which value in the selected row is the final result of the @VLOOKUP function.

How 1-2-3 Does a Lookup

1. 1-2-3 locates the first value in the lookup column that *exceeds* the selector value, *x*. Then, it backs up to the *previous row*. If the selector value is greater than all entries in the lookup column, the last row is selected.
2. 1-2-3 uses the *col#* argument to count across the selected row: the lookup column is 0, the next column is 1, etc. The numeric value of the cell reached in this way is the result of the @VLOOKUP function.

Errors. If the first cell in the lookup column exceeds the selector value, the result is *ERR*. If *col#* is negative or exceeds the number of columns in the lookup range, the result is *ERR*.

Examples:

	Income	Status	Tax	
"TAX__TABLE"	\$6,089	2	\$381	
	1	2	3	4
Over	Single	Joint	Sep.	Head
\$6,000	599	373	709	547
\$6,050	618	381	719	555
\$6,100	617	389	730	563
\$6,150	626	397	740	571
\$6,200	634	405	750	579

@HLOOKUP(INCOME,TAX__TABLE,STATUS) → 381 if INCOME = 6089 and STATUS = 2 (as shown above).

@HLOOKUP(INCOME,TAX__TABLE,STATUS) → 709 if INCOME = 6011 and STATUS = 3.

@HLOOKUP(INCOME,TAX__TABLE,STATUS) → ERR if INCOME < 6000.

@YEAR(serial number) Year (0-199) of a given date

The date argument must be the *serial number* of the desired date, as produced by the @DATE or @TODAY function.

The following chart shows how 1-2-3 handles year numbers:

Year argument to @DATE or @TODAY functions	Corresponding calendar year	Displayed in Date numeric format
0	1900	01-Jan-00
1	1901	01-Jan-01
2	1902	01-Jan-02
99	1999	01-Jan-99
100	2000	01-Jan-2000
101	2001	01-Jan-2001
199	2099	01-Jan-2099

@YEAR(@TODAY) → The current year

@YEAR(@TODAY + 365) → Next year (unless it is currently January 1 of a leap year)



20. Printing 1-2-3 Graphs

PrintGraph is the program that allows you to print or plot graphs saved as picture files using the 1-2-3 command: /Graph Save. PrintGraph allows you to control the way your graphs are printed. Graphing parameters such as colors used in the graphing, fonts (character styles), and orientation (position on the paper) may be adjusted to fit the needs of the graph(s) you want to print. PrintGraph also allows you to “queue” graphs to be printed; that is, you can select a series of graphs and PrintGraph will print them in the order you define. And, as with 1-2-3, Help is never more than a keystroke away. Pressing the [F1/Help] key gives you a Help screen appropriate to your current action.

Like 1-2-3, PrintGraph needs to know what graphics device is connected to your computer. Often you will be using the same printer to reproduce both worksheets and graphs, but you will still need to give PrintGraph that information. Chances are, though, that you'll only need to specify that information to PrintGraph once, when you first “configure” PrintGraph; after that PrintGraph will “remember” the configuration of your system.

This chapter will show you how to configure PrintGraph for your system, and how to use PrintGraph to print the graphs produced by 1-2-3.

Note. Not all printers can be used to create 1-2-3 graphs. If in doubt, consult your dealer.

How to Start PrintGraph

Because PrintGraph is supplied on a program disk, you need to have an external disk drive connected to your computer to run PrintGraph. (Refer to chapter 6 of *Using the Portable PLUS*.) Before starting PrintGraph, insert the 1-2-3 Utilities disk into Drive C.*

1. If you are in 1-2-3, you must save your current worksheet or graph using /File Save or /Graph Save.
2. Then, exit to the P.A.M. main menu by selecting /Quit Yes.
3. Press [F4/Reread Discs]. When PrintGraph appears on the P.A.M. screen, move the cursor to it and then press [F1/Start Applic].

If you should get the error **Program too big to fit in memory**, you must expand main memory in the System Configuration. After pressing [ESC] to remove the error condition, call up the System Configuration menu ([F5] on the P.A.M. menu). Then press [F3/Next Choice] to increase the size of main memory to at least 120. (To get at least 120K in main memory, you may need to store files from your electronic disk on a flexible disk, or you may need to add an HP 82981A 128K Memory Drawer.) Now exit the System Configuration and repeat step 3.

* Remember that it is best to work with a *copy* of your original disk, and retain the original for safekeeping. Copying disks using DISKCOPY is described in *Using the Portable PLUS*.

The PrintGraph menu will appear:

Option	Meaning
Select	Select a graph or series of graph files for printing.
Options	Select printing options (colors, orientation, fonts).
Go	Print the selected graphs.
Configure	Change the default PrintGraph configuration.
Align	Set the current page position as "top of page".
Page	Advance the printer paper to the top of the next page.
Quit	Quit PrintGraph.

Each of these options will be described in greater detail in the following sections.

PrintGraph's Default Configuration

PrintGraph's current configuration is always displayed in the main area of the screen, below the control panel. As you make changes to PrintGraph, the display will be updated to reflect the changes.

Just as with 1-2-3 configuration, PrintGraph initially assumes that you have certain hardware connected to your system (the *default* configuration). The first time you start PrintGraph, the default configuration will be:

DIRECTORIES

Pictures: A:\

Fonts: C:\

GRAPHICS DEVICE

HP ThinkJet

INTERFACE

System Default (which is HP-IL by the P.A.M. default)

PAGE SIZE

Length: 11.000

Width: 8.500

That is, PrintGraph assumes that your graph files are stored in the root directory of the internal disk in Drive A, that your typeface styles (fonts) are stored in the root directory of the disk in Drive C (the PrintGraph disk), that you are using an HP ThinkJet as your graphics device (printer), that the printer is connected to the HP-IL port, and that your page size will be 8½" × 11". If these assumptions are correct, then you will not need to change anything. If your system is different, read on.

Changing PrintGraph Configuration Options

If any one of these assumptions is not true for your particular system, you will need to tell PrintGraph about your different setup. The manual which accompanies your print device(s) will identify all important parameters affecting configuration.

By selecting the *Configure* option on your PrintGraph menu, you will be able to view a secondary menu of choices which offer ways for you to change the default configuration:

Files Device Page Interface Save Reset Quit

As with all 1-2-3 menus, you may make your selection either by “pointing” to the option name with the menu pointer using the ► or ◀ arrow keys and pressing [Return], or by typing the first letter of the option. As you select each option, another set of configuration choices will appear under the command line.

Files Option

Selecting this option allows you to specify which directory or directories will be searched for graph and font files when you are selecting graphs to be printed, and when you issue the Go command to print the graph files.

Choice	Meaning
Pictures	Select directory containing graph files.
Fonts	Select directory containing fonts.
Quit	Return to the Configure menu.

Initially, Pictures is set to Directory A:\ and Fonts is set to Directory C:\. For either option, you will be prompted to enter the letter of the directory in which the respective files are stored. For example, if you want to tell PrintGraph that your graph files are stored in directory MYPIX of the disk in Drive D, select Pictures and type “D:\MYPIX” in response to the prompt. Selecting Quit will return you to the Configure menu. Notice, as always, that the status area of the screen has been updated to reflect your choice.

Device Option

Graphics devices and their associated parameters (called *device drivers*) are stored in a special disk file, called a *device library*. When you select Configure Device, a list of device drivers currently available in the device library is displayed on the status area of the screen. The following Hewlett-Packard devices are included in the list of compatible devices: the HP ThinkJet printer, the HP 82905B impact printer (Opt. 248), and the HP 7470A plotter (Opt. 003). The currently selected device is marked with a # sign. (By default, the HP ThinkJet will be marked with the #.)

As Lotus adds graphics devices to the device library, new device libraries may be made available. (See your dealer for updates.) If you receive a disk containing a new device library, you need only copy the new device library onto your PrintGraph disk; when you use Configure Device, the new devices will be added to the device list.

To choose a device, use the ▲ and ▼ keys to move the highlighted pointer to the device and press [Space]. The # marker will appear next to that device. Pressing [Return] "records" the new device and you will be returned to the Configure menu. The status screen will have been updated to display the new device. Pressing [ESC] returns you immediately to the Configure menu, but the original device choice is retained.

Some of the printers compatible with PrintGraph are described as single, double, or quad density and high or low resolution. These descriptions indicate the relative density, or resolution, of the dot matrix for each printer listed. You should consult your printer's or plotter's manual for specifics concerning density and, thus, graphic resolution.

For example, the HP 82905B text and graphics printer has both low and high resolution capability. The PrintGraph device configuration menu offers you a choice of either resolution level. Choosing the high density HP 82905B will cause the graph to be printed with greater resolution than would be possible with the low density HP 82905B selection; however, the printer will also take more than double the amount of time to print the graph in the double density mode. For Epson printers, the question of which device to choose depends on your preference; any Epson equipped to handle graphics will work in either single, double, or quad density mode.

If you are still confused by the printer designations, you might want to ask your dealer for advice, or call Hewlett-Packard's Customer Support staff, whose toll-free number is in the support guide that came with *Using the Portable PLUS*. Your dealer, Hewlett-Packard, and the manual that accompanied your printer are the best sources of information.

Page Option

The Page option allows you to control the default page length and height in inches.

Choice	Meaning
Length	Length of printed page in inches (default = 11 inches)
Width	Width of printed page in inches (default = 8½ inches)
Quit	Return to the Configure menu

Depending on your selection, you will be prompted to enter a length or width in inches. The current values for length and width are always displayed in the status area of the screen. Selecting Quit returns you to the Configure menu.

Interface Option

To connect a printer to a computer, all you need is an interface cable. Since HP-IL and RS-232-C interfaces are built into your computer, you do not need an interface card. (For an HP-IB printer you would need an HP 82169A HP-IL/HP-IB converter.)

To change the printer interface type, select Interface from the menu. You can choose one of four interface types:

Choice	Meaning
1	System Default. This is <i>originally</i> HP-IL, but it will be whatever is specified by the P.A.M. System Configuration menu (which you can change—see chapter 4 of the <i>Using the Portable PLUS</i>).
2	Serial. The RS-232-C-compatible interface. The baud rate must also be specified (see below).
3	Plotter. Designates the plotter as the print device (with the Plotter interface as specified in the System Configuration).
4	HP 82164A. This is the the HP-IL/RS-232 converter. If <i>two</i> RS-232 printers are connected, one via the HP-IL port with this converter, this choice will designate the printer using the converter. The baud rate must also be specified (see below).

Selections from the interface list are made by pointing to the choice and pressing **[Return]**. Once the choice is made, PrintGraph returns to the Configure menu. The status screen will be updated to reflect the change.

Serial interfaces (choices 2 and 4) require the additional specification of a *baud rate* (the speed in characters per second that the interface will send data). When you select either the Serial or the HP 82164A option, one of the following baud rates should also be selected (they are listed in order of increasing speed):

- 110 150 300 600 1200 2400 4800 9600 19200

To determine the correct baud rate setting, check the manual that accompanied your printer, or ask your dealer for advice. Most printers and plotters seem to operate best at 1200 baud. *Be sure that the printer is compatible with your computer* by consulting the owner's manual, your dealer, or HP customer support (refer to the Support Guide that came with the Portable PLUS).

To use 1-2-3 with HP plotters on serial interfaces, you must set certain parameters in the P.A.M. Datacom Configuration as follows:

XON/XOFF Pacing	OFF
CTS Line	Observe
DSR Line	Observe
DCD Line	Observe

Save Option

Be sure the write-protect tab on the 1-2-3 Utilities disk is set to "unprotect"—its original state—before selecting this option. (Refer to your disk drive's manual.) If you made any changes in the configuration, they will immediately take effect (as reflected on the status screen). However, these changes will be "forgotten" at the end of the current PrintGraph session unless you Save them to disk. PrintGraph will then use the new configuration in subsequent PrintGraph sessions.

Choice	Meaning
Cancel	Cancels the Save and returns you to the configuration menu.
Replace	Causes the current configuration to be written to disk.

Reset Option

This menu selection allows you to cancel a PrintGraph configuration that was altered during the current session. Once Reset has been selected, all newly entered PrintGraph configuration options will be reset (1) to the configuration that was read from disk when PrintGraph was started, or (2) to a configuration that was Saved during the current session.

Quit Option

Selecting Quit allows you to exit the Configure menu and return to the main PrintGraph menu. If you have changed PrintGraph's configuration and want to save that change, you should select Save before selecting Quit.

Using PrintGraph to Output Graphs

PrintGraph's main function, of course, is to print graphs generated with 1-2-3 on a printer or other graphics device. To do this, PrintGraph reads a 1-2-3 graph file (a ".PIC" or "picture" file) and formats it according to various options which you specify. PrintGraph then outputs this graph to the graphics device.

The various format options are selected from the PrintGraph menu just as you would select an option from any 1-2-3 menu. However, because PrintGraph allows you to "queue" a list of graph files for printing, you may also select from lists of graph files on your storage diskette. Selections from lists are made by pressing [Space]. An example of this type of selection appears below.

The PrintGraph menu options which affect the formatting and printing of graph files are:

Option	Meaning
Select	Select a graph or series of graphs for printing.
Options	Select graphics printing options (colors, orientation, fonts) before printing.
Go	Print the selected graphs.
Align	Set the current paper position as "top of page".
Page	Advance the printer paper to the top of the next page.
Quit	Quit PrintGraph.

The following sections will describe each of the major PrintGraph formatting commands in greater detail.

Selecting Pictures for Printing

The first option on the PrintGraph menu, Select, allows you to specify the graph files you want to print. When you choose Select, a list of graphs is retrieved from the disk specified in the PrintGraph configuration (see above) and displayed on the status area of the screen. Note also that the list is displayed in alphabetical (descending) order, along with the date, time, and size (in bytes) for each graph.

Use the ▲ and ▼ keys to move through the list of graphs. When you want to choose a graph, press [Space] and the graph name will be marked (selected) with the symbol #. For example, suppose your data disk contained the following .PIC files: EXPENSE, INCOME, MONTHLY, and YEARLY. You want to choose MONTHLY as your first graph to be printed, so you use the ▲ and ▼ keys to move the pointer down the graph list to MONTHLY and press [Space]. The # indicator will appear next to MONTHLY to show that it is selected:

PICTURE	DATE	TIME	SIZE
EXPENSE	11-03-84	15:02	8832
INCOME	11-26-84	15:40	15488
#MONTHLY	11-26-84	14:20	13568
YEARLY	12-10-84	14:23	33920

Any graphs that were selected during the current PrintGraph session, but prior to the current Select, will also be marked with the # indicator. While in the selection list, you may press the [f10/Graph] key at any time and the graph on which the pointer is resting will be displayed on the screen, allowing you to “preview” graphs before printing them.

Note. Do not be surprised if a “previewed” graph appears to have more detail than the graph as originally displayed in 1-2-3. In fact, the smaller lines of text in a previewed graph may appear to be unreadable. This is because the picture file (.PIC file) generated by 1-2-3 actually contains more detail than can be displayed by 1-2-3’s /Graph View command. However, PrintGraph is capable of printing this detail, and the hard copy will be similar to the graph that was displayed in 1-2-3, except more precise.

Other selections can be made from the graph list in the same way. If you want to remove a graph from the currently selected list, move the pointer to the graph name, press [Space] once again, and the indicator mark will be removed. Pressing [ESC] cancels the graph list and any new selections that were made from it (selections made prior to the current selections are kept), and returns you to the PrintGraph menu. Pressing [Return] selects the currently highlighted graph and causes the currently selected list of graphs to be “saved” (don’t confuse this with PrintGraph configuration; picture selections are kept only for the duration of the current PrintGraph session). You are returned to the main PrintGraph menu and the list of selected graphs is displayed on the status screen in the order in which you selected them.

Choosing Other PrintGraph Formatting Options

Selecting Options from the main PrintGraph menu allows you to set or change various aspects of a graph or series of graphs before printing. Remember that Options apply to the entire set of selected graphs, so that if you intend to change options between graphs, you should Select only those graphs to which the options will apply. When you select Options, you are offered the following choices:

Color Font Size Pause Eject Quit

Color Option

The Color option allows you to assign colors to various parts of the graph. Printgraph displays a menu of available colors. Their possible uses are shown below. Note that the default color for the grid and the data ranges is black.

Uses: Grid (grid, axes, scale), A-range, B-range, C-range, D-range, E-range, F-range

Color selections are made by first selecting the appropriate menu item (Grid, A, B, C, D, E, or F) and then selecting a color for that item from the list displayed in the control panel. The list of colors displayed in the status area of the screen will be continuously updated to reflect changes. The color option has no effect unless you are using a color graphics device (e.g. HP 7470A plotter).

Font Option

This option allows the selection of fonts to be used in printing the text portions of the graph. Font 1 is only used for the first line of the graph title; Font 2 will be used for the rest of the graph. If no selection is made for Font 2, then Font 1 will be used for the entire graph.

Font selections are made in the same way as graph selections (see above) from the list of fonts displayed in the status area of the screen, except that only the font name and size (in bytes) are displayed.

<u>Font Name</u>	<u>Size</u>	<u>Font Name</u>	<u>Size</u>
BLOCK1	3597	ROMAN1	4744
BLOCK2	6593	ROMAN2	9117
ITALIC1	6507	SCRIPT1	5831
ITALIC2	9076	SCRIPT2	7726

Figure 20-1 (page 20-11) shows these fonts in their printed form.

The numbers after each font indicate how "bold" (dark) the font is. For example, Script2 is bolder than Script1. The current selections for Font 1 and Font 2 are displayed on the status area of the screen at all times. The bold font produces high quality graphs only with high resolution printers and plotters.

Size Option

The Size option allows you to choose the size and orientation of the graph on the paper. Each choice controls the values for margin, graph height, width, and rotation.

Choice	Meaning
Full	The graph will occupy the full page with normal margins. All variables are automatically adjusted. An indicator will appear on the screen.
Half	The graph will occupy half of a page. All variables are automatically adjusted.
Manual	Each variable of graph placement can be adjusted manually (see below).

Selecting Manual from the Size options menu allows you to select each of the aspects of graph placement.

Choice	Meaning
Height	Adjusts height of the graph (vertical page length) in inches.
Width	Adjusts the width of the graph (horizontal page width) in inches.
Left	Adjusts the size of the left margin in inches.
Top	Adjusts the size of the top margin in inches.
Rotation	Adjusts the number of counterclockwise degrees of rotation. Zero degrees of rotation will orient the X axis along the width of the page. Ninety degrees of rotation will orient the X axis along the height of the page.

Do not be alarmed if what you type for a value is not exactly what appears on the status screen (PrintGraph uses the correct value, but displays a “rounded” value).

ABCDEFGHIJKLM
 NOPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 1234567890
 !@#\$\$%^&*()
 _-+={}[]:; '~
 " ' ? / < > , . \

Block 1

ABCDEFGHIJKLM
 NOPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 1234567890
 !@#\$\$%^&*()
 _-+=[]:; '~
 " ' ? / < > , . \

Block 2

ABCDEFGHIJKLM
 NOPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 1234567890
 !@#\$\$%^&*()
 _-+={}[]:; '~
 " ' ? / < > , . \

Roman 1

ABCDEFGHIJKLM
 NOPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 1234567890
 !@#\$\$%^&*()
 _-+=[]:; '~
 " ' ? / < > , . \

Roman 2

ABCDEFGHIJKLM
 NOPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 1234567890
 !@#\$\$%^&*()
 _-+={}[]:; '~
 " ' ? / < > , . \

Italic 1

ABCDEFGHIJKLM
 NOPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 1234567890
 !@#\$\$%^&*()
 _-+=[]:; '~
 " ' ? / < > , . \

Italic 2

ABCDEFGHIJKLM
 NOPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 1234567890
 !@#\$\$%^&*()
 _-+={}[]:; '~
 " ' ? / < > , . \

Script 1

ABCDEFGHIJKLM
 NOPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 1234567890
 !@#\$\$%^&*()
 _-+={}[]:; '~
 " ' ? / < > , . \

Script 2

Figure 20-1. Graph Fonts

A Technical Note. A graph will be stretched or compressed to exactly fit the specified height and width after rotation of the graph. The degree of distortion depends on the relationship between the graph's X axis and Y axis scale values (called the "aspect ratio"). All 1-2-3 graphs are produced with an aspect ratio of approximately 1.385 to 1. Therefore, the ratio of height to width should be maintained at the same aspect ratio.

Pause Option

Selecting the Pause option causes PrintGraph to pause between printing graphs. A pause might be required to change paper or to switch settings on a printer. (You cannot change PrintGraph settings during a pause.)

The Pause setting does not matter for a plotter, which always waits to begin a plot until it has prompted you to load the correct pen(s). In addition, the plotter automatically pauses during a plot if a new pen color needs to be loaded.

Choice	Meaning
Yes	Pause between the printing of each graph. PrintGraph will signal the pause with a beep. Pressing [Space] causes PrintGraph to continue.
No	PrintGraph will not pause between printing graphs. As always, the current setting of Pause is displayed on the status area of the screen.

Eject Option

Selecting Eject allows you to control whether PrintGraph will automatically advance the paper to the next page between printing graphs. It does not affect a plotter, which always stops between graphs and waits for you to change the paper.

Choice	Meaning
Yes	Advances (ejects) the paper between printing of graphs. On a printer (a continuous paper-feed device), the paper will be advanced to the top of a new page before printing resumes.
No	No paper will be advanced between printing of graphs, unless PrintGraph determines that the next graph to be printed is too "long" for the current page, in which case the paper will be advanced to the top of the next page automatically. Otherwise, you will have to use the printer's controls to advance paper.

As always, the current setting of Eject is displayed on the status area of the screen.

Readying the Printer

Before PrintGraph does any printing, you should be sure that your printer is ready for printing. Two PrintGraph options allow you to position the paper correctly:

Option	Meaning
Align	Sets the current paper position to be the "top of page".
Page	Advances the printer paper one page.

The printer's controls can be used to advance the paper until the printhead is located at the top of a new page. You should then select Align, to tell PrintGraph that the current paper position is the top of form. Once the paper is Aligned, all subsequent Pages will cause the printer to advance exactly one page (to the top of form on the subsequent page).

The Page option works only after a graph has been printed (so that you can "page" ahead to the next page). If you need to advance the paper to Align it, use the printer's controls to do this.

Printing the Graph

Now you are ready to print your graph(s). Select Go from the PrintGraph menu. PrintGraph will then use the options you have selected to format and print the graph on your printer or plotter. As PrintGraph works, it will display messages in the status area of the screen letting you know what it is currently doing. During the printing process your printer may stop for a few seconds. This is normal. Please be patient. When all graphs have been printed, you will be returned to the PrintGraph menu.

Interrupting Graph Printing

To stop PrintGraph while a graph is being printed, press **[Break]**. Your printer may continue until it completes the current line. Then, control returns to the PrintGraph menu.

Leaving PrintGraph

When you are finished using PrintGraph, select Quit from the PrintGraph menu. (If the PrintGraph menu is not on the screen, press **[ESC]**.) You will be prompted to confirm your Quit by selecting Yes or No. Selecting No will return you to the PrintGraph menu. If you started PrintGraph from the P.A.M. menu, selecting Yes will return you to the P.A.M. screen.

A Sample PrintGraph Session: Printing Two Graphs

Suppose that you have two graphs that you want to print, PROJECT and EXPENSE, which are stored on Drive A. You normally use your HP ThinkJet printer as the graphics printer, but today you want to use an HP 7470A (Opt. 003) plotter borrowed from a friend. What do you do next? Let's follow through a sample session with PrintGraph.

First, you want to get PrintGraph running. If you are still in 1-2-3, save the current worksheet and graph(s) if you haven't already done so (using the /File Save and /Graph Save commands) and then exit 1-2-3 (using /Quit Yes). P.A.M. should appear on the screen. Insert the 1-2-3 Utilities disk in Drive C. Press [F4/Reread Discs], and when the PrintGraph label appears on the screen, select it (move the cursor to it and press [Select]). This done, the PrintGraph menu and status screen will be displayed, showing us the current PrintGraph configuration.

The first thing we should do is tell PrintGraph where the pictures and fonts we want to use are stored. Notice that the status screen gives us the current configuration:

DIRECTORIES

Pictures: A:\
 Fonts: C:\

Is that correct? Our data is located in the root directory of the internal disk (Drive A), so we don't need to change Pictures. Usually fonts are located in the root directory of the PrintGraph disk in Drive C, so that won't need to be changed either. If that weren't the case, we could:

1. Select Configure Files Pictures or Configure Files Fonts from the menu.
2. When prompted, we would type the path for the directory where pictures or fonts are stored. In either case, we would press [Return] following the entry.

The status screen would immediately show the new configuration. If we wanted to make the drive change permanent, we would also have to select Configure Save Replace to record the change in PrintGraph. Remember, we can always change the configuration at any time.

What about the printer? A quick check of the status screen tells us that the current GRAPHICS DEVICE is an HP ThinkJet, which is set to use the HP-IL INTERFACE (the P.A.M. default). Since we want to use an HP 7470A plotter (for the moment, anyway), we need to change the device. We should select Configure Device from the menu, and the list of available graphics devices will be displayed on the screen. Now we can choose the HP 7470A by moving the highlighted pointer with the ▲ or ▼ keys. To make the choice, press [Space] followed by [Return]. The status screen will be updated accordingly, and we will be returned to the Configure menu. The HP 7470A (Opt. 003) will be connected at the same interface port (the HP-IL port), but we need to change the Interface option to Plotter.

Should we Save the new printer configuration? Probably not, since the plotter is temporary. The next time we start the PrintGraph program, it will read PrintGraph's startup configuration stored on the 1-2-3 Utilities disk, and our "default" printer will again be the HP ThinkJet.

Now we should select the graphs we want to print from the files stored on our data disk. When we choose Select from the PrintGraph menu, the available picture files on the data disk will be displayed in the status area of the screen:

PICTURE	DATE	TIME	SIZE
EXPENSE	11-03-84	15:02	8832
MONTHLY	11-26-84	14:20	13568
NEWCHART	11-26-84	15:40	15488
PROJECT	02-15-85	10:56	3072
YEARLY	12-10-84	14:23	33920

The graphs we want to print are PROJECT and EXPENSE, so we should select these graphs from the list of pictures by using the ▲ and ▼ keys to move the highlighted pointer to the pictures we want to select. When we reach PROJECT and EXPENSE, we should press [Space] to select the pictures. The # indicator will appear next to the selected pictures, like this:

PICTURE	DATE	TIME	SIZE
#EXPENSE	11-03-84	15:02	8832
MONTHLY	11-26-84	14:20	13568
NEWCHART	11-26-84	15:40	15488
#PROJECT	02-15-85	10:56	3072
YEARLY	12-10-84	14:23	33920

The [Space] key acts as both a *selector* and a *deselector* for pictures (it's also called a "toggle", because it switches back and forth between two choices). So if we make a mistake, we can deselect, or select, a picture as many times as we want. While the highlighted pointer is on each name, we can press the [f10/Graph] key to produce a rough sketch of the graph on the screen. This allows us to verify our graph choices—EXPENSE and PROJECT. When we've finished selecting pictures, we should press [Return], and the status screen will be redisplayed with the selected pictures listed at the left in the exact order in which we selected them. The selection order will also be the order in which the pictures are printed. But we're not quite ready for printing yet.

We have a few more options that we can specify. Make sure the Size setting is Full. Don't worry about the Pause and Eject settings since the plotter always waits after one plot is done, prompting you to replace the paper and load new pens before starting a new plot.

We can select different colors and fonts to be used in printing the graphs. As always, PrintGraph's status screen shows the currently selected fonts and colors, and the current size and alignment settings for the soon-to-be printed graphs. Checking the status screen, we find the currently selected colors for the graph are:

COLORS

Grid:	Black
A Range:	Red
B Range:	Blue
C Range:	Green
D Range:	Orange
E Range:	Brown
F Range:	Turquoise

For the HP 7470A, a two-pen plotter, pen 1 will be used for the first color in this list, pen 2 for the next *different* color, pen 1 for the next different color, pen 2 for the next, and so on.

Suppose our graphs in EXPENSES and PROJECT involve four data ranges (A through the D), and we have four different colors of pens: black, red, blue, and green. Since Grid also needs a color, we need to repeat one color, so let's change D Range to Black:

1. Choose Options Color D Black from the menu. The status screen will be updated immediately to reflect the change.
2. We could change E and F now, too, but since our graphs won't use these ranges, these colors will just be ignored.
3. To exit the Color menu, select Quit. This puts us in the Options menu. Another Quit will put us back in the PrintGraph menu.

Finally, we have decided to print our graphs using the ROMAN2 font. We select Options Font from the PrintGraph menu, and a list of available fonts will be displayed on the status screen. Selections from this list are made in exactly the same way as selections from the Pictures list. We're allowed to pick one font each time. The first font selected will automatically become "Font 1" and will be used on graph titles; the second choice will become "Font 2" and will be used on graph legends. If we don't make a separate selection for Font 2, the font we selected for Font 1 will be used for the whole graph. As a font is selected, we are returned to the Options menu. Once we have selected the fonts, we are ready to do some graph plotting.

To plot the graphs, we should select Go from the PrintGraph menu. As PrintGraph processes the graphs and plots them, it will inform us of its progress by displaying these messages:

Loading Font C: ROMAN2

Loading Picture A: PROJECT

Generating Picture A: PROJECT

Load the following pens and press space: Black Red

The message *WAIT* will also flash in the upper right corner of the control panel. When the display prompts you to load the pens, put black into the position of pen 1 (left) and red into pen 2 (right). Further messages mark the progress:

Drawing Black

Drawing Red

Load the following pens and press space: Blue Green

Load blue into the position of pen 1 and green into pen 2.

Drawing Blue

Drawing Green

When plotting is complete on the first graph, you will see the message:

Please replace paper

The second graph (EXPENSE) will start being generated after you press the space bar.

If you'd like, you can fine-tune the graphs by altering some of the PrintGraph parameters and replotting the graphs. That's the best thing about PrintGraph; if you don't exactly like the way things look, you can electronically change them until they're just right.



Appendices

A. Configuring 1-2-3

B. Printer Control Codes

C. Error Messages

D. Command Trees

E. Translating Data Files



A. Configuring 1-2-3

How do you tell 1-2-3 what your computer system looks like? This appendix covers the hardware configuration to use with 1-2-3.

What You Need to Run 1-2-3

Your HP Sales Representative or your dealer can provide you with a description of hardware to use with 1-2-3. Once you install the 1-2-3 software modules, the HP Portable PLUS is equipped to run 1-2-3. However, there are optional pieces of hardware with which you can realize the full potential of 1-2-3:

Optional Hardware

1. A character printer such as the HP ThinkJet portable printer (which is also a graphics printer).
2. A plotter (or graphics printer) such as the HP 7470A (Opt. 003) plotter.
3. A disk drive such as the HP 9114 to hold a 3½-inch data disk. (Remember that you also have the internal, electronic disk (Drive A) at your disposal.)
4. An HP 82981A 128K Memory Drawer.

1-2-3's Default Configuration

Every time you start 1-2-3, it reads a startup configuration file, 123.CNF. Stored in this file are procedures for 1-2-3 to use during a work session unless you override them. These procedures are collectively called the **default configuration**. If 1-2-3's default configuration fits your system set-up and the requirements of your work, you will not need to do anything to begin using 1-2-3!





Transferring Data to the Printer (/Print Commands)

The following is the default configuration supplied with 1-2-3 that defines how your data is transferred to and printed by your printer.

- Printer interface: 1 (System Default, which is HP-IL by default)
- Page length: 66 lines (11" paper printed at 6 lines per inch)
- Print margins: Two empty lines at the top and bottom of a page; four-column left margin (start printing in column 5); right margin at column 76.
- Printer *setup* string: None
- Auto Line-Feed setting: The printer does *not* automatically advance the paper after each line is ended. This means that 1-2-3 will include *linefeed* characters in print output.
- End of page procedure: Does not wait for manual intervention at the end of each print page.

Transferring Data to and from Disk Storage

When you are saving a graph or a worksheet on disk, or retrieving a stored file, 1-2-3 will use its default for current disk and directory A:/ if you make no specification of your own. Using the /File Directory command, you can change the current disk and directory to something other than the default (page 14-6).

Unless a filename is preceded by a *disk prefix*, 1-2-3 will store and retrieve information using the root directory on Drive A.

If these procedures are the ones you wish 1-2-3 to use, then you will not want to change 1-2-3's default configuration.

Changing 1-2-3's Default Configuration

However, if you decide you want to change any part of this default configuration, there are two ways you can do it. Depending upon whether you would like your change to affect a particular file or all of your files, you can revise the default configuration using different 1-2-3 commands:

- /Print Options and /File Directory commands allow you to specify printing procedure and format options for a single file which can then be stored with that worksheet and which override global settings until you clear them from the file.
- /Worksheet Global Default commands allow you to reset default configuration globally, for all files.

1. Changing Defaults with /Print Options and /File Directory Commands

While using 1-2-3, you can override the default printer settings. You can define a special print format for each worksheet using /Print Printer Option, /Print File Option, and /File Directory commands. The submenus of these commands allow you the flexibility to customize each worksheet printout as your needs dictate. These worksheet-specific print and format overrides are stored in the *worksheet files* along with the worksheet contents.

You can also cancel the override—return to using the default printer settings with a /Print Printer Options Clear command.

2. Changing Defaults with /Worksheet Global Default Commands

These commands allow you to establish new, global default procedures for the current 1-2-3 session and, optionally, to alter the configuration file, 123.CNF. In the latter instance, 1-2-3 will read the new default configuration at the start of subsequent sessions. In that sense, you might want to think of the new default configuration as being “permanent”. But you *can* alter it as many times as you like, using /Worksheet Global Default.

The /Worksheet Global Default command allows you to control the default configuration through a menu structure which offers you the following options:

Printer	Directory	Status	Update	Quit
----------------	------------------	---------------	---------------	-------------

As you move the pointer among these **top-level menu** choices, Line 2 of your Control Panel will tell you what kind of change you can make with each menu selection:

Printer. Specify printer interface and other printer characteristics.

Directory. Specify the *current directory*—the standard directory to be used for data storage and retrieval.

Status. Display the default configuration settings, as currently defined.

Update. Store the configuration settings in file 123.CNF on Drive A.

Quit. Return to Ready Mode.



As with all 1-2-3 menus, choose options by moving the pointer with ◀, ▶, ▼, and [Select], then pressing [Return], or by typing the first letter of the option.

This is the default configuration supplied by Lotus for use on the Portable PLUS:

Printer

```
Interface: System Default   Auto Line-Feed: No
Left margin: 4              Right margin: 76
Top margin: 2               Bottom margin: 2
Page length: 66             Pause at end of page: No
Setup string: <none>
```

Current Directory at Startup: A:\

This listing is an illustration of the default configuration status screen (see "Status" above).

If you elect the *Printer* option, Line 1 of your Control Panel will change to display the Printer Options submenu of choices as follows

```
Interface  Auto-LF  Left Right  Top Bottom  Page Length  Wait Setup Quit
```

Each of the options has its own meaning and worksheet global default setting. Selecting an option will allow you to change its setting.

Printer Options

Interface **Possible settings: 1-4** **Lotus-supplied: 1 (HP-IL)**

To connect a printer to a computer, all you need is an interface cable. Since HP-IL and RS-232-C interfaces are built into the Portable PLUS, you do not need an interface card. (For an HP-IB printer or a *second* RS-232 printer, however, you would need an interface *converter*.*) You must tell the computer what kind of interface is connected so it will communicate correctly with the printer:

1 System Default. This is *originally* HP-IL (Hewlett-Packard Interface Loop), but it will change to whatever is set in P.A.M.'s System-Configuration menu (which you can change, as explained in chapter 4 of *Using the Portable PLUS*).

2 Serial. The RS-232-C-compatible interface. The baud rate must also be specified (see below).

3 Plotter. This designates the plotter as the print device (with the interface as specified in the System Configuration).

4 HP 82164A. This is the the HP-IL/RS-232 converter. If *two* RS-232 printers are connected, one via the HP-IL port with this converter, this choice will designate the printer using the converter. The baud rate must also be specified (see below).

* If you're using a converter, select the interface option that corresponds to the *port* you are using.

With choices 2 and 4, you must also specify the interface's *baud rate*—the speed at which data will be sent to the printer:

110 150 300 600 1200 2400 4800 9600 19200

(110 baud is roughly 11 characters per second)

To determine the correct baud rate setting, check the manual that accompanied your printer, or ask your dealer for advice. *Be sure that the printer is compatible with the Portable PLUS* by consulting the owner's manual, your dealer, or HP customer support (refer to the Support Guide that came with your computer).

To use 1-2-3 with HP plotters on serial interfaces, you must set certain parameters in the P.A.M. Datacom Configuration as follows:

XON/XOFF Pacing	OFF
CTS Line	Observe
DSR Line	Observe
DCD Line	Observe

The HP-IL port is the standard place where a printer would be connected. If you are confused about interface types and ports, you might want to check with your dealer or HP customer support to find out the correct printer port for your system.

Auto-LF

Lotus-supplied: No

Many printers do not automatically advance the paper a line. They must be sent a *linefeed* character (Control J—ASCII code 10 decimal) after every *carriage return* character (Control M—ASCII code 13 decimal). 1-2-3 indicates this condition with an Auto-LF setting of *No* in the default configuration.

(With some printers, auto-advance is a switch-selectable option.)

If your printer *does* automatically advance the paper after a carriage return, change this configuration setting to *Yes*.

Here's an easy test to determine whether this setting should be changed: Print a few rows of the worksheet using the /Print Printer command.

- If the printout is double-spaced, change the Auto-LF setting from *No* to *Yes*.
- If the printout is spaced correctly, don't change the Auto-LF setting.
- If the printer does not advance the paper at all, then change the Auto-LF setting from *Yes* to *No*.

If you're not an experimenter, check your printer's user's manual or consult your dealer.



Right, Top, Left, and Bottom Margin

Possible settings: 0-240 for Left and Right; 0-10 for Top and Bottom
Lotus-supplied: Right=76, Top=2, Left=4, Bottom=2

If you Update the configuration file (see below), 1-2-3 will use these margin settings unless you override them with /Print Options Margins commands (page 15-12). Margin settings may also be overridden when you /File Retrieve a worksheet.

- If your printer has a wide carriage or you select compressed printing with a setup string (see below) you will probably want to increase the right margin.
- If your printer is set to automatically skip over the paper perforations, set the top and bottom margins to zero.

Page-Length

Possible settings: 20-100 Lotus-supplied: 66

If you Update the configuration file (see below), 1-2-3 will use this setting unless you override it with a /Print Options Page-Length command (page 15-15). The page-length setting may also be overridden when you /File Retrieve a worksheet.

- If your printer is set to automatically skip over the paper perforations, you must reduce the page length. This may require some experimentation, but a value of 60 is typical.

Wait

Lotus-supplied: No

This setting allows you to configure printers that use either continuous, fan-fold paper or single sheets.

Yes. 1-2-3 will pause between each page of printed output. At this point, the operator should load a new sheet of paper, then press any key to continue printing.

No. 1-2-3 will not pause between pages, but will print continuously.

Setup

Lotus-supplied: none

Your printer may require 1-2-3 to send it a sequence of control characters (*setup string*) before it can begin printing, or to set printer options. The default setup string you specify here will be sent to the printer every time you issue the /Print Go command, unless you override it with a /Print Options Setup command (page 15-14). A setup string reinstated when you /File Retrieve a worksheet also overrides the default setting.

See page 15-14 for a description of how to enter a setup string.

Directory Options

At the beginning of a 1-2-3 session, one file directory becomes the *current directory*. Whenever 1-2-3 uses a file to save or retrieve data, you must supply it a filename. If you don't use a *disk prefix* with this filename (e.g. C:FILE_34), 1-2-3 uses a file in the current directory.

Your entry here determines which directory becomes current at the beginning of a 1-2-3 session. During the session, you can change the setting with the /File Directory command.

An empty entry (no characters) specifies that 1-2-3 should store data on Drive A.

Status

Temporarily erases the worksheet and displays the default configuration settings, as currently defined. Press any key to return the worksheet to the screen. Pressing this key has no other effect.

Update

If you have changed the default configuration and want to make those changes permanent, choose Update. This records the new configuration in file 123.CNF. 1-2-3 will use the new configuration the next time it starts. Then select Quit to return to Ready Mode.

If your copy of 123.CNF is lost (from Drive A), using Update will create a *new* configuration file 123.CNF with all the *default values*. You can change the configuration values again, if necessary, as described in this appendix.

Quit

If you have not changed the default configuration, or if you *don't* wish to change the contents of the configuration file, choose Quit without Updating. You return to Ready Mode.



B. Printer Control Codes

Printers often require special characters, **ASCII control codes**, to be sent to them in order to accomplish particular tasks. Control codes aren't usually required for regular printing, but if your printer is capable of special functions (using compressed type sizes, printing in color, etc.), then it probably requires control codes to do the trick.

Each printer recognizes its own set of control codes, and only its own. Be sure to consult your printer's user manual for a list of control codes.

1-2-3 allows you to send any character or characters to your printer as a **setup string**. You can define a standard (*default*) setup string using the /Worksheet Global Default Printer Setup command (page A-6). The default setup string can be overridden with the /Print Options Setup command (page 15-14).

In 1-2-3, the first 32 ASCII codes represent *control* characters. With some programs, you enter these characters by holding down the [CTRL] key and typing a character. In a setup string, control characters must be entered in the form:

`\nnn`

(*nnn* represents the character's three-digit *decimal* ASCII code)

For example, the code for the escape character is 027.

The rest of the codes may be entered either as typed characters (e.g. F) or in `\nnn` form (the code for F is `\070`).

Example 1. With an HP ThinkJet printer, these seven characters turn on both compressed print and display functions mode (to print most control codes rather than executing them):

Escape Ampersand k 2 S Escape y

With 1-2-3, this setup string would be entered as:

`\027\038\107\050\083\027\089`

or as:

`\027 & k2S \027 y`

Example 2. With an Epson MX-80 printer, these three characters turn on both compressed print and italics;

Control-O Escape 4.

With 1-2-3, this setup string would be entered as:

```
\015\027\004
```

Setup String Representation	Character	Setup String Representation	Character
\000	Control @	\044	, <i>comma</i>
\001	Control A	\045	-
\002	Control B	\046	.
\003	Control C	\047	/
\004	Control D	\048	0
\005	Control E	\049	1
\006	Control F	\050	2
\007	Control G <i>bell</i>	\051	3
\008	Control H	\052	4
\009	Control I <i>tab</i>	\053	5
\010	Control J <i>line feed</i>	\054	6
\011	Control K	\055	7
\012	Control L <i>form feed</i>	\056	8
\013	Control M <i>carr. ret.</i>	\057	9
\014	Control N	\058	:
\015	Control O	\059	;
\016	Control P	\060	<
\017	Control Q	\061	=
\018	Control R	\062	>
\019	Control S	\063	?
\020	Control T	\064	@
\021	Control U	\065	A
\022	Control V	\066	B
\023	Control W	\067	C
\024	Control X	\068	D
\025	Control Y	\069	E
\026	Control Z	\070	F
\027	[Escape]	\071	G
\028	FS	\072	H
\029	GS	\073	I
\030	RS	\074	J
\031	US	\075	K
\032	[Space]	\076	L
\033	!	\077	M
\034	”	\078	N
\035	#	\079	O

Setup String Representation	Character	Setup String Representation	Character
\ 036	\$	\ 080	P
\ 037	%	\ 081	Q
\ 038	&	\ 082	R
\ 039	' <i>apostrophe</i>	\ 083	S
\ 040	(	\ 084	T
\ 041	)	\ 085	U
\ 042	*	\ 086	V
\ 043	+	\ 087	W
\ 088	X	\ 108	l
\ 089	Y	\ 109	m
\ 090	Z	\ 110	n
\ 091	[	\ 111	o
\ 092	\	\ 112	p
\ 093	]	\ 113	q
\ 094	^	\ 114	r
\ 095	_	\ 115	s
\ 096	v	\ 116	t
\ 097	a	\ 117	u
\ 098	b	\ 118	v
\ 099	c	\ 119	w
\ 100	d	\ 120	x
\ 101	e	\ 121	y
\ 102	f	\ 122	z
\ 103	g	\ 123	{
\ 104	h	\ 124	|
\ 105	i	\ 125	}
\ 106	j	\ 126	~
\ 107	k	\ 127	DEL



C. Error Messages

There are some things that 1-2-3 just cannot do. When you ask for the impossible, it usually *beeps*, shows an *error message* at the bottom of the screen, and changes the mode indicator in the upper righthand corner of the screen to *ERROR*. The message that appears in the lower left area of the display offers a brief explanation of what is wrong.

To continue working with 1-2-3, press [ESC] or [Return]. Until you do this, 1-2-3 won't let you perform any other action. It just *beeps* with each keystroke. Pressing [ESC] or [Return], takes you back to the Ready Mode. No data will have been lost. Sometimes the worksheet will have changed. For example, when you run out of memory, the command will stop when the memory is filled.

Before trying the same command again and before resuming the activity that initiated the error message, you will have to correct whatever condition caused the error. Exactly what you must do to fix the problem depends on the error message displayed.

This section presents an alphabetical listing of 1-2-3's error messages along with an explanation of each message and a suggested procedure to follow that is appropriate for the message.

Cannot create file. This error message usually means you are trying to store too many files on your disk.

Cannot delete file. This error usually means you are trying to erase a file that does not exist.

Cannot read help file. An error has occurred while trying to read the Help file.

Directory does not exist. /File Directory or /Worksheet Global Default Directory Command: There is no directory with the name you entered. (1-2-3 *does* record the new directory name in its internal memory. It will save this name in 123.CNF when you issue a /Worksheet Global Default Update command.)

Disk drive not ready. You have tried to access a disk that is not ready or there is no disk in the drive.

Disk error. 1-2-3 has tried to read or write on a disk and an error occurred. 1-2-3 will try again automatically; if it again gets the error, it gives you this message. Probably, the disk is damaged; sometimes, the drive is at fault.



Disk full. The available disk space is exhausted. Try another disk. You can find out how much space is left on a disk with the /File List command. To save a worksheet that is too large to fit on one disk, you must use /File Xtract to save portions of the worksheet.

Disk is write-protected. You have tried to write (/File Save or Xtract, /Print File, /Graph Save or /Worksheet Global Default Update) on a write-protected disk (one with a tab covering the notch). Check the disk and try again.

File close error. This error should never occur; if it does, something may be wrong with your computer or system disk.

File does not exist. The requested input file does not exist. You can find out what files are on the current disk with the /File List command.

Formula computation error. You should never get this error message. If you do, something may be wrong with your computer or system disk.

Formula too long. The formula just entered is too long or contains too many levels of nested parentheses. Break the formula down into two or more components, writing each one into a separate cell.

Illegal cell or range address. You have given 1-2-3 a set of cell coordinates or a range name which it cannot interpret. This is usually a typing error; legal coordinates are A1 through IV2048. It can also happen if you have deleted an endpoint of a named range, which sets the named range to *ERR*.

Illegal character in filename. You can only use letters, numbers and the underscore (—) in filenames.

Illegal disk name. You have tried to use a disk prefix letter not in range A..P; this is probably a typing error.

Illegal file format. The file you attempted to /File Retrieve or /File Combine is not a valid worksheet file. Only files created with /File Save or /File Xtract can be brought into the worksheet using /File Retrieve or /File Combine. If one of these files causes this error, the disk has been damaged.

Illegal formula. While recalculating formulas, 1-2-3 found an invalid formula. When you clear the error condition, the cell pointer is positioned to the first invalid formula.

Illegal menu. Using the /X Menu command (used only in keyboard macros), you have specified more than 8 items, or all your prompts, taken together, have too many characters, or you have failed to specify any items.

Illegal “\ nnn” code in setup string. The “nnn” code is the decimal representation of the ASCII code. All three characters must be digits, and the number they represent cannot exceed 255. (See Appendix B, “Printer Control Codes”.)

Illegal number input. You provided an invalid number in response to a command prompt. This could be a typing error, or a number larger or smaller than the command can accept (Chapter 5, “Creating Cell Entries”). Type the number again.

Illegal /X command in macro. In a keyboard macro, the command “/X” is not followed by a legal character. The legal /X commands are: /XC, /XG, /XI, /XL, /XM, /XN, /XQ, /XR.


Input line too long. You have tried to /File Import a text file with a line longer than 240 characters. Since 1-2-3 expects lines to end with a carriage return, this can happen when importing files from a program that doesn't use carriage returns at the end of each line.

Justify range is full or line too long. In /Range Justify, there's not enough room in the specified range for the labels after justification. After pressing [ESC], 1-2-3 will show what justification it could do. Make more room for the labels and try again.

Key column is outside of sort range. While using /Data Sort, you specified as a key a column outside the range of cells being sorted. Respecify the key column and try again.

Macro return without macro call. In a keyboard macro, a /XR (return) command was issued without a /XC (call) command.

Memory full. The available worksheet storage space is full. You can sometimes save some space by /File Saving the file on a disk and then /File Retrieving it; this is particularly effective if you have been inserting and deleting columns and/or rows.

The biggest factor in memory usage under your control is the position of the non-blank cells farthest to the right and toward the bottom of the worksheet. By pressing [Select] followed by , you can see the lower right corner of the active area of the worksheet. The best way to save memory is to rearrange your worksheet so that it can be contained in the smallest possible rectangle, the top left corner of which is cell A1.

Missing or illegal configuration file. 1-2-3 could not find the file named 123.CNF that has your configuration data. After you press [ESC], 1-2-3 will continue to operate with default choices. Use /Worksheet Global Default to specify your equipment and Update the configuration file, as explained on page A-1.

Named range not found in worksheet file. You have attempted to /File Combine a named range that was not in the worksheet file you specified. Respecify the file or the named range; if it still doesn't work, /File Save your present file, /File Retrieve the file from which you wanted a copy of the range, and check the range names.

No files of specified type on disk. You have tried to /File List files on a disk on which there are no files of the type you requested.

No unprotected cells in range. You selected /Range Input, but there are no unprotected cells in the input range for the pointer to rest on.

Not a valid worksheet file. The file you attempted to /File Retrieve or /File Combine is not a valid worksheet file. Only files created with /File Save or /File Xtract can be brought into the worksheet using /File Retrieve and /File Combine. If one of these files causes this error, the disk has been damaged.

Number stack full. You should never get this error message; if you do, please contact Hewlett-Packard's Customer Support group. See the Customer Support guide that came with *Using the Portable PLUS*.

Part of combine file lost. You issued a /File Combine command that caused data from the incoming worksheet to "spill over" the right edge or bottom edge of the worksheet. The spillover data is lost, but all other data from the Combine file is entered into the worksheet.

Part of file is missing. A file being read has been truncated. This error should be rare since any partial file is deleted when you get a "Disk Full" error. If it does happen, probably as a result of physical damage to your disk, you must rebuild the file. This error can also appear if the end-of-file character (Control Z) is missing from an Imported file.

Printer error. There are problems with your printer. This may be as simple as being out of paper or having a loose cable.

Protected cell. You tried to change the contents of a protected cell while protection was enabled. You can /Range Unprotect the cell or /Worksheet Global Protection Disable for the entire worksheet.

Range name does not exist. You have specified a named range that does not exist.

System error. 1-2-3 has detected an internal inconsistency in the operating system. To eliminate this error, reset the system by pressing [CTRL], [Shift], and [Stop] simultaneously.

Too many fields. In /Data Query, you have specified a criterion or output range with more than the maximum of 32 fields.

Too many menu items or items too long. Using the /XM command (in a keyboard macro), you have specified more than 8 items, or all your prompts, taken together, have too many characters.

Too many nesting levels in macro calls. In a keyboard macro, you have issued too many consecutive /XC (call) commands without a /XR (return) command. The nesting limit is 16.

Too many records for output range. In /Data Query Retrieve, the output range did not contain enough rows for the number of records that fit the criteria. Therefore, the output range does not contain all the selected records.

Unrecognized key name {...}. In a keyboard macro, you have typed a name in {braces} that is not the name of key. This is usually a typing mistake.

Worksheet full. You have tried to shift non-blank cells off the right or bottom edges of the worksheet. This frequently happens when trying to /Worksheet Insert a Row in a full column or a Column into a full row. It may also happen during a /Copy or /Move where part of the target range falls off the end of the worksheet.



D. Command Trees

1-2-3 Commands

Command	Command Description	Page
/Worksheet Commands		
Global	Control over-all settings	
Format	Set the display appearance of numbers . . .	10-13
Fixed	Fixed number of decimal places 0-15 (1.23)	
Scientific	Exponential (1.2E+01)	
Currency	\$ and commas (\$1,000)	
, (comma)	Same as Currency, no dollar sign (1,000.546)	
General	No trailing 0's after decimal point	
+ / -	Display pictograph of + + or - -	
Percent	Display as percent (56.3%)	
Date	Control display of date serial numbers	
1	Day-Month-Year	
2	Day-Month	
3	Month-Year	
Text	Show formula text (+ B2*C3)	
Label-Prefix	Control label alignment in cell	10-14
Left	Label is preceded by ' '	
Right	Label is preceded by " "	
Center	Label is preceded by ^ ^ (a preceding \ creates repeating label)	
Column-Width	May be 1-72 characters wide	10-15
Recalculation	Control recalculation options	10-16
Natural	Recalculate formulas in dependency order	
Columnwise	Recalculate down columns, left to right	
Rowwise	Recalculate across rows, top to bottom	
Automatic	Recalculate every time worksheet is changed	
Manual	Recalculate only when [F9/Calc] key is pressed	
Iteration	Number of times recalculation occurs	
Protection	Control access to protected cells	10-17
Enable	Turn cell protection on	
Disable	Turn cell protection off	

Command	Command Description	Page
Default	Control printer and directory settings . . .	A-3
Printer	Control printer options	A-4
Interface	Choose Interface	A-4
Auto-LF	Send linefeed after carriage return	A-5
Left	Left margin	A-6
Right	Right margin (measured from left)	A-6
Top	Top margin (lines)	A-6
Bottom	Bottom margin (lines)	A-6
Page-Length	Total number of lines on paper	A-6
Wait	Pause after each page to change paper . . .	A-6
Setup	Send printer control codes	A-6
Quit	Return to Default submenu	A-7
Directory	Set current directory at start-up	A-7
Status	Show current Default settings	A-7
Update	Record changes to Default settings	A-7
Quit	Return to Global submenu	A-7
Insert	Add blank, unformatted cells	10-18
Column	Insert columns	
Row	Insert rows	
Delete	Remove cell contents and formats	10-19
Column	Delete entire column(s)	
Row	Delete entire row(s)	
Column-Width	Control width of an individual column . .	10-19
Set	Set new width	
Reset	Return column to global column-width	
Erase	Erase entire worksheet	10-20
Titles	Keep title cells visible on screen	10-21
Both	Freeze both rows and columns	
Horizontal	Freeze rows above pointer	
Vertical	Freeze columns to left of pointer	
Clear	Unfreeze title rows and columns	
Window	Split display screen into two parts	10-22
Horizontal	Split screen at pointer row	
Vertical	Split screen at pointer column	
Sync	Windows scroll together	
Unsync	Windows scroll independently	
Clear	Return to single-screen display	
Status	Display global settings	10-23

Command	Command Description	Page
/File Commands		
Retrieve	Retrieve worksheet from disk file	14-7
Save	Store current worksheet to disk file	14-7
Combine	Incorporate file into current worksheet . .	14-8
Copy	Incoming cells replace worksheet's cells	
Add	Overlapping cells added	
Subtract	Overlapping cells subtracted	
Xtract	Store part of current worksheet on disk file	14-10
Formulas	Save formulas	
Values	Save current formula value	
Erase	Erase one or more disk files	14-10
Worksheet	Erase worksheet (.WKS) file(s)	
Print	Erase print (.PRN) file(s)	
Graph	Erase graph picture (.PIC) file(s)	
List	List names of files, show free disk memory	14-11
Worksheet	List all worksheet (.WKS) files in current directory	
Print	List all print (.PRN) files in current directory	
Graph	List all graph (.PIC) files in current directory	
Import	Read print file from disk	14-12
Text	Read each line as a single label	
Numbers	Read numbers and double-quoted text	
Directory	Set current directory	14-13
/Print Commands		
Printer	Print to printer	15-7
File	Print to disk file	15-7
Range	Set range to be printed	15-7
Line	Advance printer one line	15-9
Page	Advance printer to top of next page	15-9
Options	Control appearance of printed page	
Header	Set header line	15-10
Footer	Set footer line	15-10
Margins	Control blank space at all edges of paper	15-12
Borders	Attach specified columns/rows to print range	15-13
Columns	Attach at left side	
Rows	Attach at top	

Command	Command Description	Page
Setup	Send special control codes to printer	15-14
Page-Length	Set total number of print lines on page	15-15
Other		
As-Displayed	Print what appears on screen	15-16
Cell-Formulas	Printout shows formula text	15-16
Formatted	Headers, footers, page breaks used	15-17
Unformatted	Headers, footers, page breaks not used ..	15-17
Quit	Return to main Print menu	
Clear	Cancel print settings	15-17
All	Return print settings to Global Default values	
Range	Cancel print range setting	
Borders	Cancel borders	
Format	Return page-length, margins, setup setting to defaults	
Align	Use when paper has been repositioned ..	15-18
Go	Print the selected range with options. . . .	15-9
Quit	Return to Ready Mode	

/Graph Commands

Type	Select graph type	16-16
Line	Graph A-F ranges as lines and or symbols	
Bar	Graph A-F ranges as clustered bars	
XY	Graph A-F ranges against X values	
Stacked-Bar	Graph A-F ranges as stacked bars	
Pie	Graph A range as pie chart	
X A B C D E F	Define X and data ranges for graphs .	16-16/17
Reset	Cancel graph settings.	16-18
Graph	Cancel all settings	
X A B C D E F	Remove range from current graph	
Quit	Return to main Graph menu	
View	Display current graph on screen	16-18
Save	Save current graph in graph file.	16-19
Options		
Legend	Label each data range	16-19
Format	Set method of displaying and connecting data-points	16-20
Graph	Set format for entire graph	
A B C D E F	Set format for a range	
Lines	Use lines only	
Symbols	Use symbols only	

Command	Command Description	Page
Both	Use both lines and symbols	
Neither	Use neither lines nor symbols	
Quit	Return to mainGraph menu	
Titles	Set title for axes and/or graph	16-22
First	Top line (large when printed)	
Second	Second line (small when printed)	
Y-axis	Title vertical axis	
X-axis	Title horizontal axis	
Grid	Display grid over graph	16-23
Horizontal	Display horizontal lines at tick marks	
Vertical	Display vertical lines at tick marks	
Both	Display both horizontal and vertical lines	
Clear	No grid lines	
Scale	Set display scale of axes	16-23
Y-axis	Not used with pie graphs	
X-axis	Only relevant for XY graphs	
Automatic	Include min. and max. data values	
Manual	Focus in on particular area of concern	
Lower	(Manual only) Set lower scale value	
Upper	(Manual only) Set upper scale value	
Format	Set format of scaling numbers	
Fixed,		
Scientific,		
Currency,		
, (comma),		
General,		
+ ' - ,		
Percent,		
Date, Text		
Quit	Return to options submenu	
Skip	Use selected X-range entries as labels	
Color	Display graph bars, lines, symbols on monitor in color (not applicable for the Portable PLUS)	16-25
B&W	Display graph bars, lines, symbols on monitor in green and black	16-25
Data-Labels	Use cells to label data-points	16-21
Quit	Return to main Graph menu	
Name	Name sets of graph specifications	
Use	Retrieve named graph and display it	16-26
Create	Save current settings under a name	16-25

Command	Command Description	Page
Delete	Eliminate a graph name	16-26
Reset	Eliminate all graph names	16-27
Quit	Return to Ready Mode	

/Data Commands

Fill	Fill range with a series of numbers	17-23
Table	Tabulate formula values	
1	Vary one input cell, tabulate one or more formulas	17-23
2	Vary two input cells, tabulate one formula	17-25
Sort	Sort a range	17-26
Data-Range	Specify range to sort	
Primary-Key	Specify first column to sort on	
Secondary-Key	Specify second column to sort on	
Reset	Cancel all Sort settings	
Go	Perform the sort	
Quit	Return to Ready mode without sorting	
Query	Perform operations on a database	17-28
Input	Specify database (Input range)	
Criterion	Specify Criterion range	
Output	Specify Output range for Extract and Unique	
Find	Highlight records matching criteria	
Extract	Copy all records matching criteria to Output range	
Unique	Extract without allowing duplicates	
Delete	Delete all records matching criteria	
Reset	Cancel all /Data Query settings	
Quit	Return to Ready Mode	
Distribution	Calculate frequency distribution	17-33

/Quit Command	End 1-2-3 session	18-1
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/PrintGraph Commands

Command	Command Description	Page
Select	Select graphs for printing	20-8
Options	Select formatting options for graphs	20-9
Color	Assign colors to parts of graph	20-9
Grid	Assign color to gridwork and text	
A B C D E F	Assign color to data range A-F	
Quit	Return to Options menu	
Font	Select fonts for graphs	20-9
1	Select font for First title	
2	Select font for rest of graph	
Size	Control size and placement of graph	20-10
Full	Produce full-page graph	
Half	Produce half-page graph	
Manual	Adjust size settings manually	
Left	Set left margin	
Top	Set top margin	
Width	Set width	
Height	Set height	
Rotation	Set counterclockwise rotation	
Quit	Exit Size submenu	
Pause	Control pause between printing	
Eject	graphs	20-12
	Control page eject between printing	
	graphs	20-12
Quit	Return to main PrintGraph menu	
Go	Print selected graphs	20-13
Configure	Configure PrintGraph to system	
hardware		20-3
Files	Select directories	20-3
Pictures	Select directory to search for Picture files	
Fonts	Select directory to search for Font files	
Quit	Return to main PrintGraph menu	
Device	Select graphics printing device	20-4
Page	Select default page size	20-5
Length	Select default page length	
Width	Select default page width	
Quit	Return to Configure submenu	
Interface	Select interface for graphics device	20-5
1	<i>System Default</i>	
2	<i>Serial</i>	
3	<i>Plotter</i>	
4	<i>HP 82164A</i>	

Command	Command Description	Page
Save	Record configuration on disk	20-6
Cancel	Cancel Save	
Replace	Replace old configuration with new	
Reset	Restore default configuration settings . . .	20-7
Quit	Return to main PrintGraph menu	20-7
Align	Make current paper position top of	
	page	20-13
Page	Advance paper to top of next page	20-13
Quit	Exit PrintGraph program	20-13
Yes	Exit to P.A.M.	
No	Return to PrintGraph program	



E. Translating Files for Data Import and Export

The 1-2-3 Utilities disk contains a program called *123 Translate*. Translate allows you to exchange data among 1-2-3 and other programs that run on your HP Portable PLUS.

Translate can perform several types of file conversion.

Source	Filename Extension	Destination	Filename Extension
VisiCalc spreadsheet	.VC	1-2-3 worksheet	.WKS
DIF (Data Interchange Format)	.DIF	1-2-3	.WKS
dBASE-II	.DBF	1-2-3	.WKS
1-2-3	.WKS	DIF	.DIF
1-2-3	.WKS	dBASE-II	.DBF

Translate Functions

Before performing any file translations, be sure that each file to be translated has the proper filename extension, as indicated in the table above. Use P.A.M.'s File Manager or the MS-DOS RENAME command to do the job.

Procedure

1. When you select Translate, the following menu appears:

VC to WKS DIF to WKS WKS to DIF DBF to WKS WKS to DBF Quit

Select a Translate function by moving the menu pointer and pressing [Return]. If you wish to return to P.A.M.'s Main Menu, choosing Quit Yes will change your screen accordingly.

2. Specify the *source drive*—the one with the files you wish to translate.
3. Translate displays a list of files of the appropriate type, e.g.:

```
ACCTS1.DBF
ACCTS2.DBF
PHONELST.DBF
PROSPECT.DBF
```

Select *one* file only, using the pointer-movement keys, [Space Bar], and [Return].

4. Specify the *destination drive*—the drive on which the translated file is to be stored.
5. Confirm the Translate request by selecting Yes. Selecting No allows you to choose another file to translate. Selecting Quit returns you immediately to the Translate menu.

DIF to WKS: Select Rowwise or Columnwise translation. If you make the same choice here that was made to create the DIF file, the data is preserved in its original form. If you make the opposite choice, the data's rows and columns are switched.

WKS to DBF: To restrict the translation to a particular range of the worksheet, enter a *range name*. If you specify a range that is only one row deep (i.e. a row of field names), Translate will process succeeding rows until it reaches a blank row. To process the entire worksheet, press [Return] alone.

DBF to WKS: Deleted records in the dBASE-II file are not written to the worksheet file.

WKS to DIF: Use only worksheet files created with /File Save.

VC to WKS: The VisiCalc functions @CHOOSE, @NOT, @OR, and @AND will not be translated as formulas. When it encounters one of these functions, Translate displays a "Formula error" message, reports the cell address, and translates the text of the VisiCalc formula as a label entry.

Ending Translate. To return to P.A.M., select Quit and Yes.

Glossary

Boldface type indicates words and phrases that have their own Glossary entries. The page reference accompanying each entry indicates the principal location in the manual at which the entry is explained.

Absolute Cell Address. (p. 8-6) An address whose column and row labels are preceded by dollar signs (e.g. **\$A\$4**, **\$BK\$210**). An absolute cell address in a formula does not change when the formula is copied to another cell.

[f4/Abs] Key. (p. 8-8) In Point mode, changes a cell address between **relative**, **absolute**, and **mixed**. Use this key only when entering a formula—it has no useful effect during execution of a 1-2-3 command.

Address. (p. 8-2) The location of a particular cell in the worksheet, labeled by its column and row, e.g. A10, BK201.

Anchor Cell. (p. 7-5) When the cell pointer is expanded to cover an entire range, the cell diagonally opposite the **free cell** is the *anchor cell*. The control panel shows this information:

B25..F60 ← free cell
 ↑
 anchor cell

Pressing [ESC] at this point shrinks the pointer down to just the anchor cell, removing the anchor.

Argument. (p. 8-22) A numeric value provided to an **@ function**. You place arguments in parentheses following the function name; separate multiple arguments with commas. 1-2-3 allows arguments that are numbers (e.g. **@SIN(-.456)**), references to single cells (e.g. **@SUM(14,H45,H50)**), and range references (e.g. **@SUM(100,H23..J50)**). You may also use another **@ function** as a single-value argument.

[Backspace] Key. (p. 5-8) **Value, Label, Edit modes:** When you're typing an entry on line 2 of the control panel, [Backspace] erases the character preceding the cursor. **Point mode:** Cancels the current range specification, returning the pointer to the **current cell**.

[BackTab] Key—Hold down [Shift] and press [Tab]. (p. 4-4) Moves the pointer or cursor to left. **Ready, Point Modes:** Moves pointer one page to left. **Value, Label Modes:** Completes current entry and move pointer one page to left. **Edit Mode:** Moves cursor 5 characters to left. (Equivalent: [CTRL]-◀.)



Border. (p. 2-10) (1) The area of the 1-2-3 screen display that contains the column letters and row numbers. The **Titles** facility effectively makes rows and/or columns part of this border. (2) Rows and/or columns to be printed along with each Print Range (/Print Options Borders command).

[Break] Key. (p. 5-8) (1) Cancels the current command, entry, or keyboard macro. (2) Interrupts a 1-2-3 or PrintGraph printing operation.

[F9/Calc] Key. (p. 8-12) **Ready Mode:** Recalculates all formulas in the worksheet. **Value, Edit Modes:** Replaces a numeric entry (on line 2 of the control panel) with its current value.

Cell. (p. 2-1) A single location in the worksheet, specified by its column-row address (e.g. cell G199).

Cell Entry. (p. 2-8, 5-1) A number, formula, or label stored in a cell of the worksheet.

Cell Pointer. (p. 2-7, 4-1) The inverse-video bar that always highlights a cell or range of cells. The location of the pointer when you begin a command or entry is called the **current cell**. While you are entering a command or formula, you can often move the pointer to another **pointer location**.

Clear. (p. 15-6) Erase a previously specified print setting. (See also **Reset.**)

Column. (p. 2-1) The worksheet has 256 columns, labeled A-Z, AA-AZ, BA-BZ, ...IV.

Column Width. (p. 2-9) A column may be displayed at any width between 1 and 72 characters. No matter what the display width, each cell in a column can store up to 240 characters. The initial column-width (9 characters) can be changed for an individual column (/Worksheet Column-Width), or for all columns not individually set (/Worksheet Global Column-Width).

Command. (p. 6-1) An instruction to 1-2-3 to perform a task. To begin a 1-2-3 command, type / (slash). Examples: /Copy, /File Save, /Range Format.

Command Menu. (p. 6-2) A list of command keywords for you to choose from. You can select a keyword by (1) Moving the pointer with **pointer-movement keys**, then pressing [**Return**], or (2) Typing the first letter of the keyword.

Configuration. (p. A-1) 1-2-3's standard procedures for transferring information between the worksheet and printers/disks. (Example: "Use the root directory of Drive A: to store data, unless specifically instructed otherwise".) These procedures are stored on Drive A in a file named 123.CNF. The PrintGraph program also has a configuration file, GRAPH.CNF.

Control Panel. (p. 2-9) The first three lines of 1-2-3's screen display. It shows (1) Information about the **pointer location** and the current mode; (2) Cell entries and command responses as you type or edit them; (3) Menus and menu choice explanations; (4) Command prompts and your replies to those prompts.

/Copy Command. (p. 12-1) Copies a cell or range of cells to another location in the worksheet. The effect of copying upon cell addresses in formulas depends on whether they are **absolute**, **relative**, or **mixed** addresses.

Criterion. (p. 17-7) A "test condition" used in /Data Query commands and by the database statistical functions. You must identify a *Criterion range* containing criteria to be applied to the *Input range* before executing a /Data Query operation.

[CTRL] Key. (p. 9-5) Along with [Shift], invokes a **keyboard macro**.

Current Cell. (p. 4-1) The location of the cell pointer when you begin to type a cell or entry or begin to issue a 1-2-3 command. As you proceed with an entry or command, you often can move the pointer to another **pointer location**.

Current Directory. (p. 14-6) The file directory that 1-2-3 will use to transfer data between the worksheet and disk storage, unless otherwise directed. To specify a source or destination other than the current directory, use a disk prefix along with the filename you type (e.g. C:ACCTS means the current directory of Disk C, ACCTS).

Current Worksheet. (p. 2-1, 2-12) The 1-2-3 worksheet currently displayed on the screen. All entries, calculations, and commands are performed on the current worksheet.

Cursor. (p. 5-1) **Value, Label, Edit Modes:** The cursor, a blinking underscore or rectangle indicates where the next insertion or deletion will take place. **Point Mode:** The cursor indicates the (expanded) cell pointer's **free corner**.

Database. (p. 17-1) A cell range that contains data records. 1-2-3's /Data commands and database statistical functions operate on a database.

Database Statistical Function. (p. 17-15) An **@ function** that performs a statistical analysis on one field of a set of records selected from a **database** (@DCOUNT, @DSUM, @DAVG, @DMIN, @DMAX, @DSTD, @DVAR).

/Data Commands. (p. 17-1) Manipulate data in tabular form, such as a **database**.

Data Disk. (p. 1-3, 2-13) A disk used to store data. Each worksheet or print job is stored in a **file** with its own name.

Data-Labels. (p. 16-11) A range of cell entries to be “pasted on” a graph at the value locations (/Graph Options Data-Labels).

Date Formats. (p. 8-25) 1-2-3 records dates as “serial numbers”, from 1 (01-Jan-1900) to 73049 (31-Dec-2099). These date numbers can be displayed in three date formats (/Worksheet Global Format and /Range Format):

D1 (Day-month-year): 12-Nov-82

D2 (Day-month): 12-Nov

D3 (Month-year): Nov-82

Default. (p. 10-1) An initial or original value or procedure, which 1-2-3 uses unless you specify a different one.

Default Configuration. (p. A-1) The standard procedures 1-2-3 or PrintGraph uses to transfer information between the worksheet and printers/disks (1-2-3: /Worksheet Global Default command; PrintGraph: Configure command). The configuration information is stored in configuration files named 123.CNF and GRAPH.CNF on Drive A.

Disk(ette). (p. 1-3) A permanent data storage medium for microcomputers. Also called “floppy disk”. See also **Electronic Disk**.

Disk Drive. (p. 1-3) The device into which diskettes are placed for use. Typically, data files are stored on disks in Drive C.

Disk Prefix. (p. 14-6) Two characters placed at the beginning of a filename (e.g. C:). The disk prefix tells 1-2-3 to use a particular disk to store or retrieve data, instead of the **current directory**. Example: “C:REFER” specifies file REFER in the current directory of disk C.

Display Screen. (p. 2-6) The “TV” screen of your computer.

Display Format. (p. 10-3) See **Mode Numeric Display Format**.

DOS. Disk Operating System. See **MS-DOS**.

[f2/Edit] **Key.** (p. 5-9) **Ready, Value, Label Modes:** Switches 1-2-3 to Edit Mode. **Edit Mode:** Returns to Value or Label Mode.

Edit Mode. (p. 5-8) A mode in which the pointer-movement keys position the cursor: on line 2 of the control panel, so that you may make character-by-character corrections to an entry. If 1-2-3 detects an error in an entry or formula, it automatically shifts into Edit Mode.

Electronic Disk. (p. 2-13) Drives A and B are internal, electronic disk drives that do *not* use diskettes. They function independently of an external disk drive. Drive A (the internal RAM disk) is available to you for storing worksheet files. Drive B (the internal ROM disk) is not accessible to you.

Entry. (p. 5-1) A **cell entry** or a response to a 1-2-3 command prompt.

Error Message. (p. C-1) A short message that 1-2-3 displays in the lower left corner of the screen, accompanied by a *beep*. This signals you that you have violated one of 1-2-3's "rules". Press [ESC] or [Return] to clear an error message and return to Ready Mode.

[ESC] **Key.** (p. 5-8) This is the "undo-it" key. **While you're issuing a command:** Returns you to the previous command step. **Value, Label Modes:** Cancels the entry and returns you to Ready Mode. **Edit Mode:** Blanks the current entry and leaves you in Edit Mode. **Point Mode:** (1) Unexpands the cell pointer, leaving it at the **anchor cell**, or (2) Returns you to the previous command step, or (3) Removes a single-cell address from a formula.

Field. (p. 17-2) A column in a 1-2-3 **database**. **Example:** The first field (column) of a database might contain *Name* entries and the second column *Address* entries.

Field Name. (p. 17-3) A label entry in the first row of a **database** (Input range). Field names in the Criterion and Output ranges must match field names in the Input range.

File. (p. 14-1) A collection of information stored on **disk**. Worksheets, print jobs, graph images, and programs all are stored in files.

Filename. (p. 14-1) The name under which a worksheet, print job, or graph image is stored. 1-2-3 data filenames may be up to eight characters long, containing letters (A..Z), numbers (0..9), and the underscore character in any combination. *Note:* Spaces are not allowed. Uppercase and lowercase letters are equivalent.

Filename Extension. (p. 14-5) A three-letter suffix, which 1-2-3 automatically adds to the filename you type when a data file is created (/File Save, /File Xtract, /Graph Save, /Print File):

<u>File type</u>	<u>Extension</u>
Worksheet file	.WKS
Graph (picture) file	.PIC
Print file	.PRN



1-2-3 recognizes *only* these extensions for data files. When importing a data file produced by another program, rename it to have the .PRN extension.

/File Commands. (p. 14-1) Store data in files and retrieve data from files.

Font. (p. 20-9) A typeface (character set) used by the PrintGraph program in printing or plotting graphs.

Format. See **Numeric Display Format.**

Formula. (p. 8-1) An instruction for 1-2-3 to calculate a number. Formulas may use the values stored in individual cells and in cell ranges. They may include arithmetic operations (addition, subtraction, etc.), logical operations (greater than, equal, etc.), and 1-2-3's built-in **@ functions**. Example: + B1*@SUM(A10..A20).

Free Cell. (p. 7-5) When the cell pointer is expanded to cover an entire range of cells (Point mode), the cursor in the free cell indicates which corner of the range will be affected if you press a pointer-movement key. The free cell is diagonally opposite the **anchor cell**. The control panel shows this information:

```

B25..F60      ← free cell
  ↑
anchor cell
  
```

Function (@ Function). (p. 8-22) Built-in "formulas" that perform particular calculations. Example: The formula @SUM(B1..B3) performs the same calculation as the formula + B1 + B2 + B3. All function names begin with the "@" character. (See also **Argument**.)

Function Keys. The function keys on the Portable PLUS keyboard are assigned special 1-2-3 functions:

[f1/Help]	Display Help screen
[f2/Edit]	Switch to/from Edit Mode for current entry
[f3/Name]	In Point Mode, display menu of range names
[f4/Abs]	In Point Mode, make cell addresses "absolute"
[f5/GoTo]	Move cell pointer to a particular cell
[f6/Window]	Move cell pointer to other side of split screen
[f7/Query]	Repeat most recently specified Data Query operation
[f8/Table]	Repeat most recently specified Data Table operation
[f9/Calc]	Recalculate worksheet or single cell ([Shift]-[f1])
[f10/Graph]	Draw the most recently specified graph ([Shift]-[f2])
[f12/Scroll Lock]	Change meaning of arrow keys between pointer movement and window movement ([Shift]-[f4])

Global Setting. (p. 10-2) A procedure that 1-2-3 follows, affecting the entire worksheet (/Worksheet Global). In many cases, you can use a corresponding /Range command to affect a particular cell or range of cells.

[f5/GoTo] Key. (p. 4-2) **Ready Mode:** Moves the cell pointer to a particular cell (1-2-3 prompts you to specify a location).

[f10/Graph] Key. (p. 16-4) (1) **Ready Mode:** Pressing the [f10/Graph] key draws a graph using the most recently entered /Graph specifications, even if cell contents have been changed subsequently. (2) **PrintGraph program:** Previews the graph stored in the currently highlighted file.

/Graph Commands. (p. 16-1) Define and display graphs using data contained in the worksheet. Store graphs on a disk as graph (picture) files (filename extension .PIC), for later printing with the PrintGraph program.

Graph File (picture file). (p. 16-10) A file (extension .PIC) that stores a graph image, created with the /Graph Save command. Graph images are printed with the PrintGraph program.

Help Facility. (p. 3-1) 1-2-3's on-line reference manual. Pressing the function key at virtually any time while using 1-2-3 or PrintGraph provides instant information about the operation currently in progress. [ESC] ends the Help break and returns you to the work session, exactly where you left off.

[f1/Help] Key. (p. 3-1) At virtually any time: Suspends the work session and invokes the **Help facility**. In 1-2-3 Help mode, pressing [f1/Help] returns you to the first Help screen you viewed.

▼ **(Home) Key. (Hold down [Extend char] and press ▼ .)** (p. 4-3) **Ready, Point Modes:** (1) Moves the pointer (or free cell) to the upper left corner of the worksheet. (2) Pressing [Select] followed by ▼ moves the pointer to the lower right corner of the **active area**. **Edit Mode:** Moves the cursor to the beginning of the entry on line 2 of the control panel. **Menu, Help Modes:** Moves the menu pointer to the first menu item. **Find Mode:** Moves to the first record in the database, whether it satisfies the criteria or not.

Indicator. (p. 2-6) (1) An inverse-video word in the upper right corner that indicates 1-2-3's current **mode** of operation. (2) An inverse-video word in the lower right corner that indicates a particular program condition (e.g. *CALC* indicates that the worksheet's formulas need to be recalculated).

Internal Disk. See **Electronic Disk**.

Justification. (p. 11-5) Rearrangement of a column of labels to a particular width (/Range Justify).



Keyboard Macro. (p. 9-1) A sequence of keystrokes “attached” to a single letter key. The macro named “\0” is automatically executed whenever a worksheet is retrieved from disk storage. A special set of commands—the **/X commands**—can be used only in a macro.

Label. (p. 5-6) A cell entry consisting of up to 240 characters that has a non-numeric meaning. (For computational purposes, a label has a value of zero.) You can control how labels appear in their cells by using **label-prefix characters** and the commands /Worksheet Global Label-Prefix and Range Label-Prefix.

Label-Prefix Character. (p. 5-6) A character at the beginning of an entry to indicate (1) That the entry is a label and (2) The manner in which the label is to be aligned in its cell:

Label-Prefix	Alignment	Example
' (apostrophe)	left-aligned	LABEL
”	right-aligned	LABEL
^	centered	LABEL
\	repeating	LABELLABEL

Logical Operator. (p. 8-20) Used in formulas to construct statements that are *TRUE* or *FALSE*. Example: $+B1 > B2$ is *TRUE* if the value in cell B1 is greater than that in cell B2; otherwise it is *FALSE*. The value *TRUE* is represented by the number 1. The value *FALSE* is represented by the number 0.

Long Label. (p. 11-5) A label that extends past the right edge of its cell, “borrowing” empty space from the cell(s) to its right. A label is always remembered by 1-2-3 in its entirety, even if you can’t always see all of it. The complete label is displayed in the control panel when the cell pointer is moved to the label’s cell.

Long Prompt. (p. 2-11) A text, displayed on Line 3 of the control panel, that explains the meaning of the currently highlighted menu choice. 1-2-3 displays long prompts with all command menus. You can define your own long prompts for use in **/XM command** menus.

Main Memory. (p. 2-12) Your computer’s temporary storage area, used for both programs and data (e.g. both 1-2-3 itself and the 1-2-3 worksheet you’re using). Main memory is also called “system memory”.

Menu. (p. 6-8) A series of choices which appear in the control panel. Menus are used throughout 1-2-3 and PrintGraph. You select menu items by moving the **menu pointer** and pressing [Return], or (for commands only) by typing the first letter of the choice. In Point Mode, pressing [F3/Name] displays a menu of **range names**.

Menu Pointer. (p. 6-10) A reverse-video bar (highlight) that you use to select an item from a menu. In Menu Mode, the pointer-movement keys move the menu pointer rather than the cell pointer.

Mixed Cell Address. (p. 8-14) An address that is part-absolute and part-relative. (See **Absolute Cell Address** and **Relative Cell Address**.)

Mode Indicator. (p. 2-6) A highlighted word in the upper right corner of the screen, indicating your current mode of operation:

1-2-3

Indicator	Meaning
READY	Waiting to do your bidding
VALUE	Entering a number or formula
LABEL	Entering a label
EDIT	Editing an entry
POINT	Pointing to a cell or range
MENU	Selecting a menu item
HELP	In the Help facility
ERROR	Waiting for [ESC] or [Return] to clear an error condition
WAIT	1-2-3 is working and cannot process commands immediately
FIND	1-2-3 is performing a /Data Query Find operation.

An additional indicator, CMD or SST (single-step), appears next to the standard indicator during execution of a keyboard macro.

/Move Command. (p. 13-1) Moves a cell or range of cells from one location on the worksheet to another. Cell addresses in formulas are preserved by /Move.

MS-DOS. The operating system supplied to you by Hewlett-Packard.

Named Range. (p. 7-11) A single cell or range of cells that have been assigned a name (/Range Name Create or /Range Name Labels). The name of a range can be substituted for its opposite-corner cell addresses. Example: The range B1..F1 is assigned the name "HEADINGS", making the formulas 45 + @COUNT(B1..F1) and 45 + @COUNT(HEADINGS) equivalent.

[f3/Name] Key. (p. 7-13) In Point Mode, pressing the [f3/Name] key produces a menu of the currently defined range names.

Number. (p. 5-4) 1-2-3 can store numbers with magnitudes between 10^{99} and 10^{-99} (approximately), both positive and negative. (In the midst of a calculation, it can keep track of even larger numbers.) All numbers are stored in "floating-point" form, to a precision of approximately 15 decimal digits.

Numeric Display Format. (p. 10-3) The way in which a cell's numeric contents are displayed (/Worksheet Global Format, /Range Format). This may be an "edited" version of the cell's actual contents (e.g. 45.60000, \$45.60, 4.56E1).



P.A.M. The Personal Applications Manager which coordinates your use of various application programs (such as **FORMAT** and **COPY FILE**).

Pointer Location. (p. 4-1) The cell being highlighted by the cell pointer. If the pointer is expanded to highlight a range of cells, the **free cell** is the pointer location. Information regarding the pointer location always is displayed in the *control panel*.

Pointer-Movement Keys. (p. 4-2) These keys move the pointer around the worksheet in Ready and Point Modes. Some of them also are active in other modes:

Key	Ready, Point	Menu, Help	Edit
◀	left 1 cell	left 1 item	left 1 char
▶	right 1 cell	right 1 item	right 1 char
▲	up 1 cell	up 1 item	end entry & up 1 cell
▼	down 1 cell	down 1 item	end entry & down 1 cell
[BackTab]	left 1 page	...	left 5 chars
[Tab]	right 1 page	...	right 5 chars
[Prev]	up 1 page	...	end entry & up 1 page
[Next]	down 1 page	...	end entry & down 1 page
↖	upper left corner	first item	first char
[Select]	end of non-blank block	last item	last char
[Select] ↘	lower right corner	...	...

Several other keys also accomplish pointer movement. [f5/GoTo] moves the pointer to a location you specify. [f6/Window] moves the pointer between windows when you are using the Split Screen facility. [f12/Scroll Lock] switches the meaning of the arrow keys between moving the cell pointer and moving the window.

[Print] Key. (p. 2-6, 16-10) Print exact image of current graphics display or graphics memory (if a graph of the worksheet was viewed previously) on a connected printer. Note: If the error message "press [Return] to clear" appears, press [Break] to clear this condition when [Return] itself does not work.

/Print Commands. (p. 15-1) Send an image of a cell range directly to the printer or to a *print file* on disk, for later use. /Print commands allow extensive formatting of the printed output.

Print File. (p. 15-1) (1) A file (extension .PRN) that stores a report for subsequent printing or for use by another program. 1-2-3 creates print files with the Print File command. (2) Data to be imported from another program must be in print file format.

PrintGraph Program. (p. 20-1) A program that creates printed versions of the graphs defined with the Graph Save command. These graph images are stored in *graph files* (extension .PIC).

Prompt. (p. 6-1) A message displayed by 1-2-3 on line 2 of the control panel during the execution of a command. When responding to a prompt, end your entry with [Return].

Protection. (p. 10-7) A 1-2-3 facility for preventing inadvertent modification of particular cells (/Worksheet Global Protection, /Range Protect, /Range Unprotect, /Range Input).

[F7/Query] Key. (p. 17-14) The [F7/Query] key repeats the most recently specified /Data Query operation (Find, Extract, Unique, Delete), even if cell contents have been changed subsequently.

Quit. (p. 6-6) In a “sticky” command menu, selecting Quit exits the menu, returning you to Ready Mode or to a higher menu level.

/Quit Command. (p. 18-1) Ends the 1-2-3 and PrintGraph sessions and returns you to P.A.M. or MS-DOS, depending upon from which program you entered 1-2-3 or PrintGraph.

RAM. (p. 2-13) Random-access (or “read-write”) memory is that portion of the computer’s memory that you have access to: you can store, retrieve, and alter information in RAM. Drive A is RAM.

Range. (p. 7-1) A rectangular block of cells. (A single cell is also considered to be a range.) You may indicate a range (1) By expanding the cell pointer; (2) By typing the cell addresses of two diagonally opposite corners; (3) By typing a range name or selecting one from a menu of range names.

/Range Commands. (p. 7-1) The set of 1-2-3 commands that affect single cells or ranges of cells. In some cases, a corresponding /Worksheet command affects the entire worksheet.

Recalculation. (p. 10-5) The reevaluation of each formula in the worksheet, using the current cell values (/Worksheet Global Recalculation).

Relative Cell Address. (p. 8-3) A cell address that doesn’t include any \$ characters (e.g. C15, not \$C\$15 or C\$15). It indicates the location of a value to be used *relative* to the formula cell. When you /Copy a formula with a relative address, 1-2-3 adjusts the address accordingly in the copy.

[Return] Key. (p. 2-6) **Value, Label, Edit Modes:** Signals the end of a cell entry or command response. **Menu Mode:** Selects the currently-highlighted menu item.

ROM. Read-only memory is that portion of the computer’s memory that you *cannot* alter, replace, delete, or add to. Drive B is ROM.



Scrolling. (p. 4-2) The process of “moving” the window (as defined by the reverse-video border of column and row labels) around the worksheet. It’s better to think of the worksheet as stationary and the window as movable than vice-versa.

[f12/Scroll Lock] Key. (p. 4-5) Switches the meaning of the arrow keys: ▲, ▼, ◀, ▶. With **SCROLL LOCK off**, these keys move the cell pointer. With **SCROLL LOCK on**, these keys move the **window** into the worksheet.

[Select] Key. (p. 4-6) **Ready, Point Modes:** (1) Pressing the **[Select]** key followed by an arrow key causes the pointer to move in the direction of the arrow to the beginning or end of a block of non-blank cells. (2) Pressing **[Select]** followed by ▼ moves the pointer to the lower right corner of the **active area**. **Edit Mode:** Moves the cursor to the end of the entry on line 2 of the control panel. **Menu, Help Modes:** Moves the menu pointer to the last menu item. **Find Mode:** Moves to the first record in the database, whether it satisfies the criteria or not.

Setup String. (p. 15-14) A sequence of characters that perform printer functions (e.g. change print size) rather than appear in a print job.

Split Screen. (p. 10-10) A 1-2-3 facility in which the screen displays two separate windows into the worksheet (/Worksheet Window). You can make these windows either totally independent or *synchronized*.

System Memory. See Main Memory.

[Tab] Key. (p. 4-4) Move the pointer or cursor to right. **Ready, Point Modes:** Move pointer one page to right. **Value, Label Modes:** Complete current entry and move pointer on page to right. **Edit Mode:** Move cursor 5 characters to right.

[f8/Table] Key. (p. 17-20) The **[f8/Table]** key repeats the most recently specified /Data Table operation, even if cell contents have been changed subsequently.

Titles. (p. 10-9) (1) Rows and/or columns “frozen in place” on the display screen (/Worksheet Titles). (2) Text lines to appear on a graph (/Graph Options Titles).

Tutorial. (p. 1-3) The *1-2-3 Electronic Tutorial*, included on the Utilities disk, provides step-by-step lessons on how to use 1-2-3.

Typing Alternative. See **Keyboard Macros**.

Value. Any **number** or **formula**.

Window. (p. 2-7, 4-9) The currently displayed portion of the worksheet (standard size: 8 columns × 11 rows). You can change the number of columns by altering column widths (/Worksheet Global Column-Width, /Worksheet Column-Width). The **Split Screen** facility allows you to split the display screen into two windows (/Worksheet Window).

[F6/Window] Key. (p. 10-10) (Split Screen only) In Ready and Point modes, the [F6/Window] key switches the cell pointer between the two windows on the worksheet.

Worksheet. (p. 2-7) 1-2-3's electronic representation of a ledger sheet, organized into columns and rows. Also called a "spreadsheet".

/Worksheet Commands. (p. 10-1) Affect the current worksheet as a whole: formatting, cell protection, insertion and deletion of columns and rows, default printer/disk configuration, recalculation procedures, column-widths, Titles, Split Screen.

Worksheet File. (p. 14-1) A file that stores a complete or partial 1-2-3 worksheet (/File Save, /File Xtract). This file is in a Lotus proprietary format—it cannot be manipulated by other programs (e.g. text-editors).

/X Commands. (p. 9-9) (Usable only in keyboard macros) Control the processing order of keyboard macro instructions, including the creation of user-defined menus.



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