LOTUS™ '1-2-3™

Update

---

1. Any 1-2-3 worksheets that you create should be stored on prepared data diskettes, not on the 1-2-3 program disks. Attempting to store 1-2-3 worksheet files on the program disks may result in loss of your data.

2. On page 9-6, **Single-Step Execution** of Keyboard Macros: after pressing **[ALT]-[1/HELP]** and **[ALT]**-letter (attached to the macro), press any key to proceed one step at a time in the execution of the macro. Pressing **[ALT]-[1/HELP]** again causes the *STEP* indicator to disappear.

3. On page 9-12, **Pause-for-Keyboard-Input Commands,** 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.

4. On page 11-8, Figure 11-6, the shading indicating unprotected cells should cover "Klassy Komputers, Inc."

5. On page 17-9, **Formula Criteria (Numeric Comparisons)** for the /Data Query commands, note that you may not use the seven database statistical functions inside the Criterion range.

6. On page 20-2 and page 20-13, "Printing 1-2-3 Graphs", DRIVES, Pictures: B: and Fonts: A: should read DIRECTORIES, Pictures B: \ and FONTS A: \ .
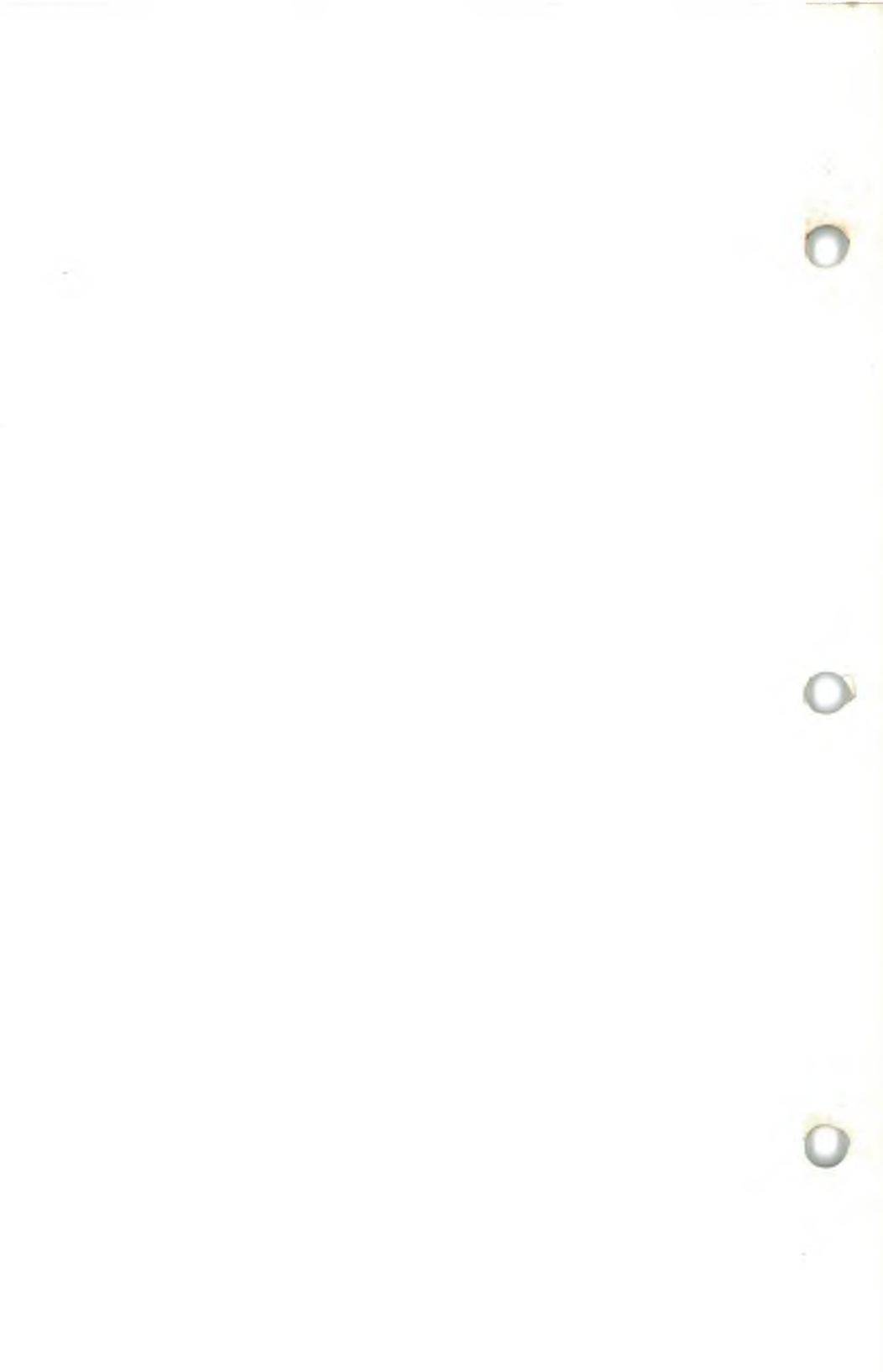
User's Manual

For the
VICTOR® 9000
Computer

Release 1A

24102

LOTUS™

1-2-3™

User's Manual

For the
VICTOR® 9000
Computer

Release 1A

24102
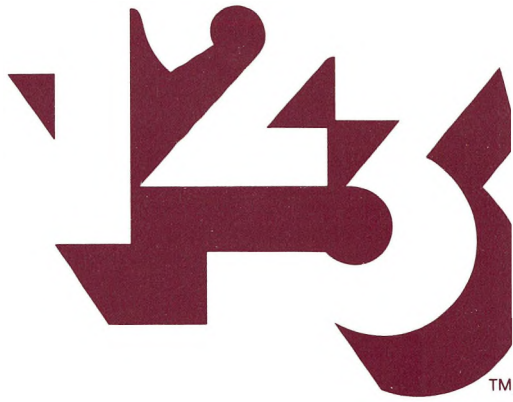
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1-2-3's Compatibility with Available Hardware and Software

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.

1-2-3 is designed to run under MS-DOS Version 1.25, Victor BIOS Version 2.61, or subsequent revisions of MS-DOS.

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Getting Started

In this introductory section of the manual, we describe a few short procedures that you must follow in order to use 1-2-3 on your Victor 9000 Computer. Then, we make some suggestions for how to start using 1-2-3. In particular, we describe the 1-2-3 Electronic Tutorial.

We suggest that you familiarize yourself with the computer, the *Victor Operator Reference Guide*, and the Victor-supplied software 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 the pages that follow, we'll explain exactly what to do, what to look for, and what keys to press. Here's an outline of the tasks you'll be performing:

1. Checking the 1-2-3 package for completeness.

2. Filling out the Purchaser Registration Card.

3. Transferring certain Victor-supplied programs (including the *operating system*) from the MS-DOS disk to the disks in the 1-2-3 package.

4. *Configuring* 1-2-3 to adopt a set of standard operating procedures that you prescribe.

5. Preparing data diskettes for use with 1-2-3.

> *Be sure to do these steps in the prescribed order. Subsequent steps depend on your having already performed preceding ones.*

1. Checking for Completeness

The 1-2-3 package, as delivered to you by your dealer, contains several parts. Use the following checklist to make sure that your package has been assembled correctly:

✔ **1-2-3 User's Manual.** The manual is a loose-leaf binder in a cardboard slipcase. Flip through the manual, checking it against the Table of Contents, to make sure you have all the pages.

✔ **Disks.** The 1-2-3 software package consists of four disks, which are provided in a heavy envelope labeled *Lotus License Agreement*:

    1-2-3 System Disk
    1-2-3 System Disk (backup copy)
    1-2-3 PrintGraph Disk
    1-2-3 Tutorial Disk

Opening this envelope constitutes your acceptance of the License Agreement. Please read the explanation on the outside of the envelope **before** *you open it.*

↙ **Quick Reference.** A handy booklet that summarizes 1-2-3 operating procedures.

↙ **Keyboard Template.** Fits over the keyboard's function keys to remind you of their meaning during a 1-2-3 session. The template comes on an extra page at the front of the *1-2-3 User's Manual* binder.

↙ **Customer Assurance Plan.** A booklet at the back of the binder that includes the Limited Warranty, the Purchaser Registration Card, and the Replacement Order Card.

2. Filling Out the Purchaser Registration Card

This detachable card is included in the Customer Assurance Plan booklet. Why return the card? There are many reasons: to make you eligible for reduced-rate upgrades, to protect you against product defects, and to facilitate your getting warranty service. For details, read the Customer Assurance Plan.

3. Transferring MS-DOS Programs

This step makes each of the Lotus-supplied disks, except the Tutorial Disk, capable of starting your computer. This is called *bootstrapping the system* or *booting*.

Two-Diskette System

Follow these instructions if your system has two diskette drives.

1. Take the Lotus disks—all four of them—from their envelope. (First, read the License Agreement printed on the envelope.)

2. Start your computer using the MS-DOS disk supplied by Victor. Note that you must use MS-DOS Version 1.25 or subsequent versions, Victor BIOS Version 2.61. If you are unsure of the revision of your MS-DOS disk, check with your dealer. Place the MS-DOS disk in Drive A (on the left), close the door, then turn on electrical power. After a short time, during which the system tests itself, you'll be prompted to enter the current date and time. Here's what you would type at 4:23 PM on June 16, 1983:

    A:DATE
    Current date is Tue 1-01-1980:
    Enter new date: **6-16-83 [RETURN]**

    A:TIME
    Current time is 0:00:08.11
    Enter new time: **16:23 [RETURN]**

Note. Use the **[RETURN]** key to finish each entry. Separate the three parts of the date with hyphens. Separate the two or three parts of the time with colons. (Both the *minutes* and *seconds* are optional.)

The MS-DOS "prompt" appears:

A>

3. Place the 1-2-3 System Disk in Drive B (on the right) and close the door.

4. At the A> prompt, type the following command:

B:INSTALL [RETURN] *(do not type a space after the colon)*

A message appears, asking you to make sure the disks are loaded correctly. Do so, then press any key to continue. A message appears when the process is complete—it takes less than a minute.

5. Wait for the disk drive lights to go off, then remove the 1-2-3 System Disk from the drive and return it to its protective sleeve. The next step, *configuration,* also writes new information onto this disk.

6. Repeat steps 3 through 5 for these diskettes in the 1-2-3 package:

1-2-3 System Disk (backup copy)

1-2-3 PrintGraph Disk

Note. The Tutorial Disk is not a *bootable* disk. Before using it, start your system with the MS-DOS disk.

7. Remove the MS-DOS disk from Drive A and return it to its protective sleeve.

Proceed to step 4, "Establishing 1-2-3's Standard Procedure".

Hard-Disk System

Follow these instructions if your system has a single diskette drive and a hard disk.

1. Take the Lotus disks—all four of them—from the sealed envelope in which they are shipped. (First, read the License Agreement printed on the envelope.)

2. Start your computer, entering the date and time. (For help, see step 2 in the preceding section.)

3. Make the hard disk the "default drive". For instance, if the hard disk is Drive C, issue the following MS-DOS command:

C: [RETURN]

4. Place the 1-2-3 System Disk in the diskette drive and close the door.

5. Issue the following MS-DOS command:

COPY $x:*.*$ [RETURN] (x = A,B,C, etc.—the diskette drive)

6. Repeat steps 4 and 5 for the 1-2-3 PrintGraph and Tutorial Disks.

You may use only MS-DOS Version 1.25 or subsequent versions, Victor BIOS Version 2.61 with 1-2-3. Once you have installed MS-DOS programs and 1-2-3 drivers on your hard disk, it effectively *becomes* your 1-2-3 System Disk. You should interpret most references in Lotus documentation to the 1-2-3 System Disk as referring to the hard disk. There are some exceptions:

1. When the 1-2-3 program begins execution, the diskette labeled *1-2-3 System Disk* must be in the first diskette drive (usually designated Drive A).

2. If your hard disk is not designated as Drive A, it may not be capable of starting *(bootstrapping)* the computer. Thus, instructions to start the computer with the 1-2-3 System Disk are not appropriate. In such situations, start the computer with your MS-DOS disk.

4. Establishing 1-2-3's Standard Procedures (Configuration)

To relieve you of the burden of making decisions at every turn, 1-2-3 often follows certain standard procedures. In particular, 1-2-3 has standard *(default)* procedures for sending data to the printer, and for transferring data to and from disk storage.

Collectively, the standard procedures are called the *default configuration.* Lotus has supplied 1-2-3 with a default configuration, but you can change it to fit your own needs and equipment.

For your first experience with 1-2-3, we're going to help you make a slight change to the default configuration. It will make 1-2-3 "all yours". Note that these procedures are used as an example of changing 1-2-3's configuration, and may be changed at any time to suit your preferences. (For complete details on the default configuration, see Appendix A, "Configuring 1-2-3".)

1. Start your system with the 1-2-3 System Disk: Turn off electrical power. Place the 1-2-3 System Disk in Drive A, and turn power back on.

After a short self-test, the computer activates Drive A.

2. As prompted, enter the date and time, just as you did in the section "3. Transferring MS-DOS Programs".

A program called the Lotus Access System automatically starts:

```
Lotus Access System Rel. 1A (C)1982, 1983 Lotus Development Corp.    MENU
1-2-3 File-Manager PrintGraph Translate Exit
Enter 1-2-3 -- Lotus Spreadsheet/Graphics/Database program
```

As its name implies, this program gives you access to 1-2-3 itself. (See Chapter 21 for more on the Access System.)

The first few lines are a *menu.* The reverse-video highlight is pointing to one of the options on the menu: "1-2-3". That's the option we want.

3. Press **[RETURN]** to start 1-2-3. When the 1-2-3 startup screen appears, press any key to clear it from the screen.

Hard Disk Systems: The following MS-DOS message will appear:

Insert diskette for drive B: and strike any key when ready

(MS-DOS lets your single diskette drive act as Drive A sometimes and as Drive B at other times.)

Don't bother to switch disks—just press a key and the 1-2-3 worksheet will appear. Later, you will need to change the *startup current directory* setting. Details are provided at the end of this section.

Similarly, you will need to change the configuration file of the PrintGraph program when you first use it. Initially, PrintGraph assumes that Pictures are stored on a disk in Drive B, and Fonts are stored on a disk in Drive A. See Chapter 20 for details.

Now, you'll issue a series of *1-2-3 commands* that will change the default configuration. We list the instructions in table form: keystrokes on the left, explanations on the right.

Keyboard Preview. You'll be using the **[RETURN]** key a lot. You'll also be using the arrow keys ← and → at the bottom of the keypad to the right of the **[RETURN]** key. The **/** (slash) key is located at the lower right corner of the typewriter section on the key with the question mark.

You can enter numbers using either the numeric keypad at the far right of the keyboard or using the row of keys at the top of the typewriter section.

4. Update 1-2-3's default configuration:

Keys to Press	Meaning
/	Makes the 1-2-3 command menu appear at the top of the screen.
[RETURN]	Selects "Worksheet".
[RETURN]	Selects "Global".
→ → → → → **[RETURN]**	Selects "Default".
[RETURN]	Selects "Printer".

The screen should look like this now:

```
A1:                                                              [MENU]
Interface Auto-LF Left Right Top Bottom Page-Length Wait Setup Quit
Specify printer interface
     A        B        C        D        E        F        G        H
  1
  2
```
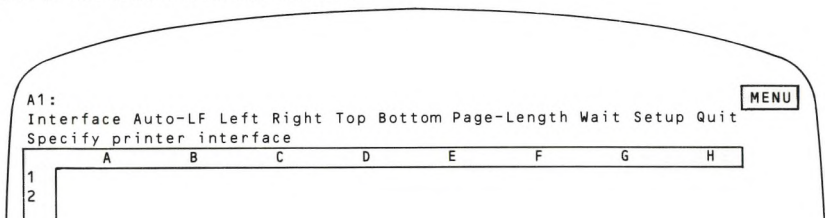
These are the settings in the default configuration, all of which you can change to fit your needs. We'll adjust the left and right margin settings.

Keys to Press	Meaning
→ → [RETURN]	Selects "Left".
0 [RETURN]	Changes the left margin setting from 4 to 0 (i.e. no left margin).
→ [RETURN]	Selects "Right".
150 [RETURN]	Changes the right margin setting from 76 to 150.
→ → → → → → [RETURN]	"Quit" returns to the previous menu.
→ → → [RETURN]	Watch Drive A! Selecting "Update" has 1-2-3 store the revised settings in its *configuration file*.
→ [RETURN]	"Quit" ends the /Worksheet Global Default command.
/ ← [RETURN]	Selects the "Quit" command.
→ [RETURN]	Selects "Yes" to confirm the command to end the 1-2-3 session.

The Lotus Access System menu returns. If you wish, perform this procedure again, to return the margin settings to 4 and 76, or to any other values between 0 and 240. 1-2-3 will use these margin settings during print operations unless you override them.

Hard Disk Systems: Use the /Worksheet Global Default command again to change the *Directory* setting from **B:** \ to the directory in which you usually want data to be stored, e.g. **C:** \ . Be sure to *Update* again.

You're ready for the next (and final) step.

5. Preparing Data Diskettes

You store your 1-2-3 work on *data diskettes*. Before you begin working with 1-2-3 in earnest, be sure you have an adequate supply of data disks (at least one-half dozen). And just purchasing the disks isn't quite enough—you must *format* (prepare) a diskette before you can use it.

You can prepare new diskettes using the following steps. See the *Victor Operator Reference Guide* for details.

1. At the end of the last section, you were at the Access System Menu.

Select Exit from the Access System Menu and confirm your choice by typing "Y" in response to the prompt. You will be returned to the MS-DOS prompt: A >.

2. Place a blank disk in Drive B and close the drive door.

3. Put your MS-DOS disk in Drive A and type the MS-DOS command:

FORMAT B: [RETURN]

4. Control passes to an MS-DOS program named FORMAT.COM.

5. When the "Format Floppy drive B complete" message appears and the light on Drive B has gone off, the disk is formatted and ready for use. You can format as many disks as you like by repeating steps 2 through 5.

6. When you've returned to the MS-DOS prompt, you may feel that you've accomplished enough for one day. In this case, simply switch the electrical power off and remove the diskettes from their drives. Before returning the disks to their protective sleeves, put the small gummed tabs provided with the disks (called *write-protect tabs*) over the small notch located to the left of the label. The write-protect tab prevents a disk from being inadvertently altered when it is in the computer.

The 1-2-3 Electronic Tutorial

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.

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 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 Spreadsheet Users" section, which begins on page xiii.

Don't skip Lessons B through 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 below in "Tutor Lessons".

Starting and Ending the Tutorial

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

Start the computer using the MS-DOS system disk. Make sure that Drive A is the default drive—you may need to issue the command

A: **[RETURN]**

Then, place the 1-2-3 Tutorial Disk in Drive A and issue the command

TUTOR **[RETURN]**

Do not remove the 1-2-3 Tutorial 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 [±] key.

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

How Tutor Works

A Tutor lesson *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 1-4, page 1-5).

It may take a little while to get used to dividing your attention like this. 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 using the keyboard with 1-2-3. 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   [SHIFT]-↓ = Page ahead   [SHIFT]-↑ = Page back   [±] = Quit

At this point you have several choices:

• Press [Space] to proceed to the beginning of the next page.

• Press [SHIFT]-↓ to jump forward to the end of the next page. In effect, Tutor automatically presses the keys for you on the next page.

• Press [SHIFT]-↑ to jump backward to the end of the previous page. This may take a few moments, since Tutor must retrace its steps.

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

The Tutor Lessons

In this section we give 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 layoff, 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.

Lesson A: Getting Started

• The Keyboard: [RETURN], [±], pointer-movement keys, [BACKSPACE], [DEL], [CAPS LOCK].

• 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 [±]
- 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], [DEL]
- 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 Screen (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 [SHIFT]-↑, [SHIFT]-↓, and [WORD→] 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 xiii 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 **Index**, at the back of the manual, provides a complete listing of page references for each topic.

3. The **Functional Index**, preceding the Index, indicates the 1-2-3 command that performs the most common worksheet operations.

4. The **Glossary** defines 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 *1-2-3 User's Manual* comprises several major sections:

Getting Started will help you through the process of installing 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. It also explains the particulars of using 1-2-3 on the Victor 9000 Computer.

The **Basic Skills** section teaches the fundamental tasks to be mastered in using 1-2-3: how to enter information, how to use menus, how to get help, 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.

The **Function Reference** describes the usage of 1-2-3's set of @ *functions*, which provide computational power and convenience.

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

The **Lotus Access System** chapter explains the use of the "switchboard" program included with 1-2-3. This program allows you to perform your data processing and housekeeping chores in a consistent, simple manner.

The **Appendices** provide additional information in several areas: *configuring* to perform standard procedures automatically; installing 1-2-3 on a hard-disk system; issuing printer-control codes; and an error message reference.

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 press 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 "pointing" the highlight at 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 Index page I-1 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	[2/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 x-y 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 [10/GRAPH] 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.

Speed of Execution. 1-2-3 is the fastest spreadsheet program currently available for the Victor 9000 Computer.

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 **[1/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.

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.

1.   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 Victor Computer (Figure 1-1). Consult the *Victor Operator Reference Guide* for details on setting up your system.
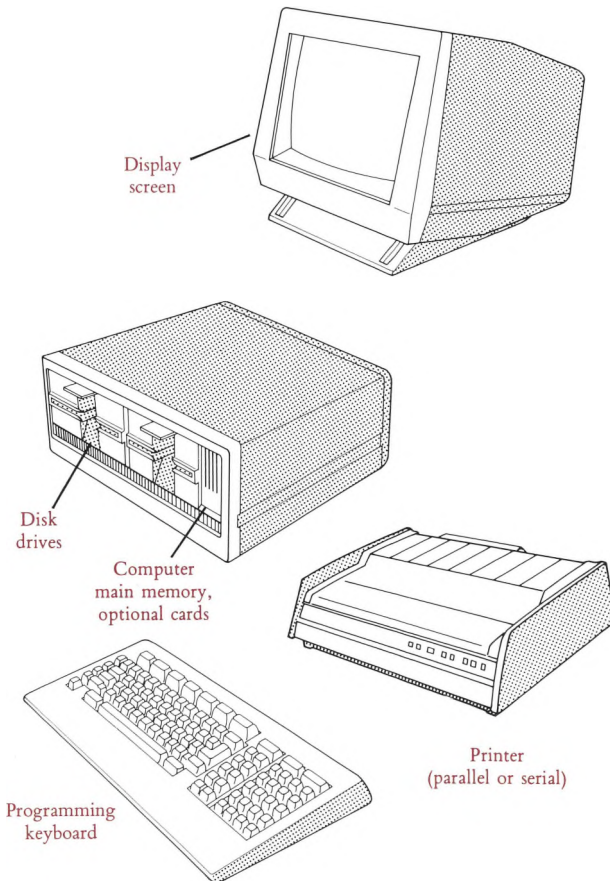
Figure 1-1. System Hardware

The Keyboard

The keyboard includes several major parts (Figure 1-2).
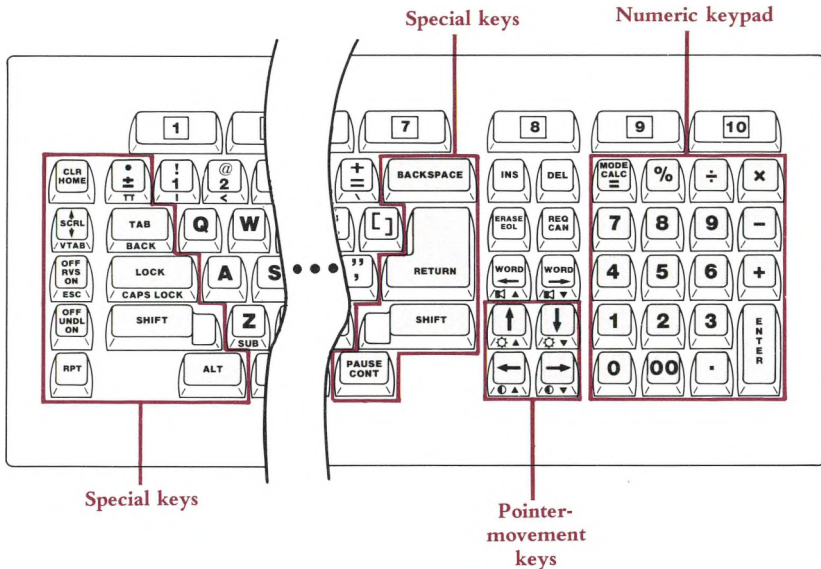
Figure 1-2. The Keyboard

Typewriter Keypad

The typewriter section acts much like a typewriter keyboard. 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 LOCK] key, which affects only the letters—you must still use [SHIFT] to type the upper symbols on non-letter keys. When [CAPS LOCK] is "on", the word CAPS appears in reverse video (black on green) in a block in the lower right corner of your screen.

The [ALT] key enables you to type the symbols on the front of the number keys in the second row of the keyboard. Holding down the [ALT] key and the number gives you the symbols you see on the front of the keys.

Another kind of shift function is performed by the [ALT] key. 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 [ALT] 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 BackTab with your keyboard: Hold down [SHIFT] and press [TAB]. This shifts 1-2-3's attention to the left.

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 (one). 1-2-3 always distinguishes them.

• 1-2-3 uses the standard signs for addition (+) and subtraction (−). You can enter these signs using either the typewriter section or the keys on the numeric keypad. 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 on the right side of the keyboard to direct 1-2-3's attention to a particular cell in the worksheet, to a particular menu choice, etc. (Chapter 4, "Moving Around the Worksheet").

The [SHIFT] key acts as a "multiplier" with these keys. For instance, sometimes ↑ means "move one row up". In such a situation, holding down [SHIFT] and pressing ↑ can mean "move 20 rows up".

Numeric Keypad

The numeric keypad at the far right of the keyboard can be used to enter numbers and arithmetic operations. For convenience, this keypad has keys that duplicate the function of certain other keys:

[ENTER]. Duplicates the [RETURN] key (see below).

= , + , − , ÷ (/), %,.. Duplicate the corresponding keys on the typewriter keypad.

Function Keys

Function keys 1 through 10 at the top of the keyboard perform various 1-2-3 operations. 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.

Special Keys

We have already introduced several of the *special keys* (Figure 1-3) that appear on your keyboard, but not on the standard typewriter keyboard.

SCRL changes
meaning of pointer-
movement keys

DEL erases a
character at
the cursor

CLR/HOME cancels a
command and returns
to READY mode

BACKSPACE erases
the last character
typed and moves the
cursor to the left

RETURN and ENTER
mean "I'm
finished typing"

± undoes current
action by steps

LOCK/CAPS LOCK
changes case of
letter keys only

ALT accesses characters
on the front of keys on
the second row

WORD- ← moves the
pointer to the upper
left corner of the
worksheet

RPT key causes
next key to repeat

ALT is used to invoke macros

WORD- → changes
meaning of arrow keys

Figure 1-3. Special Keys

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

[ALT]. When you hold down [ALT] and press a letter key, it invokes a *keyboard macro*.

[SHIFT]-[TAB] (or [ALT]-[TAB] (BackTab)). Perform 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 started".

[DEL]. In typing situations, means "Erase the character I'm pointing at".

1-4

[RPT]. Holding down the [RPT] key and another key causes that key to repeat until you release either key.

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

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

[±]. The [±] 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 pages 5-8 and 6-7).

The Display Screen

During a 1-2-3 session, the display screen typically is divided into three sections (Figure 1-4). 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.
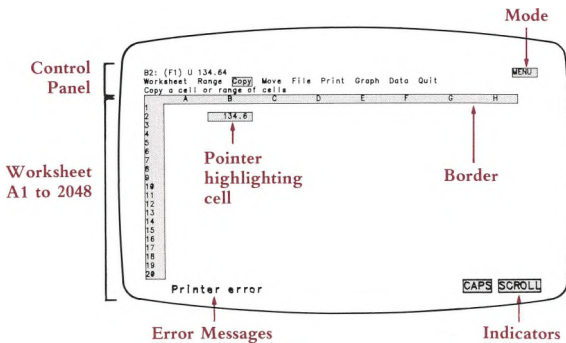
Figure 1-4. The Display Screen

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 Figure 1-4) with a reverse-video 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 1-5).
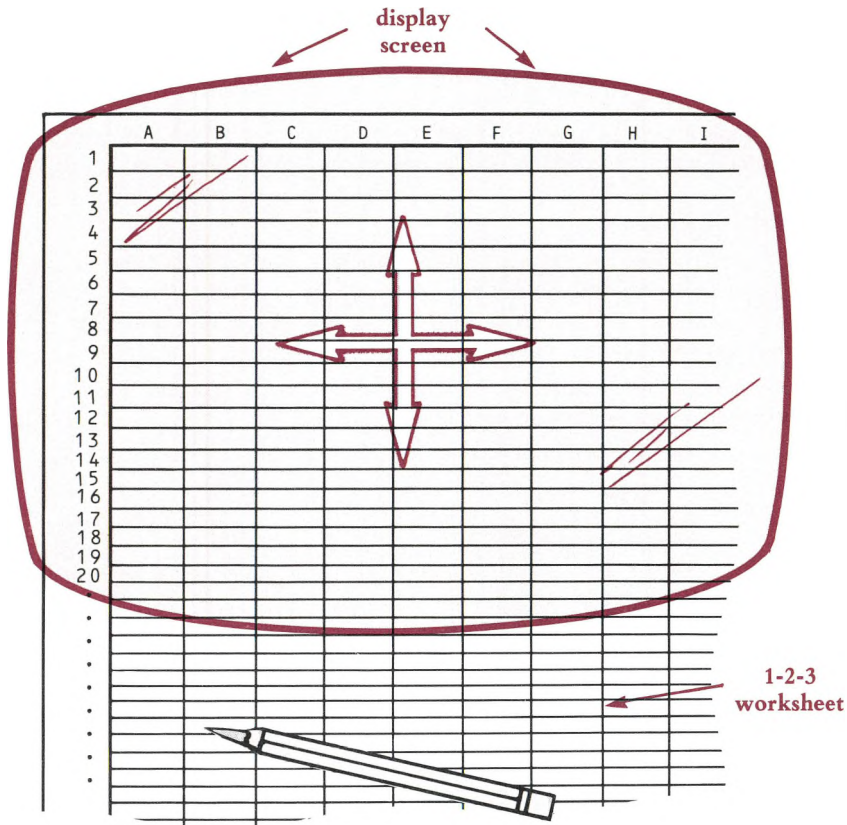
Figure 1-5. The Window

Ranges

One or more cells that form a rectangular block are called a **range** (Figure 1-6). 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".)

A "range" is a group of one or more cells arranged in a rectangle.
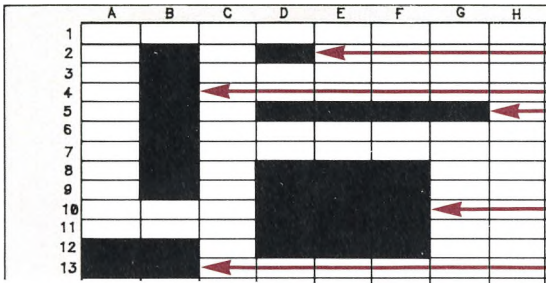
A single cell is the smallest possible range.
A range may be part of a single column or row.

This is a range that spans several rows and columns.

You can assign a name to a range, or refer to it using cell addresses
"A12...B13"
or
"DEPOSITS"

Figure 1-6. 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 large as 10 to the 99th power and as small as 10 to the −99th power. It works with negative numbers just as well as with positive numbers.

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 1-7).

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)

A number can be used in calculations.
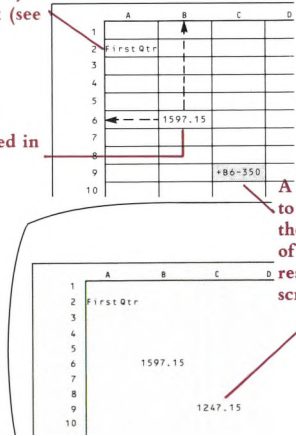
A formula is an instruction for 1-2-3 to calculate a number. Although the formula is the actual contents of the cell, typically only the resulting number is displayed on screen.

Figure 1-7. 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 appear 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 onscreen. 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 1-8).
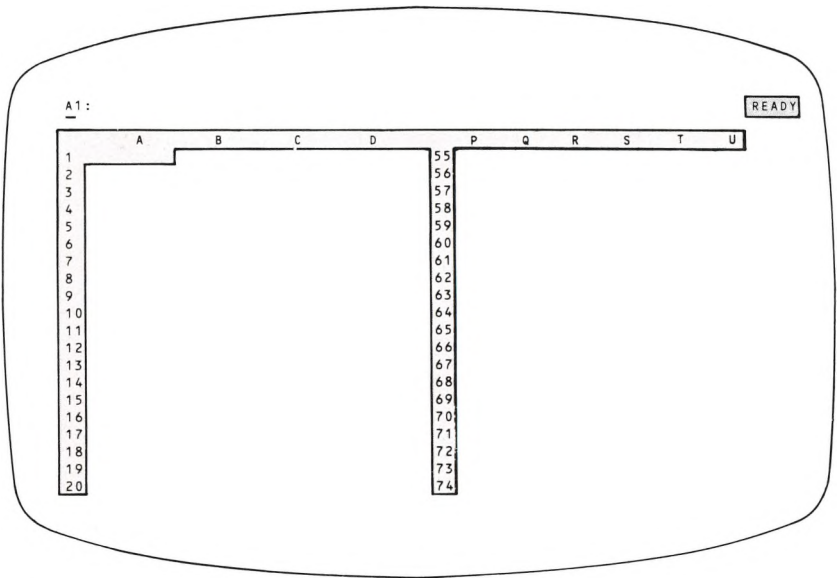
Figure 1-8. Split Screen

The Border Area

The horizontal reverse-video 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 reverse-video 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 1-9):
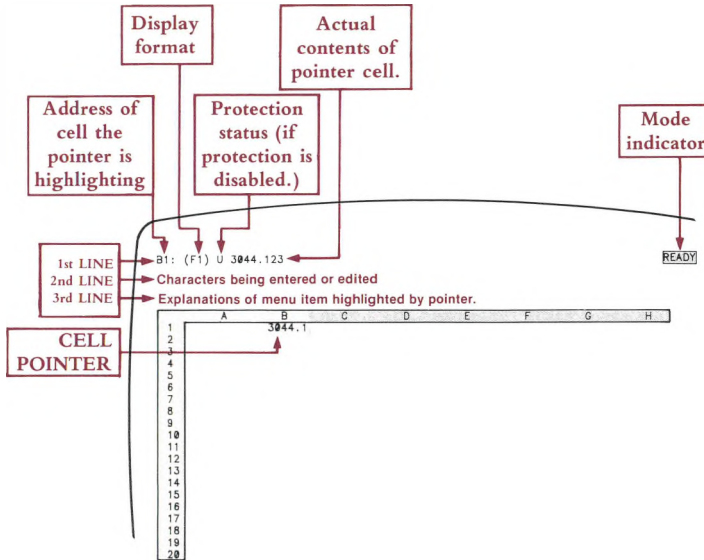
Figure 1-9. The Control Panel

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

There are many good quality printers available for use with the Victor Computer. Lotus Development Corporation does not endorse any one printer. Instead, 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.

Your sales representative can give you a complete list of printers supported by 1-2-3.

What kind of printouts can you get? By itself, 1-2-3 can use a character printer to produce 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 create a worksheet printout 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.

To make a printed version of the 1-2-3 graphs you create and save, you use the Print-Graph program. For this purpose, your system must include a *graphics printer*. You can print any graph that you've defined and saved in a **graph file**, using 1-2-3's /Graph command (page 16-19). You can print a graph even if you don't have a graphics display screen on which to view it.

Main Memory and Disk Storage

1-2-3 maintains the **current worksheet**—the one on your display screen—entirely within the computer's *main memory*. (Main memory typically is described as *random access memory—RAM.*) This strategy yields advantages in speed and flexibility. But when you end a 1-2-3 session, turn off your computer, or have a power failure, main memory is erased.

To make a permanent record of your worksheet, you must save it in a **worksheet file** on a magnetic medium, typically a **diskette**. Diskettes are like records: To use them, you place them in a "player"—a **diskette drive**.

Think of the disk as a file cabinet and each file as a folder containing a certain set of papers. You pull the file out and lay it on your desk when you want to make entries. And you close it up and return it to the file cabinet when you're done.

With 1-2-3, you are actually pulling out an exact copy of the file. The original stays safely on the disk, where it can be retrieved again, or replaced with updated information.

1-2-3 has a sophisticated facility for transferring information between the current worksheet in main memory and worksheet files in disk storage. It can also store information in *print files* and *graph files*, as explained in the previous section.

Typical Disk Configuration

Like the data you create and use, the 1-2-3 programs themselves are stored permanently on diskettes. Whenever you start a 1-2-3 session, the 1-2-3 System Disk must be in a disk drive, so that the program itself can be "loaded" into main memory.

In a standard two-diskette system, you typically keep the 1-2-3 disks in the left-hand drive (**Drive A**). Occasionally, you'll be prompted to switch disks in this drive. The **data disks**, on which you store worksheet files, print files, and graph files, typically are placed in **Drive B**, on the right. Since you can switch disks in this drive at almost any time *(not while the light is on!),* your permanent data-storage capacity is virtually unlimited.

How to Save Your Work

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, power failures, or other mishaps.

To protect yourself against a disk being damaged, lost, or simply wearing out, it is extremely important to make at least one extra copy of every disk you use. 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 use the several other methods of finding information in this manual: the Table of Contents, the Glossary, and the Indexes.

Contents

2. Starting and Ending a 1-2-3 Session

Starting a 1-2-3 Session

The procedures for starting a 1-2-3 session follow, depending on whether your computer is off or on.

When Your Computer Is Off

1. Place the 1-2-3 System Disk in Drive A (on the left). Be sure that you have *installed* this disk according to the instructions in the "Getting Started" section.

2. Turn on the computer's electrical power.

3. After a short time, during which the system tests itself, you'll be prompted to enter the current date and time. Here's what you would type at 4:23 P.M. on June 16, 1983.

    Current date is Tues 1-01-1980:
    Enter new date: 6-16-63 [RETURN]

    Current time is 0:00:08.11
    Enter new time: 16:23 [RETURN]

Note. Use the [RETURN] key to finish each entry. Separate the three parts of the date with hyphens. Separate the two or three parts of the time with colons. (Both the *minutes* and *seconds* are optional.)

4. The Lotus Access System menu appears, with the highlight indicating that 1-2-3 is the first choice. Press [RETURN] to select 1-2-3.

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

When Your Computer Is On

1. Place the 1-2-3 System Disk in Drive A (on the left). Be sure that you have *booted* this disk according to the instructions in the "Getting Started" section.

2. If necessary, issue the MS-DOS command "A: [RETURN]" to make the prompt read "A >".

3. Type the command

    123 [RETURN]

to enter 1-2-3 directly, or, optionally, type the command

    LOTUS [RETURN]

to enter the Lotus Access System. If you choose the Access System, the Access System menu will appear, with the highlight indicating that 1-2-3 is the first choice. Press **[RETURN]** to select 1-2-3.

4. The 1-2-3 startup screen 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 [±] 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 you return to the Lotus Access System or to the MS-DOS prompt.

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 **[1/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 **[1/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 a particularly useful tool:

• 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
[WORD ←]	First topic
[WORD →]	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 **[1/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 [±]. 1-2-3 redisplays the worksheet and lets you continue working exactly where you left off.

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 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 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 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 now, we'll concentrate on mastering the technique of pointing to a single cell. (See Expanding the Cell Pointer" in Chapter 7, "Indicating Cell Ranges".)
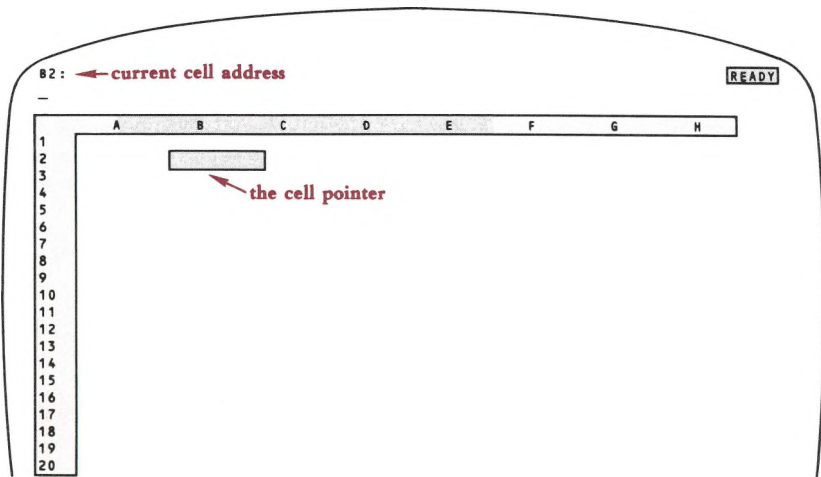
Figure 4-1. The Current Cell and the Cell Pointer

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). Holding down [RPT] and a pointer-movement key causes that key to repeat until the [RPT] key is released.
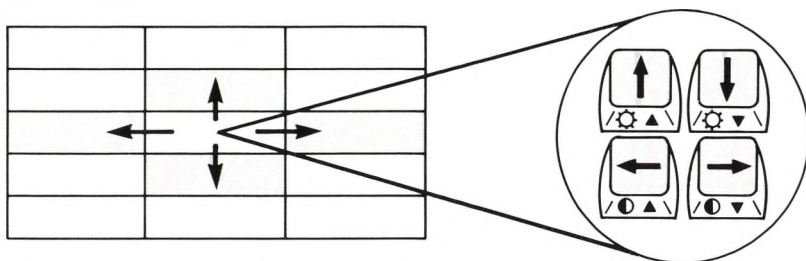
Figure 4-2. Using the Arrow Keys

Do you feel that the pointer is going off 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 that you can't do that.

Moving the Window. 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? Think of it this way: The display screen acts as a movable **window**, through which you can see part of the worksheet. The worksheet itself always remains stationary.

You cannot 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

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 [5/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 a [5/GOTO] operation (Chapter 11, "Range Commands"). 1-2-3 "goes to" the cell in the upper left corner of the range.
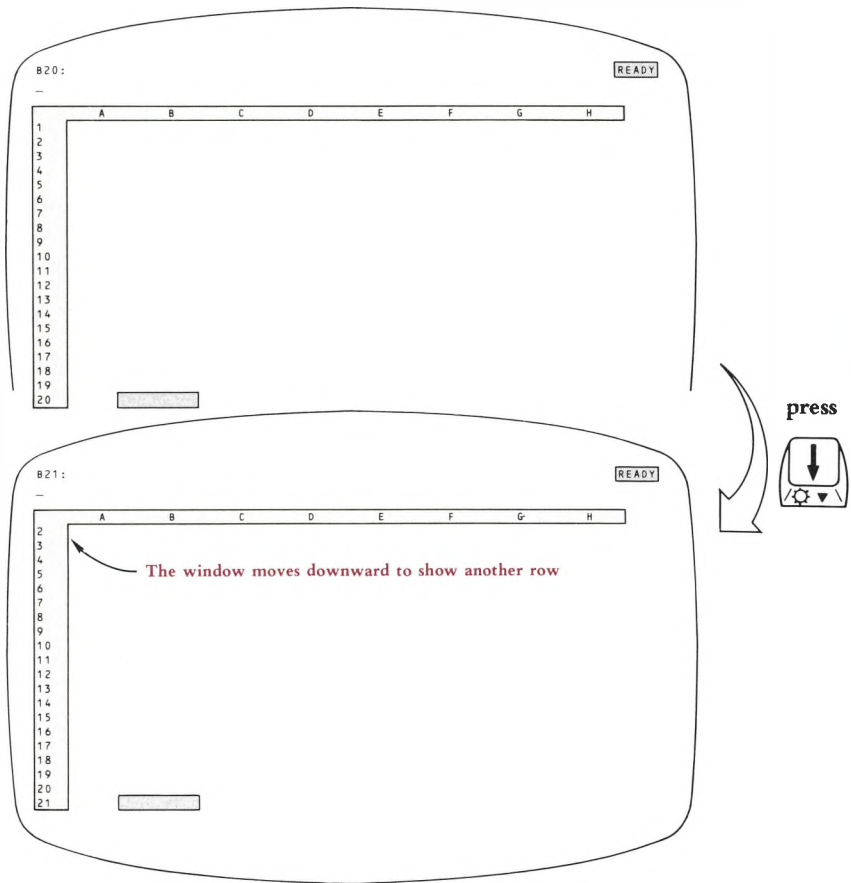
Figure 4-3. Scrolling the Window

The [WORD ←] Key. [WORD ←] is a special version of [5/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 [WORD ←] in combination with [WORD →] 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.)
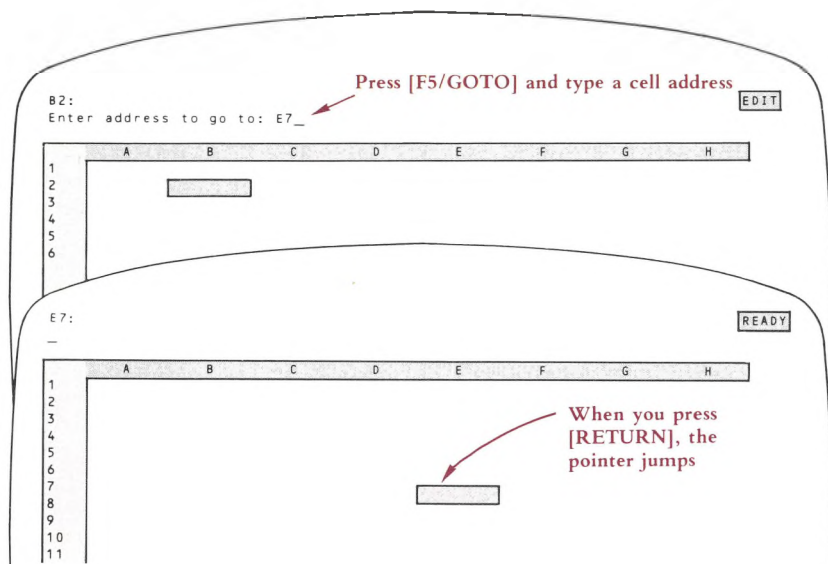
Figure 4-4. Using the [5/GOTO] Key

Moving the Window by Pages

You can think of the entire worksheet as being divided into *screens* or *pages*. Typically, pages are 20 rows high and several columns wide. (The *Titles* and *Split Screen* facilities alter the effective size of the window. See page 10-9.)

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] key	Move one page to the right (equivalent: **[SHIFT]-** →)
[BACKTAB] key	Move one page to the left (equivalent: **[SHIFT]-** ←)
[SHIFT]- ↓ key	Move one page down
[SHIFT]- ↑ key	Move one page up

Note what happens to the cell pointer during this movement: With **[SHIFT]-** ↑ and **[SHIFT]-** ↓, 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.
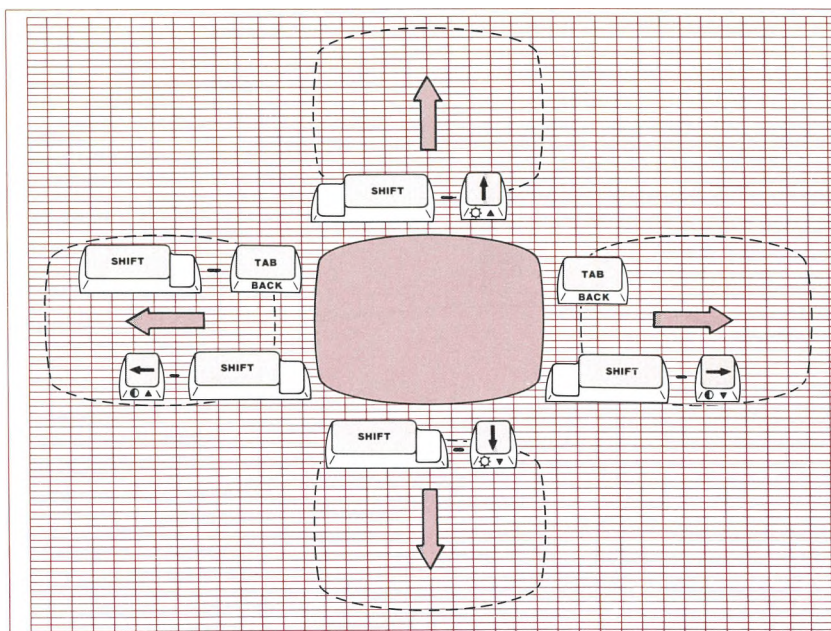
Figure 4-5. Moving by Pages

Advanced Topics

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.

Pressing the **[SCRL]** key 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 **[SCRL]**.

Notice how the cell pointer creeps toward the top of the screen when you use ↓ in conjunction with **[SCRL]**. Eventually, the pointer will hit the top of the screen. If you keep moving the window with ↓, the pointer will get "pulled along". So we have a symmetrical situation.
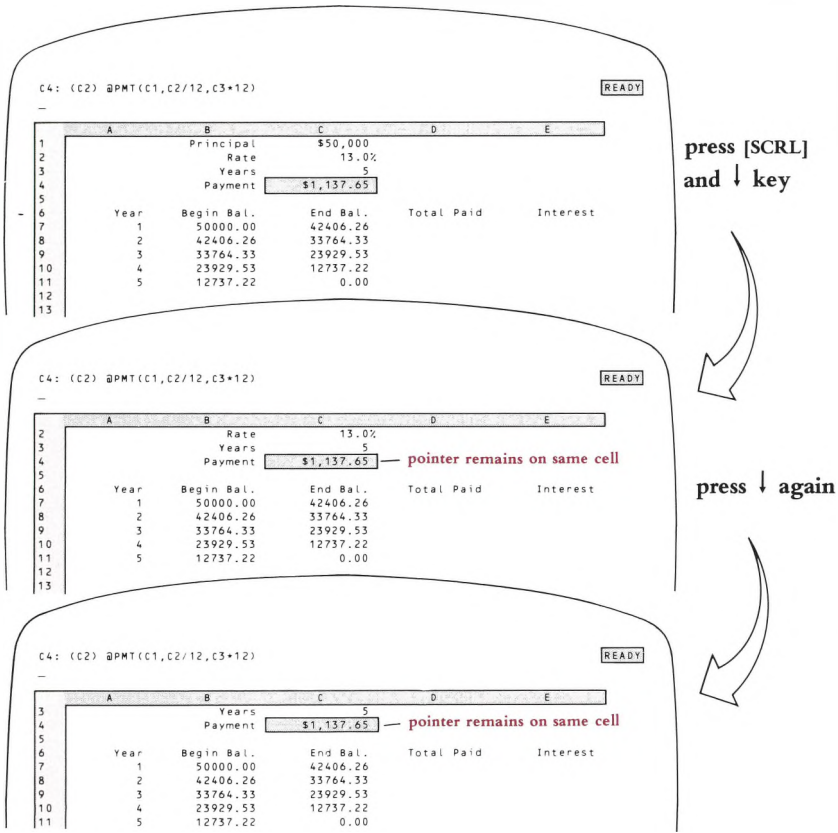
Figure 4-6. Using [SCRL]

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 [WORD →] Key

When you use [WORD →] 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 [WORD →]·↓ would move the cell pointer in a particular worksheet.
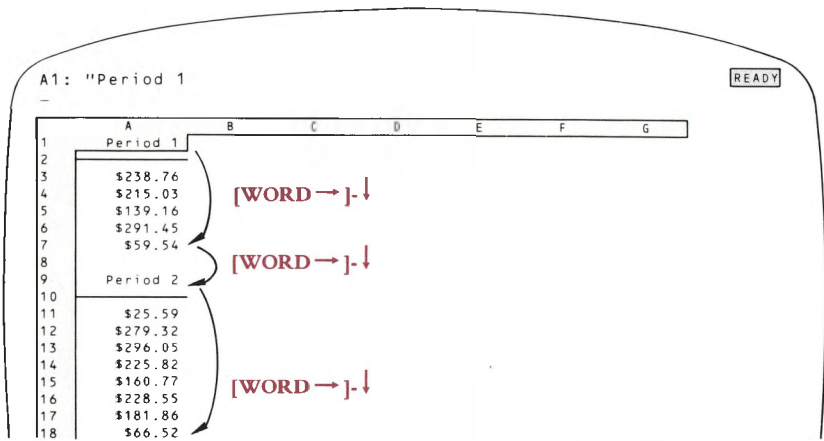
Figure 4-7. Using [WORD→]

In general, a [WORD→]-arrow key combination works as follows:

When you press [WORD→] in Ready or Point mode, an *END* indicator appears in the lower right corner of the screen. When the next key you press is an arrow key, one of the following occurs:

• 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).

And here's what happens if the next key you press is *not* an arrow key:

• Pressing [WORD→]-[WORD←] moves the pointer to the lower right corner of the worksheet's active area. See the next section and Figure 4-8 for an explanation.

• When you press any other key after [WORD→], 1-2-3 remembers [WORD→] 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 [WORD→]-type jump rather then move a single cell.

(We don't recommend that you use the [WORD→] key facility in this way. Even with the *END* indicator to help, you might forget having pressed [WORD→] and wind up with an unexpected result.)

Pressing [WORD→]-[WORD→] is a special case. The second [WORD→] 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).

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

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 [WORD →] then [WORD ←] 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, pages 10-8 and 10-23.)

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

We've used illustrations in which the worksheet is displayed using the standard window. The situation is much the same when you use either (or both) of the alternatives—*Titles* and *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, "Worksheet Commands"). 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.

There's just one new wrinkle to using Split Screen. To move the cell pointer from one window to the other, press the [6/WINDOW] key. (This key 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. We can't tell you exactly what entries to make—that depends on your particular needs. But we can tell you how.

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.

In this chapter, we present an overview of these three methods.

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).
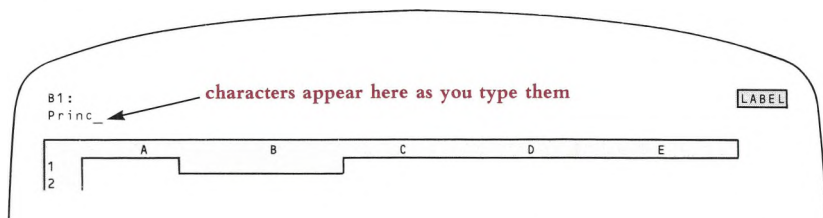
Figure 5.1. Typing a Cell Entry

A square ("block fill"), called the **cursor**, indicates where the next character you type will appear.* This may seem a bit unnecessary, but it is important. You'll need to move the cursor to make changes in the middle of an entry ("Edit mode", page 5-8).

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

---

*In this manual, we always indicate the cursor as an underscore.

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).

when you press [RETURN]

B1: 'Principal   READY
—

	A	B	C	D	E
1		Principal			
2					

1-2-3 stores the entry in its cell
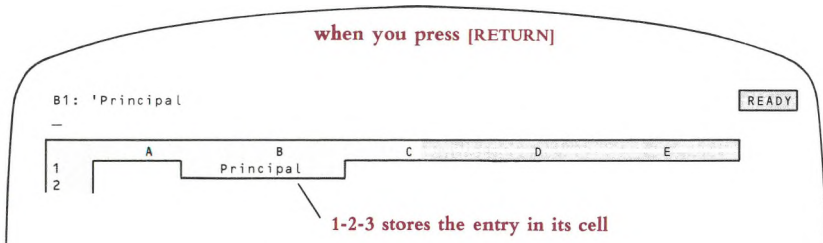
Figure 5-2. Completing an Entry with [RETURN]

Long Entries. A cell entry can be up to 240 characters long, more than 1-2-3 can display on the second line of the control panel. If you fill this line, the previously typed characters begin to scroll off to the left as you continue typing, allowing you to see the additional characters.

Using the Pointer-Movement Keys

After you finish one entry, you'll probably 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]**:

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)
[SHIFT]-↓	Move one page down
[SHIFT]-↑	Move one page up

Note. Pressing the **[TAB]** key alone invokes the **[TAB]** (forward tab) function. Holding down **[SHIFT]** and pressing **[TAB]** invokes the **[BACKTAB]** (backward tab) function. **[SHIFT]-** → is equivalent to **[TAB]**. **[SHIFT]-** ← is equivalent to **[BACKTAB]**.

(You can even use the **[WORD** → **]** key facility (page 4-6) in this situation.)

This single keystroke 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).
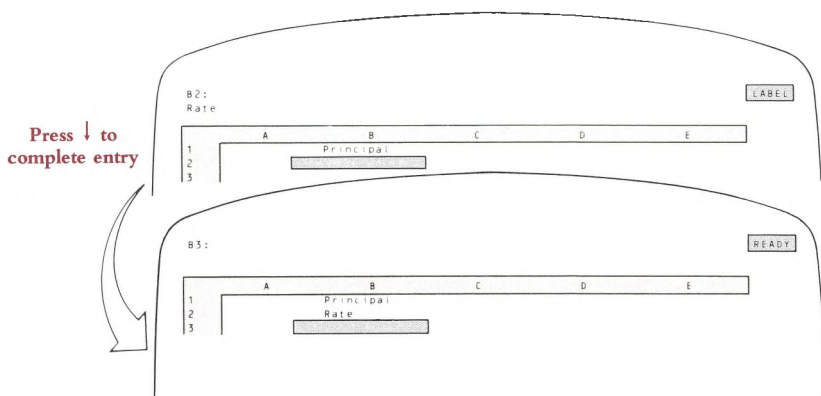
Figure 5-3. Using a Pointer-Movement Key to Complete an Entry

After You Press the [RETURN] Key

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

1. 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".)

2. 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 (page 10-16). It is also possible to have 1-2-3 perform several recalculation cycles at once (page 10-16).

3. 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).

4. 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 entries: numbers, formulas, and labels. How can 1-2-3 tell which type you want? Simple—by making an educated guess.

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: When you press [RETURN], 1-2-3 will *beep* and 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—called **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

You'll want the worksheets you construct to 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 the following situations might arise.

- You don't *know* what value to enter into 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 19-8.

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 19-8.

You can use @ERR entries to build worksheets that are smart enough to alert the user when he or she 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. (The @HLOOKUP function is described on page 19-9.)
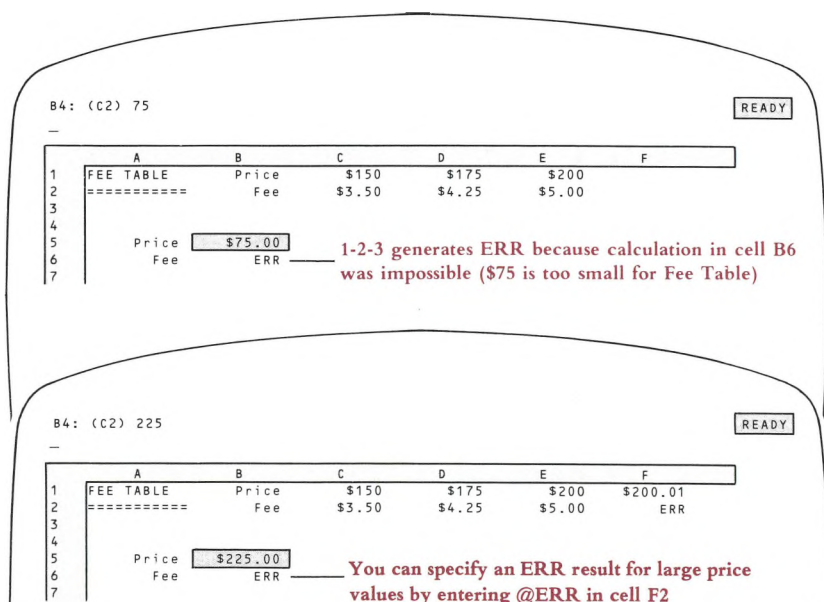
Figure 5-4. The Special Number ERR

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 **1** through **10** 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):
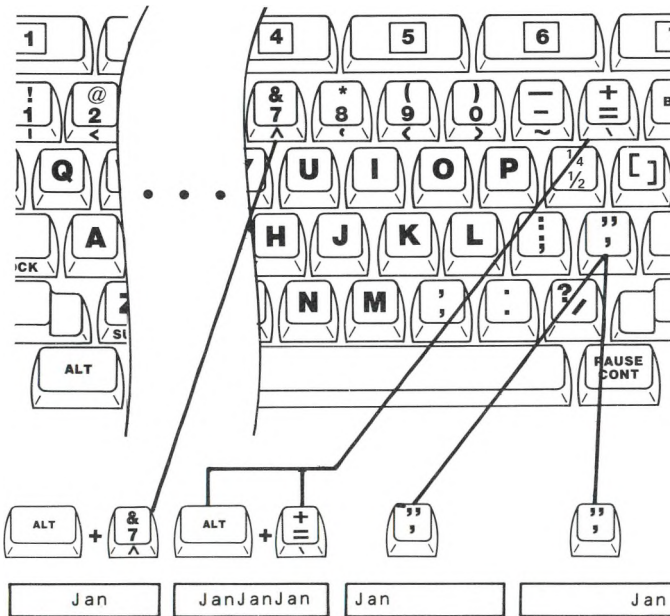
Figure 5-5. Label-Prefix Characters

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 are the answer to a question that may have occurred to you:

If 1-2-3 uses the first character to decide *LABEL* vs. *VALUE*, how do I enter a label like:

    78 Highland Avenue

The answer is: 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. The prefix character is displayed, also.) 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

Why does 1-2-3 distinguish between the processes of entering a numeric value (Value mode) and entering a label (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.

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.

We'll describe the various ways in which you can change entries, proceeding from the simple to the sophisticated.

The [BACKSPACE] Key

The [BACKSPACE] key, located 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—[±]

Whenever you're typing an entry—in Value mode or Label mode—you can cancel the entire entry and return to Ready mode just by pressing [±]. 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 [±] two or more times.

As a shortcut, you can issue a *Break*—press the [CLR/HOME] key. 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] characters. A cell that has been erased contains no characters at all.

These methods are simple, 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*@0HLOOKUP(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 [2/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
←	Move cursor 1 character to left
→	Move cursor 1 character to right
[BACKTAB]	Move cursor 5 characters to left (see Note below)
[TAB]	Move cursor 5 characters to right (see Note below)
[WORD ←]	Move cursor to first character
[WORD →]	Move 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] (backward tab) function. [SHIFT]-→ is equivalent to [TAB]. [SHIFT]-← is equivalent to [BACKTAB].

Deleting. 1-2-3 has two different ways to delete individual characters. [BACKSPACE] works right-to-left. [DEL] works left-to-right.

Key	Function
[BACKSPACE]	Delete character preceding cursor and close space
[DEL]	Delete character at cursor and close space

The keyboard's ability to repeat keystrokes is particularly useful with these editing keys. To cause a key to repeat, hold down the [RPT] key and type the other key; the repetition will continue until you release the [RPT] key.

Inserting. 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 [9/CALC] Key. In Ready mode, pressing [9/CALC] causes 1-2-3 to perform a recalculation pass on all formulas in the worksheet. But you can also use [9/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.

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

Getting Out of Edit Mode

When you have 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—↑, ↓, [SHIFT]-↑, [SHIFT]-↓—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 there by pressing [2/EDIT] again. You can use [2/EDIT] repeatedly 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
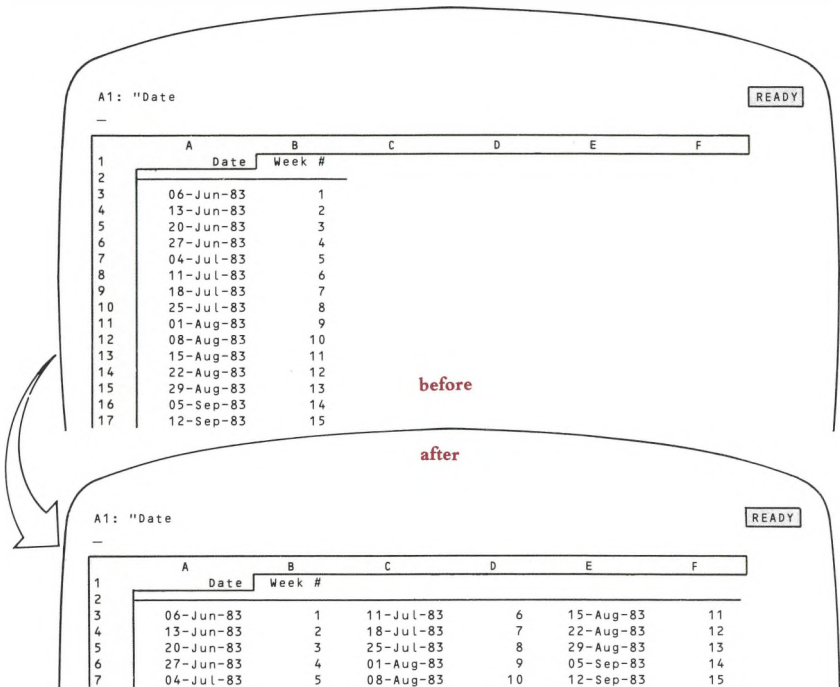
Figure 5-7. Transferring Entries with the /Move Command

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 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 for-mula) entries and/or as label entries. The most common usage is to reload a work-sheet 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 functions 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 the "Command Skills" section 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 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 ones:

Second Line Prompts (What to Do)

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

Third Line Prompts (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 by pressing [RETURN]

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.

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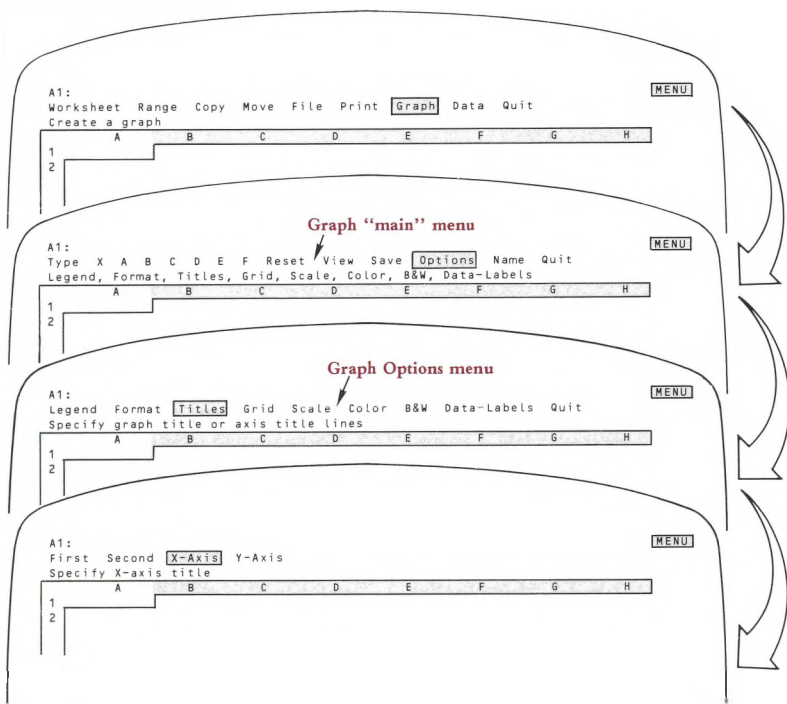
Figure 6-1. Selecting a 1-2-3 Command

Move the menu pointer (highlight) to a keyword, then press [RETURN]. Use the pointer-movement keys—1-2-3 moves 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. (For additional details see "Using Menus", 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—you can select one keyword by pointing, the next by typing, and mix the typing and pointing methods in any combination.

Responding to Prompts

After you select a command, 1-2-3 prompts you to supply more information. Sometimes you supply this information through additional menu choices in which 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—a filename, a range specification, a label for a graph you're constructing, a number, etc. 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 [3/NAME] displays a menu of the currently defined range names. You can select one of these names by pointing to it. Or 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 while you're typing it.

```
A1:                                                          ┌────┐
Enter X-axis title: _                                        │EDIT│
                                                             └────┘
┌──────────────────────────────────────────────────────────────┐
│      A       B       C       D       E       F       G       H │
│  1                                                             │
│  2                                                             │
```
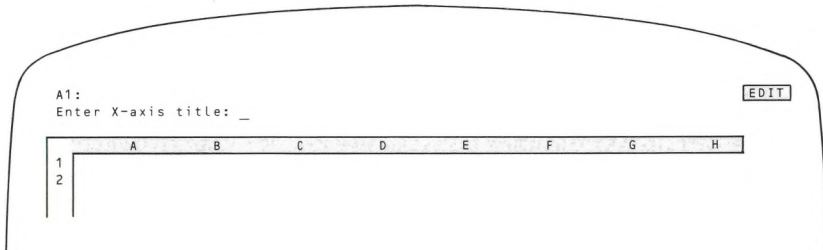
Figure 6-2. Command Prompt—Typing a New Entry

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, [DEL] or [BACKSPACE], keys.

  or

• If you'd rather type a new entry, press [±] once to clear the text from the prompt line, then start typing. (This is the way Edit mode always works.)

```
A1:                                                          ┌────┐
Enter X-axis title: 1982 Earnings_                           │EDIT│
                                                             └────┘
┌──────────────────────────────────────────────────────────────┐
│      A       B       C       D       E       F       G       H │
│  1                                                             │
│  2                                                             │
```
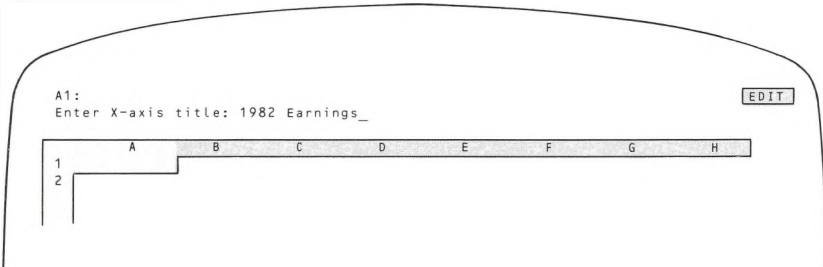
Figure 6-3. Command Prompt—Revising an Existing Text

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.)

1-2-3 displays existing or default value

```
A1:
Enter Right Margin (0..240): 75                                    MENU
         A        B        C        D        E        F        G        H
1
2
```

new value replaces old value — no [±] required

```
A1:
Enter Right Margin (0..240): 132_                                  EDIT
         A        B        C        D        E        F        G        H
1
2
```
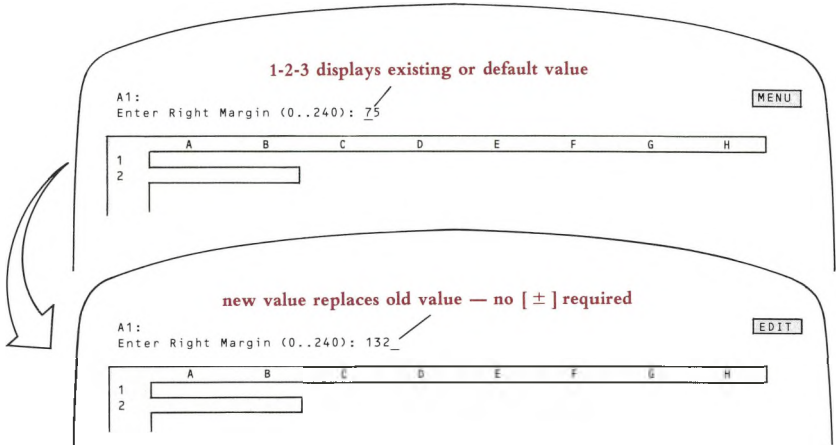
Figure 6-4. Command Prompt—Replacing an Existing Entry

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).

select "Data-Range"

```
A4: 'Fanfare & Processional                                        MENU
Data-Range  Primary-Key  Secondary-Key  Reset  Go  Quit
Specify records to be sorted
         A                       B        C        D     E   F   G   H
1   Brass Music Database
2
3   Name                        Composer   Type    Tpt  Hrn Tbn Tba Other
```

specify range of records to sort

```
H11:
Enter Data range: A4..H11                                          POINT
         A                       B        C        D     E   F   G   H
1   Brass Music Database
2
3   Name                        Composer   Type    Tpt  Hrn Tbn Tba Other
```

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

Sort menu returns
select "Primary-Key"

A4: 'Fanfare & Processional   [MENU]
Data-Range [Primary-Key] Secondary-Key   Reset   Go   Quit
Specify primary sort key column
```
        A                      B        C       D     E     F     G     H
1   Brass Music Database
2
3   Name                   Composer   Type    Tpt   Hrn   Tbn   Tba  Other
```

point to sort
key field (column)

B3: 'Composer   [EDIT]
Enter Primary sort key address: B3   Enter Sort order (A or D): A
```
        A                      B        C       D     E     F     G     H
1   Brass Music Database
2
3   Name                  [ Composer ]  Type   Tpt   Hrn   Tbn   Tba  Other
```

Sort menu returns—
select "Go"

B3: 'Composer   [MENU]
Data-Range   Primary-Key   Secondary-Key   Reset   Go   Quit
Perform sort and return to READY mode
```
        A                      B        C       D     E     F     G     H
1   Brass Music Database
2
3   Name                  [ Composer ]  Type   Tpt   Hrn   Tbn   Tba  Other
```

1-2-3 sorts records
and returns to
Ready Mode

Figure 31-6

A4: 'Fanfare & Processional   [READY]
—
```
        A                      B        C       D     E     F     G     H
1   Brass Music Database
2
3   Name                   Composer   Type    Tpt   Hrn   Tbn   Tba  Other
```

Figure 6-5. Sticky Menus (continued)

These "sticky" menus have Quit options so that you can return to Ready mode. In
some cases, several such menus 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:

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

```
A2: 0.11                                                    MENU
Worksheet  Range  Copy  Move  File  Print  Graph  Data  Quit
Format, Label-Prefix, Erase, Name, Justify, Protect, Unprotect, Input
      A        B       C       D       E       F       G       H
1
2       0.11
3       0.115
4       0.12
5       0.125
6       0.13

RETURN                                                        ±

A2: 0.11                                                    MENU
Format  Label-Prefix  Erase  Name  Justify  Protect  Unprotect  Input
Format a cell or range of cells
      A        B       C       D       E       F       G       H
1
2       0.11
3       0.115
4       0.12
5       0.125
6       0.13

RETURN                                                        ±

A2: 0.11                                                    MENU
Fixed  Scientific  Currency    General  +/-  Percent  Date  Text  Reset
Percent format (x.xx%)
      A        B       C       D       E       F       G       H
1
2       0.11
3       0.115
4       0.12
5       0.125
6       0.13

RETURN                                                        ±

A2: 0.11                                                    MENU
Enter number of decimal places (0..15): 2
      A        B       C       D       E       F       G       H
1
2       0.11
3       0.115
4       0.12
5       0.125
6       0.13
```

Figure 6-6. Undoing a Command Selection

[Break]. Issuing a *Break*—pressing **[CLR/HOME]**—cancels a command and returns you to Ready mode. A *Break* is like pressing [±] 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.

6-76-7

Using Menus

One of the cardinal rules 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). (The Lotus Access System also is "menu-driven".)
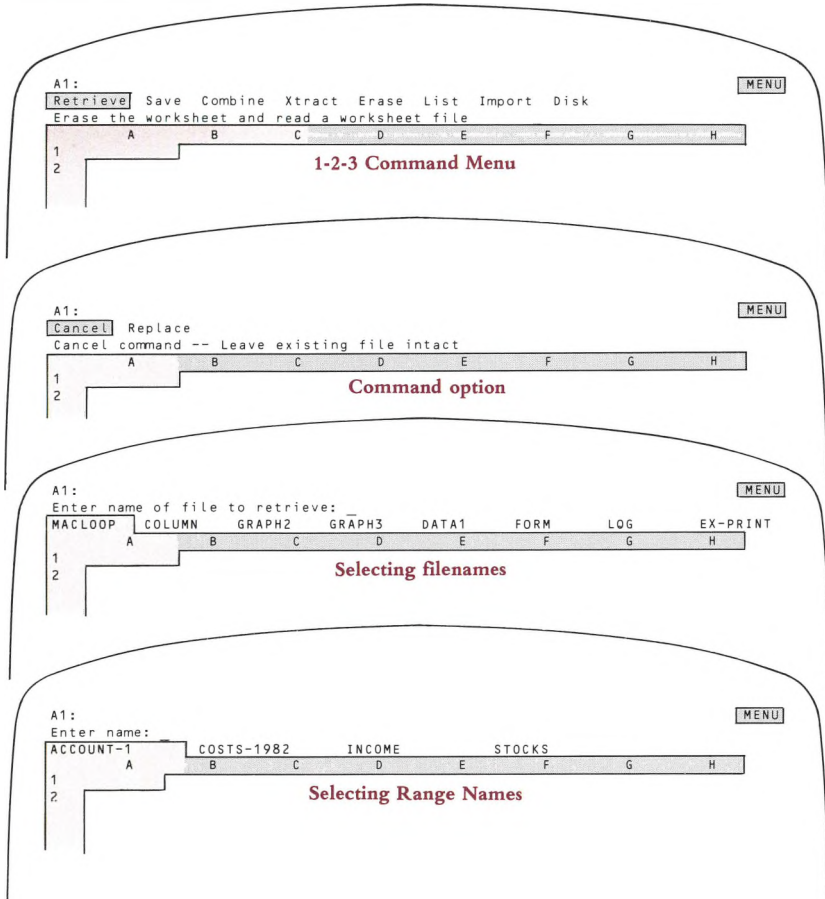
Figure 6-7. Types of Menus

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).
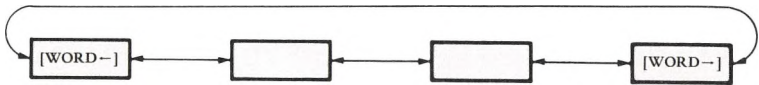
Figure 6-8. One-Line Menu

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.
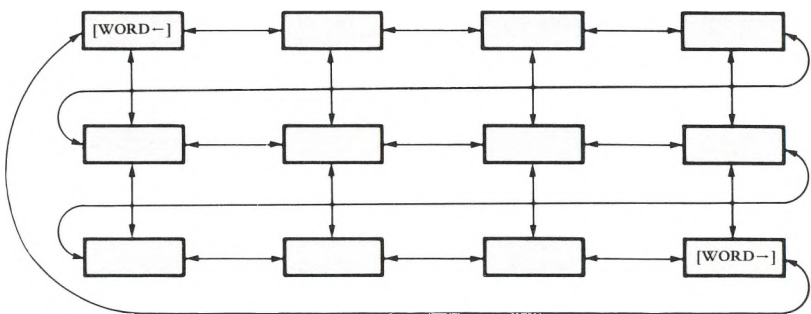
Figure 6-9. Multiple-Line Menu

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. **[WORD ←]** and **[WORD →]** jump to the menu's first and last items, which may be on different lines.

Repeatedly pressing → 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]**.

As soon as you begin typing a name, 1-2-3 realizes that you are 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 are typing, you can use the pointer-movement keys to revise the name.

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 [±] twice:

1. The first [±] erases what you've typed so far. (You could start typing a name again at this point.)

2. The second [±] returns you to Menu mode. The menu reappears and the pointer-movement keys will move the menu highlight.

The example in Figure 6-10 should make it clear how everything fits together.

press [RETURN] to select Retrieve

```
A1:                                                                        MENU
 Retrieve  Save  Combine  Xtract  Erase  List  Import  Disk
Erase the worksheet and read a worksheet file
          A         B         C         D         E         F         G         H
1
2
```

1-2-3 displays names of worksheet files on current disk

```
A1:                                                                        MENU
Enter name of file to retrieve: _
THIRD-Q   FOURTH-Q  FIRST-Q   SECOND-Q  ACCOUNTS  PERSONNL  PAYABLES
          A         B         C         D         E         F         G         H
1
2
```

use arrow keys to point to a filename

```
A1:                                                                        MENU
Enter name of file to retrieve: _
THIRD-Q   FOURTH-Q  FIRST-Q  [SECOND-Q] ACCOUNTS  PERSONNL  PAYABLES
          A         B         C         D         E         F         G         H
1
2
```

switch to typing a name—the menu disappears

```
A1:                                                                        EDIT
Enter name of file to retrieve: for_
          A         B         C         D         E         F         G         H
1
2
```

press [±] twice to restore menu

```
A1:                                                                        MENU
Enter name of file to retrieve: _
THIRD-Q  [FOURTH-Q] FIRST-Q   SECOND-Q  ACCOUNTS  PERSONNL  PAYABLES
          A         B         C         D         E         F         G         H
1
2
```

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 [3/NAME] key to display a menu of currently defined *range names*, then select a name (page 7-13).

7.   Indicating Cell Ranges

In many different situations, you specify a range of cells for 1-2-3 to process as a unit. 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.

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

(Don't worry if you don't yet know what *functions* and *arguments* are. They are explained in the "Functions" section (page 8-22) and in Chapter 19, "1-2-3 Function Reference".)

What's in a Range?

A range is a group of one or more cells in a rectangular block (Figure 7-1).

Since a range is a rectangle, you can identify it by naming the cells in two diagonally opposite corners. These four phrases all describe the same range:

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

Indicating Ranges

So much for phrases—how do you indicate a range to 1-2-3? The examples of functions above illustrate one way—typing cell addresses. There are three ways in all:

1. Typing cell addresses.

2. Expanding the cell pointer to highlight the entire range.

3. Using a range name.
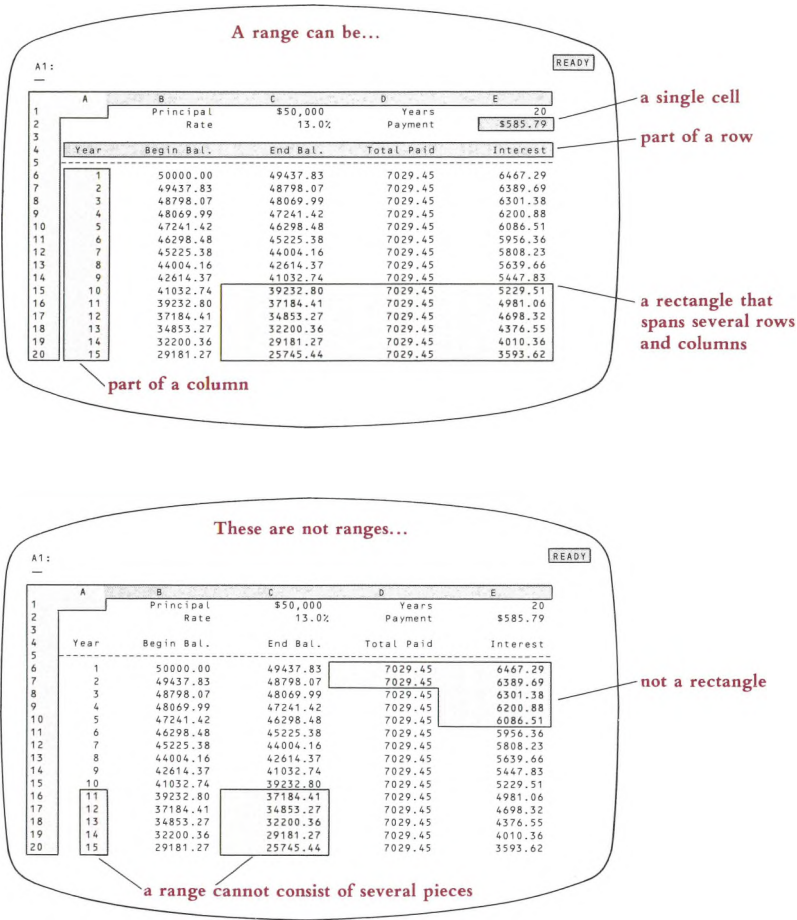
Figure 7-1. Ranges and Non-Ranges

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*. (However, specifying an absolute range at a command prompt doesn't do any harm, either.)

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   POINT
Enter range to format: B6..B6

	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)   POINT
Enter range to format: B6..E10

	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 redisplays 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 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

With these examples in mind, let's consider the whole issue of indicating ranges with the cell pointer.

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   POINT
@sum(D10

	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   POINT
@sum(D10..D10

	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   POINT
@sum(D10..D6

	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.
The 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 cursor in the middle of the free cell to remind you where it is* (Figure 7-4).
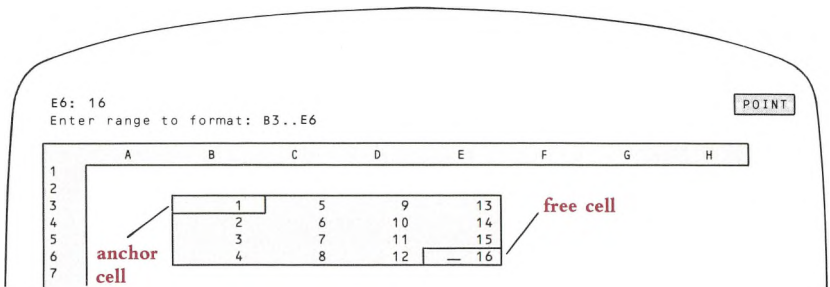
Figure 7-4. Free Cell and Anchor Cell

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)
[SHIFT]-↓	Move one page down
[SHIFT]-↑	Move one page up
[WORD ←]	Move to upper left corner of worksheet
[WORD →]	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]** (backward tab) function. **[SHIFT]-→** is equivalent to **[TAB]**. **[SHIFT]-←** 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 [±] key and the **[BACKSPACE]** key.

Press ↑ to move free cell from E6 to E5

Press ← to move free cell from E6 to D6
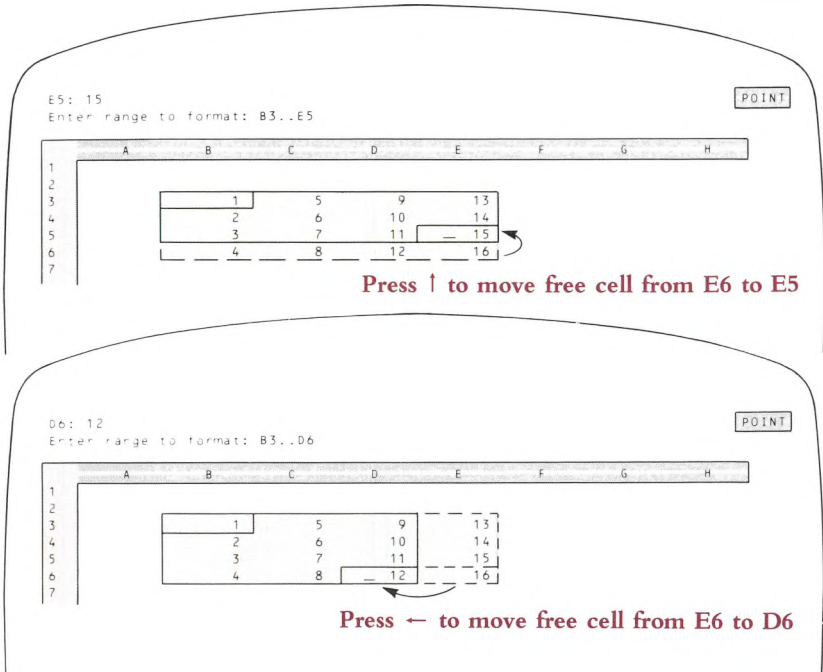
Figure 7-5. Expanding the Cell Pointer

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).
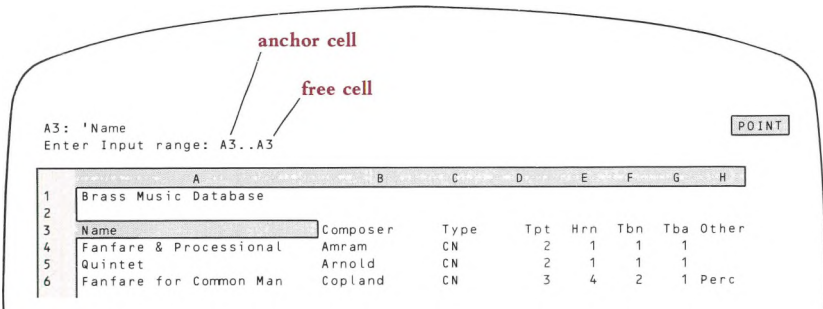
Figure 7-6. Anchoring the Cell Pointer

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 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 [±] Key. *If the pointer is not already anchored*: Pressing [±] when 1-2-3 is prompting you to indicate a range returns you to the previous command step. In a formula, pressing [±] returns the cell pointer to the current cell and erases the cell address from the end of the formula.
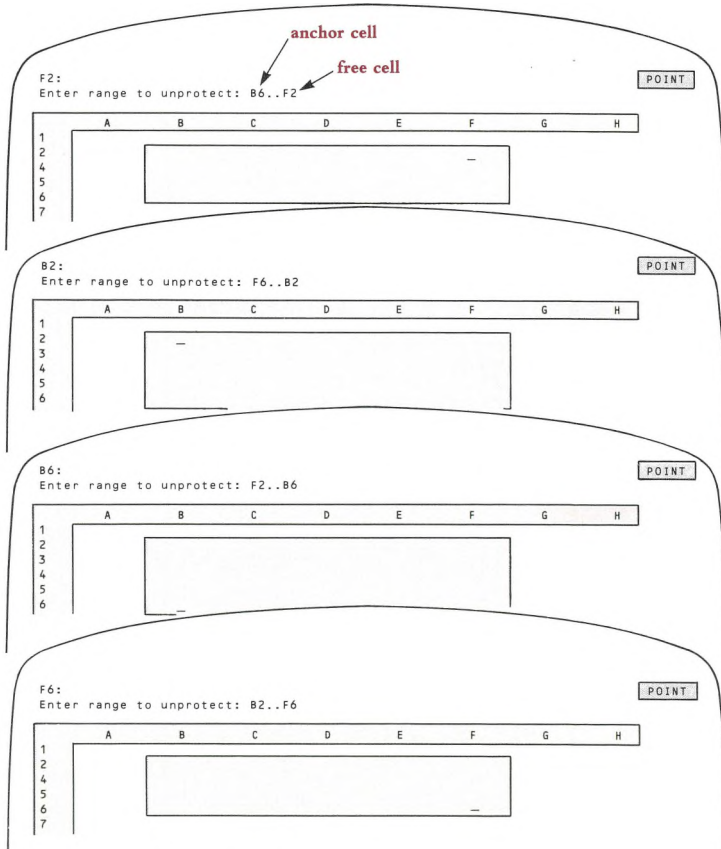
Figure 7-7. "Riding the Range"

If the pointer is already anchored: Pressing [±] 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:

anchor   free
cell   cell
      \   /
       G30..J41
       G30   **press [±]**
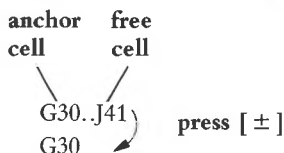
The Backspace Key, [BACKSPACE]. *Whether or not the pointer is anchored*: Pressing [BACKSPACE] cancels the range specification and returns the cell pointer, unanchored, to the current cell—where the pointer was located when you began the command or formula. As with [±], 1-2-3 remains in Point mode, so you can begin the anchoring and expanding process anew.

anchor   free
cell   cell
      \   /
       G30..J41
       B5   **press [BACKSPACE]**
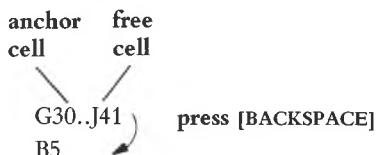
This is particularly useful when you want to point to a range that begins at the current cell, but 1-2-3 offers to reuse another, previously specified range. Pressing [BACKSPACE] effectively tells 1-2-3 to "forget" the previous range specification.

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 [4/ABS] key allows you to do this while you are 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 [4/ABS] when "pointing" cell addresses into a formula:

@sum(C50..C65	press [4/ABS]
@sum($C$50..$C$65	press [4/ABS]
@sum($C50..$C65	press [4/ABS]
@sum(C$50..C$65	press [4/ABS]

```
F2:  (C2) @ERR                                                        ┌───────┐
@hlookup(B6,C1..F2                                                    │ POINT │
                                                                     └───────┘
          A            B             C         D         E         F
 1   FEE TABLE       Price        $150      $175      $200      $200.01
 2   ===========     Fee          $3.50     $4.25     $5.00        ERR
 3
 4
 5                   Price        Fee       1. While entering a formula in
 6                   155.00                    cell C6, point to the "lookup
 7                   187.99                    table" range.
 8                   205.00
 9                   197.50
```

2. Press [4/ABS] key to make range "absolute".

```
F2:  (C2) @ERR                                                        ┌───────┐
@hlookup(B6,$C$1..$F$2                                               │ POINT │
                                                                     └───────┘
          A            B             C         D         E         F
 1   FEE TABLE       Price        $150      $175      $200      $200.01
 2   ===========     Fee          $3.50     $4.25     $5.00        ERR
 3
 4
 5                   Price        Fee
 6                   155.00
 7                   187.99
 8                   205.00
 9                   197.50
```

3. Finish formula as usual.

```
C6:  (F2) @HLOOKUP(B6,$C$1..$F$2,1)                                   ┌───────┐
                                                                     │ READY │
                                                                     └───────┘
          A            B             C         D         E         F
 1   FEE TABLE       Price        $150      $175      $200      $200.01
 2   ===========     Fee          $3.50     $4.25     $5.00        ERR
 3
 4
 5                   Price        Fee
 6                   155.00      │ 3.50 │ ──────── Subsequent copies of formula
 7                   187.99                        have same "absolute" range.
 8                   205.00
 9                   197.50
```
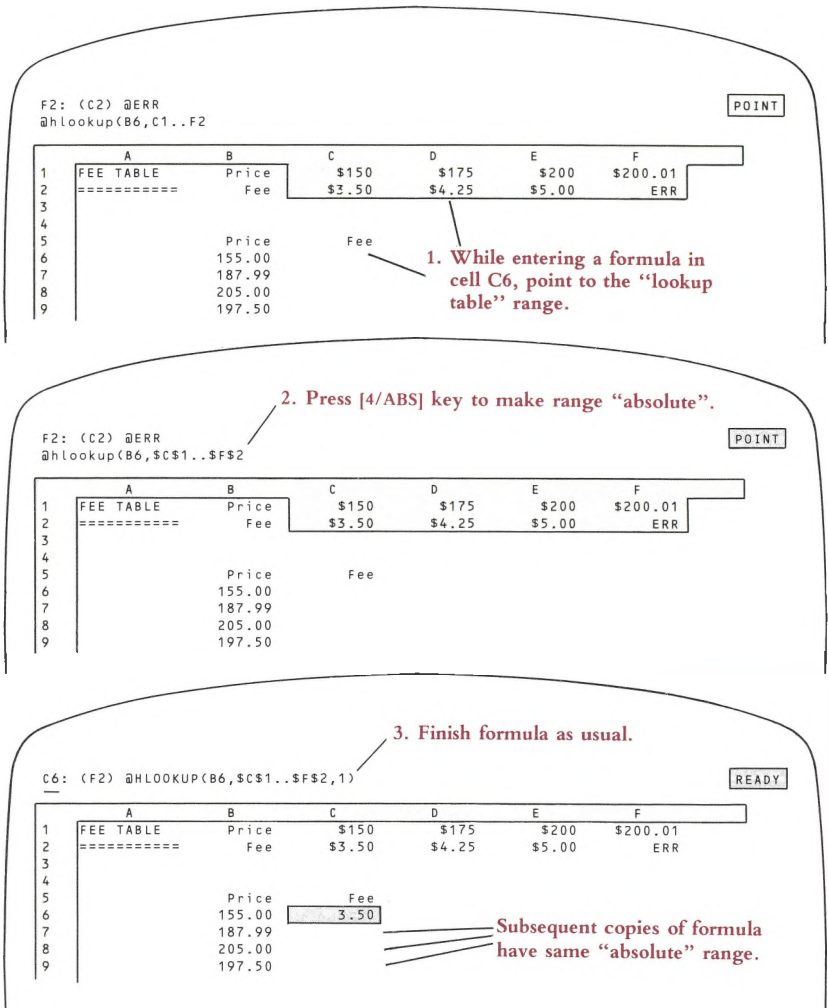
Figure 7-8. Pointing to an Absolute Range

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 of 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).
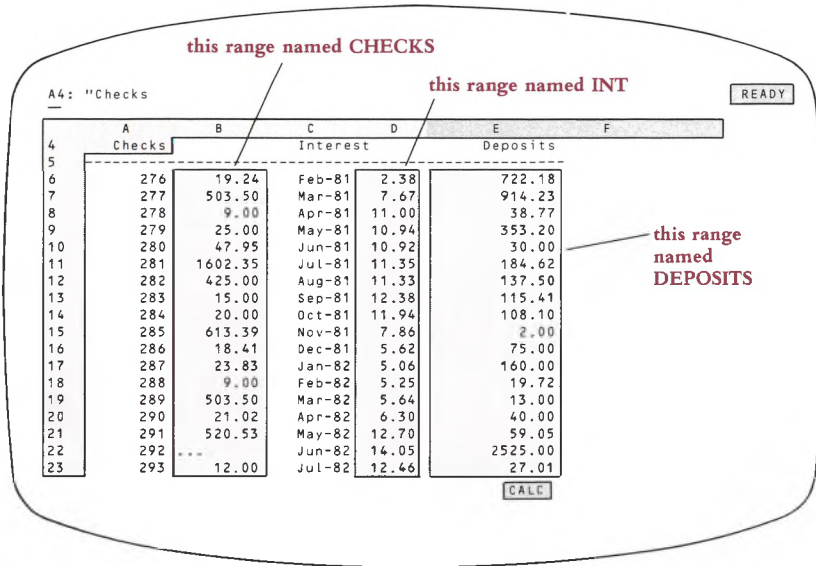
Figure 7-9. Range Names

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..E23. 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..E23 **[RETURN]**

There's an extra wrinkle 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 [3/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).
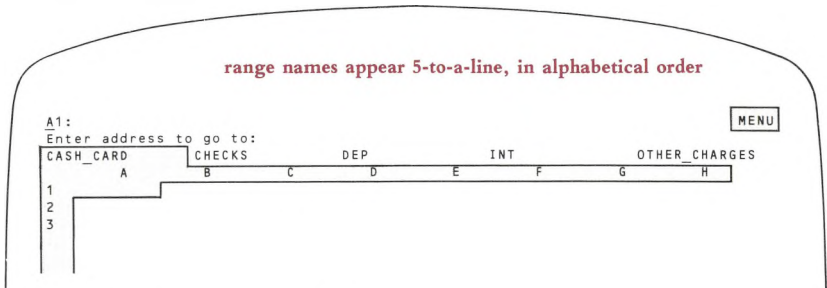

Figure 7-10. Range Name Menu

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 [±] 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 **[3/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 **[CLR/HOME]** or several [±]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— Implementation Details

For the most part, you need not concern yourself with the details of 1-2-3's bookkeeping. But in the cases of *remembered ranges* (both command ranges and named ranges), a few background facts may make it easier for you to understand how 1-2-3 adjusts to changes.

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 similar to a reference by these two 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. This includes:

• **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 similar 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

Several 1-2-3 commands—/Move, /Worksheet Insert, and /Worksheet Delete—can change the definition of a range name implicitly. This occurs when one of these commands moves or obliterates the upper left or lower right corner cell of a remembered range.

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 changes 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 an upper left or lower right 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 D from the worksheet. 1-2-3 automatically:

1. Cancels the definitions of DEPOSITS and DEPS.

2. Cancels the /Data Sort Data-Range specification.

3. Changes the formula in cell N1 to @COUNT(ERR). Cell N1, and any other cells whose values depend on N1, will be displayed as *ERR*.

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

If 1-2-3 did no more than record numbers and labels in a column-row structure, it would still be sitting on the shelf at your computer store. But it does much more than that. In this section, we'll examine its single most powerful capability—formula calculation.

Formula writing can be a principle procedure; in the hands of an experienced user, 1-2-3 offers an extremely sophisticated tool for complex formula calculation. We suggest that you read this chapter several times, returning to read the more intricate sections as you gain experience with 1-2-3.

In any cell, you can enter a **formula**—an instruction for 1-2-3 to calculate a number.

Let's explore the formula concept with 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).
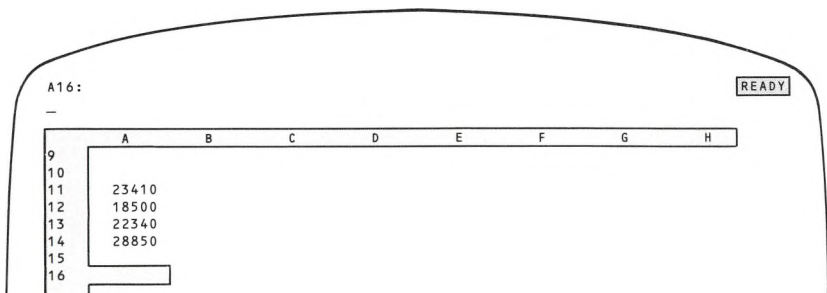

Figure 8-1. A Column of Figures to Be Added

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. That's simple enough!

There are two positive lessons to be learned from this first attempt at formula-writing:

• 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.

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.*
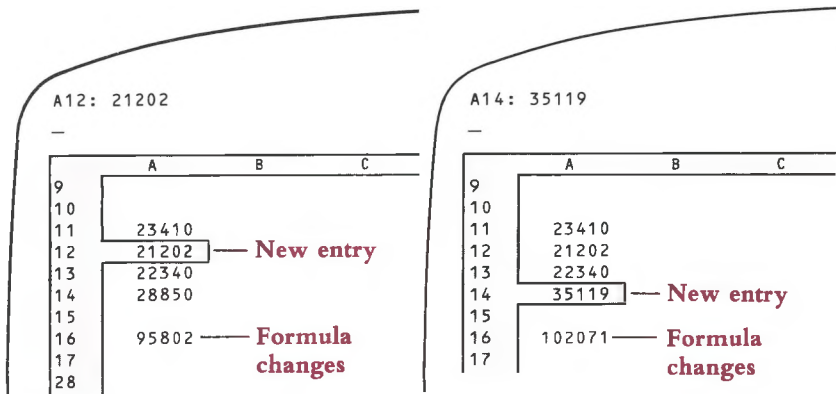

Figure 8-2. "What if" a Number Changes?

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—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.

① A16:

② A11: 23410
+A11

③ A14: 28850
+A11+A12+A13+A14
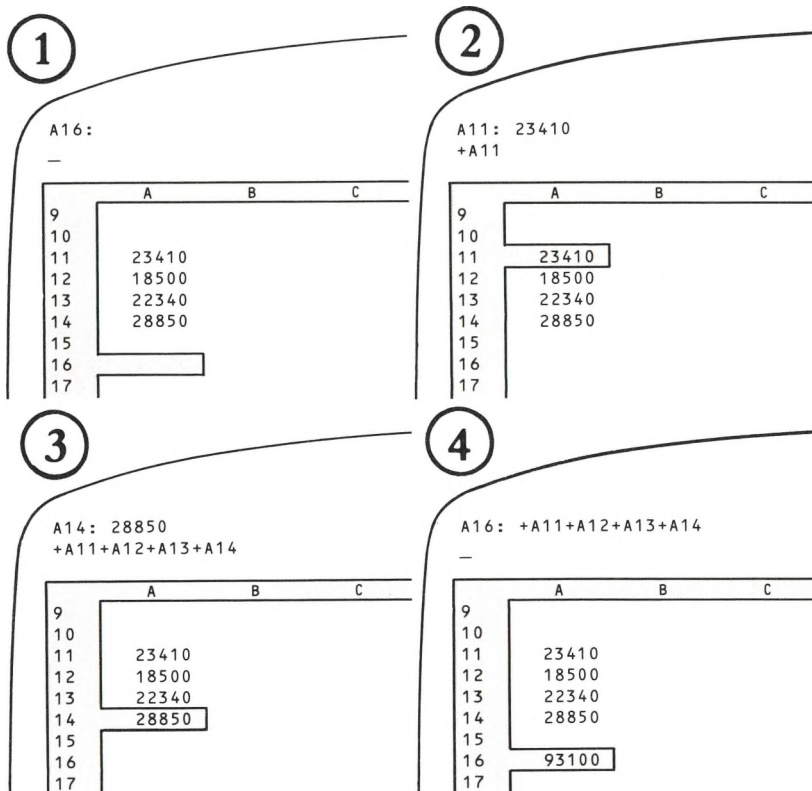
When you press " + " again, pointer
returns to A16. Move it to the next
cell to be added. And so on, and so on...

④ A16: +A11+A12+A13+A14

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.

We don't mention this just on aesthetic grounds, though we *have* found that most people prefer pointing rather than typing cell addresses. There's a very real reason to appreciate the positional relationships among the cells involved in a formula—1-2-3 itself "remembers" the formula in this way.

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).
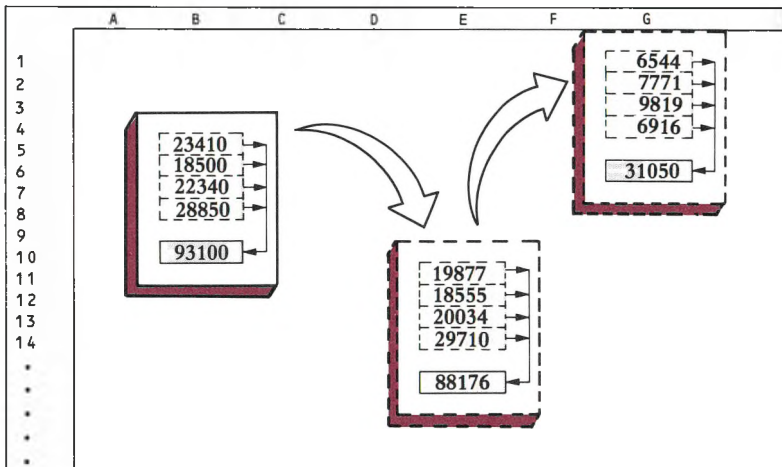
Figure 8-4. A Relative Address "Machine"

We describe this situation by saying that the formula 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 you 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).

A16: +A11+A12+A13+A14

all addresses are relative

READY

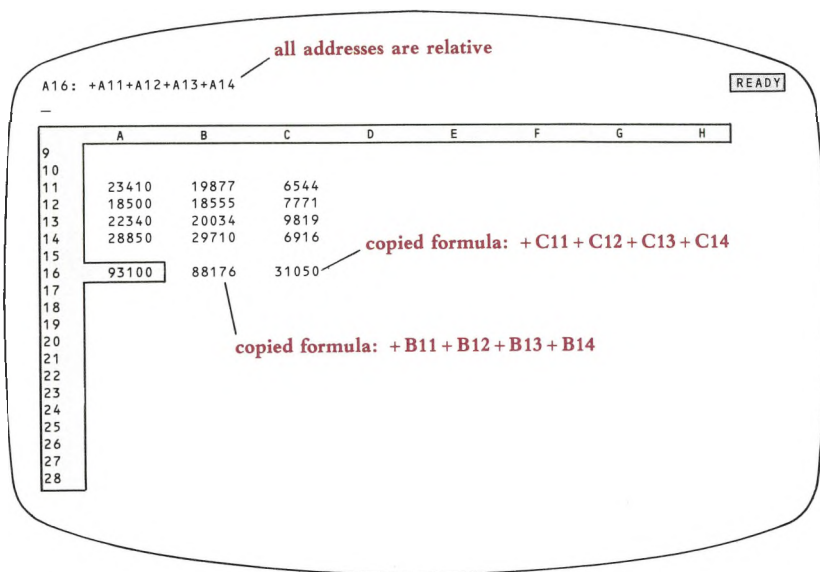|	A	B	C	D	E	F	G	H
9								
10								
11	23410	19877	6544					
12	18500	18555	7771					
13	22340	20034	9819					
14	28850	29710	6916					
15								
16	93100	88176	31050					
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								

copied formula: +C11+C12+C13+C14

copied formula: +B11+B12+B13+B14

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.

C4: (C2) (1-B4)*A4

1-2-3 considers all these
formulas to be identical

READY

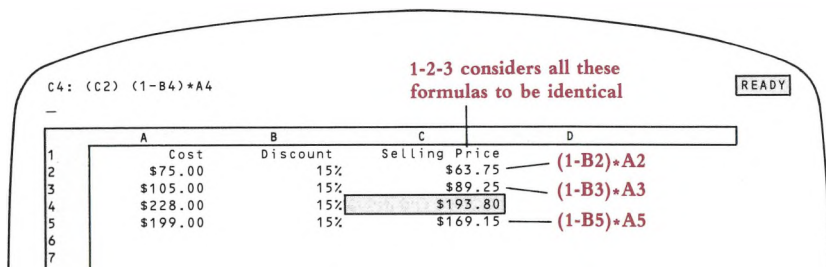|	A	B	C	D
1	Cost	Discount	Selling Price	
2	$75.00	15%	$63.75	(1-B2)*A2
3	$105.00	15%	$89.25	(1-B3)*A3
4	$228.00	15%	$193.80	
5	$199.00	15%	$169.15	(1-B5)*A5
6				
7				

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'll 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.)

```
D7: (F2)                                                            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  [          ]
 8             2       42406.26     33764.33
 9             3       33764.33     23929.53
10             4       23929.53     12737.22
11             5       12737.22         0.00
12
```

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.

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

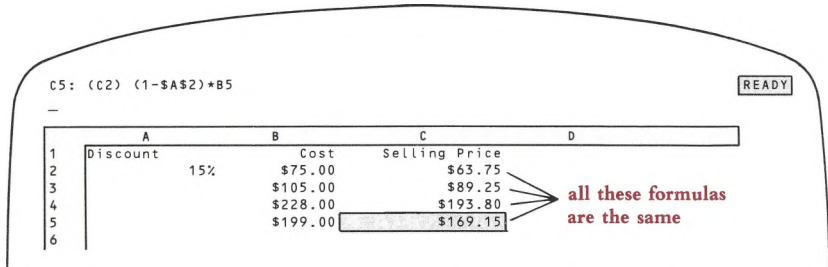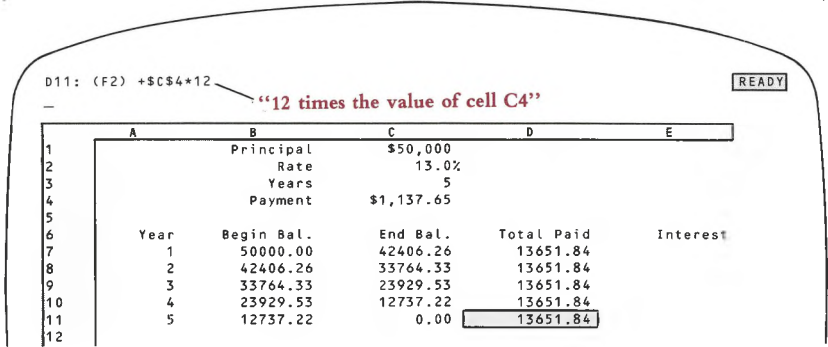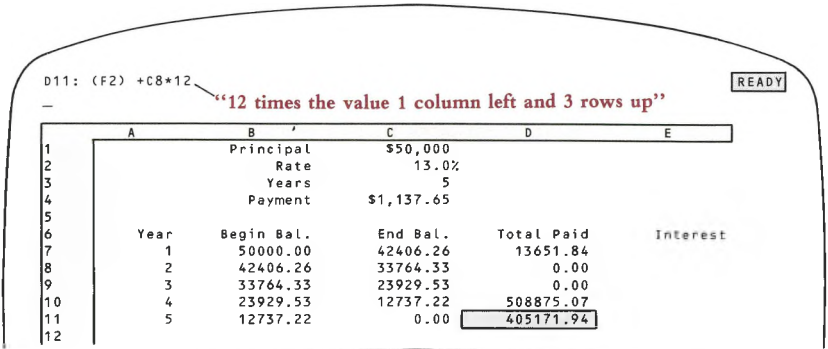Figure 8-9 shows a modification of the Cost-Discount-Selling Price example above.

```
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]
12
```

```
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]
12
```

```
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      ⎫  all these formulas
4                      $228.00        $193.80     ⎬  are the same
5                      $199.00       [$169.15]    ⎭
6
```

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 [4/ABS] key (Figure 8-10). Pressing [4/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.

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	
12				

Press [4/ABS] in Point Mode

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	
12				

Figure 8-10. Using the [4/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 [4/ABS] repeatedly to switch between absolute and relative addresses.

Specifying Ranges in Formulas

1-2-3 formulas can calculate with entire ranges of values as well as individual values. But ranges of values can't be processed with the ordinary arithmetic operations. For instance, you can't add or subtract two ranges like two individual values. Instead, you process ranges with special @ functions (page 8-22). For example:

@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"

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".)

Single-Cell vs. Multiple-Cell Ranges

You can't do ordinary arithmetic with multiple-cell ranges. For example, you can't subtract two ranges:

B10..D30 – F10..H30 can't be done!

Likewise, if "EXPENSES" = B10..D30 and "REVENUES" = F10..H30, 1-2-3 won't accept the formula REVENUES – EXPENSES.

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.)

In general, feel free to use ranges (including range names) in formulas. Just be sure that each range you specify is appropriate to the context:

+ 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

Just as a cell address in a formula can be *relative* or *absolute*, so can a range specification. When pointing to a range, use [4/ABS] to make it absolute. 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, because you can *point* cell addresses into a formula.

As you're entering a formula, the mode indicator in the upper right 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 [2/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.)
[±]	Cancel the entire entry and return to Ready mode.

Edit Mode

1-2-3 goes to Edit mode if you press [2/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 the following editing keys.

Key	Function
[BACKSPACE]	Delete character preceding cursor
[DEL]	Delete character at the cursor
[±]	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)
[WORD ←][WORD →]	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] (backward tab) function. [SHIFT]- → is equivalent to [TAB]. [SHIFT]- ← is equivalent to [BACKTAB].

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: [±] and [BACKSPACE]. Their effect depends on when you use them.

If you're pointing to a single cell:

• Pressing [±] 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, but does not erase the address. 1-2-3 remains in Point mode.

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

• Pressing [±] 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.
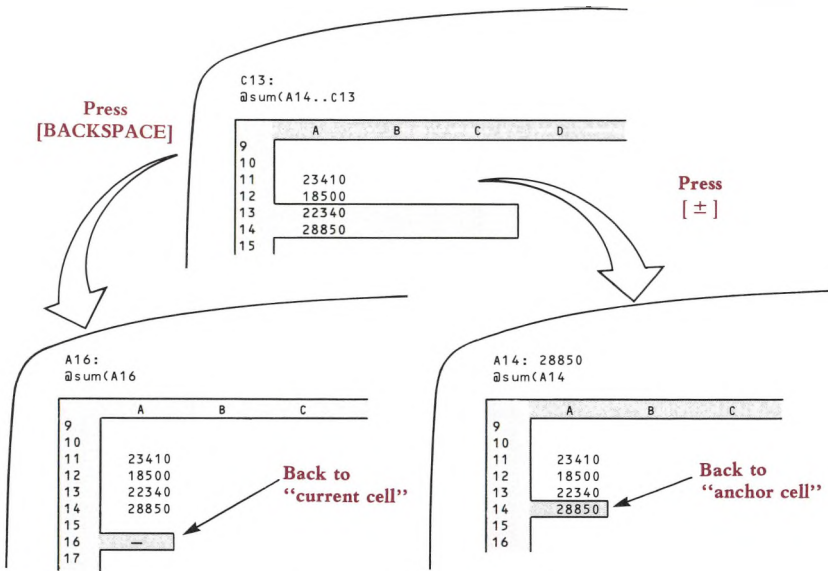
Figure 8-11. [±] and [BACKSPACE] **Correct Pointing Errors—Expanded Pointer**

The [9/CALC] Key

Pressing **[9/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 **[9/CALC]** when entering a formula (Value mode) or when editing a formula (Edit mode). **[9/CALC]** converts the formula into a number—the formula's current value. No other recalculation takes place.

This use of **[9/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 **[9/CALC]** to see the value; (3) Press [±] to clean up.

Similarly, you could calculate the value 56.7 × 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 **[9/CALC]** to convert this formula to the number 31.415926536; (3) Press **[RETURN]** to enter the number.

Automatic (Implicit) Changes to Formulas

The previous section explained how you can use 1-2-3's editing features to explicitly change formulas stored in the worksheet. In addition, there are situations in which another action you take changes one or more formulas:

/Worksheet Delete Columns and /Worksheet Delete Rows (Figure 8-12)
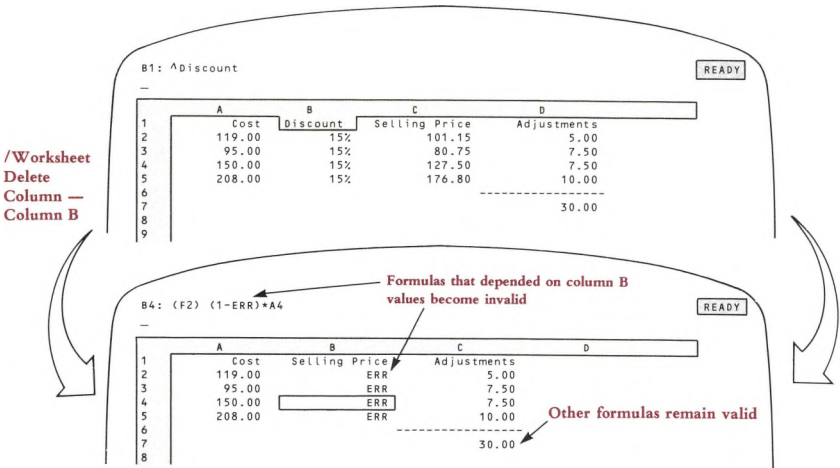
Figure 8-12. Be Careful When Deleting Rows or Columns

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)

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*.

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.

Moral: Feel free to /Move cells; 1-2-3 does the housekeeping for you. But be sure to pick an unused area of the worksheet as the destination for the /Moved cells.
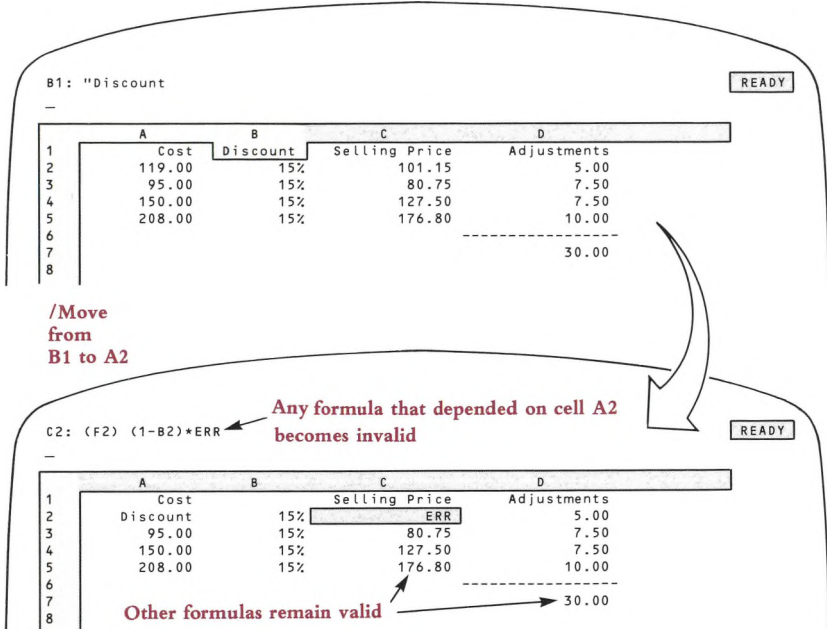
Figure 8-13. Be Careful When Moving Cell Entries

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

In this section, we describe a sophisticated 1-2-3 facility that can be a tremendous timesaver once you become familiar with it. *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. In order for the solution to make sense, let's look at the 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 an @PMT function as its entry. Here's the challenge: Can we type just *one* such formula, then /Copy it to the 19 other cells?

C16:   READY
—
          A   B   C   D   E   F   G   H
    15   11.0%   11.5%   12.0%   12.5%
    16           $50,000
    17           $55,000
    18           $60,000
    19           $65,000
    20           $70,000
    21
    22
    23

"Mixed" cell addresses allow you to use the same formula in each cell of this table
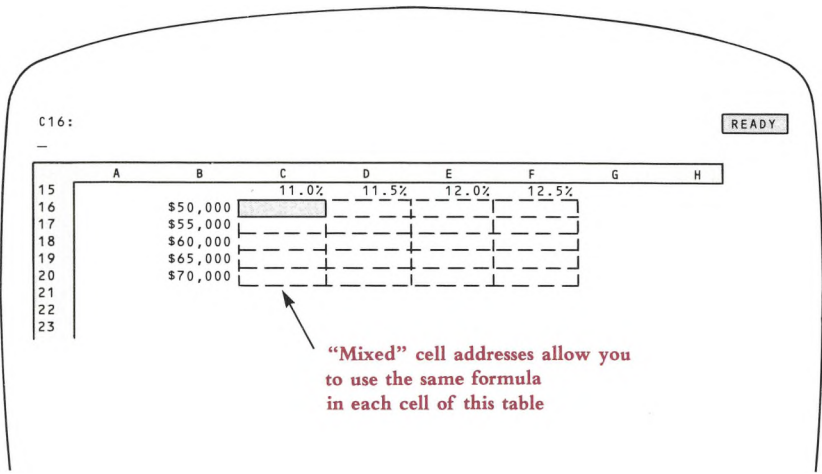
Figure 8-14. Building a Mixed Cell Addresses Table

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

"the cell to my left"   "column B, row 16"

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

$B   16 —————————→ $B16

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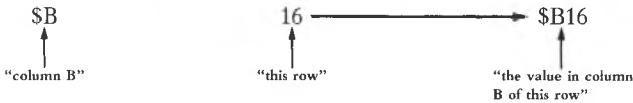
The situation with the interest rate values is a precise mirror image. We want to represent "the value in row 15 of this column" as a cell address. For a formula in cell C16, this translates to:

C $15 —————————→ C$15

"this column"   "row 15"   "the value in row 15 of this column"
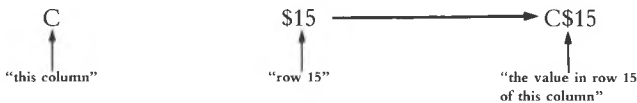
Here's the complete formula, using two different mixed cell addresses:

@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 alternative, 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 specificaton 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**:

Operator	Meaning
+	addition
−	subtraction
*	multiplication
/	division

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

"Three-fourths" is 3/4 not $\dfrac{3}{4}$

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


```
E3: +A3+A7-A5+1                                              READY
─
         A        B        C        D        E      F      G      H
1  Numbers              Formulas
2  ─────────            ─────────
3        3             Add & Subtract:    [  100  ]    -27    283
4
5       24             Multiply & Divide:     5     15
6
7      120
8
```

You can produce a report of all cell entries with /Print Options Other Cell-Formulas.

```
E3:  +A3+A7-A5+1
F3:  -A5-A3
G3:  +A7+40+A7+A3
E5:  +A7/A5
F5:  +A7/A5*A3
```

Figure 8-15. Simple Formulas

Parentheses and Precedence (Order of Operations)

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%	"minus 50 percent"

You can also precede a cell address with " – " to indicate its 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 is smart enough to 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; you may include extra " + " characters if they help you keep things straight:

@IF(C6375, – D9, + D9) is equivalent to @IF(C6375, – D9,D9)

As with " – ", 1-2-3 is smart enough to tell the difference between a " + " that indicates addition and a " + " that indicates 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" and "not the negative" 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" and "not the negative" take precedence over "multiply" and "divide".

• "Multiply" and "divide" take precedence over "add" and "subtract".

Powers. But there's more. 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, assigning precedence numbers:

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

The operations we've examined so far have the precedence numbers listed below. The actual numbers don't have a specific meaning. What's important is that "negative" has a larger number than "division", "multiplication" has a larger number than "addition", etc.

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

Examples:

+ 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 (page 8-26).

Logical Operators and Formulas

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, logical formulas can be used 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(EXPNS3REV,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. 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 as always, greater sophistication means a greater possibility of confusion. So let's take it slowly, proceeding in a 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 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". For convenience, a short listing of the functions, grouped according to the type of calculation they perform, appears at the beginning of this chapter. 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 very complex:

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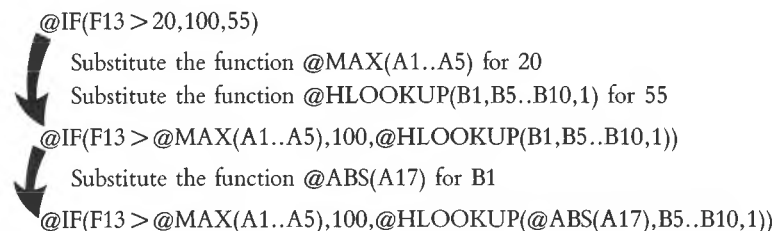
You'll probably give up before 1-2-3 does. But, it *is* possible to create a formula that is so complex that 1-2-3 can't understand it. In this case, 1-2-3 displays the error message "Formula too long". Break the formula into two or more parts, entering them in two or more cells.

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
.	.
72685	January 1, 2099
73049	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 (30926 and 30444), then the answer is a simple subtraction: $30444 - 30926 = 482$. 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.

Convinced? We hope so. 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. Always enter the correct date and time when you start your computer (unless you're lucky enough to have a non-stop "clock" included in your system).

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

Function	Description
@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 variety 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(83,4,15) is *TRUE* (has the value 1) before April 15, 1983. After that, it is *FALSE* (has the value 0).

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. Using Keyboard Macros— the 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 name, **macro**.

You "attach" each macro to one of the letter keys: A, B, C, ..., Z. When you hold down the [ALT] key 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*. But we won't mind if you do as the programmers do—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 use 1-2-3 to work through the example in the next section.

A Simple Example

Suppose that one of your 1-2-3 worksheets provides the data for several types of reports. 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, noting all the keys you press:

Keystrokes	Result
[5/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—and record all the keystrokes as a label entry:

'{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 column-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 [ALT] key and press C. 1-2-3 instantly types the stored keystrokes, 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]! 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.

We'll examine both these steps in detail, then proceed to a discussion of using (invoking) macros.

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 are indicated by enclosing the name of their function in braces, e.g. {Home} for [WORD ←], {Esc} for [±].

• The arrow pointer-movement keys are similarly indicated by name, e.g. {left}, {RIGHT}, {Up}, {DOWn}.

(As these examples indicate, 1-2-3 accepts either uppercase or lowercase letters in these key names.)

• 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. These standard designations for 1-2-3 macros differ from the actual key names on your keyboard. 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]	~	[2/EDIT]	{Edit}
↑	{Up}	[3/NAME]	{Name}
↓	{Down}	[4/ABS]	{Abs}
←	{Left}	[5/GOTO]	{GoTo}
→	{Right}	[6/WINDOW]	{Window}
[WORD ←]	{Home}	[7/QUERY]	{Query}
[WORD →]	{End}	[8/TABLE]	{Table}
[SHIFT]-↑	{PgUp}	[9/CALC]	{Calc}
[SHIFT]-↓	{PgDn}	[10/GRAPH]	{Graph}
[DEL]	{Del}	Pause for manual	{?}
[BACKSPACE]	{Bs}	input until user	
[±]	{Esc}	presses [RETURN]	
		(Interactive Macros,	
		page 9-8)	

Figure 9-2. Indicating Key Functions in Macros

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 9-9.)

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.

(Programmers write little notes to themselves like this all the time. They call this process *commenting*.)

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.

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 [5/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 particularly useful in combination with the auto-loading worksheets (page 21-3).

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

[ALT]-letter

That is, hold down the [ALT] key and press the letter key. We call this process "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 back to Figure 9-1:

• Assign the cell containing Macro 1 the range name \ X. Then, pressing [ALT]-X in Ready mode enters the formula in the current cell.

• Assign the cell containing Macro 3 the range name \ Y. Then, pressing [ALT]-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 [ALT]-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 [ALT]-P types the word "Revenues" and finishes the entry. (Remember, " ~ " means [RETURN].) But pressing [ALT]-Q doesn't type [RETURN]. That means you can press [ALT]-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 [ALT]-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 [ALT] 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 what happens when you press [ALT]-letter, see page 9-13.

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 [ALT] key and press [1/HELP]. This causes a *STEP* indicator to appear in the lower right corner of the screen. Pressing [ALT]-[1/HELP] again causes the indicator to disappear.

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

	G	H	I	J	K	L
1	Name	Company	Address	City	State	Zip
2	F. Reinhardt	ABC Medical	453 Hunter Lane	Barton	VA	12222
3	T. Fountain	Masnum Music	1 Goodwin Place	Upstate	NY	99667
4	R. Ford	Smart Art Shop	1001 Knight St.	Rosoff	TX	09909
5	J. Schwarz	Peninsula Review	Apple Court	Wiyo	OH	88512

A1:   READY

	A	B	C	D	E
1					26-May-83
2					
3					
4		← Name, Company, Address go here			
5					
6					
7	Dear Sirs:				
8					
9	Account #: ← Account # goes here				
10					
11					
12	Please be advised that your account is seriously overdue.				
13	If you do not pay the full balance of your account within				
14					
15	days, we will take legal action. ← # of days goes here				
16					
17	Thank you.				
18					

Macro \A

/c ~ b2 ~ {right}	Copy "Name"
/c ~ b3 ~ {right}	Copy "Company"
/c ~ b4 ~ {right}	Copy "Address"
/c{right}{right} ~ b5 ~	Copy "City-State-Zip"
{right}{right}{right}	Move to "Account #"
/c ~ c9 ~	Copy "Account #"
{home}{goto}b14 ~ '	Move to "# of days"

Macro \B

{up}{up}	Move to top of paragraph
/rjb12..e15 ~	Justify paragraph
/pprb1.e16 ~ 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). In between 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 **[ALT]-[1/HELP]** turns off the *STEP* indicator, but does not resume 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 the **[CLR/HOME]** key. Control returns immediately to Ready mode.

Similarly, you can press **[CLR/HOME]** 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:

{?}{Right}	1-2-3 accepts keyboard input, then automatically presses the → key.
{?}{PgDn}	1-2-3 accepts keyboard input, then automatically presses **[SHIFT]**-↓.

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

/c ~ b2 ~ {right}	Copy "Name"
/c ~ b3 ~ {right}	Copy "Company"
/c ~ b4 ~ {right}	Copy "Address"
/c{right}{right} ~ b5 ~	Copy "City-State-Zip"
{right}{right}{right}	Move to "Account #"
/c ~ c9 ~	Copy "Account #"
{home}{goto}b14 ~	Move to "# of days"
'{?} ~	Start entry, pause, then finish entry
{up}{up}	Move to top of paragraph
/rjb12..e15 ~	Justify paragraph
/pprb1.e16 ~ gq	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: Do You Sincerely Want to Become a Programmer?

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:

• [5/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.

This facility gives the 1-2-3 user 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.

Programmers call these unanticipated decisions "bugs". Any programmer can tell you that tracking down bugs and getting rid of them can be a tricky business. The additional Alternative Typing capability can open the door on a brave new world, or it can open the lid of Pandora's Box. It's up to you.

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
/XI*condition* ~ . . .	If-Then
/XG*location* ~	GoTo
/XC*location* ~	Call subroutine (GoTo, then return)
/XR	Return from subroutine
/XQ	Quit macro execution

Pause for Keyboard Input

Command	Function
/XM*location* ~	Process a user-defined menu
/XL*message* ~ *location* ~ /XN*message* ~ *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.

/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. We strongly suggest 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.)

/XI*condition* ~ . . .   **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.

/XG*location* ~   **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 [5/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 [5/GOTO].

/XC*location* ~   **Call Subroutine**
/XR   **Return from Subroutine**

Similar to /XG (GoTo). Continue reading keystrokes at *location*. When an /XR command is encountered, return to reading keystrokes at the point just beyond the */XClocation* ~ 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 just two keystrokes: **[2/EDIT]**, then **[9/CALC]**. This is followed by ↓ (move to the next entry to be converted) and **[9/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.

/wgrm	Set Recalc to Manual
/rncNUMBER ~ b1 ~	Create "NUMBER" variable
/rncCOUNTER ~ b2 ~	Create "COUNTER" variable
/rncCOLUMN ~ {bs}.{end down} ~	Name the formulas COLUMN
{goto}NUMBER ~	Initialize NUMBER
@count(COLUMN){calc} ~	
{down} + COUNTER + 1 ~	Initialize COUNTER
{goto}COLUMN ~ *Assign range name "LOOP" to this cell*	Move to top of COLUMN
{edit}{calc}{down}{calc}	Convert and increment
/xiCOUNTER < = NUMBER ~ /xgLOOP ~	Branch on condition
/wgra	Endgame: Automatic Recalc
{home}{goto}COUNTER ~ Done! ~	Done message
{goto}COLUMN ~	Return to starting point
/xq	End macro

Figure 9-6. A "Looping" Macro

Pause-for-Keyboard-Input Commands

/XL*message* ~ *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.

/XN*message* ~ *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 [±].)

/XM*location* ~   **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 the 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 →, ←, [WORD ←], and/or [WORD →], 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).

This cell is the location to   1st row: 2nd row:
which the /XM command refers.   menu choices   long prompts

```
Save                 Print                 Graph                Quit
file: CHART23        Entire worksheet      Draw bar graph       Ready mode
/FSchart23 ~ R ~     /PPCA                 /GRG                 /XQ
/XGstart ~           RA1.H97 ~             TB
                     OML10 ~ MR140 ~       XC13.C22 ~           After menu
                     QQ                    AF13.F22 ~           choice, macro
                     /XGstart ~            OSYFC0 ~ Q           continues on
                                           TFSales History ~    third line
                                           QVQ
                                           /XGstart ~
```
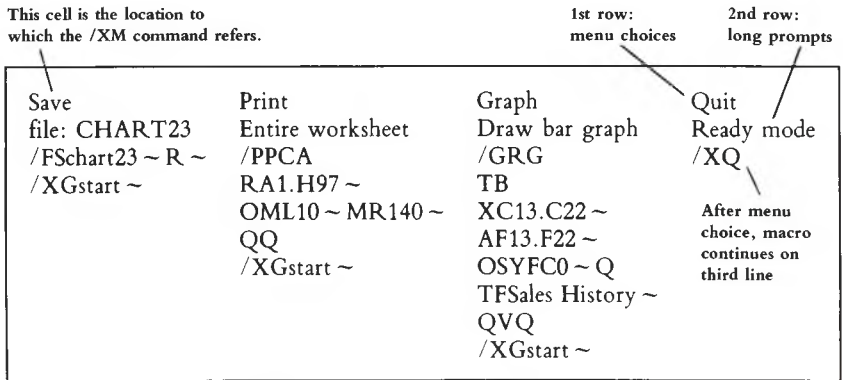
Figure 9-7. A User-Defined Menu

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 [±] 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, **[ALT]**-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 an /XQ command. In these cases, macro execution terminates.

• It reads an /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 [ALT]-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.

Contents

10.   Worksheet Commands

The /Worksheet commands control various overall aspects of 1-2-3 usage. The commands fall into several categories:

Starting Out. When you install 1-2-3 on your computer, you can use /Worksheet commands to tell 1-2-3 about your system's hardware. From time to time, you'll need to inform 1-2-3 of any changes you make in the system hardware.

At the Beginning of a Session. Certain /Worksheet commands are useful at the beginning of a 1-2-3 session. Some of them determine the overall appearance of the worksheet—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. And they can 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

Using /Worksheet Global commands, you can control these overall aspects of worksheet appearance:

- Display format for numbers and formulas.
- Prefix character for labels (determines label alignment).
- Column widths.

For example, Figure 10-1 shows how the same entries might result in quite different appearances, depending on the /Worksheet Global 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. Any changes you make thereafter 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
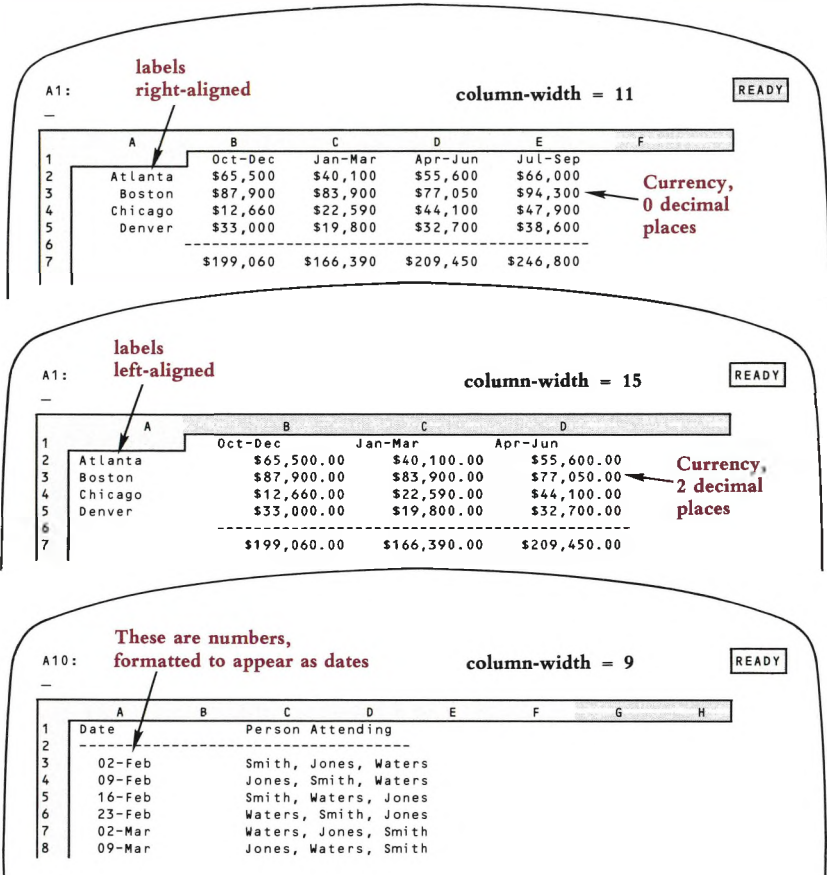
Figure 10-1. Global Settings

Standards and Overrides

The /Worksheet Global commands establish overall (*global*) standards. Unless you issue an override for a particular cell or column, 1-2-3 displays it according to the /Worksheet Global settings. This global-setting-and-override system allows you the flexibility both to establish the rules and to specify the exceptions to them:

• The global numeric display format can be overridden for particular cells with /Range Format commands (page 11-9).

• The global label alignment can be overridden for particular cells by typing *label-prefix characters* and issuing /Range Label-Prefix commands (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 above to produce the different illustrations in Figure 10-2.
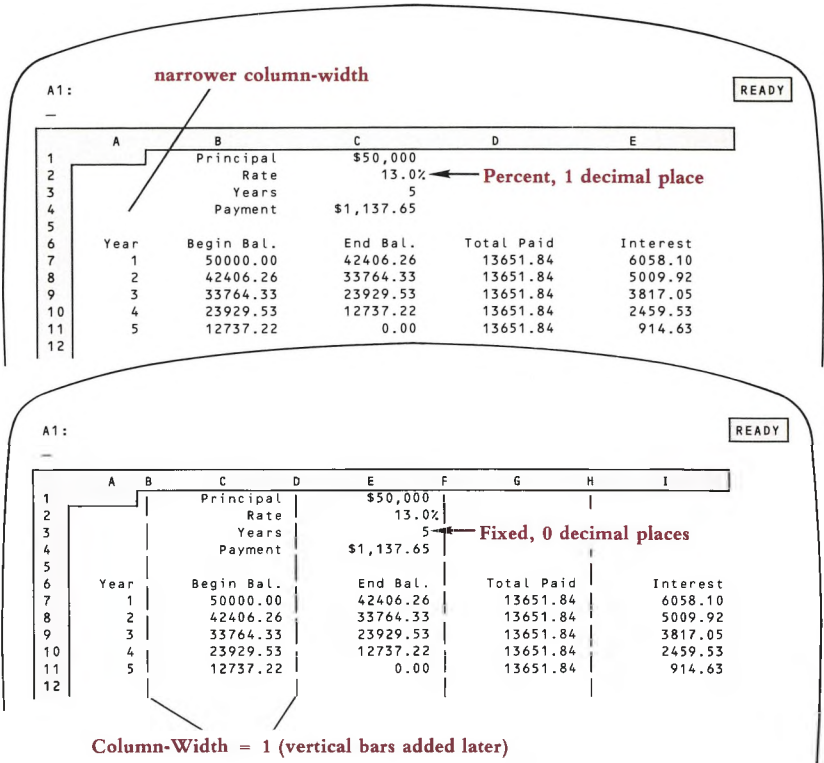
Figure 10-2. Overriding Global Settings

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:

    Numeric Formats: /Worksheet Global Format
    Label Formats: /Worksheet Global Label-Prefix

(Numeric and label formats, along with numerous examples, are described in the command summaries later 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 have your cake and eat it, too.

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. The term *default* commonly describes what occurs when you don't do anything to change the situation. For instance, when you don't pay back a loan, you are "in default".

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.
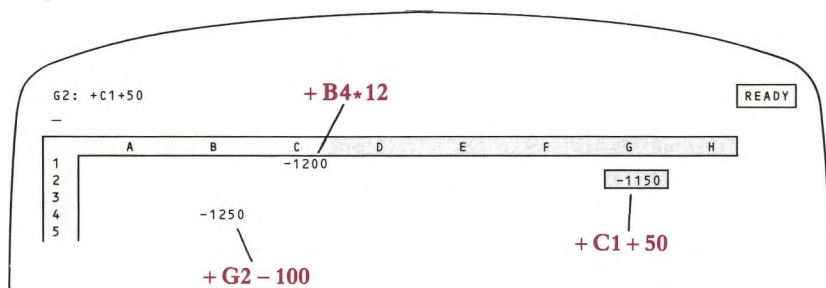
Figure 10-3. Circular References

This situation is called a **circular reference**. The value of cell B4 depends indirectly on itself. Independence is a desirable trait in people, but not usually in worksheets! (There are some exceptions in both cases, to be sure. For instance, you can 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 recalculation process:

• Set the order in which 1-2-3 processes formulas to Natural, Columnwise, or Rowwise. Both of 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 **[9/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 **[9/CALC]** before trusting the worksheet's values.

Cell Protection

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.

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.

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.

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 on page 11-7.

Initially, all cells have protection fences,
but the protection "power" is off.

/Worksheet Global
Protection command
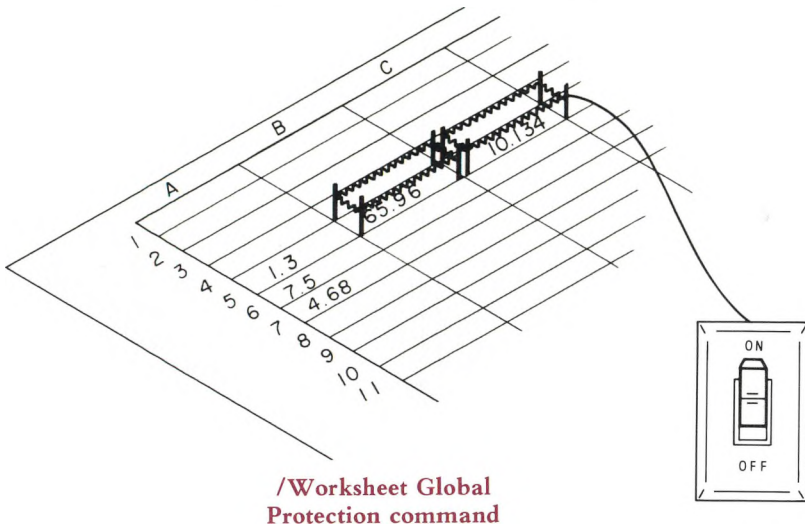
Figure 10-4. Protection Fences

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 (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
- Global label-prefix
- Global column-width
- Recalculation procedure
- Cell protection

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).
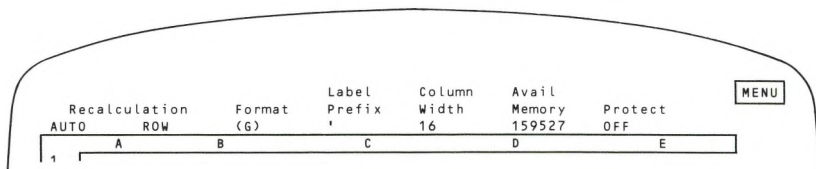
Figure 10-5. Worksheet Status Display

Altering the "Window" into the Worksheet

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 20 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 include column headings a bit more meaningful than **A** or **B,** and row headings more informative than **14** or **75** (Figure 10-6).
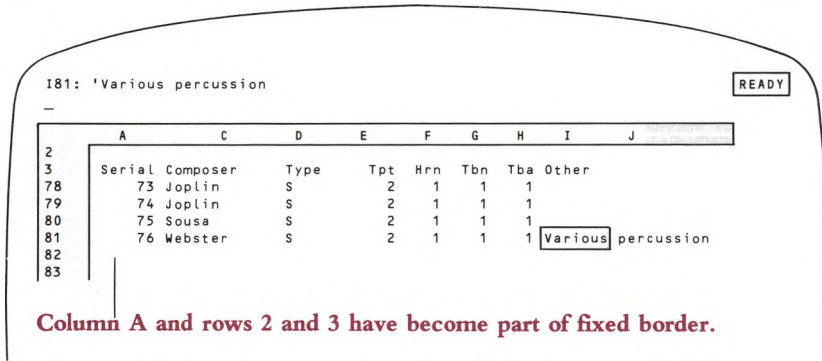
Figure 10-6. Worksheet Titles

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 15 rows and a block of 4 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 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. **[5/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 **[6/WINDOW]** key in Ready mode or Point mode.

```
D50: (T) 2                                                    READY
—
          A              B        C     D    E    F    G    H
 1  Brass Music Database
 2
 3  Name                 Composer    Type   Tpt  Hrn  Tbn  Tba Other
 4  Fanfare & Processional  Amram    CN      2    1    1    1
 5  Quintet              Arnold      CN      2    1    1    1
 6  Fanfare for Common Man  Copland  CN      3    4    2    1 Perc
 7  Toccata              Haines      CN      2         2
 8  Morgenmusik          Hindemith   CN      2         1    1
          A              B        C     D    E    F    G    H
49  Name                 Composer    Type   Tpt  Hrn  Tbn  Tba Other
50  horizontal split                               2
51
```

vertical split

```
R1: "Proj 10                                                  READY
—
        A         B          C              R        S        T
 1  Start Date  01-Mar-83              1  Proj 10  Proj 11  Proj 12
 2  End Date    15-Apr-83   Manpower   2    $675   $1,350     $844
 3                         Materials   3    $500     $550   $1,000
 4  Cal. Days         45  ---------   4  ---------------------------
 5                            Total    5  $1,175   $1,900   $1,844
 6  Hourly Charge    $6.75             6
 7                                     7
```

Figure 10-7. Split Screen

Large-Scale Editing

Several additional /Worksheet commands make major changes to the worksheet:

/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 Save command to store it). All cell formats are lost, and all /Worksheet Global settings return to their startup 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—numeric entries will be displayed in the global format.

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).

Insert one row at row 10 and at row 5 (repeating labels added later)
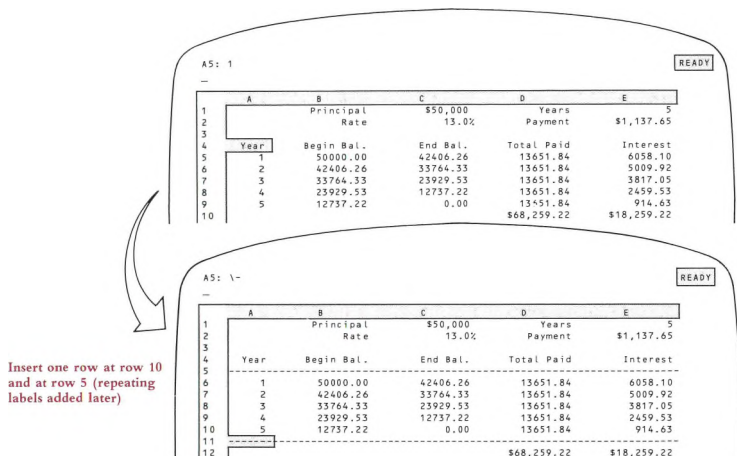
Figure 10-8. Inserting Rows

/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 remaining in the worksheet whose formula depends on a deleted cell will be rendered invalid (Figure 10-9).

Delete columns J, H, F, D, and B.
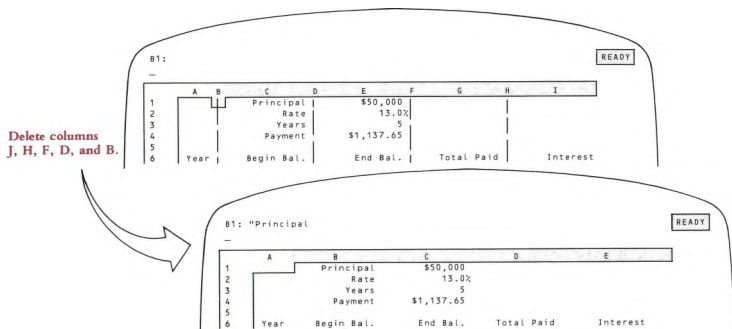
Figure 10-9. Deleting Columns

/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
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	Value is 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	Value is 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	15-Jan-84 05-Mar-2015
	D2: Day-Month	15-Jan 05-Mar
	D3: Month-Year	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.

Alignment	Prefix	Effect on Label
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 $\longrightarrow$ 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 $\leftarrow$ and $\rightarrow$ 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 **[9/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 [9/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 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 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 accommodate values that are 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 9 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. It is often helpful to place blank columns between blocks of data. This enhances the visual presentation and lets you use the **[WORD →]** 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 are 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 [6/**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 many 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.

• Preventing 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 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

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 flying above a cell, 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, leaving empty flagpoles.

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).

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
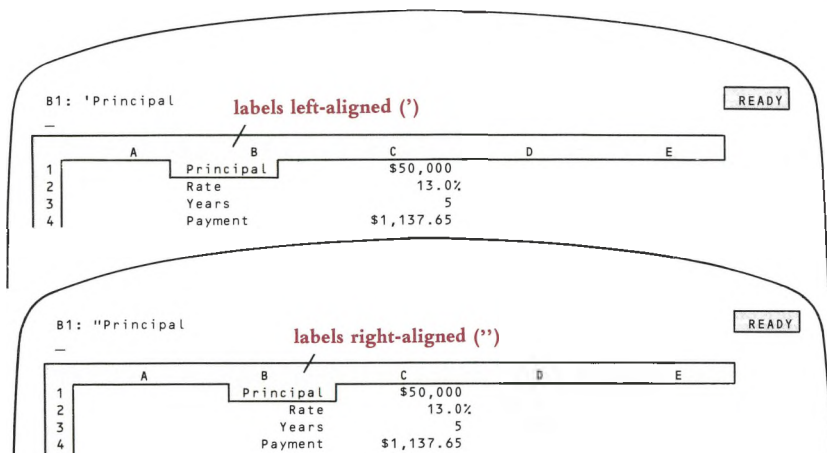
Figure 11-1. Changing Label Alignment

(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, /Range Name Labels, 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).
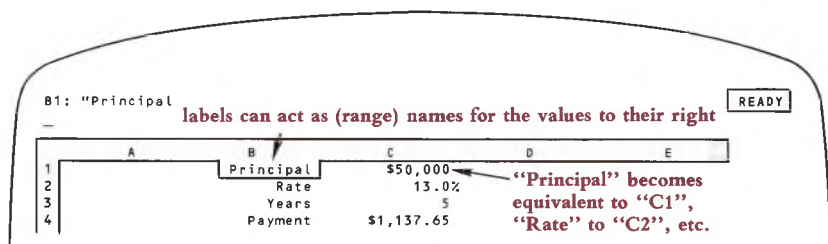
Figure 11-2. Using Label Entries as Range Names

It would make 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 (Chapter 8, "Writing Formulas").

@PMT(Principal,Rate/12,Years*12)

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 or to name 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 [3/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.)

all these "long labels" are entries in Column A
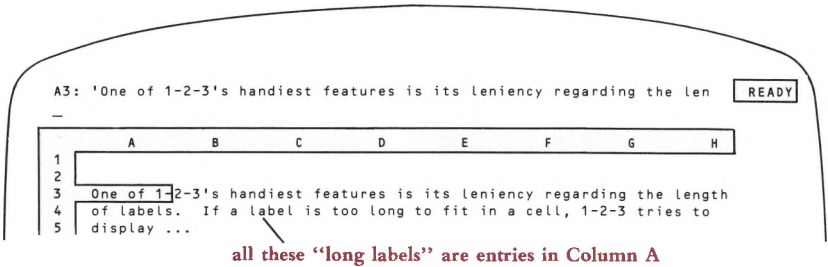
Figure 11-3. A Column of Labels is a "Paragraph"

For instance, a single command can convert the paragraph illustrated above into either of the layouts shown in Figure 11-4.

subsequent column A entries move down to make room

subsequent column A entries move down to make room
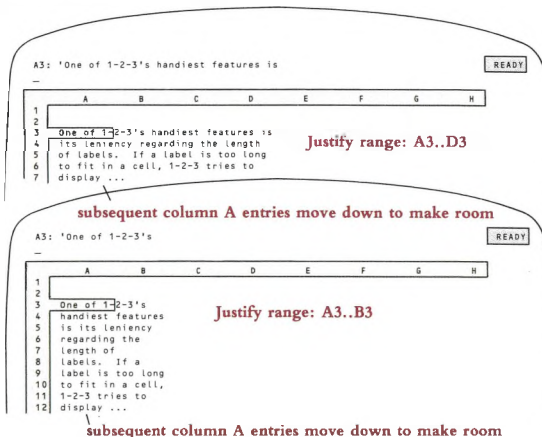
Figure 11-4. /Range Justify: Adjusting Paragraph Width

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).
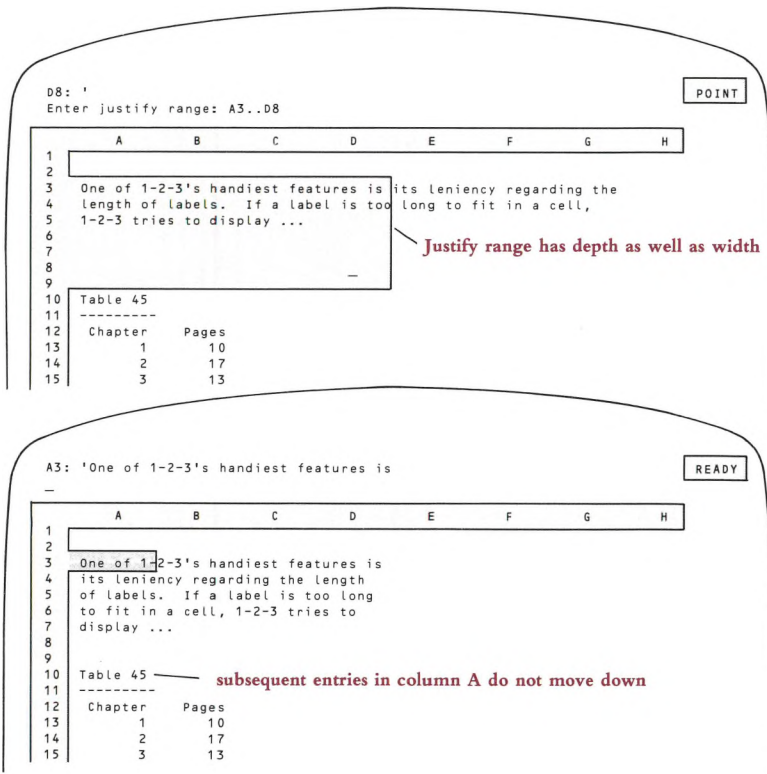
Figure 11-5. /Range Justify: Limiting Vertical Readjustment

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.

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 made later 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.

Form-Oriented Data Entry

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.

Restricting the user to the "proper" cells is accomplished through a combination of the cell protection facility and the /Range Input command:

```
                                    cell is "unprotected"
    C7: U  'John Rensop                                                      READY
                         color indicates unprotected cells, used for data input
    _

        AB        C                        D              E       F       G      H
    1   +================================================================+
    2         Lotus Development Company -- Prospective Customer Log
    3   +================================================================+
    4
    5   NAME                 COMPANY              INTEREST (1..5)
    6   + ----                -------              ---------------              +
    7    John Rensop         Klassy Komputers, Inc        2                ?
    8
    9   ADDRESS              CITY                 ST    AREA    PHONE #
    10  + -------             ----                 --    ----    -------- +
    11   555 Melrose Ave.    Waverly              TX    999    555.1212
    12  +================================================================+
```
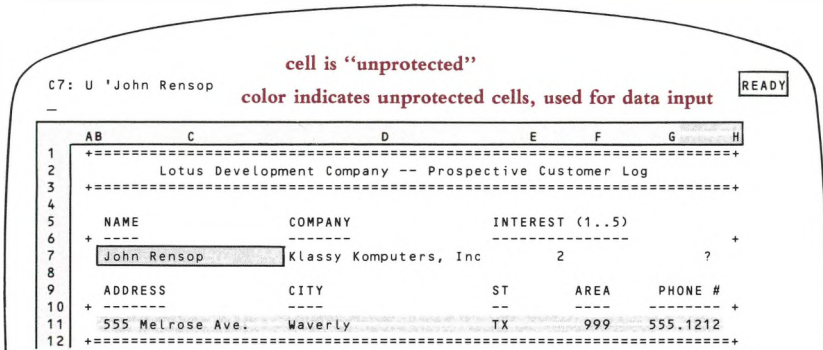
Figure 11-6. /Range Input: A Data Entry Form

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.

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. (Chapter 17, "Data Commands", explains the concept of a database and how to use it.)

/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 stores 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
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	Value is 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	Value is 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	15-Jan-84 05-Mar-2015
	D2: Day-Month	15-Jan 05-Mar
	D3: Month-Year	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 that is 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

• 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.

• Unprotected cells are displayed at normal intensity or with green characters. Protected cells are displayed at bright intensity or with white characters.

• 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 and 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 (Chapter 9).

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 **[3/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 only to 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. 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.

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, whichever comes first.

Paragraph Width: The width of the justify range you specify (maximum: 240 characters).

To justify a paragraph, 1-2-3 rearranges the words 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 ←, →, ↑, ↓, [WORD ←], and [WORD →] 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 **[1/HELP]**, **[2/EDIT]**, and **[9/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 [±] 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 the position they occupied 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

The /Copy command creates new cell entries that are copies of existing entries. This can save you a great deal in time and keystrokes. But more important, /Copy provides the key to one of 1-2-3's greatest strengths: the ability to project and extrapolate. This capability is what makes 1-2-3 an important tool for rapid and confident decision-making. Here are some examples:

• 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.

But copying formulas is the most sophisticated use of the /Copy command. Let's start simple . . . .

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.
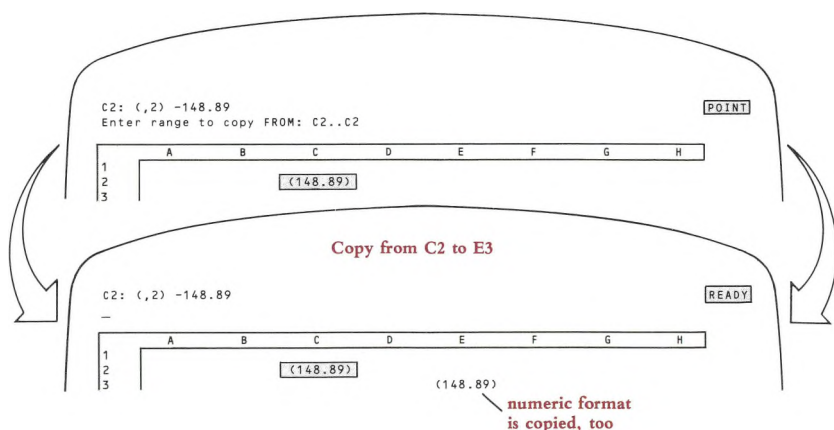
Figure 12-1. Making One Copy of an Entry

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                └────────────────────────────────────────┘
```
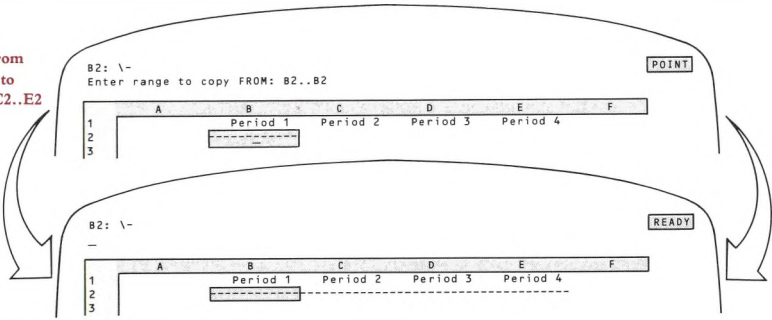
Figure 12-2. Copying an Entry TO a Range

Copy from range A1..E1 to cell B2

```
A1: \x                                                             READY
_

        A          B         C          D          E          F        G        H
  1  xxxxxxxxx              xxxxxxxxx              xxxxxxxxx
  2
  3
```

Copy from range A1..F2 to cell A3

```
A1: \x                                                             READY
_

        A          B         C          D          E          F        G        H
  1  xxxxxxxxx              xxxxxxxxx              xxxxxxxxx
  2              xxxxxxxxx              xxxxxxxxx              xxxxxxxxx
  3
```

```
A1: \x                                                             READY
_

        A          B         C          D          E          F        G        H
  1  xxxxxxxxx              xxxxxxxxx              xxxxxxxxx
  2              xxxxxxxxx              xxxxxxxxx              xxxxxxxxx
  3  xxxxxxxxx              xxxxxxxxx              xxxxxxxxx
  4              xxxxxxxxx              xxxxxxxxx              xxxxxxxxx
  5
```
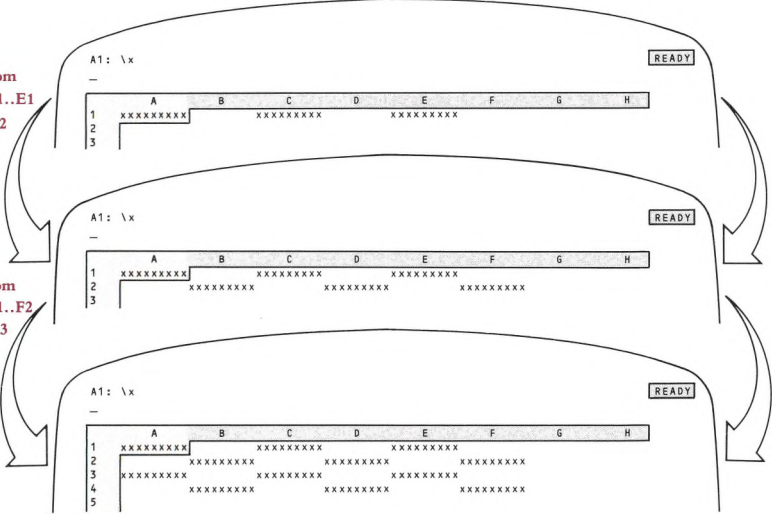
Figure 12-3. Copying FROM a Range of Entries

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):
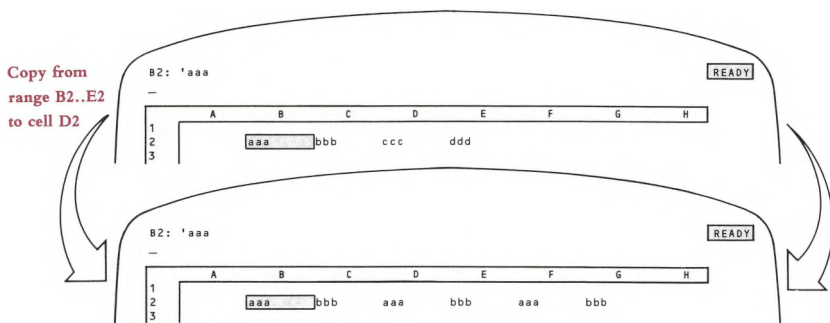
Figure 12-4. Oops—Overlapping FROM and TO Ranges

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.

1-2-3 makes only exact copies of formulas. However, a copied formula can perform a calculation that is similar, but not identical, to the original calculation.

Did that sound like a contradiction? It's not—many formulas that *seem* to be merely similar are, in fact, precisely the same. The key is for you to adjust your viewpoint on formulas a bit, to conform to 1-2-3's point of view. We'll state here 1-2-3's procedure in performing a /Copy, assuming that you're familiar with the concepts of *relative* and *absolute* cell addresses. (For a complete discussion, see Chapter 8, "Writing Formulas".)

When 1-2-3 copies a formula:

• 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 [2/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)

A16: +A11+A12+A13+A14

	A	B	C	D
9				
10				
11	23410	19877	6544	
12	18500	18555	7771	
13	22340	20034	9819	
14	28850	29710	6916	
15				
16	93100			

B16: +B11+B12+B13+B14

	A	B	C	D
9				
10				
11	23410	19877	6544	
12	18500	18555	7771	
13	22340	20034	9819	
14	28850	29710	6916	
15				
16	93100	88176	31050	

Copy from cell A16 to range B16..C16
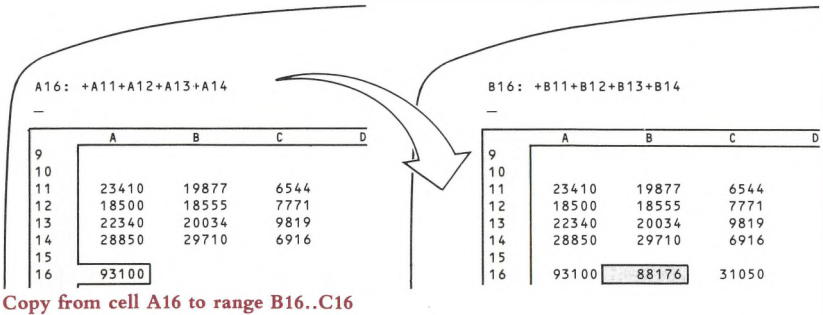
Figure 12-5. Example 2: Copying a Formula—Relative Cell Addresses

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)

C2: (C2) (1-B2)*A2

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

C4: (C2) (1-B4)*A4

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

Copy from cell C2 to range C3..C5
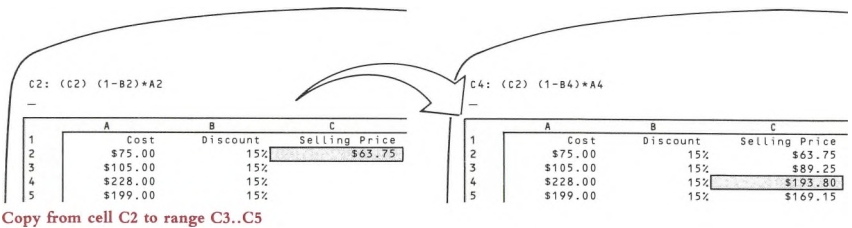
Figure 12-6. Example 3: Copying a Formula—Relative Cell Addresses

1. Formula typed in cell C2: (1 – B2)*A2

2. /Copy command specs:

   FROM range: C2
   TO range: C3..C5

3. Resulting formulas in *TO* range:

   C3: $(1 - B3) * A3$
   C4: $(1 - B4) * A4$
   C5: $(1 - B5) * A5$

Example 4. (Figure 12-7)
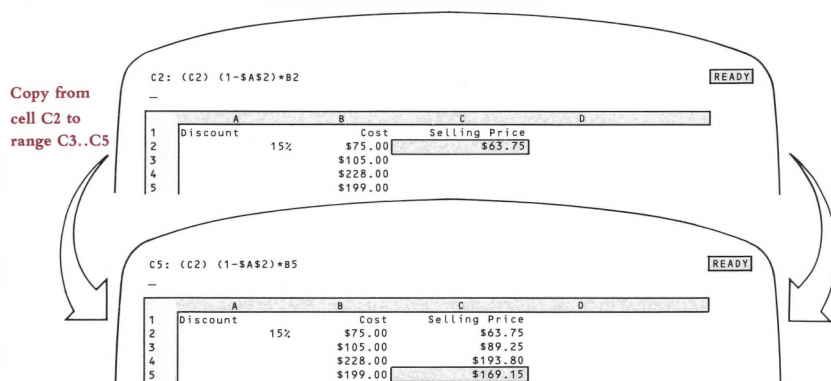
Figure 12-7. Example 4: Copying a Formula—Absolute and Relative Addresses

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)

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.)
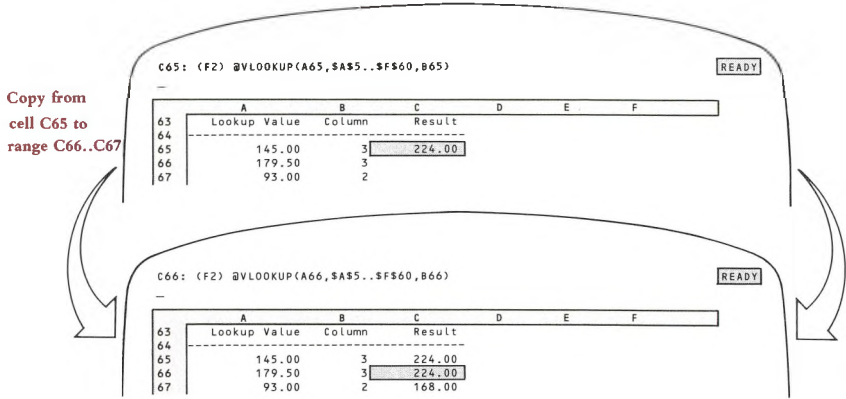
Figure 12-8. Example 5: Copying a Formula—Absolute Range

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,$D AT ARECS,B65)

2. Resulting formulas when copied:

   C66: @VLOOKUP(A66,D @ARECS,B66)
   C67: @VLOOKUP(A67,D @ARECS,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 a *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.

For example, you might do a first pass on a loan-analysis worksheet that looks like Figure 13-1.
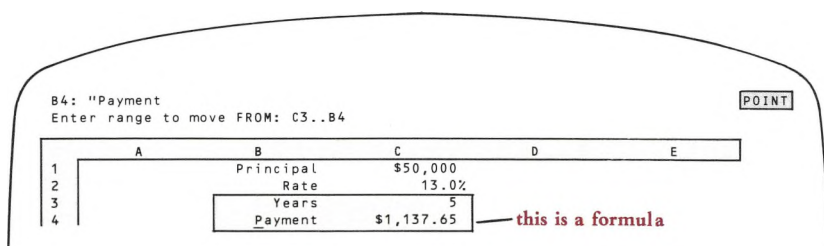
Figure 13-1. Moving Cell Entries—Before

(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 through 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)?
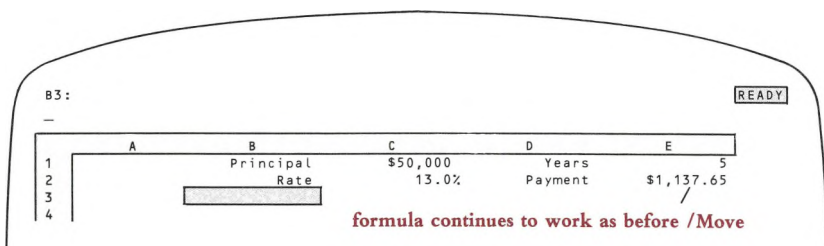
Figure 13-2. Moving Cell Entries—After

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.
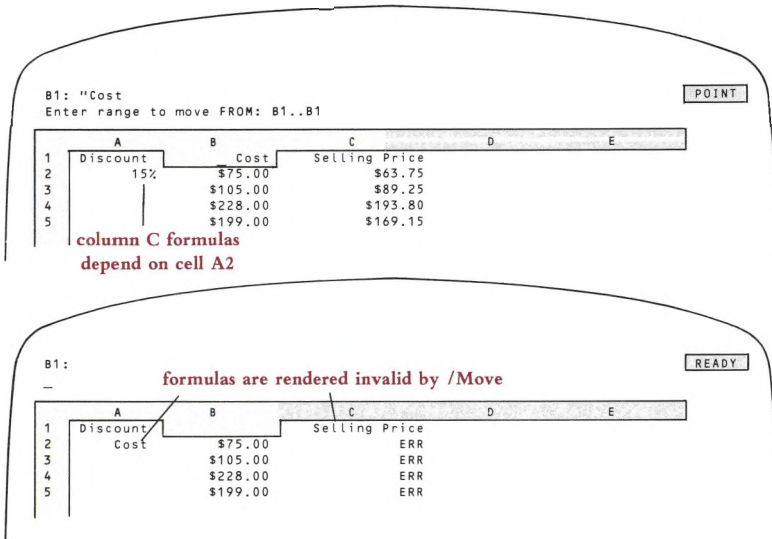
Figure 13-3. /Move Destroys Destination Cells

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).

E2: @SUM(COLUMN) —— "COLUMN" is range name for A1..A5   READY

	A	B	C	D	E	F	G	H
1	10	100	1000					
2	10	100	1000		50			
3	10	100	1000					
4	10	100	1000					
5	10	100	1000					

E2: @SUM(COLUMN)   definition of "COLUMN" changes to A1..C5   READY

	A	B	C	D	E	F	G	H
1	10	100	1000					
2	10	100	1000		4550			
3	10	100	1000					
4	10	100	1000		formula value reflects change in range specification			
5		100	10					

/Move A5 to C5

E2: @SUM(COLUMN)   READY

	A	B	C	D	E	F	G	H
1	10	100	1000					
2	10	100	1000		40			
3		100	1000					
4	10	100	1000					
5	10	100	1000					
6								
7								
8		10			after move, "COLUMN" still names range A1..A5			

/Move A3 to B8

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—Implementation Details", 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, or when your computer's electric power is shut off. 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 the computer's disk(s). (1-2-3 is designed to run under MS-DOS Version 1.25 or subsequent versions, and Victor BIOS Version 2.61.) The 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. MS-DOS maintains a directory of filenames—a listing of all the files on a disk. To keep things straight, MS-DOS insists that all files in each disk directory must have different filenames. In different directories, though, two files may have the same name.

(Confusing? Try this way of looking at it: 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	
ACCTSREC	ACCOUNTSRECEIVABLE	too long (filename will be truncated to eight characters)
CHECKS	CHK BOOK	spaces not allowed

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 14-5).

How 1-2-3 Uses Files

Think of the computer's main memory 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 14-9.)

/File Retrieve. Restores a worksheet to main memory (and the display screen) exactly as you stored it using /File Save or /File Xtract. (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.

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.

```
TE47: (F2) 815.95141794                                              POINT
Enter xtract file name: loantabl        Enter xtract range: A41..E47

      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

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. There are several ways to combine the new data with the old:

• *Copy.* Entries from the worksheet file replace entries in the current worksheet.

• *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.

• *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. We encourage you to use other computer programs. In most cases, 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 the memo once it's there).

14-3

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 Retrieve and Combine in the same way /Print File differs from Save and Xtract: Retrieve and Combine process *worksheet files* created by 1-2-3. 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, a statistical program, or a word processing program, for instance.

/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.

Whenever you try to create a file with a name already in use, 1-2-3 informs you of the situation (Figure 14-2).
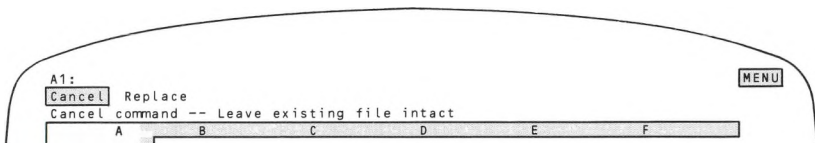
Figure 14-2. Overwriting Files—Your Choice

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.

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. The "standard 1-2-3 configuration" is to keep the Program Disk in Drive A and use Drive B for your data disk(s). For details concerning the configuration, including how to change it, see Appendix A, "Configuring 1-2-3".

With MS-DOS Version 1.25, Victor BIOS Version 2.61, all files stored on a disk are grouped together. We say that all the files are in a single **directory**. (See the *Victor Operator Reference Guide* 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 directory assignment with a 1-2-3 command:

/File Directory. Sets the current directory to a particular disk: A, B, 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.

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 one 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 diskette supply. All diskettes must be *formatted*, using the MS-DOS program FORMAT. (See the *Victor Operator Reference Guide* for details.)

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. Your computer's main memory is temporary, but disk storage is permanent. If you suffer a power failure, the worksheet currently on the screen will be lost, but the most recently created worksheet file will be preserved. Frequent storage is also insurance against human error—mistakes of judgment or typing—that may 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 [±], 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 work-sheet 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 file(s) 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.

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 [±] 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 filename extension .PRN—1-2-3 requires all print files to have this extension. Use the MS-DOS RENAME command or the Lotus Access System File Manager.

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 displayed. To retain it, press **[RETURN]**.

To change the current directory, type a single letter.

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 the filename you type 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

The /Print commands allow you to obtain a printed copy (*hardcopy*) of worksheet data. You can print an entire worksheet or you can excerpt one or more ranges for printing. You can send print output directly to the computer's printer, or you can store it in a *print file* for printing later with 1-2-3 or for use with some other program.

The /Print command offers many choices in addition to those mentioned above. You can dispense with 1-2-3's *options* if a quick printout is all you're after. If you're preparing the final version of a report for public distribution, you'll probably want to take advantage of 1-2-3's options: the ability to adjust formats, print page headings, number pages, and so forth. If you'd like a set of 1-2-3 print options to become your installation standard, you can store these options, always retaining the choice to override them. And you can even choose not to use formatting options at all for a particular printout.

Print It Now vs. Print It Later

If a printer is connected to the computer, you can obtain hardcopy of your work during a 1-2-3 session. Otherwise, you'll have to store the print output in a print file instead, then print at some other time.

After you end the 1-2-3 session, you can print this electronic (*softcopy*) version of the printout using the MS-DOS command *Type* or a special printing program.

Printing to a file is also useful if you want to revise the contents a bit before actually printing it—1-2-3's print files can be used by most word processing programs.

To allow you to print either now or later, the /Print command always starts with a choice:

/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.

What to Print (and How Many)

After you've chosen the destination of the print output, 1-2-3 displays a /Print menu:

Range   Line   Page   Options   Clear   Align   Go   Quit

This menu is your temporary home—after you perform one of these functions, this menu returns to allow you to perform another one. 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. If you're done, 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.
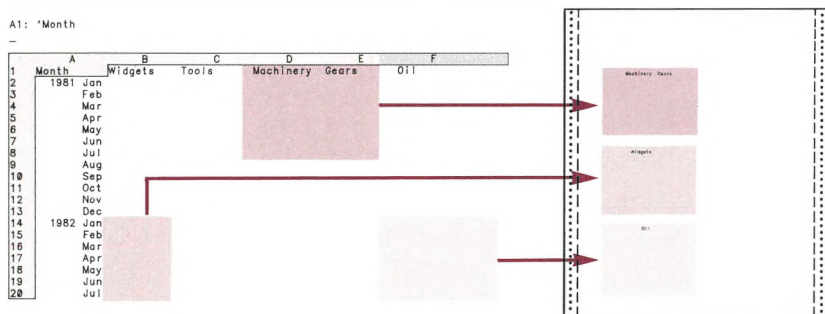
Figure 15-1. A Print Job with Several Parts

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):
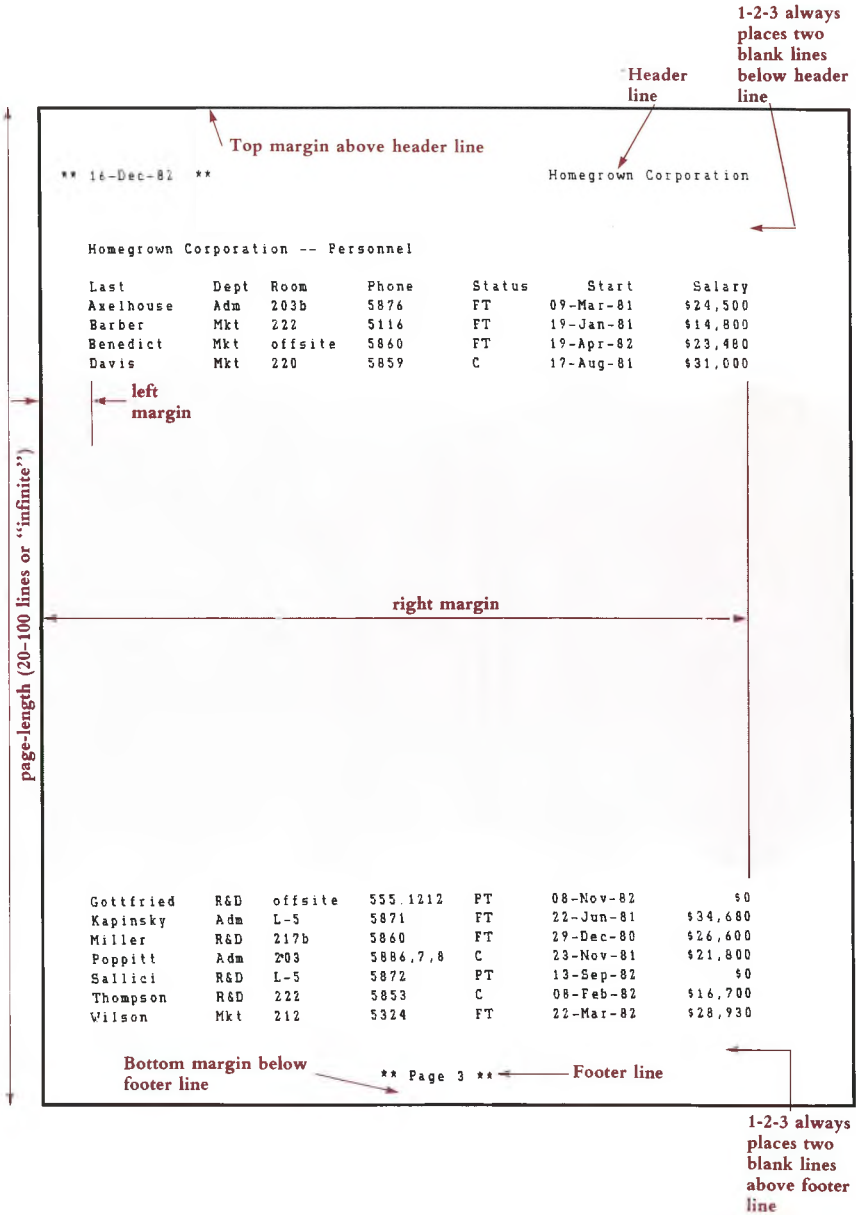
Figure 15-2. Page Layout Options

Text labels within the figure:

1-2-3 always places two blank lines below header line

Header line

Top margin above header line

```
** 16-Dec-82  **                              Homegrown Corporation


Homegrown Corporation -- Personnel

Last        Dept  Room      Phone      Status      Start       Salary
Axelhouse   Adm   203b      5876       FT        09-Mar-81    $24,500
Barber      Mkt   222       5116       FT        19-Jan-81    $14,800
Benedict    Mkt   offsite   5860       FT        19-Apr-82    $23,480
Davis       Mkt   220       5859       C         17-Aug-81    $31,000
```

left margin

page-length (20-100 lines or "infinite")

right margin

```
Gottfried   R&D   offsite   555.1212   PT        08-Nov-82         $0
Kapinsky    Adm   L-5       5871       FT        22-Jun-81    $34,680
Miller      R&D   217b      5860       FT        29-Dec-80    $26,600
Poppitt     Adm   203       5886,7,8   C         23-Nov-81    $21,800
Sallici     R&D   L-5       5872       PT        13-Sep-82         $0
Thompson    R&D   222       5853       C         08-Feb-82    $16,700
Wilson      Mkt   212       5324       FT        22-Mar-82    $28,930
```

Bottom margin below footer line

** Page 3 **

Footer line

1-2-3 always places two blank lines above footer line

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. (Appendix C, "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).
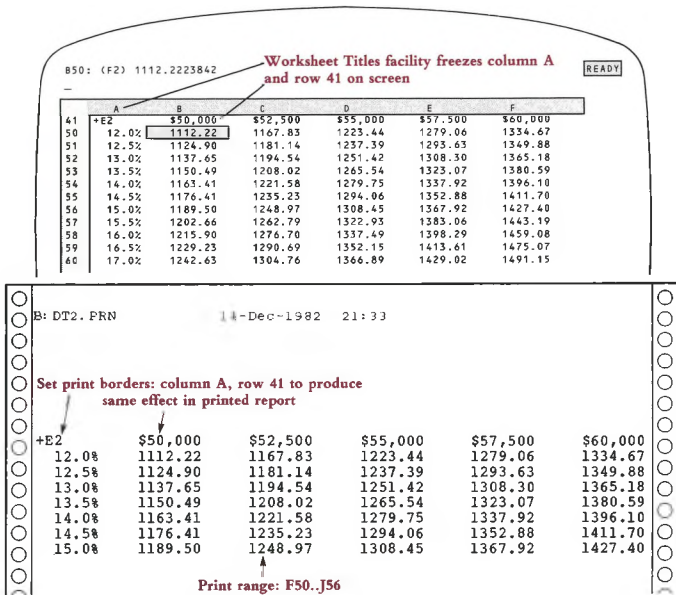
Figure 15-3. Print Borders

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).

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.

```
              Principal      50000       Years              5
                   Rate      13.0%       Payment      $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: (P1) 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 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).

2. *File only:* 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:RECPRINT means the current directory of disk C, file RECPRINT), 1-2-3 stores the file in the *current directory* (/File Directory, /Worksheet Global Default Directory).

3. *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.

4. The main /Print menu appears:

    Range   Line   Page   Options   Clear   Align   Go   Quit

This is a "sticky" menu (page 6-5): To return to Ready mode, choose Quit or press [±]. 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	
	4	22	if it extends beyond the right margin.	
	5	23	41	
	6	24	42	
	7	25	43	
	8	26	44	These characters
	9	27	45	will be lost.
	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	

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 is equivalent to Line, advancing the printer one line.

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 number counter back to page 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, hold down [SHIFT] and press the [CLR/HOME] key. 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. 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 [±] to clear the error message and continue working. No data is lost. Often, you need only switch your printer *on-line*, then choose Go again.

2. 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   /PPOH and /PPOF
Header and Footer   /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 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-83). *Be sure to enter the current date when you start the computer.*

Formatted Headers and Footers. You can use ¦ characters (typed with [ALT]-1 on the Victor keyboard) to separate a header or footer line into three parts.
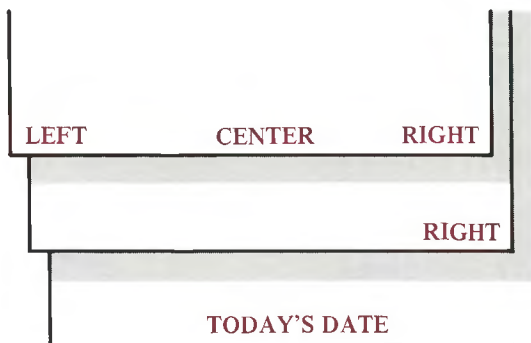
Figure 15-5. Placement of Headers and Footers

1. Flush against the left margin.

2. Centered between the margins.

3. Flush against the right margin.

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-83 **

on page 15 of print job

on February 23, 1983

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 below).

Notes

1. To cancel a header or footer, edit the text down to zero characters (using [BACKSPACE] or [±]). 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 [±]. 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-1) 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 1-2-3 System Disk. 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 [±], 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 combine rows or columns that are non-adjacent in a print job.

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 [±], 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

Examples (for Epson MX-80 printer):

\ 015 (Control O): turn on compressed print
\ 018 (Control R): turn off compressed print

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 1-2-3 System 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 [±]. 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.

Notes

1. At the beginning of a session, 1-2-3 reads the *default printer configuration* from the file 123.CNF on the 1-2-3 System Disk. 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 For-matted 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).

As these examples indicate, you can also annotate graphs using titles, legends, axis labels, and data-value labels. 1-2-3 allows you to store such additional graph specifications either in the worksheet as cell entries, or separately, as optional graph settings.

The /Graph command is loaded with features that will help you draw *effective* graphs—pictures that communicate numeric data dramatically, pictures that help you to see relationships and trends that you might not spot in the numbers themselves. Here is a partial list of these features:

Multiple Data Sets. You can represent up to six sets of data in the same graph 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 **[10/GRAPH]**.

Storage of Graph Settings. You instruct 1-2-3 to draw a graph by 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

(Thousands)

$34
$32
$30
$28
$26
$24
$22
$20
$18
$16
$14
$12
$10
$8
$6
$4
$2
$0

Jan Feb Mar Apr May Jun

Development Cost Consistently Highest

Prod. Devel. Mkt. Admin.
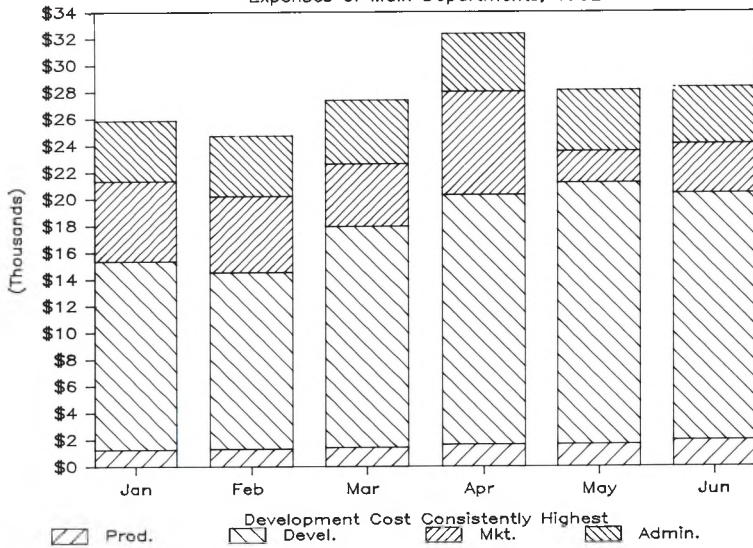
Costs of Four Departments

The Year of 1981

(Thousands)

20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1

J F M A M J J A S O N D

□ Prod   + Dev   ◇ Ads   △ Admin
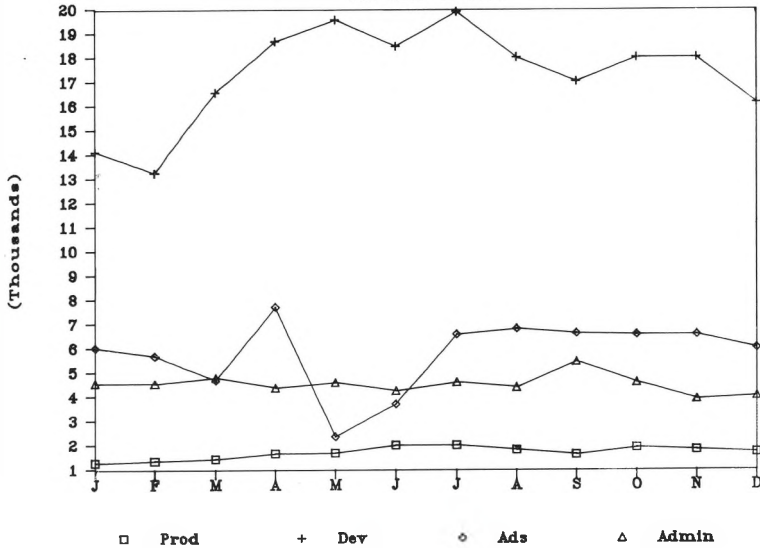
Figure 16-1. 1-2-3 Graph Types

Acme Hitech, Inc.
Departmental Corporate Costs, 1982

Facilities (4.6%)   Production (4.7%)

Administration (16.7%)

Advertizing (22.1%)

Development (51.9%)
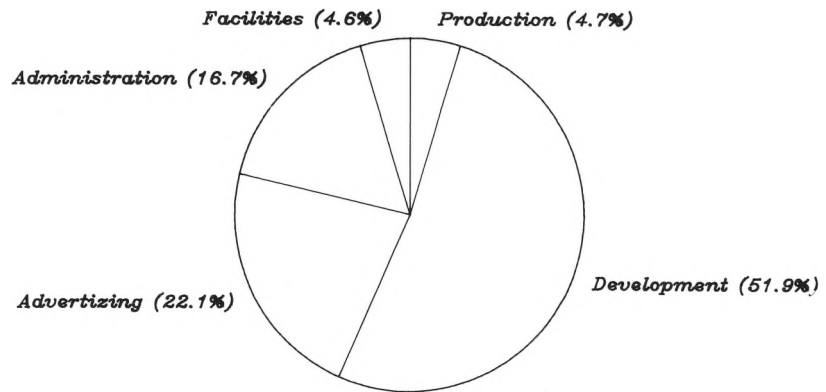
Spiraling Form
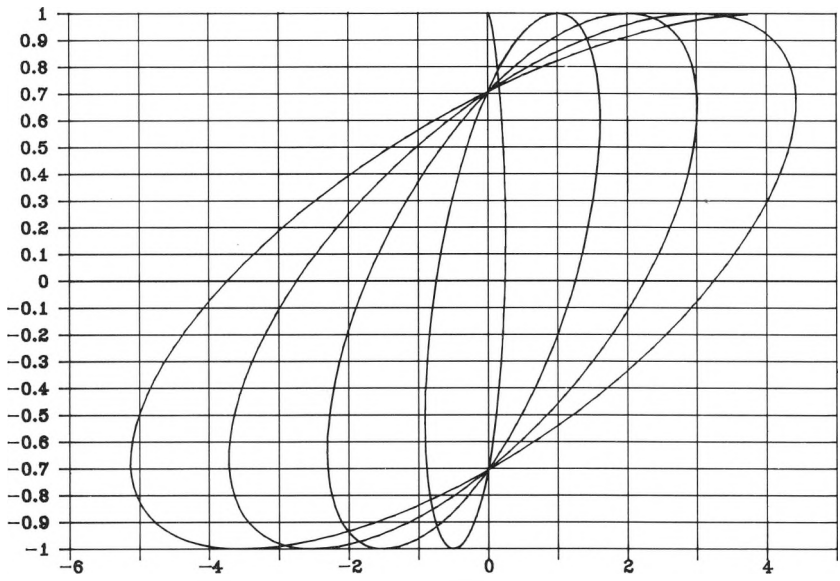
Figure 16-1. 1-2-3 Graph Types (continued)

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, colors, and more. (You invoke the PrintGraph program through the Lotus Access System. For a complete description, see Chapter 20, "Printing 1-2-3 Graphs".)

With such a wide range of features available, making full use of the /Graph command can get 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. What 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 specifications 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 [10/GRAPH] Key

Pressing [10/GRAPH] performs a Graph View when you're in Ready mode and 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 [10/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 [10/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.

	A	B	C	D	E	
A1: 'My First Graph						READY
1	My First Graph	14-Mar-83		Worksheet: GRAPH1		
3	X-range: B3..E3 — Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	A-range: B4..E4
4	Atlanta	$65,500	$40,100	$55,600	$66,000	B-range: B5..E5
5	Boston	$87,900	$83,900	$77,050	$94,300	C-range: B6..E6
6	Chicago	$12,660	$22,590	$44,100	$47,900	D-range: B7..E7
7	Denver	$33,000	$19,800	$32,700	$38,600	
9		$199,060	$166,390	$209,450	$246,800	

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
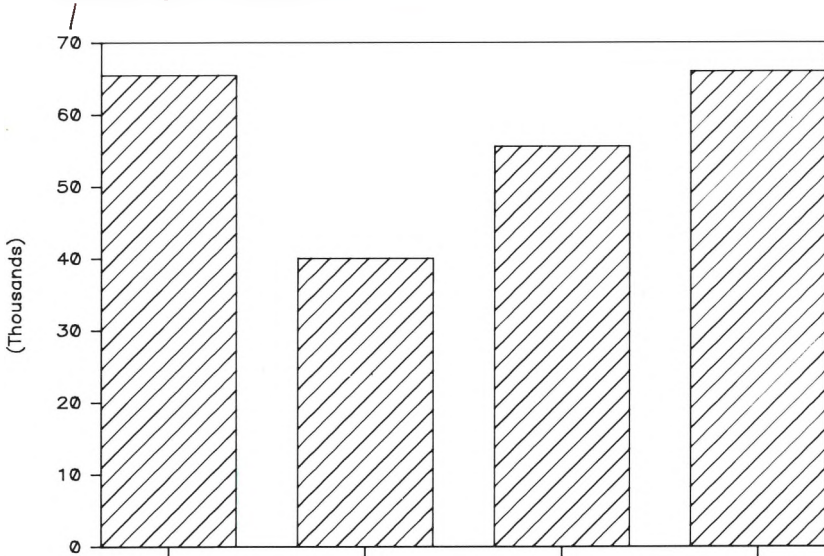
Figure 16-3. A Bar Graph—One Data Range
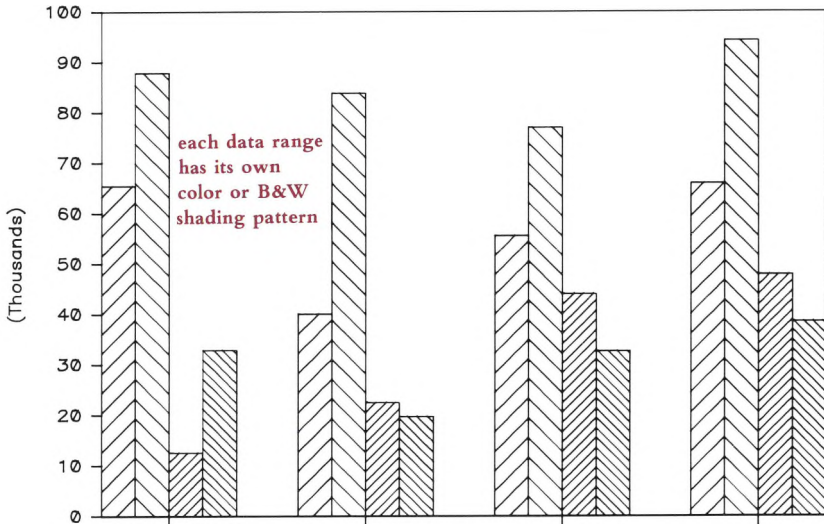
Figure 16-4. A Bar Graph—Four Data Ranges

B&W and Color

1-2-3 for the Victor Computer draws graphs in black and white, using a different crosshatching 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 Graphs

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
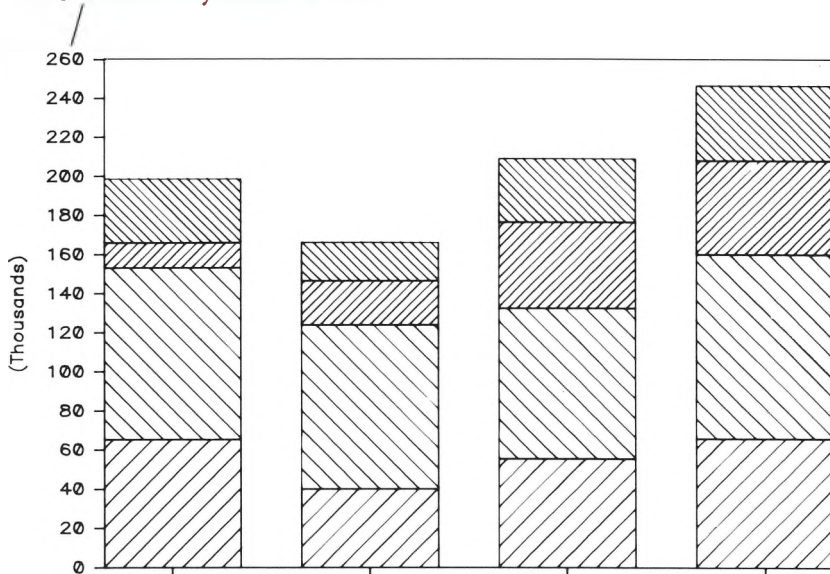
Figure 16-5. Switching the Graph Type—Stacked-Bar

In our example, this type of graph has the virtue of implicitly showing the total sales figure for each sales period.

16-7

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).
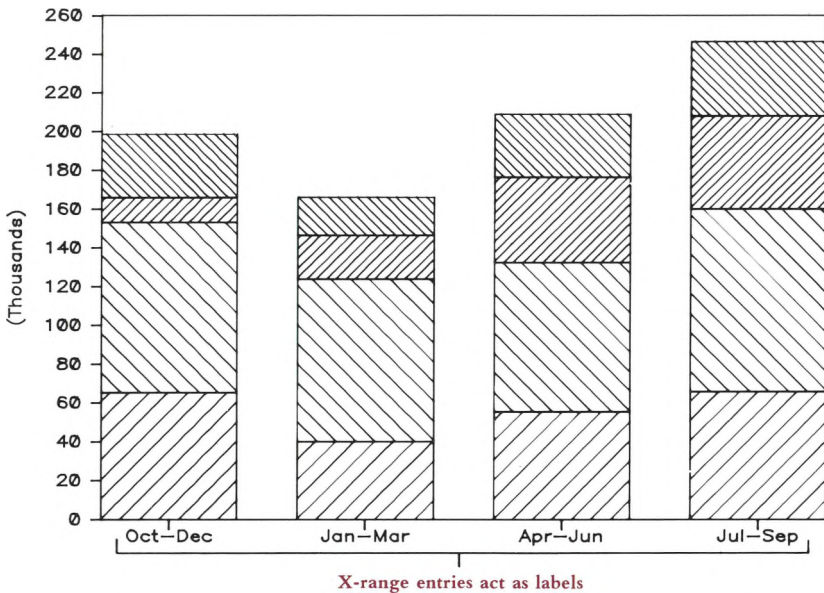
Figure 16-6. Adding X-axis Labels

How about some overall **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 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).

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, we suggest that you keep legends as short as possible.

Second title
(same size when displayed,
smaller when printed)

First title

My First Graph
November 11, 1982

Y-axis title

Gross Revenues
(Thousands)

260
240
220
200
180
160
140
120
100
80
60
40
20
0

Oct—Dec   Jan—Mar   Apr—Jun   Jul—Sep

Fiscal Quarters

X-axis title

100
80
60
40
20
0

Oct—Dec   Jan—Mar   Apr—Jun   Jul—Sep

Fiscal Quarters

Atl   Bos   Chi   Den

A-range legend text

A-range pattern or color
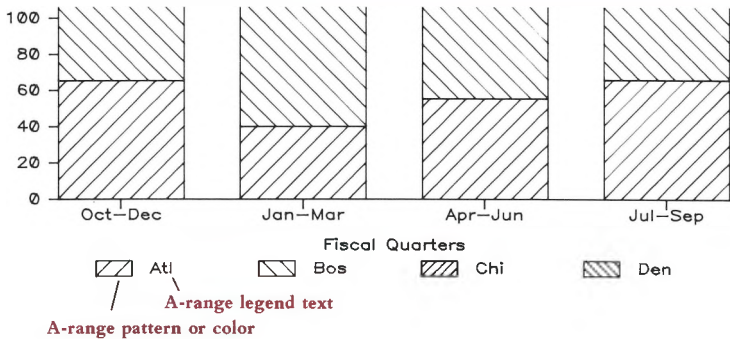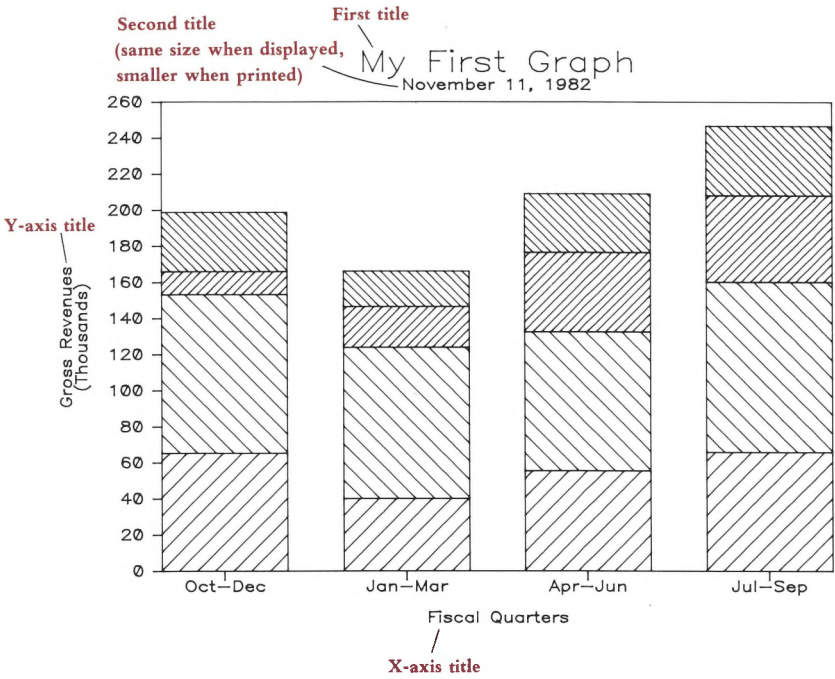
Figure 16-8. Adding Legends

Printing Graphs

Now that we've created a feature-loaded graph, how about getting a printout? 1-2-3 does not have a "Graph Print" command that allows you to send a graph image directly to your printer or plotter. Instead, it has the command /Graph Save, which stores 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, including:

- 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.

See Chapter 20 for details.

We could add even more features to our bar graph, but things would get a bit crowded. So let's double back to cover some points we missed the first time around. In particular, we've looked only at *Bar* and *Stacked-Bar* graphs so far. 1-2-3 can draw several other types of graphs, as well.

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.
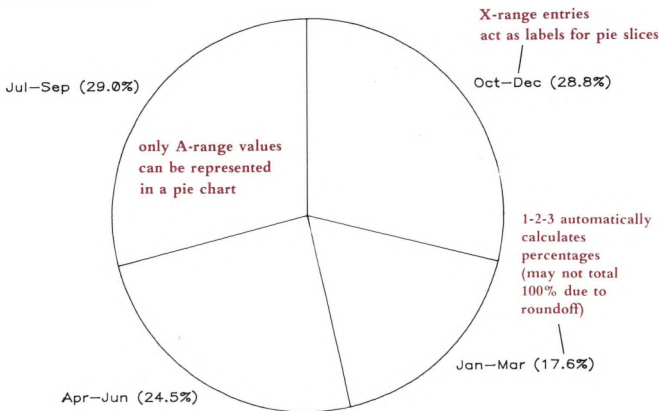
Figure 16-9. A Pie Chart

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

A third 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).
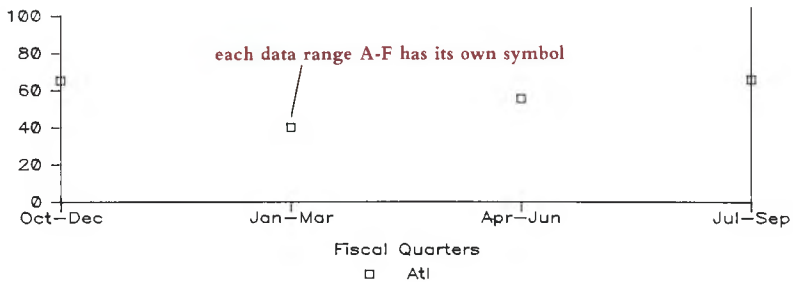
Figure 16-10. A Line Graph—Formatted with Symbols Only

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.
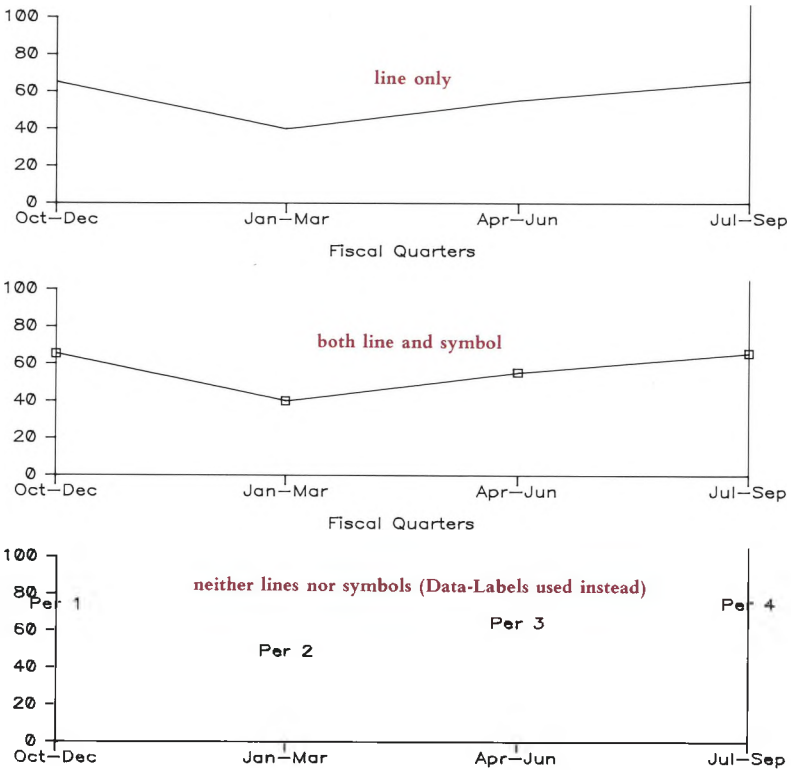
16-11

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.
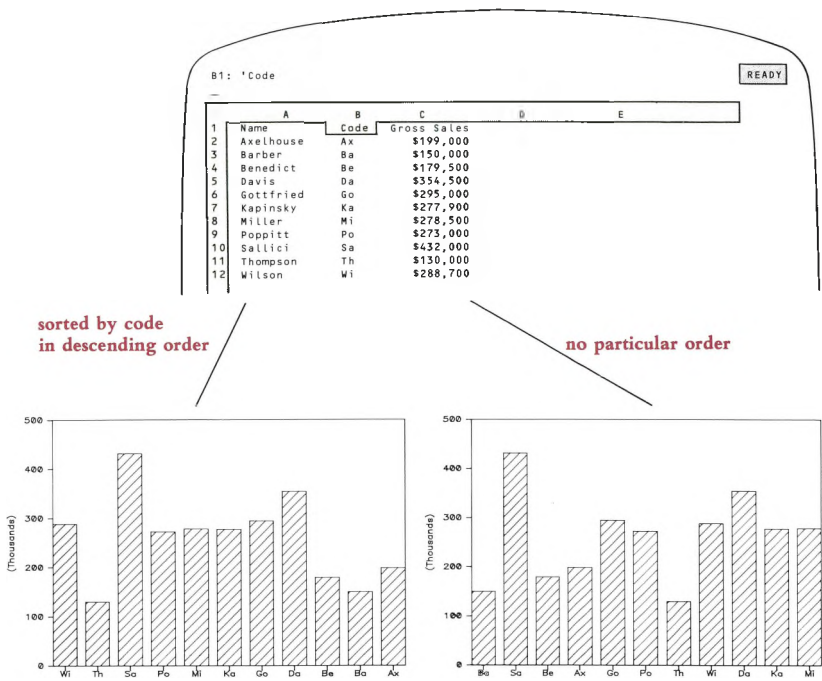
Figure 16-12. Two Bar Graphs of the Same Data

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 **[10/GRAPH]**.

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	Sallici	Sa	$432,000	$21,800	
4	Benedict	Be	$179,500	$23,480	
5	Axelhouse	Ax	$199,000	$24,500	
6	Gottfried	Go	$295,000	$25,750	
7	Poppitt	Po	$273,000	$26,600	
8	Thompson	Th	$130,000	$28,400	
9	Wilson	Wi	$288,700	$28,930	
10	Davis	Da	$354,500	$31,000	
11	Kapinsky	Ka	$277,300	$34,680	
12	Miller	Mi	$278,500	$36,000	

A-range Data-Labels A-range   X-range
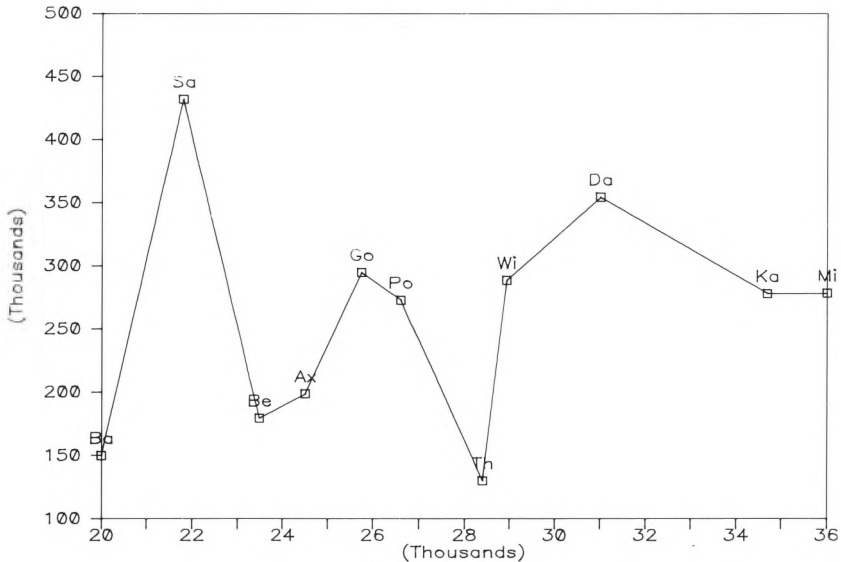
Figure 16-13. An XY Graph

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 long 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. For instance, when you cancel a B-range setting, 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 **[10/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 **[10/GRAPH]** key.

4. You cannot overlay two types of graphs, 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, their total may not be exactly 100%.

/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 their own cross-hatching pattern.

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, points on each range are represented by unique shapes (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 [10/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   /GV

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 [10/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.

Results

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 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.

Results

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 graphs: 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. 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.

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 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:✕ 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.)

4. 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 "pasted" onto 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

1. 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.

2. 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 the cell is subsequently relocated by /Move, /Worksheet Insert, or /Worksheet Delete.

3. 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 21-1), 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.

Results

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

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 graphs 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 black-and-white crosshatch patterns. All titles, scale numbers, axes, grid lines, and symbols appear in white.

Range	Crosshatching
A	
B	
C	
D	
E	
F	

/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 you have more than three of, 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 (*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**—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 applies to the item. Figure 17-1 contains typical examples of records.

```
A20:                                                            READY
─
      A           B           C              D        E   F       G
 1  Last name   first      address         city      st  zip
 2  Jones       Fred       313 Concord Lane Athens   MA 13579
 3  Hanrahan    June       12 Grove Street  Rome     OR
 4
```

```
D40:                                                            READY
─
      D         E        F              G        H      I      J       K
21  part #    part     type           color   size price      inven
22  0080-2L   widget   left-handed     purple  21cm   0.63       321
23
24
25
```

```
A31:                                                            READY
─
    A   B   C   D      E              F       G         H          I
12  mon day yr  num    payee          amt     item      account
13  Jan 31  82  621    ABC Supply      42.06  pushpins  G&A
14
15
16
```

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 17-28 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 0621 is $42.06.

By the way, don't worry about what order the records are in; you'll be able to rearrange them later, very easily.

Field Names

In each of the examples above, the top row of the database is 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 get just the information you need—1-2-3 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] 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 Just Some 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".

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. 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 just type the 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).

```
A20:                                                                    READY
─

         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
12   Miller      5860      3     13 R&D  FT      29-Dec-80       26,600
13   Sallici     5872      3     14 R&D  PT      13-Sep-82            0
14   Thompson    5853      4     16 R&D  C       08-Feb-82       16,700
15
16
```

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] character at the beginning or end of a cell entry may affect the order of sorted labels. For example: "A [Space]" 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.*

	A	B	C	D	E	F	G
1	Homegrown Corporation -- Personnel						
2							
3	Name	Phone	Floor	Office	Dept		
4	Axelhouse	5876	2	11	Adm		
5	Kapinsky	5871	2	21	Adm		
6	Poppitt	5886,7,8	4	17	Adm		
7	Barber	5116	4	14	Mkt		
8	Benedict	5860	2	3	Mkt		
9	Davis	5859	3	12	Mkt		
10	Wilson	5324	2	14	Mkt		
11	Gottfried	555.1212	2	18	R&D		
12	Miller	5860	3	13	R&D		
13	Sallici	5872	3	14	R&D		
14	Thompson	5853	4	16	R&D		
15							
16	Name	Phone	Office				
17							
18							

G19:   READY

Floor Dept
        Mkt

Criterion range

Input range

Output range

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 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.


```
 G20:                                                              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   Kapinsky     5871        2      21   Adm
```

Figure 17-4. A Formula Criterion

The criterion in the example selects records of people in offices above the fourth floor. It does not matter that it is in the column headed *Floor;* 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.

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.

```
G20:                                                                    READY
  —
         A        B      C       D        E        F        G          H
  1
  2              ABC Corporation
  3
  4    date     high    low    close   volume(k)          close
  5    25-Mar-83  26.50  24.00  26.25      730          +D5<(D4-0.5)
  6    28-Mar-83  26.75  26.25  26.50      660
  7    29-Mar-83  29.25  26.50  28.50      750
```

Criterion range

```
G20:                                                                    READY
  —
         A          B       C       D        E      F      G
  1    Homegrown Corporation -- Personnel
  2
  3    Name       Phone   Floor  Office  Dept      Floor Dept      Criterion range
  4    Axelhouse  5876      2      11   Adm          4  Mkt
  5    Kapinsky   5871      2      21   Adm
  6    Poppitt    5886,7,8   4      17   Adm
```

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".

17-11

```
G20:                                                              READY
-
        A            B         C      D       E       F      G
1  Homegrown  Corporation  --  Personnel
2
3  Name         Phone     Floor Office Dept    Floor Dept
4  Axelhouse    5876         2    11  Adm        4
5  Kapinsky     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        Criterion range
```

Figure 17-8. "Or"—Two Criteria in Different Rows

```
G20:                                                              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        4   Mkt    range
5  Kapinsky     5871         2    21  Adm        2   Mkt
6  Poppitt      5886,7,8     4    17  Adm
7  Barber       5116         4    14  Mkt
8  Benedict     5860         2     3  Mkt
```

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 expendable, 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 key to the usefulness of the /Data Query commands is the fact that they 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 respecify them, and 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. **[WORD ←]** and **[WORD →]** move the cell pointer to the first and last records in the database, 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 **[7/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 [7/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 [7/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.

1j

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. A solution is presented in the next section.
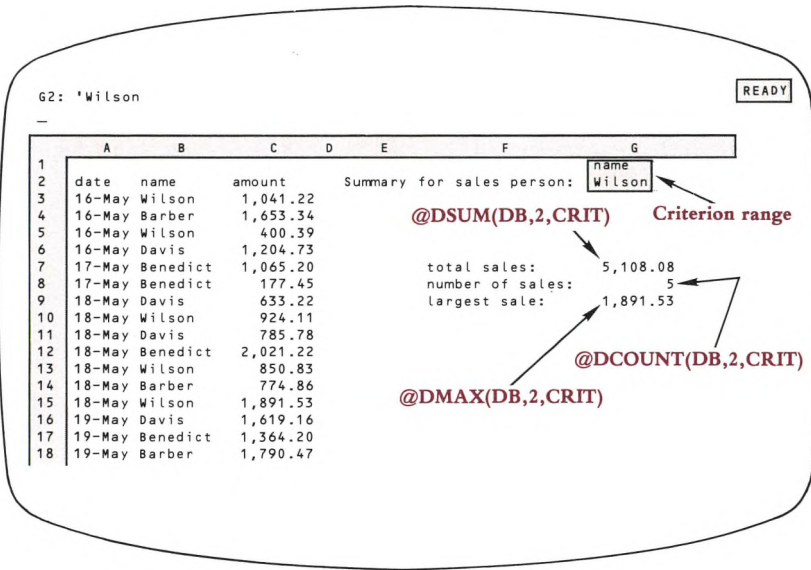
Figure 17-10. Using Database Statistical Functions to Construct a Table

/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:

```
                          ┌─────────┐
                          │ 10.0%   │
                          │ 10.5%   │
                          │ 11.0%   │
                          │ 11.5%   │   1. One-at-a-time, substitute each
                          │ 12.0%   │      entry on this list into INPUT CELL
   DT1                    │ 12.5%   │
                          └─────────┘
   A1:                                                              READY

            A          B          C           D              E
   1                Principal      60000         Years              5
   2                   Rate        10.5%        Payment      $1,289.63
   3
   4      Year    Begin Bal.    End Bal.    Total Paid      Interest
   5   - - - - - - - - - - - - - - - - - - - - - - - -      FORMULAS whose
   6       1      60000.00      50369.68     15475.61        5845.29    values depend
   7       2      50369.68      39678.06     15475.61        4283.99    on INPUT CELL
   8       3      39678.06      27808.20     15475.61        3605.74
   9       4      27808.20      14630.23     15475.61        2297.64
  10       5      14630.23         0.00      15475.61         845.38
  11   - - - - - - - - - - - - - - - - - - - - - - - -
  12                                       $77,378.04     $17,378.04
```

And here is how you make this concept a reality with the /Data Table 1 command:

2. Each time an entry is substituted
   in INPUT CELL, record the values
   of these FORMULAS in a table.

```
  13
  14           +E2          +C9          +E12
  15    10.0%   $1,274.82    $14,500.48    $16,489.36
  16    10.5%   $1,289.63    $14,630.23    $17,378.04
  17    11.0%   $1,304.55    $14,760.36    $18,272.72
  18    11.5%   $1,319.56    $14,890.88    $19,173.39
  19    12.0%   $1,334.67    $15,021.78    $20,080.01
  20    12.5%   $1,349.88    $15,153.04    $20,992.58
```

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        Input cell                    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   ----------------------------------------- Projected Revenues calculated
 10
 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   ================================================================
 16   Prof (Loss)  $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
        A           B           C           D           E
1                Principal    ┌ 60000 ┐      Years          5
2                   Rate      ┆ 10.5% ┆    Payment     ($1,289.63)
3
4       Year    Begin Bal.    End Bal.    Total Paid    Interest
5 ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─
6        1      60000.00     50369.68     15475.61      5845.29
7        2      50369.68     39678.06     15475.61      4783.99
8        3      39678.06     27808.20     15475.61      3605.74
9        4      27808.20     14630.23     15475.61      2297.64
10       5      14630.23         0.00     15475.61       845.38
11 ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─
12                                        $77,378.04   $17,378.04



13
14    ( +E2 )                 ┌ $50,000 ─ ─ ─ ─ $55,000 ─ ─ ─ ─ $60,000 ┐
15                ┌ 10.0% ┐   ┆$1,062.35     $1,168.59     $1,274.82┆
16                ┆ 10.5% ┆   ┆$1,074.70     $1,182.16     $1,289.63┆
17                ┆ 11.0% ┆   ┆$1,087.12     $1,195.83     $1,304.55┆
18                ┆ 11.5% ┆   ┆$1,099.63     $1,209.59     $1,319.56┆
19                ┆ 12.0% ┆   ┆$1,112.22     $1,223.44     $1,334.67┆
20                └ 12.5% ┘   ┆$1,124.90     $1,237.39     $1,349.88┆
```

3. Enter a single FORMULA in upper left corner cell (see note).

2. Type entries for INPUT CELL 2 in a row.

1. Type entries for INPUT CELL 1 in a column.

4. Issue /Data Table 2 command. Indicate entire range as Table range. Indicate both INPUT CELLS (not pictured).

5. 1-2-3 fills in remaining cells of the table. For instance, this cell gets the value of FORMULA when INPUT CELL 1 contains 11.5% and INPUT CELL 2 contains 55000.

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
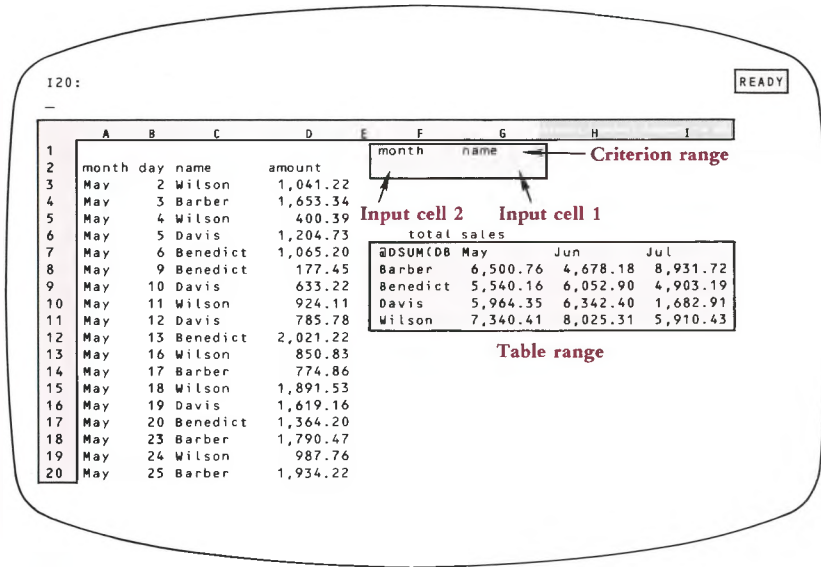
Figure 17-11. Using Database Statistical Functions with /Data Table 2

The [8/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 **[8/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 **[8/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

There are still two more /Data commands, Fill and Distribution, but they are not specific to databases, and this is a good time to review.

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 which 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. **Note:** The Stop value can be exceeded because of rounding errors.

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 for a full discussion):

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-2). 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. 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 or 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] characters always count in an exact or approximate label-match. Extra [Space] 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.   unless you wish to specify the most-
                                  recently specified range of that type
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 through 3, choose Reset. To return to Ready mode without cancelling the specifications, choose Quit.

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 cursor to the next and previous selected record. If there are no more such records in that direction, 1-2-3 *beeps*.

• → and ← move the cursor side-to-side within the record. This is useful with databases that are too wide to fit on the display screen.

• [WORD ←] moves the highlight to the database's first record, whether or not it satisfies the criteria. Similarly, [WORD →] moves the highlight to the last record in the database.

• Press [RETURN] or [±] 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 range.

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:

No   Yes

• Selecting No cancels the /Quit command and returns you to Ready mode.

• Selecting Yes ends the session without further delay. Control returns to the Lotus Access System or to the computer's operating system, 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 an electrical blackout or an erroneous command that could destroy your work.

In any event, if you have any work to save, be sure to perform one or more of these data-storage procedures before issuing a /Quit command:

/File Save command. This command stores your entire worksheet, exactly as it currently stands, in a *worksheet file*.

/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.)

/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". You can think of @ functions as "built-in" formulas. Like a formula, a function has a numeric or logical value (or *ERR* or *NA*). This value usually depends on its **arguments**: numbers, cell or range references, or even other functions.

Use functions by typing the function name, followed by its arguments. The function name always begins with an @ sign; the rest of the name can be typed using any combination of uppercase and lowercase letters. The arguments follow the function name, separated by commas and enclosed in parentheses:

@functionname(arg1,arg2,..,argN)

arguments

Spaces are not allowed in a function, except within a range name.

Depending on the function, an argument can be either a *single value* or a *range*:

• 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)

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*.

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. Blank cells in a range argument are ignored.

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

In this section, we list the @ functions by category. Detailed descriptions appear in the following 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
@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 $\pi = 3.14159\ldots$
@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 (*FALSE*)
@TRUE	the value 1 (*TRUE*)
@ISNA(x)	the value 1 (*TRUE*) if expression x has the value *NA*
@ISERR(x)	the value 1 (*TRUE*) if expression x has the value *ERR*
@IF(*cond,true-value,false-value*)	true-value if cond is *TRUE*; *false-value* if cond is *FALSE*

Special Functions

Argument requirements:

x, row#, col#, v0, v1, v2, . . . must be single values
range must be a multiple-cell range

@NA	the value *NA* (not available)
@ERR	the value *ERR* (error)
@CHOOSE(*x,v0,v1,..vn*)	select argument value
@HLOOKUP(*x,range,row#*)	horizontal table lookup
@VLOOKUP(*x,range,col#*)	vertical table lookup

Financial Functions

Argument requirements:

x, pmt, int, term, prn, and *guess* must be single values
range must be a muliple-cell range

@IRR(*guess,range*)	internal rate of return
@NPV(*x,range*)	net present value
@FV(*pmt,int,term*)	future value
@PV(*pmt,int,term*)	present value
@PMT(*prn,int,term*)	mortgage payment

Date Functions

Argument requirements:

year, month, and *day* must be single values
date must be a single value: a date's "serial number"

@DATE(*year,month,day*)	number of days since 31-Dec-1899
@TODAY	today's date
@DAY(*date*)	day number
@MONTH(*date*)	month number
@YEAR(*date*)	year number

Statistical Functions

Argument requirements: Any number of arguments, of any type, may be included in the list.

@COUNT(*list*)	number of items in list
@SUM(*list*)	sum of all items in list
@AVG(*list*)	average of all items in list
@MIN(*list*)	minimum of all items in list
@MAX(*list*)	maximum of all items in list
@STD(*list*)	standard deviation of all items in list
@VAR(*list*)	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(*input,offset,criterion*)	number of items in field
@DSUM(*input,offset,criterion*)	sum of items in field
@DAVG(*input,offset,criterion*)	average of items in field
@DMIN(*input,offset,criterion*)	minimum of items in field
@DMAX(*input,offset,criterion*)	maximum of items in field
@DSTD(*input,offset,criterion*)	standard deviation of items in field
@DVAR(*input,offset,criterion*)	variance of items in field

Alphabetical Function Reference

@ABS(*x*)   Absolute value of *x*

@ABS(1.258) $\rightarrow$ 1.258

@ABS(– 6.2) $\rightarrow$ 6.2

@ABS(DIFF__FACTOR) $\rightarrow$ 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) $\rightarrow$ 1.8754889 (radians)

@ASIN(.5)∗180/@PI = 30 (additional calculations convert to degrees)

@ACOS(B1) $\rightarrow$ 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) $\rightarrow$ 0.7853 (radians)

@ATAN(B1) $\rightarrow$ 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 @TAN(y/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) ⟶ *ERR* if the range B10..F29 contains only empty cells.

Note. @AVG(*list*) ⟶ @SUM(*list*)/@COUNT(*list*)

@AVG(2,7,4,22) ⟶ 8.75

@AVG(B1,4,B5..B75,OTHER__RANGE) ⟶ 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, . . . , 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,* . . . as follows:

- If $x = 0$, then @CHOOSE ⟶ *v0*.
- If $x = 1$, then @CHOOSE ⟶ *v1*.
- If $x = 2$, then @CHOOSE ⟶ *v2*.
- If $x < 0$ or $x > n$, then @CHOOSE ⟶ *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 a @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/2) $\rightarrow$ 1

@COS(60*@PI/180) $\rightarrow$ 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) $\rightarrow$ 1

• @COUNT(@ERR) and @COUNT(@NA) $\rightarrow$ 1 (These are the only cases in which the "ripple-through-the-worksheet" effect of *NA* and *ERR* is halted.)

• @COUNT(H54) $\rightarrow$ 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:

@COUNT(A1..A4) $\rightarrow$ 3

@COUNT(A3) $\rightarrow$ 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(*date*)   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(*input,offset,criterion*)	@DSTD(*input,offset,criterion*)
@DCOUNT(*input,offset,criterion*)	@DSUM(*input,offset,criterion*)
@DMAX(*input,offset,criterion*)	@DVAR(*input,offset,criterion*)
@DMIN(*input,offset,criterion*)	

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.

offset

Input range

1. **Use Input range and Criterion range arguments to select set of data records**

Criterion range

2. **Use offset argument to "zero in" on one field**
3. **Calculate average of selected field values**
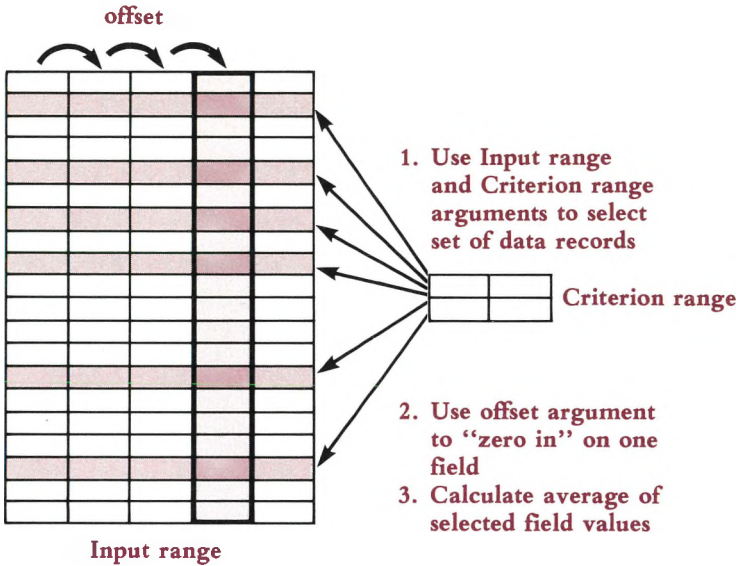
Consider the database (Input range) and the two Criterion ranges pictured here:

	A	B	C	D	E	F
1	Item	Quantity	Type		Type	Item
2	1001	2	nut		nut	+ B2 > 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*.

@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:

$$@FV \text{ result} = \text{pmt} * \frac{(1 + \text{int})^{\text{term}} - 1}{\text{int}}$$

@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,lookup-range,row#*)   Horizontal table lookup

Arguments:

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.

range (lookup range)   A range specification that identifies the lookup table itself. The first row 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.

row# Indicates which value in the selected column is the final result of the @HLOOKUP function.

How 1-2-3 Does a Lookup

1. 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*.

2. 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 $6,089	Status 2	Tax $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) $\rightarrow$ 381 if INCOME = 6089 and STATUS = 2 (as shown above).

@HLOOKUP(INCOME,TAX_TABLE,STATUS) $\rightarrow$ 599 if INCOME = 6011 and STATUS = 3 (as shown above).

@HLOOKUP(INCOME,TAX_TABLE,STATUS) $\rightarrow$ *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) → .10212 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(x) | Natural logarithm (base e) of x |
| @LOG(x) | Common logarithm (base 10) of x |

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(*list*) | Maximum of the values in a list |
| @MIN(*list*) | 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)

| @MOD(x,y) | Integer remainder when x is divided by y |

1-2-3 calculates this as: $x - (y*@INT(x/y))$. If $y = 0$, the result is *ERR*.

@MOD(15,7) → 1

| @MONTH(*date*) | Month of the year (1-12) of a given date |

The date 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 *NA* (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: $\text{NPV} = \sum_{i=1}^{n} \dfrac{V_i}{(1+x)^i}$

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:

$$\text{@PMT result} = prn \ast \frac{int}{1 - (1 + int)^{-term}}$$

   @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:

$$@PV \text{ result} = pmt* \ \frac{1 - (1 + int)^{-term}}{int}$$

@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 **[9/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.

@ROUND(7145.258,H12)

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.

Column A values displayed in Fixed 2 format

Column A values @ROUNDed to 2 places

	A	B	C
1	133.8227	133.82	133.82
2	19.51033	19.51	19.51
3	59.54498	59.54	59.54
4	100.6876	100.69	100.69
5			
6	313.5656	313.57	313.56

Calculated values

Discrepancy in sum

No discrepancy in sum

@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 (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 19-16). If @COUNT(*list*) is zero, the result is *ERR*. Empty cells in the range are ignored. Label cells count as zeros.

19-15

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, then 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,lookup-range,column*)	Vertical table lookup

Arguments:

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.

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.

column 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*.

2. 1-2-3 uses the *column* 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 *column* is negative or exceeds the number of columns in the lookup range, the result is *ERR*.

Examples:

	Income	Status	Tax	
	$6,089	2	$381	
"TAX__TABLE"				
	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) → 599 if INCOME = 6011 and STATUS = 3 (as shown above).

@HLOOKUP(INCOME,TAX__TABLE,STATUS) → *ERR* if INCOME < 6000.

@YEAR(*date*)	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 and @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 Print-Graph will print them in the order you define. And, as with 1-2-3, Help is never more than a keystroke away. Pressing the [1/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 (see Save Option, page 20-6).

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 its own program disk, you will need to put the PrintGraph Disk in Drive A before you can start PrintGraph. If you are in MS-DOS, then put the PrintGraph Disk in Drive A, type "GRAPH", press [RETURN] and the PrintGraph menu will appear.

If you are in 1-2-3, you must exit the worksheet, using the /Quit Yes command. Remember to /File Save your current worksheet and /Graph Save your graphs before quitting! You will now see the Lotus Access System menu (see page 21-2). Select PrintGraph from the Access System menu by pointing to the command and pressing [RETURN], or type the letter P. You may then be prompted to change disks. Remove the 1-2-3 System Disk from Drive A, insert the PrintGraph Disk, and press any key. 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.

Changing 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:

DRIVES
Pictures: B:
Fonts: A:

GRAPHICS DEVICE
Epson FX80/1

INTERFACE
Parallel

PAGE SIZE
Length: 11.000
Width: 8.000

That is, PrintGraph assumes that your graph files are stored in the root directory of the disk in Drive B, that your typeface styles (fonts) are stored on Drive A (the Print-Graph Disk), that you are using an Epson FX-80 in single-density mode as your graphics device (printer), that the printer is connected to the parallel port, and that your page size will be 8″ × 11″. Note that the default page width is set to 8″ because the Epson FX-80's maximum page size is 8″. If these assumptions are correct, then you will not need to change anything. If your system is different, read on.

PrintGraph Configuration Options

Since we are immediately concerned with changing PrintGraph's default configuration, you should select Configure from the PrintGraph menu. As with all 1-2-3 menus, options are selected 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, a list 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 drive containing graph files.
Fonts	Select drive containing fonts.
Quit	Return to the Configure menu.

Initially, Pictures is set to Drive B: (typically, a data disk containing picture files would be in Drive B) and Fonts is set to Drive A:. 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 on the disk in Drive A, select Pictures and type "A:" 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 currently selected device is marked with #.

As Lotus adds graphics devices to the device library, new device libraries may be made available. 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. A typical device list is shown below. Note that the Epson FX80 (the default graphics device) is marked with # to show that it is currently selected.

Type of Graphic Output

#Single Density Epson FX80 Printer
Double Density Epson FX80 Printer
Triple Density Epson FX80 Printer
Quad Density Epson FX80 Printer
Single Density IBM Graphics Printer

Double Density IBM Graphics Printer
Triple Density IBM Graphics Printer
Quad Density IBM Graphics Printer
Single Density Epson MX80 or MX100
Double Density Epson MX80 or MX100
Triple Density Epson MX80 or MX100
HP 7470A Plotter
Okidata 82A or 83A Printer
Okidata 84, 92, or 93 Printer
Single Density Prism 80 or 132 Printer
Double Density Prism 80 or 132 Printer
Strobe 100 Plotter
Sweet P Plotter
NEC 8083
Anadex 9620-A

To choose a device, use the ↑ or ↓ 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 [±] returns you immediately to the Configure menu, but the original device choice is retained.

Notice that some of the printer names on the list are described as single, double, or quad density. These descriptions indicate the relative density, or resolution, of the dot matrix for each printer listed. For example, choosing Double Density Prism 80 or 132 will cause the graph to be printed with greater resolution than would be possible with the Single Density Prism selection; however, the printer will also take more than double the amount of time to print the graph in the double density mode. For the devices marked with more than one density selection, the question of which device to choose depends on your preference; those printers so marked will work in the modes listed.

If you are still confused by the printer designations, you might want to ask your dealer for advice. Your dealer or 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 = 8 inches)
Quit	Return to the Configure menu

Note that for Epson FX80 and MX80 printers, the default page width should be set to 8″ (8.000). For an Epson MX100 printer, the page width should be set to 13.600.

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

Computers communicate with printers or plotters using two different means: parallel or serial. You must tell the computer what kind of printer or plotter you are using and where it is connected or PrintGraph will not communicate correctly with the device.

To change the printer type, select Interface from the menu. You can choose one of four interface types:

Choice	Meaning
1	Parallel. The standard parallel connector at the rear of the Victor computer.
2	Serial. The first serial (RS232C-compatible) connector (the one on the left) at the rear of the Victor computer. Baud rate must also be specified (see below).
3	Second Parallel. There is no second parallel connector supplied with the Victor computer. Selecting this choice will cause the first parallel connector to be selected.
4	Second Serial. The second serial connector (on the right) at the rear of the Victor computer. 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 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 Second Serial option, one of the following baud rates should also be selected (they are listed in order of increasing speed):

Choice	Baud Rate	Choice	Baud Rate
1	110	5	1200
2	150	6	2400
3	300	7	4800
4	600	8	9600
		9	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, but you should select the fastest available baud rate that will correctly transmit data without losing it.

If you are confused about printer types and connectors, you might want to check with your dealer to find out the correct printer port for your system.

PrintGraph supports only devices which are Victor-compatible. Check with your dealer or consult the device literature to be sure that the device you have selected is compatible.

Save Option

Be sure to remove the write-protect tab from the PrintGraph Disk before selecting this option. 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 Print-Graph 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 Print-Graph 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.

You can select the various format options 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-Bar]. An example of this type of selection appears below.

3jThe 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-Bar] 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-Bar]. The # indicator will appear next to MONTHLY to show that it is selected:

PICTURE	DATE	TIME	SIZE
EXPENSE	11-03-82	15:02	8832
INCOME	11-26-82	15:40	15488
#MONTHLY	11-26-82	14:20	13568
YEARLY	12-10-82	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 [10/GRAPH] key at any time and the graph on which the pointer is resting will be displayed on the graphics monitor, 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 hardcopy 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-Bar] once again, and the indicator mark will be removed. Pressing [±] 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. Prism printer or 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.

Font Name	Size	Font Name	Size
BLOCK1	3597	ROMAN1	4744
BLOCK2	6593	ROMAN2	9117
ITALIC1	6507	SCRIPT1	5831
ITALIC2	9076	SCRIPT2	7726

Figure 20-1 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 from the Size options menu allows you to select each of the aspects of graph alignment.

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 switch settings on a printer, or to change pens on a plotter (in addition to the automatic pause to change pens provided for all plotters).

Choice	Meaning
Yes	Pause between the printing of each graph. PrintGraph will signal the pause with a continuous *beeping*. 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.

Choice	Meaning
Yes	Advance (eject) 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. On a plotter, you will be prompted to put a new sheet of paper on the plotter before printing will resume.
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 print head is located at the top of a new page. You should 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.

Leaving PrintGraph

When you are finished using PrintGraph, select Quit from the PrintGraph menu. 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 Access System menu, selecting Yes will return you to the Access System. You will be prompted to remove the PrintGraph Disk and reinsert your 1-2-3 System Disk if you select 1-2-3. If you started PrintGraph from MS-DOS, selecting Yes will return you to MS-DOS.

A Sample PrintGraph Session: Printing Two Graphs

Suppose that you have two graphs that you want to print, PROJECT and EX-PENSE, which are stored on a data disk in Drive B. You normally use your Epson FX-80 printer as the graphics printer, but today you want to use an IDS Prism 80 printer borrowed from a friend. What do you do next? Let's follow through a sample session with PrintGraph.

First, we want to get PrintGraph running. If we're still in 1-2-3, we need to save the current worksheet and graph(s) if we haven't already done so (using the /File Save and /Graph Save commands) and then exit 1-2-3 (using /Quit Yes). We are now in the Access System menu. We should select PrintGraph from the menu, at which time we will be prompted to remove the 1-2-3 System Disk from Drive A and insert the PrintGraph Disk into the same drive. This done, the PrintGraph menu and status screen will be displayed, showing us the current PrintGraph configuration.

(If the MS-DOS prompt A > had been displayed on the screen, we would have put the PrintGraph Disk in Drive A and typed:

GRAPH [RETURN]

and the PrintGraph menu and status screen would have been displayed after a few seconds.)

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:

DRIVES

Pictures: B:
Fonts: A:

Is that correct? Our data disk is located in Drive B, so we don't need to change Pictures. Usually fonts are located on the PrintGraph Disk in Drive A, 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 letter for the drive 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 a "Single Density Epson FX80 Printer", which is set to use the "Parallel" INTERFACE. Since we want to use an IDS Prism printer (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 Prism 80/1 or Prism 80/2 (depending on the desired quality of resolution for the graph) by moving the highlighted pointer with the ↑ and ↓ 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. Since the Prism 80 will be connected at the same printer port, we don't need to change the Interface option.

Should we Save the new printer configuration? Probably not, since the IDS printer is temporary. The next time we start the PrintGraph program, it will read the startup configuration stored on the PrintGraph Disk, and our "default" printer will again be the single-density Epson FX80.

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	11-03-82	15:02	8832
MONTHLY	11-26-82	14:20	13568
NEWCHART	11-26-82	15:40	15488
PROJECT	02-15-83	10:56	3072
YEARLY	12-10-82	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	11-03-82	15:02	8832
MONTHLY	11-26-82	14:20	13568
NEWCHART	11-26-82	15:40	15488
#PROJECT	02-15-83	10:56	3072
YEARLY	12-10-82	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 [10/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 could specify. We could select different colors and fonts to be used in printing the graphs. We could also change the size and alignment of the graphs on the page, whether PrintGraph pauses between printing graphs, and whether each graph should be printed on a new page. 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 that the currently selected colors for the graph are:

COLORS

Grid:	Black
A Range:	Red
B Range:	Orange
C Range:	Brown
D Range:	Green
E Range:	Blue
F Range:	Purple

Since our hypothetical printer has a (hypothetical) black and red ribbon, we could keep the current color assignment (orange, of course, will print as black), but we've decided to print the graphs entirely in black. EXPENSES and PROJECT each involve only two data ranges. So here's how we can specify the colors for those data ranges:

1. Select Options Color A Black from the menu. The status screen will be immediately updated to reflect the change.

2. Now, since we haven't left the Color menu, choose B Black and the color for the B Range will also be changed to black. Again, the status screen will reflect this.

3. To exit the Color menu, we should select Quit and we'll be returned to 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 printing.

Did you manually change the position of the printer paper? If so, reposition it at the top of the next page and Align from the PrintGraph menu. Nothing will happen (so it appears), but PrintGraph will "know" where the top of the paper is. If the paper isn't at top of page, use the printer's controls to advance the paper until it is, then select Align.

Before printing, we have one more thing to do: Instruct PrintGraph to "page-eject" between graphs. To do this, we select the Eject Yes option.

To print the graphs, we should select Go from the PrintGraph menu. As PrintGraph processes the graphs and prints them, it will inform us of its progress by displaying these messages:

Loading Font A: ROMAN2

Loading Picture B: PROJECT

Generating Picture B: PROJECT

The message *WAIT* will also be displayed in the upper right corner of the control panel. Incidentally, do not be dismayed if your graphics printer seems to run slower than usual, or pauses to think, when printing graphs; the fine resolution required to print graphs causes the print head to move much slower than normal. When the graphs are done printing, we can select Page and the paper will advance to the top of the next page.

Our two graphs are printed the way we wanted them. We can now "fine tune" the graphs by altering some of the other PrintGraph parameters. 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.

21. Lotus Access System

As powerful as it is, 1-2-3 can't do the whole job alone. So, to keep things running smoothly for you, a number of additional programs are included on your disks.

Lotus has gathered the essential programs needed to support 1-2-3 usage under a single, easy-to-use umbrella: the **Lotus Access System**. Think of the Access System as a "switchboard", through which you can invoke any of the programs provided by Lotus. When you finish using a program, control automatically returns to the central switchboard.

Using the Access System is like using 1-2-3 itself in several ways:

• You select tasks to perform from a series of menus that both present all your options and provide a short explanation of each one.

• Every step of the way, you can press the [1/HELP] key to get more detailed explanations.

• Procedures that erase data are protected with confirmation steps, to minimize the likelihood of accidentally doing something you'll later regret.

The biggest payoff is that learning 1-2-3 skills also makes the rest of the Access System easy to learn.

Access System Functions

Here is an outline of the essential functions you can perform using the Lotus Access System:

1-2-3 Functions

• Start a 1-2-3 session.

• Print the "graph files" created with 1-2-3.

• Translate files created by other programs into a form that 1-2-3 can use.

• Translate files created by 1-2-3 into a form other programs can use.

Housekeeping Chores

• Perform *file-maintenance* functions: copying, renaming, and erasing individual files; displaying lists of filenames sorted by name, by creation date, etc.

Starting Your Computer with the System Disk

Before starting, be sure you've prepared the 1-2-3 System Disk according to the instructions in "Getting Started".

When you turn the computer on with the 1-2-3 System Disk (or its backup) in Drive A (the drive on the left), the computer automatically passes control to the Lotus Access System. First, though, it prompts you to enter the current date and time. If you have any trouble with these entries, see the "How to Set the Date and Time" section in the *Victor Operator Reference Guide*.

If you have already started your computer and are at MS-DOS's **A >** prompt, you can reenter the Access System by typing the following MS-DOS command:

LOTUS [RETURN]

(Uppercase and lowercase letters are equivalent to the MS-DOS command processor.)

The Access System menu screen appears (Figure 21-1).


```
Lotus Access System v.1.10 (C)1982, 1983 Lotus Development Corp.          MENU
1-2-3 File-Mgr PrintGraph Translate Exit
Enter 1-2-3 -- Lotus Spreadsheet/Graphics/Database program


                              Tue 22-Mar 83
                               9:06:35am

        Use the arrow keys to highlight command choice and press [Return].
    Press [-] to cancel a choice; Press [1/Help] for information on command choices.
```
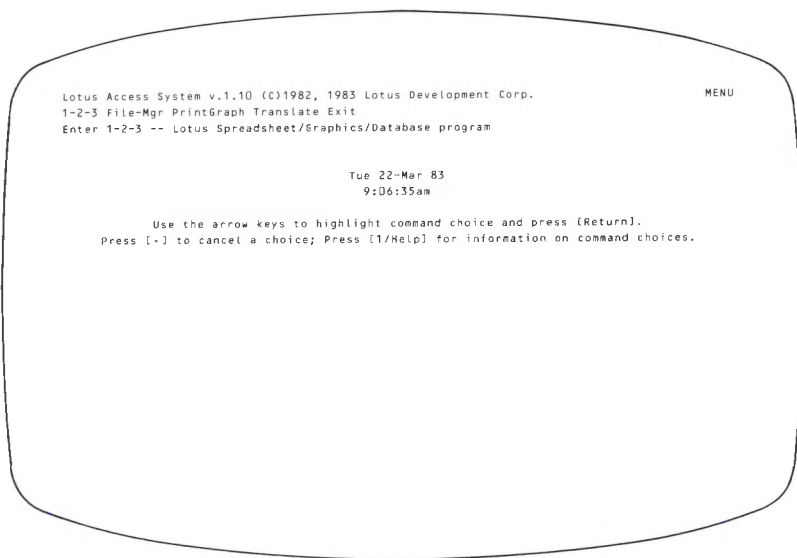
Figure 21-1. Lotus Access System Menu

Note. This startup procedure is stored on the 1-2-3 System Disk in a file named AUTOEXEC.BAT. Don't alter or erase this file unless you wish to change the startup procedure. (See the "AUTOEXEC.BAT File" section in the MS-DOS manual.)

21-2

It is possible to bypass date and time entry, but we urge you to be conscientious in entering them each time the computer prompts you to do so. These entries allow MS-DOS to *timestamp* all the data you store, a very valuable service. You'll quickly find that life becomes quite difficult if you can't determine when files were created.

You can *reset* the computer—get it to "start again from scratch"—without turning the power off and on: Use the push button at the rear of the Victor to restart the computer.

Getting Help

Whenever you're at an Access System menu, you can press the [1/HELP] key to interrupt the session and view a Help screen. To return to using the Access System, press [±]. In some cases, selecting a menu choice takes you to another menu. You can return to a "higher" menu level by selecting the Quit choice or by pressing [±]. (For details, see Chapter 6, "Using 1-2-3 Commands".)

Using Access System Menus

Using the menus in the Access System is just like using 1-2-3 command menus (page 6-8). There are two ways to select a menu choice:

1. Use the pointer-movement keys on the right side of the keyboard to highlight your choice, then press [RETURN].

2. Type the first letter of the menu choice.

Switching Disks

When you select a function from the Access System menu, the program may prompt you to switch disks. For example:

Put 1-2-3 System Disk in Drive A, and press any key.

When you're switching disks, be sure always to replace the outgoing disk in its protective sleeve. We won't mention the details of disk-switching any further in this chapter, trusting that you'll find the Acess System instructions easy to follow.

In the following sections, we describe each program that you reach through the Access System switchboard.

1-2-3   Start a 1-2-3 session

The 1-2-3 startup screen appears at the beginning of a session. Press any key to erase the startup screen and to begin using the program. Once 1-2-3 is active, do not remove the 1-2-3 System Disk from Drive A unless you are specifically instructed to do so.

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).

Ending 1-2-3. To end a 1-2-3 session, issue the /Quit command. Be sure to save your work first, using the /File Save command. 1-2-3 does *not* automatically save data when you end a session.

PrintGraph   Start a PrintGraph session

The PrintGraph program provides a convenient way to print the graphs you've defined using 1-2-3. For a description of PrintGraph program usage, see Chapter 20.

Ending the PrintGraph Program. To end a PrintGraph session, issue the Quit command and confirm by selecting Yes.

Translate   Translate files for data import/export

Translate allows you to exchange data among 1-2-3 and other programs that run on the Victor 9000 Computer. You can even exchange data with other computers—all you need is an appropriate data-communications program.

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 worksheet	.WKS
dBASE-II	.DBF	1-2-3 worksheet	.WKS
1-2-3 worksheet	.WKS	DIF	.DIF
1-2-3 worksheet	.WKS	dBASE-II	.DBF

Ending Translate. To return to the Access System main menu, select Quit and confirm by selecting Yes.

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 the Lotus Access System File Manager or the MS-DOS REN 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]** or Quit back to the Access System main menu.

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], and **[RETURN]**. (For details, see "Selecting Files" on page 21-9.)

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. The first row of the partial or complete worksheet must be database's top row, i.e. the row of field names. *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 the /File Save command.

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.

File-Manager   Start a File Manager session

The File Manager menu appears (Figure 21-2). This program provides an easy-to-use way to handle individual files and groups of files on your data disks. When you select the File Manager, it asks you to choose a disk drive to use as a source for processing. (Don't worry—you can change in midstream.) Then, the File Manager menu appears above a list of all the files in the *current directory* of the *source* disk.

Ending File Manager. To return to the Access System main menu, select Quit and confirm by selecting Yes.

Descriptions of the File Manager functions follow:

Disk-Drive

Specify the disk drive that contains the disk with the files to be processed. Use this function whenever you switch disks in any diskette drive. Only the *current directory* of the source disk is processed by the File Manager.

```
Lotus File Management System (C)1982,1983 Lotus Development Corp.   MENU

Copy Erase Rename Archive Disk-Drive Sort Quit
Copy selected files from the current disk to another.

FILENAME EXT    DATE     TIME    SIZE
123      CNF  08-Mar-83   2:44pm    128
123      EXE  16-Mar-83   9:37am  87680
AUTOEXEC BAT  22-Nov-82  11:40am     20
CHKDSK   COM  07-May-82  12:00pm   1720    Current Drive:      A
COMMAND  COM  07-May-82  12:00pm   4959    Number of Files:   17
DISKCOMP COM  07-May-82  12:00pm   1640    Total Bytes Used: 158720
DISKCOPY COM  07-May-82  12:00pm   2008    Total Bytes Free: 163840
FILEMGR  COM  18-Jan-83   4:26am  15740
FORMAT   COM  07-May-82  12:00pm   3816
GO       DRV  24-Feb-83   5:16pm   2139
KB       DRV  13-Jan-83   2:50pm    370
LOTUS    COM  21-Feb-83   8:12pm    359
LTSLOAD  COM  03-Mar-83  12:57pm   9329
PR       DRV  11-Feb-83   6:43am    316
PRTSC0   SCR  22-Mar-83   9:06am   4608
PRTSC1   SCR  22-Mar-83   9:07am   4608
TD       DRV  06-Feb-83   2:47pm    745
```

Figure 21-2. File Manager Menu

Procedure

1. Before selecting Disk-Drive, place the disk containing the files you wish to process in the desired drive.

2. Select Disk-Drive and indicate the letter of the chosen drive.

A list of files in the current directory of the chosen disk appears, sorted according to the current sort settings (Figure 21-3).

Whenever you are not in the midst of a File Manager function, you can switch disks and/or respecify the Disk-Drive setting.

21-6

Copy

Copy files from the current directory of the source disk to the current directory of another disk. (If your system has only two disk drives, then there will be no choice as to the files' destination.) The newly created files always have the same names as the originals.

Procedure

1. Select a set of files. (See "Selecting Files" below.)

2. Make sure the proper disk is in the destination drive. Then confirm the *Copy* request by selecting Yes. Selecting No returns you to Step 1. Selecting Quit returns you immediately to the File Manager menu.

```
Lotus File Management System (C)1982,1983 Lotus Development Corp.    MENU

Copy Erase Rename Archive Disk-Drive Sort Quit
Copy selected files from the current disk to another.

FILENAME EXT    DATE       TIME    SIZE
ACCOUNTS WKS  21-Sep-82   3:23pm   2712
CHECKS   WKS  20-Nov-82  12:44pm  16768
DUEDATE  WKS  13-Oct-82   6:11pm   2816
FEES     WKS  20-Nov-82  12:47pm   3584      Current Drive:    B
FINAL    WKS  21-Sep-82   3:19pm   4846      Number of Files:  18
FORMLETT WKS  13-Oct-82   5:27pm   4992      Total Bytes Used: 100352
HELLO    WKS  14-Oct-82  10:16pm   8064      Total Bytes Free: 222208
HOMES    WKS  21-Sep-82   3:22pm   3995
IDS445   WKS  21-Sep-82   3:25pm   2177
INVOICE  WKS  15-Nov-82   2:07pm   1920
MAILBL1  WKS  29-Sep-82   5:44pm   2432
MAILBL2  WKS  10-Feb-83   5:44pm   3072
PERSCALL WKS  24-Sep-82   1:23pm   2560
PHONBILL WKS  21-Sep-82   3:20pm   3013
PHONE    WKS  22-Feb-83   5:48pm  12032
SAILBOAT WKS  28-Jan-83   6:21pm   1664
SALARY   WKS  20-Nov-82  12:57pm   1792
TAX      WKS  29-Sep-82  10:19pm  16384
```

Figure 21-3. Filename Listing

Erase

Erase one or more files in the current directory of the source disk.

Procedure

1. Select a set of files. (See "Selecting Files" below.)

2. Confirm the *Erase* request by selecting Yes. Selecting No returns you to Step 1. Selecting Quit returns you immediately to the File Manager.

21-7

The File-Manager highlights each filename as it erases the file. You can hold down [Shift] and press [CLR/HOME] to interrupt a multiple-file erasure.

Rename

Assign a new name to one or more files in the directory of the source disk.

Procedure

1. Select a set of files. (See "Selecting Files" below.)

2. Confirm the *Rename* function by selecting Yes. Selecting No returns you to Step 1. Selecting Quit returns you immediately to the File Manager menu.

3. One at a time, type new filenames (you *must* include filename extensions) as the File Manager prompts you. The renaming takes place as you type each name. To quit in the middle of this process, press [Shift]-[CLR/HOME].

Archive

Create a second copy of one or more files in the current directory of the source disk. Each new copy must have a name different from the original.

Procedure

1. Select a set of files. (See "Selecting Files" below.)

2. Confirm the *Archive* function by selecting Yes. Selecting No returns you to Step 1. Selecting Quit returns you immediately to the File Manager menu.

3. One at a time, type new filenames (you *must* include filename extensions) as the File Manager prompts you. The copying takes place as you type each name. To quit in the middle of this process, press [Shift]-[CLR/HOME].

Sort

Rearrange the displayed list of filenames.

The files themselves are not affected. The Sort function works very similarly to 1-2-3's /Data Sort command (page 17-4). You can sort the lines of filenames, in Ascending or Descending order, according to the data in any one or two of the four columns.

Procedure

1. A sort menu appears:

   Primary-Key   Secondary-Key   Reset   Go   Quit

2. (Optional) If you wish to cancel existing sort specifications, choose Reset.

3. Select Primary-Key to display this list of choices:

Name   Extension   Date/Time   Size

Move the highlight to indicate the column to be used as the primary basis for the reordering.

4. (Optional) Select Secondary-Key to redisplay the same list of choices. Select the column to be used to break ties in case two files have the same Primary-Key entry.

5. Select Ascending (A-Z) or Descending (Z-A) sort order.

6. Select Go to perform the sort. The File Manager menu returns.

You can resort the filename list as many times, in as many ways, as you wish. Do not switch disks in the midst of a sort operation.

Selecting Files

The Copy, Erase, Rename, and Archive functions all process a set of one or more files stored in the current directory of the source disk. The process of selecting sets of files is something unique to the File Manager: 1-2-3 itself never processes more than one file at a time. You indicate the files to be processed as follows:

1. Select a Command: Copy, Erase, Rename, or Archive. An indicator will appear in the upper right corner to remind you which command you are using.

2. Select the File(s). Use these keys to move the highlight among the filenames:

Key	Function
↑	Up one name
↓	Down one name
[SHIFT]-↑	Up one page of names
[SHIFT]-↓	Down one page of names
[WORD ←]	First filename
[WORD →]	Last filename

Whenever a filename is highlighted, you can press [Space] to select the file (Figure 21-4). File Manager marks the filename with the character #. Pressing [Space] at a filename that is already marked removes the mark and "deselects" the file.

3. When you are finished marking filenames, press [RETURN] to proceed to the next step. To cancel your work, press [±]. This removes all the marks from the list and returns you to the File Manager menu.

Special case. If you wish to select a single file, you may skip step 2. Just move the pointer to the file you desire and press [RETURN].

```
                                                              COPY

Select files for processing.

        FILENAME EXT    DATE      TIME     SIZE
        ACCOUNTS WKS  21-Sep-82   3:23pm   2712
        CHECKS   WKS  20-Nov-82  12:44pm  16768
        DUEDATE  WKS  13-Oct-82   6:11pm   2816
        FEES     WKS  20-Nov-82  12:47pm   3584      Current Drive:      B
        FINAL    WKS  21-Sep-82   3:19pm   4846      Number of Files:   18
        FORMLETT WKS  13-Oct-82   5:27pm   4992      Total Bytes Used: 100352
    ➤   HELLO    WKS  14-Oct-82  10:16pm   8064      Total Bytes Free: 222208
        HOMES    WKS  21-Sep-82   3:22pm   3995
        IDS445   WKS  21-Sep-82   3:25pm   2177
        INVOICE  WKS  15-Nov-82   2:07pm   1920      Press [Space] to toggle mark.
    ➤   MAILBL1  WKS  29-Sep-82   5:44pm   2432      Press  ↵  to process.
    ➤   MAILBL2  WKS  10-Feb-83   5:44pm   3072      Press [Esc] to return to menu.
        PERSCALL WKS  24-Sep-82   1:23pm   2560
        PHONBILL WKS  21-Sep-82   3:20pm   3013
        PHONE    WKS  22-Feb-83   5:48pm  12032
        SAILBOAT WKS  28-Jan-83   6:21pm   1664
        SALARY   WKS  20-Nov-82  12:57pm   1792
        TAX      WKS  29-Sep-82  10:19pm  16384
```

Figure 21-4. Selecting Files with [Space]

Exit   Return to MS-DOS

End the Access System session and return control of the computer to MS-DOS. Confirm the request by selecting Yes. Selecting No leaves you in the Access System.

Contents

A.   Configuring 1-2-3

Now that you've bought 1-2-3, what do you need in the way of hardware to get it up and running, and how do you tell 1-2-3 what your computer system looks like? This appendix covers both of these questions.

What You Need to Run 1-2-3

Your dealer should have provided you with an explanation of the minimum hardware needed to run 1-2-3, but if he or she didn't, here are the facts.

Required Hardware

1. A Victor 9000 Computer, with at least 256KB of main memory.

2. The monochrome display screen.

3a. Two diskette drives.

   or

3b. One diskette drive and one hard disk.

That's the minimum system needed to support 1-2-3. But to realize 1-2-3's full power, you can include some other hardware.

Optional Hardware

1. Additional memory. 1-2-3 can use all additional memory that you install.

2. A character printer *(parallel* or *serial)*.

See Chapter 20, "Printing 1-2-3 Graphs", for a list of graphics printers and plotters compatible with 1-2-3.

1-2-3's Default Configuration

Every time you start 1-2-3, it reads a startup configuration file, 123.CNF, from the 1-2-3 System Disk. 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**. Following is the default configuration supplied with 1-2-3 by Lotus:

Data transfer to the printer (/Print commands)

• Printer interface: First "parallel" port

• 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: Do not wait for manual intervention at the end of each print page.

Data transfer to/from disk storage (used by several commands)

• Unless a filename is preceded by a *disk prefix*, store and retrieve information on diskettes using the root directory of the disk in Drive B (on the right).

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

What if you want to change the default configuration? There are two ways to do it:

1. Use the /Worksheet Global Default commands (described below).

This establishes new default procedures for the current 1-2-3 session and, optionally, alters the configuration file, 123.CNF. At the start of subsequent sessions, 1-2-3 will read the new default configuration. In that sense, you might want to think of the default configuration as being "permanent". But you *can* alter it as many times as you like, using /Worksheet Global Default.

2. Use /Print Options and /File Directory commands.

While using 1-2-3, you can override the default printer settings. These overrides are stored in the *worksheet files* in which you store worksheets. This makes it easy to define a special print format for each worksheet.

You can also cancel the override—return to using the default printer settings (/Print Printer Options Clear).

Note. While we recommend always leaving the 1-2-3 System Disk in Drive A, the other configuration options can be changed to suit the requirements of your system or your personal taste.

The /Worksheet Global Default command allows you to control the default config-
uration through the following menu structure:

Printer Directory Status Update Quit

Interface Auto-Lf Right Top Left Bottom Page-Length Wait Setup

The default configuration supplied by Lotus includes these settings:

Printer

    Interface: Parallel
    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: B:

This listing is an illustration of the default configuration status screen (see "Status"
below).

Top-Level Menu

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 the 1-2-3 System Disk.

Quit. Return to Ready mode.

As with all 1-2-3 menus, choose options by moving the pointer with ←, →,
[WORD←], and [WORD→], then pressing [RETURN], or by typing the first letter
of the option.

Printer Options

Interface   **Lotus-supplied: 1 (Parallel)**

Computers communicate with printers using two different means: *parallel* or *serial*. You don't necessarily have to understand the method of communication being used, but you must tell 1-2-3 what kind of printer you are using and where it is connected:

1 Parallel. The standard parallel connector at the rear of the Victor computer.

2 Serial. The first serial (RS232C-compatible) connector (the one on the left) at the rear of the Victor computer. Baud rate must also be specified (see below).

3 Second Parallel. Since no second parallel connector is provided, this will select the first parallel port.

4 Second Serial. The second serial connector (on the right) at the rear of the Victor. Baud rate must also be specified (see below).

With choices 2 and 4, you must also specify the printer'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 User Manual that accompanied your printer, or ask your dealer. *Be sure that your printer is compatible with the Victor 9000 Computer.*

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*.

You can also check your printer's User 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: Left = 4, Right = 76, Top = 2, 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   Lotus-supplied: B:

At the beginning of a 1-2-3 session, one disk drive 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 in the directory in which the 1-2-3 program resides.

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

Before issuing this command, be sure that you have removed the "write-protect" tab from the 1-2-3 System Disk, and that the disk is loaded in its drive. Replace this tab when the Update operation is finished.

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.

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.

A-6

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-5). 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)

The rest of the codes may be entered either as a typed character (e.g. F) or in \ *nnn* form (the code for **F** is \ 070).

Example 1. 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 \ 0274

Example 2. With an IDS Prism printer, these seven characters select the magenta color on a process ribbon:

> Escape   ,   Q   ,   2   , $.

With 1-2-3, this setup string could be entered as:

> \ 027,Q,2,$

or

> \ 027, \ 081, \ 050, \ 036

or

> \ 027 \ 044 \ 081 \ 044 \ 050 \ 044 \ 036

or any number of similar combinations.

The table on the next page shows the standard ASCII codes in \ *nnn* form, along with their character equivalents.

Setup String Representation	Character	Setup String Representation	Character
\ 000	Control @	\ 043	+
\ 001	Control A	\ 044	, *comma*
\ 002	Control B	\ 045	-
\ 003	Control C	\ 046	.
\ 004	Control D	\ 047	/
\ 005	Control E	\ 048	0
\ 006	Control F	\ 049	1
\ 007	Control G *bell*	\ 050	2
\ 008	Control H	\ 051	3
\ 009	Control I *tab*	\ 052	4
\ 010	Control J *line feed*	\ 053	5
\ 011	Control K	\ 054	6
\ 012	Control L *form feed*	\ 055	7
\ 013	Control M *carriage return*	\ 056	8
\ 014	Control N	\ 057	9
\ 015	Control O	\ 058	:
\ 016	Control P	\ 059	;
\ 017	Control Q	\ 060	<
\ 018	Control R	\ 061	
\ 019	Control S	\ 062	>
\ 020	Control T	\ 063	?
\ 021	Control U	\ 064	@
\ 022	Control V	\ 065	A
\ 023	Control W	\ 066	B
\ 024	Control X	\ 067	C
\ 025	Control Y	\ 068	D
\ 026	Control Z	\ 069	E
\ 027	[Escape]	\ 070	F
\ 028	FS	\ 071	G
\ 029	GS	\ 072	H
\ 030	RS	\ 073	I
\ 031	US	\ 074	J
\ 032	[Space]	\ 075	K
\ 033	!	\ 076	L
\ 034	"	\ 077	M
\ 035	#	\ 078	N
\ 036	$	\ 079	O
\ 037	%	\ 080	P
\ 038	&	\ 081	Q
\ 039	' *apostrophe*	\ 082	R
\ 040	(	\ 083	S
\ 041	)	\ 084	T
\ 042	*	\ 085	U

Setup String Representation	Character	Setup String Representation	Character
\ 086	V	\ 108	l
\ 087	W	\ 109	m
\ 088	X	\ 110	n
\ 089	Y	\ 111	o
\ 090	Z	\ 112	p
\ 091	[	\ 113	q
\ 092	\	\ 114	r
\ 093	]	\ 115	s
\ 094	^	\ 116	t
\ 095	__	\ 117	u
\ 096	` [grave]	\ 118	v
\ 097	a	\ 119	w
\ 098	b	\ 120	x
\ 099	c	\ 121	y
\ 100	d	\ 122	z
\ 101	e	\ 123	{
\ 102	f	\ 124		
\ 103	g	\ 125	}
\ 104	h	\ 126	~
\ 105	i	\ 127	DEL
\ 106	j		
\ 107	k		

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 to *ERROR*. The message is a brief explanation of what is wrong.

To continue working with 1-2-3, press [±] or **[RETURN]**. Until you do this, 1-2-3 won't let you perform any other action. It just *beeps* with each keystroke. After you press [±] or **[RETURN]**, you are back in 1-2-3 in Ready mode. No data will have been lost. Sometimes the worksheet will have changed, such as when you run out of memory; the command will stop when the memory is filled.

Before trying the same command again, fix whatever caused the error. This depends on the error message. This section contains suggestions of what to do.

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 directory name in 123.CNF when you issue a /Worksheet Global Default Update command, even though the directory does not currently exist.)

Disk drive not ready. You have tried to access a disk that is not ready; the disk drive door is probably open, 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 diskette. 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 or diskette (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 /XM Menu command (used only in keyboard macros), you have specified more than eight 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 [±], 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 cell. In a keyboard macro, an /XR (return) command was issued without an /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 [WORD →] followed by [WORD ←], 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 [±], 1-2-3 will continue to operate with default choices. Use /Worksheet Global Default to specify your equipment and Update the configuration file.

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 un-protected 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 Lotus Customer Support. See the Customer Service Booklet.

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. Restart the system immediately.

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 key-board macro), you have specified more than eight 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 an /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 a 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.

Glossary

Boldface type indicates words and phrases that also have Glossary entries. The page reference accompanying each entry indicates the principal location in the manual where the entry is explained.

[±] **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.

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.

[4/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.

Access System. (p. 21-1) See **Lotus Access System**.

Address. (p. 8-2) The location of a particular cell in the worksheet, labeled by its column and row, e.g. A10, BK201.

[ALT] **Key.** (p. 9-5) (1) Invokes a **keyboard macro**. (2) "Multiplies" the effect of the arrow-keys in moving the cell pointer or the **cursor**.

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 [±] 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**. Arguments, separated by commas, are placed within parentheses following the function name. 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. (p. 4-4) **(Hold down [SHIFT] and press [TAB]).** Move the pointer or cursor to left. **Ready, Point modes:** Move pointer one page to left. **Value, Label modes:** Complete current entry and move pointer one page to left. **Edit mode:** Move cursor 5 characters to left. (Equivalent: **[SHIFT]-** ← .)

Border. (p. 1-9) (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).

[9/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. 1-5) A single location in the worksheet, specified by its column-row address (e.g. cell G199).

Cell Entry. (p. 5-1) A number, formula, or label stored in a cell of the worksheet.

Cell Pointer. (p. 1-6) The reverse-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 often can move the pointer to another **pointer location**.

Clear. (p. 15-5) Erase a previously specified print setting. (See also **Reset**.)

[CLR/HOME] Key. (p. 5-8) When used with **[SHIFT]**, (1) Cancels the current command, entry, or keyboard macro. (2) Interrupts a 1-2-3 or PrintGraph printing operation.

Column. (p. 1-5) The worksheet has 256 columns, labeled A-Z, AA-AZ, BA-BZ, . . . IV.

Column-Width. (p. 1-8) 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 from which 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 B to store data, unless specifically instructed otherwise".) These procedures are stored on the 1-2-3 System Disk in a file named 123.CNF. The PrintGraph program also has a configuration file, GRAPH.CNF.

Control Panel. (p. 1-10) 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.

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. 14-5) 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, file ACCTS).

Current Worksheet. (p. 1-5) 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, an 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 section of the worksheet 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. 1-11) 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. 10-2) 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 the program disks.

Disk(ette). (p. 1-11) A permanent data storage medium for microcomputers. Also called "floppy disk".

Disk Drive. (p. 1-11) The device into which diskettes are placed for use. Typically, the 1-2-3 System Disk resides in Drive A, while data files are stored on disks in Drive B. (See also **Hard Disk.**)

Disk Prefix. (p. 14-5) 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. 1-5) The "TV" screen of your computer; also called CRT screen.

Display Format. (p. 10-3) See **Numeric Display Format**.

DOS. See **MS-DOS**

[2/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.

Entry. (p. 5-1) A **cell entry** or a response to a 1-2-3 command prompt.

Error Message. (p. 1-4) 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 [±] or **[RETURN]** to clear an error message and return to Ready mode.

Field. (p. 17-3) A column in a 1-2-3 **database**. Example: The first field (column) of a database might contain *Name* entries and the second column might contain *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 as 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):

File type	Extension
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. 20-8) 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 ten function keys on the Victor 9000 Computer keyboard are assigned special 1-2-3 functions:

[1/HELP]:	Display Help screen
[2/EDIT]:	Switch to/from Edit mode for current entry
[3/NAME]:	In Point mode, display menu of range names
[4/ABS]:	In Point mode, make cell addresses "absolute"
[5/GOTO]:	Move cell pointer to a particular cell
[6/WINDOW]:	Move cell pointer to other side of split screen
[7/QUERY]:	Repeat most recently specified Data Query operation
[8/TABLE]:	Repeat most recently specified Data Table operation
[9/CALC]:	Recalculate worksheet or single cell
[10/GRAPH]:	Draw the most recently specified graph

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.

[5/GOTO] Key. (p. 4-2) **Ready mode:** Moves the cell pointer to a particular cell (1-2-3 prompts you to specify a location).

[10/GRAPH] Key. (p. 16-4) (1) **Ready mode:** Pressing the [10/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.

Hard Disk. (p. iii) An alternative permanent data storage medium to the diskette, typically having many times the storage capacity of a diskette. You can use a hard disk with 1-2-3, but you must have at least one diskette drive in your system.

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, PrintGraph, or the Lotus Access System provides instant information about the operation currently in progress. [±] ends the Help break and returns you to the work session, exactly where you left off.

[1/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 **[1/HELP]** returns you to the first Help screen you viewed.

Indicator. (p. 1-10) (1) A reverse-video word in the upper right corner that indicates 1-2-3's current **mode** of operation. (2) A reverse-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).

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
'	left-aligned	LABEL
"	right-aligned	LABEL
^	centered	LABEL
\	repeating	LABELLABELLABE

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. 6-1) 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.

Lotus Access System. (p. 21-1) A menu-driven "switchboard" program that allows you to move easily between 1-2-3, PrintGraph, and other system functions.

Macro. See **Keyboard Macro**.

Main Memory. (p. 1-11) 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).

Menu. (p. 6-8) A series of choices which appear in the **control panel**. Menus are used throughout 1-2-3, PrintGraph, and the **Lotus Access System**. 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 **[3/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. 1-10) 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 [±] 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. (p. ii) The Microsoft Disk Operating System, supplied by Victor.

[3/NAME] Key. (p. 7-13) In Point mode, pressing the **[3/NAME]** key produces a menu of the currently defined range names.

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.

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).

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 work-sheet 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] or [SHIFT]- ←	left 1 page	...	left 5 chars
[TAB] or [SHIFT]- →	right 1 page	...	right 5 chars
[SHIFT] ↑	up 1 page	...	end entry & up 1 page
[SHIFT] ↓	down 1 page	...	end entry & down 1 page
[WORD ←]	upper left corner	first item	first char
[WORD →]	end of non-blank block	last item	last char

Several other keys also accomplish pointer movement. [5/GOTO] moves the pointer to a location you specify. [6/WINDOW] moves the pointer between windows when you are using the Split Screen facility. [SCRL] switches the meaning of the arrow keys between moving the cell pointer and moving the window.

/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).

[7/QUERY] Key. (p. 17-14) The [7/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 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, PrintGraph, or File-Manager session. Control returns to the Lotus Access System or to MS-DOS.

Range. (page 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.

Range Name. (p. 7-11) See **Named Range**.

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 copied entry.

[RETURN] Key. (p. 1-5) **(equivalent: [ENTER]). Value, Label, Edit modes:** Signals the end of a cell entry or command response. **Menu mode:** Selects the currently highlighted menu item.

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.

[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.

Setup String. (p. 15-14) A sequence of special characters that perform printer functions (e.g. change print size).

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*.

[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 one page to right. **Edit mode:** Move cursor 5 characters to right. (Equivalent: **[SHIFT]-→**.)

[8/TABLE] Key. (p. 17-20) The **[8/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. vii) The *1-2-3 Electronic Tutorial* on the 1-2-3 Tutorial Disk provides step-by-step lessons on how to use 1-2-3.

Typing Alternative. See **Keyboard Macros**.

Value. (p. 8-1) Any **number** or **formula**.

Window. (p. 1-6) The currently displayed portion of the worksheet (standard size: 8 columns × 20 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).

[6/WINDOW] Key. (p. 10-10) **(Split Screen only).** In Ready and Point modes, the **[6/WINDOW]** key switches the cell pointer between the two windows on the worksheet.

[WORD →] Key. (p. 4-6) **Ready, Point modes:** (1) Pressing the **[WORD →]** 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 **[WORD →]** followed by **[WORD ←]** 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.

[WORD ←] Key. (p. 4-3) **Ready, Point modes:** (1) Moves the pointer (or free cell) to the upper left corner of the worksheet. (2) Pressing **[WORD →]** followed by **[WORD ←]** 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.

Worksheet. (p. 1-5) 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.

1-2-3 and PrintGraph Command Trees

1-2-3 Commands   **Page**

/Worksheet Commands

/Range Commands

A B C D E F	Assign color to data range A-F
Quit	Return to Options menu
Font	Select fonts for graphs 20-8
1	Select font for First title
2	Select font for rest of graph
Size	Control size and placement of graph 20-9
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 clockwise rotation
Quit	Exit Size submenu
Pause	Control pause between printing graphs
Eject	Control page eject between printing graphs
Quit	Return to main PrintGraph menu
Go	Print selected graphs 20-12
Configure	Configure PrintGraph to system
	hardware 20-2
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 20-3
Page	Select default page size 20-4
Length	Select default page length
Width	Select default page width
Quit	Return to Configure submenu
Interface	Select interface for graphics device 20-5
1	Parallel interface
2	Serial interface
3	Second Parallel interface
4	Second Serial interface
Save	Record configuration on disk 20-6
Cancel	Cancel Save
Replace	Replace old configuration with new
Reset	Restore default configuration settings 20-6
Quit	Return to main PrintGraph menu 20-6
Align	Make current paper position top of page . . . 20-12
Page	Advance paper to top of next page 20-12
Quit	Exit PrintGraph program 20-12
Yes	Exit to MS-DOS or Access System
No	Return to PrintGraph program

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Functional Index

Alphabetical Index

Note: [P] denotes a PrintGraph program command