Lotus 1-2-3 *for* UNIX* System V

User Reference

Part No. 16123

Lotus 1-2-3 *for* UNIX* System V

User Reference

Contents

Reference

Chapter 1
Using 1-2-3

This chapter presents the basic concepts that you need to know to work with 1-2-3. For example, the chapter explains how to move around 1-2-3 worksheets, enter data, select commands from 1-2-3 menus, specify ranges for commands and formulas, and work with 1-2-3 files, all of which are tasks you perform whenever you use 1-2-3.

How to Use This Chapter

The information in this chapter is divided among 11 sections:

- "The 1-2-3 Screen" describes the basic elements of the 1-2-3 screen and explains how you use the information on the screen. Topics of the section include worksheet structure, moving around the worksheet, and the 1-2-3 function keys.
- "Entering Data" explains how to enter, edit, and protect data in a worksheet.
- "Viewing Your Data" describes the different ways you can display the data in your worksheets.
- "Using 1-2-3 Menus" explains how to use the 1-2-3 menus to perform 1-2-3 commands.
- "Working with Ranges" explains how to specify ranges in commands and formulas in order to work with cells collectively instead of individually.
- "Working with Formulas" describes 1-2-3 formulas (including @functions) and explains how to enter them. The section also describes the three types of cell and range references you can use in formulas.

- "Working with Files" discusses 1-2-3 files, UNIX and MS-DOS file names, and file protection.
- "Using Multiple-Sheet Files" explains how to create files that contain more than one worksheet, how to move between worksheets, and how to specify three-dimensional ranges. The section also discusses the use of GROUP mode to make changes to all worksheets in a file simultaneously.
- "Working with Multiple Files" explains how to work with several files at once and how to specify cells and ranges in other files.
- "Linking Files with Formulas" explains how to create and recalculate formulas that refer to data in other files.
- "Using the 1-2-3 Help System" explains how to use the electronic Help screens that come with 1-2-3.

You can read the entire chapter straight through or scan it first and then read the sections that interest you. If you use the second approach, be aware that much of the material in later sections assumes knowledge of information presented earlier in the chapter.

First Time 1-2-3 Users

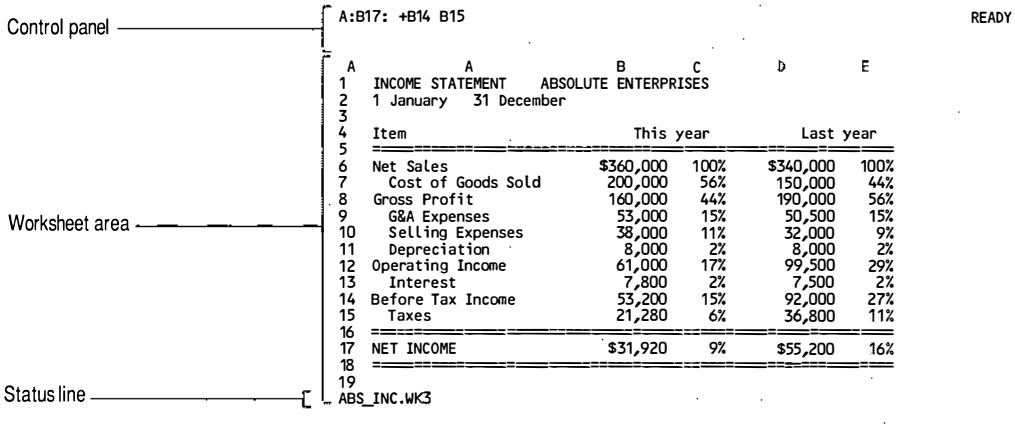
If you are a first-time 1-2-3 user, you may want to begin with the *Tutorial* and come back to this chapter later. The *Tutorial* gives you a step-by-step, hands-on introduction to 1-2-3. If you do begin directly with this chapter, read each section in combination with the appropriate lesson or lessons in the *Tutorial*. For example, read "The 1-2-3 Screen" and then complete Lesson 1 in the *Tutorial*.

Regardless of how you go about learning 1-2-3, make sure you know how to save your work in 1-2-3 before you create your own worksheets. See Lesson 3 in the *Tutorial* or /File Save in Chapter 2 of *User Reference* for instructions on saving your work.

Experienced 1-2-3 Users

"Using 1-2-3" contains information specific to UNIX versions of 1-2-3, so read this chapter regardless of how familiar you are with other versions of 1-2-3. If you have worked with 1-2-3 running on personal computers, you may want to browse the manual *Quick Start for PC Users* in the *User Guide*.

The 1-2-3 Screen



	A	A	B	C	D	E
1	INCOME STATEMENT	ABSOLUTE ENTERPRISES				
2	1 January	31 December				
3						
4	Item		This year		Last year	
5						
6	Net Sales		$360,000	100%	$340,000	100%
7	Cost of Goods Sold		200,000	56%	150,000	44%
8	Gross Profit		160,000	44%	190,000	56%
9	G&A Expenses		53,000	15%	50,500	15%
10	Selling Expenses		38,000	11%	32,000	9%
11	Depreciation		8,000	2%	8,000	2%
12	Operating Income		61,000	17%	99,500	29%
13	Interest		7,800	2%	7,500	2%
14	Before Tax Income		53,200	15%	92,000	27%
15	Taxes		21,280	6%	36,800	11%
16						
17	NET INCOME		$31,920	9%	$55,200	16%
18						
19						

Figure 1-1. *The 1-2-3 screen*

1-2-3 divides the screen into three areas: the worksheet area, the control panel, and the status line. The number of columns and rows that your terminal or PC console displays is dependent upon how you have configured your terminal or what display drivers you have selected in **setup123**.

The Worksheet Area

The worksheet area, located in the center of the screen, displays the worksheet you are currently working in. In Figure 1-2, the worksheet area displays an income statement.

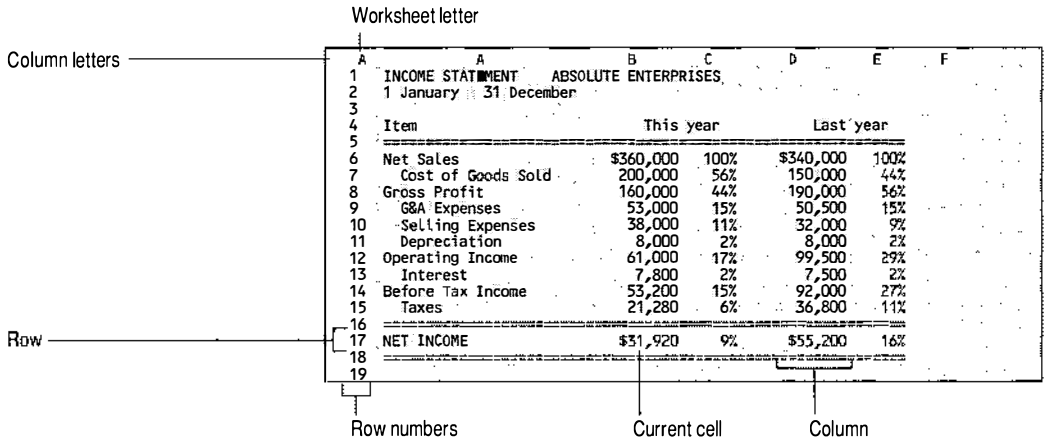


Figure 1-2. *The worksheet area*

To understand the contents of the worksheet area, you need to understand the structure of a 1-2-3 worksheet.

1-2-3 Worksheet Structure

A 1-2-3 **worksheet** is a grid consisting of 8,192 rows and 256 columns. Each intersection of a row and column is called a **cell** and is used to store data.

The worksheet contains a rectangular highlight, called a **cell pointer**, which you can move around the worksheet to select the cell you want to work with. The cell that contains the cell pointer is called the **current cell.** In Figure 1-2, cell B17 (the cell formed by the intersection of column B and row 17) is the current cell.

Above and to the left of the worksheet is the **worksheet frame**. The worksheet frame displays the **column letters** and **row numbers** so you can keep track of where you are as you move around a worksheet. Columns are lettered from A to IV (A – Z, AA – AZ, BA – BZ, ..., IA – IV). Rows are numbered consecutively from 1 to 8192.

You can have more than one worksheet in memory at once, as explained in "Using Multiple-Sheet Files" later in this chapter. 1-2-3 assigns a letter to each worksheet so you can keep track of them. 1-2-3 displays the **worksheet letter** in the upper left corner of the worksheet frame.

Moving Around the Worksheet

The following table lists the **pointer-movement keys** you use to move around a worksheet and each one's effect on the cell pointer. To determine which keys on your terminal keyboard are associated with 1-2-3 pointer-movement keys, refer to the keyboard template in *Quick Reference* appropriate for your keyboard.

Key	*Effect*
↑ or ↓	Moves the cell pointer up or down one row.
→ or ←	Moves the cell pointer right or left one column.
BIG LEFT or **BIG RIGHT**	Moves the cell pointer left or right one full screen.
END ↑ or **END** ↓	(Press **END** and then press ↑ or ↓) Moves the cell pointer up or down the current column, to the next cell in the column that contains data and adjoins a cell above or below that does not contain data. For example, in Figure 1-3, **END** ↓ moves the cell pointer from A1 to A5. If no more cells in the current column contain data, moves the cell pointer to the top or bottom edge of the worksheet.
END → or **END** ←	(Press **END** and then press → or ←) Moves the cell pointer right or left in the current row to the next cell in the row that contains data and adjoins a cell on either side that does not contain data. For example, in Figure 1-3, **END** → moves the cell pointer from A5 to D5. If no more cells in the current row contain data, moves the cell pointer to the right or left edge of the worksheet.

(continued)

Key	*Effect*
END HOME	(Press **END** and then press **HOME**) Moves the cell pointer to the lower right corner of the worksheet's **active area** (the rectangular area between cell A1 and the lowest and rightmost nonblank cells in the worksheet). A **nonblank cell** is a cell that contains data and/or special formatting.
HOME	Moves the cell pointer to cell A1 unless column A is hidden or worksheet titles are set.
PGUP or **PGDN**	Moves the cell pointer up or down one full screen.

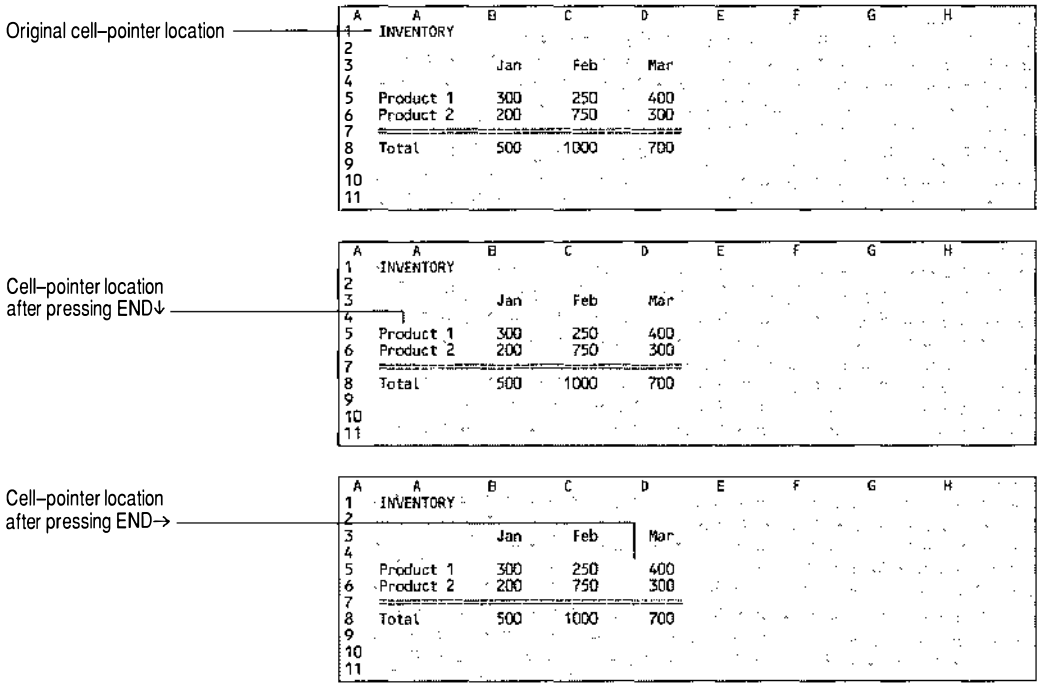


Figure 1-3. *Using* **END** ↓ *and* **END** →

You can also use the GOTO function key to move the cell pointer around the worksheet, as described in "1-2-3 Function Keys" later in this section.

The Control Panel

The **control panel**, located in the top three lines of the screen, displays information about what 1-2-3 is doing and about your work. Figure 1-4 shows the control panel with information in each of the three lines.

```
A:A1: 'INVENTORY                                                    MENU
Worksheet  Range  Copy  Move  File  Print  Graph  Data  System  Quit
Copy a cell or range of cells
```

Figure 1-4. *The control panel*

First Line

In the first line of the control panel, 1-2-3 displays information about the current cell and the mode indicator.

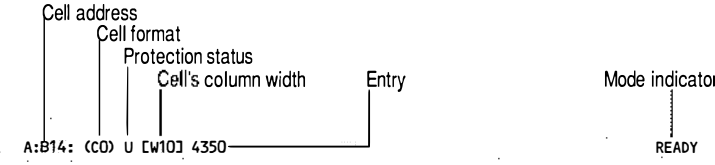


Figure 1-5. *Control panel with current cell information and mode indicator in first line*

At the far left, 1-2-3 displays the address of the current cell. A **cell address** consists of a worksheet letter followed by a colon, a column letter, and a row number. For example, A:B14 is the address for the cell in worksheet A at the intersection of column B and row 14.

To the right of the cell address, 1-2-3 displays the following settings for the current cell, left to right:

- The **cell format** (the way 1-2-3 displays data in the cell) if you used /Range Format or Automatic formatting to set the cell format.

- The cell's protection status: protected or unprotected. If you turn worksheet protection on with /Worksheet Global Prot without having unprotected the cell with /Range Unprot, 1-2-3 displays PR to indicate you cannot make changes to that cell. If you use /Range Unprot to unprotect the cell, 1-2-3 displays U.
- The cell's column width if you used /Worksheet Column to set the width.

In Figure 1-5, cell A:B14 is formatted as Currency with 0 decimal places, is unprotected, and has a column width of 10.

To the right of the settings information, 1-2-3 displays the data in the current cell (the **entry**) if the cell contains an entry. In Figure 1-5, 4350 is the current cell entry.

The **mode indicator**, located at the far right, tells you what **mode**, or state, 1-2-3 is currently in. For example, when waiting for you to type or enter a command, 1-2-3 is in READY mode and the mode indicator displays READY; when you are entering a value, 1-2-3 is in VALUE mode and the mode indicator displays VALUE. The following table describes the various 1-2-3 modes.

Mode	*Explanation*
EDIT	You pressed **EDIT** to edit an entry, selected /Data Parse Format-Line Edit to edit a format line, or entered data incorrectly.
ERROR	1-2-3 is displaying an error message. Press **HELP** to display a Help screen that describes the error; press **ENTER** and **ESC** to clear the error message.
FILES	1-2-3 is displaying a list of files.
FIND	You selected /Data Query Find or pressed **QUERY** to repeat a previous /Data Query Find, and 1-2-3 is highlighting a database table record that matches your criteria.
HELP	You pressed **HELP** and 1-2-3 is displaying a Help screen.
LABEL	You are entering a label.
MENU	1-2-3 is displaying a menu of commands.

(continued)

Mode	*Explanation*
NAMES	1-2-3 is displaying a list of names; for example, range names, graph names, print settings names, @function names, or external table names.
POINT	1-2-3 is prompting you to specify a range or you are creating a formula by highlighting a range.
READY	1-2-3 is ready for you to enter data or select a command.
STAT	1-2-3 is displaying the /Worksheet Status or /Worksheet Global Default Status screen.
VALUE	You are entering a value.
WAIT	1-2-3 is completing a command or process.

1-2-3 also uses the mode indicator to display indicators you create with the advanced macro command {INDICATE}, which is described in Chapter 4.

Second Line

In the second line of the control panel, 1-2-3 displays one of three types of information, depending on the current activity.

- When you are entering or editing data, the second line displays the characters you are typing or editing (Figure 1-6).

Figure 1-6. *Control panel with data in second line*

- When you are using 1-2-3 menus, the second line displays the menu you are currently in. In Figure 1-7, the second line is displaying the **main menu,** the menu that contains the top-level 1-2-3 commands.

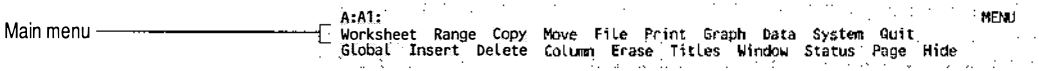


Figure 1-7. *Control panel with main menu in second line*

- If you select a command in which 1-2-3 prompts you for information, the second line displays the prompt. For example, Figure 1-8 shows the first prompt 1-2-3 displays when you select /Copy.

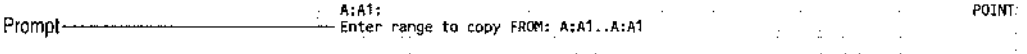


Figure 1-8. *Control panel with prompt in second line*

Third Line

The third line of the control panel displays two different types of information, depending on the current activity.

- When a 1-2-3 menu is in the second line of the control panel, the third line displays information about the highlighted command (Figure 1-9) or a list of subcommands for the highlighted command.

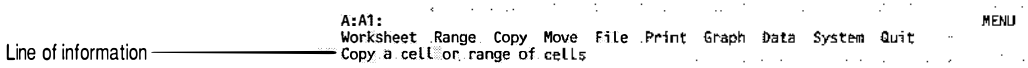


Figure 1-9. *Control panel with information about the highlighted command in third line*

- When you use NAME or select a command that prompts you for a range name, graph name, print settings name, external table name, or file, the third line displays a list of names or files. Figure 1-10 shows an example of a list 1-2-3 might display in the third line when you select /File Retrieve.

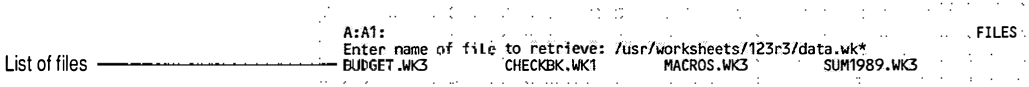


Figure 1-10. *Control panel with file list in third line*

The Status Line

The status line (Figure 1-11) is the last line of the screen. 1-2-3 uses this line to display the file-and-clock indicator and the status indicators described below.

Figure 1-11. ***Status line with file-and-clock indicator and several status indicators***

File-and-Clock Indicator

The file-and-clock indicator appears in the left corner of the status line. If the current worksheet is part of a file, 1-2-3 displays that file's name in the indicator. If you haven't saved the current worksheet in a file, 1-2-3 displays the current date and time in the indicator. In Figure 1-11, the current worksheet is in a file named ABS_INC.WK3.

NOTE With /Worksheet Global Default Other Clock, you can change the file-and-clock indicator so it always displays the current date and time or you can also suppress the indicator display entirely.

Status Indicators

1-2-3 uses the rest of the status line to display the status indicators. **Status indicators** appear on the screen when you use certain 1-2-3 keys and when 1-2-3 performs certain actions.

Status indicator	*Explanation*
CALC	If blue (or, for monochrome displays, reverse-video), some of your formulas may not be up-to-date; press **CALC** to recalculate them. If red (or, for monochrome terminals, white), 1-2-3 is performing a background formula recalculation. Formula recalculation in 1-2-3 is discussed in "Recalculating Your Formulas" later in this chapter.

(continued)

Status indicator	*Explanation*
CAP	You pressed **CAPS LOCK** to type uppercase letters without using **SHIFT**. Note that the **CAPS LOCK** function on many terminal keyboards may be implemented inconsistently and may not display at all.
CIRC	You entered a formula that contains a circular reference. Use /Worksheet Status to locate the formula.
CMD	1-2-3 is running a macro.
END	You pressed **END** to use it in conjunction with another pointer-movement key.
FILE	You pressed **FILE** to move between files using one of the pointer-movement keys, as described in "Working with Multiple Files" later in this chapter.
GROUP	The current file is in GROUP mode. GROUP mode is described in "Using GROUP Mode for a File" later in this chapter.
MEM	The amount of available computer memory has fallen below the acceptable level that 1-2-3 considers safe. If you continue using 1-2-3 without first freeing up additional memory, you may get a 'Memory full' error. This indicator may not display consistently or at all on some terminal models.
NUM	You pressed **NUM LOCK** to use the numeric keypad to type numbers. The NUM LOCK function on many terminal keyboards is implemented inconsistently and may not display at all.
OVR	You pressed **INS** to edit data in overstrike mode instead of insert mode. In **overstrike mode**, 1-2-3 replaces the character above the cursor with the character you type. In **insert mode**, 1-2-3 inserts the character you type to the left of the cursor.

(continued)

Status indicator	*Explanation*
RO	The current file has read-only status, which means you cannot save changes you make to the file unless you save it under a new name. The RO indicator appears when you are using 1-2-3 on a network or in another multi-user environment and do not have the reservation for the current file; it also appears if the current file was previously saved with its file reservation set to Manual.
SCROLL	Pointer-movement keys like ↑, ↓, →, and ← move the worksheet as well as the cell pointer.
SST	1-2-3 is running a macro in STEP mode, as described in "Debugging a Macro" in Chapter 4.
STEP	You pressed **RECORD** and selected Step to run a macro in STEP mode.
ZOOM	After using /Worksheet Window to create horizontal, vertical, or perspective windows, you pressed **ZOOM** for a full-screen view of the current window.

1-2-3 Function Keys

Function keys are assigned to the most frequent operations in 1-2-3. Although these **1-2-3 function key commands** have names derived from the key labels on a PC keyboard, you can find all of these functions defined in the default layouts shipped with 1-2-3. These default keyboard assignments are displayed on keyboard templates in the *Quick Reference* booklet. If you are using a PC terminal emulator or some other type of terminal, you can also use the Lotus **`keyedit`** utility to reassign any of the default key commands to other keys on your terminal keyboard. For more information on keyboard layouts and definitions in 1-2-3, see "Customizing your Keyboard with `keyedit`" in the *Configuration Guide*.

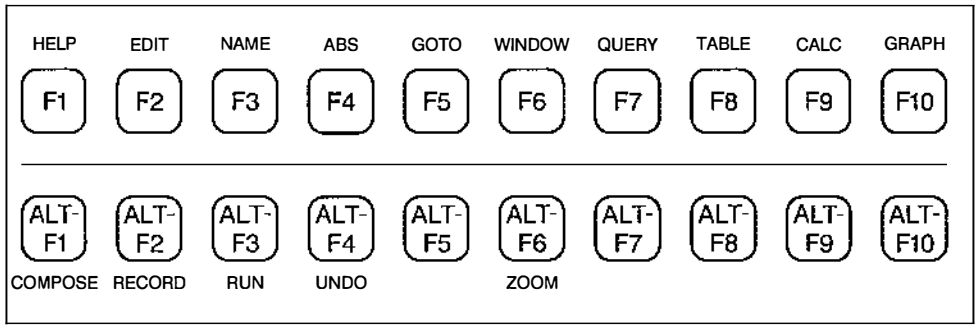


Figure 1-12. *The 1-2-3 function keys on a UNIX/386 console keyboard*

The following list defines each of the function keys.

ABS in EDIT, POINT, and VALUE modes adjusts a cell or range reference between a relative, absolute, and mixed reference. "Using Cell and Range References in Formulas" later in this chapter describes the three types of references and details the use of ABS.

ADDIN is a reserved keyboard command for future 1-2-3 add-in products. Pressing ADDIN at present does nothing.

APP1, APP2, and APP3 are reserved keyboard commands for future 1-2-3 add-in products. Pressing APP1, APP2, or APP3 at present does nothing.

CALC in READY mode updates all formulas in all active files except for formulas that refer to data in files on disk. (To update those formulas, use /File Admin Link-Refresh.) In EDIT or VALUE mode, if 1-2-3 is displaying a formula in the second line of the control panel, CALC converts the formula to its current value.

COMPOSE creates characters in 1-2-3 that you cannot enter directly from your keyboard. Appendix A contains information on COMPOSE and the LMBCS character set.

EDIT in READY mode puts 1-2-3 in EDIT mode so you can edit the entry in the current cell, as explained in "Editing an Entry" later in this chapter. If the entry occupies more than

one line in the control panel, the control panel expands to display the entire entry when you press EDIT.

EDIT also switches 1-2-3 between LABEL or VALUE mode and EDIT mode so you can edit an entry as you type it. And from FILES mode, EDIT switches 1-2-3 to EDIT mode so you can edit the prompted file name.

GOTO moves the cell pointer to a specific cell or named range, another worksheet in the same file, or another active file.

- To move the cell pointer to a specific cell, press GOTO and enter the cell address. For example, to move the cell pointer to cell B:C5, press GOTO and enter B:C5.

  If the cell is in another active file, precede the cell address with a **file reference** — the file specification enclosed in << >> (double angle brackets, created by typing two less-than symbols and two greater-than symbols). For example, to move the cell pointer to B:C5 in file SALES89.WK3, press GOTO and enter <<SALES89.WK3>>B:C5. Information on using file references is in "Specifying Cells and Ranges in Other Files" later in this chapter.

- To move the cell pointer to a named range in the current file, press GOTO and then either enter the range name (preceded by a file reference, if necessary) or press NAME. If you press NAME, 1-2-3 displays a list of range names in the current file. Highlight the appropriate range name and press ENTER. The cell pointer moves to the first cell in the specified range.

- To move the cell pointer to another worksheet in the current file, press GOTO and enter the worksheet letter followed by : (colon). The cell pointer moves to the cell you last highlighted in that worksheet. For example, to move the cell pointer to the cell you last highlighted in worksheet F, press GOTO and enter f:. "Using Multiple-Sheet Files" later in this chapter contains information about creating and working with files that contain two or more worksheets.

- To move the cell pointer to another active file, press GOTO and then either enter the appropriate file reference or press NAME and select the file reference from the displayed list. The cell pointer moves to the cell you last highlighted in that file. For example, to move the cell pointer to the cell you last highlighted in SALES89.WK3, press GOTO and enter <<SALES89.WK3>>.

GRAPH displays the current graph, or creates an automatic graph using the data around the cell pointer. "Graph Commands" in Chapter 2 contains more information on creating and displaying 1-2-3 graphs.

HELP displays the 1-2-3 Help screens. "Using the 1-2-3 Help System" at the end of this chapter describes the context-sensitive Help screens that come with 1-2-3.

NAME displays a list of names related to the command you selected or the formula you are creating. To select a name from the displayed list, highlight the name and press ENTER.

You can use NAME at the following times:

- After you select a command that prompts you for a range (for example, /Range Format or /Print [E,F,P] Range), press NAME to display a list of range names in the current file and the names of other active files. Press NAME again for a full-screen list.
- After you select a command that automatically displays a list of names (for example, /File Retrieve, /Graph Save, /Range Name Create, or /Print [E,F,P] Options Name Use), press NAME to display a full-screen list of names.
- When entering a formula, press NAME after specifying a cell or range address to replace the address with the corresponding range name. If the specified cell or range has no range name, or if it has more than one name, 1-2-3 displays a complete list of range names when you press NAME.
- When entering a formula, press NAME after typing any operator (for example, + & ^ #AND# or ;) to display a list of range names in the current file and the names of other active files. Press NAME again for a full-screen list.

- When entering a formula, press NAME after typing @ to display a list of 1-2-3 @functions. Press NAME again for a full-screen list.
- When entering a macro, press NAME after typing { (left brace) to display a list of macro key names and advanced macro commands. Press NAME again for a full-screen list.
- After you press GOTO, press NAME to display a list of range names in the current file and the names of other active files. Press NAME again for a full-screen list.
- After you press RUN, press NAME to display a full-screen list of range names in the current file and the names of other active files.

NOTE In commands and @functions that accept multiple ranges (such as /Print [E,F,P] Range, /Data Query Input, and @SUM), you can use NAME repeatedly to create a multiple-range list. For each range you want to add to the list, type an argument separator, press NAME and select a range name. "Specifying Multiple Ranges" later in this chapter contains more information on multiple ranges and the commands and @functions that accept them.

QUERY in READY mode repeats the most recent /Data Query Extract or Find command. During a /Data Query Find command, QUERY switches 1-2-3 between FIND mode and READY mode.

RECORD lets you use the contents of the **record buffer,** a 512-byte area of computer memory in which 1-2-3 records your keystrokes. RECORD also turns STEP mode on and off.

When you press RECORD, 1-2-3 displays the following commands:

Command	*Task*
Copy	Copies keystrokes from the record buffer into a worksheet.
Erase	Clears the record buffer.
Playback	Replays keystrokes from the record buffer.

(continued)

Command	*Task*
Step	Switches STEP mode on or off for macro debugging.

"Debugging a Macro" and "Using the Record Feature for Macros" in Chapter 4 contain more information on RECORD.

RUN selects a macro to run, as described in "Running a Macro" in Chapter 4.

TABLE repeats the last Data Table command you selected.

UNDO (when the undo feature is on) lets you cancel any changes you made to your worksheets since 1-2-3 was last in READY mode. When you press UNDO, 1-2-3 displays a No/Yes menu. Select No to return 1-2-3 to READY mode without undoing anything. Select Yes to complete the undo procedure.

NOTE Initially, the undo feature is off when you start 1-2-3. To turn it on so you can use UNDO, select /Worksheet Global Default Other Undo Enable.

WINDOW moves the cell pointer between windows you create with /Worksheet Window Horizontal, Vertical, or Perspective.

ZOOM enlarges the current horizontal, vertical, or perspective window to full-screen size or shrinks it to its original size.

NOTE 1-2-3 uses the ESC function to cancel data entries and to navigate menus. The ESCAPE key labeled on most terminals transmits the ASCII character "Escape" to 1-2-3 or any other application. Because the "Escape" character also precedes most of the codes sent by keys on the keyboard, 1-2-3 must wait for a second when you press the terminal ESCAPE key to determine whether the "Escape" character is a prefix or not. To notify 1-2-3 that you want it to execute the ESC function immediately, you can use the 1-2-3 function key called ESC on your 1-2-3 keyboard template.

Entering Data

To enter data in a cell, follow this procedure:

1. Move the cell pointer to the cell in which you want to enter the data.
2. Type the data to be entered in the cell, up to 512 characters.

   NOTE The 512-character maximum applies only when the entry consists entirely of single-byte characters — characters in Group 0 of the Lotus Multibyte Character Set (LMBCS). If you include multibyte characters in the entry (characters not in LMBCS Group 0), the character maximum will be fewer than 512. Appendix A provides information on LMBCS and the different LMBCS character groups.

3. Press ENTER or a pointer-movement key to complete the entry.

As you type an entry, 1-2-3 displays the characters in the second line of the control panel. If you type more characters than fit on a single line, the control panel expands to display all the characters. When you press ENTER or a pointer-movement key, 1-2-3 enters the data in the current cell. 1-2-3 checks the data before entering it to make sure you typed a valid entry. ("Types of Entries" below describes valid entries.) If the entry is not valid, 1-2-3 goes into EDIT mode and displays the data in the second line of the control panel for editing. Information on editing data is in "Editing an Entry" later in this section.

The cell-pointer location after you enter data depends on the key you use to complete the entry. If you use ENTER, the cell pointer remains in the same cell. If you use a pointer-movement key, the cell pointer moves to the same cell it moves to when you use the key in READY mode. For example, when you use ↓ to complete an entry, 1-2-3 enters the data and moves the cell pointer down one cell.

Types of Entries

1-2-3 classifies every entry as one of two types: labels or values. **Labels** are text entries. **Values** are number and formula entries.

When you start typing an entry, 1-2-3 determines whether the entry is a label or value based on the first character you type and changes the mode indicator to LABEL or VALUE accordingly. For example, if the first character you type is a letter or one of the label prefixes ' " ^ \ or |, 1-2-3 displays LABEL as the mode indicator. If the first character is a number or one of the symbols + – @ . (# or $ (when $ is the default currency symbol), 1-2-3 displays VALUE as the mode indicator.

Labels

A label is a text entry. It can include any combination of characters in LMBCS. For example, Paul Robinson, 714 Bristol Road, and $19,803 can all be entered as labels.

If the mode indicator changes to LABEL when you start typing the entry (meaning that 1-2-3 recognizes the entry as a label), 1-2-3 automatically adds a label prefix. A **label prefix** is one of the five characters ' " ^ \ or | at the beginning of a label. 1-2-3 does not display the label prefix in the cell but does display it in the first line of the control panel when you highlight that cell.

When you want to create a label that starts with a number or + – @ . (# or $ (if $ is the default currency symbol), you must type the label prefix so 1-2-3 does not interpret the entry as a value. For example, to enter 714 Bristol Road or $19,803 as a label, you must type a label prefix before typing the label.

A label prefix not only makes an entry a label, it also determines how 1-2-3 displays the label. Each of the five label prefixes produces a different result, as shown in the following table.

Label prefix	*Effect on label display*
'	Aligns the label with the left edge of the cell (initial alignment for labels).
"	Aligns the label with the right edge of the cell.
^	Centers the label in the cell.
\	Repeats the characters in the label to fill the cell.
|	Creates a nonprinting label. 1-2-3 displays the label on the screen but will not print it.

Figure 1-13 shows the label Total: entered with five label prefixes.

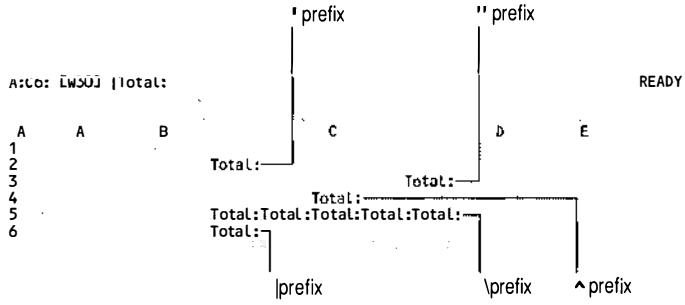


Figure 1-13. *A label with different label prefixes*

Long Labels When a label is longer than the cell's column width, 1-2-3 displays as much of the label as it can, as follows:

- If cells to the right of the label are blank, 1-2-3 displays the part of the label that overlaps those cells.
- If cells to the right of the label contain data, 1-2-3 **truncates** the label (does not display the overlapping part) for cell display.

In Figure 1-14, cell A1 contains a long label that overlaps B1. 1-2-3 displays the entire label because B1 is blank. Cell A6 also contains a long label, but because B6 contains an entry, 1-2-3 displays only the part of the label that fits in A6.

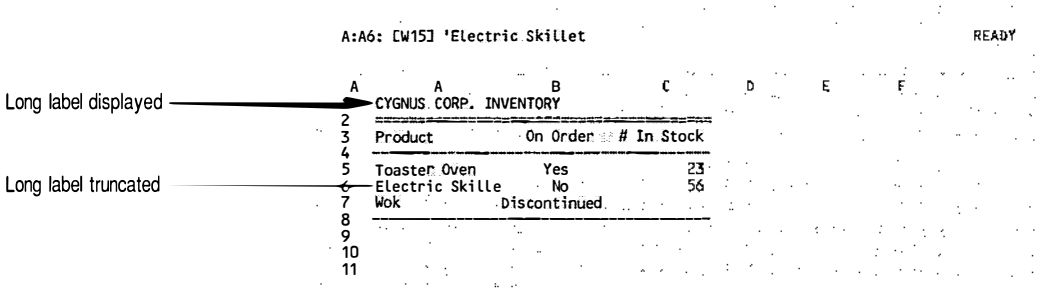


Figure 1-14. *Long labels in a worksheet*

Values

Any entry that begins with a number (0 through 9) or one of the symbols + – @ . (# or $ (assuming $ is the default currency symbol) is a value. The entry can be a number or a formula.

Numbers 1-2-3 accepts as an entry any number between 1E-99 (10^{-99}) and 9.99E+99 ($9.99*10^{99}$). To enter a number, you can type it with or without thousands separators. For example, 123,000 and 123000 are both valid ways to enter the number 123000. You can also type a number as a percentage (with the percent sign after the number), in scientific notation, as currency, or as a fraction. For example, to enter 1.75, you can type 175%, 17.5E-1, $1.75, or 1 3/4.

NOTE 1-2-3 displays up to 15 significant digits for every number you enter. If you enter a number with more than 15 significant digits or retrieve a worksheet containing numbers with more than 15 significant digits, 1-2-3 rounds the number to 15 digits.

Formulas A formula is an entry that performs a calculation. All formulas are one of three types: numeric, string, or logical. "Working with Formulas" later in this chapter defines the three types of formulas and explains how to enter and work with them.

In Figure 1-15, column B contains values. B3 through B8 are numbers, and B10 is a formula that subtracts the values in cells B4 through B8 from the value in B3. Notice that the values are right-aligned. 1-2-3 always right-aligns values in cells, and, unlike labels, you cannot change their alignment.

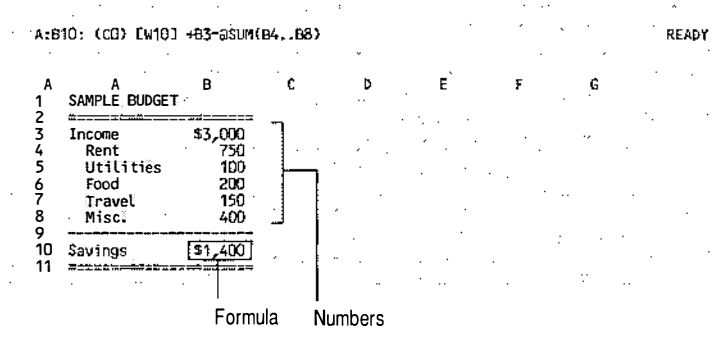


Figure 1-15. *Values*

Displaying Values in the Worksheet You control the way 1-2-3 displays values by setting the cell format with /Worksheet Global Format or /Range Format. For example, 1-2-3 can display the value 2.47 as $2.5, 247%, or 2.47E+00, depending on the cell format you specify. Figure 1-16 shows several cell formats.

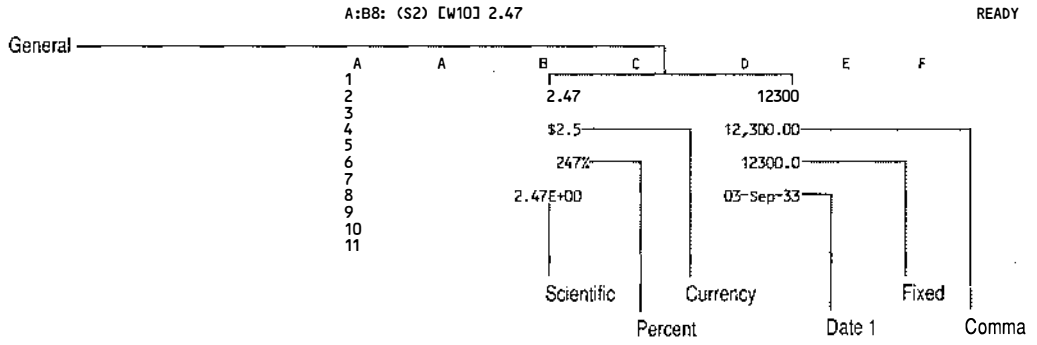


Figure 1-16. *Examples of cell formats*

Long Values A **long value** is a value that, as displayed, is wider than the cell's column width minus 1. For example, in a nine-character-wide cell formatted as Currency with 2 decimal places, 1500 is a long value — $1,500.00 contains nine characters, which is one more than the cell's column width minus 1.

1-2-3 treats long values differently from the way it treats long labels. Unlike long labels, 1-2-3 does not overlap long values into adjacent blank cells, nor does it display only a part of the value when adjacent cells contain data. Instead, 1-2-3 handles long values as follows:

- If the cell in which you enter a long value is formatted as General and the integer part of the value exceeds the cell's column width, 1-2-3 displays the value in scientific notation. If the cell is too narrow to display the value in scientific notation, 1-2-3 displays asterisks across the cell. For example, in a nine-character-wide cell formatted as General, the value 123456789.99 appears as 1.2E+08; in a four-character-wide cell, the value appears as ****.

- If the cell is formatted as General and the integer part of the long value fits within the cell's column width but some or all of the value's decimal part does not fit, 1-2-3 displays the long value rounded. For example, in a nine-character-wide cell, the value 123456.78999 appears as 123456.8.
- If the cell is formatted as anything other than General, 1-2-3 displays asterisks across the cell instead of the long value. To display the value, change the cell format or widen the column with /Worksheet Column Set-Width.

In Figure 1-17, cells B2, B4, and C2 all contain the value 12300. Cells B2 and C2 are both formatted as Currency with 2 decimal places. 1-2-3 displays asterisks in cell B2 because the value as formatted — $12,300.00 — exceeds column B's width. Column C, on the other hand, is wide enough to display the value as formatted. Cell B4 is formatted as Fixed with 2 decimal places. In this case, the value as formatted — 12300.00 — fits within column B's width.

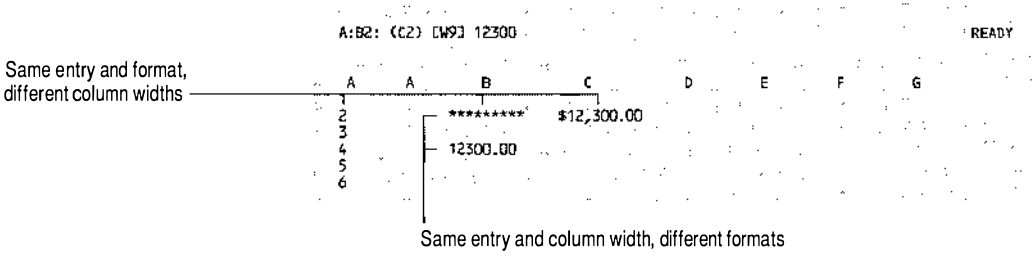


Figure 1-17. *Long values in a worksheet*

Annotating Values in the Worksheet You can **annotate** (include an explanatory note with) any value you enter in a worksheet. To do so, type ; (semicolon) immediately after the value and then type the explanatory note. (If you leave a space between the end of the value and the semicolon, 1-2-3 will not accept the entry.) For example,

275000; projected 1989 advertising budget

is an annotated value.

When the cell pointer is on a cell containing an annotated value, the annotation appears in the control panel. The

annotation does not appear in the cell itself unless the cell is formatted as Text.

Entering Dates and Times

Entering a date or time in 1-2-3 involves two steps:

- Entering a date or time number (a value that corresponds to a date or time)
- Formatting the cell in a Date or Time format

Entering a Date Number 1-2-3 assigns an integer to each of the 73,050 days from January 1, 1900 through December 31, 2099. These integers (1 through 73050, consecutively) are called **date numbers**. For example, the integer 5 corresponds to January 5, 1900; the integer 32762 corresponds to September 11, 1989. To create a date entry, you enter the appropriate date number and assign the cell a Date format.

You can enter a date number in three ways:

- Type the actual number. For example, to enter the date number for September 11, 1989, type 32762.
- Type the date as it would appear in a cell formatted as Date 1 (D1), Date 2 (D2), or Date 4 (D4). 1-2-3 translates the entry into the corresponding date number. For example, type 11-Sep-89 to enter the date number 32762. /Range Format in Chapter 2 contains descriptions of the Date formats.
- Type a date @function that calculates the date number. For example, type @date(89,9,11) to enter the date number 32762. "Date and Time @Functions" in Chapter 3 contains information on the date @functions.

Entering a Time Number 1-2-3 assigns a decimal number to each second from midnight through 11:59:59 p.m. These decimal numbers are called **time numbers**. For example, the decimal number .5 corresponds to 12:00:00 p.m.; the decimal number .9993 corresponds to 11:59:00 p.m. To create a time entry, you enter the appropriate time number and assign the cell a Time format.

You can enter a time number in three ways:

- Type the actual time number. For example, type .9993 to enter the time number for 11:59:00 p.m.

- Type the time as it would appear in a cell formatted as any Time format except Short Intn'l (D9) when configured as HH.MM. 1-2-3 translates the entry into the corresponding time number. For example, type 11:59 PM to enter the time number .9993. /Range Format in Chapter 2 contains descriptions of the Time formats and /Worksheet Global Default Other International in Chapter 2 contains information on international time configurations.
- Type a time @function that calculates the time number. For example, type @time(23,59,0) to enter the time number .9993. "Date and Time @Functions" in Chapter 3 contains information on the time @functions.

Formatting the Cell in a Date or Time Format Along with entering the date or time number, you need to assign the cell a Date or Time format so 1-2-3 displays the entry as a date or time. You set the format for a specified group of cells with /Range Format. You set the format for an entire worksheet with /Worksheet Global Format.

In Figure 1-18, cell B2 contains the date number 32762 and is formatted as Date 1 (D1) to display the day, month, and year. Cell E5 contains the time number .9993 and is formatted as Time 2 (D7) to display the hour and minutes.

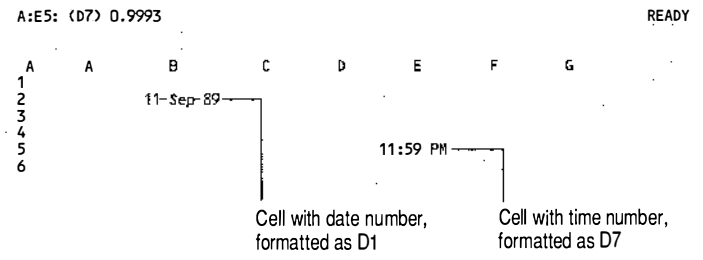


Figure 1-18. *Date and time entries*

Using Automatic Format to Enter Dates and Times

When a cell is formatted as Automatic, you can create a date entry by entering the date exactly as it would appear in Date 1 (D1), Date 2 (D2), or Date 4 (D4) format. For example, to enter

the date September 11, 1989 in a cell formatted as Automatic, you could enter 11-Sep-89 (the way 32762, the date number for September 11, 1989, appears in D1 format). 1-2-3 translates your entry to 32762 and changes the cell format from Automatic to D1.

When a cell is formatted as Automatic, you can create a time entry by entering the time exactly as it would appear in any Time format, except Short Intn'l format (D9) when Short Intn'l is configured as HH.MM. For example, if you enter 11:59 PM — the way .9993, the time number for 11:59 p.m., appears in Time 2 (D7) format — in a cell formatted as Automatic, 1-2-3 translates your entry to .9993 and changes the cell format from Automatic to D7.

Performing Date and Time Arithmetic Because dates and times are values, you can use formulas to perform date and time arithmetic in 1-2-3. For example, the formula @DATE(89,9,11)–@DATE(57,7,10) calculates the number of days between July 10, 1957, and September 11, 1989.

Editing an Entry

Editing an entry means altering existing data rather than replacing it with entirely new data. You can edit an entry either while typing it or after entering it in a cell.

Editing as You Type

While typing an entry, you can edit the entry in any of these ways:

- To erase characters starting at the cursor, press **BACKSPACE**. For example, if you typed Quarter 3 but meant to type Quarter 4, press **BACKSPACE** to erase 3 and then type 4.
- To erase everything you typed and start again, press **ESC**. For example, if you typed Quarter 3 but meant to type Q3, press **ESC** to erase Quarter 3 and type Q3.
- To change part of what you typed, press **EDIT** to enter EDIT mode and use the editing keys listed in the table below. For example, if you typed Quarter 3 but meant to type Qtr. 3, press **EDIT**. Then press **BIG LEFT** to move the cursor to the t in Quarter; press **BACKSPACE** three times to delete the r, a, and u; press → and **DEL** to delete the e; press →; and type . (period).

Editing a Completed Entry

To edit a completed entry, highlight the cell and press **EDIT** to enter EDIT mode. Use the editing keys to change the entry, and then press **ENTER**, **PGUP**, or **PGDN** to enter the edited data. If the entry occupies a single line in the control panel, you can also use ↑ and ↓ to enter the edited data. When using multiple worksheets, you can press **NEXT SHEET** or **PREV SHEET** to enter the edited data and move forward or back one worksheet.

The table below lists the editing keys you can use in EDIT mode.

Key	*Effect*
→ or ←	Moves the cursor one character to the right or left in the entry.
↑ or ↓	If the entry occupies one line in the control panel, enters the correction and moves the cell pointer up or down one cell. If the entry occupies more than one line, moves the cursor one line up or down.
BACKSPACE	Erases the character to the left of the cursor.
BIG LEFT	Moves the cursor left five characters in the entry.
BIG RIGHT	Moves the cursor right five characters in the entry.
CALC	Converts a formula to its current value.
DEL	Erases the character above the cursor.
EDIT	Switches 1-2-3 between EDIT and LABEL or VALUE mode, depending on the type of entry you are editing.
END	Moves the cursor to the last character in the entry.
ENTER	Completes editing.
ESC	Erases all characters in the entry.
HOME	Moves the cursor to the first character in the entry.
INS	Switches between insert mode (where 1-2-3 inserts characters to the left of the cursor) and overstrike mode (where 1-2-3 writes over the character above the cursor) for editing.

(continued)

Key	*Effect*
NEXT SHEET or **PREV SHEET**	Enters the correction and, if you are using multiple worksheets, moves the cell pointer forward or back one worksheet.
PGUP or **PGDN**	Enters the correction and moves the cell pointer up or down one screen.

Protecting Worksheet Data

To protect worksheet data, you can use two 1-2-3 commands: /Worksheet Global Prot Enable and /File Admin Seal File.

- /Worksheet Global Prot Enable turns on worksheet protection. With worksheet protection on, you can enter, edit, or erase data only in cells you explicitly unprotect with /Range Unprot. If you try to enter or edit data in protected cells or use commands that erase, change, or move protected data (for example, /Range Erase, /Range Justify, /Worksheet Delete, or /Worksheet Insert), 1-2-3 displays an error message.
- /File Admin Seal File seals a file so its settings cannot be changed. By sealing a file after turning on worksheet protection, you prevent users from either turning off worksheet protection or unprotecting specific cells in order to change data.

Viewing Your Data

Initially, 1-2-3 displays your data in one full-screen window, showing one area of one worksheet at a time (Figure 1-19).

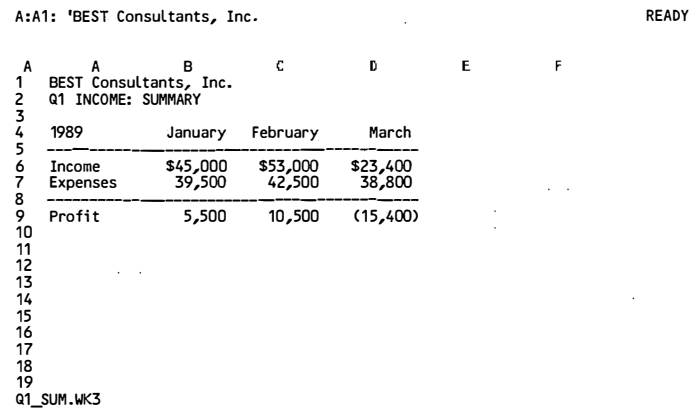


Figure 1-19. *Full-screen view*

With the Worksheet Window commands, you can change the way 1-2-3 displays your data to make it easier for you to examine and work with that data. For example, /Worksheet Window Vertical or Horizontal lets you split the screen into vertical or horizontal windows to view data in different worksheet areas simultaneously. Figure 1-20 shows the screen divided into horizontal windows.

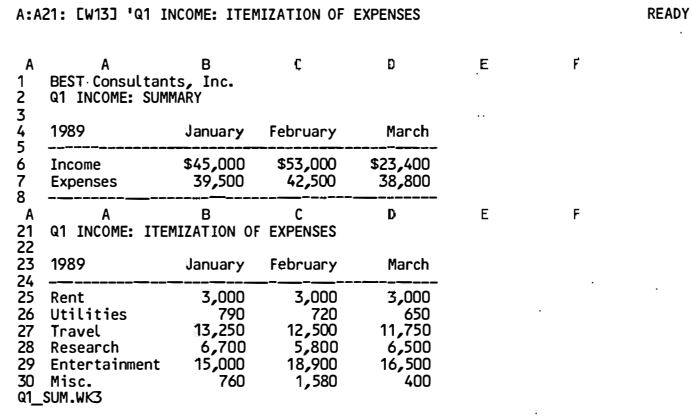


Figure 1-20. *Viewing your work through horizontal windows*

When you have several worksheets in memory, you can use /Worksheet Window Perspective to create a **perspective view** of data in three or more consecutive worksheets, as shown in Figure 1-21. You can specify the number of windows that 1-2-3 displays in perspective mode with the command-line option **-p [n]**. The valid values for **n** range from 3 to 26. The default value is 3.

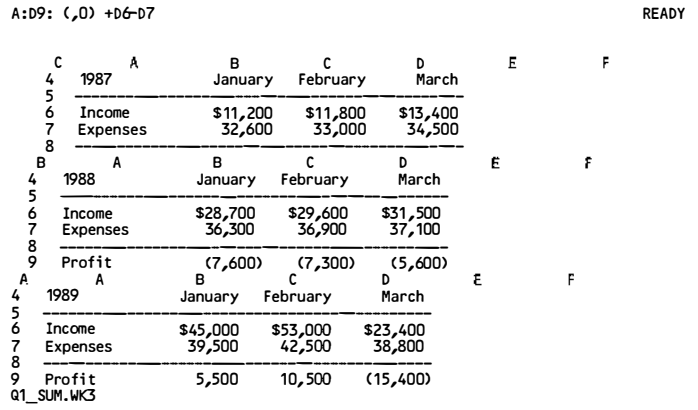


Figure 1-21. *Using perspective view*

In addition, /Worksheet Window Map lets you create a map view of your data. A **map view** shows you the type of data in each cell rather than the data itself: " for labels, # for numbers, and + for formulas and annotated numbers. You can use this feature to track your entries, for example, to confirm that you haven't written over any formulas with values. Figure 1-22 shows a map view of the worksheets in Figure 1-21.

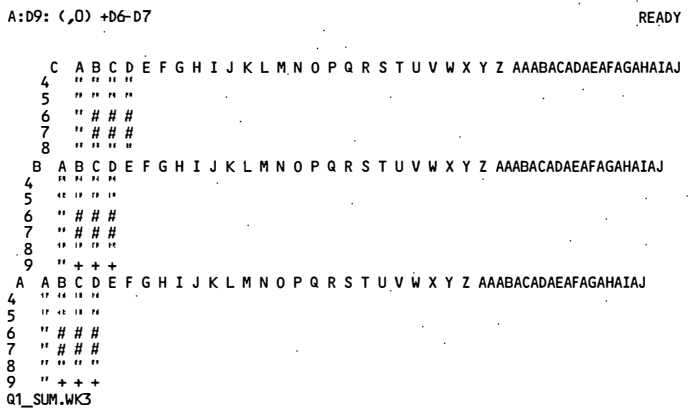


Figure 1-22. *Using map view*

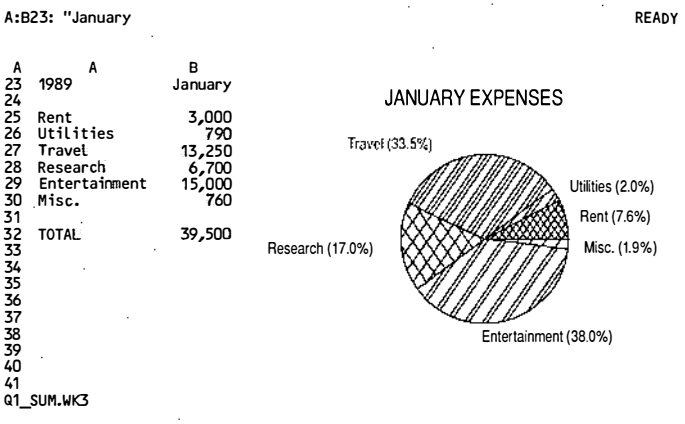


Figure 1-23. *Using a graph window to view your data and the current graph simultaneously*

Using 1-2-3 Menus

To work with the data in your worksheets, you use 1-2-3 commands. For example, you use 1-2-3 commands to erase, move, and print your data, change the way 1-2-3 displays the data in worksheets, and save your worksheets in a file. All

1-2-3 commands are on menus, so to perform commands you need to know how to use these menus.

To start using the 1-2-3 menus, press / (slash) or < (less-than symbol) with 1-2-3 in READY mode. 1-2-3 immediately displays the main menu of 1-2-3 commands in the second line of the control panel, as shown in Figure 1-24. Notice that the highlight (called the **menu pointer**) is on the first command in the menu (Worksheet), and the menu of Worksheet commands appears in the third line of the control panel.

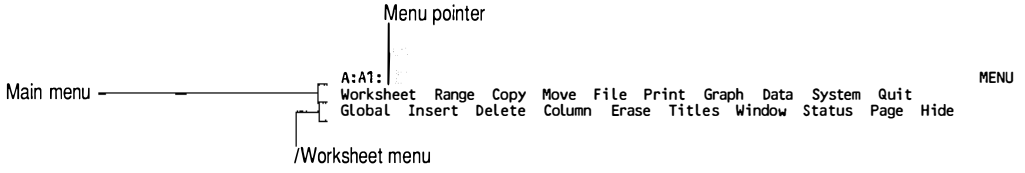


Figure 1-24. *The 1-2-3 main menu*

To move the menu pointer to another command in the menu, use the space bar, →, ←, HOME, or END. As you move the menu pointer through the menu, 1-2-3 changes the third line in the control panel to display either a menu for the highlighted command (if the command has a menu) or a line of information related to the highlighted command. In Figure 1-25, Range is highlighted, and the /Range menu appears in the third line of the control panel.

```
A:A1:                                                          MENU
Worksheet  Range  Copy  Move  File  Print  Graph  Data  System  Quit
Format Label Erase Name Justify Prot Unprot Input Value Trans Search
```

Figure 1-25. *The 1-2-3 main menu and the /Range menu*

You can select a command from a menu in two ways:

- Highlight the command and press ENTER.
- Press the first character of the command.

For example, to select Range from the main menu, either move the menu pointer to Range and press ENTER or press the letter r.

When you select a command from a menu, one of three things happens, depending on the command:

- If the selected command has a menu, 1-2-3 displays that menu in the second line of the control panel. For example, the Range command has a menu, so when you select Range from the main menu, 1-2-3 displays the /Range menu in the second line of the control panel (Figure 1-26). You can now select a command from the /Range menu.

```
A:A1:                                                              MENU
Format  Label  Erase  Name  Justify  Prot  Unprot  Input  Value  Trans  Search
Fixed Sci Currency , General +/- Percent Date Text Hidden Other Reset
```

Figure 1-26. *The /Range menu*

- If 1-2-3 requires more information before it can complete the selected command, it displays a prompt for that information in the second line of the control panel. For example, if you select Unprot from the /Range menu, 1-2-3 prompts you for the range to unprotect (Figure 1-27). You can now specify the range.

```
A:A1:                                                              POINT
Enter range to unprotect: A:A1..A:A1
```

Figure 1-27. *The /Range Unprot prompt in the control panel*

- If 1-2-3 requires no further information to complete the selected command, it performs the command.

Use the following keys to display, move around, and remove the 1-2-3 menus:

Key	*Effect*
/ (slash) or < (less than symbol)	Displays the main menu in READY mode.
→ or space bar	Moves the menu pointer one command to the right. When you reach the last command, wraps the menu pointer around to the beginning of the menu.

(continued)

Key	*Effect*
←	Moves the menu pointer one command to the left. When you reach the first command, wraps the menu pointer around to the end of the menu.
BREAK	Leaves the menu and returns 1-2-3 to READY mode.
ENTER	Selects the highlighted command.
ESC	Returns to the previous menu.
HOME or **END**	Moves the menu pointer to the first or last command on the menu.
First character of a command	Selects the command on the menu that begins with that character.

Working with Ranges

A **range** is a rectangular block of adjacent cells. It can be a single cell, a row, a column, or several rows and columns. Figure 1-28 shows several examples of ranges, as well as an example of a group of cells that is not a range.

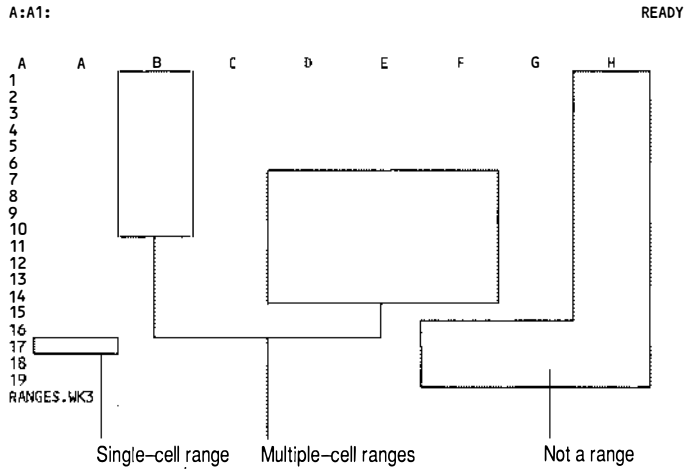


Figure 1-28. *Ranges*

A range can also be three-dimensional (span two or more worksheets) as long as the worksheets are contiguous and in the same file. "Specifying Three-Dimensional Ranges" later in this chapter contains more information on three-dimensional ranges.

You use ranges in commands and formulas to perform operations on more than one cell at the same time. To use a range in a command or formula, you need to identify, or **specify,** the range.

Specifying a Range in the Current File

You can specify a range in three ways:

- Type the range address.
- Use a range name.
- Highlight the range.

This section explains how to use these three methods to specify a range in the current file. The procedures for specifying ranges in other files are explained in "Working with Multiple Files" later in this chapter.

Typing a Range Address

You can specify a range by typing its address. A **range address** consists of the cell addresses of any two diagonally opposite corners of the range, separated by one or two periods. For example, to specify the range whose corner cells are B3, B9, D3, and D9, you could type b3..d9, b9.d3, d9..b3, or d3.b9. (The only situation in which you must use two periods in range addresses is if you configured 1-2-3 to use the period as the argument separator by selecting /Worksheet Global Default Other International Punctuation B or F.)

If the range is not in the current worksheet or is three-dimensional, you must precede the cell addresses with worksheet letters (for example, A:B3..C:D9) to identify the worksheet(s) the range occupies. Whenever a cell address is not preceded by a worksheet letter, 1-2-3 assumes the cell is in the current worksheet.

Using a Range Name

/Range Name Create and /Range Name Labels assign a name to a specified range, creating a **defined range name**. You can use defined range names in place of range addresses in commands and formulas. For example, if you want to move the

data in A54..B98 and you have assigned the name SALES to that range, you can specify SALES instead of A54..B98 as the range to move. You can also use SALES in any @function that takes a range as an argument, for example, @SUM(SALES).

To use a defined range name, you can either type it or select it from the range-name list 1-2-3 displays in the control panel. For some commands, 1-2-3 displays the range-name list automatically; for other commands and for formulas, you must use NAME to display the list, as described in "1-2-3 Function Keys" earlier in this chapter.

You can use a range name in formulas (but not in commands) before assigning the name to a range or after disassociating the name from a range with /Range Name Undefine. A range name not assigned to a range is called an **undefined range name**. When you use an undefined range name in a formula, 1-2-3 returns ERR as the formula's value until you use /Range Name Create or /Range Name Labels to assign the range name to a range.

Highlighting a Range

When 1-2-3 is in POINT mode, you can specify a range by highlighting it. To highlight a range, you must first **anchor** the cell pointer by moving it to a corner cell in the range and typing . (period) or : (colon). This cell is now the **anchor cell**.

NOTE Some commands that prompt you for ranges (such as /Copy, /Move, and /Range Format) automatically anchor the cell pointer in the current cell. To highlight a range that starts somewhere else, press ESC to unanchor the cell pointer, move the cell pointer to the appropriate cell, and anchor the cell pointer there.

Once the range you want to highlight is anchored, use the pointer-movement keys to move to the diagonally opposite corner of the range. The highlight expands to cover the range.

As you expand the highlight, 1-2-3 displays the address of the highlighted range in the second line of the control panel. When you have highlighted the entire range, press ENTER to complete the range specification.

Figure 1-29 shows an example of highlighting a range in the /Range Format command.

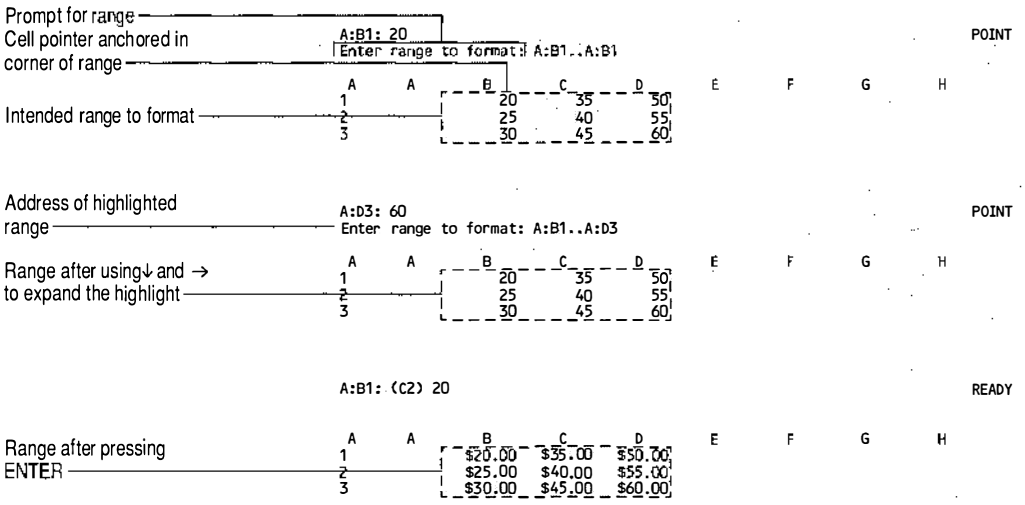


Figure 1-29. *Highlighting a range in the /Range Format command*

The following table lists the keys you can use to specify a range when 1-2-3 is in POINT mode.

Key	*Range unanchored*	*Range anchored*
. (period)	Makes the current cell the anchor cell.	Moves the anchor cell consecutively around the corners of the highlighted range.
: (colon)	Makes the current cell the anchor cell.	Moves the anchor cell to the last or first worksheet in a three-dimensional range.

(continued)

Key	*Range unanchored*	*Range anchored*
BACK-SPACE	Returns the cell pointer to wherever it was before 1-2-3 entered POINT mode.	Returns the cell pointer to wherever it was before 1-2-3 entered POINT mode and removes the anchor.
ESC	If you are using a command, returns you to the previous menu or prompt. If you are highlighting a range while creating a formula (as described in "Using Cell and Range References in Formulas" later in this chapter), returns 1-2-3 to VALUE or EDIT mode from POINT mode.	Shrinks the highlight to the anchor cell and removes the anchor.

Specifying Multiple Ranges

Most 1-2-3 commands and @functions that deal with ranges operate on only one range at a time. However, the following commands and @functions can operate on two or more ranges at the same time:

- /Print [E,F,P] Range
- /Data Query Input
- All database and statistical @functions (listed in "Types of @Functions" in Chapter 3)

To specify multiple ranges for these commands and @functions, list the ranges as follows: specify the first range in the list (using any of the methods described in the preceding section), type an argument separator (the semicolon is recommended), specify the next range, type another argument separator, specify the next range, and so on. Here are two examples of multiple-range lists:

```
A:A1..C:D4;EXPENSES;M22.K22
```

```
FIRST;SECOND;THIRD
```

Remembered Ranges

With some commands that operate on ranges, such as /Print [E,F,P] Range and /Data Fill, 1-2-3 remembers the range you specified the last time you used the command; it then prompts you with that range the next time you use the command. Press ENTER to accept the prompted range or press ESC or BACKSPACE to clear it and specify a different range.

Working with Formulas

A formula is an entry that performs a calculation using numbers, other formulas, or strings. The calculation can be a simple mathematical operation such as subtracting one number from another, or a more complicated operation such as determining the net present value of a series of future cash flows.

When you enter a formula in a cell, 1-2-3 displays the formula's result in the cell and the formula itself in the control panel. For example, if you enter the formula 25+5, 1-2-3 displays 30 in the cell and 25+5 in the control panel (Figure 1-30).

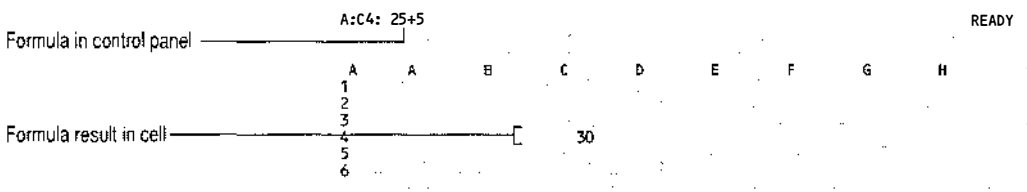


Figure 1-30. *Sample formula*

NOTE To display formulas in cells instead of their results, use /Range Format Text or /Worksheet Global Format Text.

You can use addresses and range names in formulas to include worksheet data in your calculations, as described in "Using Cell and Range References in Formulas" later in this section. For example, suppose you enter the formula +B2+C2 in cell C4. When B2 and C2 contain the values 25 and 5, the formula evaluates to 30. However, the result of the formula changes if you change the entry in either B2 or C2 (Figure 1-31).

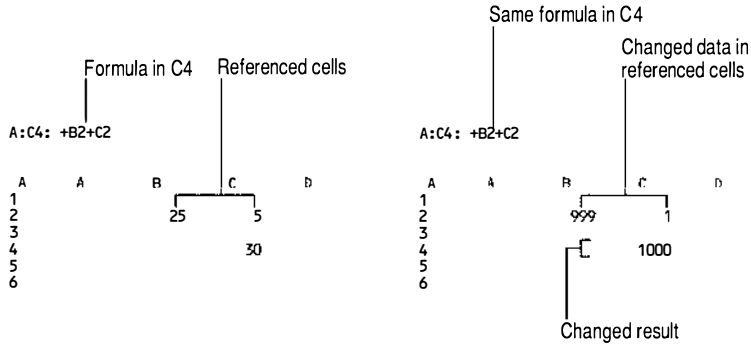


Figure 1-31. *Sample formula using cell addresses*

Types of Formulas

1-2-3 lets you enter three types of formulas: numeric, string, and logical.

- **Numeric formulas** perform calculations with numbers, using one or more of the **arithmetic operators** + – * / ^ and/or @functions. **@Functions** are built-in formulas in 1-2-3 that perform numeric, string, and logical calculations. Chapter 3 provides a complete description of the 1-2-3 @functions.

  Two examples of numeric formulas are 2*H16 and @SUM(H16..H32)/2. The formula 2*H16 returns a numeric value by multiplying the value in cell H16 by 2. The formula @SUM(H16..H32)/2 returns a numeric value by dividing the sum of the values in H16..H32 by 2.

  The number of decimal places 1-2-3 displays for a calculated value depends on the cell format. Regardless of how many decimal places 1-2-3 displays for the value, however, 1-2-3 calculates the value to a precision of 15 decimal places unless you use @ROUND to specify a different precision or unless the magnitude of the calculated value differs widely from one or more numbers used in the calculation.

NOTE When you enter a formula that looks like a fraction (for example 9/2 or 137/100), 1-2-3 enters the result (4.5, 1.37) rather than the formula. To keep the entry as a formula, enclose it in parentheses and begin the entry with a + (plus sign), for example, +(9/2). When you enter a formula that looks like a date in Date 1, Date 2, or Date 4 format (for example, 30-Nov-95, 30-Nov, or 11/30/95 when Date 4 format is configured as MM/DD/YY), 1-2-3 enters the corresponding date number rather than the formula. To identify the entry as a formula rather than a date, begin the entry with a plus sign or enclose it in parentheses.

- **String formulas** perform calculations with **literal strings** (text enclosed in quotation marks) and labels, using the **string operator** & (ampersand) and/or @functions.

  For example, when D4 contains the label PROFIT, the formula +"NET"&D4 returns NET PROFIT by concatenating (joining) the literal string "NET" with the contents of D4. The formula @LOWER(D4) returns "profit" by converting the contents of D4 to lowercase.

- **Logical formulas** are statements that return 1 if true and 0 if false. For example, the logical formula +A12>=500 returns 1 if cell A12 contains a value greater than or equal to 500. Otherwise, the formula returns 0. The logical formula @ISRANGE(PROFIT) returns 1 if PROFIT is a range name in the current file; otherwise, the formula returns 0. Logical formulas use the **logical operators** = < > <= >= <> #AND# #OR# and #NOT# and/or @functions.

Figure 1-32 shows examples of the three formula types. Columns A and D contain identical formulas, but column D has been formatted with /Range Format Text to display the formulas instead of their values.

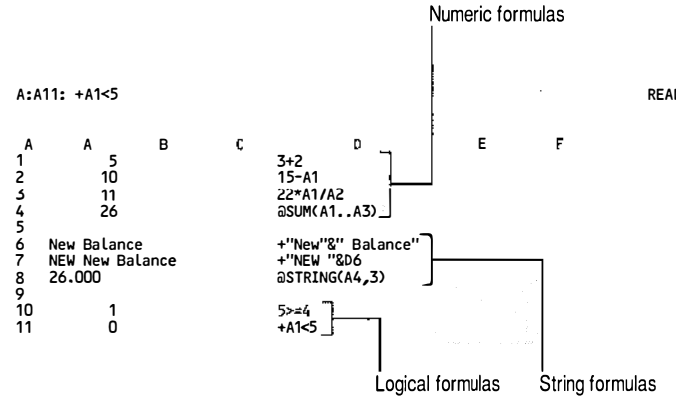


Figure 1-32. *Types of formulas*

Order of Precedence

The following table shows the arithmetic, string, and logical operators you can use in formulas and their order of precedence. **Precedence numbers** represent the order in which 1-2-3 performs operations in a formula. The lower the precedence number, the earlier 1-2-3 performs the operation. Operations with the same precedence number are performed sequentially from left to right.

Operator	*Operation*	*Precedence number*
^	Exponentiation	1
– +	Identification of value as negative or positive	2
* /	Multiplication and division	3
+ –	Addition and substraction	4
= < >	Equal-to and not-equal-to tests	5
< >	Less-than and greater-than tests	5
<=	Less-than-or-equal-to test	5
>=	Greater-than-or-equal-to test	5
#NOT#	Logical-NOT test	6

(continued)

Operator	*Operation*	*Precedence number*
#AND# #OR#	Logical-AND and logical-OR tests	7
&	String concatenation	7

Overriding Order of Precedence You can override the order of precedence by enclosing an operation in parentheses. 1-2-3 performs operations inside parentheses first. Within each set of parentheses, precedence numbers apply.

Figure 1-33 shows the order in which 1-2-3 performs the operations in a formula that contains nested parentheses.

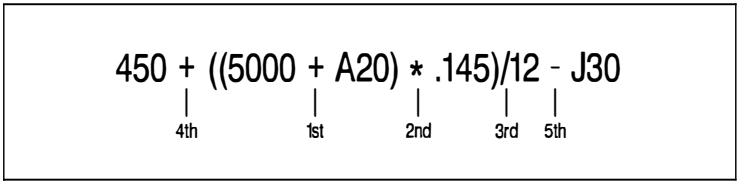


Figure 1-33. *Order of operations in a formula*

Entering Formulas

Use the following guidelines when entering a formula:

- A formula can begin with a number or one of the symbols + – @ . (or #. (The # symbol can be used only at the beginning of a logical formula.)
- When the first element in a formula is a cell address, range name, or file reference, begin the formula with + or – (or enclose the formula in parentheses). The following examples are all valid formulas.

  +B7/B8, –B7*B8, (SALES-EXPENSES)
  +<<BUDGET.WK3>>A:B7
- When a string formula starts with a literal string, begin the formula with + or enclose the formula in parentheses. For example, +"Ms. "&LAST and ("Ms. "&LAST) are both valid formulas.

- When a formula looks like a date in Date 1, Date 2, or Date 4 format, begin the formula with + (or enclose the formula in parentheses). Otherwise, 1-2-3 enters a date number instead of the formula. For example +30-NOV-95, +30-NOV, and (11/30/95) are valid formulas.
- A formula can contain up to 512 characters. (If you include multibyte characters in a formula, the character maximum will be less than 512.)
- A formula cannot contain spaces, except within literal strings in string formulas.
- To annotate a formula (include an explanatory note with the formula), type a ; (semicolon) immediately after the formula and then type the note. For example,

  @PV(YEARLY,RATE,20); present value of my annuity

  is an annotated formula. The annotation does not appear in the cell with the formula unless the cell is formatted as Text; it appears only in the control panel when the cell pointer is on the cell.

You can use the following types of data in a formula:

- Numbers, for example, 450, –92, 7.1E+12, date numbers, and time numbers
- Literal strings, for example, "Budget for " and "TOTAL"
- @Functions, for example, @SUM(A4..A8)
- Cell and range addresses, for example, B12, FF23..FH35, and A:B12

  NOTE To have 1-2-3 treat a single cell such as B12 as a range in a formula, use a range address rather than a cell address in the formula, for example, B12..B12, or precede the cell address with ! (exclamation point), for example, !B12.

- Range names, for example, JANSALES and BUDGET_90

  NOTE In certain situations, 1-2-3 returns ERR as a formula's value. Here are some of those situations:

- You use zero as a denominator in the formula.
- The formula contains an undefined range name.

- In a string formula, you refer to a cell that contains a numeric value.
- You use a file reference in the formula, and the specified file does not exist.
- The formula contains an ERR value. This happens, for example, when you move data into the first or last cell of a range whose address is used in a formula; 1-2-3 replaces the address with ERR.

Using Cell and Range References in Formulas

To perform calculations with worksheet data, you create formulas that refer to the cell or range that contains the data. Use any of the following methods to include a cell or range reference in a formula:

- Type the cell or range address in the formula.

  For example, to multiply the value in cell B1 by 100, you can type +b1*100. To add the values in E5..H7, you can type @sum(e5..h7).

  When a cell or range is in another worksheet or is three-dimensional, you must include worksheet letters in the address. For example, to enter in worksheet A a formula that adds the values in cells E5 through H7 in worksheets B through E, type @sum(b:e5..e:h7).

  When the cell or range is in another file, precede the address with a file reference. A **file reference** is a file specification enclosed in << >> (double angle brackets, created by typing two less-than symbols and two greater-than symbols). "Linking Files with Formulas" later in this chapter contains more information on using file references in formulas.

  NOTE If, after entering a formula that uses a range address, you assign a name to that range, 1-2-3 automatically replaces the address in the formula with the range name you assigned. For example, if you enter the formula @SUM(E5..H7) and later assign E5..H7 the name ALL_COSTS, 1-2-3 automatically changes @SUM(E5..H7) to @SUM(ALL_COSTS). Note that this automatic replacement occurs only for range addresses. For example, if you assign a range name to C10, 1-2-3 updates the formulas @AVG(C10..C10) and @AVG(!C10) but not the formula @AVG(C10).

- If the cell or range has a range name, type the range name in the formula, preceding the range name with a file reference if the named range is in another file.

  For example, if cells B1 and C1 are named INSTOCK and ONORDER, you can add the values in those cells by typing +instock+onorder.

  NOTE When a formula includes an undefined range name (a name not assigned to a range), 1-2-3 returns ERR as the formula's value. When you define the range name (assign it to a range with /Range Name Create or /Range Name Labels), 1-2-3 displays the formula's value.

- If the cell or range has a range name, use **NAME** to include the range name in the formula.

  For example, suppose C6..C12 has the range name SCORES and you want to find the largest value in that range using an @MAX formula. To include SCORES in the @MAX formula, type @MAX(, press **NAME**, and select SCORES from the range-name list 1-2-3 displays.

- Highlight the cell or range while typing the formula.

  If you press a pointer-movement key after typing an operator in a formula, for example, after typing + > & (or ;, 1-2-3 enters POINT mode. Highlight the cell or range you want to include in the formula and type the next operator (or press **ENTER** to complete the formula). The cell pointer returns to the cell in which you are entering the formula.

  For example, to create the formula +B1+D1 in B3, move the cell pointer to B3, type +, move the cell pointer to B1, type +, move the cell pointer to D1, and press **ENTER** to complete the formula (Figure 1-34). To create the formula @SUM(B1..D1), type @sum(and move the cell pointer to B1, type . (period) to anchor the cell pointer, highlight the range B1..D1, then type) and press **ENTER** to complete the formula.

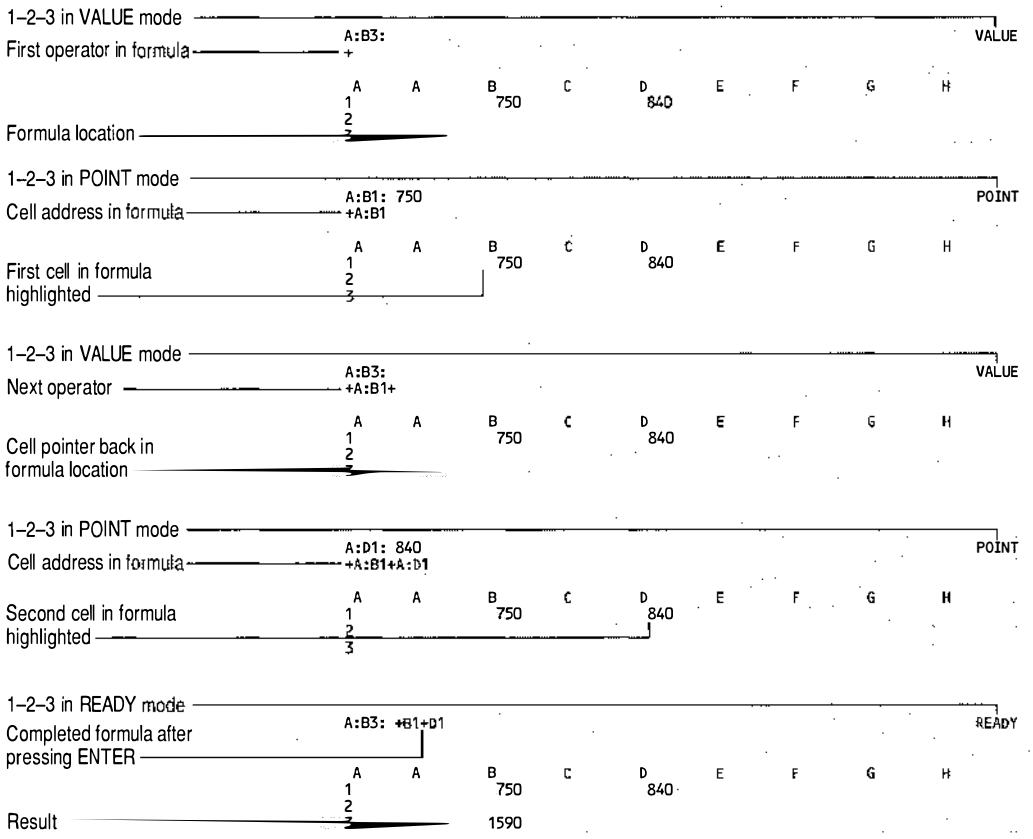


Figure 1-34. *Creating a formula by highlighting cells*

NOTE When creating or editing a formula, you can press NAME after typing a cell or range address or highlighting a cell or range. If the specified cell or range has a range name, 1-2-3 automatically substitutes the name for the address in the formula. If the specified cell or range has no range name, or if it has more than one range name, 1-2-3 displays a complete list of range names. Select a range name from the list to substitute for the address in the formula.

Editing Cell and Range References in Formulas

To change a cell or range reference in a formula you are editing, use BACKSPACE or DEL to delete the current reference and then do any of the following:

- Type the new cell or range reference.
- If you want to use a named range as the new reference, press NAME to display a list of named ranges in the control panel and select the appropriate name from the list.
- Highlight the new cell or range.

  To highlight a new cell or range while editing a formula, position the cursor on the operator that follows the deleted reference, such as +, &, or ;. (Note that after deleting the reference, this operator will be adjacent to the operator that immediately precedes the deleted reference.) Or, if the reference you deleted was at the end of the formula, position the cursor at the end of the formula, immediately after the operator that precedes the deleted reference. Then press ↑ or ↓ to enter POINT mode, highlight the new cell or range, and press ENTER to complete your edit.

  For example, to change the formula @SUM(D1..D8)*A5 to @SUM(A6..C18)*A5, press EDIT to enter EDIT mode and delete D1..D8 in the formula. The formula now reads @SUM()*A5. Move the cursor to the close parenthesis at the end of the @SUM formula and press ↓ to enter POINT mode. Highlight A6..C18 and press ENTER to complete your edit. The formula now includes the new range address.

Types of Cell and Range References

You can use three types of cell and range references in a formula: relative, absolute, and mixed. The type of reference you use determines what happens when you copy the formula with /Copy.

Relative References A **relative reference** is a cell or range reference that 1-2-3 interprets as a location relative to the current cell. The reference can be an address or range name. To create a relative reference in a formula, you simply type the address or range name, such as B1, A:D25..C:D30, or PROFITS.

When you use a relative reference in a formula, 1-2-3 uses the reference to determine the position of the specified cell or range relative to the cell that contains the formula. For example, when you enter the formula +B1+B2 in cell B4, 1-2-3 interprets the formula as "add the contents of the cell three rows above B4 to the contents of the cell two rows above B4." When you enter +B1+B2 in cell A1, 1-2-3 interprets the formula as "add the contents of the cell one column to the right of A1 to the contents of the cell one column to the right of and one row below A1."

When you copy a formula that contains a relative reference, 1-2-3 adjusts the reference in the copied formula. The cell or range in the copied formula occupies the same position relative to the copied formula that the cell or range in the original formula occupies relative to the original formula. For example, Figure 1-35 shows that when you copy the formula +B1+B2 from B4 to C4, 1-2-3 changes the formula in C4 to +C1+C2.

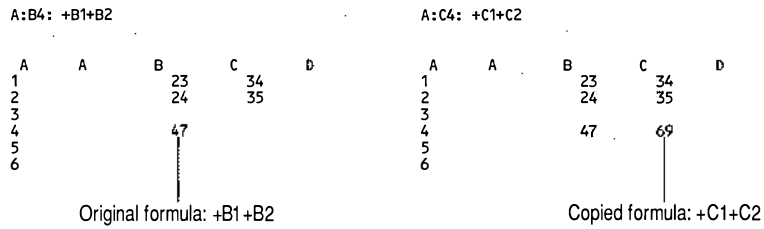


Figure 1-35. *Copying a formula with relative cell addresses*

Absolute References Sometimes when you copy a formula, you want 1-2-3 to keep the original cell or range reference in the copied formula. To do so, you use an **absolute reference**.

An absolute reference can be an address or range name. To create an absolute address, type a $ (dollar sign) in front of the worksheet letter, column letter, and row number of the address (for example, $A:$F$2 or $B:$A$5..$C:$B$10).

For example, suppose you are calculating the interest on a series of principal values, as shown in Figure 1-36. Cell F2 contains the interest rate and cells D5..D8 contain the principal values. To perform the calculations, you enter in F5 the formula +D5*$F$2 (to multiply the value in D5 by the interest rate in F2), then copy that formula to cells F6..F8. When you copy the

formula from F5 to cells F6..F8, 1-2-3 keeps the F2 reference in each formula but changes the D5 reference to D6, D7, and D8, respectively.

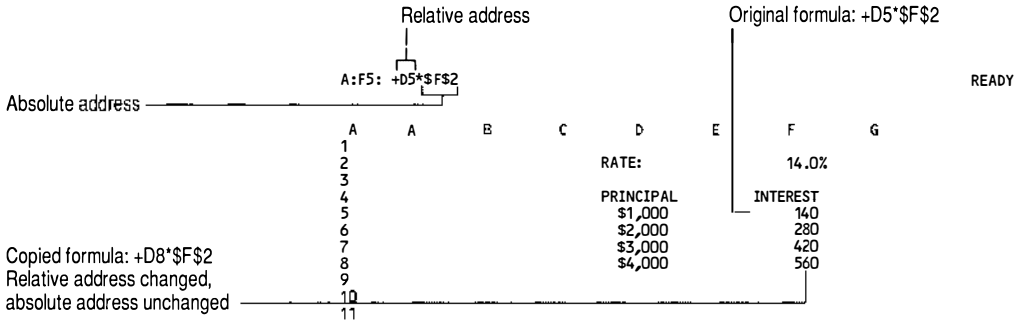


Figure 1-36. *Using an absolute reference in a formula*

To create an absolute range name, type a dollar sign in front of the range name, for example, $RATE.

Use absolute range names when you want to keep the original cell and range references in formulas that you copy to other files. When you copy a formula that contains an absolute range name to another file, 1-2-3 automatically adds the appropriate file reference in front of the range name. For example, suppose you enter the formula +$RATE*12 in file ONE.WK3 and then copy that formula to file TWO.WK3. The copied formula in TWO.WK3 will look something like this: +<<**/usr/worksheets/ONE.WK3**>>$RATE*12. (The exact file reference 1-2-3 creates depends on the directory that ONE.WK3 is in and your current file mode.)

1-2-3 adds file references to formulas you copy between files only when the formulas use absolute range names; it does not add file references to formulas that use absolute cell or range addresses. Therefore, if you are going to copy formulas between files, be sure to use range names rather than addresses for any absolute references in those formulas.

Mixed References At times, when you copy a formula that refers to a cell, you may want part of the cell address to stay the same in the copied formula and part of the address to change. For example, you may want the column letter to stay

the same but the row number to change. You do this by using a **mixed cell address** in the formula.

To create a mixed cell address, precede the worksheet letter, column letter, or row number in the address (or two of these, but not all three) with a $ (dollar sign), for example, A:$C4, $A:$C4, or A:C$4. In an abbreviated cell address (any address that does not include the worksheet letter), precede either the column letter or the row number with a dollar sign, for example, $C4 or C$4.

The table in Figure 1-37 (B7..E10) calculates a series of interest amounts depending on the principal value and interest rate. To create the table, you enter in cell B7 a formula containing two mixed references: +$A7*B$5.

$A7 refers to the principal value for the calculations in row 7 ($1,000). When you copy the formula from B7 to the rest of the table, the column letter, A, remains the same (all principal values are in column A), but the row number for the principal value changes depending on which row the formula is in.

B$5 refers to the interest rate for the calculations in column B (14.0%). When you copy the formula from B7 to the rest of the table, the column number for interest rate changes depending on which column the copied formula is in, but the row number, 5, remains the same (all interest rates are in row 5).

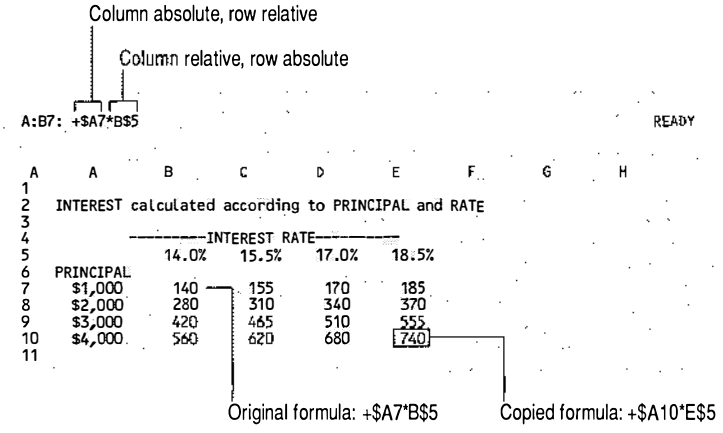


Figure 1-37. *Using mixed references in formulas to calculate a table*

Displaying Cell Addresses in Formulas Whether 1-2-3 displays the worksheet letter in a cell address in a formula depends on the address type (relative, absolute, or mixed) and on where you enter the formula.

- For a relative or absolute cell address that refers to the same worksheet in which you enter the formula, 1-2-3 does not display the worksheet letter in the address. For example, if you enter the formulas +A:B6 and +$A:$B$6 in worksheet A, 1-2-3 displays the formulas as +B6 and +$B$6, respectively. If you enter the same two formulas in any other worksheet, however, 1-2-3 displays them as A:B6 and $A:$B$6.

- For a mixed cell address that uses a relative worksheet letter that refers to the same worksheet in which you enter the formula, 1-2-3 does not display the worksheet letter. For example, if you enter the formula +A:$B6 in worksheet A, 1-2-3 displays the formula as +$B6. If you enter the same formula in any other worksheet, however, 1-2-3 displays it as +A:$B6.

- For a mixed cell address that uses an absolute worksheet letter, such as +$A:B6 or +$A:B$6, 1-2-3 always displays the worksheet letter in the address, regardless of where you enter the formula.

When you use an abbreviated cell address in a formula, 1-2-3 assumes that the address refers to the current worksheet. Whether 1-2-3 makes the worksheet reference relative or absolute depends on how you entered the abbreviated cell address.

- If you entered the abbreviated cell address as a relative or mixed reference, for example, +B6 or +$B6, 1-2-3 makes the worksheet reference relative.

- If you entered the abbreviated cell address as an absolute reference, such as $B$6, 1-2-3 makes the worksheet reference absolute.

Using ABS to Change Reference Type When entering or editing a formula, you press **ABS** when the cursor is on or immediately to the right of a cell address to change the reference type. If the address corresponds to a named range and 1-2-3 is in VALUE or EDIT mode, 1-2-3 replaces the address with the corresponding range name when you press **ABS**. You

can then press **ABS** again to change the range name from relative to absolute or vice versa. If the address does not correspond to a named range or 1-2-3 is in POINT mode, 1-2-3 cycles the address through the different reference types when you press **ABS**.

For example, the following table shows how pressing **ABS** changes the address A:C5 after you type +A:C5.

When screen shows this	*Press* **ABS** *to get this*
+A:C5	+$A:$C$5 (absolute address)
+$A:$C$5	+$A:C$5 (mixed address with absolute worksheet and row references)
+$A:C$5	+$A:$C5 (mixed address with absolute worksheet and column references)
+$A:$C5	+$A:C5 (mixed address with absolute worksheet reference)
+$A:C5	+A:$C$5 (mixed address with absolute column and row references)
+A:$C$5	+A:C$5 (mixed address with absolute row reference)
+A:C$5	+A:$C5 (mixed address with absolute column reference)
+A:$C5	+A:C5 (relative address)

When entering or editing a formula that contains a range name, press **ABS** with the cursor on or immediately to the right of the range name to change it from relative to absolute or vice versa.

Recalculating Your Formulas

Depending on the current /Worksheet Global Recalc setting, 1-2-3 uses one of two methods for recalculating (updating) your formulas when you change worksheet data they refer to.

NOTE These recalculation methods apply only to formulas that refer to data in active files. For information on how 1-2-3 recalculates formulas linked to files on disk, see "Linking Files with Formulas" later in this chapter.

- When /Worksheet Global Recalc is set to Automatic (the default), 1-2-3 immediately recalculates formulas whenever you change data they refer to since automatic recalculation occurs in the background, you can continue your work while it is happening.

  NOTE If, in a complex worksheet with many dependent formulas, you enter or edit a formula when recalculation is set to Automatic, the formula's result may not appear in the cell immediately. It will appear as soon as 1-2-3 completes the background recalculation.

  1-2-3 displays a red (or, for monochrome displays, white) CALC indicator in the status line whenever it is performing an automatic recalculation.

- When /Worksheet Global Recalc is set to Manual, 1-2-3 recalculates formulas only when you press CALC since manual recalculation occurs in the foreground, you must wait for 1-2-3 to complete it before continuing your work.

  With manual recalculation, 1-2-3 displays a blue (or, for monochrome displays, white reverse-video) CALC indicator in the status line whenever you change worksheet data, to remind you that some of your formulas may now need updating.

Whenever 1-2-3 performs a recalculation pass, it recalculates only those formulas that are affected by the changes in worksheet data; it skips over any formulas that are not affected by those changes. This technique, called **optimal recalculation,** can minimize recalculation time considerably, especially in large worksheets that contain many unrelated formulas.

Working with Files

To keep a permanent record of the work you do during a 1-2-3 session, you must **save** your worksheets (copy them from memory to worksheet files on disk). Unless you save your worksheets in worksheet files, your work is preserved only as long as the worksheets remain in memory.

Once you create a worksheet file (with /File Save, /File Xtract, or /File New), you can **read** the file (copy the file from disk into memory with /File Retrieve or /File Open) at any time. When you use these commands, 1-2-3 displays the file as it was when you last saved it .

A worksheet file in memory is called an **active file**. You can have more than one file in memory at one time, as explained in "Working with Multiple Files" later in this chapter. The active file that contains the cell pointer is called the **current file**.

In addition to creating worksheet files, you can create text, encoded, and graph files.

Text files, which you create with /Print File, store worksheet data in ASCII format.

Encoded files, which you create with /Print Encoded, store data, graphs, and special formatting characters using codes specific to your current printer. Encoded files contain all the formatting codes necessary to spool the encoded file to a printer and have it print your graph or data range correctly.

Graph files, which you create with /Graph Save, store 1-2-3 graphs for use with other programs. 1-2-3 can create graph files in two different formats: graphic metafile and picture file. Some graphics editors and publishing systems can import these files for further embellishment.

Along with worksheet, text, encoded, and graph files, 1-2-3 creates **temporary files** during processes such as printing. These files are automatically deleted when you select /Quit to end the 1-2-3 session. In most cases, 1-2-3 stores temporary files in memory, but occasionally it saves them on disk. To set the directory in which 1-2-3 saves temporary files on disk, use /Worksheet Global Default Temp.

When using /File Save or /File Xtract, if you specify the name of an existing file as the file to save or extract and then select Backup, 1-2-3 creates a **backup file** of the existing disk file instead of writing over the existing disk file with the file in memory.

Specifying a File

If you are running 1-2-3 on a network, it is likely that some users will be working exclusively in UNIX, others will be running both UNIX and MS-DOS, and still others will be running PC versions of 1-2-3 and transferring these worksheets to the network. Although a 1-2-3 worksheet file created on a PC is identical to one created on a UNIX system, the way PC users and UNIX users refer to files stored on the network will differ. From department to department, files will be named according to different conventions: UNIX mixed-case, DOS-style uppercase, or DOS-style lowercase.

UNIX versions of 1-2-3 let you decide which naming convention is most appropriate for your needs by offering three **file modes**—one for UNIX file-naming conventions and two for MS-DOS file-naming conventions (uppercase only and lowercase only).

Some of the reasons you may choose to use MS-DOS file-naming conventions include:

- If your department has important macro applications that are shared by users of MS-DOS and UNIX versions of 1-2-3, you can use MS-DOS file mode to preserve macro compatibility. For example, if an application developed on PC references a file called E:\MYFILE.WK3, you can define an environment variable **`DOS_E=/usr/worksheets`** and have the macro succeed in connecting the PC file reference E:\MYFILE.WK3 with the file stored in the UNIX directory **`/usr/worksheets`.**
- PC users connected to your network may use a communications program that converts all MS-DOS file names to uppercase or lowercase when transferring files to your system. If you run 1-2-3 in MS-DOS file mode, you can work with files named in this default case without having to worry about accidentally changing the case of these files and risking redundant versions.
- If PC 1-2-3 users require only occasional access to 1-2-3 on a UNIX system, they may feel more comfortable running 1-2-3 in a file mode with which they are most familiar —MS-DOS. Having both UNIX and MS-DOS file modes provides flexibility for a larger population of 1-2-3 users.

The features of UNIX file mode and MS-DOS file modes are discussed in detail in this "Working with Files" section. Here is a brief overview of what file modes mean and where you can learn more about them.

- **UNIX file mode** lets you specify any valid UNIX file path or file name whenever you retrieve, save, list, or reference files stored on your workstation or network. In UNIX mode, 1-2-3 displays all files conforming to UNIX filenaming standards regardless of case. See the sections "Specifying UNIX File Paths," "Specifying UNIX File Names," and "Specifying UNIX File Extensions" for more information on UNIX file mode.

- **MS-DOS file modes** (uppercase or lowercase) provide a file-naming convention that is compatible with the MS-DOS file system. While running 1-2-3, you can specify a file by a disk drive name like C:\summary.wk3 or D:\budget.wk1 and have 1-2-3 retrieve the file from the UNIX file system. MS-DOS file modes in 1-2-3 do not fully emulate the behavior and functions of an actual MS-DOS system, but they provide sufficient emulation to support macros referencing MS-DOS files and directories. See the sections "Using MS-DOS File Conventions" and "Specifying Uppercase and Lowercase MS-DOS Files" for more information on MS-DOS file modes.

  In DOS-upper mode, 1-2-3 will retrieve, save, or list only those files named in an MS-DOS style in uppercase. In DOS-lower mode, 1-2-3 will retrieve, save, or list only those files named in an MS-DOS style in lowercase.

  The MS-DOS disk drive specifications A-Z are translated into the UNIX file directories defined with the environment variables **`DOS_D=/dir/dir`**, **`DOS_E=/dir/dir`**, etc. For more information on defining environment variables for MS-DOS drive names, see "Specifying MS-DOS File Paths" later in this chapter.

  NOTE All file references (whether typed into a cell or retrieved in a file) are translated into the current file mode automatically. For example, in DOS-lower mode you may type the file reference C:\UPPER.WK3 and see the reference displayed in uppercase, but when 1-2-3 executes the file reference, it will search for the file **`upper.wk3`** (in lower case) on disk.

There are two different methods for specifying whether you want 1-2-3 to operate in UNIX file mode or in the MS-DOS file modes:

- The Lotus **setup123** utility enables you to select either UNIX, DOS-upper, or DOS-lower file mode. Once you have selected a file mode in **setup123** and saved the configuration file to disk, your subsequent sessions in 1-2-3 use this selected file mode as your default.
- You can override this default file mode with command-line options. The command-line option for file mode, which you specify when you start 1-2-3, defines the file mode to use for that session. To use UNIX file names for a session, use the **-f** [unix | dos] command-line option as follows:

  $ 123 -f unix runs 1-2-3 in UNIX file mode

  To use DOS file names for a session, you must also specify upper- or lowercase. You specify case with the **-c** [upper | lower] command-line option. For example, to specify that you want to work with DOS-upper file mode, use the **-f** and the **-c** command-line options as follows:

  $ 123 -f dos -c upper runs 1-2-3 in DOS-upper file mode

Using UNIX Files

When you use a 1-2-3 command that prompts you for a file, you must identify the file by specifying its file path, file name, and file extension.

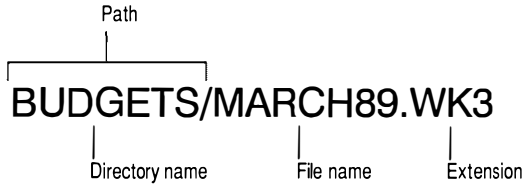


Figure 1-38. *A sample file specification*

Specifying UNIX File Paths

The **file path** or **directory name** tells 1-2-3 where to find the file in the UNIX file system. UNIX versions of 1-2-3 support the following conventions in specifying file paths:

- **Absolute file paths** must include each directory in the UNIX file system above the specified file.

```
/local/worksheets/updates/file.wk3
/local/worksheets.mine/file.wk3
```

- File paths are case-sensitive so 1-2-3 considers the following file paths as distinct:

```
/local/worksheets/file.WK3
/LOCAL/WORKSHEETS/file.WK3
```

- **Relative file paths** may include directory substitutions. Note that file path names relative to the current /File Dir or /Worksheet Global Default Dir will become invalid if you use /File Dir or /Worksheet Global Default Dir to change the current file directory. Relative file paths are not expanded to absolute file paths as in MS-DOS.

`../lotus/file name.wk3`	Matches a file in a subdirectory under the directory immediately above the current working directory.

NOTE The substitution character ~ (tilde) is not supported in the specification of UNIX file-path names in 1-2-3 because it conflicts with the 1-2-3 macro symbol for ENTER.

NOTE **Mounted file systems** are treated as local file paths by 1-2-3. If you are running 1-2-3 on a network supporting NFS, for example, you can refer to files stored on other workstations by specifying the correct file path.

Specifying UNIX File Names

When you run 1-2-3 in UNIX file mode, all file specifications conform to the following UNIX file naming conventions:

- 1-2-3 file names can consist of any valid UNIX file name, except those beginning with a . (period). If you attempt to reference a file name that begins with a period, 1-2-3 returns an error message.
- File names are **case-sensitive**. In UNIX file mode, 1-2-3 considers the following file names distinct:

```
FILE.WK3, file.wk3, file.WK3, FILE.wk3
```

- References to UNIX files can contain the following wild-card characters:

  ? Matches exactly one occurrence of any character:

  file?.wk3 matches **file6.wk3** and **file7.wk3,** but not **file.wk3**

  [az] Matches exactly one character from the set enclosed in braces:

  file[az].wk[13] matches **filea.wk3, filea.wk1, filez.wk3,** and **filez.wk1**

  [a-z] Matches any character in the delimited range:

  file[a-m].wk3 matches **filea.wk3, filem.wk3,** and **fileg.wk3,** but not **filen.wk3**

  * Matches any number of characters:
  ***.wk3** matches any file with a .wk3 extension
  file*7.wk3 matches **file007.wk3, file07.wk3,** and **filexy7.wk3**

- Wildcard characters can be included in file names by **escaping** or **quoting** them with a \ (backslash) character.

  file\?.wk3 matches **file?.wk3** but not **file7.wk3** or **filex.wk3**

Specifying UNIX File Extensions

When 1-2-3 creates a backup, encoded, graph, text, or worksheet file, it automatically adds a three-character extension to the file name to identify the file type. The following table lists the extensions 1-2-3 uses for the six types of files:

File type	*Extension*
Backup	.bak or .BAK
Encoded	.enc or .ENC
Graph	.cgm or .CGM, or .pic or .PIC, depending on current /Worksheet Global Default Graph setting
Temporary	.tmp or .TMP

(continued)

File type	*Extension*
Text	no default extension
Worksheet	.wk3 or .WK3

Except for backup files, you can override the extension 1-2-3 automatically uses for a file by typing an extension when you specify the file. The extension must begin with a . (period) and have from one to three characters.

Using MS-DOS File Conventions

MS-DOS file modes let you specify MS-DOS file paths and names while working in a UNIX version of 1-2-3. All files are stored in the UNIX file system; the MS-DOS file mode simply makes it easier for you to run macros with embedded MS-DOS file specifications and to develop macros for execution on MS-DOS or OS/2 personal computers.

Specifying Uppercase and Lowercase MS-DOS Files

When working with MS-DOS file names on your network, you may need to specify files in either uppercase or lowercase mode. Often communication and file transfer programs automatically translate MS-DOS names into uppercase names (for example, KERMIT) or lowercase names (such as PC-NFS). To provide flexibility in working with PC files on your network, 1-2-3 lets you specify file paths and file names in either uppercase or lowercase.

- In **DOS-upper mode**, all uppercase file paths and all uppercase files conforming to the MS-DOS 8.3 file-specification convention on your UNIX file system are available during your 1-2-3 session. This convention specifies up to eight characters for file names and up to three characters for file extensions. Any file that does not conform to the MS-DOS file specifications or uses lowercase letters is not available when you are running 1-2-3 in DOS-upper mode.

  In the following table, the first column shows the files on your disk, and the second column lists only those files available to you when you use DOS-upper mode. Note that `LONGLONGNAMES.WK3`, although uppercase, is not valid because the file name exceeds eight characters.

Files on disk	*Valid DOS-upper files*
`/local/macros.wk1`	
`/LOCAL/MACROS.WK1`	`U:\LOCAL\MACROS.WK1`
`budget.wk3`	
`BUDGET.WK3`	`BUDGET.WK3`
`BuDgEt.Wk3`	
`LONGLONGNAMES.WK3`	

Any macros or file links referring to uppercase or lowercase MS-DOS file names are automatically converted to uppercase file paths and names. This preserves case-insensitivity in macros created on personal computers.

- In **DOS-lower mode**, all lowercase file paths and all lowercase files conforming to the MS-DOS 8.3 file specification convention on your UNIX file system are available to your 1-2-3 session. Any file that does not conform to the MS-DOS file specifications or uses uppercase letters is not available when you run 1-2-3 in DOS-lower mode.

  In the following table, the first column shows the files on disk, and the second column lists only those files available to you when you use DOS-lower mode.

Files on disk	*Valid DOS-lower files*
`/local/macros.wk1`	`u:\local\macros.wk1`
`/LOCAL/MACROS.WK1`	
`budget.wk3`	`budget.wk3`
`BUDGET.WK3`	
`BuDgEt.Wk3`	
`LONGLONGNAMES.WK3`	

Any macros or file links referring to uppercase or lowercase MS-DOS file names are converted to lowercase file paths and names. This preserves case-insensitivity in macros created on personal computers.

Directories and file names that consist of mixed uppercase and lowercase characters or invalid conventions for MS-DOS will not be available to your 1-2-3 session in either DOS-upper or DOS-lower mode.

Specifying MS-DOS File Paths

File paths in MS-DOS consist of a **drive name** (A-Z) and optional **directory names**.

Because the UNIX file system does not support disk drive names in the style MS-DOS expects, UNIX versions of 1-2-3 substitute a UNIX path name for an equivalent MS-DOS drive name. To associate an MS-DOS drive name for a UNIX file path, use the following guidelines:

- A drive name always consists of a single letter followed by a colon, for example, D: or E:.
- Define UNIX environment variables for drive names with the following syntax for the Bourne shell and C shell:

  Bourne shell

`DOS_D=/path1`	`D:\FILE.WK3` matches `/path1/FILE.WK3`
`DOS_E=/path2`	`E:\FILE.WK3` matches `/path2/FILE.WK3`
`DOS_W=/path3`	`W:\FILE.WK3` matches `/path3/FILE.WK3`
`EXPORT DOS_`*`n`*	Exports the shell variable where n is D, E, ... or W

  C shell

`setenv DOS_D /path1`	`D:\FILE.WK3` matches `/path1/FILE.WK3`
`setenv DOS_E /path2`	`E:\FILE.WK3` matches `/path2/FILE.WK3`
`setenv DOS_W /path3`	`W:\FILE.WK3` matches `/path3/FILE.WK3`

- 1-2-3 reserves the MS-DOS drive letters C:\ and U:\.
  `DOS_C=`*`home directory`*
  `DOS_U=`*`root`*

1-2-3 automatically translates the \ (backslash) delimiters in the directory names to the equivalent UNIX / (slash). If you have defined the drive name D:\ to be equivalent to the UNIX directory `/local/worksheets/new`, then the MS-DOS file path `D:\accts90\filename.wk3` specifies a subdirectory named `accts90` under the UNIX path `/local/worksheets/new`. 1-2-3 first expands the environment variable associated with the drive letter and then appends the name of the

worksheet file. In specifying MS-DOS directory names, note that a \ (backslash) or / (slash) must separate the directory name from both the drive name and the file name.

Specifying MS-DOS File Names

You can use any valid MS-DOS file name in UNIX versions of 1-2-3. Every file in a directory has a unique name that you assign when you first create the file. When assigning MS-DOS file names, observe the following guidelines:

- You can use any combination of letters, numbers, _ (underscores), and - (hyphens) in file names.
- Although UNIX versions of 1-2-3 allow file names of more than eight characters, you will not be able to save worksheets with these long names on systems that support fewer characters. In MS-DOS file mode, 1-2-3 automatically truncates file names longer than eight characters.

Specifying MS-DOS File Extensions

When 1-2-3 creates a backup, encoded, graph, text, or worksheet file, it automatically adds a three-character extension to the file name to identify the file type. The following table lists the extensions 1-2-3 uses for the six types of files:

File type	*Extension*
Backup	.bak or .BAK
Encoded	.enc or .ENC
Graph	.cgm or .CGM, .pic or .PIC, depending on current /Worksheet Global Default Graph setting
Text	no default extension
Worksheet	.wk3 or .WK3

Except for backup and temporary files, you can override the extension 1-2-3 automatically uses for a file by typing an extension when you specify the file. The extension must begin with a . (period) and have from one to three characters.

Using Wildcard Characters in File Names and Extensions

When you run 1-2-3 in MS-DOS file mode, you can generate a list of files with similar names or extensions by including the wildcard characters * and ? in your response to the prompt. For example, to have 1-2-3 list any file names that begin with the characters MARCH8 (such as MARCH8.WK3, MARCH88.WK3, and MARCH89.WK3), enter MARCH8* at the file-name prompt.

The * (asterisk) wildcard character represents any number of consecutive characters in a file name or extension. For example, to have 1-2-3 list all files with the extension .WK3, enter *.WK3 at the file-name prompt. To have 1-2-3 list all files that begin with B and have the extension .CGM, enter B*.CGM.

The ? (question mark) wildcard character represents any single character in a file name or extension. For example, to have 1-2-3 list all files with a three-character extension that begins with .W, enter *.W?? at the file-name prompt.

Protecting Worksheet Files

To protect a file you create, you can do any combination of the following:

- Limit access to the file by saving it with a password with /File Save or /File Xtract.
- Prevent changes to the file's worksheet and reservation settings with /File Admin Seal.
- Prevent changes to individual worksheets in the file by protecting the worksheets with /Worksheet Global Prot.
- When the file is on a network, get a reservation for the file to prevent others from changing the file while you are working with it.
- Using the UNIX command *chmod*, you can restrict file permissions on a worksheet if you are its owner. See your UNIX user documentation for more information on the use of this command.

Using Multiple-Sheet Files

A worksheet file can contain from 1 to 256 worksheets. If you are working with a small amount of data, you may choose to store the data in a single-sheet file. In many cases, however, you will find it easier and more practical to create multiple-sheet files for your data. Multiple-sheet files have the following advantages over single-sheet files:

- Multiple-sheet files give you more flexibility in organizing and formatting your data.

  For example, suppose you are creating a loan-evaluation application that includes an input area for the loan variables, an area for the application's formulas, an output area for printing, and an area for macros. In a single-sheet file, all four areas are situated in the same worksheet and are controlled by the same worksheet settings. In a multiple-sheet file, you can put the four areas in four different worksheets and assign each worksheet the settings that are most appropriate (Figure 1-39).

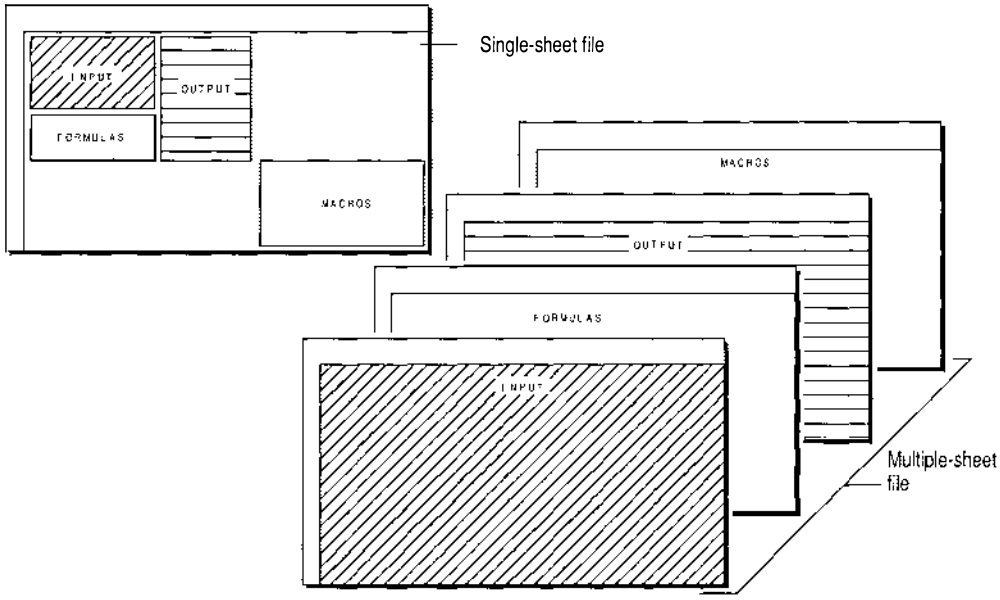


Figure 1-39. *Multiple-sheet files provide flexibility in data organization*

- Multiple-sheet files provide greater protection for your data.

  For example, in the loan-evaluation scenario described above, when the input, formulas, output, and macro areas are all in the same worksheet, any formatting changes you make to one area (inserting or deleting rows or columns, or changing column widths, for instance) may damage the data in another area. In a multiple-sheet file, placing the input, formulas, output, and macro areas in separate worksheets protects each area from formatting changes in other areas.

- Multiple-sheet files give you faster, easier access to data.

  For example, suppose you have four sets of sales and inventory data, one for each quarter of the year. Instead of creating separate files for the four sets of data, you can store the data in a single file, with each set of data in a different worksheet (Figure 1-40).

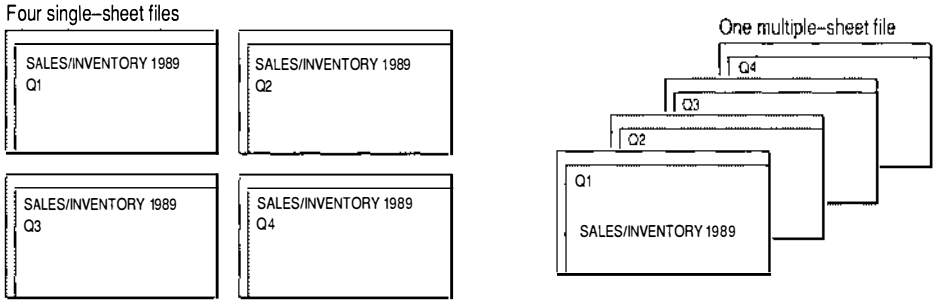


Figure 1-40. *Multiple-sheet files give you fast and easy access to data*

- Multiple-sheet files let you use @functions to perform consolidations and other types of calculations on data in a series of worksheets.

  For example, suppose your company includes several divisions. You are responsible for collecting and consolidating the financial data for all divisions. You can create a multiple-sheet file with a worksheet for each of the divisions and, in a cover worksheet, enter @SUM formulas to perform the consolidations (Figure 1-41).

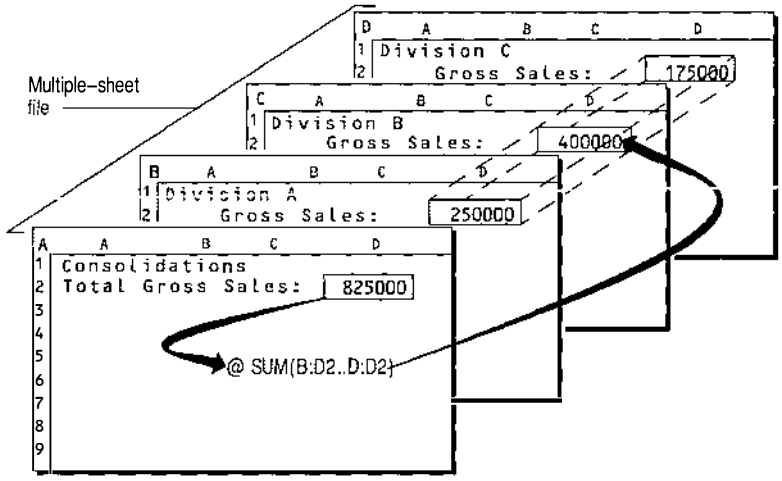


Figure 1-41. *Using @SUM to consolidate data in a multiple-sheet file*

Creating Multiple-Sheet Files

A file can contain as many as 256 worksheets, providing your system has sufficient memory. 1-2-3 assigns each worksheet in the file a letter from A (for the first worksheet) to IV (for the 256th worksheet).

To create a multiple-sheet file, use /Worksheet Insert Sheet to insert additional worksheets in memory and then use /File Save to save the entire set of worksheets together as a single file.

Moving Around Multiple-Sheet Files

The following pointer-movement keys move the cell pointer between worksheets. In most cases, cell-pointer movement stops at the end of the current file.

Key	*Effect*
END NEXT SHEET	Moves the cell pointer back through worksheets in the current file. Staying in the same row and column, the cell pointer moves back to the next cell that contains data and adjoins a blank cell either in front of or behind it. For example, **END NEXT SHEET** moves the cell pointer from A:F5 to D:F5 if B:F5 and C:F5 are blank and D:F5 contains data. Cell-pointer movement stops at the last worksheet in the current file.
END PREV SHEET	Moves the cell pointer forward through worksheets in the current file. Staying in the same row and column, the cell pointer moves forward to the next cell that contains data and adjoins a blank cell either in front of or behind it. For example, **END PREV SHEET** moves the cell pointer from F:A1 to D:A1 if E:A1 is blank and D:A1 contains data. Cell-pointer movement stops at the first worksheet in the current file.
FIRST CELL	Moves the cell pointer to cell A:A1 in the current file unless worksheet A is hidden, column A in the worksheet is hidden, or titles are set for the worksheet.
LAST CELL	Moves the cell pointer to the lower right corner of the current file's active area (the three-dimensional area between cell A:A1, the lowest and rightmost nonblank cells in the file, and the last nonblank worksheet in the file). For example, in a five-sheet file, suppose B:D200 is the lowest nonblank cell, C:AK200 is the rightmost nonblank cell, worksheet D contains data, and worksheet E is blank. In that file, **LAST CELL** moves the cell pointer to D:AK200.

(continued)

Key	*Effect*
NEXT SHEET	Moves the cell pointer to the next worksheet, for example, from worksheet A to worksheet B, or from the last worksheet in one file to the first worksheet in the next file. If GROUP mode (described later in this section) is on or if you are using perspective view with synchronized windows (select /Worksheet Window Perspective and Sync), the cell pointer goes to the same cell it was in in the worksheet you moved from. Otherwise, it goes to the cell you last highlighted in the worksheet you move to.
PREV SHEET	Moves the cell pointer to the previous worksheet, for example, from worksheet B to worksheet A, or from the first worksheet in one file to the last worksheet in the previous file. If GROUP mode is on or if you are using perspective view with synchronized windows, the cell pointer goes to the same cell it was in in the worksheet you moved from. Otherwise, it goes to the cell you last highlighted in the worksheet you move to.

Specifying Three-Dimensional Ranges

When you are working with multiple-sheet files, you can specify three-dimensional ranges in commands and formulas. A **three-dimensional range** is a range that spans two or more consecutive worksheets in the same file. (Note that the worksheets must be in the same file; a three-dimensional range cannot span files.)

For example, suppose you are setting up a multiple-sheet file for monthly business expenses, as shown in Figure 1-42. Instead of entering the column headings in all three worksheets, you can enter the headings in worksheet A and then use /Copy to copy those headings to worksheets B and C. To copy the headings from worksheet A to worksheets B and C, you specify a three-dimensional copy TO range.

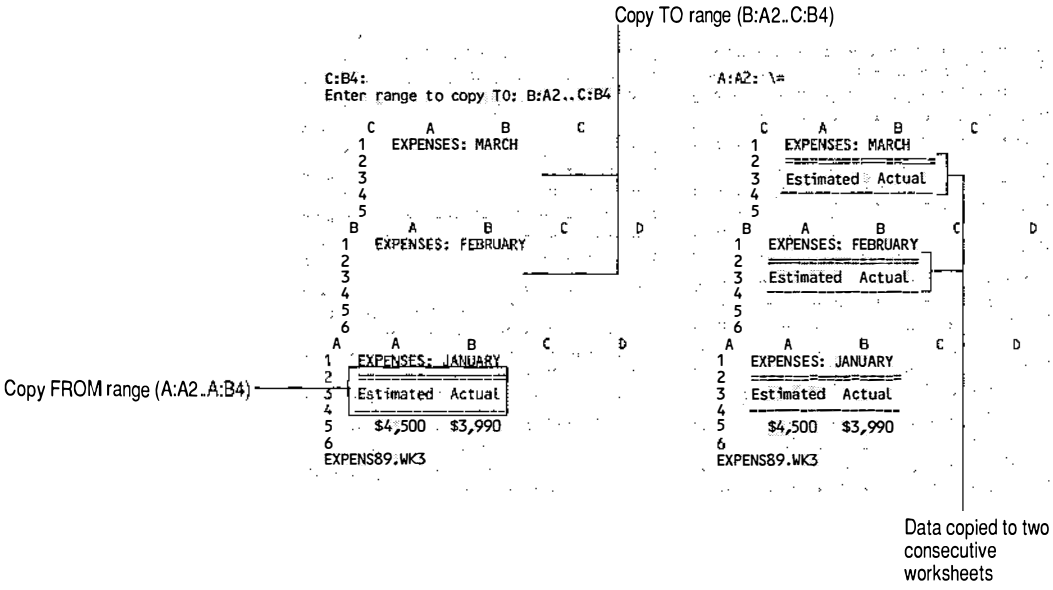


Figure 1-42. *Using a three-dimensional range in /Copy*

Use the following guidelines when specifying three-dimensional ranges:

- When specifying a three-dimensional range by typing its address, use full cell addresses. For example, to specify the range that includes cells A2..B4 in worksheets B and C, type B:A2..C:B4.

  If you use an abbreviated cell address when specifying a range, 1-2-3 assumes the cell is in the current worksheet. For example, if the cell pointer is in worksheet B and you type B:A2..B4 to specify a range, 1-2-3 interprets the address as B:A2..B:B4. If you type the same abbreviated address when the cell pointer is in worksheet C, 1-2-3 interprets the address as B:A2..C:B4.

- When specifying a three-dimensional range by highlighting, anchor the cell pointer in one corner of the range (the upper left corner in the first worksheet of the range, for example) and use the pointer-movement keys to move to the diagonally opposite corner of the range. For example, to specify the range B:A2..C:B4, anchor the cell pointer in B:A2 and move to C:B4.

Using GROUP Mode for a File

You can group all the worksheets in a file together by turning on GROUP mode for the file. When you turn on GROUP mode (with /Worksheet Global Group Enable), 1-2-3 assigns the current worksheet's cell formats and settings to all worksheets in the current file and, as you move between worksheets in the file, keeps the cell pointer in the same cell in each worksheet. In addition, until you turn off GROUP mode (with /Worksheet Global Group Disable), changes you make to one worksheet with any of the following commands affect every worksheet in the file: /Range Format, Label, Prot, and Unprot; /Worksheet Column; /Worksheet Delete Column or Row; /Worksheet Global Col-Width, Format, Label, Prot, or Zero; /Worksheet Insert Column or Row; and /Worksheet Page and Titles.

Use GROUP mode when you want all the worksheets in a file to look the same. For example, suppose you are setting up the multiple-sheet file shown in Figure 1-43, where each worksheet in the file contains expense figures for a different month. You can format one worksheet in the file and then, with the cell pointer in that worksheet, select /Worksheet Global Group Enable to format the remaining worksheets identically.

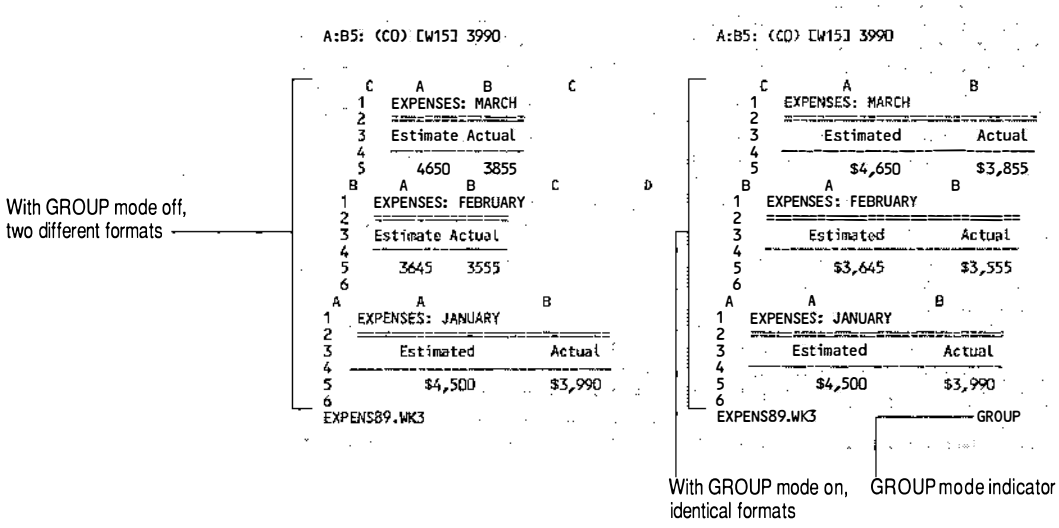


Figure 1-43. *A multiple-sheet file before and after turning on GROUP mode*

Working with Multiple Files

In 1-2-3, two or more files can be active at the same time. Reasons for using more than one active file include the following:

- To simplify the process of combining files or of working with data in more than one file.
- To run a macro located in one file while working in another file.
- To view a graph created in one file when the graph is based on data in other files.
- To specify a range in another file by highlighting it.
- To create a formula that refers to data in other files, or **link** files. When the files that contain the data you want the formula to refer to are active, you can build the formula either by highlighting the data in those files or by using **NAME** to specify named ranges in those files. The next section, "Linking Files with Formulas," explains both of these procedures.

To read multiple files into memory, use /File Open.

Moving Between Active Files

To move between active files, use the following keys:

Key	*Effect*
FIRST FILE	Moves the cell pointer to the cell you last highlighted in the first active file.
LAST FILE	Moves the cell pointer to the cell you last highlighted in the last active file.
NEXT FILE	Moves the cell pointer to the cell you last highlighted in the next active file.
PREV FILE	Moves the cell pointer to the cell you last highlighted in the previous active file.

Worksheet Settings for Files

Most worksheet settings you create when working within a file apply to that file only. 1-2-3 retains those settings for the file, regardless of how many other files are active. Worksheet settings that apply to individual files include the following:

- Range names. Although only one range per file can have a particular name, you can assign the same range name to ranges in any number of files. To refer to named ranges in other files, you use a file reference, as explained in the next section, "Specifying Cells and Ranges in Other Files."
- Current graph and print settings you establish with Graph and Print commands. For example, suppose you use /Graph X, /Graph A — F, and /Graph Options Titles to set the graph data ranges and titles while working in file A, then move the cell pointer to file B and set different graph data ranges and titles. When you are in file A, 1-2-3 uses the first set of data ranges and titles for the current graph. When you are in file B, 1-2-3 uses the second set of data ranges and titles for the current graph.
- Graph and print settings names you create with /Graph Name and /Print [E,F,P] Options Name. While each graph or print settings name must be unique in any given file, you can use the same name for graphs and print settings in any number of files.
- Settings you establish with all Worksheet Global commands except /Worksheet Global Default.

  NOTE /Worksheet Global Recalc changes the way 1-2-3 recalculates all active files, but 1-2-3 saves the new recalculation settings only with the file that is current when you use the command. The recalculation settings for the other active files do not change.

- Window settings you create with Worksheet Window commands.

  While the Worksheet Window commands change the window display for all active files, 1-2-3 saves the new window settings only with the file that is current when you create them. The window settings for the other active files do not change.

Specifying Cells and Ranges in Other Files

With any 1-2-3 command or formula that uses cell or range specifications, the cells or ranges you specify can be in files other than the current file. For example, with /Copy, the copy FROM and copy TO ranges can be in other files. With @SUM, the ranges of values to sum can be in other files.

To specify a cell or range in another file, you can use any of the methods described in "Specifying a Range in the Current File" earlier in this chapter — typing the address, using the range name (either by typing it or by selecting it from a range-name list), or highlighting the range — with the following additional guidelines:

- To specify a cell or range in another file by typing its address, precede the address with a file reference. A **file reference** is a file specification enclosed in << >> (double angle brackets, created by typing two less-than symbols and two greater-than symbols). For example, <<CHECKBK.WK3>>B3..D9 specifies range B3..D9 in file CHECKBK.WK3.

  When the file you are referring to is in the current file directory, you need to include only the file's name and extension in the file reference. Otherwise, you must include the file's path as well as its name and extension in a reference like <</usr/files/worksheets/CHECKBK.WK3>>.

  To specify cells and ranges in worksheets you have not yet saved in a file, use the **noname file reference** <<>> (double angle brackets with no spaces between them). For example, <<>>A:C4..B:E5 refers to C4..E5 in your first two unsaved worksheets.

- To specify a range in another file by typing its range name, precede the name with a file reference as described above. For example, <<BUDGET89.WK3>>JANSALES specifies range JANSALES in file BUDGET89.WK3.

  When a range name is unique among active files, you can also specify the named range using the wildcard file reference. The **wildcard file reference** is a ? (question mark) enclosed in << >> (double angle brackets); when you use it in front of a range name, 1-2-3 searches all active files for the named range. For example, <<?>>JANSALES tells 1-2-3 to search all active files for a range named JANSALES.

- To specify a named range by selecting its name from a range-name list, first select the file name that contains the named range. (1-2-3 includes the names of active files in all range-name lists.) 1-2-3 now displays a list of range names in the selected file; select the range name from this list. When you use this method to specify a range in another file, 1-2-3 automatically adds the appropriate file reference (including the path) to the range specification.
- When the file containing the specified cell or range is active, you can specify the range by highlighting it. When you use this method to specify a cell or range in another file, 1-2-3 automatically adds the appropriate file reference (including the path) to the cell or range specification.

NOTE Cells and ranges you specify for formulas can be in any file, active or on disk, as explained in the next section, "Linking Files with Formulas." For most 1-2-3 commands that require range specifications, however, the file containing the specified range must be active. Except when a command description in Chapter 2 explicitly says that a range you specify for that command can be in a file on disk, you should assume the range must be in an active file.

Linking Files with Formulas

A 1-2-3 formula can refer to data in any worksheet file. When you enter a formula in one file that refers to data in another file, you create a **link** between the two files. The way you enter the formula and the way 1-2-3 recalculates the formula depend on whether the file you are linking to (the file that contains the referenced data) is on disk or is active.

Linking to a File on Disk

When the data you want to refer to is in a file on disk, you must type a file reference in front of the cell or range address or range name in the formula. For example, in the formula @SUM(<<BUDGET89.WK3>>TRAVEL), <<BUDGET89.WK3>> is a file reference; it tells 1-2-3 that range TRAVEL is in the file named BUDGET.WK3 in the current directory.

Unless the file you are linking to is in your current directory, include the file's path as well as its name and extension in the reference. Suppose BUDGET89.WK3 in the preceding example is in **/usr/files/worksheets** but your current working directory is **/usr/files/templates.** To create a link to BUDGET89.WK3, you must enter the formula **@SUM(<</usr/files/worksheets/BUDGET89.WK3>>TRAVEL).**

NOTE You may want to include a file specification in the file reference even when the file you are linking to is in your current directory. This ensures that the link to that particular file will work even if you change your current directory. On the other hand, if you want the link to work regardless of what the current directory is (for example, if you will be sharing the file with others and want the link to work for a file in each of their current directories), you should not include a path in the file reference.

NOTE You cannot link a worksheet formula to a password-protected file on disk because a correct password must be entered before any data can be extracted from the file.

Linking to an Active File

When the data you want to refer to is in an active file, you can create the link in any of the following ways:

- Type the file reference in the formula as described in "Linking to a File on Disk" above. Unless the file is in the current directory, be sure to include the path in the file reference.
- Enter **POINT** mode and use the pointer-movement keys to highlight the cell or range you are referring to. When you use this method to specify the cell or range, 1-2-3 automatically inserts the corresponding file reference, including the path, in the formula.
- If the data is in a named range, use **NAME** to specify the range name.

  For example, in Figure 1-44, cell D2 in both DIV_1.WK3 and DIV_2.WK3 has the range name SALES and contains a division sales figure. Suppose you want to total the two division sales figures in the summary file, TOTALS.WK3. You can do so as follows: with the cell pointer in TOTALS.WK3, type +, press **NAME**, specify the file name

DIV_1.WK3 (displayed in the control panel as <<DIV_1.WK3>>), and then specify the range name SALES. Type another + and use NAME again to specify the range name SALES in DIV_2.WK3, and then press ENTER to complete the formula. The sum of the two sales figures ($340,000) appears in the summary file.

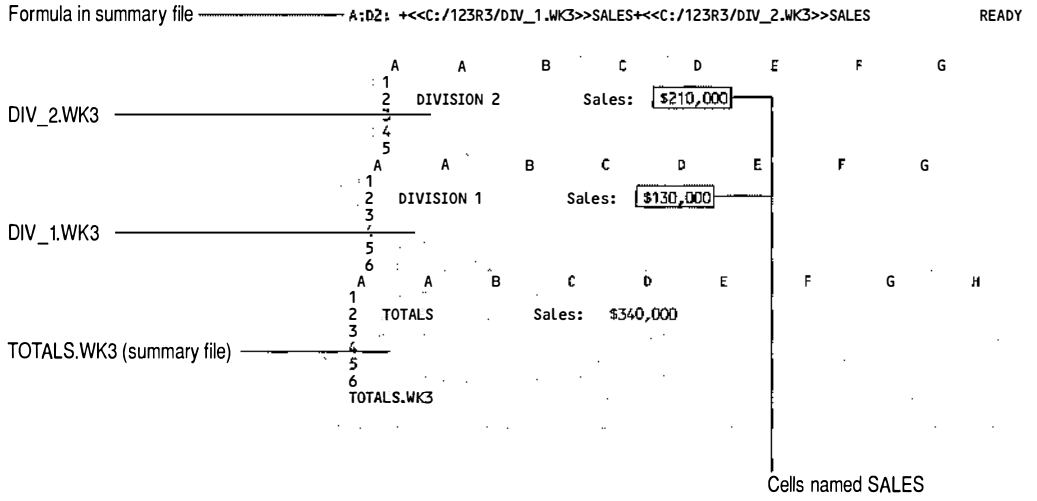


Figure 1-44. *Using NAME to create a formula that links active files*

As with highlighting, when you use NAME to specify a range in another active file, 1-2-3 automatically inserts the corresponding file reference, including the path, in the formula.

- If the data is in a named range and only one active file contains a range with that name, you can use the <<?>> wildcard file reference in the formula. For example, when only one active file contains a range named TRAVEL, you can create a link to that file with a formula such as +<<?>>TRAVEL/12.

  NOTE If you use a wildcard file reference in a formula and then delete the range name to which the formula refers, 1-2-3 treats the range name as an undefined range name and returns ERR as the formula's value.

You can also create formulas that refer to data in worksheets you have not yet saved in a file. To create such a formula, precede the cell or range reference with the noname file reference <<>> (double angle brackets with no spaces between them). For example, the formula +<<>>A:A4*100 multiplies by 100 the value in cell A4 of your first unsaved worksheet. (Note that if you then save this worksheet in a file or delete it from memory, the noname file reference becomes invalid and the formula evaluates to ERR.)

Recalculating Linked Formulas

How 1-2-3 updates formulas in active files that link to data in other files depends on whether the other files (the "linked files") are on disk or are active.

- If the linked files are on disk, 1-2-3 updates the formulas whenever you select /File Admin Link-Refresh or whenever you read the linked files into memory. (In either case, you must press CALC to complete the recalculation if worksheet recalculation is set to Manual.)

  NOTE Whenever you read a file into memory, you must use /File Admin Link-Refresh to update any formulas in the file that link to files on disk.

- If the linked files are active, 1-2-3 updates the formulas whenever you change the referenced data or whenever you use /File Admin Link-Refresh.

If a file to which a formula refers does not exist when you create the formula, or if you subsequently erase the referenced file on disk, 1-2-3 keeps the file reference in the formula and returns ERR as the formula's value.

Using the 1-2-3 Help System

1-2-3 provides a series of Help screens that help you use 1-2-3. You can view these screens at any time during a 1-2-3 session by pressing HELP. The 1-2-3 Help system is context-sensitive, which means that when you press HELP, the screen 1-2-3 displays directly relates to what you are currently doing in 1-2-3. For example,

- If you press / (slash) to display the main menu and then press **HELP**, 1-2-3 displays a Help screen with information about 1-2-3 menus (see Figure 1-45 below).
- If you are in the middle of a command and press **HELP**, 1-2-3 displays the Help screen for that command.
- If you type @ and press **HELP**, 1-2-3 displays the Help @Function Index. If you type an @function name followed by an open parenthesis — for example, @SUM(— and press **HELP**, 1-2-3 displays the Help screen that describes the @function whose name you typed.
- If you type { and press **HELP**, 1-2-3 displays the Help Macro Command Index. If you type { followed by an advanced macro command keyword — for example, {BRANCH — and press **HELP**, 1-2-3 displays the Help screen that describes the advanced macro command whose keyword you typed.
- If you press **HELP** while 1-2-3 is displaying an error message, 1-2-3 displays the Help screen related to that error message.

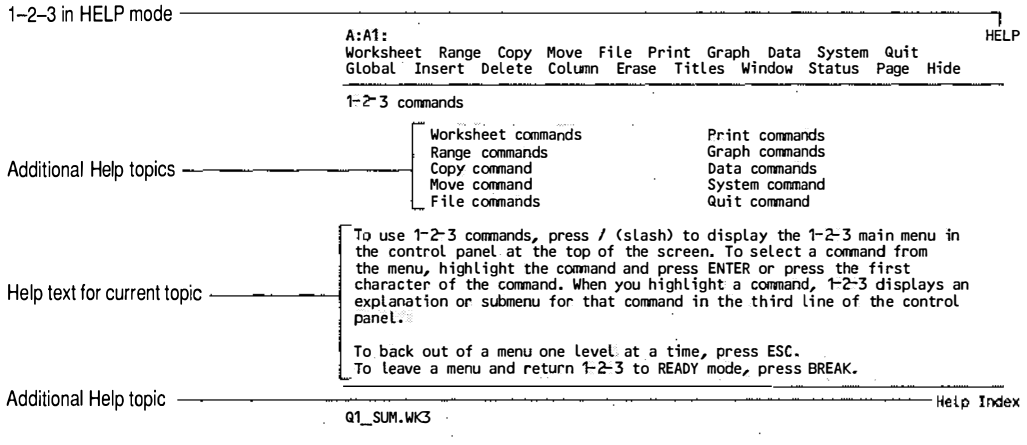


Figure 1-45. *Help screen for 1-2-3 main menu*

Each Help screen includes cross-references to additional Help topics. To view the Help screen for a cross-referenced topic, use the pointer-movement keys to highlight the topic and press **ENTER**. You can view any number of Help screens while you are in the Help system. When you finish using Help, press **ESC** to return to the current worksheet at the same place you left it.

The following table lists the keys you use to navigate through Help topics.

Key	*Effect*
↑ or ↓	Moves the highlight up or down one topic in the current Help screen.
← or →	Moves the highlight left or right one topic in the current Help screen.
BACKSPACE	Displays the previous Help screen.
END	Moves the highlight to the last topic in the current Help screen.
ENTER	Displays the Help screen for the highlighted topic.
HELP	Displays the first Help screen you saw when you pressed **HELP**.
HOME	Moves the highlight to the first topic in the current Help screen.

Chapter 2
Commands

You use 1-2-3 commands to erase, move, and print your data, change the way 1-2-3 displays the data in worksheets, and save your worksheets in a file.

How to Use This Chapter

Chapter 2 is divided into 10 major sections — one for each command on the main menu. The sections, listed in alphabetical order in this chapter, include Copy, Data, File, Graph, Move, Print, Quit, Range, System, and Worksheet.

Each major section in Chapter 2 describes one of these main menu commands and includes the following information:

- A menu tree showing the command and its subcommands for the commands that have subcommands.
- An introduction that describes the tasks that the command and its subcommands perform. Most sections also contain a list of common uses for the command, a suggested reading path, terms you need to know, and general information about using the command.
- An alphabetical listing of each subcommand with descriptions, procedures, and examples.

Use Chapter 2 to find detailed information and procedures about specific 1-2-3 commands. If you plan to use the undo feature, also read Appendix C.

NOTE For most 1-2-3 commands that require you to specify a range, the specified range must be in an active file. You should assume that a range must be in an active file unless the command description in this chapter explicitly says that a range can also be in a file on disk.

Copy Command

/Copy

/Copy copies a range of data, including cell formats and the protection status, to another range in the same file or to a range in a different file. You can make one copy (Figure 2-1) or more than one copy (Figure 2-2) of a range of data.

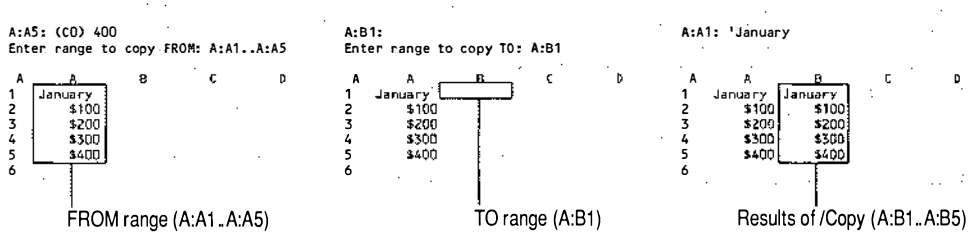


Figure 2-1. *Making one copy of a range of data*

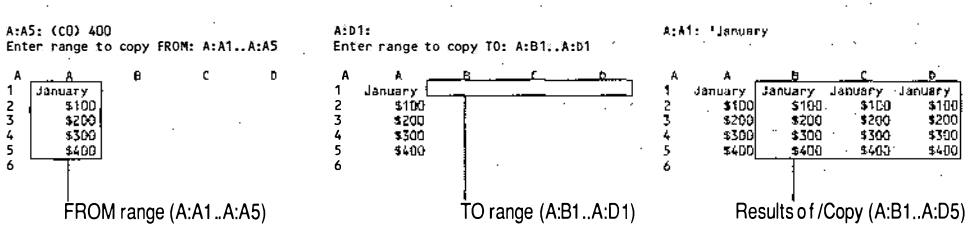


Figure 2-2. *Making multiple copies of a range of data*

Before you use /Copy, read the following sections in Chapter 1:

- "Working with Ranges" explains how to specify a range.
- "Working with Formulas" explains how 1-2-3 copies formulas with relative, absolute, and mixed cell and range references.
- "Using Multiple-Sheet Files" explains how to move the cell pointer between worksheets and how to specify a three-dimensional range.

Procedure

1. (Optional) If you want to highlight an onsheet range instead of typing the cell addresses, move the cell pointer to the first cell in the range you want to copy.
2. Select /Copy.
3. Specify the range you want to copy FROM.

   The FROM range can be in any file, active or on disk.

   NOTE If the FROM range is in a file on disk, 1-2-3 copies only labels and values, not formulas or cell formats.

4. Specify the range you want to copy TO.

   CAUTION If you copy data to a range that already contains data, 1-2-3 replaces the existing data with the copied data.

   The TO range must be in an active file.

   If you want to make one copy of the FROM range, you need to specify only one cell as the TO range (Figure 2-1). If you want to make more than one copy, specify a range of cells as the TO range (Figure 2-2).

   If you copy a three-dimensional range, be sure there are enough worksheets between the first cell of the TO range and the end of the file to hold the copied data. For example, if you copy data from a range that spans worksheets A, B, and C to worksheet D, the file must have at least two more worksheets (E and F) for 1-2-3 to complete the copy.

Copying Numbers and Labels

When you copy numbers and labels, 1-2-3 makes exact duplicates of them. For example, you can copy labels across worksheets to set up several worksheets in the same format. Figure 2-3 shows how to use /Copy to set up three worksheets to track monthly sales of three products in three different cities. After you enter the labels in worksheet A, you can copy the labels to worksheets B and C. This example illustrates how to highlight ranges when copying, but you could also specify the ranges by typing the range addresses at the prompts.

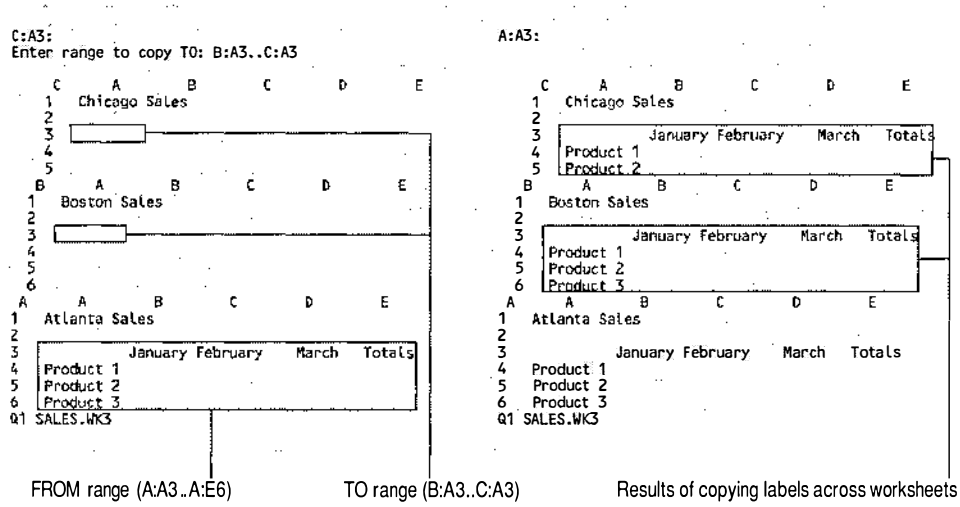


Figure 2-3. *Copying labels across worksheets*

Copying Formulas

You can also copy formulas, but you should be aware of what 1-2-3 does with your formulas when you copy them. When you copy formulas, 1-2-3 may adjust cell or range references in the formulas, depending on the kind of references (relative, absolute, or mixed) you used.

- If a formula contains relative references, 1-2-3 adjusts the references in the copied formula to reflect the new location of the formula.
- If a formula contains absolute references, 1-2-3 does not adjust the references in the copied formula.
- If a formula contains mixed references, 1-2-3 adjusts the part of the reference that is relative in the copied formula.

If you copy a formula with a relative, mixed, or absolute range address to another file, the formula refers to the file into which it is copied. For example, if you copy @SUM(A1..B5), @SUM($A1..$B5), or @SUM($A$1..$B$5) from one file to another, the formula refers to the range in the file it is in, not to the file from which it was copied.

CAUTION

Copying formulas with three-dimensional ranges to files that contain fewer worksheets than are in the three-dimensional ranges may produce unexpected results. For example, if you copy @SUM(A:A1..D:A5) to a file that contains one worksheet, the copied formula will refer to data only in worksheet A. To ensure the accuracy of your data, use /Range Value to convert these formulas to values before you copy them, or copy the formulas to a file that contains at least as many worksheets as in the original file.

The following examples show how 1-2-3 adjusts formulas with relative references when you copy them within the same worksheet (Figure 2-4) and to different worksheets (Figure 2-5).

In Figure 2-4, the formula in A:E4, @SUM(B4..D4), totals the sales for Product 1 during three months. When you copy the formula from A:E4 to A:E5..A:E6, 1-2-3 adjusts the references in the formulas, totaling the values in rows 5 and 6 for Products 2 and 3.

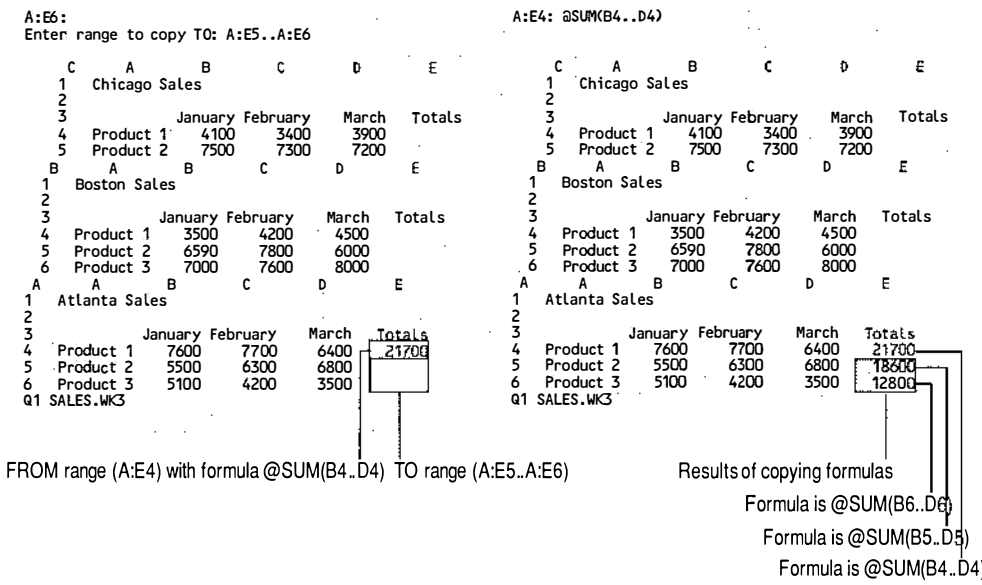


Figure 2-4. *Copying a formula with relative references*

Figure 2-5 illustrates how 1-2-3 adjusts formulas with relative references when you copy them across worksheets. The formulas in A:E4..A:E6 total the sales of each product for three months for Atlanta. If you copy these formulas to B:E4..C:E4, you can total the sales for the products for Boston and Chicago. When you copy the formulas from A:E4..A:E6 to B:E4..C:E4, 1-2-3 adjusts the references in the formulas, totaling the values in rows 4, 5, and 6 for worksheets B and C.

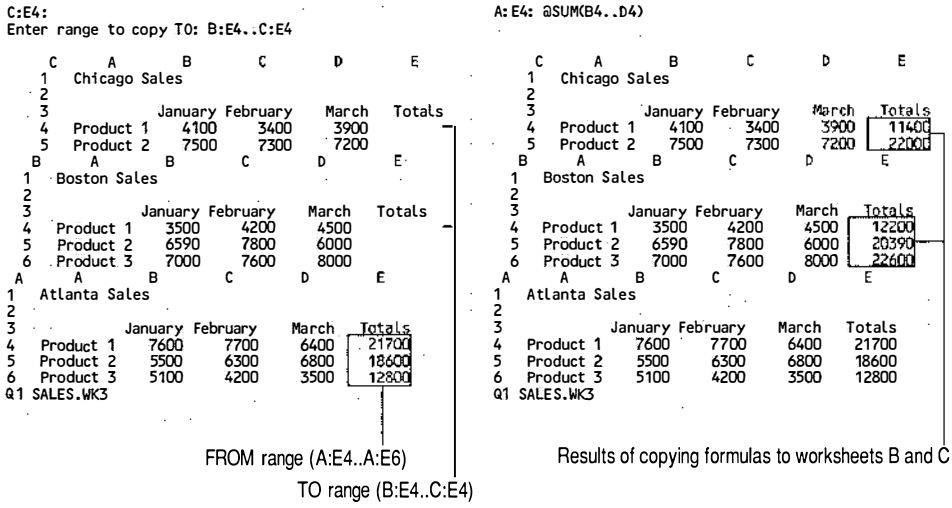
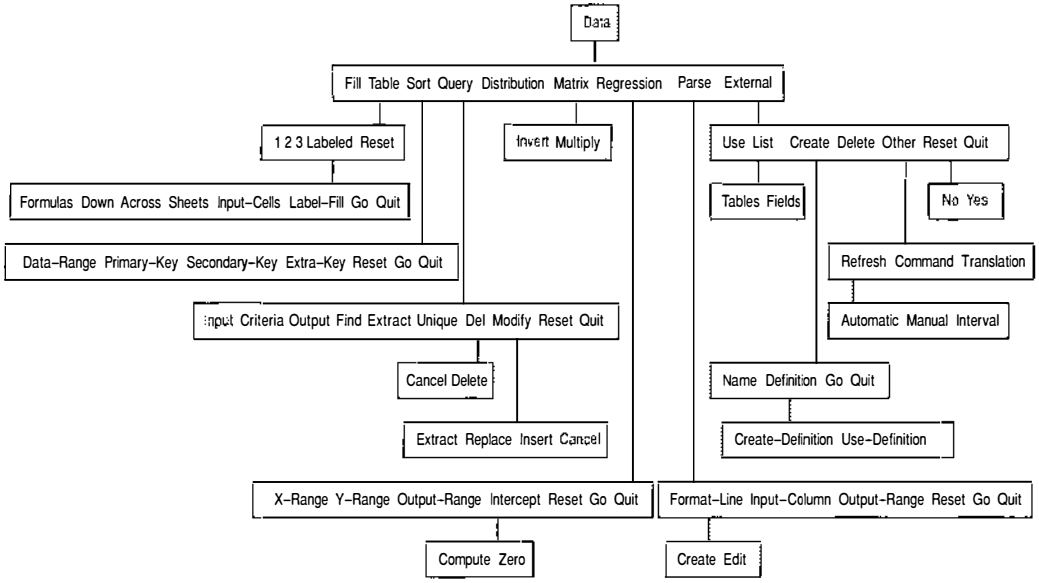


Figure 2-5. *Making multiple copies of formulas*

TIP You can link two files by copying a formula that contains an absolute range name from one file to another. When you do so, the formula always refers to the data in the original file.

For example, if you copy the formula @SUM($TOTALS) from JULY.WK3 to SUMMARY.WK3 by highlighting the FROM range, 1-2-3 automatically adds the path and file name to the formula. If JULY.WK3 was in a directory named **/local/1123/budget**, the copied formula becomes @SUM(<<local/1123/budget/JULY.WK3>>$TOTALS). If the file is not in the current directory and you specify the FROM range by typing the range address, you must enter the path as well as the file name.

Data Commands



The Data commands analyze and manipulate data in 1-2-3 database tables and in external databases.

The Data commands perform the following tasks:

Command	*Task*
/Data Distribution	Creates a frequency distribution (the number of values in a range that fall within specified numeric intervals).
/Data External	Links 1-2-3 to an external table.
/Data Fill	Fills a range with a sequence of values.
/Data Matrix	Inverts or multiplies matrices formed by rows and columns of entries.
/Data Parse	Separates and converts a single column of long labels into several columns of data.
/Data Query	Locates and edits selected records in a database table.

(continued)

Command	*Task*
/Data Regression	Performs a regression analysis (determines the relationships of up to 75 independent variables to a dependent variable).
/Data Sort	Arranges records in a database table in the order you specify.
/Data Table	Creates a table that shows how the results of formulas vary when you change the numbers used in the formulas.

Common Uses for Data Commands

The Data commands let you sort, locate, and manipulate groups of similarly organized data in 1-2-3 worksheet files, and many of the Data commands also let you manipulate data in databases external to 1-2-3. For example, if you need to keep track of a large mailing list, you can use the Data commands to sort the list by last name, delete duplicate entries, and group selected entries in the list, such as all entries with an address in California. You can also use the Data commands to do any of the following:

- Enter values in a range in a specified sequence (/Data Fill).
- Perform what-if or sensitivity analysis on a table of data to show how the results of a formula vary when you change the data the formula depends on (/Data Table).
- Use data in an external database, such as ASCII tabular files, while you are working in 1-2-3 (/Data External).

Reading Path

- Before you begin working with any Data commands, read "Working with Ranges" in Chapter 1 for information on specifying ranges.
- Read "Database Tables" below to learn the basic organization of a 1-2-3 database table.
- For hands-on experience with a 1-2-3 database table, complete Lessons 13 and 14 of the *Tutorial*.
- For detailed information about any Data command, refer to the appropriate command in "Data Command Descriptions" later in this section.

Also, remember that you can press **HELP** when you are using any Data command to get information about the command. In addition, you can refer to *Task Summary* to identify the data command that accomplishes a particular task.

Database Tables

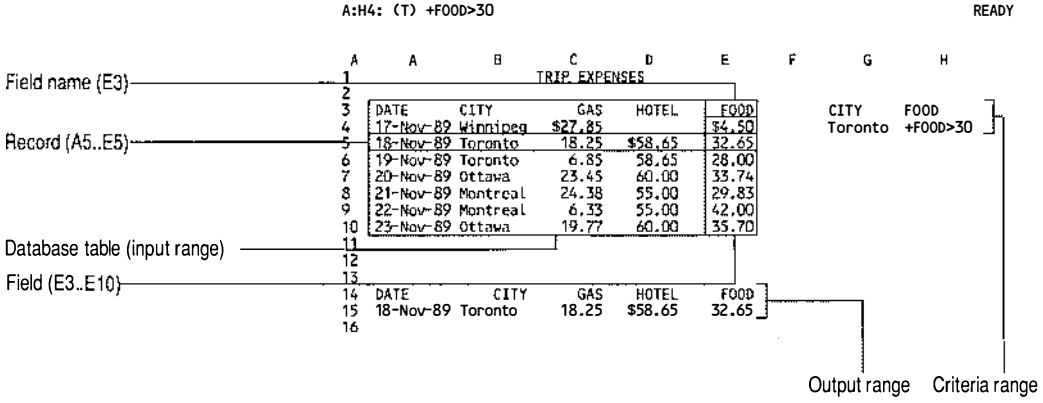


Figure 2-6. ***1-2-3 database table***

A 1-2-3 **database table** is a range of related data organized in rows and columns in one worksheet in a worksheet file. A worksheet file can contain many different database tables, providing no table extends beyond one worksheet. For example, a file that contains three worksheets might have five database tables — three in worksheet A, one in worksheet B, and one in worksheet C.

A **record** is a one-row collection of information about one item in a database table. For example, in a mailing list database table, each row containing a name and an address is a record. In the trip expense database table in Figure 2-6, each row containing information on the expenses for a particular day is a record.

A **field** is a category that each record in the database table has in common. For example, in a mailing list, each address has several categories in common: a name, a street, a city, and so on. In a mailing list database table, each of these categories is a field. In the trip expense database table in Figure 2-6, the fields are DATE, CITY, GAS, HOTEL, and FOOD.

In a 1-2-3 database table, each record is a row and each field is a column. The top row of a database table contains the field names, one per column. The **field names** are the labels that identify the fields in the database table.

Any collection of data that you organize in records and fields can be a database table. When you create a database table, remember these rules:

- The first row of the database table must contain the field names. Subsequent rows must contain the records. Do not insert any blank rows or divider lines between the field names (the first row) and the records.
- The entries in a field must be either all labels or all values. Do not enter values in some records and labels in other records for the same field.
- Field names must be unique within a database table.
- A database table can contain up to 256 fields and 8,191 records.

An **external table** is a database table stored in a database file maintained by a program other than 1-2-3.

Data Command Descriptions

The following sections describe each of the Data commands in alphabetical order.

/Data Distribution

/Data Distribution creates a frequency distribution of the values in a range. A frequency distribution counts how many of the values in a range (the values range) fall within specified numeric intervals (the bin range).

For example, in Figure 2-7, you can use /Data Distribution to determine how many of the sales totals for March are less than or equal to $3000, greater than $3000 and less than or equal to $5000, greater than $5000 and less than or equal to $7000, and greater than $7000.

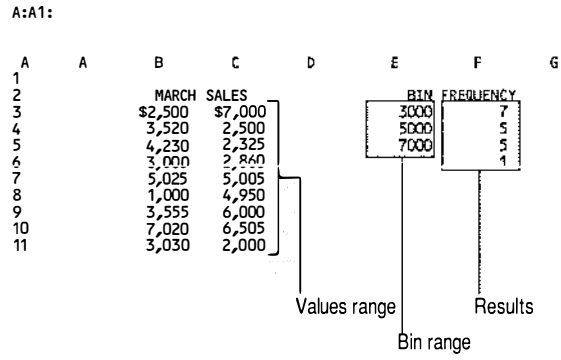


Figure 2-7. */Data Distribution*

Procedure

1. Before you select /Data Distribution, make certain that the values you want to analyze (the values range) are in a range. 1-2-3 ignores blank cells and cells that contain labels.
2. Decide on two adjacent columns for the intervals in the bin range and for the frequency distribution. You will use the first column (the bin range) to enter the intervals; 1-2-3 will enter the distribution in the second column.
3. Enter the intervals for the frequency distribution in the bin range.

   You can use any values (including formulas) in the bin range, provided each value within the range is unique, and provided the values are in ascending order (from smallest to greatest).

   NOTE Do not include labels or blank cells in the bin range. If you include labels or blank cells in the bin range, you may get unexpected results.
4. Select /Data Distribution.
5. Specify the values range.

   The values range can be in any file, active or on disk.
6. Specify the bin range.

   The bin range must be a single-sheet column. For example, in Figure 2-7, the bin range is E3..E5.

The frequency values appear in the column to the right of the bin range. The last frequency value in the column appears in the row below the last row of the bin range.

The numbers in the column to the right of the bin range represent how many values in the values range are less than or equal to the adjacent value in the bin range, but greater than the preceding value. The last number in that column is the number of values in the values range that are greater than the last value in the bin range.

TIP To create a bin range with equal intervals, use /Data Fill.

/Data External

The Data External commands let you exchange data between 1-2-3 and external tables. An **external table** is a table in a database maintained with a database management program other than 1-2-3. Once you establish a connection between 1-2-3 and an external table, you can use database @functions that refer to data in the external table or use the 1-2-3 Data Query commands to work with the records in a 1-2-3 worksheet.

To exchange data with external database tables, 1-2-3 uses DataLens drivers developed specifically for the files created by each type of external database manager. **Read-only** DataLens drivers can extract records from external tables, but cannot delete, create, or modify records in the external table. **Read-and-write** DataLens drivers can extract, delete, create, or modify records from an external table.

For example, you can

- Copy the contents of an external table to a range in a worksheet by querying the external table and extracting the data you want to a worksheet range.
- Join the contents of an external table with the contents of other external tables or 1-2-3 database tables. For example, if you have one external table that contains data on customers and one that contains data on current orders, you can join the two tables to create one table that contains both customer and order data. For more information, see "Extracting Data from Multiple Tables" in "The Output Range" in /Data Query.

The Data External commands perform the following tasks:

Command	*Task*
Create	Creates an external table in an external database.
Delete	Removes an external table from an external database.
List	Lists the tables in an external database or lists the fields in an external table.
Other	Sends a command to a database management program, re-executes Data Query and Data Table commands and updates database @functions, and specifies a character set for the translation of data that 1-2-3 copies to or extracts from an external table.
Quit	Returns 1-2-3 to READY mode.
Reset	Breaks the connection to an external table.
Use	Establishes a connection to an external table.

Before Using /Data External

To use /Data External, you need a **database driver**, a program that allows 1-2-3 to read data from and/or send data to external tables. To work with external tables in databases maintained by database management programs, you will need database drivers for those databases. For more information about DataLens drivers for database programs, check with your system administrator.

To use /Data External, you also need an external table.

Read the following sections to learn about procedures for working with external tables:

- "Specifying External Table Names"
- "Connecting to an External Table"
- "Copying the Contents of an External Table to a Worksheet"
- "Creating an External Table"

Specifying External Table Names

When you select /Data External Use, Delete, or List Tables to work with external tables or select /Data External Create Name to create a table, you must identify the table by specifying the full table name. A **full table name** consists of three parts: the name of a database driver, the name of an external database, and the name of an external table within the database.

If the external database requires you to supply an owner name to use an external table, you include the owner name after the name of the external database. An **owner name** is part of the table name and is usually the user ID of the user who created the table. If you are not sure whether an external database requires the use of owner names, see the documentation for the database driver.

The following figure shows two full table names. Notice that a space follows each component of a full table name.

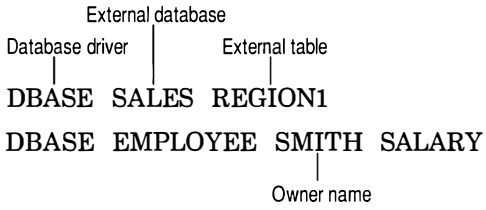


Figure 2-8. *Full table names*

You can specify each part of a full table name by typing it or highlighting it and pressing ENTER. If you type one or more parts of a table name, separate each part from the next with a space.

If the name of an external database you want to use does not appear on the list when you are specifying a full table name using a Data External command, you can type the name of the database and then finish specifying the table name.

If you want the name of an external database to appear automatically when you specify a table name using a Data External command, you must modify the **lotus.bcf** file in your home directory. The **lotus.bcf** file tells 1-2-3 which database drivers to list and the options to be used with them. For information on modifying the **lotus.bcf** file, see the documentation for the database driver you are using.

Connecting to an External Table

Before you can begin working with an external table, you must establish a connection to that table and assign it a 1-2-3 range name. The following procedure shows you how to use /Data External Use to establish a connection to an external table.

1. Select /Data External Use.

   1-2-3 displays a list of the database drivers currently accessible and highlights the name of the first database driver in the list.

2. Specify the database driver you want to use.

   1-2-3 displays a list of the external databases you can use with the database driver you specified.

   1-2-3 displays a list of the table names in the external database you specified. The table names and/or owner names may be case sensitive so refer to your database driver documentation for naming conventions.

3. Specify the external table you want to use.

   1-2-3 prompts you to enter a range name and displays the table name you specified. You will use the range name to refer to the table in data queries and database @functions.

4. Press ENTER to accept the default range name (if one is displayed) or type a new range name of up to 15 characters and press ENTER. 1-2-3 accepts uppercase and lowercase letters in range names and ignores the case.

NOTE When you disconnect from an external table by using /Data External Reset, range names in database @functions that refer to that external table become undefined. To redefine a range name you created for an external table, respecify that range name when you reconnect to the external table to which the range name refers.

NOTE If the administrators of the external database containing the table you want to work with have restricted access to the database, you may not be able to work with the table, even though you have assigned it a 1-2-3 range name. You may want to make sure you have a valid login or sufficient permissions for (rights of access to) the external database before you use /Data External Use to connect to an external table in that database.

Copying the Contents of an External Table to a Worksheet

If you want to look at the records in an external table to which you are connected, you can copy the contents of the external table to a range in a worksheet by using a Data External command and several Data Query commands. The following procedure shows you how to do this using the sample external table. You should be familiar with the Data Query commands before you use this procedure.

1. Complete the steps in the previous section, "Connecting to an External Table."
2. Select /Data External List Fields, specify the range name of the external table containing the data you want to copy, and specify a location for the results of the command.
3. Select Quit to return 1-2-3 to READY mode.
4. Copy the field names for the external table to a row in a worksheet by selecting /Range Trans, specifying the list of field names (the first column of the results of /Data External List Fields) as the range to transpose, and specifying the location where you want 1-2-3 to transpose the range. You will use the resulting row of field names as part of the criteria range for a data query operation.
5. Enter your search criteria in the row(s) below the row of field names you created in step 4.
6. Set up an output range by copying the field names from the row you created in step 4 to another location.
7. Select /Data Query Input and specify the range name of the external table as the input range.
8. Select Criteria and specify the criteria range.

9. Select Output and specify the row of field names you created in step 4 as the output range.
10. Select Extract to copy the information in the external table to the output range.
11. Select Quit to return 1-2-3 to READY mode.

NOTE If the database driver you are using allows you to change records in an external table, you can edit selected records in or add records to an external table using the Data Query Modify commands. If you do not know whether the database driver allows you to edit records in an external table, refer to the documentation for the database driver. For more information on the Data Query Modify commands, see /Data Query Modify later in "Data Command Descriptions."

Creating an External Table

You have learned how to work with an existing external table. To create a new external table, you must create a structure, or definition, for the new table and then create the table.

A **table definition** is a six-column range that contains information on the field names, data types, and field widths you want to specify for a new table and sometimes includes column labels, field descriptions, and creation strings, as well. When you select /Data External Create Go to create a new table, the database driver you are using reads the information in the table definition and sets up the table accordingly.

To create an external table, you can either copy the structure of an existing table or create a new table definition from scratch.

NOTE If the administrators of the external database in which you want to create a new table have restricted access to the database, you may not be able to create the table. You may want to make sure you have sufficient permissions for, or rights of access to, the external database before you try to create a new table in that database.

Copying the Structure of an Existing Table Unless you need to set up a new structure for a new table, the easiest way to set up the structure for a new external table is to copy the structure of an existing table. When you copy the structure

of an existing table, 1-2-3 creates a table definition for you automatically; you do not need to know anything about the contents of the table definition to create the new table.

1. Decide on an existing table to use as a model for the new external table.

   If you want to use a 1-2-3 database table, make sure the 1-2-3 database table is in an active file and contains a row of field names and at least one record.

   If you want to use an existing external table, complete the steps in "Connecting to an External Table" earlier in this section.

2. Select /Data External Create Name to connect to the external database in which you want to create the new table and to assign a name to the table.

3. Select Definition Create-Definition to specify the following:

   - The external table or 1-2-3 database table you want 1-2-3 to use as a model for the table definition
   - The range in which you want 1-2-3 to enter the table definition

4. Select Go to set up the structure for the new table using the specified table definition. This command creates a table that contains field names.

5. Select Quit to return 1-2-3 to READY mode.

You can now use the Data Query commands to copy records from an existing external table or 1-2-3 database table to the new external table. See /Data Query later in "Data Command Descriptions."

Creating a New Structure for an External Table If you want to create a new external table that has a structure different from that of any existing external table or 1-2-3 database table — for example, that has fewer fields or contains different types of data — you must create and edit a table definition before you can create the new external table.

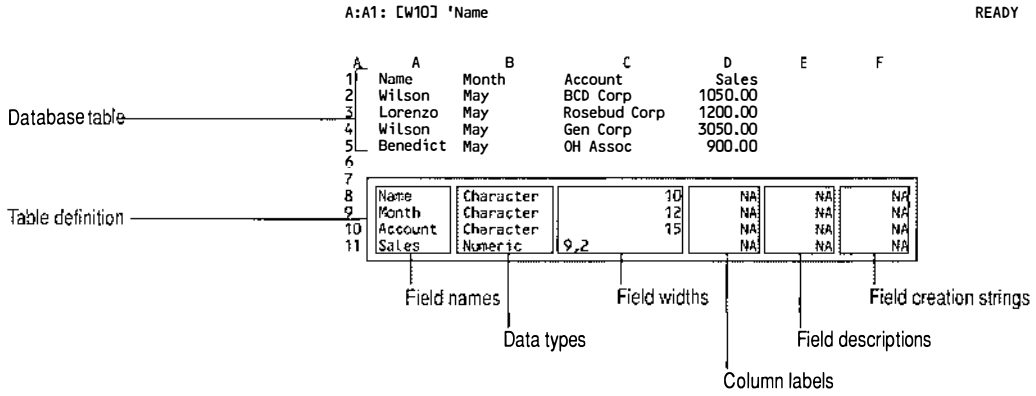


Figure 2-9. *A database table and the associated table definition*

A table definition is organized as follows:

- Column 1 contains field names. A **field name** is the name of a field as you want it to appear in the external table. Check your database driver documentation for case sensitivity rules.
- Column 2 contains data types. The **data type** of a field identifies the type of data in the field. For example, 1-2-3 has two data types: labels and values. External databases have other classifications and may distinguish between different types of values. For example, in 1-2-3, a date (or date number) is a value. Numeric values and dates are different types of data. The data-type names that appear in this column vary depending on the requirements of the database driver.
- Column 3 contains field widths. The **field width** is the width assigned to a field. Fields may or may not require field widths, depending on the requirements of the database driver.

NOTE When you are creating a table, you can specify a field width by editing the contents of column 3. Field widths are entered as values, except for those containing decimal places. 1-2-3 enters these decimal places as a label containing a comma separator. For example, in the third column of the table definition in Figure 2-9, the entry 9,2

indicates a width of 9 and 2 decimal places. See the NOTE in "Editing a Table Definition" later in this section for more information.

- Column 4 contains column labels. A **column label** is an alternate version of a field name. A column label makes it easier to identify a field that may have an abbreviated field name. For example, a field with the name EMPID may have the column label Employee Number. The fourth column in a table definition may include column labels, depending on the requirements of the external database in which you want to create an external table.
- Column 5 contains field descriptions. A **field description** is a short description of the contents of a field. The fifth column in a table definition may include field descriptions.
- Column 6 contains field creation strings. A **field creation string** is a special piece of information an external database uses to help specify a field in a new table. Not all external databases require you to use field creation strings, however. For information on the field creation strings that an external database requires, if any, refer to the documentation for that particular database driver.

NOTE If the external database in which you want to create a new table does not require column labels, field descriptions, or field creation strings, or if the external table or 1-2-3 database table you are using as a model for the table definition does not have column labels, field descriptions, or field creation strings, 1-2-3 displays NAs in the corresponding column or columns of the table definition. Even if you put a creation string in column 6, 1-2-3 changes it to NA if you then use that table defintion to create another table definition. Your database driver may not accept NA in the field creation string so you may have to edit this out.

To create an external table with a structure different from that of any existing external table or 1-2-3 database table, you must complete the steps in the following three sections:

- "Creating a Table Definition"
- "Editing a Table Definition"
- "Using a Table Definition You Created and Edited"

Creating a Table Definition To create a table with a new structure, you need an existing external table or 1-2-3 database table that has a structure similar to the one you want for your new table. In this section, you'll learn how to create a table definition for the existing table; in the next section, you'll learn how to modify the table definition for use when creating the new table.

NOTE If you know exactly what information a particular database driver needs to create a table in a particular external database, you can create a table definition by typing the information into a range in a worksheet. If you create a table definition this way, skip the procedures in this section and continue with "Using a Table Definition You Created and Edited."

If the existing table is a 1-2-3 database table, follow these steps:

1. Select /Data External Create Name to connect to the external database in which you want to create the new table and assign a name to the table.
2. Select Definition Create-Definition to specify the following:
   - The 1-2-3 database table you want 1-2-3 to use as a model for the table definition
   - The range in which you want 1-2-3 to enter the table definition
3. Select Quit to return 1-2-3 to READY mode.

If the existing table is an external table, follow these steps:

1. Select /Data External Use to connect to the external table.
2. Select /Data External List Fields to specify the following:
   - The range name of the external table
   - The range in which you want 1-2-3 to enter the results of the command

   /Data External List Fields lists information about the fields in an external table. The list has a format identical to the format of a table definition; you can use its contents as the basis for a table definition.

Editing a Table Definition Edit the table definition if you want to specify any of the following for the new external table:

- More or fewer fields than are in the table you used as a model for the table definition. For example, to specify an additional field named Region in the table definition in Figure 2-9, you could enter the label Region in A12 and the associated information on data type, field width, and (if necessary) column label, field description, and field creation string in cells B12, C12, D12, E12, and F12, respectively; or you could insert this information in a new row between any two rows in the table definition. To delete a field from a table definition, delete the row containing the field information.
- A new order for the fields. For example, in Figure 2-9, you could switch the positions of the Account and Month fields by moving the information in row 9 to row 10 and the information in row 10 to row 9.
- Different field names, field widths, data types, column labels, field descriptions, or field creation strings for any field specified in the table definition.

NOTE If you create a table definition using a 1-2-3 database table as the model for the table definition, and if the database table includes fields that contain values, 1-2-3 does not assign field widths to those fields in the table definition. To specify a field width for a field containing values, enter a number in the appropriate cell in the table definition. To specify a field width and the number of decimal places for values in a field, enter a label prefix, the field width, a thousands separator, and the number of decimal places. For example, the entry '10,2 specifies a field width of 10 and 2 decimal places. Do not enter a field width unless the driver requires one; specify the width in the syntax required by the driver. If you do not specify a field width or the number of decimal places, the database driver may (depending on its capabilities) assign the field a default field width and default number of decimal places when you select /Data External Create Go to create the table.

Using a Table Definition You Created and Edited

1. Select /Data External Create Name to connect to the external database in which you want to create the new table and to assign a name to the table.
2. Select Definition Use-Definition to specify the range containing the table definition you created and edited.

   The range must contain the six columns necessary for the table definition and one row for each field you want to include in the new external table.
3. Select Go to define the table in the external database using the specified table definition.
4. Select Quit to return 1-2-3 to READY mode.

You can now use the Data Query commands to copy records from an existing external table or 1-2-3 database table to the new external table. See /Data Query later in "Data Command Descriptions."

The following is an alphabetical listing of the Data External commands.

/Data External Create

/Data External Create sets up the structure for a new table in an external database.

NOTE If the administrators of the external database in which you want to set up a new table have restricted access to the database, you may not be able to set up the table. You may want to make sure you have sufficient permissions for the external database before you use this command.

The Data External Create commands perform the following tasks:

Command	*Task*
Definition	Lets you create or use a table definition.
Go	Creates a new external table.

(continued)

Command	*Task*
Name	Connects to the external database in which you want to create a new table and assigns a name to the table.
Quit	Returns 1-2-3 to READY mode.

/Data External Create Definition creates a table definition derived from an external table or 1-2-3 database table you specify (/Data External Create Definition Create-Definition); or specifies a range that contains a table definition for a new table (/Data External Create Definition Use-Definition).

/Data External Create Definition Create-Definition creates a table definition derived from an external table or 1-2-3 database table you specify.

Before you use this command, you must name the new table using /Data External Create Name. See "Creating an External Table" earlier in this section for more information.

Procedure

1. Select /Data External Create Definition Create-Definition.
2. Specify the external table or 1-2-3 database table you want 1-2-3 to use as a model for the table definition.

   To specify an external table, use the range name you assigned the table with /Data External Use.

   If you specify a worksheet range as a model for a table definition, remember that the first row of the range must contain field names and the second must contain a record. If the range contains hidden columns, 1-2-3 does not display the contents of these columns when you highlight the range. In addition, 1-2-3 ignores hidden columns when it creates the table definition.
3. Specify a location for the table definition. You need to specify only the first cell of the range in which you want the table definition to appear.

CAUTION 1-2-3 creates a table definition that has six columns and one more row than there are fields in the model range and writes over any existing data in the location you specify. Make sure this location is blank or contains unimportant data.

If you specified a 1-2-3 database table as the model for the table definition, 1-2-3 creates the table definition by using the field names in the first row of the database table and assigning a data type for each field in the second row of the database table. If a cell in the second row of the database table contains a label, 1-2-3 assigns the corresponding field a width that matches the width of the column containing the label. 1-2-3 does not assign widths to fields that contain values.

If you specified an external table as the model for the table definition, 1-2-3 creates the table definition by using the field names, data types, and field widths in the external table. (1-2-3 may or may not display widths for fields that contain values, depending on the requirements of the database driver.)

/Data External Create Definition Use-Definition specifies a range that contains a table definition for a new table.

Procedure

1. Select /Data External Create Definition Use-Definition.
2. Specify the range that contains the table definition.

/Data External Create Go creates a new external table in an external database.

Before you use this command, you must name and define the structure of the new table using /Data External Create Name and Definition. See "Creating an External Table" earlier in this section for more information.

Procedure

1. Select /Data External Create Go.

/Data External Create Name connects to the external database in which you want to create a new table and assigns a table name and a 1-2-3 range name to the table. If it prompts for a table creation string, enter one only if your driver supports it.

When you refer to the new table in data queries, data table commands, database @functions, or any Data External command except /Data External Delete, you must use the range name you assigned the table.

Procedure

NOTE Either a database driver or an external database or both may require you to provide a user ID and password during the following procedure. If 1-2-3 prompts you for a user ID, type the user ID and press ENTER and then type a password and press ENTER to continue to the next step.

1. Select /Data External Create Name.
2. Specify the database driver associated with the external database in which you want to create the table.
3. Specify the external database in which you want to create the table.
4. Type a name for the table and press ENTER. Check the list of table names on the screen to make sure you type a new table name. Check your database driver documentation for case sensitivity rules.

   NOTE If the external database you are connecting to requires you to provide an owner name, type the owner name, a space, and then the table name, and then press ENTER. For example, to create a table with the name SALARY in an external database that requires you to use the owner name SMITH, you would type SMITH SALARY and then press ENTER.

   NOTE Make sure you do not specify a table name with more characters than the external database allows.

   1-2-3 prompts you to enter a range name and displays the table name you entered.

5. Press ENTER to accept the default range name (the table name) or type a new range name of up to 15 characters and press ENTER. 1-2-3 accepts uppercase and lowercase letters in range names, but ignores the case.

NOTE If the table name you entered in step 4 starts with $ or !, contains a . (period), or could be a cell address, 1-2-3 does not display a default range name for the table. You must enter a range name.

1-2-3 prompts you to enter a table creation string.

6. If necessary, specify a table creation string. If you do not need to specify a table creation string, just press ENTER.

   If you are not sure whether you need to specify a table creation string, refer to the documentation for the database driver.

NOTE If you use this command and then leave the /Data External Create menu before you finish creating a new external table with the other Data External Create commands, 1-2-3 does not remember the new table name you specified with /Data External Create Name. You must select /Data External Create Name again and respecify the name for the new external table before you can continue creating the new external table.

/Data External Create Quit returns 1-2-3 to the previous menu.

Procedure

1. Select /Data External Create Quit.

/Data External Delete

/Data External Delete permanently removes a table from an external database.

You do not need to establish a connection to an external table with /Data External Use before you delete an external table with /Data External Delete.

You cannot delete an external table if

- The administrators of the external database from which you want to delete a table have restricted access to the database. You may want to make sure you have sufficient permissions for the external database before you use /Data External Delete.

- The database driver does not allow you to delete external tables. If you do not know whether a database driver allows you to delete tables, refer to the documentation for the database driver.

Procedure

NOTE Either a database driver or an external database or both may require you to provide a user ID and password during the following procedure. If 1-2-3 prompts you for a user ID, type the user ID and press ENTER and then type a password and press ENTER to continue to the next step.

1. Select /Data External Delete.
2. Specify the name of the database driver associated with the external database containing the table you want to delete.
3. Specify the name of the external database containing the table you want to delete.

   1-2-3 lists the names of the external tables in the external database you specified.

   NOTE If the external database requires the use of owner names, an owner name precedes each table name on the list on the screen. For example, if the external database includes tables REGION1, REGION2, and REGION3, each with the owner name SMITH, these table names appear as SMITH REGION1, SMITH REGION2, and SMITH REGION3.
4. Specify the name of the external table you want to delete.
5. Select No to return to the /Data External menu without deleting the table or Yes to delete the table.

/Data External List

/Data External List lists the names of the fields in an external table (/Data External List Fields) or lists the names of tables in an external database (/Data External List Tables).

/Data External List Fields lists the names of the fields in an external table to which you are currently connected and lists information about these fields. This information is useful if you want to know what type of data an external table

contains so you can query the external table, or if you want to use the results of the command as the basis for a table definition for a new external table.

1-2-3 lists the field names vertically beginning in the cell you specify. In the columns to the right of the field names, 1-2-3 lists the data type, field width, column label (if any), and description (if any) of each field. In addition, 1-2-3 creates a sixth column in which you can enter field creation strings (see NOTE below). If the external table does not include column labels or field descriptions, NAs appear in the fourth and fifth columns of the range. 1-2-3 always displays NAs in the sixth column of the range. For more information on data types, field widths, column labels, and descriptions, see "Creating a New Structure for an External Table" earlier in this section.

NOTE If you want to use the results of this command to create a table definition for a new table, you may need to enter field creation strings in the sixth column, depending on the type of external database you are using. For information on whether the external database in which you want to create a new table requires field creation strings, see the documentation for the database driver associated with the external database.

Figure 2-10 shows the type of information 1-2-3 lists when you select /Data External List Fields.

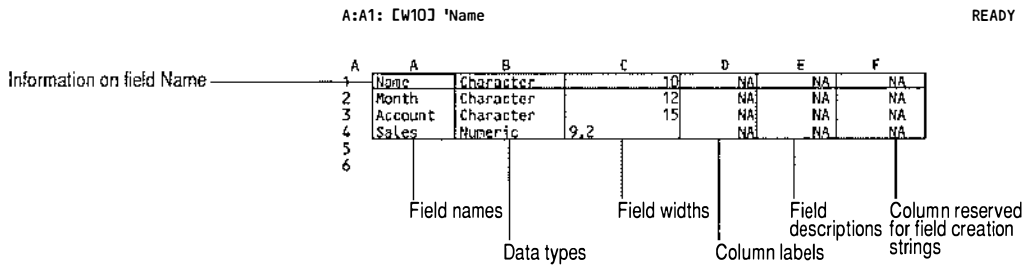


Figure 2-10. *List of fields in an external table*

Procedure

1. Make sure you are connected to the external table containing the fields you want to list. If you are not, use /Data External Use to connect to the table.

2. Select /Data External List Fields.
3. Specify the range name of the table whose fields you want to list.
4. Specify a location for the list of field names and related field information. You need to specify only the first cell of the range in which you want the field information to appear.

   CAUTION 1-2-3 creates a list that has six columns and one more row than there are fields in the external table and writes over any existing data in the location you specify. Make sure you specify a part of the worksheet that is blank or contains unimportant data.

If no external tables are in use when you select /Data External List Fields, 1-2-3 displays a prompt in the second line of the control panel, but does not display a list of range names. Press ESC twice to return to the /Data External menu.

/Data External List Tables lists the names of the tables in an external database and the owner names and descriptions (if any) of the tables. This list is useful if you do not remember which external database contains tables you want to use.

1-2-3 lists the table names, owner names (if any), and descriptions (if any) in a three-column range beginning in the cell you specify. The table names appear in the first column of the range, the owner names in the second, and the descriptions in the third. If the external database containing the tables you are listing does not have owner names and/or descriptions, 1-2-3 lists NAs in the second and/or third columns of the range.

Figure 2-11 shows the type of information 1-2-3 lists when you select /Data External List Tables.

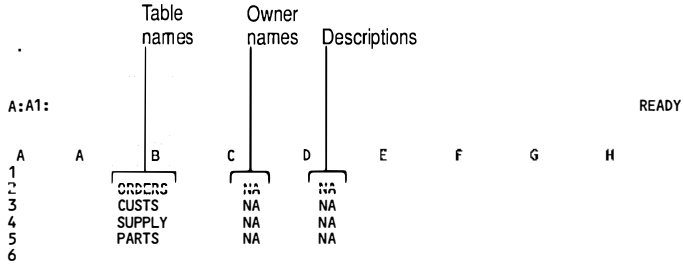


Figure 2-11. *List of external tables*

Procedure

NOTE Either a database driver or an external database or both may require you to provide a user ID and password during the following procedure. If 1-2-3 prompts you for a user ID, type the user ID and press ENTER and then type a password and press ENTER to continue to the next step.

1. Select /Data External List Tables.
2. Specify the name of the database driver associated with the external database containing the tables you want to list.
3. Specify the name of the external database whose tables you want to list.
4. Specify a location for the list of table names. You need to specify only the first cell of the range in which you want the table information to appear.

   CAUTION 1-2-3 creates a list that has three columns and one more row than there are tables in the external database and writes over any existing data in the location you specify. Make sure you specify a part of the worksheet that is blank or contains unimportant data.

1-2-3 lists external table names (not 1-2-3 range names) in the location you specify.

/Data External Other

The Data External Other commands perform the following tasks:

Command	*Task*
Command	Sends a command to a database management program.
Refresh	Re-executes Data Query and Data Table commands and updates database @functions at regular intervals.
Translation	Lets you change the default character set or code page for a specific database.

/Data External Other Command issues a command directly to the database management program associated with an external database to which you are currently connected, letting you perform functions not available through the 1-2-3 Data commands and database @functions.

Commands you issue with /Data External Other Command are unrelated to 1-2-3 and depend entirely on the command syntax of the database management program with which you want to work. Most database drivers will not allow you to enter "SELECT" (or any data return) statements here.

NOTE Depending on the database driver or external database you are working with, you may not be able to use /Data External Other Command to send a command to a database management program. For more information, refer to the documentation for the database driver.

Procedure

1. Make sure you are connected to an external table in the external database to which you want to send a command. If you are not, use /Data External Use to connect to a table in that external database.
2. Select /Data External Other Command.
3. Specify the name of the database driver associated with the external database to which you want to send a command.

4. Specify the name of the external database to which you want to send a command.
5. Enter a command as a string.

1-2-3 returns to READY mode.

/Data External Other Refresh updates database @functions and reissues, at regular intervals, the last Data Query and Data Table commands you issued. This command is useful if you are working with external databases that other users may be changing frequently and you need to ensure that the information you are working with is current.

The Data External Other Refresh commands perform the following tasks:

Command	*Task*
Automatic	Updates database @functions, data queries, and data tables at a specified time interval.
Interval	Specifies the time interval at which 1-2-3 automatically updates database @functions, data queries, and data tables.
Manual	Updates database @functions, data queries, and data tables only on command.

/Data External Other Refresh Automatic executes the current Data Query and Data Table commands and recalculates database @functions at the time interval you specify with /Data External Other Refresh Interval. If you do not specify a time interval with /Data External Other Refresh Interval, 1-2-3 executes the commands and performs the recalculations at 1-second intervals.

Because 1-2-3 performs background recalculation, you can continue moving around the worksheet and selecting commands during the recalculation cycle.

Be aware that if 1-2-3 requires more time to execute the commands and perform the recalculations than is currently specified, 1-2-3 begins a new recalculation cycle as soon as the current cycle is complete, and therefore cannot respond as quickly to the commands you enter at the keyboard or to the data-entry operations you perform. If you expect your queries

to take longer than one second to complete, you may want to select /Data External Other Refresh Interval and specify an interval greater than one second before you select /Data External Other Refresh Automatic.

/Data External Other Refresh Automatic affects the frequency with which 1-2-3 recalculates database @functions only if 1-2-3 is in automatic recalculation mode. If 1-2-3 is in manual recalculation mode, /Data External Other Refresh Automatic re-executes Data Query and Data Table commands, but does not update database @functions. (You can change the recalculation mode with /Worksheet Global Recalc.)

NOTE After you select /Data External Other Refresh Automatic, you cannot select Data Query or Data Table commands to create or update queries or data tables. To restore the use of the Data Query and Data Table commands, select /Data External Other Refresh Manual.

Procedure

1. Select /Data External Other Refresh Automatic.

/Data External Other Refresh Interval specifies the time interval at which 1-2-3 automatically executes the current Data Query and Data Table commands and recalculates database @functions.

The time interval you select using /Data External Other Refresh Interval remains in effect until you end the current work session or select another interval. 1-2-3 does not save the setting for the time interval when you save the file.

Procedure

1. Select /Data External Other Refresh Interval.
2. Specify the number of seconds.

   You can specify any number from 0 to 3600 (the number of seconds in one hour). The default is 1 second.

TIP If you want to use the same interval setting each time you start 1-2-3, select an interval and then save the setting by using /Worksheet Global Default Update.

/Data External Other Refresh Manual stops the automatic execution of the current Data Query and Data Table commands and the automatic recalculation of database @functions.

Once you select /Data External Other Refresh Manual, you must use Data Query or Data Table commands to update the current data query or database data table.

Procedure

1. Select /Data External Other Refresh Manual.

/Data External Other Translation selects the character set a database driver uses to translate information extracted from or copied to external tables in an external database you specify.

If you are not sure whether you need to specify a character set to work with an external table, use the Data Query commands to extract records from the external table and then examine the results of the query. If the information you extracted includes nonstandard characters, specify a character set with /Data External Other Translation and then extract the records a second time.

The character set you select using /Data External Other Translation remains in use for all the external tables in that particular external database until you end the current work session or select another character set for that external database.

Procedure

1. Make sure you are connected to an external table in the external database for which you want to select a character set. If you are not, use /Data External Use to connect to a table in that external database.
2. Select /Data External Other Translation.
3. Specify the name of the database driver associated with the external database for which you want to select a character set.
4. Specify the name of an external database for which you want to select a character set.
5. Specify the name of a character set.

1-2-3 returns to READY mode.

/Data External Quit

/Data External Quit returns 1-2-3 to READY mode.

Procedure

1. Select /Data External Quit.

/Data External Reset

/Data External Reset disconnects an external table, ending all data exchange between 1-2-3 and the external table. After you use this command, you cannot make any further references to the range name of the specified table. Any data queries, database data table commands, or database @functions that refer to the table may result in errors. 1-2-3 will not update these queries, commands, or @functions until you select /Data External Use and specify that table and table range name again.

Procedure

1. Select /Data External Reset.
2. Specify the range name of the external table you want to disconnect.

If the table you specified was the only one in use in the associated external database when you selected /Data External Reset, 1-2-3 automatically ends the connection to the external database. If the external database containing the table you stopped using was the only external database in use for a particular database driver when you selected /Data External Reset, 1-2-3 disconnects from the driver.

If no external tables are in use when you select /Data External Reset, 1-2-3 displays a prompt in the second line of the control panel, but does not display a list of range names. Press ESC twice to return to the /Data External menu.

/Data External Use

/Data External Use establishes a connection between 1-2-3 and a table in an external database and assigns a 1-2-3 range name to the external table. After you establish a connection to an external table and assign it a range name, you can refer to the information in the external table in data queries, database data table commands, and database @functions by using the range name you assigned to the table. You can establish

connections to more than one external table in one work session, and the external tables can be in different external databases.

Keep the following in mind when assigning a range name to a table:

- The range name you assign with /Data External Use must be unique within the current file.
- You can assign more than one range name to the same table. For example, you could assign the range names SAL1, SAL2, and SAL3 to an external table with the name SALARY. However, do not attempt to extract data from one external table to the same external table or an error will occur.

NOTE If the administrators of the external database containing the table you want to work with have restricted access to the database, you may not be able to work with the table, even though you have assigned it a 1-2-3 range name. You may want to make sure you have sufficient permissions for the external database before you use /Data External Use to connect to an external table in that database.

Procedure

NOTE Either a database driver or an external database or both may require you to provide a user ID and password when you connect to an external table. If 1-2-3 prompts you for a user ID, type the user ID and press **ENTER** and then type a password and press **ENTER** to continue to the next step.

1. Make sure the cell pointer is in the file in which you want to create a range name for an external table.
2. Select /Data External Use.
3. Specify the name of the database driver associated with the external database containing the table you want to use.
4. Specify the name of the external database containing the table you want to use.

   1-2-3 lists the names of the external tables in the external database you specified.

NOTE If the external database requires the use of owner names, an owner name precedes each table name on the list on the screen. For example, if the external database includes tables REGION1, REGION2, and REGION3, each with the owner name SMITH, these table names appear as SMITH REGION1, SMITH REGION2, and SMITH REGION3.

5. Specify the name of the table you want to use.

   1-2-3 prompts you to enter a range name and displays the table name you specified.

6. Press ENTER to accept the default range name (the table name) or type a new range name of up to 15 characters and press ENTER. 1-2-3 accepts uppercase and lowercase letters in range names, but will ignore case.

   NOTE If the table name you selected in step 5 starts with $ or !, contains a . (period), or could be interpreted as a cell address, 1-2-3 does not display a default range name for the table. You must type a range name and press ENTER.

7. (Optional) To connect to another external table in the same external database or in a different external database, select /Data External Use again and repeat steps 3 through 6.

To look at the records in an external table connected to 1-2-3, you must first copy the records from the external table to a range in a worksheet. You can use the Data Query commands to copy the records. For more information on using the Data Query commands to copy and work with records, see /Data Query later in "Data Command Descriptions."

TIP To display a list of the names and characteristics of the fields in an external table connected to 1-2-3, use /Data External List Fields.

/Data Fill

/Data Fill enters a sequence of values in a specified range. You can enter a sequence of numbers, dates, times, or percentages.

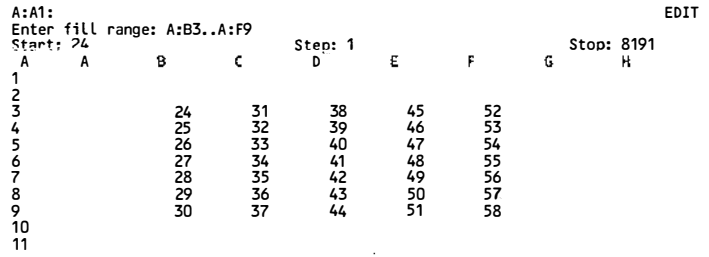


Figure 2-12. */Data Fill*

Procedure

1. Select /Data Fill.
2. Specify the fill range.

   The **fill range** is the range in the current file that you want 1-2-3 to fill with sequential values.

3. Specify the start value.

   The **start value** is the first value 1-2-3 enters in the fill range. The start value can be any value (including a formula, date, time, or percentage) or a cell or range reference that evaluates to a value. If you do not specify a start value, 1-2-3 uses the default value (0) or the most recent value entered.

4. Specify the step value.

   The **step value** is the increment between each of the values in the sequence. The step value can be any value (including a formula, date, time, or percentage) or a cell or range reference that evaluates to a value. If you do not specify a step value, 1-2-3 uses the default value (1) or the most recent value entered.

   If you used a date or a time for the start value, you can specify a special value (for example, a value representing a number of days) for the step value. See "Using /Data Fill with Dates and Times" for more information.

5. Specify the stop value.

   The **stop value** is the value 1-2-3 uses as a limit for the sequence.

   The stop value can be any value (including a formula, date, time, or percentage) or a cell or range reference that evaluates to a value. If you do not specify a stop value, 1-2-3 uses the default value (8191) or the most recent value entered. If you specify a negative step value, you must specify a stop value that is less than the start value.

1-2-3 erases the range you specified as the fill range and then enters the start value in the first cell of the fill range. 1-2-3 continues to enter a value in each cell of the range, adding the step value to each previous value, until it fills the range or reaches the stop value. 1-2-3 fills cells column by column, from left ro right.

If 1-2-3 reaches the stop value before it fills the range, 1-2-3 leaves the remaining cells in the range blank.

If you select a multiple-sheet fill range, 1-2-3 fills the first worksheet in the range, then the second worksheet (beginning with a value that equals the step value plus the value in the last cell of the range in the first worksheet), and so on.

If you enter percentages as start, step, and stop values, 1-2-3 enters the decimal values of the percentages in the fill range. For example, if you specify 5% as the start value, 1-2-3 enters 0.05 in the first cell of the fill range.

Using /Data Fill with Dates and Times

To fill a range with sequential dates or times, you use special start, step, and stop values.

Filling a Range with Dates

1. Select /Data Fill.
2. Specify the fill range.
3. Enter the start value as a date in any one of the 1-2-3 Date formats except Short Intn'l (D5).

   For example, enter 14-Nov-87 as the start value.

   1-2-3 makes some assumptions about the date you enter when you use certain formats. For example, if you enter Nov-87 as the start value, or any date without the day,

1-2-3 assumes you mean the first day of that month. Similarly, if you enter 03-Nov, or any date without the year, 1-2-3 assumes you mean the current year.

4. Enter the step value as one of the following:

   - An integer or an integer followed by the letter d to specify a number of days as the increment.
   - An integer followed by the letter w to specify a number of weeks as the increment.
   - An integer followed by the letter m to specify a number of months as the increment.
   - An integer followed by the letter q to to specify a number of quarters as the increment.
   - An integer followed by the letter y to specify a number of years as the increment.

   For example, if you enter 14-Nov-87 as the start value and 1d as the step value, 1-2-3 begins the fill range with the date number for 14-Nov-87, enters the date number for 15-Nov-87 in the next cell in the fill range, and continues to increase the date by one day for each entry in the range; if you enter 1m as the step value, 1-2-3 begins the fill range with 14-Nov-87 and increases the date by one month for each entry in the range (1-2-3 enters the date number for 14-Dec-87 in the next cell in the fill range).

5. Enter the last date as the stop value. You can enter the date in any one of the 1-2-3 Date formats except Short Intn'l (D5). For example, you can enter 31-Dec-88 as the stop value if you want the fill range to end when 1-2-3 reaches the date December 31, 1988.

Filling a Range with Times

1. Select /Data Fill.
2. Specify the fill range.
3. Enter the start value as a time in one of the 1-2-3 Time formats.

   For example, enter 10:30 AM as the start value.

4. Enter the step value as one of the following:

   - An integer followed by the letter s to specify a number of seconds as the increment.
   - An integer followed by the letters min to specify a number of minutes as the increment.
   - An integer followed by the letter h to specify a number of hours as the increment.

   For example, if you enter 10:30 AM as the start value and 1h as the step value, 1-2-3 begins the fill range with the time number for 10:30 AM, enters the time number for 11:30 AM in the next cell in the fill range, and continues to increase the time by one hour for each entry in the range; if you enter 1min as the step value, 1-2-3 begins the fill range with 10:30 AM and increases the time by one minute for each entry in the range (1-2-3 enters the time number for 10:31 AM in the next cell in the fill range).

5. Enter the last time as the stop value. You can enter the time in any one of the 1-2-3 Time formats.

   NOTE To ensure that 1-2-3 enters the value you want it to enter as the last value in the fill range, specify a stop value that is slightly greater than the desired last value by an amount less than the step value. For example, if the step value is 5min and you want the fill range to end when 1-2-3 reaches 3:00 PM, enter a time between 3:00 PM and 3:05 PM — for example, 3:01 PM — as the stop value. This is necessary because of the slight imprecision that sometimes results when 1-2-3 translates binary numbers (numbers 1-2-3 calculates with internally) into decimal numbers (numbers 1-2-3 stores in cells containing time numbers).

TIPS You can use the contents of a range as a start, step, or stop value by specifying a range address at the prompt for the value. Type +, –, or an @function and open parenthesis — for example, @sum(— and then type a single-cell or multiple-cell range address or press ↓ or ↑ to enter POINT mode and highlight a cell or range of cells.

Use /Range Format Other Automatic to format a range you want to fill with dates or times. When you fill the range with /Data Fill, 1-2-3 formats the range with the format of the date or time you specify as the start value.

/Data Matrix

/Data Matrix inverts or multiplies matrices.

You can use the Data Matrix commands to solve simultaneous equations.

NOTE Not every matrix can be inverted. 1-2-3 displays an error message if it cannot create an inverse for the matrix you specified.

/Data Matrix Invert

/Data Matrix Invert creates the inverse of a square matrix. Figure 2-13 shows a matrix range and its inverse (the contents of the output range). Note that the output range is formatted as Fixed with 3 decimal places.

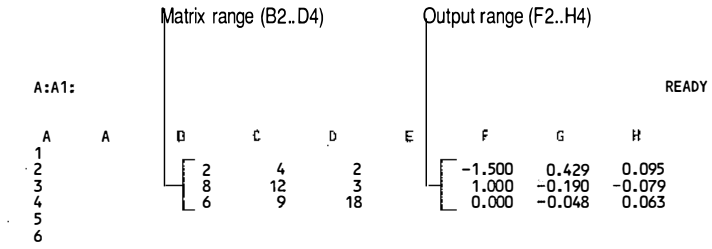


Figure 2-13. */Data Matrix Invert*

NOTE Matrix inversion algorithms by their nature propagate small errors. Inverting an ill-conditioned matrix (a matrix that contains numbers differing widely in magnitude) may result in large errors.

Procedure

1. Select /Data Matrix Invert.
2. Specify the matrix range you want to invert. The matrix range must have the same number of columns and rows, and can contain up to 80 columns and 80 rows. The matrix range can be in any file, active or on disk.

3. Specify the output range (the range in which you want 1-2-3 to enter the results of the inversion).

   You can specify either the entire range or only the first cell in the range.

   CAUTION 1-2-3 creates an output range that is the same size as the matrix you are inverting and writes over any existing data in that range. Make sure the output range is blank or contains unimportant data.

If you specified a three-dimensional range to invert, 1-2-3 inverts the matrix in the first worksheet of the range and enters the results in the first worksheet in the output range; inverts the matrix in the second worksheet of the range and enters the results in the second worksheet in the output range; and so on. For example, if you specify A:A1..C:D4 as the matrix range and A:A10 as the output range, 1-2-3 inverts A:A1..A:D4 and enters the results beginning in A:A10; inverts B:A1..B:D4 and enters the results beginning in B:A10; and inverts C:A1..C:D4 and enters the results beginning in C:A10.

/Data Matrix Multiply

/Data Matrix Multiply multiplies the columns of one matrix with the rows of a second matrix and creates a third matrix that contains the results of the multiplication.

When you multiply matrices, you must have the same number of columns in the first matrix as there are rows in the second matrix. For example, the matrices in Figure 2-14 can be multiplied because the matrix in B2..C6 has two columns (B and C) and the matrix in E2..G3 has two rows (2 and 3). You could not reverse the order of the matrices, however, because the matrix in E2..G3 has three columns and the matrix in B2..C6 has five rows.

NOTE The formulas in Figure 2-14 show the calculations 1-2-3 performs when you select /Data Matrix Multiply. However, 1-2-3 does not actually create and store formulas in the worksheet when you select the command.

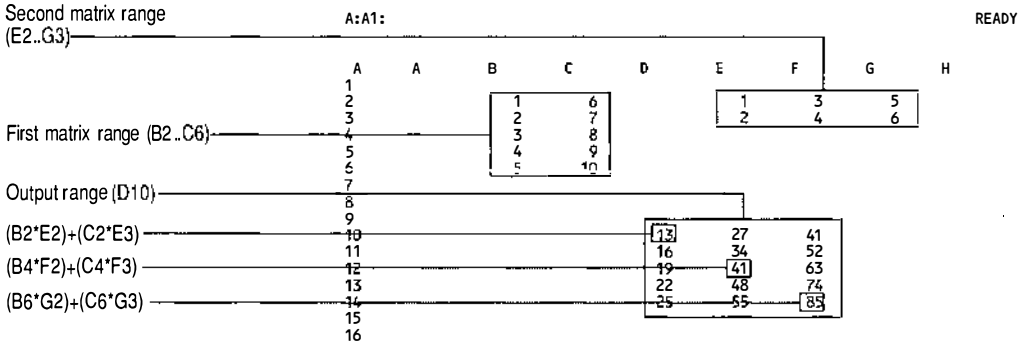


Figure 2-14. */Data Matrix Multiply*

Procedure

1. Select /Data Matrix Multiply.
2. Specify the first range you want to multiply. 1-2-3 can multiply any matrix of values up to a maximum of eighty rows by 80 columns. The range can be in any file, active or on disk.
3. Specify the second range you want to multiply. The range can be in any file, active or on disk. If you are multiplying three-dimensional ranges, the first and second ranges must contain the same number of worksheets.
4. Specify the output range (the range in which you want 1-2-3 to enter the results of multiplication.

   You can specify either the entire range or only the first cell in the range.

   CAUTION 1-2-3 creates an output range that contains the number of rows in the first range and the number of columns in the second range and writes over any existing data in the output range. Make sure the output range is blank or contains unimportant data.

If you specified three-dimensional ranges in steps 2 and 3, 1-2-3 multiplies the matrix in the first worksheet in the first range by the matrix in the first worksheet in the second range and enters the results in the first worksheet in the output range; multiplies the matrix in the second worksheet in the first range by the matrix in the second worksheet in the second range and enters the results in the second worksheet in the output range; and so on. For example, if you specify A:A1..C:C4 as the first range, A:A10..C:D12 as the second range, and A:A30 as the output range, 1-2-3 multiplies A:A1..A:C4 and A:A10..A:D12 and enters the results beginning in A:A30; multiplies B:A1..B:C4 and B:A10..B:D12 and enters the results beginning in B:A30; and multiplies C:A1..C:C4 and C:A10..C:D12 and enters the results beginning in C:A30.

Solving Simultaneous Equations with /Data Matrix

You can use both Data Matrix commands to solve simultaneous equations in 1-2-3. For example, you use the following procedure to solve these equations:

```
3x + 7y = 17

7x - 3y = 1
```

1. Create two matrices — one that corresponds to the x and y coefficients in your equations (the number 3 and 7 in both the equations above), and one that corresponds to the constants (17 and 1 in the equations above). Figure 2-15 shows the matrices you create for the equations above.

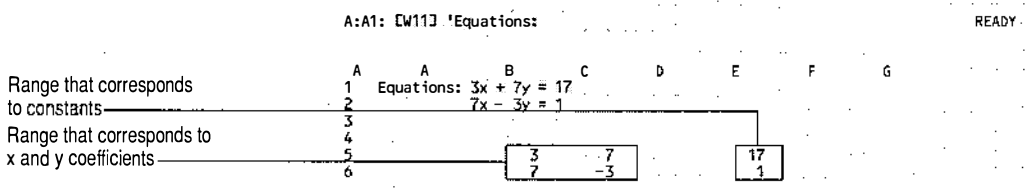


Figure 2-15. *Solving simultaneous equations with /Data Matrix*

2. Select /Data Matrix Invert.
3. Specify the matrix that corresponds to the x and y coefficients as the range you want to invert. In Figure 2-15, you specify B5..C6 as the range you want to invert.

4. Specify an output range. In Figure 2-16, the output range is B9.

   1-2-3 performs a matrix inversion.

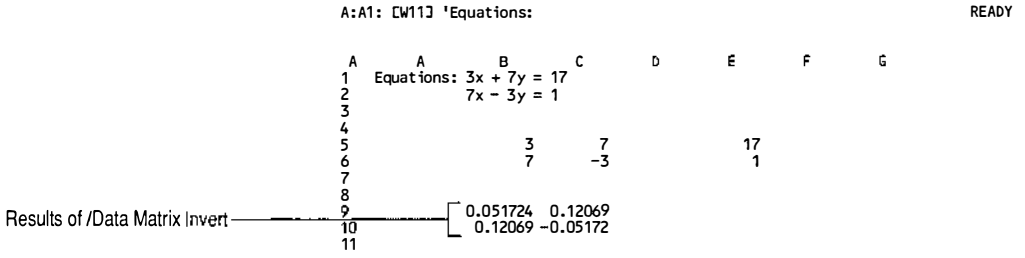


Figure 2-16. */Data Matrix Invert*

5. Select /Data Matrix Multiply.
6. Specify the inverted matrix as the first range to multiply. In Figure 2-16, the inverted matrix is B9..C10.
7. Specify the range containing the constants as the second range to multiply. In Figure 2-16, E5..E6 contains the constants.
8. Specify an output range. In Figure 2-17, the output range is E9..E10.

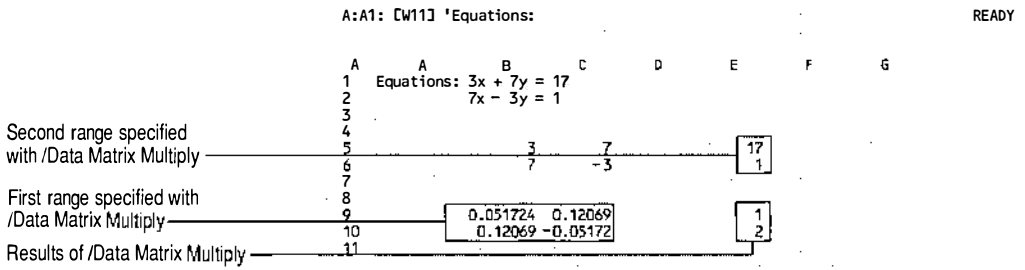


Figure 2-17. */Data Matrix Multiply*

The result of the matrix multiplication is the solution to the equations. In Figure 2-17, x = 1 and y = 2.

/Data Parse

/Data Parse separates and converts a single column of long labels into several columns of data of one or more types (values, dates, times, and labels).

Use /Data Parse to convert an imported text file into separate columns of data. 1-2-3 treats data you import with /File Import Text as long labels. The labels are contained in one column, even though the data may look like it extends across several columns.

You can view or print imported data when it appears as long labels, but you cannot calculate with the numbers each label contains, nor can you easily move any part of the label. To be able to work with the imported data, you must separate the data within the long labels into individual entries with /Data Parse.

The Data Parse commands perform the following tasks:

Command	*Task*
Format-Line	Creates or edits a format line that controls the way 1-2-3 divides a long label into blocks of data that will become individual entries, one per column.
Go	Parses the data and returns 1-2-3 to READY mode.
Input-Column	Specifies the single-column range that contains the format line and data you want to parse. The first cell in the input column must be a format line.
Output-Range	Specifies the range in which you want 1-2-3 to place the parsed data.
Quit	Returns 1-2-3 to READY mode without parsing the data.
Reset	Clears the current settings for the input column and output range.

Format Lines

A **format line** determines the way 1-2-3 parses the label below the format line into individual entries, separating the label wherever there are one or more spaces. For example, 1-2-3 parses the three-word label Average Monthly Sales into three separate pieces, because the spaces after Average and Monthly indicate the beginning of a new entry.

The pieces into which 1-2-3 breaks up the label are **data blocks**. In Figure 2-18, cell A3 contains four data blocks because the label contains spaces in three places.

The format line is a label, preceded by the vertical bar label prefix (|). (Some screens may display a split vertical bar; others, an unbroken vertical bar.) The characters in the format line indicate the data type and the width of each data block in the long label below it. The **data type** is the type of data — value, date, time, or label — within a data block.

Format lines can contain the following symbols:

Symbol	*Description*
D	Represents the first character of a date block.
L	Represents the first character of a label block.
S	Skips the data block below the symbol when parsing. You enter the skip symbol (S) when you edit a format line. Use this symbol when your labels include a data block you do not want 1-2-3 to parse. For example, in Figure 2-18, if you do not want to include the value 3450 in the parsed entries, you would edit the format line to replace the V above that block with an S.
T	Represents the first character of a time block.
V	Represents the first character of a value block.
>	Represents characters in a data block. For example, 1-2-3 displays a value block that is four characters wide as V>>>.
*	Represents a blank space that can become part of a data block if that block in any label requires extra characters.

1-2-3 creates the following format line in cell A2 for the unparsed label in cell A3.

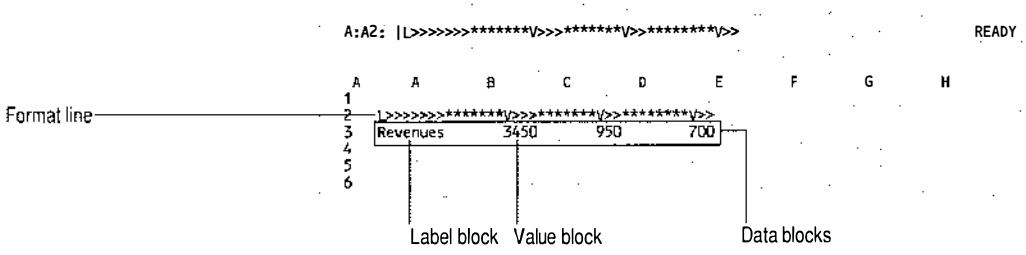


Figure 2-18. *Creating a format line*

If you select /Data Parse Go with this format line, 1-2-3 enters Revenues as a label in one column, 3450 as a value in the next column, 950 as a value in the third column, and 700 as a value in the fourth column.

This single format line in cell A2 correctly parses both of the labels below it:

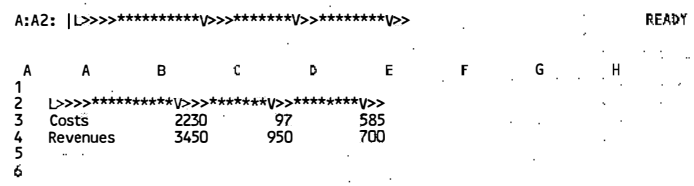


Figure 2-19. *Using the format line*

The format line has a sufficient number of undefined spaces (*) to accommodate the additional width of the label Revenues and the additional digit in 950.

Creating a Format Line and Parsing the Data

1. Position the cell pointer in the cell that contains the first long label you want to parse.
2. Select /Data Parse Format-Line Create.

   1-2-3 analyzes the label in the current cell, inserts a row, and creates a format line in the current cell.

   The characters in the format line reflect the data type and width of each of the data blocks in the cell below it. When you select Go, 1-2-3 uses the format line to parse the label. 1-2-3 treats each group of characters separated by one or

more blank spaces as a single data block and identifies each of these data blocks as one of the following data types: a value, date, time, or label.

NOTE If a data block contains an ambiguous entry — that is, data to which 1-2-3 could assign more than one data type — 1-2-3 determines the data type using the following order of precedence: value, date, time, and label. For example, if a data block contains the characters 4/10, 1-2-3 identifies the data type as a value instead of a date, because values come before dates in the order of precedence.

3. (Optional) Select Format-Line Edit to edit the format line. Follow the procedure in "Editing a Format Line," which follows step 9.

   You need to edit the format line if

   - Any data block (including adjacent * characters) is not wide enough to accommodate any of the data that 1-2-3 will parse in the labels below it.
   - You want 1-2-3 to parse an ambiguous entry in a particular way. In the example in the NOTE above, you would change the data-type character from V (value) to D (date) if you wanted 1-2-3 to interpret 4/10 as a date.
   - Any single block contains a space, because the format line treats the block as two shorter blocks (see Example following "Editing a Format Line").

4. (Optional) Create one or more additional format lines.

   To create each additional format line, select Quit to return 1-2-3 to READY mode, position the cell pointer in the next cell in the column requiring a new format line, and select /Data Parse Format-Line Create. Edit each new format line if necessary.

   You need to create additional format lines if

   - Any label below the format line contains a block whose data type does not match that indicated in the format line.

- Any label below the format line contains a block whose width should be different from that indicated in the format line.
- In addition to values, your imported data contains titles, column headings, other descriptive labels, or a row of characters separating different parts of the worksheet.

5. Select Input-Column.
6. Specify the single-column range that contains the format line(s) and labels you want to parse. The first cell in the input-column range must contain a format line. 1-2-3 ignores any cells that do not contain labels.
7. Select Output-Range.
8. Specify the address or range name of the first cell in a blank range large enough to hold your rows and columns of parsed data.

   CAUTION Be sure the area you specify as the output range is blank or contains unimportant data. /Data Parse uses as many rows and columns as it needs to hold the parsed data and writes over any existing data in that range with the parsed data.

9. Select Go.

1-2-3 produces a parsed copy of the imported data in the output range by entering each data block as a value, date, time, or label in an individual cell. If 1-2-3 cannot parse a particular entry using the format specified in the preceding format line, 1-2-3 parses the entry as a label.

NOTE If the input column contains one or more blank cells, 1-2-3 ignores these cells when it parses the information in the output range. For example, if the input column is A1..A10 and contains two blank cells, A3 and A4, and you specify A20 as the output range, 1-2-3 enters the parsed labels in rows 20 through 26.

Editing a Format Line

1. Position the cell pointer in the cell that contains the format line you want to edit.
2. Select /Data Parse Format-Line Edit.

   1-2-3 highlights the format line, places the cursor under the first character in the line, and goes into OVR (overstrike) mode.
3. Edit the format line.

   Use the 1-2-3 editing keys you use in EDIT mode to move through the format line and edit the characters you want to change. See "Editing an Entry" in Chapter 1 for a complete list of editing keys.

   Several keys have special functions when you use them to edit a format line.

Key	*Action*
↓ or ↑	Scrolls the unparsed labels below the format line down or up one row at a time so you can compare each label with the format line.
BREAK	Cancels edits you made to the format line and returns 1-2-3 to READY mode.
ESC	Erases the format line, but does not delete the row.
HOME	Returns the cursor to its initial position in the format line and, if you scrolled the unparsed labels below the format line, displays the unparsed labels that were visible before you began scrolling.
PGDN or **PGUP**	Scrolls the unparsed labels below the format line down or up one full screen.

4. Press **ENTER** when you finish editing the format line to enter the changes and return to the /Data Parse menu.

Example

The following figures illustrate the process you use with /Data Parse.

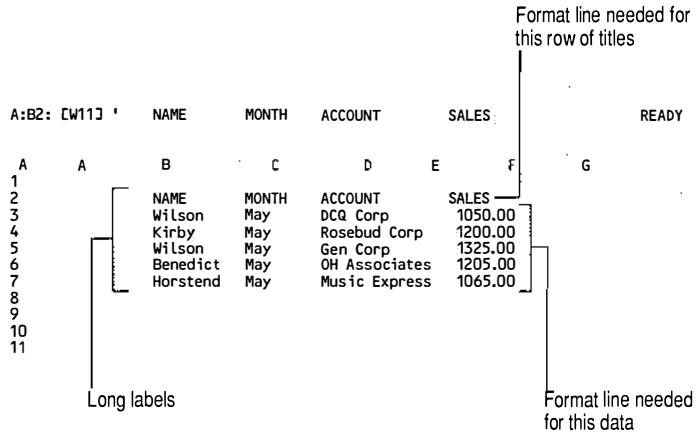


Figure 2-20. *The imported data*

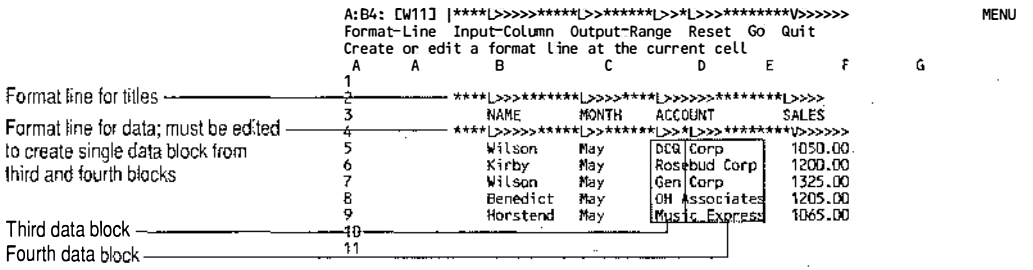


Figure 2-21. *Creating the format lines*

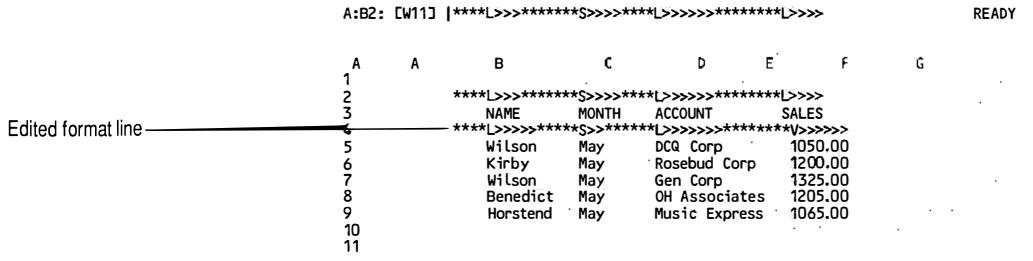


Figure 2-22. *The edited format line*

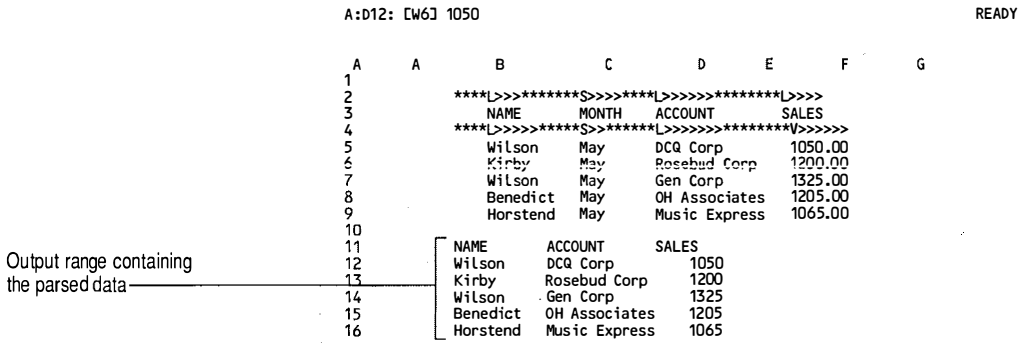


Figure 2-23. */Data Parse Go*

/Data Query

The Data Query commands locate selected records in a database table. Use these commands to edit and work with records in a database table.

Command	*Task*
Criteria	Specifies the criteria range, which contains the selection criteria for records in the database table.
Del	Deletes the records in the input range that match the criteria you specified in the criteria range.
Extract	Copies to the output range the records in the input range or ranges that match the criteria you specified in the criteria range.
Find	Locates the records in the input range that match the criteria you specified in the criteria range.
Input	Specifies the range or ranges that contain the records you want to manipulate. You can specify one or more 1-2-3 database tables or external tables.
Modify	Inserts records from the output range in the input range or replaces records in the input range with records from the output range. Modify lets you extract records from a database table (/Data Query Modify Extract), modify those records, and then return the modified records to the database table (/Data Query Modify Replace). Modify also lets you create new records and add them to the database table (/Data Query Modify Insert).

(continued)

Command	*Task*
Output	Specifies the range or external table in which you want 1-2-3 to place the results of /Data Query Extract, /Data Query Modify Extract, or /Data Query Unique; or specifies the range or external table containing the records you want to add to the input range using /Data Query Modify Insert.
Quit	Returns 1-2-3 to READY mode.
Reset	Clears the settings for the input, criteria, and output ranges.
Unique	Copies to the output range the records in the input range that match the criteria you specified in the criteria range. Unlike /Data Query Extract, /Data Query Unique eliminates any duplicate records from the output range and sorts the records.

In addition to the Data Query commands, you can also use QUERY to repeat any query operation except an operation you performed using /Data Query Delete or the Data Query Modify commands. This is especially helpful if you are using a command such as /Data Query Extract, because you can change values in the database table or the criteria range and then instantly repeat the command without using the menu.

NOTE If you select a Data Query Modify command and then press QUERY, 1-2-3 displays the /Data Query Modify menu.

Before Using /Data Query

Before you can begin to locate or work with records in a database table, you need to create two data query ranges: an input range and a criteria range. You use the input and criteria ranges with all the commands that locate records in a database table and with the command that deletes records from a database table. You must create an output range whenever you use commands to copy records from a database table to another range.

NOTE Depending on the capabilities of the database driver you are using, you can also use the Data Query commands with external tables. For information on the Data Query commands you can use with an external table, see the documentation for the database driver. In addition, before you use the Data Query commands with an external table, you need to use /Data External Use to establish a connection to the external table you want to work with. For more information, see /Data External Use.

The Input Range

The input range is the range or set of ranges that contains the records you want 1-2-3 to search when you select a Data Query command. You can specify one or more input ranges for each query. Each input range must be a single-sheet range or an external table. You use /Data Query Input to specify the input range or ranges. Figure 2-24 shows a typical input range.

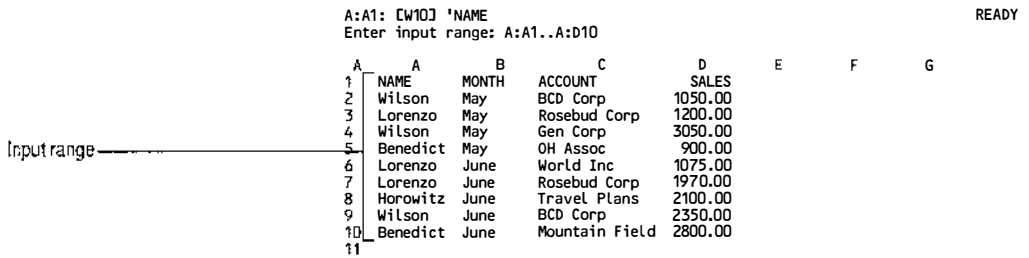


Figure 2-24. *The input range*

NOTE If you are using /Data Query Del, /Data Query Find, or /Data Query Modify, you can specify only one table as the input range.

Use the following guidelines when you create an input range:

- If you are using a 1-2-3 database table, the input range must include the field names and some or all of the records in the table.
- If you are using an external database, the input range is the range name of the table in that database that contains the records you want 1-2-3 to search. For information on external tables, see /Data External.

- If you are using more than one database table in the input range, you should name each table with /Range Name Create. Naming the tables makes it easier to refer to them in formulas in the criteria and output ranges. It also lets you refer to a field name that appears in more than one table.

  NOTE When you select /Data Query Extract, /Data Query Modify Extract, or /Data Query Unique, 1-2-3 uses the data in all the database tables in the input range to complete the command; you cannot specify multiple database tables in the input range and then work with the data in one table only. In addition, under most circumstances, you will need to enter a special type of formula called a join formula in the criteria range when you work with multiple database tables. See "Extracting Data from Multiple Tables" in "The Output Range" below for information on working with multiple database tables.

The Criteria Range

The criteria range tells 1-2-3 which records to search for in the input range. You use /Data Query Criteria to specify the criteria range. The first row of the criteria range contains copies of one or more field names from the input range you are searching. The remaining rows contain the criteria you want 1-2-3 to use.

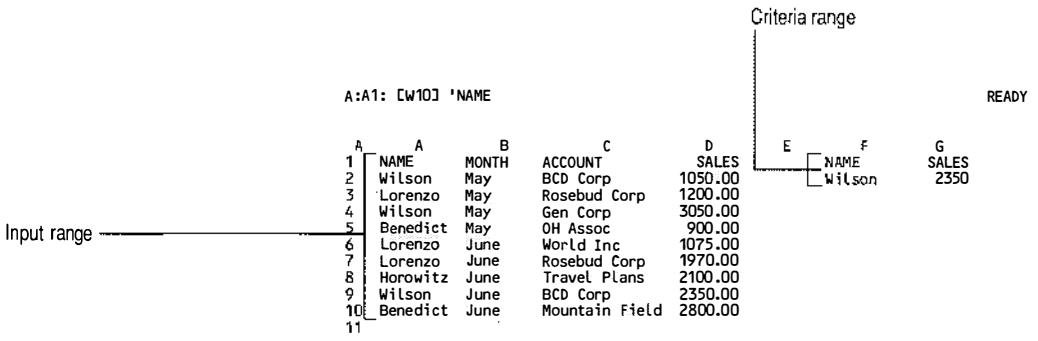


Figure 2-25. *The criteria range*

For example, Figure 2-25 shows a criteria range that contains two field names from the input range, NAME and SALES. In the row below the field names are the criteria 1-2-3 uses when searching in those fields during a Data Query command. In this example, 1-2-3 searches for records that contain the name Wilson in the NAME field and the amount $2350.00 in the SALES field.

Use the following guidelines when you create a criteria range:

- Choose a blank range either several rows above, to the right, or to the left of the input range or in a separate worksheet. In general, it is not a good idea to choose the area below the input range, unless you are certain that you will not be adding records to the input range. Do not choose an area below the output range if you specify a single-row output range, because 1-2-3 erases the area below a single-row output range when you select /Data Query Extract.

- In the first row of the criteria range, copy some or all of the field names from the input range. You must copy field names exactly as they appear in the input range. You need to copy only the names of the fields you want 1-2-3 to search. Copying all the field names, however, makes it easier to change criteria (using any fields) whenever you want. You can include up to 256 field names in the criteria range.

  If the input range includes more than one named database table, and if one or more field names appear in more than one table, edit those field names in the criteria range so that each begins with the name of the table the field name is in, followed by a . (period). For example, SALES.NAME refers to the field NAME in the table SALES. If two or more database tables in the input range have the same range name, and if duplicate field names appear in these tables, edit these field names in the criteria range so that each begins with a file reference, followed by the name of the table the field name is in and a . (period). For example, <<REGION1.WK3>>SALES.NAME refers to the field NAME in the table SALES in file REGION1.

  NOTE If the current argument separator is a . (period), use a , (comma) to separate table and field names. To display the current argument separator, select /Worksheet Global Default Status.

- In the second and subsequent rows of the criteria range, enter your criteria. Enter each criterion below the appropriate field name. You can enter labels or values exactly as they appear in the input range if you want 1-2-3 to search for records that match the criteria exactly; or you can use wild-card characters to search for records that are similar to the search criteria. You can also enter formulas as criteria.

Entering Labels as Criteria

- To search for exact matches, enter labels exactly as they appear in the input range.
- Use the wild-card characters ? and * to search for similar labels in the input range:

  ? Matches any single character. For example, h?t matches hat, hot, and hut, but does not match huts; h??d matches head and hood, but not heel.

  * Matches all characters to the end of a label. For example, cat* matches cat, catsup, and category, but not cart.
- Precede a label with a ~ (tilde) to search for all labels except that one. For example, ~Smith matches all records with an entry in that field other than Smith.
- Combine a ~ (tilde) with wild-card characters to create label criteria. For example, ~S* matches all records with an entry in that field that do not begin with S.
- Precede a label with a label prefix (' " or ^) followed by one of the logical operators (= < <= > >= and <>) to search for labels that match a specific condition you set. For example, '<>Smith matches all entries that are not Smith. The entry '>Mat matches Matthew, Max, Meg, and Nathan.

  NOTE If a label contains a wild-card character, you can precede the label with the logical operators = or <> only.
- 1-2-3 never matches a label criterion with blank cells in the input range.

Entering Values as Criteria

- You do not need to format values exactly as they appear in the input range to search for exact matches. For example, $23 matches 23, 23.000, and 2.30E+01.
- Precede a value with a label prefix (' " or ^) followed by one of the logical operators (= < <= > >= and <>) to search for values that match a specific condition you set. For example, '>1500 matches all entries greater than 1500.

  You cannot link such criteria using the logical operators #AND#, #NOT#, or #OR#, because 1-2-3 evaluates the operator (and the neighboring characters) as a string and assigns the string a value of 0. For example, '>3#AND#<6 matches all entries greater than 0, because the string 3#AND#<6 has a value of 0. See the following section for information on entering formulas as criteria.

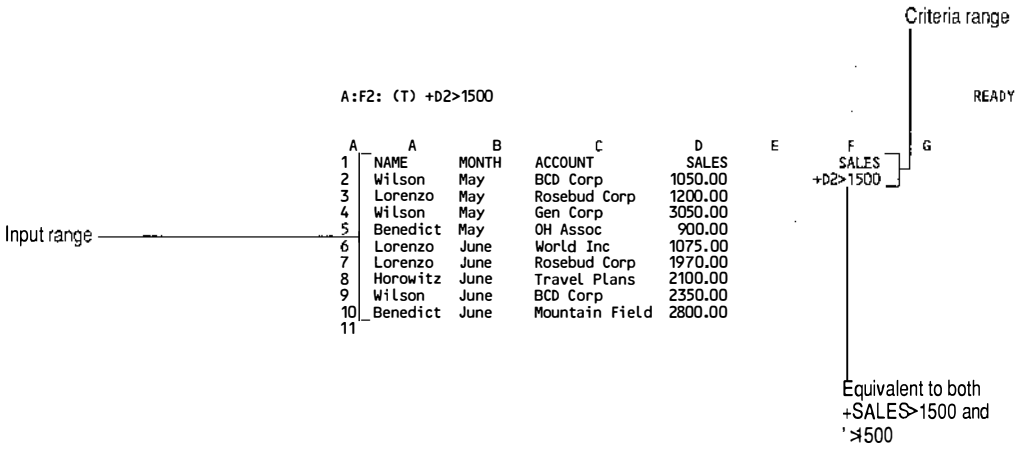
  NOTE When 1-2-3 is in READY mode, entering a < (less-than symbol) displays the main menu instead of < (less-than symbol). To use an entry that begins with <, you must precede the < sign with a label prefix.

Entering Formulas as Criteria

- You can enter one or more formulas linked by logical operators to search for labels or values. A formula you enter as a criterion can include a field name or the address of the first record in a field, an operator, and a value or label.

  For example, in Figure 2-26 the formula +D2>1500 in cell F2 causes Data Query commands to search for all records with sales entries greater than 1500. You could also enter the formula in Figure 2-26 as +SALES>1500. Or you could enter the criterion +MONTH="May" in cell F2 to search for all records with sales in the month of May.

  NOTE Cell F2 in Figure 2-26 is formatted with /Range Format Text so you can see the formula in the cell.



	A	B	C	D	E	F	G
1	NAME	MONTH	ACCOUNT	SALES			
2	Wilson	May	BCD Corp	1050.00			
3	Lorenzo	May	Rosebud Corp	1200.00			
4	Wilson	May	Gen Corp	3050.00			
5	Benedict	May	OH Assoc	900.00			
6	Lorenzo	June	World Inc	1075.00			
7	Lorenzo	June	Rosebud Corp	1970.00			
8	Horowitz	June	Travel Plans	2100.00			
9	Wilson	June	BCD Corp	2350.00			
10	Benedict	June	Mountain Field	2800.00			
11							

Figure 2-26. *Using a formula as a criterion*

NOTE If a formula contains a field name that matches an existing range name, the data query operation may not yield the correct results. Make sure your formulas do not contain field names that match existing range names, unless the named range is a single-cell range that refers to the cell below the corresponding field name.

- You can also combine criteria in a formula to search for records that match more than one criterion. For example, in Figure 2-26, you could enter +MONTH="May"#AND#SALES>1500 in cell F2 to search for all records in May with sales greater than 1500.
- If the input range includes more than one named database table and you want to use a formula that includes a field name that appears in more than one database table in the input range, precede the field name in the formula with the range name of the table the field is in, followed by a . (period). For example, the formula +JAN.SALES=2200 searches for all records in the field SALES in the database table range JAN with sales equal to 2200.

  If two or more database tables in the input range have the same range name and you want to use a formula that includes a field name that appears in two or more tables with duplicate names, precede the field name in the formula with a file reference, followed by the name of

the table the field name is in and a . (period). For example, <<REGION1.WK3>>SALES.NAME refers to the field NAME in the table SALES in file REGION1.

NOTE If the current argument separator is a . (period), use a , (comma) to separate table and field names. To display the current argument separator, select /Worksheet Global Default Status.

- Use relative cell addresses or field names in formulas that refer to other fields in the input range. Use absolute cell addresses to refer to values outside the input range. For example, if the field names JAN_SALES and FEB_SALES are in cells A:B1 and A:C1, respectively, you can use the criterion +A:B2<>A:C2 or +JAN_SALES<>FEB_SALES to search for records whose entry in the JAN_SALES field is not equal to its entry in the FEB_SALES field; use the criterion +A:B2<>$A:$J$2 or +JAN_SALES<>$A:$J$2 to search for records whose entry in the JAN_SALES field is not equal to the value in cell J2, which is outside the input range.

- You can enter formulas that contain database @functions. For example, you could use @DGET in a formula in the criteria range to specify a value in a field from another database table. As another example, you could enter the formula +SALES>@DAVG(A1..D10,3,H1..H2) in cell F2 in Figure 2-26 to search for records of all salespeople with sales greater than the average of the values in the SALES field. (In this example, H1 could contain any field name in the database table, and H2 would be blank.)

  You can nest up to eight database @functions in a formula in a criteria range.

  A database @function containing a misspelled field name is equivalent to a blank cell. See the following section, "Entering Multiple-Field Criteria," for information on blank cells in criteria ranges.

  NOTE The criteria range you specify as one of the arguments for a database @function cannot be the criteria range containing the database @function. Such a database @function results in a circular reference, causing 1-2-3 to display an error message when you select /Data Query Extract to perform the query.

NOTE 1-2-3 converts all field names in formulas to upper case. For case-sensitive drivers, you may not be able to use mixed or lower case names in formulas.

See "Database @Functions" in Chapter 3 for information on database @functions.

- You can combine the contents of records in different database tables by entering a join formula in the criteria range. For more information, see "Extracting Data from Multiple Tables" in "The Output Range," which follows.

Entering Multiple-Field Criteria

- Enter criteria for different fields in a single row of the criteria range to search for only those records that match all the criteria at once. 1-2-3 treats criteria in the same row as if they were linked by the logical operator #AND#. In Figure 2-27, if you selected F1..G2 as the criteria range, 1-2-3 would find only the record in row 3.

- A blank cell in the criteria range tells 1-2-3 to include any records in the input range, as long as the records match the other criteria. In Figure 2-27, if you selected F5..G6 as the criteria range, 1-2-3 would find all records with the month May (the records in rows 2 through 5), regardless of the SALES values.

- Enter criteria for different fields in separate rows of the criteria range to search for records that match any of the criteria. 1-2-3 treats criteria in separate rows as if they were linked by the logical operator #OR#. In Figure 2-27, if you selected F8..G10 as the criteria range, 1-2-3 would find all records with the month May or with sales that equal 2350 (the records in rows 2 through 5 and the record in row 9).

  NOTE If a multiple-row criteria range contains a blank row, 1-2-3 ignores the blank row and selects all the records that match any criteria in the remaining row(s) of the criteria range.

- Use the logical operators #AND#, #NOT#, or #OR# in formulas to create criteria that match more than one condition in the same field. For example, the formula +SALES>1500#AND#+SALES<2200 searches for all records with SALES entries greater than 1500 but less than 2200.

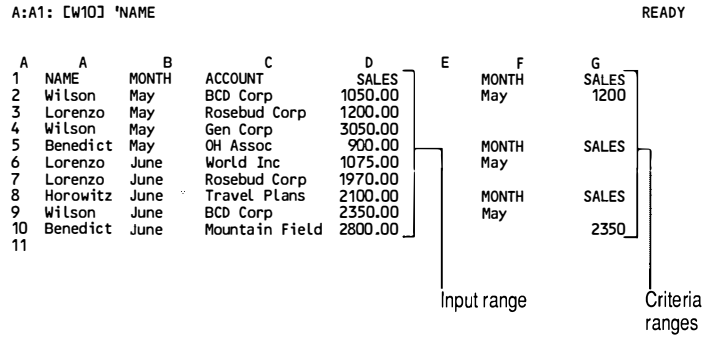


Figure 2-27. *Using multiple-field criteria*

The Output Range

The output range is the area to which 1-2-3 copies the results of /Data Query Extract, /Data Query Modify Extract, or /Data Query Unique. You use /Data Query Output to specify the output range.

Like the criteria range, the first row of the output range contains copies of one or more field names from the input range you want 1-2-3 to search. 1-2-3 uses the remaining rows of the output range to copy the selected records. The output range can be a range in an active file or the range name of an external table.

The first row of the output range can also contain formulas. For more information on using formulas in the output range, see "Creating a Computed Column in the Output Range," which follows.

Figure 2-28 shows a typical output range after 1-2-3 selected records based on the specified criteria. Cell G2 is formatted with /Range Format Text so you can see the formula in the cell.

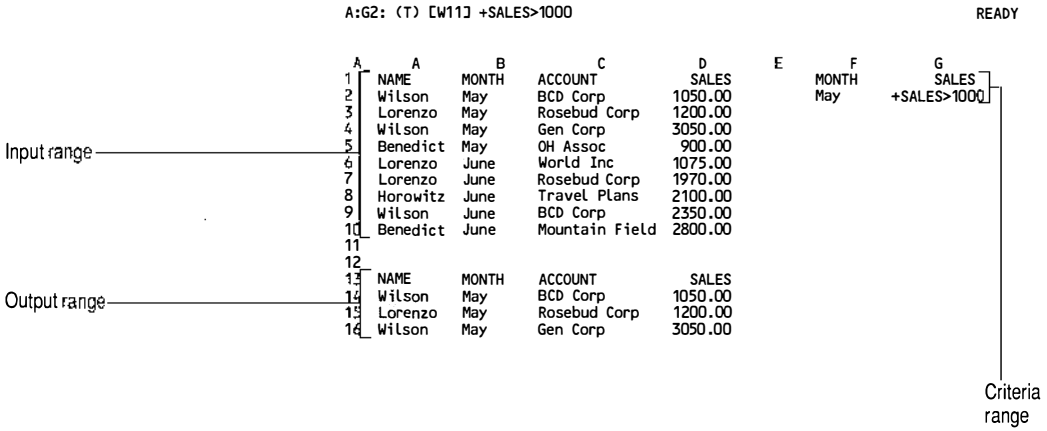


Figure 2-28. *The output range*

Use the following guidelines when you create an output range:

- Choose an area in the current file that does not overlap your input or criteria ranges. Be sure that you leave enough rows in the output range for the maximum number of records 1-2-3 will select. In general, it is not a good idea to choose the area below the input range, unless you are certain that you will not be adding records to the input range.
- Copy field names from the input range to the first row of the output range. Include each of the fields that you want listed when 1-2-3 copies records that match your criteria. Each field name must be identical to the corresponding field name in the input and criteria ranges, but you can arrange the fields in the output range in any order.

  If the input range includes more than one named database table, and if one or more field names appear in more than one table in the input range, edit those field names in the output range so that each begins with the name of the table the field name is in, followed by a . (period). For example, SALES.NAME refers to the field NAME in the table SALES. If two or more database tables in the input range have the same name, and if duplicate field names appear in these tables, edit these field names in the output range so that each begins with a file reference, followed by the name

of the table the field name is in and a . (period). For example, <<REGION1.WK3>>SALES.NAME refers to the field NAME in the table SALES in file REGION1.

NOTE If the current argument separator is a . (period), use a , (comma) to separate table and field names. To display the current argument separator, select /Worksheet Global Default Status.

If you are using a formula containing a field name as an entry in the first row of the output range, and if that field name appears in more than one database table in the input range, precede the field name in the formula with the name of the table the field is in, followed by a . (period). For example, the formula +JAN.SALES*0.1 multiplies each entry in the field SALES in the database table JAN by 10%. For more information on using formulas in the output range, see "Creating a Computed Column in the Output Range," which follows.

NOTE If a formula contains a field name that matches an existing range name, the data query operation may not yield the correct results. Make sure your formulas do not contain field names that match existing range names, unless the named range is a single-cell range that refers to the cell below the corresponding field name.

- Specify a single-row output range that contains only the field names if you want 1-2-3 to extract all the records specified by the criteria, regardless of how many rows of the sheet are required. Any cells below the output range will be erased.

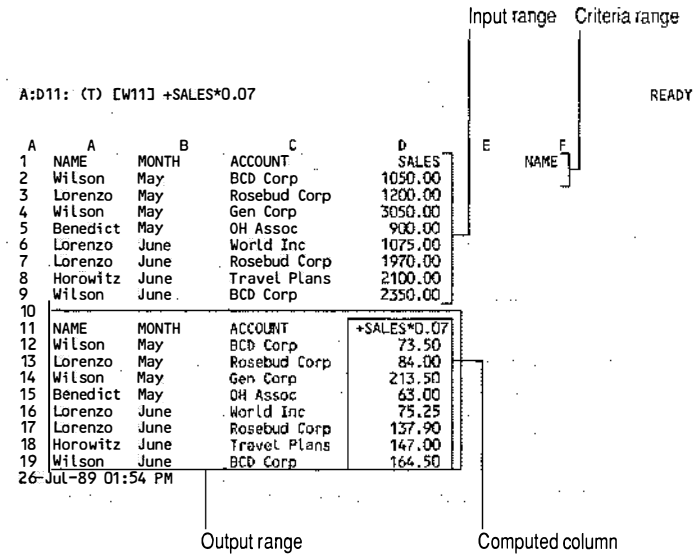
Creating a Computed Column in the Output Range You can perform calculations in one or more columns in the output range by entering one or more formulas in the first row of the output range.

You can use any type of formula except @AVG, @COUNT, @MIN, @MAX, @SUM, and the database @functions to create a computed column in the output range. A **computed column** is a column in which 1-2-3 calculates values for a group of records. You can use @AVG, @COUNT, @MIN, @MAX, and @SUM to create an aggregate column in the output range. An **aggregate column** is a column in which 1-2-3 calculates a total

for a group of related values. See the following section, "Creating an Aggregate Column in the Output Range," for more information on aggregate columns.

To create a computed column in the output range, enter a formula instead of a field name in the first cell in the column. In Figure 2-29, for example, column D in the output range (A11..D19) is a computed column in which 1-2-3 calculates the commission due each salesperson, given a commission rate of 7%. Because the criteria range in F1..F2 contains no selection criteria, 1-2-3 selects all the records in the input range and calculates a commission for each record.

NOTE Cell D11 is formatted with /Range Format Text so you can see the formula in the cell. If you do not format a cell containing a formula with /Range Format Text, the formula will evaluate to 0, 1, ERR, or some other value. This will not affect the results in the output range, however.



	A	B	C	D	E	F
1	NAME	MONTH	ACCOUNT	SALES		NAME
2	Wilson	May	BCD Corp	1050.00		
3	Lorenzo	May	Rosebud Corp	1200.00		
4	Wilson	May	Gen Corp	3050.00		
5	Benedict	May	OH Assoc	900.00		
6	Lorenzo	June	World Inc	1075.00		
7	Lorenzo	June	Rosebud Corp	1970.00		
8	Horowitz	June	Travel Plans	2100.00		
9	Wilson	June	BCD Corp	2350.00		
10						
11	NAME	MONTH	ACCOUNT	+SALES*0.07		
12	Wilson	May	BCD Corp	73.50		
13	Lorenzo	May	Rosebud Corp	84.00		
14	Wilson	May	Gen Corp	213.50		
15	Benedict	May	OH Assoc	63.00		
16	Lorenzo	June	World Inc	75.25		
17	Lorenzo	June	Rosebud Corp	137.90		
18	Horowitz	June	Travel Plans	147.00		
19	Wilson	June	BCD Corp	164.50		

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Figure 2-29. *Output range with a computed column*

You can refer to more than one field in a formula in the output range. For example, if the input range in Figure 2-29 included a COMMISSION field that contained commission rates, you could include the formula +SALES*COMMISSION in the output range to calculate the commission due each salesperson.

You can use more than one formula in the output range. For example, if the input range in Figure 2-29 contained the fields COMMISSION and EXPENSES, you could include the formulas +SALES*COMMISSION and +SALES-EXPENSES as field names in the output range to calculate the commission due each salesperson and the net profit each salesperson made for each account.

The output range can contain both computed columns and aggregate columns only if the field name or names to which the computed column(s) refer appear in the output range as field names that are not part of formulas. For example, if you want to use the formulas COST*1.05 and @AVG(SALARY) in the output range, you must include COST as a field name in the output range. Similarly, you cannot use /Data Query Unique if the output range contains a computed column unless the field name(s) to which the computed column refers appear in the output range as field names that are not part of formulas.

Creating an Aggregate Column in the Output Range You can create an aggregate column in the output range that calculates a total for a group of related values. You create aggregate columns by specifying a formula as a field in the output range. The formula must be one of the following @functions: @AVG, @COUNT, @MIN, @MAX, and @SUM. For example, in Figure 2-30 the formula @SUM(SALES) totals the sales amounts for each month. Cell B12 is formatted with /Range Format Text so you can see the formula in the cell.

NOTE If you do not format a cell containing a formula with /Range Format Text, the formula will evaluate to 0, 1, ERR, or some other value. This will not affect the results in the output range, however.

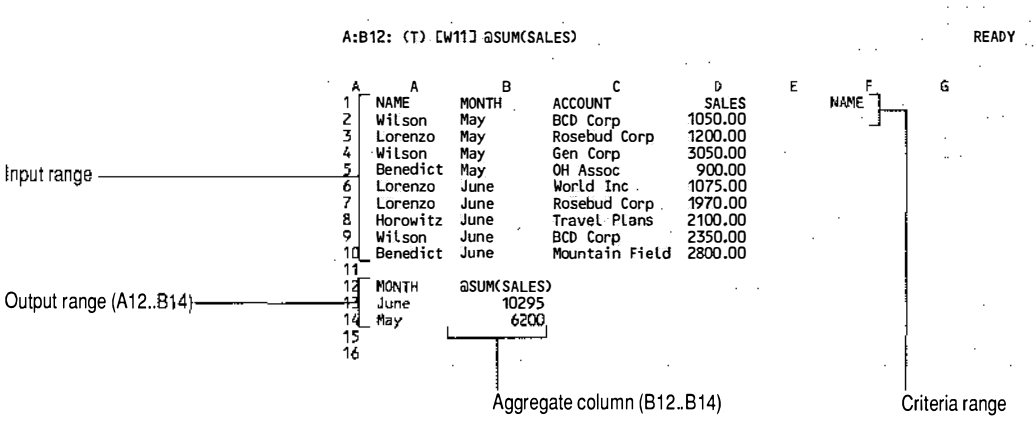


Figure 2-30. *Aggregate column in the output range*

When you select /Data Query Extract, 1-2-3 calculates the aggregate column based on the fields you specified in the output range. In Figure 2-30, 1-2-3 sums the sales amounts by month. If the output range included the field ACCOUNT, 1-2-3 would sum the sales for each account by month.

You can also limit the number of records 1-2-3 selects for the output range by specifying criteria in the criteria range. For example, in Figure 2-31, the aggregate column (B12..B14) counts the number of sales by month for Wilson. Cell B12 is formatted with /Range Format Text so you can see the formula in the cell.

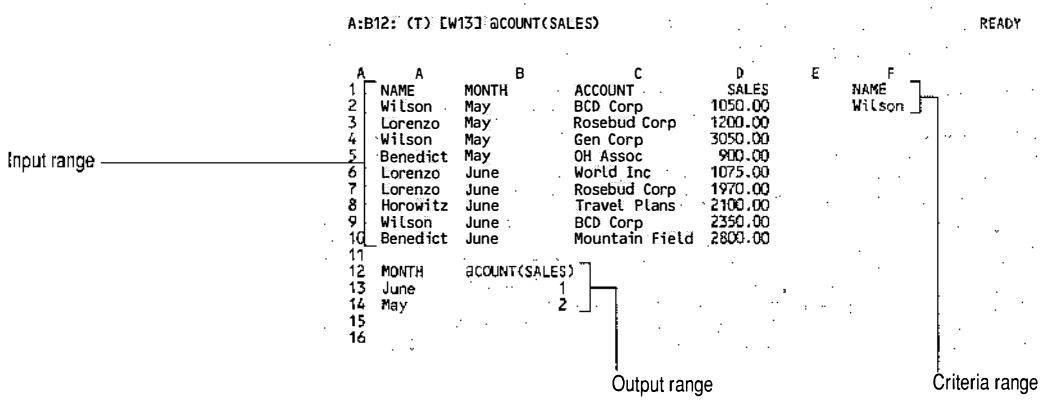


Figure 2-31. *Aggregate column in the output range with selected records*

Extracting Data from Multiple Tables You can create an output range that contains records composed of fields from two or more database tables or the results of calculations based on fields from different database tables. Figure 2-32 shows an output range that joins the contents of two database tables, TABLE1 (A1..B5) and TABLE2 (D1..E4). The output range (A7..B11) contains a computed column that multiplies the contents of a field in TABLE1 (SALES) by the contents of a field in TABLE2 (RATE). Cells B7 and G2 are formatted with /Range Format Text so you can see the formulas in the cells.

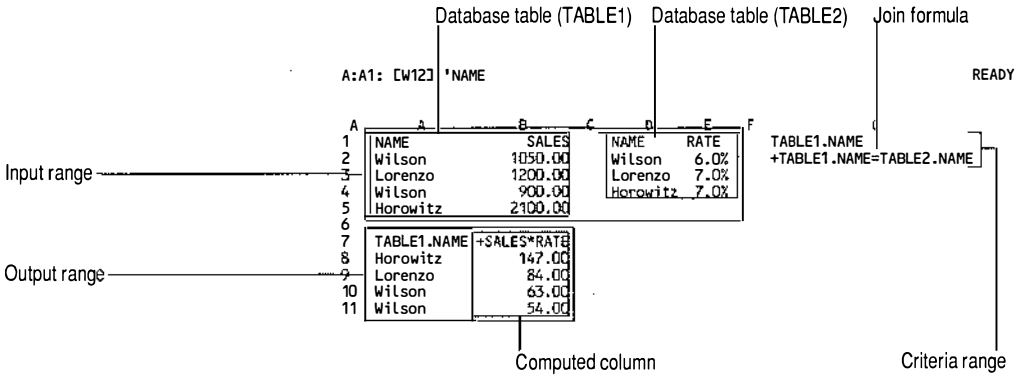


Figure 2-32. *Output range with input range that contains two database tables*

You combine the contents of records in different database tables by entering a join formula in the criteria range, using /Data Query Input to specify two or more database tables as the input range, and then selecting /Data Query Extract or /Data Query Unique. A **join formula** establishes a relationship between the keys in two database tables. A **key** is a field or set of fields containing information that uniquely identifies each record in a database table. The NAME field is the key field in both database tables in Figure 2-32, for example.

When you select /Data Query Extract or /Data Query Unique, 1-2-3 compares the contents of the key fields in the join formula and, for each set of records the contents of whose key fields meet the conditions in the formula, creates a new record in the output range, using the fields listed in the first row of the output range.

For example, the join formula in Figure 2-32 (+TABLE1.NAME=TABLE2.NAME) tells 1-2-3 to compare the contents of the first database table with the contents of the second database table and create a third, new record for each pair of records with matching NAME entries. Because the name Lorenzo appears in both key fields of both database tables in the input range, for instance, 1-2-3 creates an entry for Lorenzo in the output range. 1-2-3 then performs the multiplication specified in the computed column (B7..B11) using the contents of the SALES field in one database table and the contents of the RATE field in the other database table.

Note that the join formula +TABLE1.NAME=TABLE2.NAME is equivalent to +A2=D2.

If you want a field name in a join formula or in the first row of an output or criteria range to refer to a field the name of which appears in more than one database table in the input range, you must precede the field name with a table name. Because there are two NAME fields in the input range in Figure 2-32, for example, the join formula refers to these fields as TABLE1.NAME and TABLE2.NAME, and the output range contains a field called TABLE1.NAME. Use /Range Name Create to name a table.

NOTE If you specify two or more input ranges using /Data Query Input, but leave the criteria range blank, 1-2-3 copies to the output range a set of records that combines the contents of each field in each input range with the contents of every other record in the input ranges. For example, if you specify an output range for two input ranges containing 10 records each and then select /Data Query Extract or /Data Query Unique without specifying a criteria range that contains either a join formula or selection criteria, 1-2-3 copies 100 records to the output range.

Use the following guidelines when creating join formulas:

- You can use more than one set of fields in a formula to join database tables that have multiple-field keys. For example, if the key in each database table consists of the fields NAME and ACCT, you can use the formula +JAN.NAME=FEB.NAME#AND#JAN.ACCT=FEB.ACCT to join the contents of the two database tables.

- You can join the contents of multiple database tables by creating join formulas that refer to the keys in each table. For example, to join the contents of database tables CUSTOMER, ORDERS, and SALES, each of which has a key field called CUST_ID, you could create the join formula CUSTOMER.CUST_ID=ORDERS.CUST_ID#AND# ORDERS.CUST_ID=SALES.CUST_ID.

- Make sure the field name of a key field does not contain special characters such as spaces, , (commas), and # (pound signs). If you use a field name containing these characters in a join formula, 1-2-3 cannot calculate the formula correctly.

- The field names do not need to be the same to link the fields in two database tables. For example, the formula +JAN.NAMES=FEB.EMPLOYEE is acceptable. (If the field names NAMES and EMPLOYEE are unique within the input range, the formula +NAMES=EMPLOYEE is also acceptable.)

  NOTE You can use any of the logical operators < > <> <= or >= in a formula in the criteria range. 1-2-3 compares the contents of each field in each input range with the contents of every other record in the input ranges and copies to the output range all the resulting field combinations (records) that match the search criteria. The number of records 1-2-3 copies can range from zero to the number of records in the first input range multiplied by the number of records in the second input range.

The following sections explain how to use the Data Query commands to specify the input, criteria, and output ranges and work with the records in a database table.

/Data Query Criteria

/Data Query Criteria specifies the criteria range, which contains the selection criteria for records in the database table. You must use /Data Query Criteria before you can complete any data query operation, except /Data Query Modify Insert.

See "The Criteria Range" earlier in this section for guidelines on creating a criteria range.

Procedure

1. Select /Data Query Criteria.
2. Specify the criteria range.

   The criteria range cannot be a three-dimensional range.

/Data Query Del

/Data Query Del deletes the records in the input range that match the criteria you specified in the criteria range and shrinks the input range to remove the blank rows. As a safety precaution, 1-2-3 prompts you for confirmation before it deletes the records.

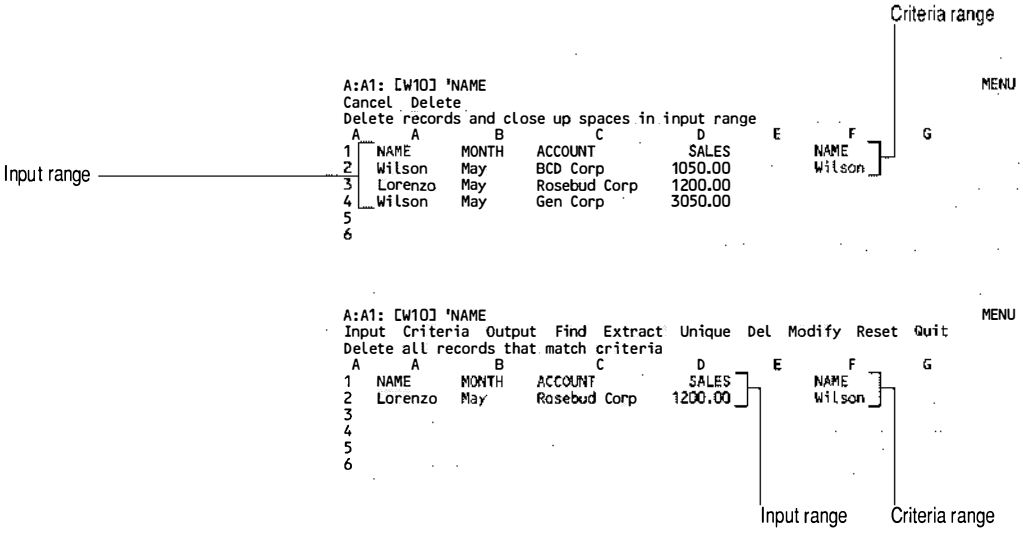


Figure 2-33. */Data Query Del*

Procedure

1. Before you can use /Data Query Del, you must specify a one-table input range and a criteria range with /Data Query Input and /Data Query Criteria. See "Before Using /Data Query" earlier in this section for information on creating these two ranges.
2. Select /Data Query Del.

3. Select Cancel to return to the /Data Query menu without deleting any records or select Delete to delete all records in the input range that match the criteria in the criteria range.

TIP If you are using a database table in an active file, you can use /Data Query Find to preview the records that 1-2-3 will delete before 1-2-3 deletes the records. /Data Query Del does not highlight the records it deletes.

/Data Query Extract

/Data Query Extract copies to the output range the records in the input range(s) that match the criteria you specified in the criteria range.

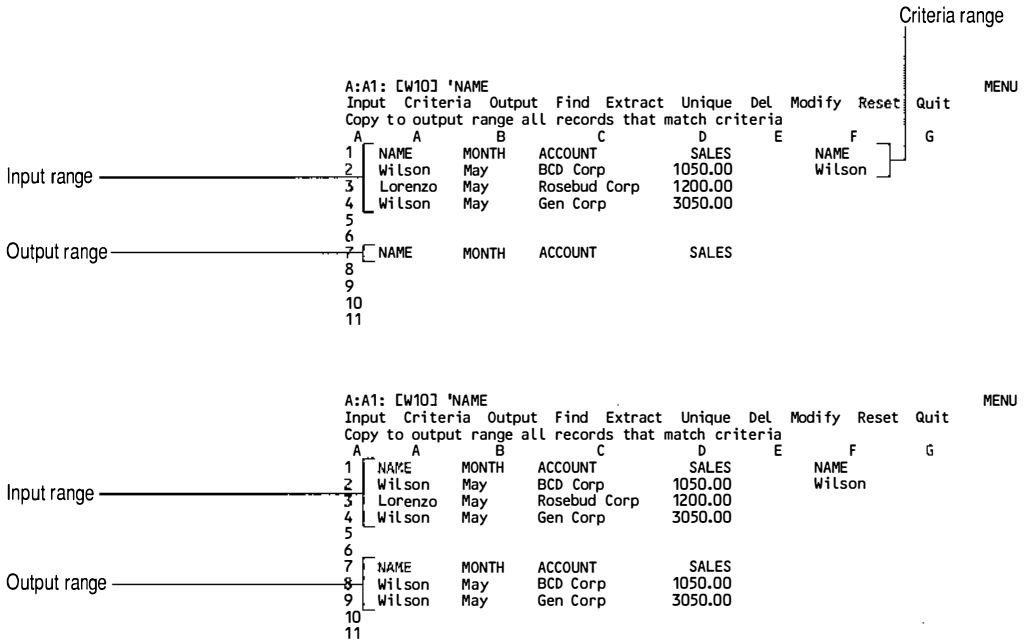


Figure 2-34. */Data Query Extract*

Procedure

1. Before you can use /Data Query Extract, you must specify an input range, a criteria range, and an output range. See "Before Using /Data Query" earlier in this section for information on these three ranges.

2. Select /Data Query Extract.

1-2-3 copies to the output range the records from the input range(s) that match your criteria. 1-2-3 copies only the fields specified by field names in the output range.

If the input range is a 1-2-3 database table and the output range is in a worksheet, 1-2-3 formats each cell in the output range with the format of the corresponding cell in the input range. In Figure 2-34, for example, 1-2-3 formats the cells in A8..D8 with the cell formats in A2..D2. If one or more cells in the input range are protected, the corresponding cells in the output range also become protected. Also, if a field in the input range contains one or more formulas, 1-2-3 converts the formulas to values in the corresponding field in the output range. 1-2-3 does not change the cell formats of cells in a computed column.

If the input range is an external table that contains information formatted as dates or times and the output range is in a worksheet, 1-2-3 formats cells containing dates with the Date format and cells containing times with the Time format.

If the output range is an external table, where and how the information is copied depends on the capabilities of the database driver. For more information, see the documentation for the database driver. The information copied to the external table takes on the formats in the external table. For more information on external tables, see /Data External.

1-2-3 displays an error message if you specified a multiple-row output range and there are more matching records than can fit the range. Press ESC to return to the /Data Query menu. Use/Data Query Output to specify an output range with more rows, or if it is safe to do so specify just the row that contains the field names as the output range.

CAUTION If you specify a one-row output range, 1-2-3 writes over the data in the rectangular area defined by the row under the output range, the columns containing the range, and the last row of the worksheet (row 8192) when it copies the extracted data. For example, if you specify B12..E12 as the output range, 1-2-3 writes over data in B13..E8192 when it copies the extracted

data. Make sure the entire area of the worksheet below the one-row range you specified as the output range is blank or contains unimportant data.

/Data Query Find

/Data Query Find locates the records in the input range that match the criteria you specified in the criteria range. You cannot use an external table or multiple input ranges with /Data Query Find.

Use /Data Query Find to locate records that you want to edit.

NOTE You cannot use /Data Query Find to locate information in hidden columns.

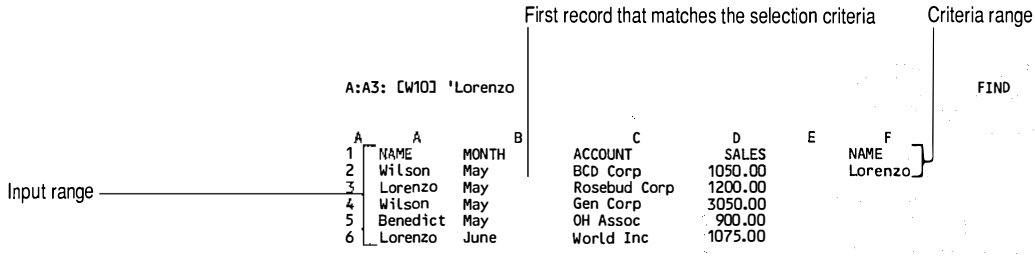


Figure 2-35. */Data Query Find*

Procedure

1. Before you can use /Data Query Find, you must specify an input range and a criteria range. See "Before Using /Data Query" earlier in this section for information on these two ranges.
2. Select /Data Query Find.

   1-2-3 highlights the first record in the input range that matches the criteria. If there are no matching records, 1-2-3 returns to the /Data Query menu.

3. Use the following keys to move among the matching records in the input range.

Key	*Action*
↓ or ↑	Moves the cell pointer to other records in the input range that match the criteria. If there are no more matching records in that direction, 1-2-3 beeps.
← or →	Moves the cursor from field to field within a highlighted record.
EDIT	Lets you edit the field displayed in the current record. Press ENTER to save the changes and continue using /Data Query Find; press ESC to cancel the changes and continue using /Data Query Find.
ENTER or **ESC**	Ends /Data Query Find and returns you to the /Data Query menu.
HOME or **END**	Moves the cell pointer to the first or last record in the input range that matches the criteria.
QUERY	Ends /Data Query Find, leaves the cell pointer in the current cell in the current record, and returns 1-2-3 to READY mode.

4. Press **ENTER** and select Quit to return 1-2-3 to READY mode.

1-2-3 moves the cell pointer to the cell it was in when you selected /Data Query Find.

/Data Query Input

/Data Query Input specifies the input range or ranges that contain the records you want 1-2-3 to search when you select a Data Query command. You can specify one or more 1-2-3 database tables or external tables. You must use /Data Query Input before you can complete any data query operation. See "The Input Range" earlier in this section for more information on input ranges.

Procedure

1. Select /Data Query Input.
2. Specify an input range. Be sure you include the row that contains the field names in the range. If you are using an external table, enter the range name you assigned it with /Data External Use.

   If you intend to use /Data Query Extract to copy records in the input range to the output range, the input range can be in any file, active or on disk, or can be an external table. If you intend to use /Data Query Modify Insert or Replace to add or replace records in the input range, the input range must be either in an active file or an external table.
3. (Optional) To specify more than one input range, press the argument separator instead of ENTER after typing or highlighting the range address or range name. 1-2-3 prompts you for the next range to enter. Press ENTER after the last range to complete the specification.

   NOTE The argument separator can be a , (comma), . (period), or ; (semicolon). You change the argument separator with /Worksheet Global Default Other International Punctuation. Initially, 1-2-3 uses a , (comma) for the argument separator. To display the current argument separator, select /Worksheet Global Default Status. Do not use a . (period) as an argument separator if you have range names that contain periods, because 1-2-3 considers a period in a range name to be an argument separator.

/Data Query Modify

/Data Query Modify inserts records from the output range in the input range or replaces records in the input range with records from the output range.

Use /Data Query Modify to extract records from a 1-2-3 database table or external table, modify those records in the output range, and then return the modified records to the database table.

For information on modifying the contents of a cell, see "Editing an Entry" in Chapter 1.

The Data Query Modify commands perform the following tasks:

Command	*Task*
Cancel	Cancels the current Modify operation without updating the records in the input range.
Extract	Copies to the output range the records in the input range that match the criteria you specified in the criteria range. Unlike /Data Query Extract, /Data Query Modify Extract remembers the location in the input range for the extracted records, so you can modify the records and reinsert them in their original location.
Insert	Adds the records from the output range to the input range.
Replace	Replaces the original records in the input range with the corresponding records that 1-2-3 copied to the the output range with /Data Query Modify Extract.

/Data Query Modify Cancel Cancels the current Modify operation without updating the records in the input range.

Use /Data Query Modify Cancel to leave the /Data Query Modify menu if you used /Data Query Modify Extract to copy records to the output range and decide you do not want to update the input range. You cannot perform /Data Query Modify Replace after you select /Data Query Modify Cancel.

Procedure

1. Select /Data Query Modify Cancel.

/Data Query Modify Extract Copies to the output range the records in the input range that match the criteria you specified in the criteria range. Unlike /Data Query Extract, which also copies records to the output range, /Data Query Modify Extract remembers the location in the input range for the extracted records, so you can modify the records and reinsert them in their original location.

Procedure

1. Before you use /Data Query Modify Extract, you must specify an input range, a criteria range, and an output range. See "Before Using /Data Query" earlier in this section for information on these three ranges.
2. Select /Data Query Modify Extract.

1-2-3 copies only the fields specified by field names in the output range. If a field in the input range contains one or more formulas, 1-2-3 converts the formulas to values in the corresponding field in the output range. 1-2-3 also adjusts the address of the output range to include the extracted records.

1-2-3 displays an error message if you specified a multiple-row output range and there are more matching records than can fit in the range. Press ESC to return 1-2-3 to READY mode. Use /Data Query Output to specify an output range with more rows, or if it is safe to do so, specify just the row that contains the field names as the output range.

CAUTION If you specify a one-row output range, 1-2-3 writes over the data in the rectangular area defined by the row under the output range, the columns containing the range, and the last row of the worksheet (row 8192) when it copies the extracted data. For example, if you specify B12..E12 as the output range, 1-2-3 writes over data in B13..E8192 when it copies the extracted data. Make sure the entire area of the worksheet below the one-row range you specified as the output range is blank or contains unimportant data.

If you specified a single-row output range, 1-2-3 automatically updates the address of the output range to include the new records. If you want to use /Data Query Modify Extract again to copy records to the output range and extend the range, you must first select /Data Query Output and respecify a single-row output range.

/Data Query Modify Insert Adds records from the output range to the input range.

Procedure

1. Before you use /Data Query Modify Insert, you must specify an input range and an output range. See "Before Using /Data Query" earlier in this section for information on these two ranges.

   NOTE The first row of the output range must contain field names, and the remaining rows must contain data. You cannot specify a single-row output range to use with /Data Query Modify Insert. 1-2-3 automatically extends the output range if you specified a one-row output range and then extracted records to the output range using /Data Query Modify Extract; if you entered the records in the output range in any other way, you must use /Data Query Output to expand the output range to include all the records you want to insert in the input range.

   CAUTION You should not create the output range below the input range if you are planning to use /Data Query Modify Insert, because 1-2-3 could write over existing data in the output range.

2. Select /Data Query Modify Insert.

/Data Query Modify Replace Replaces the original records in the input range with the corresponding records that 1-2-3 copied to the output range with /Data Query Modify Extract.

Use /Data Query Modify Replace if you want to replace records in a database table or external table with edited records from the output range.

CAUTION If the output range contains values that are the results of formulas, 1-2-3 replaces the formulas in the input range with the values when you select /Data Query Modify Replace. If you do not want to write over formulas in the input range with /Data Query Modify Replace, make sure the output range does not include the names of fields that contain formulas.

Under some circumstances, you may want to replace selected formulas in the input range with the values of those formulas. For example, assume you have a database table of salespeople that calculates salaries based on a commission rate that varies from month to month, and assume that the commission rate is stored in a cell outside the database table. At the end of each month, you can extract the records for that month and then use /Data Query Modify Replace to replace the salary formulas in the input range with values of those formulas. You can then change the commission rate in the cell outside the database table to calculate salaries for the current month without affecting the salaries 1-2-3 calculated for the previous month.

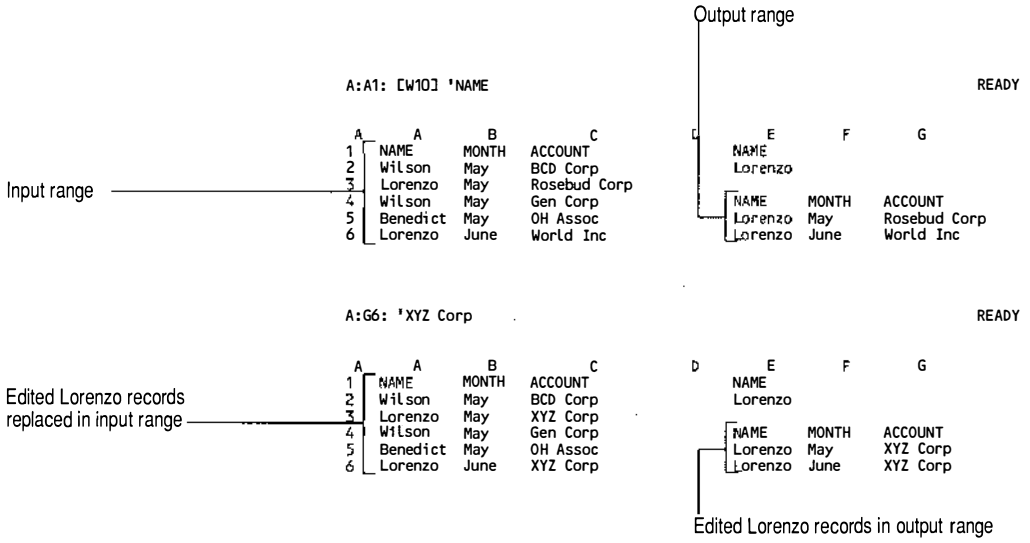


Figure 2-36. ***/Data Query Modify Replace***

Procedure

1. Before you use /Data Query Modify Replace, you must specify an input range, a criteria range, and an output range. See "Before Using /Data Query" earlier in this section for information on these three ranges.
2. Select /Data Query Modify Extract to copy records to the output range.

You must use /Data Query Modify Extract (and not /Data Query Extract) to copy records to the output range before you can use /Data Query Modify Replace.

3. Edit the records in the output range.

   CAUTION Do not add or delete rows in the output range or sort the records in the output range. If you do, 1-2-3 will not be able to match correctly the edited records with the records you want to replace in the input range.

4. Select /Data Query Modify Replace.

1-2-3 copies the records from the output range to the input range, replacing the original records with the copies you extracted and modified.

NOTE You cannot use /Data Query Input, Output, or Criteria to check or respecify a range after you select /Data Query Modify Extract and before you select /Data Query Modify Replace. If you try to check the address of a range at this point, 1-2-3 displays an error message when you select /Data Query Modify Replace. Press ESC to clear the error message and repeat the above procedure, beginning with step 2. You may first want to save your changes to another area of the sheet.

/Data Query Output

/Data Query Output specifies the output range in which you want 1-2-3 to place the results of /Data Query Extract, /Data Query Unique, and /Data Query Modify Extract, or specifies the range containing records you want to add to the input range using /Data Query Modify Insert. You must use /Data Query Output before you can complete any of the above operations. See "The Output Range" earlier in this section for more information on output ranges.

Procedure

1. Select /Data Query Output.
2. Specify the output range.

NOTE Specify a multiple-row output range if you want to be certain that 1-2-3 does not write over existing entries. If you specify a multiple-row output range, however, be aware that the range may not be large enough to accommodate all the records that match your selection criteria.

/Data Query Quit

/Data Query Quit returns 1-2-3 to READY mode.

Procedure

1. Select /Data Query Quit.

/Data Query Reset

/Data Query Reset clears the settings for the input, criteria, and output ranges you specified with the Data Query commands.

Use /Data Query Reset to clear the settings for these ranges if you want to use /Data Query with another database table or external table.

Procedure

1. Make sure the cell pointer is in the file containing the input, criteria, and output range settings you want to clear.
2. Select /Data Query Reset.

/Data Query Unique

/Data Query Unique performs the same operation as /Data Query Extract except it eliminates any duplicate records in the output range and sorts the records in the output range.

/Data Query Unique uses the fields in the output range to judge duplicates. So, for example, even though two records in the input range are not exactly alike, if the output range contains only fields that are the same for those two records, 1-2-3 does not copy the second record. In Figure 2-37, for example, 1-2-3 extracts one Wilson and one Benedict record each for the month of May.

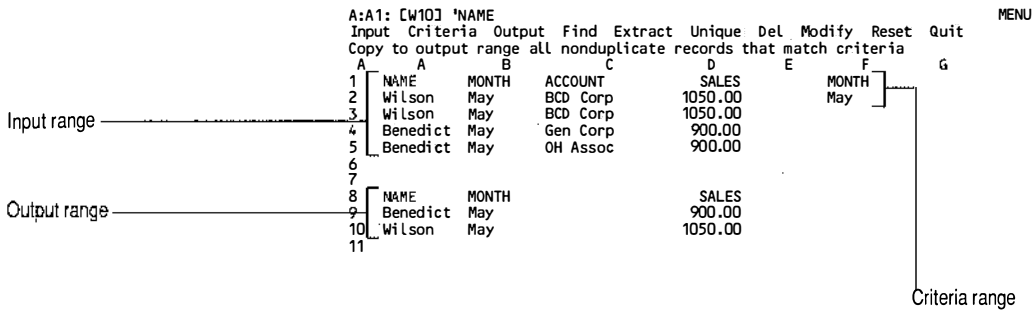


Figure 2-37. */Data Query Unique*

Procedure

1. Before you can use /Data Query Unique, you must specify an input range, a criteria range, and an output range. See "Before Using /Data Query" earlier in this section for information on these three ranges.
2. Select /Data Query Unique.

Unlike /Data Query Extract, /Data Query Unique sorts the records (using the contents of the leftmost field in the output range to determine the sort order, and using ascending order) before it copies them to the output range.

1-2-3 displays an error message if you specified a multiple-row output range and there are more matching records than can fit in the range. Press **ESC** to return 1-2-3 to READY mode. Use /Data Query Output to specify an output range with more rows, or if it is safe to do so, specify just the row that contains the field names as the output range.

CAUTION If you specify a one-row output range, 1-2-3 writes over the data in the rectangular area defined by the row under the output range, the columns containing the range, and the last row of the worksheet (row 8192) when it copies the extracted data. For example, if you specify B12..E12 as the output range, 1-2-3 writes over data in B3..E8192 when it copies the extracted data. Make sure the entire area of the worksheet below the one-row range you specified as the output range is blank or contains unimportant data.

/Data Regression

/Data Regression performs multiple linear regression analysis.

Use /Data Regression to predict a value for a dependent variable based on the values for one or more independent variables. /Data Regression also reports on the strength of the correlation of the independent variables to the dependent variable.

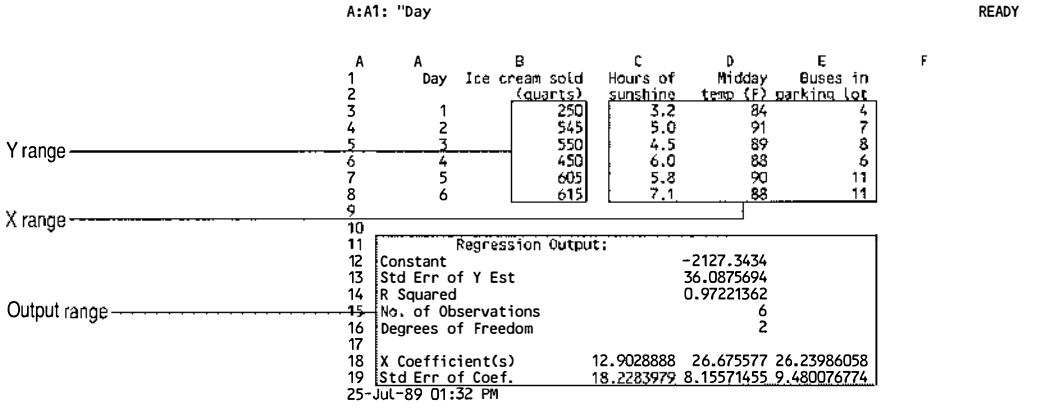


Figure 2-38. */Data Regression*

NOTE /Data Regression performs matrix inversions and multiplications using the values in the X and Y ranges (see below). Matrix inversion algorithms by their nature propagate small errors. Inverting an ill-conditioned matrix (a matrix that contains numbers differing widely in magnitude) may result in large errors. Keep this in mind when you enter values in the X and Y ranges.

You use some or all of the following Data Regression commands to perform a regression analysis:

Command	*Task*
Go	Calculates a data regression for the selected X range and Y range and enters the results in the output range.
Intercept	Determines whether 1-2-3 calculates the y-axis intercept (default) or uses zero as the intercept. The y-axis intercept appears in the results as the constant.
Output-Range	Specifies the range in which 1-2-3 places the results of the regression analysis.
Quit	Returns 1-2-3 to READY mode.
Reset	Clears the X range, Y range, and output range settings; resets the intercept to Compute.
X-Range	Specifies the independent variable(s).
Y-Range	Specifies the dependent variable.

Procedure

1. Select /Data Regression.
2. Select X-Range to specify the independent variable(s).

   Independent variables are the values you are testing for their effect on the dependent variable. You can specify up to 75 independent variables. The values for each variable must be in a column, and the columns of values must be adjacent. For example, if you have three independent variables, the values for these variables must be in three adjacent columns. You can have up to 8192 values in each column.
3. Specify the X range.

   NOTE You can select Reset at any time to clear the regression settings.
4. Select Y-Range to specify the dependent variable.

   The **dependent variable** is the variable for which you have current information, but which you want to predict in the future.

5. Specify the Y range.

   NOTE The Y range must be a single column and must have the same number of rows as the X range.

6. (Optional) Select Intercept.

   Intercept determines how 1-2-3 calculates the y-axis intercept.

   Select either Compute or Zero. If you select Compute, 1-2-3 automatically calculates the y-axis intercept; if you select Zero, 1-2-3 uses zero as the y-axis intercept. Do not select Zero unless your data is such that, if all the independent variables equaled zero, the dependent variable would also equal zero.

7. Select Output-Range.

8. Specify the output range in a blank area of the current file.

   Specify a single cell or a range. If you specify a single cell, 1-2-3 enters the regression calculations beginning in that cell when you select Go.

   CAUTION If you specify a single-cell output range, 1-2-3 writes over the data in a rectangular area nine rows deep and a minimum of four columns wide, with an additional column for each X variable after the second X variable. Make sure this area is blank or contains unimportant data.

   If you specify a multiple-cell range that is too small to contain the regression calculations, 1-2-3 cannot perform the regression and displays an error message when you select Go.

9. Select Go to calculate the regression or select Quit to return 1-2-3 to READY mode without calculating the regression.

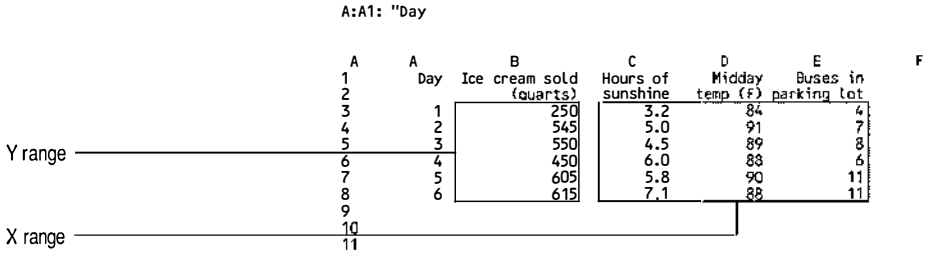
When you select Go, 1-2-3 enters the following information in the output range:

Item	*Description*
Constant	The y-axis intercept.
Degrees of freedom	The number of observations minus the number of independent variables minus 1. If you use a zero intercept, the degrees of freedom equal the number of observations minus the number of independent variables.
Number of observations	The number of rows of data in the X and Y ranges.
R^2 value	The reliability of the regression (a value from 0 to 1). *Note:* If 1-2-3 displays a value less than zero, you specified a zero intercept when it was not appropriate to do so. Use /Data Regression Intercept Compute and then /Data Regression Go to recalculate the regression and adjust the R^2 value accordingly.
Standard error of the x coefficients	The standard error of each of the x coefficients.
Standard error of the y estimate	The standard error of the estimated y value.
X coefficients	The slope for each independent variable.

Example for Performing a Regression Analysis

You are the proprietor of an ice cream stand at a tourist location, and you want to be able to predict in advance roughly how many quarts of ice cream you will sell the next day. You believe that your sales are influenced by three key factors: the number of hours of sunshine, the midday temperature, and the number of buses in a nearby parking lot.

You created a database table that contains the available information for a six-day period. (In practice, you would probably collect data for a much longer period to get greater accuracy.)



	A	B	C	D	E	F
1	Day	Ice cream sold (quarts)	Hours of sunshine	Midday temp (F)	Buses in parking lot	
2						
3	1	250	3.2	84	4	
4	2	545	5.0	91	7	
5	3	550	4.5	89	8	
6	4	450	6.0	88	6	
7	5	605	5.8	90	11	
8	6	615	7.1	88	11	
9						
10						
11						

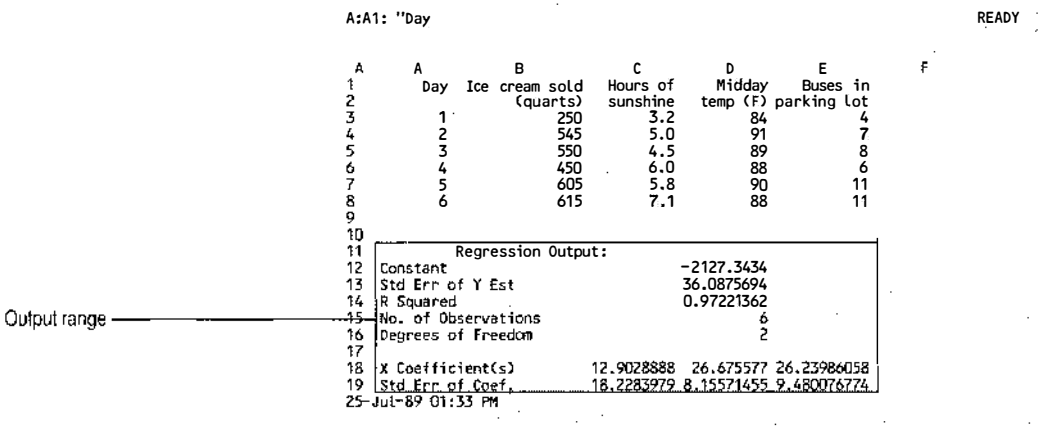
Figure 2-39. *Sample database table*

Before you can predict sales, you need to perform the regression on the available data. First, select /Data Regression X-Range. The X range contains the independent variables in the database table: the number of hours of sunshine, the midday temperature, and the number of buses in the parking lot (the range C3..E8).

Next, select /Data Regression Y-Range. The Y range contains the dependent variable in the database table (the variable you want to predict). For the ice cream stand, the dependent variable is the amount of ice cream sold (the range B3..B8).

Now, select /Data Regression Output-Range to indicate the area of the current file in which you want 1-2-3 to place the results of the regression analysis. You need to specify only the first cell of the range, say A11.

Finally, select /Data Regression Go and 1-2-3 does the regression calculations. 1-2-3 automatically enters the following calculated results (including labels) in the output range:



	A	B	C	D	E
1	Day	Ice cream sold (quarts)	Hours of sunshine	Midday temp (F)	Buses in parking lot
2					
3	1	250	3.2	84	4
4	2	545	5.0	91	7
5	3	550	4.5	89	8
6	4	450	6.0	88	6
7	5	605	5.8	90	11
8	6	615	7.1	88	11

Figure 2-40. *Results of /Data Regression*

Example for Using the Regression Results

Now you'll make the prediction. Suppose the weather forecast tells you that tomorrow will be cloudy, with only two hours of sunshine and a midday temperature of 84F. You guess that no more than five buses will visit. These values (2, 84, and 5) are the X values (the independent variables).

Here's how you can use the regression data to predict the ice cream sales (Y value) for tomorrow. Enter the values 2, 84, and 5 in cells C9..E9 of the database table. Next, enter the following formula in the cell where you want to see the prediction. (Enter the formula in cell F9 so that the prediction is not confused with actual sales.)

```
+(C9*$C$18)+(D9*$D$18)+(E9*$E$18)+$D$12
```

This formula may look complicated, but it is really only the sum of the following:

- the first x value multiplied by the first x coefficient plus
- the second x value multiplied by the second x coefficient plus

- the third x value multiplied by the third x coefficient plus
- the constant (or y-axis intercept)

Use absolute references for the x coefficients and the constant because you may want to copy the formula to other cells, and you do not want any adjustment made in references to the coefficients or the constant in the output range.

With labels added to cells B9, F1, and F2, the worksheet looks like this:

```
A:F9: (F0) [W11] (C9*$C$18)+(D9*$D$18)+(E9*$E$18)+$D$12                    READY

 A      A         B          C          D          E          F
 1       Day  Ice cream sold  Hours of    Midday   Buses in  Estimated
 2                (quarts)   sunshine  temp (F) parking lot      sale
 3         1           250        3.2         84          4
 4         2           545        5.0         91          7
 5         3           550        4.5         89          8
 6         4           450        6.0         88          6
 7         5           605        5.8         90         11
 8         6           615        7.1         88         11
 9               Prediction:      2.0         84          5        270
10
11           Regression Output:
12   Constant                            -2127.3434
13   Std Err of Y Est                    36.0875694
14   R Squared                           0.97221362
15   No. of Observations                          6
16   Degrees of Freedom                           2
17
18   X Coefficient(s)         12.9028888  26.675577 26.23986058
19   Std Err of Coef.         18.2283979 8.15571455 9.480076774
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```

Figure 2-41. *Using the regression results*

The prediction indicates that you should expect to sell approximately 270 quarts of ice cream tomorrow.

/Data Sort

/Data Sort arranges the data in a range in the order you specify.

You can use /Data Sort to rearrange the records in a database table. For example, you could use /Data Sort to alphabetize the records in a database table of names and addresses.

You cannot use /Data Sort to sort the data in an external table.

The Data Sort commands perform the following tasks:

Command	*Task*
Data-Range	Selects the range you want to sort.
Extra-Key	Defines all sort keys after primary and secondary (up to 253 extra sort keys). 1-2-3 prompts you for an extra-key number, defaulting to the number following the number of the last extra key you defined or, if you have not defined any extra keys, to the number 1. For example, if you already selected a primary and a secondary sort key, 1-2-3 prompts you for Extra-Key 1; if you already selected a primary and a secondary sort key and defined one extra key, 1-2-3 prompts you for Extra-Key 2. Once you enter a key number, 1-2-3 prompts you for the sort-key field and sort order, ascending or descending.
Go	Sorts the range according to the current selections and returns 1-2-3 to READY mode.
Primary-Key	Determines the primary field for ordering the records in the database table or the rows in the range. /Data Sort rearranges records (or rows) so that the values in the primary-key field appear in either ascending or descending order or labels in alphabetical order.
Quit	Returns 1-2-3 to READY mode and does not sort the records or rows.

(continued)

Command	*Task*
Reset	Clears all /Data Sort settings.
Secondary-Key	Determines the order for records in the database table or rows in the range that have the same primary sort key entries. For example, if you select the field NAME as the primary sort key and the field SALES as the secondary sort key, 1-2-3 sorts any records with the same NAME by SALES.

Sort Order

The sort order is the order in which 1-2-3 arranges records when the sort keys (the fields you are sorting by) contain a mixture of different types of labels — that is, labels beginning with letters, labels beginning with numbers, and labels beginning with special characters. The sort order is also called the **collating sequence**.

The following table shows the collating sequences you can use with 1-2-3 and the order in which each sorts records when you choose Ascending sort order for a sort key. Descending sort order reverses the order shown in the table. Notice that, regardless of the collating sequence you use, ascending sort order always places blank cells before labels and labels before values.

Collating sequence	*Sort order (ascending)*
Numbers First	1. Blank cells 2. Labels beginning with a space 3. Labels beginning with numbers in numerical order 4. Labels beginning with letters in alphabetical order 5. Labels beginning with other characters 6. Values Lowercase letters precede uppercase letters.

(continued)

Collating sequence	*Sort order (ascending)*
Numbers Last	1. Blank cells 2. Labels beginning with a space 3. Labels beginning with letters in alphabetical order 4. Labels beginning with numbers in numerical order 5. Labels beginning with other characters 6. Values Lowercase letters precede uppercase letters.
ASCII	1. Blank cells 2. All labels, using their ASCII values 3. Values Uppercase letters precede lowercase letters.

Procedure

1. Select /Data Sort.
2. Select Data-Range to specify the database table or range you want to sort.
3. Specify the data range.

   The data range contains all the records or rows you want to sort. If you are sorting a database table, do not include the field names (the first row of the database table). For example, in Figure 2-42, the data range is A2..D17; it is not A1..D17 because that would include the field names.
4. Select Primary-Key.
5. Specify the primary sort key by entering the cell address of any cell in the field you want 1-2-3 to use to determine the new order for your records.
6. Enter the primary sort order (A for ascending or D for descending order). See "Sort Order" above for further information.
7. (Optional) Select Secondary-Key if some records have the same entries in the primary-key field and you want these records arranged in a specific order.

   Specify the secondary sort key by entering the cell address of any cell in the field you want 1-2-3 to use to break ties in the primary-key field.

Enter the secondary sort order (A for ascending or D for descending order).

8. (Optional) Select Extra-Key if you want to specify the sort with more than two sort keys.

   Enter the extra sort-key number. 1-2-3 prompts you with the next available key number. For example, if you already specified one extra sort key, 1-2-3 prompts you for Extra-Key 2.

   Enter the cell address of any cell in the field you want 1-2-3 to use to break ties in both the primary-key and secondary-key fields.

   Enter the extra sort order (A for ascending or D for descending order).

   To edit information for an extra sort key, select Extra-Key and specify the number of the extra sort key you want to edit. To specify a sort-key number, either type a number and press ENTER or use ← and→ to display a new sort-key number and press ENTER. 1-2-3 displays the current address for that sort key. Specify a new address and/or sort order for the sort key.

9. (Optional) Repeat step 8 to specify an additional extra sort key(s).

10. Select Go to sort the database table or range.

    NOTE If you specify a three-dimensional range as the data range, 1-2-3 sorts the contents of each worksheet in the range separately; 1-2-3 does not move entries from one worksheet to another when you sort the contents of a three-dimensional range.

Examples

A:A1: [W10] 'NAME READY

	A	B	C	D	E	F	G
1	NAME	MONTH	ACCOUNT	SALES			
2	Wilson	May	BCD Corp	1050.00			
3	Lorenzo	May	Rosebud Corp	1325.00			
4	Wilson	May	Gen Corp	1325.00			
5	Benedict	May	OH Assoc	1205.00			
6	Horowitz	May	Music Express	1050.00			
7	Wilson	May	Gen Corp	3050.00			
8	Benedict	May	OH Assoc	850.00			
9	Lorenzo	June	World Inc	1075.00			
10	Lorenzo	June	Rosebud Corp	1970.00			
11	Horowitz	June	Travel Plans	2100.00			
12	Wilson	June	BCD Corp	2350.00			
13	Benedict	June	Mountain Field	2800.00			
14	Horowitz	July	Seabreeze	1200.00			
15	Wilson	July	World Inc	1350.00			
16	Benedict	July	Music Express	975.00			
17	Wilson	July	Shoe & Boot	850.00			
18							
19							

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Figure 2-42. *Unsorted database table*

Figure 2-42 shows a database table with four fields (NAME, MONTH, ACCOUNT, and SALES) and 16 records (rows 2 through 17). Once you select the database table (not including the field names) as the data range, you can sort the records in many different ways, depending on the information you need to gather.

For example, if you want to review each salesperson's sales, you would sort the database table using the NAME field as the primary sort key (cell A1). Figure 2-43 shows the database table sorted by salesperson in ascending order.

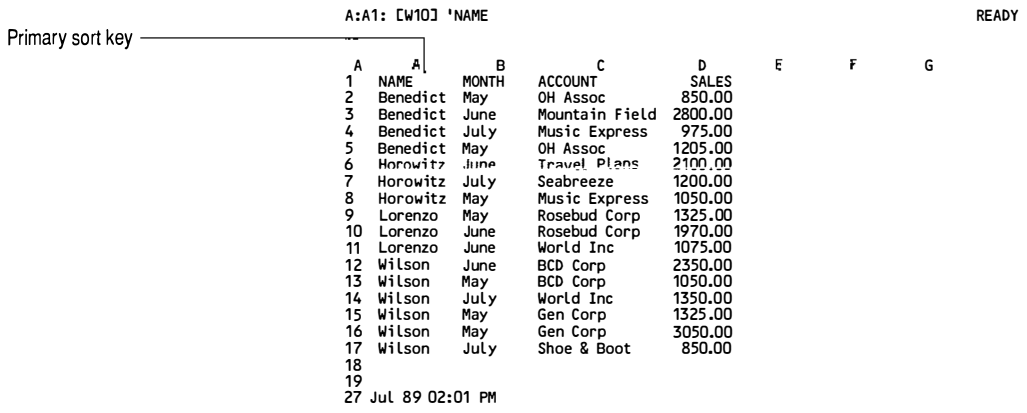


Figure 2-43. *Sorting a database table using one sort key*

You can also sort by several keys at once. For example, you can sort the database table by salesperson, with each person's sales sorted by account, and each account's sales sorted by amount. Figure 2-44 shows the database table sorted by three keys. The primary sort key is NAME (cell A1) in ascending order, the secondary sort key is ACCOUNT (cell C1) in ascending order, and the one extra sort key is SALES (cell D1) in descending order.

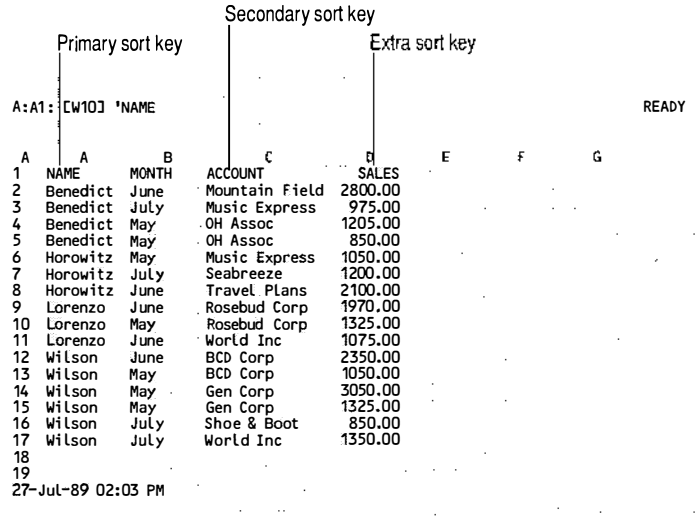


Figure 2-44. *Sorting a database table using three sort keys*

TIPS

Be careful when you sort ranges that contain formulas. If a cell that contains a formula moves when you select /Data Sort Go, 1-2-3 adjusts relative references in the formulas to reflect the new position of the cell.

Use /Data Fill to enter a field of record numbers in a database table before you use /Data Sort, and include the record numbers in the data range. You can then use the field that contains these numbers as the primary sort key if you want to resort the records back to their original order.

To remove a extra sort key, assign the number of the extra sort key to the field specified as the preceding sort key. For example, if you have six extra sort keys and you want to remove the sixth extra sort key, select /Data Sort Extra-Key, enter 6, specify the address of the field you defined as the fifth extra sort key (Extra-Key 5), and specify the sort order you specified for Extra-Key 5.

/Data Table

/Data Table commands create tables that show how the results of formulas vary when you change the numbers used in the formulas.

Use the Data Table commands to do the following:

- Perform what-if or sensitivity analysis.
- Cross-tabulate the information in a 1-2-3 database table to reveal relationships that would otherwise be difficult to discern.

Using /Data Table to Perform What-If Analysis

The table in Figure 2-45 shows how using different interest rates and principal amounts in an @PMT formula affect the result of the formula (the monthly mortgage payment). The table helps you find the combination of rate and principal that you need for the payments you want to make.

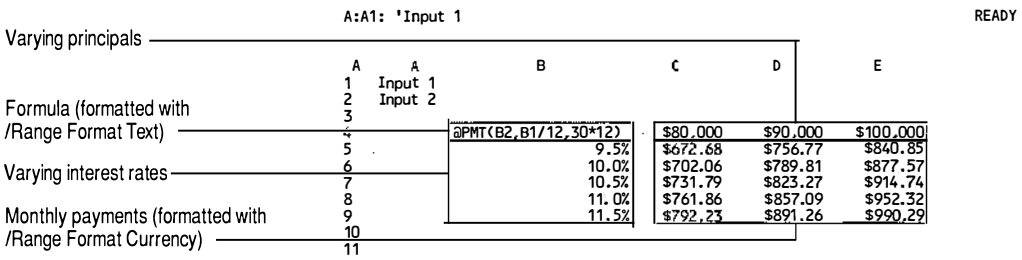


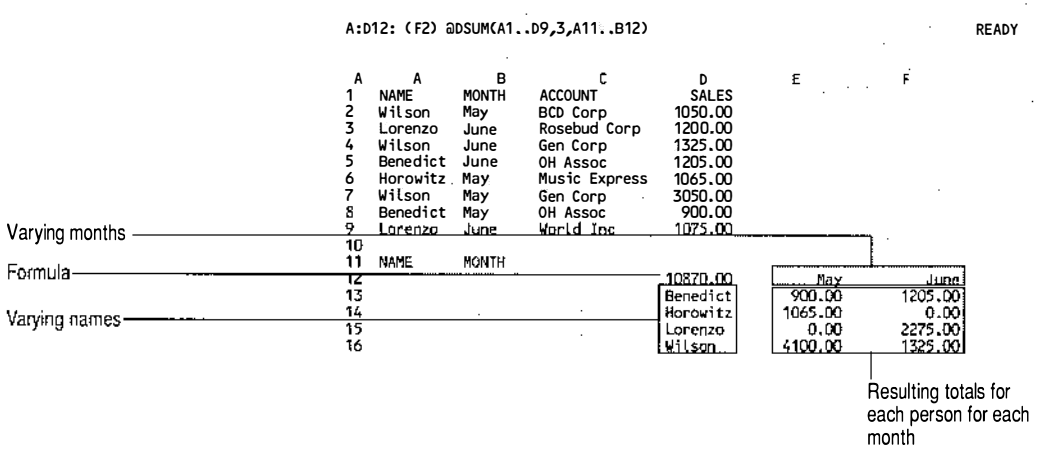
Figure 2-45. *Using /Data Table for what-if analysis*

In the preceding table, 1-2-3 pairs each interest rate with each principal amount and, using the formula in the table, calculates the monthly payment for each pair of values. For example, the value in cell D6 ($789.81) shows the amount of the monthly payment when the interest rate is 10.0% (cell B6) and the principal is $90,000 (cell D4).

Using /Data Table to Cross-Tabulate Information

Assume you have a database table that shows company sales broken down by salesperson, month of sale, account, and dollar amount for each sale. With the Data Table commands, you can cross-tabulate the information in the database table to

show the total sales for each person for each month. Figure 2-46 shows a database table and a table that cross-tabulates the information in the database table.



	A	B	C	D	E	F
1	NAME	MONTH	ACCOUNT	SALES		
2	Wilson	May	BCD Corp	1050.00		
3	Lorenzo	June	Rosebud Corp	1200.00		
4	Wilson	June	Gen Corp	1325.00		
5	Benedict	June	OH Assoc	1205.00		
6	Horowitz	May	Music Express	1065.00		
7	Wilson	May	Gen Corp	3050.00		
8	Benedict	May	OH Assoc	900.00		
9	Lorenzo	June	World Inc	1075.00		
10						
11	NAME	MONTH				
12				10870.00	May	June
13				Benedict	900.00	1205.00
14				Horowitz	1065.00	0.00
15				Lorenzo	0.00	2275.00
16				Wilson	4100.00	1325.00

Figure 2-46. *Using /Data Table for cross-tabulation*

Terms You Need to Know

- A **data table** is an area of a worksheet that contains the results of a Data Table command and some or all of the information used to generate the results. Depending on the type of Data Table command you use, a data table may contain two or three of the following: the input values, the formulas, and the results of the calculations. In Figure 2-45, for example, the data table is in B4..E9.
- A **table range** is a range that contains a data table. In Figure 2-45, for example, the table range is B4..E9.
- A **variable** is a part of a formula for which values can be substituted. For example, the formula in Figure 2-45 — @PMT(B2,B1/12,30*12) — contains two variables: the cell address B1 (the interest rate) and the cell address B2 (the principal).

- An **input cell** is a cell in which 1-2-3 temporarily stores values while it performs the calculations for the data table. When you create a data table, you specify one input cell for each variable in a formula. For example, the data table in Figure 2-45 has two input cells, because the formula contains two variables. Input cells must be unprotected.

- The variables in the formula(s) determine the addresses of the input cells. For example, the input cells in Figure 2-45 are cells B1 and B2, because the formula contains the variables B1 and B2.

  NOTE Do not overlap the input cells with each other or with the table range or you may get unexpected results.

- An **input value** is a value 1-2-3 substitutes for a variable when it performs the calculations for a data table. For example, the data table in Figure 2-45 has two sets of input values: the values representing the principal amounts (C4..E4) and the values representing the interest rates (B5..B9). When 1-2-3 performs the calculations for the data table, it substitutes each input value in C4..E4 for variable B2 in the @PMT formula and each input value in B5..B9 for variable B1.

- The **results area** is the area of a data table in which 1-2-3 enters the results of the calculations. In Figure 2-45, for example, the results area is in C5..E9. The results area must be unprotected.

Types of Data Tables

You can create four types of data tables: data table 1, data table 2, data table 3, and data table labeled. The type of data table you create depends on the number of variables you want to use in your formulas.

Data table type	*Function*
Data table 1	Calculates the results of one or more formulas, each of which uses one variable.
Data table 2	Calculates the results of one formula that uses two variables.

(continued)

Data table type	*Function*
Data table 3	Calculates the results of one formula that uses three variables.
Data table labeled	Calculates the results of one or more formulas that use one or more variables.

For example, each data table in the preceding illustrations (Figures 2-45 and 2-46) is a data table 2.

You use the Data Table commands to create data tables. In addition, you can use **TABLE** to repeat the last Data Table command you selected. This key is helpful if you are using a Data Table command such as /Data Table 2 to perform a what-if analysis, because you can change values and then instantly repeat the command without using the menu.

NOTE Formulas in data tables can contain values, strings, or cell addresses. Do not use logical formulas in data tables because logical formulas always produce the value 0 or 1, and all the resulting values will equal 0 or 1.

/Data Table 1

/Data Table 1 produces a table that shows the effect of changing one variable in one or more formulas. For example, the data table in Figure 2-47 shows the effect of varying the interest rate in two @PMT formulas.

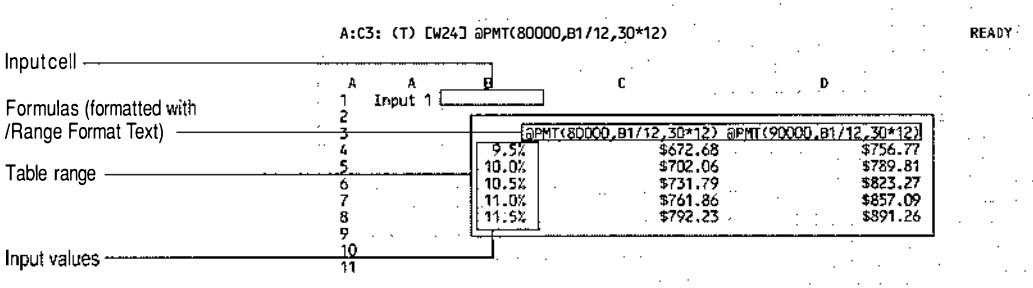


Figure 2-47. */Data Table 1*

See "Using /Data Table 1 to Cross-Tabulate Information" later in this section for information on using /Data Table 1 with database @functions.

Procedure

Before using /Data Table 1, you must set up the table range. The following procedure uses the data table in Figure 2-47 as an example for setting up a table range.

1. Decide on a location for the table range. The data table will occupy one more columns than the number of formulas you are analyzing and one more row than the number of input values you are substituting in each formula. In Figure 2-47, for example, the table range is B3..D8.
2. Decide on a location outside the table range for the input cell and, if you want to, document the location of the input cell by entering a label such as Input 1 to the left of the input cell. For example, Figure 2-48 shows the label Input 1 in A1, the cell to the left of the input cell (B1).
3. In the first row of the table range, beginning with the second cell in the row, enter the formula(s) you want to analyze. Make sure each formula refers to the input cell. For example, Figure 2-48 shows the two @PMT formulas (formatted with /Range Format Text) in C3 and D3. Both formulas contain references to B1, the input cell.

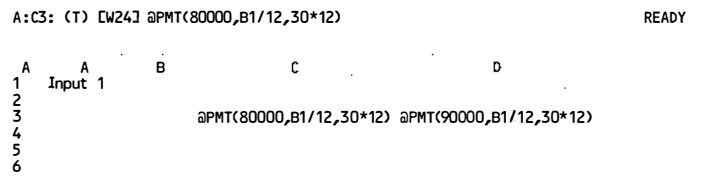


Figure 2-48. *Documenting the input cell and entering the formulas*

You may want to format the formula cells with /Range Format Text. Otherwise, unless the input cell contains data, the formulas will evaluate to 0 or ERR. This will not affect the results of the /Data Table command, however.

4. In the first column of the table range, beginning with the second cell in the column, enter the input values you want to use in each of the formulas. For example, Figure 2-49 shows the input values (the interest rates, formatted as Percent, 1) in B4..B8.

If you are using string formulas in the data table, enter labels instead of values in the first column of the table range.

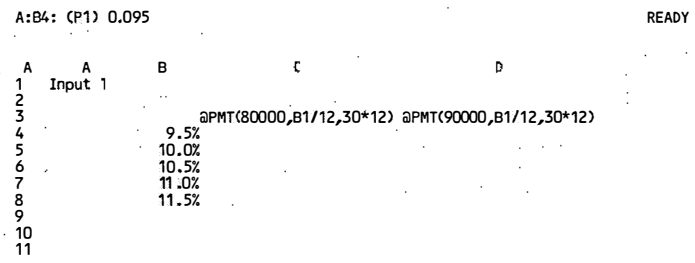


Figure 2-49. *Entering the input values*

With the data table set up, you are ready to use /Data Table 1, as follows:

5. Select /Data Table 1.
6. Specify the table range.
7. Specify the input cell.

1-2-3 calculates each of the formulas, using each of the input values. The result of each calculation appears in a cell below the appropriate formula and to the right of the corresponding input value.

Figure 2-47 shows a data table created with /Data Table 1.

TIP You can use an XY graph to graph information from a data table 1. Use the values in the first column as the X range; use other columns in the results area of the table as the A — F data ranges.

Using /Data Table 1 to Cross-Tabulate Information /Data Table 1 lets you analyze or cross-tabulate the data in a 1-2-3 database table or an external table.

Before you use /Data Table 1 with a database table, you need to be familiar with the following:

- The structure of database tables. For more information on database tables, see "Database Tables" at the beginning of "Data Commands."

- Database @functions. You can use database @functions in the formulas in the top row of the table range. Database @functions let you perform calculations using data from selected records in the database table. See "Database @Functions" in Chapter 3 for detailed information on these @functions.

Figure 2-50 shows a sales database table that contains information on salesperson's name, month, account, and dollar amount for each sale. The figure also shows the associated database data table, which calculates the total and average sales for each salesperson.

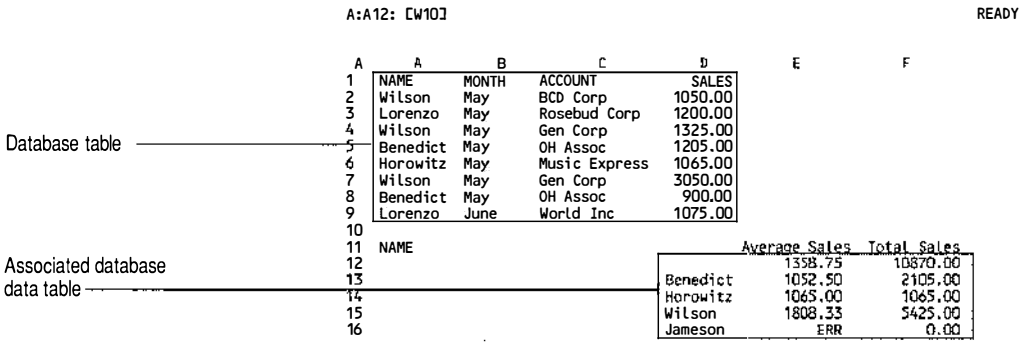


Figure 2-50. *Using /Data Table 1 with a database table*

Procedure

Before using /Data Table 1, you must set up the table range. The following procedure uses the data table in Figure 2-50 as an example for setting up a table range.

1. Decide on a location for the table range. In Figure 2-50, for example, the table range is D12..F16.
2. Decide on a location for the input cell. The input cell must be immediately below a cell containing the field name for the variable you want to analyze. If you already created a criteria range for the database table, you can use it to specify the input cell, or you can create a separate criteria range specifically for the data table. For example, Figure 2-51 shows the input cell in A12, the cell immediately below the field name for the variable that will be analyzed in the data table (NAME).

3. In the first row of the table range, beginning with the second cell in the row, enter the formulas that calculate the results you want to analyze.

   In Figure 2-51, the formulas — database @functions that calculate the average and total sales for each salesperson — are in E12..F12. The formula in E12 is @DAVG(A1..D9,3,A11..A12), and the formula in F12 is @DSUM(A1..D9,3,A11..A12). In both formulas, A1..A9 is the input range, which contains the field names and all the records in the database table, and A11..A12 is the criteria range, which contains a copy of the field name NAME and a blank cell (the input cell). The 3 in both formulas is the offset number for the SALES field.

   NOTE If you are cross-tabulating the information in an external table, specify the range name of the external table as the input range in the database @function.

4. In the first column of the table range, beginning with the second cell in the column, enter values or labels from the field you are using in the criteria range. These are the input values for the database data table. When 1-2-3 calculates the data table, it uses these values or labels as the criteria to determine which records to include in calculations.

   NOTE To include groups of records containing similar field entries in the calculations, you can use labels containing values preceded by logical operators or labels containing wild-card characters as input values. You can also use any type of formula except a logical formula as an input value. 1-2-3 uses the result of the formula as an input value. See "The Criteria Range" in /Data Query for information on the types of labels, values, and formulas you can enter as input values.

   In Figure 2-51, the labels in the first column of the table range are the names of salespeople for whom 1-2-3 will calculate average and total sales. To calculate average and total sales for specific months, you would enter months instead of names of salespeople, and you would change the criteria range so that the field name was MONTH and not NAME.

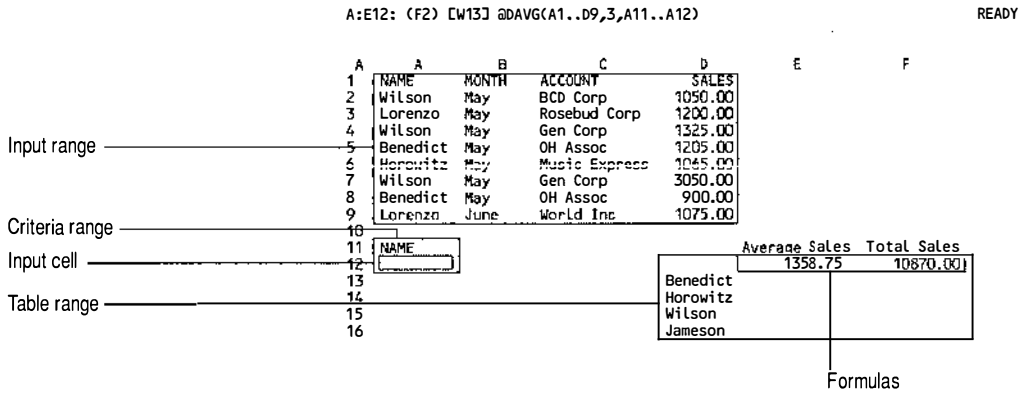


Figure 2-51. *Setting up a data table 1 for use with a database table*

With the data table set up, you are ready to use /Data Table 1, as follows:

5. Select /Data Table 1.
6. Specify the table range.
7. Specify the cell you want to use as the input cell.

1-2-3 calculates the data table using the formulas in the first row of the table range and the input values inthe first column of the range.

Figure 2-50 shows the data table after 1-2-3 calculates the average and total sales for each of the salespeople entered as input values. Notice that 1-2-3 attempts to calculate totals for each of the input values, regardless of whether they are found in the database table (such as Jameson in cell D16).

/Data Table 2

/Data Table 2 produces a table that shows the effect of changing two variables in one formula. For example, the data table in Figure 2-52 shows the effect of varying the interest rate and the principal in an @PMT formula.

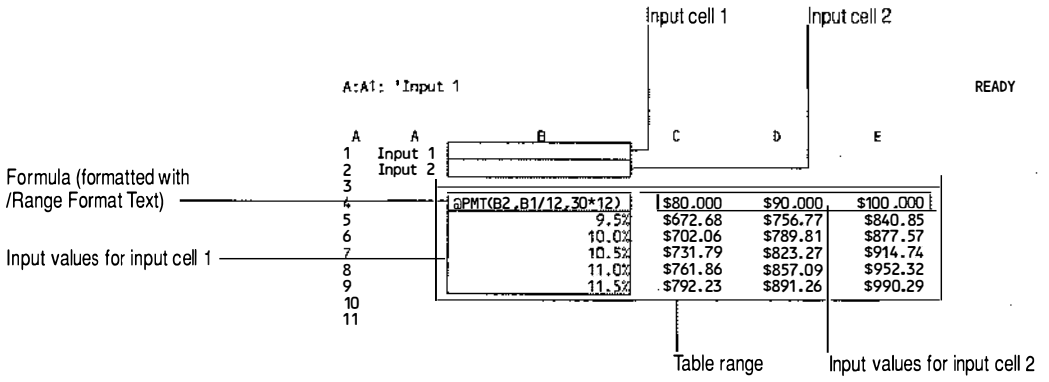


Figure 2-52. */Data Table 2*

See "Using /Data Table 2 to Cross-Tabulate Information" later in this section for information on using /Data Table 2 with database @functions.

Procedure

Before using /Data Table 2, you must set up the table range. The following procedure uses the data table in Figure 2-52 as an example for setting up a table range.

1. Decide on a location for the table range. In Figure 2-52, for example, the table range is B4..E9.
2. Decide on a location outside the table range for the two input cells and, if you want to, document the location of each input cell by entering a label such as Input 1 to the left of the input cell. For example, Figure 2-53 shows the labels Input 1 and Input 2 in cells A1 and A2, the cells to the left of the first and second input cells (B1 and B2).

   Keep the following in mind when deciding on the location for the input cells:

   - You will include the addresses of the input cells in the formula. Cells B1 and B2 are the input cells for the data table in the example because the addresses of these cells will appear in the @PMT formula as the variables for the principal (B2) and the interest rate (B1).

- The positions of the input values in the table range determine which of the input cells should be input cell 1 and which input cell 2. Input cell 1 always refers to the input values in the first column of the table range, and input cell 2 always refers to the input values in the first row of the table range.

  For example, because the input values for the interest rate in this example will be in the first column of the data table, cell B1 (which represents the interest rate in the @PMT formula) must be input cell 1. Because the input values for the principal will be in the first row of the data table, cell B2 (which represents the principal in the @PMT formula) must be input cell 2.

3. In the upper left cell of the table range, enter the formula you want to analyze. Make sure the formula refers to both input cells. For example, Figure 2-53 shows the @PMT formula (formatted with /Range Format Text) in B4. The formula contains references to B1, the first input cell, and B2, the second input cell.

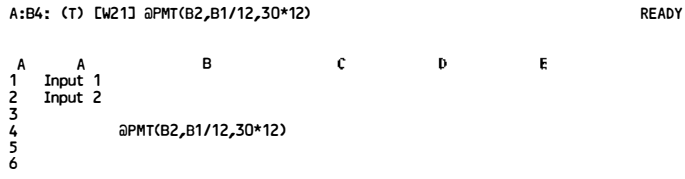


Figure 2-53. *Documenting the input cells and entering the formula*

You may want to format the formula cell with /Range Format Text. Otherwise, unless the input cells contain data, the formula will evaluate to 0 or ERR. This will not affect the results of the /Data Table command, however.

4. In the first column of the table range, beginning with the second cell in the column, enter the input values for the variable associated with input cell 1. For example, Figure 2-54 shows the input values for the interest rate (formatted with /Range Format Percent) in B5..B9 because the variable that represents the interest rate (B1) is associated with input cell 1.

If you are using string formulas in the data table, enter labels instead of values in the first column of the table range.

5. In the first row of the table range, beginning with the second cell in the row, enter the input values for the variable associated with input cell 2. For example, Figure 2-54 shows the input values for the principal in C4..E4 because the variable that represents the principal (B2) is associated with input cell 2.

   If you are using string formulas in the data table, enter labels instead of values in the top row of the table range.

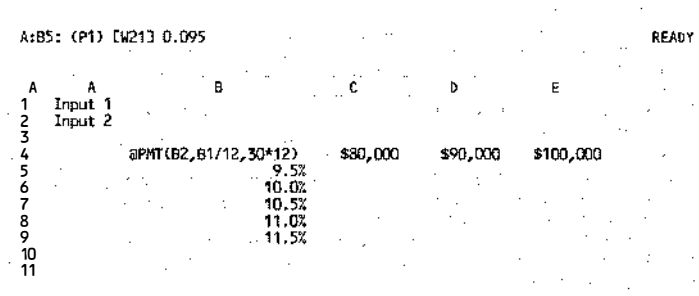


Figure 2-54. *Entering the input values*

With the data table set up, you are ready to use /Data Table 2, as follows:

6. Select /Data Table 2.
7. Specify the table range.
8. Specify the cell you want to use as input cell 1.
9. Specify the cell you want to use as input cell 2.

NOTE Do not overlap any of your input cells and table ranges.

To produce the data table, 1-2-3 pairs each input value in the first column of the table range with each input value in the top row of the table range and calculates the formula using each pair of values. 1-2-3 enters the result of each calculation in the cell at the intersection of the row and column containing the two input values used in the calculation.

Figure 2-52 shows a data table created with /Data Table 2.

TIP You can use an XY graph to graph information from a data table 2. Use the values in either the first column or the top row as the X range; use other columns or rows in the results area of the table as the A — F data ranges. Do not include the formula in the top left cell of the table range in any of the graph ranges.

Using /Data Table 2 to Cross-Tabulate Information /Data Table 2 lets you analyze or cross-tabulate the data in a 1-2-3 database table or an external table.

Before you use /Data Table 2 with a database table, you need to be familiar with the following:

- The structure of database tables. For more information on database tables, see "Database Tables" at the beginning of "Data Commands."
- Database @functions. You can use a database @function in the formula in the first cell of the table range. Database @functions let you perform calculations using data from selected records in the database table. See "Database @Functions" in Chapter 3 for detailed information on these @functions.

Figure 2-55 shows a sales database table that contains information on salesperson's name, month, account, and dollar amount for each sale. The figure also shows the associated database data table, which calculates the total sales for each salesperson for each month.

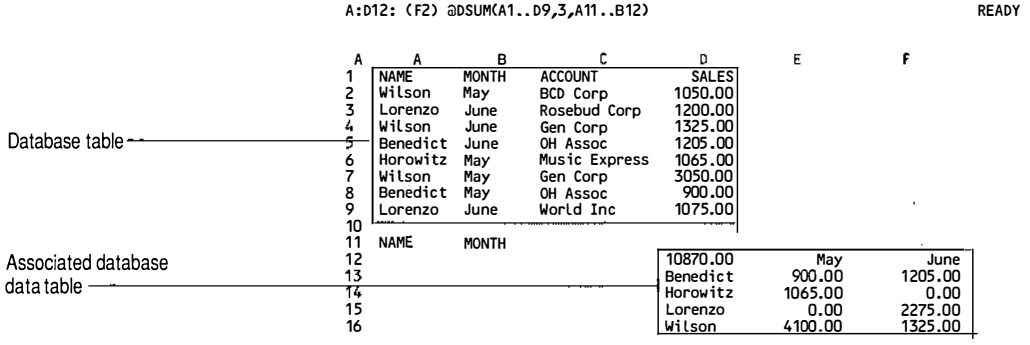


Figure 2-55. *Using /Data Table 2 with a database table*

Procedure

Before using /Data Table 2, you must set up the table range. The following procedure uses the data table in Figure 2-55 as an example for setting up a table range.

1. Decide on a location for the table range. In Figure 2-55, for example, the table range is D12..F16.

2. Decide on locations for the two input cells. Each input cell must be immediately below a cell containing the field name for a variable you want to analyze. If you already created a criteria range for the database table, you can use it to specify the input cells, or you can create a separate criteria range specifically for the data table. For example, Figure 2-56 shows the input cells are A12 and B12, the cells immediately below the field names for the variables that will be analyzed in the data table (NAME and MONTH).

3. In the upper left cell of the table range, enter a formula that calculates the results you want to analyze.

   In Figure 2-56, the formula — a database @function that calculates the total sales for each salesperson in each month — is in D12. The formula is @DSUM(A1..D9,3,A11..B12). A1..D9 is the input range, which contains the field names and all the records in the database table, and A11..B12 is the criteria range, which contains copies of the field names NAME and MONTH and two blank cells (the two input cells). The 3 is the offset number for the SALES field.

   NOTE If you are cross-tabulating the information in an external table, specify the range name of the external table as the input range in the database @function.

4. In the first column of the table range, beginning with the second cell in the column, enter values or labels from the field associated with input cell 1 in the criteria range. In Figure 2-56, the labels in the first column of the table range are the names of the salespeople for whom 1-2-3 will calculate total sales.

NOTE To include groups of records containing similar field entries in the calculations, you can use labels containing values preceded by logical operators or labels containing wild-card characters as input values. You can also use any type of formula except a logical formula as an input value. 1-2-3 uses the result of the formula as an input value. See "The Criteria Range" in /Data Query for information on the types of labels, values, and formulas you can enter as input values.

5. In the first row of the table range, beginning with the second cell in the row, enter values or labels from the field associated with input cell 2 in the criteria range. In Figure 2-56, the labels in the first row of the table range are the months for which 1-2-3 will calculate total sales.

   When 1-2-3 calculates the data table, it uses the values, labels, and/or formulas you entered in steps 4 and 5 as the criteria for selecting the records to include in the calculations.

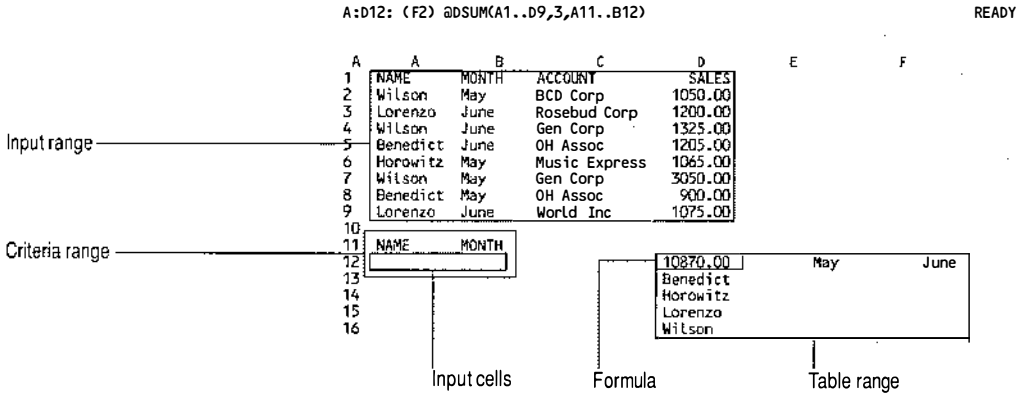


Figure 2-56. ***Setting up a data table 2 for use with a database table***

With the data table set up, you are ready to use /Data Table 2, as follows:

6. Select /Data Table 2.
7. Specify the table range.

8. Specify the cell you want to use as input cell 1.
9. Specify the cell you want to use as input cell 2.

1-2-3 calculates the data table using the formula in the upper left cell of the table range. Figure 2-55 shows the data table after 1-2-3 calculates the total monthly sales for each of the sales people listed in the first column and for each month listed in the first row.

/Data Table 3

/Data Table 3 produces a table that shows the effect of changing three variables in one formula. The table spans a three-dimensional range.

For example, the data table in Figure 2-57 shows the effect of varying the principal, interest rate, and mortgage term in an @PMT formula. The results area (A:D3..C:F5) is formatted with /Range Format Currency, and the formula in A:B2 is formatted with /Range Format Text.

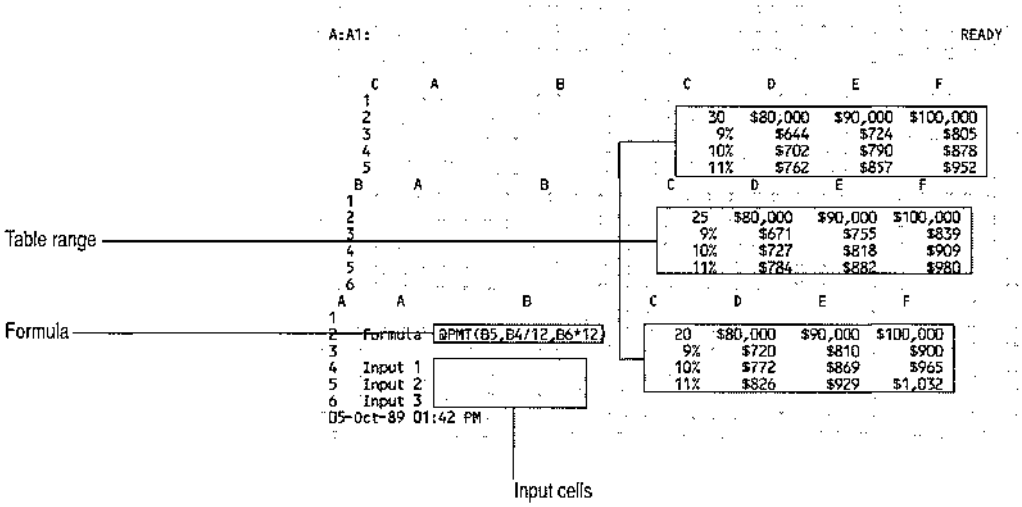


Figure 2-57. */Data Table 3*

See "Using /Data Table 3 to Cross-Tabulate Information" later in this section for information on using /Data Table 3 with database @functions.

Procedure

Before using /Data Table 3, you must set up the table range. The following procedure uses the data table in Figure 2-57 as an example for setting up a table range.

1. Decide on a location for the table range. Be certain that the range you select does not contain data in any of the worksheets it includes.

   The size of the table range depends on the number of input values you want to substitute for each of the three variables. Use the following calculations to determine the size of a table range for a data table 3:

   - Number of rows: 1 + number of input values for the variable associated with input cell 1
   - Number of columns: 1 + number of input values for the variable associated with input cell 2
   - Number of worksheets: number of input values for the variable associated with input cell 3

   For example, if you have 10 input values for input cell 1, 5 input values for input cell 2, and 3 input values for input cell 3, the table range will be 11 rows long (1+10) and 6 columns wide (1+5) and will contain 3 worksheets.

   In Figure 2-57, the table range is A:C2..C:F5.

2. Decide on locations for the three input cells and, if you want to, document the location of each input cell by entering a label such as Input 1 to the left of the input cell. For example, Figure 2-58 shows the labels Input 1, Input 2, and Input 3 in A:A4..A:A6, the cells to the left of the first, second, and third input cells (A:B4, A:B5, and A:B6).

   Keep the following in mind when deciding on the location for the input cells:

   - You will include the addresses of the input cells in the formula. Cells A:B4, A:B5, and A:B6 are the input cells for the data table in the example, because the addresses of these cells will appear in the @PMT formula as the variables for the interest rate (B4), principal (B5), and term (B6).

- The positions of the input values in the table range determine which of the input cells should be input cell 1, which input cell 2, and which input cell 3. Input cell 1 always refers to the input values in the first column of the table range; input cell 2 always refers to the input values in the first row of the table range; and input cell 3 always refers to the input values in the first cell in the table range of each worksheet in the three-dimensional table range.

  For example, because the input values for the interest rate in this example will be in the first column of each worksheet in the three-dimensional table range, cell A:B4 (which represents the interest rate in the @PMT formula) must be input cell 1. Because the input values for the principal will be in the first row of each worksheet in the three-dimensional table range, cell A:B5 (which represents the principal in the @PMT formula) must be input cell 2. Because the input values for the term will be in the upper left corner of each worksheet in the three-dimensional table range (in A:C2..C:C2), cell A:B6 (which represents the term in the formula) must be input cell 3.

3. In a cell outside the table range, enter the formula for the results you want to analyze and, if you want to, a label to document the location of the formula. Make sure the formula refers to all three input cells. For example, Figure 2-58 shows the label Formula in cell A:A2 and the @PMT formula (formatted with /Range Format Text) in cell A:B2.

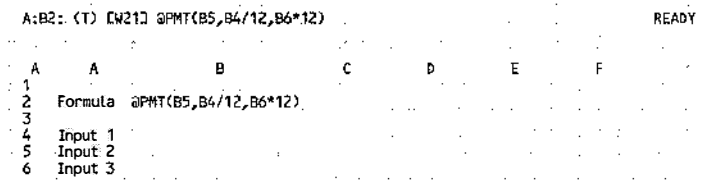


Figure 2-58. *Documenting the input cells and entering the formula*

You may want to format the formula cell with /Range Format Text. Otherwise, unless the input cells contains data, the formula will evaluate to 0 or ERR. This will not affect the results of the /Data Table command, however.

4. In the first column of each worksheet of the table range, beginning with the second cell in each column, enter the input values for the variable associated with input cell 1. For example, Figure 2-59 shows the input values for the interest rate in A:C3..C:C5 (formatted with /Range Format Percent) because the variable that represents the interest rate (B4) is associated with input cell 1.

   If you are using a data table 3 to perform what-if analysis, you should use the same values in the first column of each worksheet in the table range.

   If you are using string formulas in the data table, enter labels instead of values in the first column of each worksheet in the table range.

5. In the first row of each worksheet of the table range, beginning with the second cell in each row, enter the input values for the variable associated with input cell 2. For example, Figure 2-59 shows the input values for the principal in A:D2..C:F2 because the variable that represents the principal (B5) is associated with input cell 2.

   If you are using a data table 3 to perform what-if analysis, you should use the same values in the first row of each worksheet in the table range.

   If you are using string formulas in the data table, enter labels instead of values in the first row of each worksheet in the table range.

6. In the first cell of each worksheet of the table range, enter the input values for the variable associated with input cell 3. For example, Figure 2-59 shows the input values for the term in A:C2..C:C2 because the variable that represents the term (B6) is associated with input cell 3.

   If you are using string formulas in the data table, enter labels instead of values in the first cell of each worksheet in the table range.

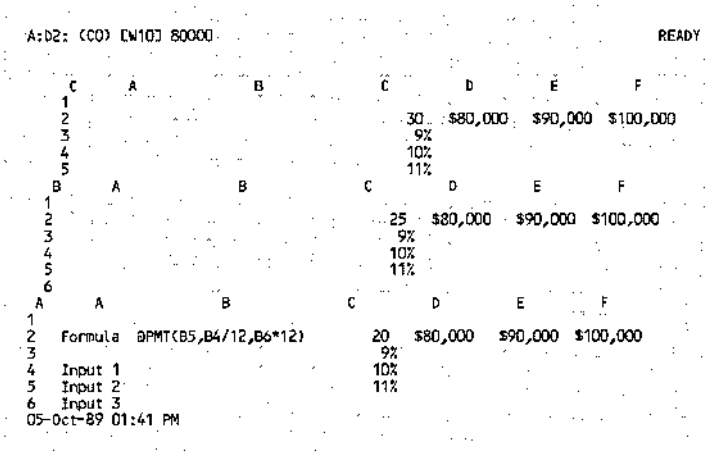


Figure 2-59. *Entering the input values*

With the data table set up, you are ready to use /Data Table 3, as follows:

7. Select /Data Table 3.
8. Specify the table range.

   NOTE Unlike the table ranges for /Data Table 1 and /Data Table 2, the table range should not include the formula you are analyzing.

9. Specify the cell containing the formula.
10. Specify the cell you want to use as input cell 1.
11. Specify the cell you want to use as input cell 2.
12. Specify the cell you want to use as input cell 3.

For each worksheet in the table range, 1-2-3 calculates the formula by substituting the input values in the first column, top row, and upper left cell of that part of the range for the variables in the formula. 1-2-3 enters the results of the calculations at the intersections of the appropriate rows and columns in each worksheet in the range.

Figure 2-57 shows a data table created with /Data Table 3.

TIP You can use an XY graph to graph information from a data table 3. Use the values in the first column, the top row, or the top left cell of the table range of each worksheet as the X range; use other columns, rows, or three-dimensional ranges in the results area of the table as the A — F data ranges.

Using /Data Table 3 to Cross-Tabulate Information /Data Table 3 lets you analyze or cross-tabulate the data in a 1-2-3 database table or an external table.

Before you use /Data Table 3 with a database table, you need to be familiar with the following:

- The structure of database tables. For more information on database tables, see "Database Tables" at the beginning of "Data Commands."
- Database @functions. You can use a database @function in the formula associated with the data table. Database @functions let you perform calculations using data from selected records in the database table. See "Database @Functions" in Chapter 3 for detailed information on these @functions.

Figure 2-60 shows a sales database table that contains information on salesperson's name, month, account, and dollar amount for each sale. The figure also shows the associated database data table, which calculates the total sales for two salespeople for two months for two accounts.

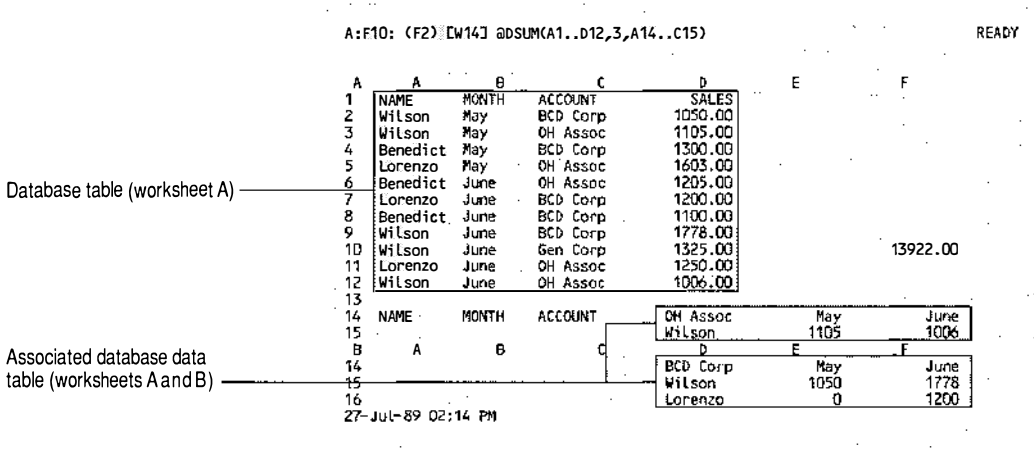


Figure 2-60. *Using /Data Table 3 with a database table*

Procedure

Before using /Data Table 3, you must set up the table range. The following procedure uses the data table in Figure 2-60 as an example for setting up a table range.

1. Decide on a location for the table range. In Figure 2-60, for example, the table range is A:D14..B:F16.

2. Decide on locations for the three input cells. Each input cell must be immediately below a cell containing the field name for a variable you want to analyze. If you already created a criteria range for the database table, you can use it to specify the input cells, or you can create a separate criteria range specifically for the data table. For example, Figure 2-61 shows the input cells are A:A15, A:B15, and A:C15, the cells immediately below the field names for the variables that will be analyzed in the data table (NAME, MONTH, and ACCOUNT).

3. In a cell outside the table range, enter a formula that calculates the results you want to analyze.

   In Figure 2-61, the formula — a database @function that calculates the total sales for selected salespeople in each month for two accounts — is in A:F10. The formula is @DSUM(A1..D12,3,A14..C15). A:A1..A:D12 is the input range, which contains the field names and all the records in the database table, and A:A14..A:C15 is the criteria

range, which contains copies of the field names NAME, MONTH, and ACCOUNT and three blank cells (the input cells). The 3 is the offset number for the SALES field.

NOTE If you are cross-tabulating the information in an external table, specify the range name of the external table as the input range in the database @function.

4. In the first column in each worksheet of the table range, beginning with the second cell in the column, enter values or labels from the field associated with input cell 1 in the criteria range (in this example, the NAME field). In Figure 2-61, the labels in the first column of each worksheet of the table range (A:D15..B:D16) are the names of the salespeople for whom 1-2-3 will calculate total sales.

   NOTE To include groups of records containing similar field entries in the calculations, you can use labels containing values preceded by logical operators or labels containing wild-card characters as input values. You can also use any type of formula except a logical formula as an input value. 1-2-3 uses the result of the formula as an input value. See "The Criteria Range" in /Data Query for information on the types of labels, values, and formulas you can enter as input values.

5. In the top row of each worksheet of the table range, beginning with the second cell in the row, enter values or labels from the field associated with input cell 2 in the criteria range (in this example, the MONTH field). In Figure 2-61, the labels in the first row of each worksheet of the table range (A:E14..B:F14) are the names of the months for which 1-2-3 will calculate total sales.

6. In the upper left cell of each worksheet of the table range, enter the values or labels from the field associated with input cell 3 in the criteria range (in this example, the ACCOUNT field). In Figure 2-61, the labels in the upper left cell of each worksheet of the table range (A:D14..B:D14) are the names of the accounts for which 1-2-3 will calculate total sales.

   When 1-2-3 calculates the data table, it uses the values, labels, and/or formulas you entered in steps 4, 5, and 6 as the criteria for selecting the records to include in calculations.

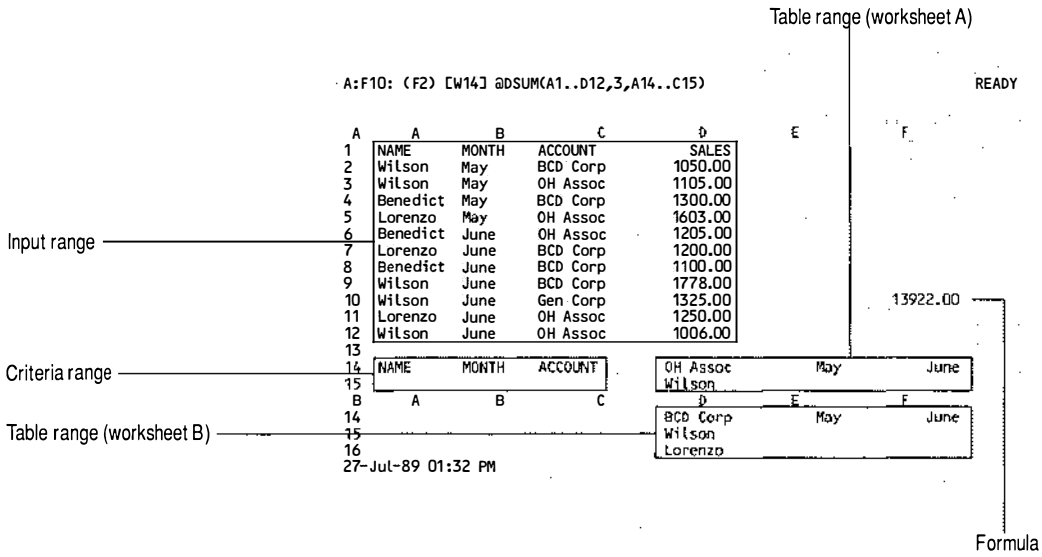


Figure 2-61. *Setting up a data table 3 for use with a database table*

With the data table set up, you are ready to use /Data Table 3, as follows:

7. Select /Data Table 3.
8. Specify the table range.
9. Specify the cell containing the formula.
10. Specify the cell you want to use as input cell 1.
11. Specify the cell you want to use as input cell 2.
12. Specify the cell you want to use as input cell 3.

1-2-3 calculates the data table using the formula you specified.

Figure 2-60 shows the data table after 1-2-3 calculated the results. For each of the two accounts in A:D14..B:D14 (the input values associated with input cell 3), 1-2-3 calculated the total monthly sales for each salesperson listed in column D in the table range (the input values associated with input cell 1) and for each month listed in row 14 in the table range (the input values associated with input cell 2). Because the database table does not contain a record showing a sales figure for

Lorenzo for the BCD Corp account for the month of May, the sum of Lorenzo's sales for that month and that account is 0 (cell B:E16).

/Data Table Labeled

/Data Table Labeled produces a table that shows the effect of changing one or more variables in one or more formulas, much as /Data Table 1, 2, and 3 do. With /Data Table Labeled, however, you have more flexibility. In a data table you create with /Data Table Labeled, you can

- Specify existing data in different areas of a file as your input values.
- Control the placement of formulas, input values, and results.
- Use more variables.
- Include labels that identify the items in the data table.
- Include blank rows or columns to improve the layout of the data table.
- Include formulas within the data table so you can perform calculations with the data table results.
- Include text within the data table so you can annotate the contents of the data table.

This section assumes you are familiar with the procedures outlined in the previous three sections (/Data Table 1, /Data Table 2, and /Data Table 3). Before you use /Data Table Labeled, therefore, you should know how to create a data table using /Data Table 1, /Data Table 2, or /Data Table 3.

Figure 2-62 shows an example of a data table created with /Data Table Labeled. The data table shows the effect of varying the principal, interest rate, and mortgage term in an @PMT formula.

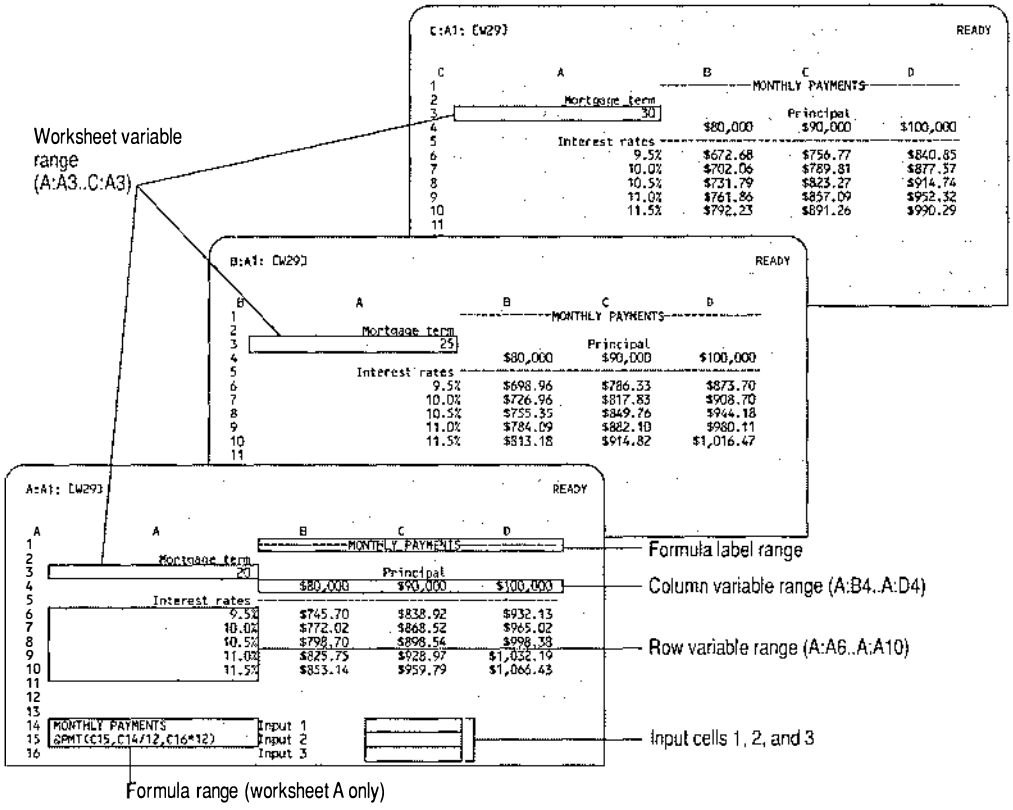


Figure 2-62. */Data Table Labeled*

See "Using /Data Table Labeled to Cross-Tabulate Information" later in this section for information on using /Data Table Labeled with database tables.

Terms You Need to Know

- The **formula range** is the range that contains the formulas you want to use to calculate the data table and labels that describe the formulas. For example, in Figure 2-62, the formula range is A:A14..A:A15. Figure 2-63 shows formula ranges for two different data tables. The cells containing the formulas are formatted with /Range Format Text so you can see the formulas in the worksheet.

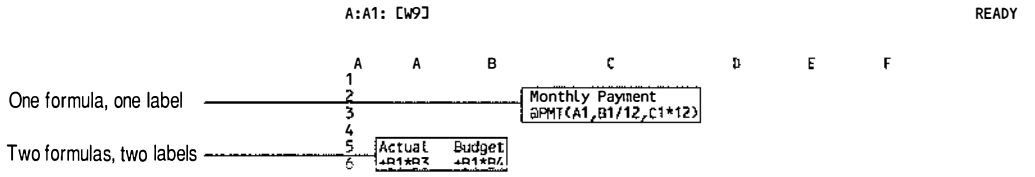


Figure 2-63. *Formula ranges*

- The **formula label range** contains a copy of the labels in the formula range and can also contain values, blank cells, and labels that do not appear in the formula range. When you calculate a data table labeled, 1-2-3 uses the formula label range in two ways: to determine which formula to use with the input values in the corresponding row, column, or worksheet of the data table, and to determine the placement of the results of the calculations. For example, in Figure 2-62, the formula label range is A:B1..A:D1. This range contains the label MONTHLY PAYMENTS, a copy of the label in the top cell of the formula range (A:A14..A:A15), and some special characters called label-fill characters, described below.

  NOTE If the formula label range contains values, blank cells, and labels that do not appear in the formula range, 1-2-3 does not enter results in the corresponding column or row of the results area.

- A **label-fill character** is a formatting character that lets you center a label in a formula label range. Generally, you use label-fill characters when your formula range contains one formula and your formula label range spans two or more adjacent columns. For example, Figure 2-64 shows a formula label range that contains label-fill characters. Cell A9 is formatted with /Range Format Text so you can see the formula in the cell. Notice that the formula label is in the leftmost cell of the formula label range, A:D2.

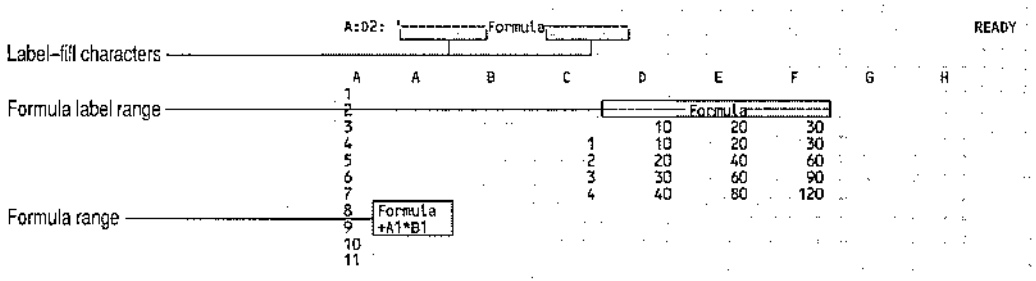


Figure 2-64. *A formula label range that contains label-fill characters*

You can also use spaces to center a label in a formula label range. 1-2-3 ignores label-fill characters and spaces when it looks at the formula label during a /Data Table Labeled procedure.

You can also use label-fill characters or spaces in a column variable range if the range contains labels, as it might in a database data table.

- A **row variable range** is a range that contains rows of input values, organized by columns. A row variable range can be one or more columns, as long as each column contains a separate set of input values. For example, in Figure 2-62, the row variable range is A:A6..A:A10.
- A **column variable range** is a range that contains columns of input values, organized by rows. A column variable range can be one or more rows, as long as each row contains a separate set of input values. For example, in Figure 2-62, the column variable range is A:B4..A:D4.
- A **worksheet variable range** is a range that contains input values organized in a three-dimensional range. It can contain more than one set of input values. For example, in Figure 2-62, the worksheet variable range is A:A3..C:A3.

NOTE Unlike the other Data Table commands, /Data Table Labeled does not require you to create a table range.

Before Using /Data Table Labeled

Before you use /Data Table Labeled, you need to complete the following tasks, described in the next two sections:

- Decide which ranges you need in the data table
- Plan the layout of the data table labeled

Deciding on the Ranges to Use in a Data Table Labeled

The types of ranges you include in a data table labeled depend on the organization you want for your data table. For example, the data table in Figure 2-62 has three variable ranges — a row variable range, a column variable range, and a worksheet variable range. A data table that shows the effects of changing two variables in a formula, however, might have a row variable range and a column variable range, or a row variable range and a worksheet variable range.

Planning the Layout of a Data Table Labeled

The appearance, or layout, of a data table labeled depends on the locations of the ranges 1-2-3 uses to create the table and on the contents of those ranges. Before you begin entering the information for the ranges used in the data table, therefore, you need to know how 1-2-3 uses the information you enter to create the data table so you can achieve the effect you want.

By manipulating the locations and contents of the row, column, and worksheet variable ranges and the formula label range, you can

- Include blank rows, columns, and worksheets between the ranges containing the information you need to set up the data table (the ranges containing the input values and formula labels) and the results area.
- Include blank rows, columns, and worksheets in the results area.

Including Blank Rows, Columns, and Worksheets Between the Table Ranges and the Results Area

1-2-3 enters the results of the calculations for a data table labeled at the intersections of all the variable ranges. This means you can include any number of columns and rows between the

variable ranges and the results area by adjusting the number of columns and rows between the variable ranges in the worksheet.

The following two figures show two data tables that contain identical column and row variable ranges located in different areas in the worksheet. Figure 2-65 shows a data table with the column and row variable ranges beginning in adjacent columns and rows. Figure 2-66 shows the same data, arranged so that one column and three rows are between the column and row variable ranges.

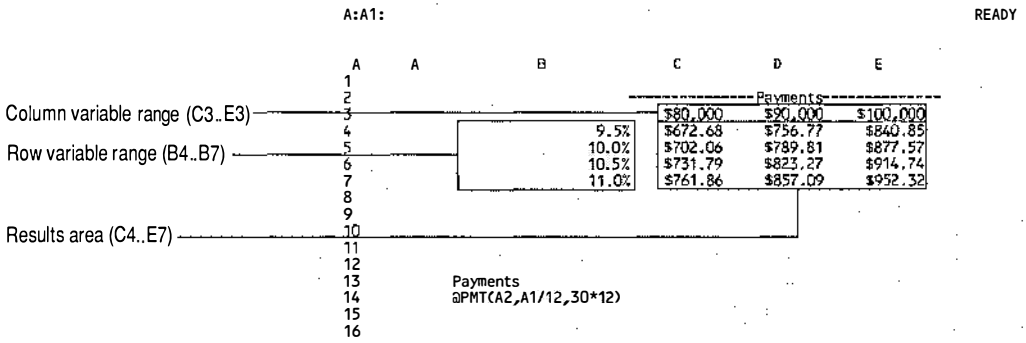


Figure 2-65. *A data table with adjacent variable ranges*

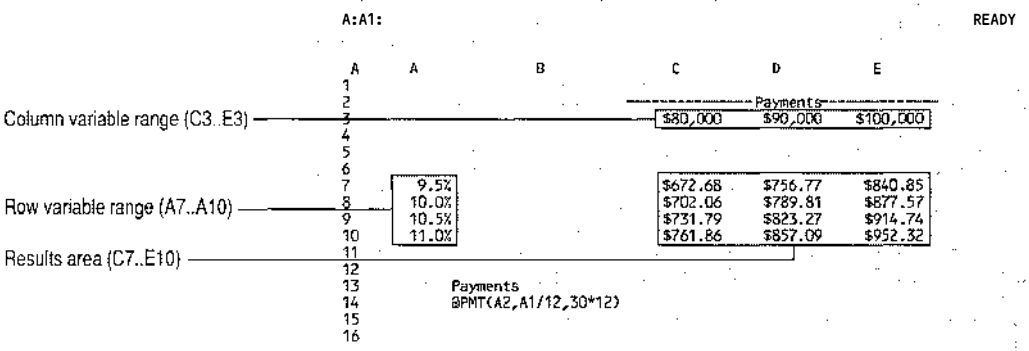


Figure 2-66. *A data table with variable ranges separated by rows and columns*

Because the column and row variable ranges in Figure 2-65 begin in adjacent columns and rows, the results area begins in the column and row immediately to the right of and below the two variable ranges. Because the column and row variable ranges in Figure 2-66 are separated by one column and three rows, the results area begins in the column one column to the right of the row variable range and in the row four rows below the column variable range.

If the data table contains a row variable range but no column variable range or contains a column variable range but no row variable range, 1-2-3 enters the results of the data table calculations at the intersection of the formula label range and the row or column variable range, whichever exists.

If the data table is three-dimensional, you can include blank worksheets between the results area and some of the ranges used to create the data table by adjusting the number of worksheets between the ranges. For example, if you have a file containing worksheets A, B, C, and D, you can enter the row and column variable ranges in worksheet A and the worksheet variable range in worksheets C and D. When 1-2-3 creates the data table, it enters the results in worksheets C and D only, at the intersections of the columns and rows that correspond to the columns and rows in the column and row variable ranges in worksheet A, as long as there are input values in the column and row variable ranges in worksheets C and D.

You can enter formulas and text in the blank rows, columns, and worksheets between the results area of a data table and the ranges used to create the data table. For example, you could enter the formula @AVG(C7..E7) in cell B7 in Figure 2-66 to average the results of the data table calculations in row 7. You can enter the formulas and text before or after you create the data table.

NOTE If you have a one-cell formula label range and one-cell column and row variable ranges, the formula label range must be in the same column containing the column variable range, as long as the formula label range is not in the cell at the intersection of the column and row variable ranges.

Including Blank Rows, Columns, and Worksheets in the Results Area You can include blank rows and columns in the results area by including one or more blank cells in the ranges used to create the data table. (Information on using blank worksheets within the results area is included later in this section.)

When you select /Data Table Labeled Go to create the data table, 1-2-3 checks the following areas for blank cells:

- The bottom row of the column variable range, if the data table includes a column variable range
- The rightmost column of the row variable range, if the data table includes a row variable range
- The formula label range, if the data table

  Contains either a row variable range or a column variable range, but not both ranges; or

  Contains a row variable range and a column variable range, and the formula label range is either in a column to the right of the row variable range or in a row below the column variable range

If any of these areas contains blank cells, 1-2-3 leaves the corresponding rows and/or columns blank in the results area of the data table.

Figure 2-67 shows a data table containing two adjacent blank columns. The blank columns appear because the formula label range (in this example, the only horizontal range in the data table) contains two adjacent blank cells. Cells A10, B10, and C10 are formatted with /Range Format Text so you can see the formulas in the cells.

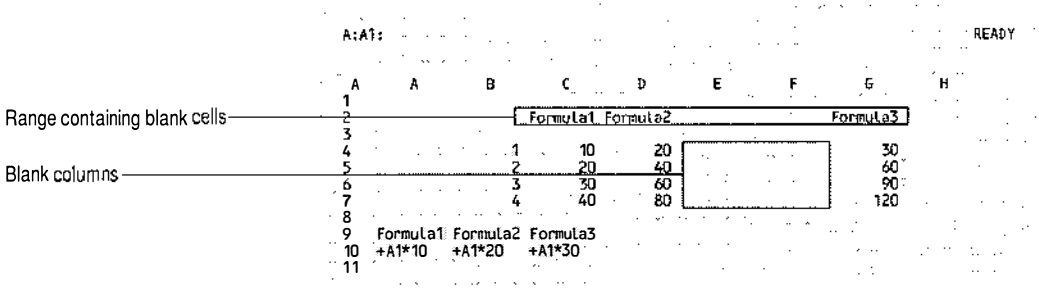


Figure 2-67. *A data table that contains blank columns*

You can include blank worksheets in your data table by including one or more blank cells in the rightmost or bottom group of cells in the worksheet variable range (or in a formula label range that spans worksheets). 1-2-3 ignores — that is, leaves blank — the worksheet(s) that correspond to the blank cell(s) in the results area of the table. For more information on the structure of a worksheet variable range, see step 6 of the procedure following this section.

You can also include blank rows and columns in your data table by including dummy labels in the formula label range. A **dummy label** is a label that does not match any of the labels in the formula range. For example, if you entered the label Totals in cell E2 of the formula label range in Figure 2-67 and then selected /Data Table Labeled Go, 1-2-3 would again leave E4..E7 in the resulting data table blank.

You can enter formulas and text in the blank areas of the data table. For example, you could enter the formula @SUM(D4..D7) in cell F7 in Figure 2-67 to add the results of the data table calculations in column D. You can enter the formulas and text before or after you create the data table.

Setting Up a Data Table Labeled

Before using /Data Table Labeled, you must set up the ranges 1-2-3 uses to create a data table labeled. The following procedure uses the data table in Figure 2-68 as an example for setting up the ranges in a data table labeled.

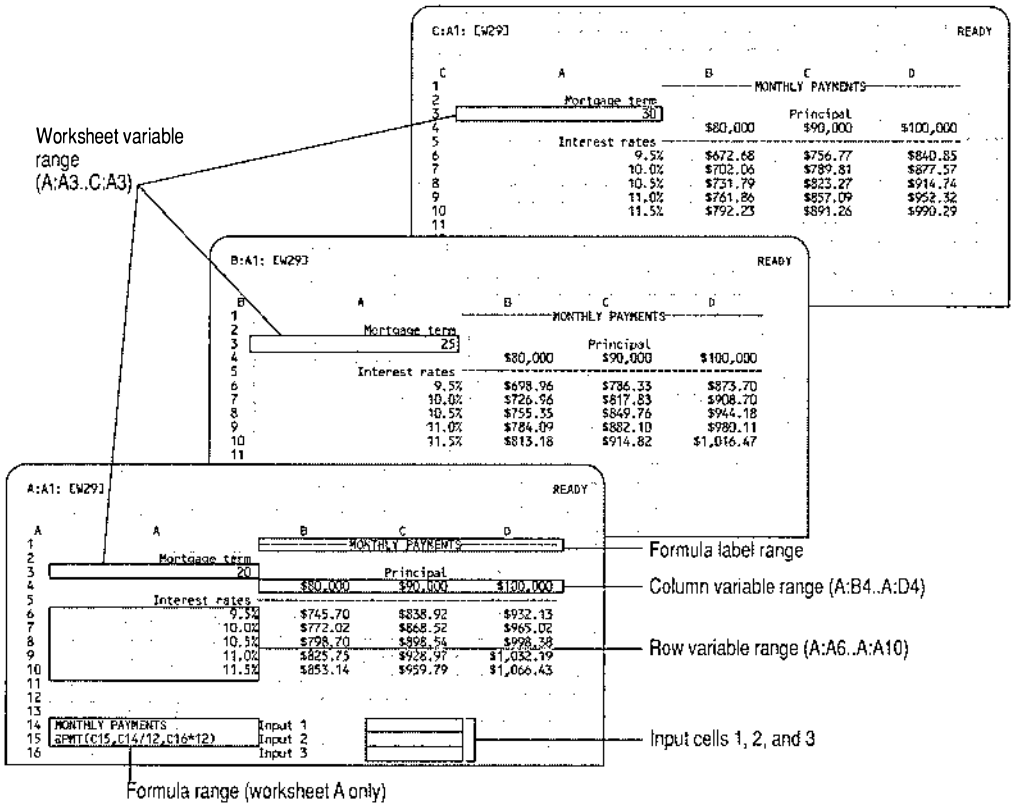


Figure 2-68. */Data Table Labeled*

1. Decide on a location for the data table. In Figure 2-68, for example, the data table is in A:A1..C:D10.
2. Decide on a location outside the variable ranges for the input cell or cells and, if you want to, document the location of each input cell by entering a label such as Input 1 to the left of the input cell. For example, Figure 2-69 shows the labels Input 1, Input 2, and Input 3 in cells A:B14..A:B16.
3. In a two-row range outside the area that will contain the input values and results, enter the formulas and labels for the formula range. Enter the labels in adjacent cells in the first row of the range and the formulas in adjacent cells in the second row. You must enter one formula label for each formula. Make sure the formulas refer to the input cells.

For example, Figure 2-69 shows the formula range in A:A14..A:A15. Cell A15 is formatted with /Range Format Text so you can see the formula in the cell.

4. (Optional) If you want the data table to have a row variable range, enter the input values for the row variable range.

   The row variable range can be to the right or left of the results area. If you want the range to contain more than one set of input values, enter the first set of input values in the rightmost column of the range, the second set of input values in the column to the immediate left of the rightmost column, and so on.

   For example, in Figure 2-69, the row variable range contains a single set of five input values and is in A:A6..A:A10, immediately to the left of the area in which 1-2-3 will enter the results of the calculations.

   If you want to create a three-dimensional data table, you must enter input values in the remaining worksheets in the data table in ranges that correspond to the row variable range. For example, because the data table in Figure 2-69 spans three worksheets beginning with worksheet A and the input values for the row variable range are in A:A6..A:A10, B:A6..B:A10 and C:A6..C:A10 also contain input values.

5. (Optional) If you want the data table to have a column variable range, enter the input values for the column variable range.

   The column variable range can be above or below the results area. If you want the range to contain more than one set of input values, enter the first set of input values in the bottom row of the range, the second set of input values in the row immediately above the bottom row, and so on.

   For example, in Figure 2-69, the column variable range contains a single set of three input values and is in A:B4..A:D4, two rows above the area in which 1-2-3 will enter the results of the calculations.

   If you want to create a three-dimensional data table, you must enter input values in the remaining worksheets in the data table in ranges that correspond to the column variable range. For example, because the data table in Figure 2-69 spans three worksheets beginning with

worksheet A and because the input values for the column variable range are in A:B4..A:D4, B:B4..B:D4 and C:B4..C:D4 also contain input values.

6. (Optional) If you want the data table to have a worksheet variable range, enter the input values for the worksheet variable range.

   To set up a worksheet variable range that contains only one set of input values, enter the first input value in a cell outside the data table; enter the second input value in a cell in the same relative position in the worksheet behind the first worksheet; and so on. For example, the worksheet variable range in Figure 2-69, A:A3..C:A3, contains one set of three input values (the values in A:A3, B:A3, and C:A3).

   To set up a worksheet variable range that contains more than one set of input values, enter each set in a group of cells so that the first input value is in a cell in the first worksheet in the worksheet variable range, the second input value is in a cell in the same relative position in the worksheet behind the first worksheet, and so on. For example, a worksheet variable range with the address A:A1..C:B1 would contain two sets of input values, each in a group of three cells. The first set of input values would be in A:A1, B:A1, and C:A1. The second set of input values would be in A:B1, B:B1, and C:B1.

   Also, to set up a worksheet variable range that contains more than one set of input values, you must enter the input values such that the input values in any one worksheet in the worksheet variable range are in adjacent cells in a single row or column. For example, to set up a worksheet variable range that contains four sets of input values, you could enter the input values in A:A1..C:D1 (where, in worksheet A, the four input values in the four sets of input values are in row 1). You could also enter the values in A:A1..C:A4 (where, in worksheet A, the four input values in the four sets of input values are in column A). You cannot enter four sets of input values in A:A1..C:B2 (where, in worksheet A, the input values in each of the four sets are in A1..B2 — a range with the dimensions of a square).

7. Decide on a location for the formula label range and copy the formula label(s) to the formula label range. For example, Figure 2-69 shows the formula label range in A:B1..A:D1.

   You can enter the formula label range in many places: in a row above or below the column variable range; in a column to the left or right of the row variable range; or in a three-dimensional range. Make sure you do not enter the formula label range in the area in which 1-2-3 will enter the results of the command.

   If the formula label range is in a row above the data table, the formula label range must contain as many cells as there are columns of input values. In Figure 2-69, for example, because there are input values in A:B4..A:D4 — a range that contains three columns of data — the formula label range must be a row of three cells, even though there is only one formula label. If the formula label range is in a column to the left of the data table, the formula label range must contain as many cells as there are rows of input values. For example, if you have input values in B2..B10 — a range that contains nine rows of data — the formula label range should be a column of nine cells, even if you have only one formula label.

   If your formula range contains one formula and your formula label range spans two or more adjacent columns, enter the formula label and the preceding and succeeding spaces or label-fill characters in the first cell of the formula label range. You can use any character for the label-fill character. (The default label-fill character is - [hyphen].) The formula label range in Figure 2-69 contains label-fill characters.

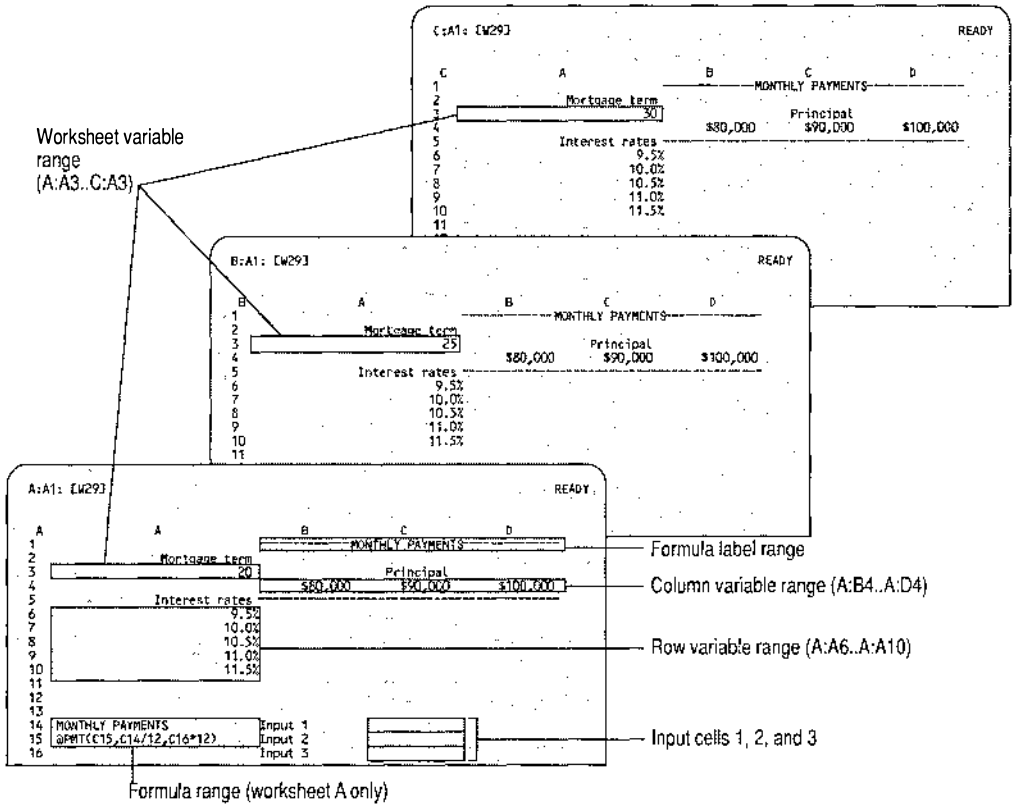


Figure 2-69. *Setting up a data table labeled*

NOTE If you are creating a three-dimensional data table and the formula label range is in a row or column in the first worksheet in the data table, you do not have to enter formula labels in the remaining worksheets in the data table. 1-2-3 uses the formula labels in the first worksheet in the range to perform the calculations with the input values in each worksheet in the data table.

Calculating a Data Table Labeled

With the data table set up, you are ready to use /Data Table Labeled, as follows:

1. Select /Data Table Labeled.

   1-2-3 displays the following menu:

Across	Specifies the column variable range and input cells.
Down	Specifies the row variable range and input cells.
Formulas	Specifies the formula range and the formula label range.
Go	Calculates the results.
Input-Cells	Specifies the input cells for column, row, and works sheet variables. You use Input-Cells to verify or edit the input cells you selected with Across, Down, and Sheets.
Label-Fill	Specifies a label-fill character for the formula label range or column variable range.
Quit	Returns 1-2-3 to READY mode without calculating the results.
Sheets	Specifies the worksheet variable range and input cells.

2. Select Formulas.
3. Specify the formula range.
4. Specify the formula label range.
5. If you have a row variable range, select Down and specify the row variable range.

   1-2-3 displays the address of the leftmost column of input values in the row variable range. Press **ENTER** to identify this set of input values as the set to which you will next assign an input cell.

   Specify the input cell for that column of input values.

Next, if you entered a row variable range that contains more than one column, 1-2-3 repeats the prompts for assigning input cells for each additional column of input values, moving from left to right.

NOTE If you specify the wrong input cell for a set of input values in this step or in either of the following two steps, you may be able to correct the mistake before you complete the command. For more information, see the following section, "Respecifying Input Cells Before Completing a Command."

6. If you have a column variable range, select Across and specify the column variable range.

   1-2-3 displays the address of the top row of input values in the column variable range. Press ENTER to identify this set of input values as the set to which you will next assign an input cell.

   Specify the input cell for that row of input values.

   Next, if you entered a column variable range that contains more than one row, 1-2-3 repeats the prompts for assigning input cells for each additional row of input values, moving from top to bottom.

7. If you have a worksheet variable range, select Sheets and specify the worksheet variable range.

   1-2-3 displays the address of the first group of cells in the worksheet variable range. Press ENTER to identify this set of input values as the set to which you will next assign an input cell.

   Specify the input cell for that group of input values.

   Next, if you entered a worksheet variable range that contains more than one one-cell-wide, three-dimensional group of cells, 1-2-3 repeats the prompts for assigning input cells for each additional group of input values, moving left to right (if the cells in the parts of the three-dimensional groups visible in the current worksheet are organized in a row) or top to bottom (if the cells in the parts of the three-dimensional groups visible in the current worksheet are organized in a column).

8. (Optional) If you want to review or edit any of the selections in steps 5 through 7, select Input-Cells.

   1-2-3 cycles through each set of input values and input cells. Press ENTER to accept the entries or specify new addresses. When you finish viewing the last input cell you specified, press ENTER to return to the /Data Table Labeled menu. For more information on using /Data Table Labeled Input-Cells to specify new input cells, see "Respecifying Input Cells After Completing a Command" later in this section.

9. (Optional) If you need to specify a label-fill character for the formula label range or the column variable range, select Label-Fill and specify the character.

   The - (hyphen) is the default label-fill character. You do not need to select the Label-Fill command unless you want to specify a different character.

10. Select Go.

1-2-3 calculates the formulas, replacing each variable in each formula with the input values in the corresponding variable ranges. 1-2-3 enters the result of each calculation in the data table, in the cell at the intersection of the appropriate worksheet, row, and column in the data table.

Figure 2-68 shows the data table after 1-2-3 calculates the monthly mortgage payments. Notice that the row of hyphens between the column variable range and the results area has no effect on the calculations.

NOTE If the results area remains blank but no error message appears when you select /Data Table Labeled Go again to create your data table, check the following:

- The spelling of the labels in the formula range and in the formula label range. If the labels in the formula label range do not match the labels in the formula range exactly, edit the labels in either one of the ranges to match the labels in the other range.
- The label-fill character (if any) in the formula label range. You may have used a label-fill character that does not match the label-fill character you specified with /Data Table Labeled Label-Fill. Use /Data Table Labeled Label-Fill to change the label-fill character to match the character in the formula label range.

After you change the label-fill character or edit the labels in either the formula label range or the formula range, select /Data Table Labeled Go again to create the data table.

NOTE If you create a data table using this procedure and then select /Data Table Labeled Across, Down, or Sheet, 1-2-3 "remembers" the range you specified and displays the address in the control panel — just as it remembers a table range you specify with /Data Table 1, 2, or 3. If you then press ENTER, however, 1-2-3 clears the settings for the input cells associated with the range and prompts you to specify an input cell for the first set of input values in the range. You must respecify the input cells before you can select /Data Table Labeled Go to recalculate the formulas in the current data table or create a new table.

Respecifying Input Cells Before Completing a Command

If you inadvertently assign the wrong input cell to a set of input values while using /Data Table Labeled Across, Down, or Sheet, you can respecify the input cell for that particular set of input values before you complete the command, provided the variable range includes more than one set of input values and at least one set of input values has not yet been assigned an input cell.

For example, assume you selected /Data Table Labeled Down to specify C4..E8 as the row variable range, specified input cells for the first two columns in the range (C4..C8 and D4..D8), and then realized you specified the input cell for C4..C8 incorrectly. (At this point, 1-2-3 displays a prompt asking you to accept the address of the next set of input values in the range, E4..E8.) You can change the input cell for C4..C8 using the following procedure:

1. At the prompt that asks you to accept the address of a set of input values, specify the address of the set of input values to which you want to assign a new input cell. In this example, you would specify C4..C8.

   1-2-3 prompts you for the address of an input cell.

2. Specify the address of the correct input cell.

   1-2-3 prompts you to accept the address of the first of the remaining set of input values for which you have not yet assigned an input cell. In this example, 1-2-3 would prompt you to accept the input values in E4..E8.

3. Press ENTER to identify the highlighted set of input values as the set for which you will next specify an input cell.

4. Specify the input cell for the highlighted set of input values.

5. (Optional) Repeat steps 3 and 4 to specify input cells for the remaining sets of input values in the range.

See "Calculating a Data Table Labeled" earlier in this section for information on specifying the remaining variable ranges (if necessary) and calculating the data table.

Respecifying Input Cells After Completing a Command

If, while specifying input cells with /Data Table Labeled Across, Down, or Sheet, you inadvertently assign the wrong input cell to a set of input values and then complete the command, you can respecify the input cell for that set of input values by using /Data Table Labeled Input-Cells.

1. Select /Data Table Labeled Input-Cells.

   1-2-3 displays the address of a set of input values in the data table. Depending on the types of variable ranges in the data table, the input values may be in the row variable range, the column variable range, or the worksheet variable range.

2. Specify the address of the set of input values to which you want to assign a new input cell.

   If you are changing an input cell associated with a set of input values in the row variable range, specify a column in that range. If you are changing an input cell associated with the column variable range, specify a row in that range. If you are changing an input cell associated with the worksheet variable range, specify a three-dimensional group of cells in that range.

   1-2-3 prompts you for the address of an input cell.

3. Specify the address of a new input cell.

   1-2-3 prompts you to confirm the address of the next set of input values in the range. (If the set of input values for which you just specified an input cell is the last set in that range, 1-2-3 prompts you to confirm the address of the first set of input values in another range in the data table.)

4. (Optional) Repeat steps 2 and 3 to respecify other input cells in the data table.

5. Press ESC to return to the /Data Table Labeled menu.

Using /Data Table Labeled with Multiple-Variable Variable Ranges

You can use more than three variables in a data table by using /Data Table Labeled to specify row, column, and worksheet variable ranges that contain more than one set of input values. The data table in Figure 2-70, for example, includes a row variable range that contains two sets of input values instead of one.

The data table shows how changes in the principal, interest rate, and term of a mortgage affect the monthly mortgage payment. The example uses the function @PMT(*principal*,*interest*,*term*).

The two sets of input values in the row variable range are in columns B and C. The input values in column B (B3 and B7) represent the term of the loan in years. The input values in column C (C3..C9) represent the loan principal. Each of the two sets of input values within the row variable range has an input cell. In this example, the input cell for column B is A1, and the input cell for column C is A2.

Notice that the input values in column B change less frequently than the input values in column C. When you select /Data Table Labeled Go, 1-2-3 uses the first value in column B (20) to calculate the mortgage payments for each of the three principal amounts in C3, C4, and C5 (given the interest rates in cells D2, E2, and F2); when 1-2-3 encounters the second value in column B (30), it uses this value to calculate the mortgage payments for the remaining principal amounts in column C (the values in C7, C8, and C9), given the interest rates in cells D2, E2, and F2.

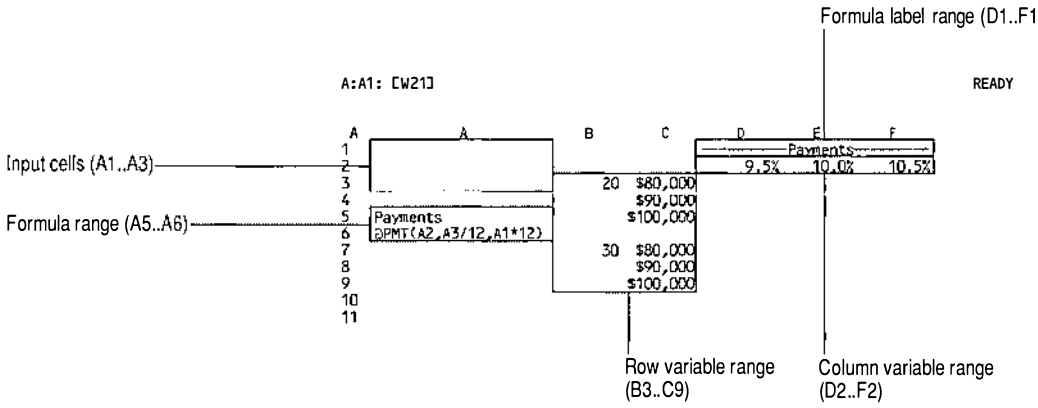


Figure 2-70. */Data Table Labeled with a two-variable row variable range*

Figure 2-71 shows the results of the /Data Table Labeled calculations. The value in cell D4, for example, shows the result of the @PMT function given a principal amount of $90,000 (C4), an interest rate of 9.5% (D2), and a term of 20 years (B3). Because the rightmost column of the row variable range contains a blank cell (C6), 1-2-3 leaves a blank row in the data table (row 6). The results area (D3..F9) is formatted with /Range Format Currency.

A:A1: [W21] READY

	A	B	C	D	E	F
1					Payments	
2				9.5%	10.0%	10.5%
3		20	$80,000	$746	$772	$799
4			$90,000	$839	$869	$899
5	Payments		$100,000	$932	$965	$998
6	@PMT(A2,A3/12,A1*12)					
7		30	$80,000	$673	$702	$732
8			$90,000	$757	$790	$823
9			$100,000	$841	$878	$915
10						
11						

Figure 2-71. *Results of /Data Table Labeled*

In a column variable range that contains more than one set of input values, the bottom row should contain the input values that change with the greatest frequency. For example, if the column variable range is in A2..D5, A5..D5 must contain the input values that change with the greatest frequency.

In a worksheet variable range that contains more than one set of input values, the bottom or rightmost group of cells in the range should contain the input values that change with the greatest frequency. For example, if the worksheet variable range is in A:A2..C:A5, A:A5..C:A5 must contain the input values that change with the greatest frequency. If the worksheet variable range is in A:A2..C:D2, A:D2..C:D2 must contain the input values that change with the greatest frequency.

You can also have multiple-variable variable ranges in which every cell contains an input value. For example, in Figure 2-71, you could enter values in B4, B5, B8, and B9, and 1-2-3 would calculate the data table using the values in these cells. You would not enter a value in B6, however, because the adjoining blank cell in the rightmost column of the row variable range, C6, causes 1-2-3 to ignore any values in row 6 when it calculates the data table.

Using /Data Table Labeled to Cross-Tabulate Information

/Data Table Labeled lets you analyze or cross-tabulate the data in a 1-2-3 database table or an external table.

Before you use /Data Table Labeled with a database table, you need to be familiar with the following:

- The structure of database tables. For more information on database tables, see "Database Tables" at the beginning of "Data Commands."
- Database @functions. You can use database @functions in the formulas associated with the data table. Database @functions let you perform calculations using data from selected records in the database table. See "Database @Functions" in Chapter 3 for detailed information on these @functions.

Figure 2-72 shows a sales database table that contains information on salesperson's name, month, account, and dollar amount for each sale. The figure also shows the associated database data table, which calculates the total sales for selected salespeople (row variable range) for selected months (column variable range) and selected accounts (worksheet variable range).

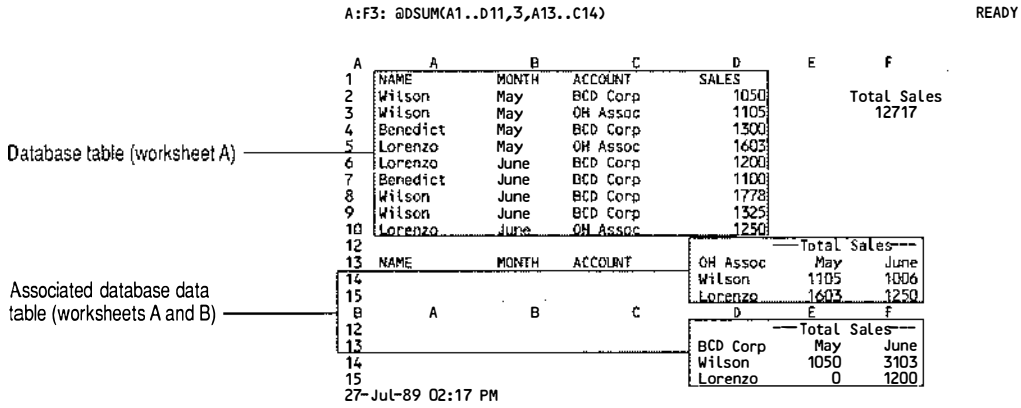


Figure 2-72. *Using /Data Table Labeled with a database table*

Setting Up a Data Table Labeled

Before using /Data Table Labeled with a database table, you must set up the ranges 1-2-3 uses to create a data table labeled. The following procedure uses the data table in Figure 2-72 as an example for setting up the ranges in a data table labeled.

1. Decide on a location for the data table. In Figure 2-72, for example, the data table is in A:D12..B:F15.

2. Decide on a location for the input cell(s). Each input cell must be immediately below a cell containing the field name for a variable you want to analyze. If you already created a criteria range for the database table, you can use it to specify the input cells, or you can create a separate criteria range specifically for the data table. For example, Figure 2-73 shows the input cells are A:A14, A:B14, and A:C14, the cells immediately below the field names for the variables that will be analyzed in the data table (NAME, MONTH, and ACCOUNT).

3. In a two-row range outside the area that will contain the input values and results, enter the formulas and labels for the formula range.

   For example, Figure 2-73 shows the formula range in A:F2..A:F3. The formula label Total Sales is in F2, and the formula — @DSUM(A1..D11,3,A13..C14) — is in F3. A:A1..A:D11 in the formula is the input range, which contains the field names and all the records in the

database table, and A:A13..A:C14 is the criteria range, which contains copies of the field names NAME, MONTH, and ACCOUNT and three blank cells (the input cells). The 3 is the offset number for the SALES field.

NOTE If you are cross-tabulating the information in an external table, specify the range name of the external table as the input range in the database @function.

4. (Optional) If you want the data table to have a row variable range, enter values or labels from the field associated with input cell 1 (in this example, the NAME field) in the row variable range. In Figure 2-73, the labels in the row variable range (A:D14..A:D15) and in the corresponding cells in worksheet B are the names of the salespeople for whom 1-2-3 will calculate total sales.

   NOTE To include groups of records containing similar field entries in the calculations, you can use labels containing values preceded by logical operators or labels containing wild-card characters as input values. You can also use any type of formula except a logical formula as an input value. 1-2-3 uses the result of the formula as an input value. See "The Criteria Range" in /Data Query for information on the types of labels, values, and formulas you can enter as input values.

5. (Optional) If you want the data table to have a column variable range, enter values or labels from the field associated with input cell 2 (in this example, the MONTH field) in the column variable range. In Figure 2-73, the labels in the column variable range (A:E13..A:F13) and in the corresponding cells in worksheet B are the names of the months for which 1-2-3 will calculate total sales.

6. (Optional) If you want the data table to have a worksheet variable range, enter values or labels from the field associated with input cell 3 (in this example, the ACCOUNT field) in the worksheet variable range. In Figure 2-73, the labels in the worksheet variable range (A:D13..B:D13) are the names of the accounts for which 1-2-3 will calculate total sales.

When 1-2-3 calculates the data table, it uses the values, labels, and/or formulas you entered in steps 4, 5, and 6 as the criteria for selecting the records to include in calculations.

7. Decide on a location for the formula label range and copy the formula label(s) to the formula label range. For example, Figure 2-73 shows the formula label range in A:E12..A:F12.

   If you copied the formula labels to a row above the data table, the formula label range must contain as many cells in the row as there are columns of input values. For example, because the column variable range in Figure 2-73 (A:E13..A:F13) contains two columns, the formula label range (A:E12..A:F12) contains two cells, even though the formula label is in A:E12 only.

   If you copied the formula labels to a column to the left of the data table, the formula label range must contain as many cells in the column as there are rows of input values. For example, if the row variable range is A:B2..A:B10, the formula label range should be A:A2..A:A10, even if the formula label is only in A:A2.

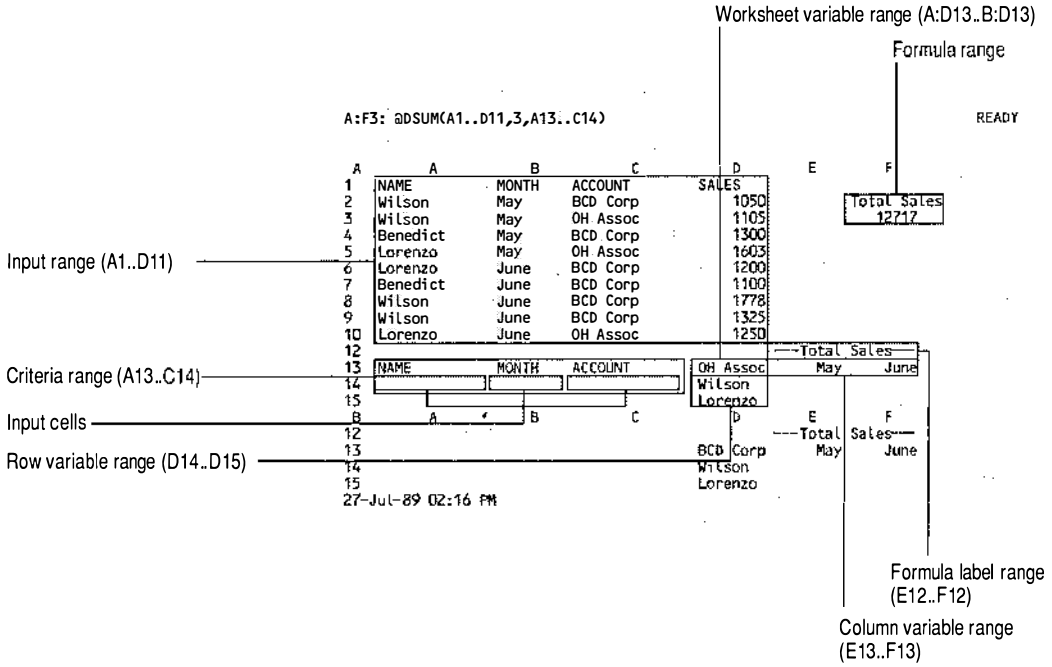


Figure 2-73. *Setting up a data table labeled for use with a database table*

Calculating a Data Table Labeled

With the data table set up, you are ready to use /Data Table Labeled. See the procedure in "Calculating a Data Table Labeled" earlier in this section.

When you select /Data Table Labeled, 1-2-3 calculates the formulas, replacing each variable in each formula with the input values in the corresponding variable ranges. The result of each calculation appears in the data table, in the cell at the intersection of the appropriate worksheet, row, and column in the table range.

Figure 2-72 shows the data table after 1-2-3 calculated the results. Because the database table does not contain a record showing a sales figure for Lorenzo for the BCD Corp account for the month of May, the sum of Lorenzo's sales for that month and that account is 0 (cell B:E15).

TIP You can position the variable ranges and the formula label range anywhere in a worksheet, as long as you have one range containing information arranged in rows (the formula label range or the column variable range) and one range containing information arranged in columns (the row variable range). For example, Figure 2-74 shows a data table with a row variable range to the right of the results area (instead of to the left) and a column variable range below the results area (instead of above the results area). Compare this illustration with Figure 2-71, which shows the same data organized differently.

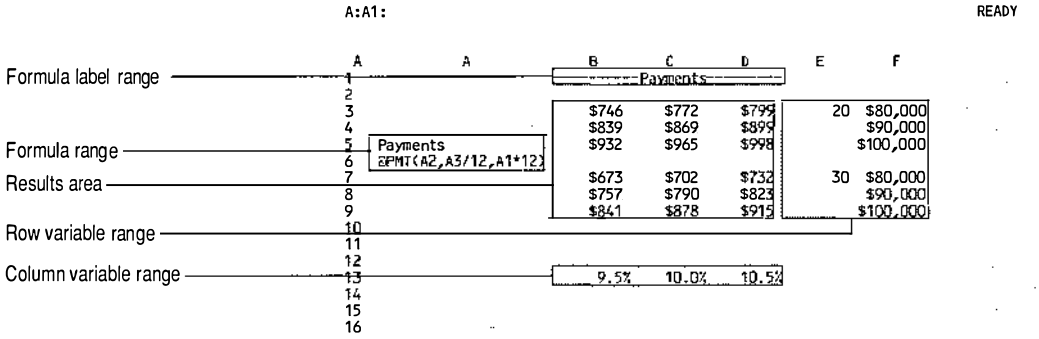


Figure 2-74. *Variable ranges below and to the right of the results area*

/Data Table Reset

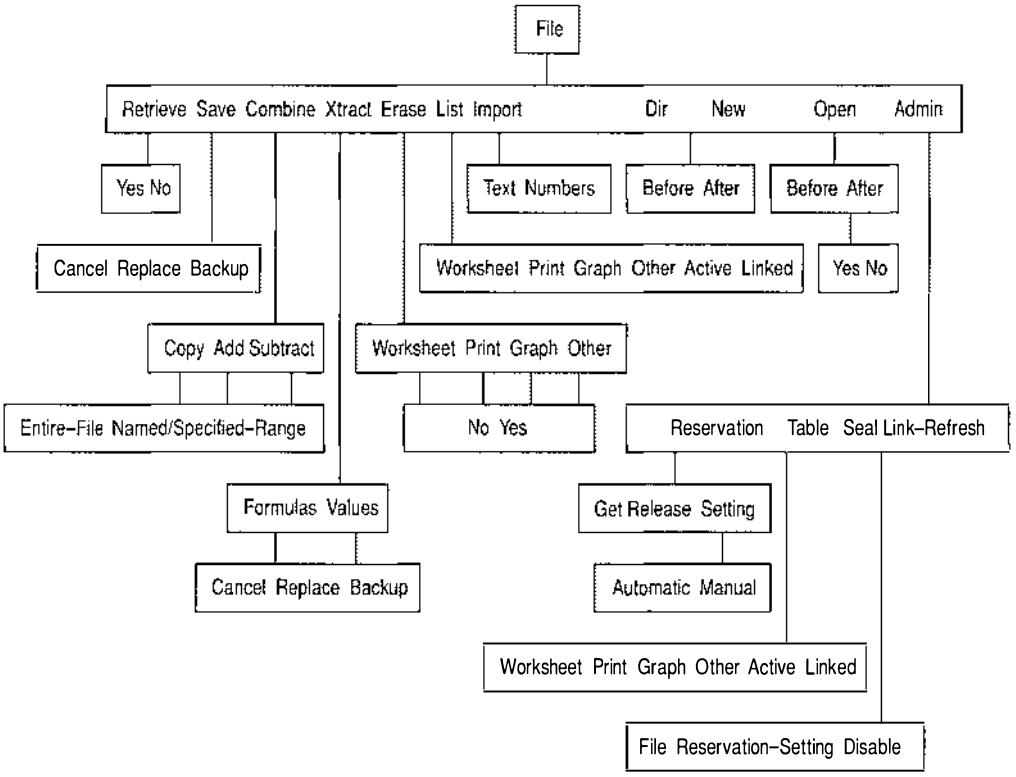
/Data Table Reset clears all the table-range and input-cell settings you specified in the current file.

Use /Data Table Reset before you save a file if you do not want to save table range and input-cell settings with the file.

Procedure

1. Make sure the cell pointer is in the file containing the table-range and input-cell settings you want to clear.
2. Select /Data Table Reset.

File Commands



The data you enter in a 1-2-3 worksheet is temporary until you save it in a file on disk. By saving the worksheet in a file, you create a permanent copy of your work. You use the File commands to save worksheets in files on disk and to read the files into 1-2-3. In addition, the File commands help you organize and maintain the information you store in files.

The File commands perform the following tasks:

Command	*Task*
/File Admin	Controls reservations for sharing worksheet files; creates a table of information about files; seals some graph, print, range, worksheet, and reservation settings in worksheet files; and recalculates formulas that refer to data in other files.
/File Combine	Incorporates data from a worksheet file on disk into the current file.
/File Dir	Changes the directory that 1-2-3 uses when you save, read, or list files.
/File Erase	Erases a file on disk.
/File Import	Reads data from a text file on disk into the current work sheet.
/File List	Displays a temporary list of information about files.
/File New	Creates a new blank worksheet file on disk and in memory.
/File Open	Reads a worksheet file into memory and places it before or after the current file. /File Open lets you use several files at one time.
/File Retrieve	Reads a worksheet file into memory. The retrieved file replaces the file that was current when you selected /File Retrieve.
/File Save	Saves worksheet files on disk.
/File Xtract	Extracts a range of data by copying the data from an active file and saving it in a worksheet file on disk.

Common Uses for File Commands

The File commands let you save and read files, work with one or more files in 1-2-3, and consolidate data from different files. You could use the File commands to do any of the following:

- Read several files into memory at the same time so you can compare the data in those files or copy data from one file to another (/File Open).
- Make a smaller file by extracting some of the data from a large file (/File Xtract).

- Add data from separate monthly files into one file for a year-to-date report (/File Combine).
- Copy a memo from a text file into a worksheet (/File Import).
- Erase a file on disk that you no longer need (/File Erase).
- Make a list of active files, files on disk, or files linked to active files (/File Admin Table or /File List).
- Prevent someone else from using a file that contains sensitive data by saving the file with a password (/File Save).
- Let someone use a file but prevent the user from changing some graph, print, range, worksheet, or reservation settings or protected data (/File Admin Seal).

Reading Path

- Before you begin working with the File commands, read "Working with Files" in Chapter 1, which covers naming and specifying files.
- To learn about using more than one file at the same time, complete Lesson 12 in the *Tutorial*.
- To learn about linking files, read "Linking Files with Formulas" in Chapter 1.
- For detailed information about any File command, refer to the command in "File Command Descriptions" later in this section.

Also, remember that you can press HELP when you are using any File command to get information about the command. In addition, you can refer to "Using Files" and "Protecting Data and Files" in *Task Summary* for a summary of File commands that accomplish specific tasks.

Terms You Need to Know

- A **file** is a named collection of data. A file on disk is a permanent record of your work.
- When 1-2-3 **saves** a file, it copies a file from memory to disk, making a permanent copy of the file.
- When 1-2-3 **reads** a file, it copies a file from disk into memory.
- An **active file** is a file in memory.

- The **current file** is the active file that contains the cell pointer.
- A **sealed file** is a file that was sealed with /File Admin Seal. You can read a sealed file into 1-2-3, but you cannot change the settings that were sealed in the file.
- A **password-protected file** is a file that was saved with a password. You cannot read a password-protected file into 1-2-3 unless you know the password.
- A **file reservation** is a guarantee that a user can save changes to the file on disk, even though several people may be using the file.
- **Linked files** are any two files, one of which contains a formula that refers to data in the other.

File Command Descriptions

The following sections describe each of the File commands in alphabetical order.

/File Admin

The File Admin commands help you maintain file security and data integrity for shared files. 1-2-3 provides concurrency controls, called reservations, to ensure that no more than one user at a time can save changes to a file, although a number of users can read the file simultaneously. A **reservation** is a guarantee that you can save changes to a file using the same file name with which you retrieved the file. 1-2-3 also provides File Admin commands that you can use alone or in conjunction with operating system commands to limit access to shared files.

The File Admin commands perform the following tasks:

Command	*Task*
Link-Refresh	Recalculates formulas in active files that refer to data in other active files or files on disk.
Reservation	Lets you get and release the current file's reservation and change the reservation setting. Use this command when you share worksheet files on a network or in another multi-user environment.
Seal	Prevents changes to some graph, print, range, worksheet, and reservation settings.
Table	Creates a table of information about active files, files on disk, or files linked to the current file.

The following sections discuss the 1-2-3 file reservation system. For information on specific commands, see /File Admin Reservation.

Reservations

When more than one user can read or write information to a disk file, that file can be accessed concurrently. Concurrency controls do not prevent users from changing a file or part of a file, as access controls do, but rather ensure that users who share files do not inadvertently write over each other's changes. 1-2-3 provides concurrency controls through file reservations. The file reservation system provides reminders to help prevent users from wasting time changing a file if they are unable to save their changes.

- A file's reservation status changes depending on whether another user has it. If no user has the reservation, it is available; if another user has the reservation, it is unavailable.
- Only one user can have a file's reservation at any one time.
- The only user who can save changes to a file under its original name and in its original file location is the user who has the reservation. Any user may retrieve the file and save it under a new name or in a different location unless the file is password-protected.

Reservation Setting A file's reservation setting determines the method by which a user gets the file's reservation. A file's reservation setting is either Automatic or Manual. When it is Automatic, the first person to read a file into memory gets the file's reservation automatically. When it is Manual, no one automatically gets the reservation. To secure the reservation, a user must use /File Admin Reservation Get while the file is current to try to get the reservation.

Reservation Status A file's reservation status is either available or unavailable. 1-2-3 checks the reservation status of a file before reading it into memory and takes different actions depending on the file's reservation status and reservation setting.

- If the reservation setting is Automatic and the reservation is available, 1-2-3 reads the file into memory with its reservation.
- If the reservation setting is Automatic but the reservation is not available, 1-2-3 displays a prompt asking if you want to read the file into memory without a reservation. If you do, 1-2-3 reads the file into memory without the reservation.
- If the reservation setting is Manual, 1-2-3 reads the file into memory without the reservation, regardless of its reservation status. You can use /File Admin Reservation Get while the file is current to try to get the reservation.

If you read a file into memory without a reservation, you will be able to look at the file but you will not be able to save changes to it under its original name. 1-2-3 displays the RO (read-only) indicator to remind you that you will not be able to save changes to the file with the original name until you get the file's reservation.

NOTE You can use /File Xtract to save changes to a file for which you do not have a reservation if no other user has the reservation. When you use /File Xtract, 1-2-3 automatically gets the file's reservation if it is available; 1-2-3 then makes the changes, saves the file, and releases the reservation.

NOTE A user may assign a file read-only status with an operating system command, or a file may be in a read-only directory. Operating system and network commands take precedence over the 1-2-3 reservation status. For example, you will not be able to get the reservation of a file that has been given read-only status through an operating system command even if no other user has the reservation.

Getting and Releasing Reservations You will automatically get the reservation of a file you create with a unique file name, an existing file you save with a unique file name, and a file you read into memory that has an automatic reservation setting and an available reservation.

1-2-3 will release a file's reservation in the following situations:

- When you select /Quit to end 1-2-3 or when you log out of your current session.
- When you select /File Retrieve, /Worksheet Erase, /Worksheet Delete File, or /File Admin Reservation Release.
- If you save a file with a new name. In this case, 1-2-3 will release the reservation of the original file after you successfully create a new one.

Guidelines for Sharing Files

- Keep in mind that if you create or save a shared file and then release the reservation or end 1-2-3, another user may get the file's reservation and save changes to it. Therefore, the file may change before you next get the reservation on it. You can use /File List to see when changes were last saved to the file.
- If you read a file into memory without the reservation and save changes to the file with a different file name, do not copy the new file over the original file when its reservation becomes available. If you do, you may write over another user's work.

- If you read a file that has an Automatic reservation setting into memory and you do not intend to save changes to the file, remember to release the reservation so another user can obtain it.

- If you try to read a shared file that was created in 1-2-3 Release 1A or 2 format without the .WK1 extension (for example, Symphony .WR1 files), 1-2-3 reads the file into memory and renames it in memory with the .WK3 extension. If no .WK3 file of the same name already exists, 1-2-3 gets a reservation for the new .WK3 file. If a .WK3 file of the same name already exists, 1-2-3 gives the file in memory read-only status and displays the RO indicator and an error message. You will need to rename the file before you can save it.

- If you try to read a file from disk while another user is doing so, or if you try to read a file while another user is saving it to disk, 1-2-3 will display the WAIT indicator until the first user completes the process of reading or saving the file. 1-2-3 should never display the WAIT indicator for very long; you can, however, press **BREAK** to interrupt the wait cycle and return to the point prior to which you tried to read or save the file. If 1-2-3 cannot read or save the file within one wait cycle, it will display an error message. Try to read or save the file again.

Guidelines for Choosing Reservation Settings

If a file's reservation setting is Automatic, the first person to read the file into memory gets the reservation and prevents other users from saving changes to it. If a file's reservation setting is Manual, a number of people can read the file and a subsequent user will be able to get the reservation.

To decide on a reservation setting for a particular file or group of files, consider the work group that will share it.

- If most of the users in the work group are likely to save changes to the file each time they read it into memory, give the file an Automatic reservation setting. That way, the first user to read the file into memory, who is likely to need the reservation, will get it. This obviates the extra work of each user asking for the reservation each time he or she needs it.

- If most members of the work group will use the file for reference only, give the file a Manual reservation setting. That way, only the person who needs the reservation will get it; someone who does not need the reservation will not inadvertently prevent other users from getting it.
- A work group that shares a spreadsheet model may increase its ability to work in parallel by breaking the model up into separate files by author and giving each file a Manual reservation setting. That way, the primary author of a section would always ask for and get the reservation, and other group members would not need to release their reservations when referring to the file.

To seal a file's reservation setting so no other user can change it, use /File Admin Seal Reservation-Setting, described below.

/File Admin Link-Refresh

/File Admin Link-Refresh recalculates formulas in active files that refer to data in other active files or files on disk. Formulas linked to other files do not automatically update when you read the files that contain the formulas into memory. Use /File Admin Link-Refresh to update linked formulas after you use /File Open or /File Retrieve.

Procedure

1. Select /File Admin Link-Refresh.

NOTE If /Worksheet Global Recalc is set to Manual, 1-2-3 does not update links but displays the CALC indicator after you select /File Admin Link-Refresh. Press CALC to update the linked formulas in the current file.

/File Admin Reservation

/File Admin Reservation lets you get and release the current file's reservation and change the reservation setting.

Use /File Admin Reservation when you want to get the reservation for the current file, release the reservation so someone else can get it, or control whether the reservation setting for the file is Automatic or Manual.

You can get the reservation for the current file only if the reservation is available and no one has saved changes to the file since you read it into memory or since you last saved it.

Procedure

1. Select /File Admin Reservation.
2. Select Get, Release, or Setting.

   Get — Gets the file's reservation if it is available and no one has saved changes to the file since you read it into memory or since you last saved it.

   Release — Gives up the reservation for the current file so someone else can get it.

   Caution If you made changes to the file and want to save them, select /File Save before you release the reservation. Otherwise you will not be able to save the changes unless you get the reservation before another user does.

   Setting — Sets the reservation setting (Manual or Automatic) of a 1-2-3 file when you save it.

3. If you selected Get and got the reservation, 1-2-3 removes the RO indicator from the screen. You can save changes to the file.

   If you selected Get and did not get the reservation, the file changed on disk since you read it into memory or last saved it, the reservation is not available, or you do not have write access to the file. 1-2-3 displays the appropriate message.

   If you selected Release, 1-2-3 releases the reservation, making it available to other users, and displays the RO indicator at the bottom of the screen.

   If you selected Setting, select Automatic or Manual.

   - Automatic sets the file's reservation setting so the first person who reads the file into memory gets the reservation. Subsequent users can read the file but can get the reservation only after the first user releases it. This is the initial setting for a new file.
   - Manual sets the file's reservation setting so no one automatically gets the reservation. When you read the file into memory, you will have read-only access to the file. To get the reservation, you must use /File Admin Reservation Get.

4. If you selected Setting to set the file reservation setting, save the file with /File Save. When you save the file, 1-2-3 saves the specified reservation setting with the file.

TIPS To seal the reservation setting of a file so no one else can change it, use /File Admin Seal Reservation-Setting.

When you do not get a reservation because the current file has changed on disk since you read it into memory or last saved it, 1-2-3 displays an error message. Use /File Retrieve or /File Open to read the newest version of the file into memory. If you then do not get the reservation with the file (the file may have a Manual setting), use /File Admin Reservation Get to try to get the reservation.

To check the time and date an active file was last changed on disk, whether the file has changed on disk since you read it into memory, and whether the file has read-only status, use /File Admin Table Active or /File List Active.

If you select the [ALL MODIFIED FILES] option when using /File Save but do not have the reservations for all modified files in memory, 1-2-3 will display a message stating you cannot use this option until you get reservations for the unreserved modified files. Try to get reservations for these unreserved files with /File Admin Reservation Get and retry the [ALL MODIFIED FILES] option.

/File Admin Seal

/File Admin Seal seals either the current file or just the current file's reservation setting. When you seal a file, the following commands are sealed and cannot be used to change the file.

- /File Admin Reservation Setting
- /Graph Name [Create, Delete, Reset]
- /Print [E,F,P] Options Name [Create, Delete, Reset]
- /Range Format
- /Range Label
- /Range Name [Create, Delete, Labels, Reset, Undefine]
- /Range Name Note [Create, Delete, Reset]

- /Range Prot
- /Range Unprot
- /Worksheet Column
- /Worksheet Hide
- /Worksheet Global [Col-Width, Format, Group, Label, Prot, Zero]

When you seal only the file's reservation setting, you can change everything in the file except for the reservation setting, which controls how you get a reservation (automatically or manually) when you read a file into memory.

If you want to use /File Admin Seal File to create a file for data input, you can use /Range Unprot and /Worksheet Global Prot Enable before you seal the file to protect data or macros in one part of the file but allow changes to data in unprotected cells. When you seal a file that is globally protected, you can change data only in the unprotected cells.

Use /File Admin Seal Reservation-Setting to seal the file's reservation setting when you share the file on a network or in another multi-user environment and need to control the file reservation setting.

Procedure

1. Select /File Admin Seal.
2. Select File, Reservation-Setting, or Disable

Disable	Unseals the current file and/or the reservation setting.
File	Seals the current file and the reservation setting.
Reservation-Setting	Seals only the reservation setting for the current file.

3. Type a password and press ENTER.

   A password can include up to 15 characters. 1-2-3 displays an * (asterisk) for each character as you type the password. 1-2-3 is case-sensitive for passwords, so you must remember the exact combination of uppercase or lowercase letters you use when you create the password.

4. If you selected File or Reservation-Setting, type the same password again and press ENTER.

   CAUTION Remember your password. When you seal a file with a password, you can unseal the file only if you enter the exact password.

TIPS To prevent other people from reading a file into memory, use /File Save to save the file with a password.

To prevent changes to data but allow other changes to a file, use /Worksheet Global Prot Enable rather than /File Admin Seal File.

/File Admin Table

/File Admin Table creates a table of information about files on disk, active files, or files linked to the current file.

Procedure

1. Decide on a worksheet location for the table. The table can be in any unprotected area of any active file and will occupy as many rows as the number of files and subdirectories you are listing plus one blank row. Tables of files on disk or linked files occupy four columns. Tables of active files occupy seven columns.

   CAUTION Make sure the worksheet location is blank or contains unimportant data because 1-2-3 writes over existing data when it creates the table.

2. Select /File Admin Table.
3. Select Worksheet, Print, Graph, Other, Active, or Linked.

Active	Creates a table of all active files.
Graph	Creates a table of graph files in the specified directory. The type of graph file in the table (.CGM or .PIC) depends on the current /Worksheet Global Default Graph setting.
Linked	Creates a table of all files that are linked by formula references to the current file.
Other	Creates a table of all files in the specified directory.

Print	In DOS modes, creates a table of files in the specified directory with a .PRN or .prn extension. In UNIX mode, lists all files.
Worksheet	Creates a table of worksheet files in the specified directory. The types of worksheet files in the table (for example, all files whose extension begins with .WK) depend on the current /Worksheet Global Default Ext List setting.

4. If you selected Worksheet, Graph, Print, or Other and want to list files with a different extension or in a different directory, edit the extension or directory and press ENTER.
5. Specify the location you decided on in step 1.

The result of /File Admin Table depends on which type of file table you selected.

- If you selected Worksheet, Print, Graph, or Other, 1-2-3 lists the names of all relevant files in the specified directory, the date and time each file was last saved (as date and time numbers), and the size of the file on disk in bytes.

  Figure 2-75 illustrates a table of worksheet files on disk. The second and third columns in the table are formatted as Date and Time respectively, and the second column is widened to display the date. Adjusting column widths and formatting ranges must be performed manually.

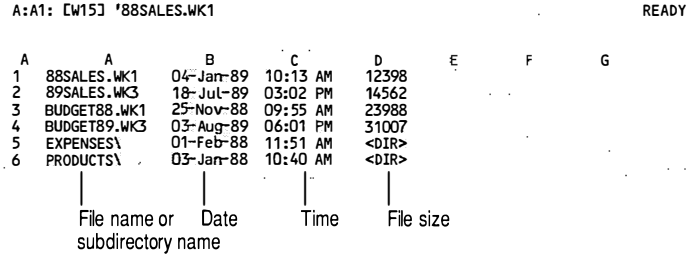


Figure 2-75. *Table created with /File Admin Table Worksheet*

- If you selected Linked, 1-2-3 lists the same information it lists when you select Worksheet, Print, Graph, or Other, but includes the path as well as the file name of each linked file if you entered the path in the formula.

- If you selected Active, 1-2-3 creates a table that lists the names of all active files, the date and time each file was last saved (as date and time numbers), and the size of the file on disk in bytes. The fifth column displays the number of worksheets in each file. The sixth column displays 1 if you have modified the active file since reading it into memory and 0 if you have not modified the file. The seventh column displays 1 if you have the file's reservation and 0 if you do not have the file's reservation. 1-2-3 displays (no name) for a worksheet that you have never named.

  Figure 2-76 illustrates a table of active files. The second and third columns in the table are formatted as Date and Time respectively, and the second column is widened to display the date.

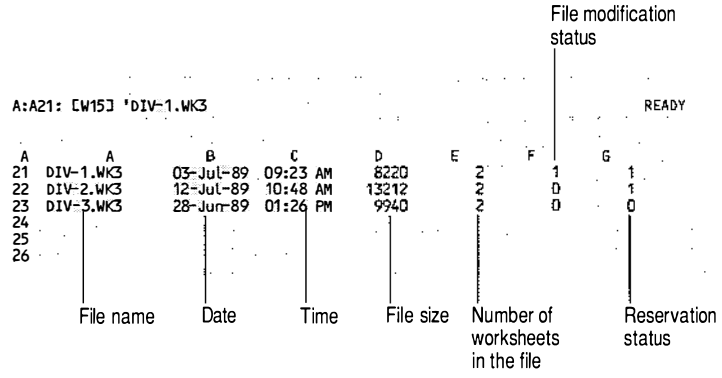


Figure 2-76. *Table created with /File Admin Table Active*

TIP To display a temporary list of file information instead of creating a table in the worksheet, use /File List.

/File Combine

/File Combine lets you incorporate data from a worksheet file on disk into the current file with the following commands:

Command	*Task*
Add	Adds numeric data in a worksheet file on disk to numbers or blank cells in the current file.
Copy	Copies specified data from a worksheet file on disk to the current file.
Subtract	Subtracts numeric data in a worksheet file on disk from numbers or blank cells in the current file.

Before you use /File Combine, note the following:

- /File Combine can incorporate data from any 1-2-3 Release 1A, 2, or 3 file into the current file.
- To simplify /File Combine, use range names in files that contain data you want to combine. Then you can specify the range name and do not have to remember the exact cell addresses for the data.
- When you use /File Combine Add or Subtract, the data in the current file and the incoming data should be organized in the same way.
- /File Combine changes cell formats in the current file to reflect those of the incoming data. However, /File Combine does not change column widths or other worksheet settings in the current file, and does not add to or change any of the current file's range names.
- /File Combine incorporates data from other files into the current file beginning at the current cell-pointer location. Therefore, before you use /File Combine, verify that the file is large enough to hold all incoming data and that the cell pointer is positioned correctly.

/File Combine Add

/File Combine Add adds numbers and the results of numeric formulas in a worksheet file on disk to numbers or blank cells in the current file. /File Combine Add adds numeric data to other numeric data only — whenever the incoming value would overlay a label or formula in the current file, 1-2-3 discards the incoming value and retains the label or formula.

Use /File Combine Add to summarize and consolidate numeric data in several files. For example, you can use /File Combine Add to create year-to-date totals by consolidating sales data from several monthly files into the current file.

CAUTION /File Combine Add changes data in the current file beginning in the current cell. To avoid possible data loss from combining files incorrectly, save the current file before using this command.

Procedure

1. Move the cell pointer to where you want 1-2-3 to start adding numeric data from the file on disk.
2. Select /File Combine Add.
3. Select Entire-File or Named/Specified-Range.

   Entire-File adds all numeric data in a file on disk to the current file.

   Named/Specified-Range adds a specified range of numeric data in a file on disk to the current file.
4. If you selected Named/Specified-Range, specify the range that contains the numeric data you want to add to the current file. You can use either a range name or address to specify the range in the file on disk.
5. Specify the file on disk whose data you want to add to the current file.
6. If the file on disk is password-protected, type the password and press ENTER. Remember, 1-2-3 is case-sensitive for passwords, so you must use the same combination of uppercase and lowercase letters that you used when you created the password.

Example

Figure 2-77 shows two files. The current file contains the July sales data for an ice cream shop and a file on disk contains the August sales data.

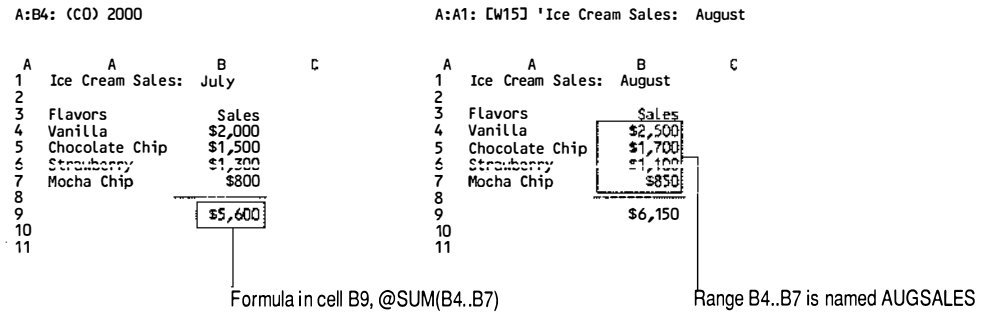


Figure 2-77. *Current file (July sales) and a file on disk (August sales)*

To add values from the two files, place the cell pointer in cell B4 of the July sales file, select /File Combine Add Named/Specified Range and enter AUGSALES as the range to add. Then specify the August file on disk that contains the August ice cream sales.

Figure 2-78 shows the result of /File Combine Add with the July and August sales data. The formula in B9, @SUM(B4..B7), reflects the new total after adding together data in these two files.

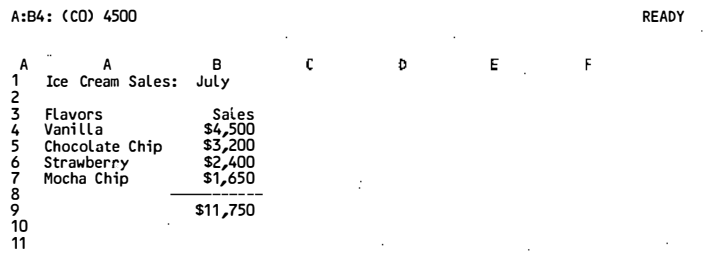


Figure 2-78. *Current file after using /File Combine Add*

TIP Do not use /File Combine Add to add date or time numbers because the results will not be meaningful.

/File Combine Copy

/File Combine Copy copies data from a worksheet file on disk to the current file, beginning at the current cell.

Use /File Combine Copy to combine data from several smaller files into one file. For example, you can combine database table records from several files into one database table.

CAUTION Using /File Combine Copy to copy formulas with three-dimensional ranges to files that contain fewer worksheets than are in the three-dimensional ranges may produce unexpected results. For example, if you copy @SUM(A:A1..D:A5) to a file that contains one worksheet, the copied formula will refer to data only in worksheet A. To ensure the accuracy of your data, use /Range Value to convert these formulas to values before you use /File Combine Copy, or copy the formulas to a file that contains at least as many worksheets as in the original file.

CAUTION /File Combine Copy combines data in the current file beginning at the current cell. To avoid possible data loss from combining files incorrectly, save the current file before using /File Combine Copy.

Procedure

1. Move the cell pointer to where you want 1-2-3 to start copying data from the file on disk.
2. Select /File Combine Copy.
3. Select Entire-File or Named/Specified-Range.

   Entire-File copies all data in a file on disk to the current file.

   Named/Specified-Range copies a specified range of data in a file on disk to the current file.
4. If you selected Named/Specified-Range, specify the range that contains the data you want to copy to the current file. You can use either a range name or address to specify the range in the file on disk.
5. Specify the file on disk whose data you want to copy to the current file.

6. If the file on disk is password-protected, type the password and press ENTER. Remember, 1-2-3 is case-sensitive for passwords, so you must use the same combination of uppercase and lowercase letters that you used when you created the password.

Example

Figure 2-79 shows the current file, named Q1-89, which contains sales data for the first quarter of 1989. A similar file on disk, named Q2-89, contains sales data for the second quarter of 1989. You can use /File Combine Copy to copy data from the file on disk to the current file so you can see information from both quarters at one time. You can copy the data to the current worksheet or to a separate worksheet in the same file.

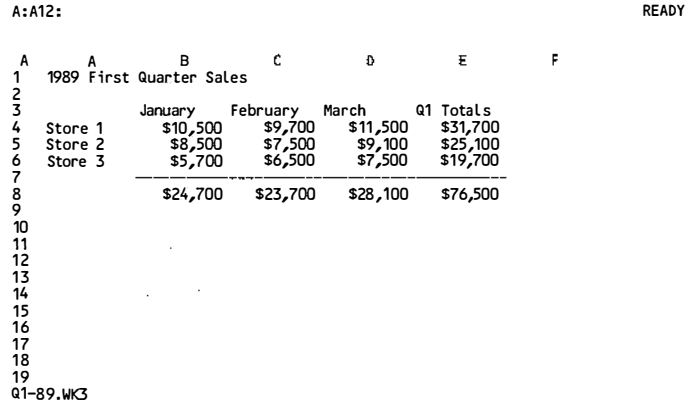


Figure 2-79. *Current file contains Q1 sales data*

To combine data from the two files into the same worksheet, move the cell pointer to the first cell in a blank area of the worksheet. In this example, the cell pointer is in A12. Select /File Combine Copy Entire-File and specify the file named Q2-89. 1-2-3 copies all data from Q2-89 to the current file, beginning in cell A12. Figure 2-80 shows the results.

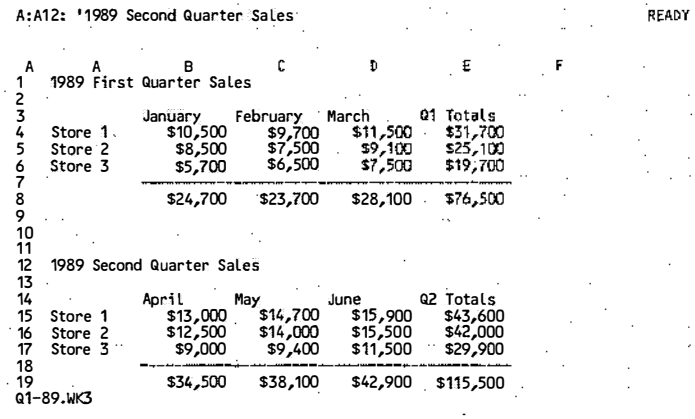


Figure 2-80. *Current file contains one worksheet with Q1 and Q2 sales data*

To combine data from the two files into separate worksheets, select /Worksheet Insert Sheet After to insert a blank worksheet behind the current one and move the cell pointer to the blank worksheet. In this example, the cell pointer is in B:A1 as shown in Figure 2-81. Select /File Combine Copy Entire-File and specify the file named Q2-89. 1-2-3 copies all data from Q2-89 to the current file, beginning in cell B:A1. Figure 2-81 shows the results with the file in perspective view.

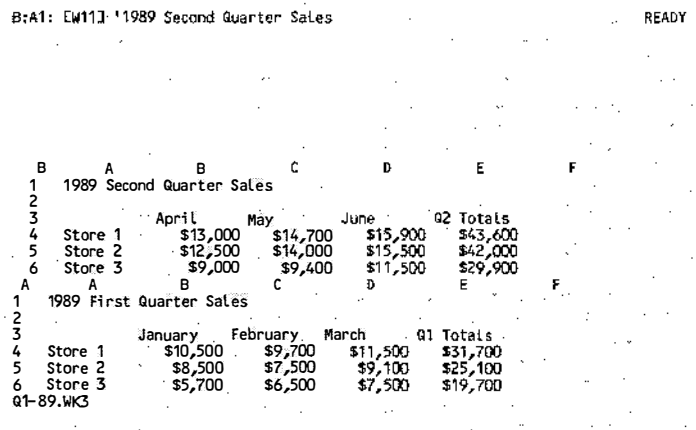


Figure 2-81. *Current file contains two worksheets with Q1 and Q2 sales data*

/File Combine Subtract

/File Combine Subtract subtracts numbers and the results of numeric formulas in a worksheet file on disk from numbers or blank cells in the current file. /File Combine Subtract subtracts numeric data from other numeric data only — whenever the incoming value would overlay a label or formula in the current file, 1-2-3 discards the incoming value and retains the label or formula.

CAUTION /File Combine Subtract changes data in the current file beginning at the current cell. To avoid possible data loss from combining files incorrectly, save your work before using this command.

Procedure

1. Move the cell pointer to where you want 1-2-3 to start subtracting numeric data from the file on disk.
2. Select /File Combine Subtract.
3. Select Entire-File or Named/Specified-Range.

   Entire-File subtracts all numeric data in a file on disk from the current file.

   Named/Specified-Range subtracts a range of numeric data in a file on disk from the current file.
4. If you selected Named/Specified-Range, specify the range that contains the numeric data you want to subtract. You can use either a range name or address to specify the range in the file on disk.
5. Specify the file on disk whose data you want to subtract from the current file.
6. If the file on disk is password-protected, type the password and press ENTER. Remember, 1-2-3 is case-sensitive for passwords, so you must use the same combination of uppercase and lowercase letters that you used when you created the password.

TIPS Do not use /File Combine Subtract to subtract date or time numbers because the results will not be meaningful.

If you subtract a positive number from a blank cell, the result is a negative number because a blank cell evaluates to zero.

/File Dir

/File Dir changes the directory 1-2-3 uses when you save, read, or list files.

NOTE 1-2-3 displays directories and files matching your current file mode. In UNIX file mode, all files stored in the UNIX filesystem are available. In DOS-upper or DOS-lower file mode, only directories matching the guidelines for DOS-upper or DOS-lower conventions are available in /File Dir. DOS mixed case directories are not available in either DOS-upper or DOS-lower file mode.

Use /File Dir to override the default directory. For example, suppose your default directory is **`/usr/files/123`**, but the files you want to use are in **`/usr/files/expenses`**. You can use /File Dir to make **`/usr/files/expenses`** the current directory so 1-2-3 automatically uses that directory for all 1-2-3 file operations during the current session.

Procedure

1. Select /File Dir.
2. Press ENTER to accept the current directory or type a different directory name and press ENTER.

1-2-3 uses the current directory until you use /File Dir again, use /Worksheet Global Default Dir, or end the 1-2-3 session.

TIPS To change the default directory for future sessions, use /Worksheet Global Default Dir followed by /Worksheet Global Default Update.

For information on creating directories, refer to your operating system manual.

/File Erase

/File Erase erases a file on disk. You cannot erase a file on disk if you or someone else is using the file with the reservation. If you are using the file, you must release the reservation with /File Admin Reservation Release before you can erase it. If someone else is using the file with the reservation, you cannot erase the file on disk.

CAUTION Once you erase a file on disk, you cannot read the data in that file. Therefore, before using /File Erase, make sure that you no longer need the data in the file you are erasing.

Also, make sure that /File Erase is the command you need to use, and note the differences between it and two related commands, /Worksheet Erase and /Worksheet Delete File:

- /File Erase erases a file on disk but does not remove the active version of the file from memory.
- /Worksheet Delete File removes one active file from memory but does not erase the corresponding file on disk.
- /Worksheet Erase removes all active files from memory, leaving one blank worksheet, but does not erase the corresponding files on disk.

Procedure

1. Select /File Erase.
2. Select Worksheet, Print, Graph, or Other.

Graph	Lists graph files in the current directory. The type of graph file listed (.CGM or .PIC) depends on the current /Worksheet Global Default Graph setting.
Other	Lists all files in the current directory.
Print	Lists all files in UNIX mode. In DOS modes, lists all .PRN or .prn files.
Worksheet	Lists worksheet files in the current directory. The types of worksheet files listed (for example, all files whose extension begins with .WK) depends on the current /Worksheet Global Default Ext List setting.

   To list files in a different directory or with a different extension, press EDIT, edit the path or extension, and press ENTER. To clear the extension and directory and enter a new directory, press ESC twice, type a new directory, and press ENTER.

   If 1-2-3 lists subdirectories, you can highlight a subdirectory and press ENTER to display a list of files in that subdirectory.

3. Specify the name of the file you want to erase.
4. Select No to cancel the command without erasing the file or select Yes to erase the file on disk.

/File Import

/File Import reads data from a text file or a delimited text file created in another program into the current worksheet beginning at the current cell-pointer location.

A **text file** is a file on disk in ASCII format. A **delimited text file** is a file on disk in ASCII format that contains characters (delimiters) to separate data. The delimiters between numbers can be commas, spaces, colons, or semicolons; and all labels must be enclosed in quotation marks. Some programs have commands or translate programs that create delimited text files. Figure 2-82 illustrates a nondelimited text file and Figure 2-85 illustrates a delimited text file.

When you use /File Import Numbers, make sure that the numbers in the text file do not contain commas because commas act as delimiters. For example, 1-2-3 will interpret the number 12,345 as two values: 12 and 345.

CAUTION To avoid possible data loss from incorrectly importing files, save the current file before using /File Import.

Procedure

1. Move the cell pointer to an area of the worksheet that is large enough to hold all of the imported data.
2. Select /File Import.
3. Select Text or Numbers.

Numbers	Imports labels and numbers from a delimited text file and enters them in separate cells in the current worksheet beginning in the current cell. When a text file is not delimited, Numbers imports only numbers.
Text	Imports each line of data from a text file as a long label and enters it in one cell in the current worksheet, beginning in the current cell. 1-2-3 enters each successive line from the text file in the same column below the cell pointer. If a line in the text file exceeds 512 characters, an error results and no data is imported. Select Text to import both text and numbers from a nondelimited text file.

To list files in a different directory or with a different extension, press EDIT, edit the path or extension, and press ENTER. To clear the extension and directory and enter a new directory, press ESC twice, type a new directory, and press ENTER.

4. Specify the name of the text file you want to import.

1-2-3 imports data from a text file either as text, numbers, or both, depending on the contents of the text file and the option (Text or Numbers) you selected.

Example of Importing a Nondelimited Text File

Figure 2-82 illustrates a nondelimited text file that contains text and numbers.

```
First   Last      Travel   Food   Misc.
Beth    Read         350     85      30
Merry   Milton      1400    300      80
Stew    Kipling      850    200      35
Tracy   Rilke       1250    260      55
Janet   Shelly       650    120      40
```

Figure 2-82. *A nondelimited text file on disk*

Figure 2-83 illustrates using /File Import Text with the nondelimited text file on disk. The cell pointer was in cell A1 when 1-2-3 imported the file.

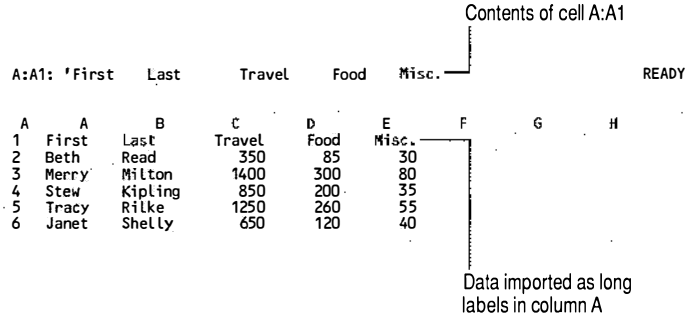


Figure 2-83. */File Import Text with a nondelimited text file*

When 1-2-3 imports a nondelimited file using /File Import Text, it enters each line of data as a long label in one cell, beginning in the current cell. Although the data in each line appears to be entered in separate columns, each line is actually one long label. You can view or print this data, but you cannot use the numbers in calculations unless you use /Data Parse to place the labels and numbers in separate columns in the worksheet.

Figure 2-84 illustrates using /File Import Numbers with the nondelimited text file on disk. 1-2-3 enters the numbers from the file into separate columns and omits the labels.

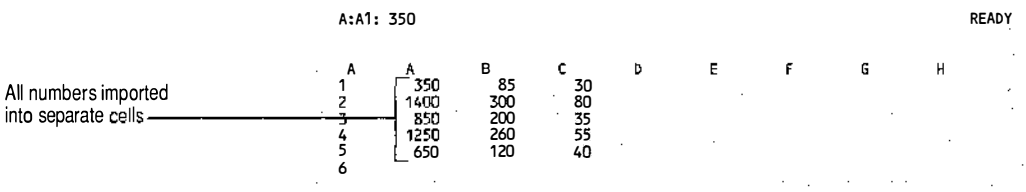


Figure 2-84. */File Import Numbers with a nondelimited text file*

Example of Importing a Delimited Text File

Figure 2-85 shows a delimited text file with commas as delimiters and quotation marks around text.

```
"First","Last","Travel","Food","Misc."
"Beth","Read",350,85,30
"Merry","Milton",1400,300,80
"Stew","Kipling",850,200,35
"Tracy","Rilke",1250,260,55
"Janet","Shelly",650,120,40
```

Figure 2-85. *A delimited text file on disk*

Figure 2-86 illustrates using /File Import Numbers to import the delimited text file on disk. The cell pointer was in cell A1 when 1-2-3 imported the file.

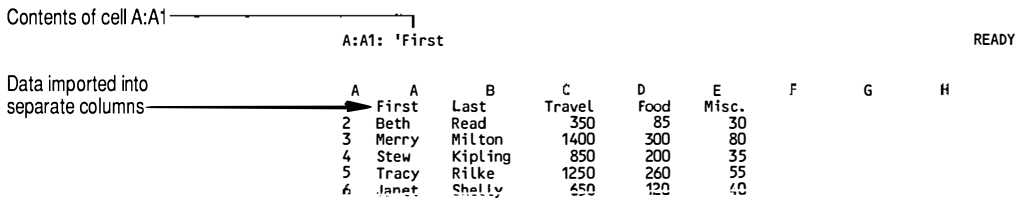


Figure 2-86. *A delimited text file imported into 1-2-3 using /File Import Numbers*

TIPS To create a text file with 1-2-3, use /Print File.

Some word processing programs produce files that contain special non-ASCII characters. 1-2-3 cannot import these characters properly with /File Import.

/File List

/File List displays a list of files and subdirectories, which temporarily overlays the current worksheet. When you highlight a file name in the list, 1-2-3 displays specific information about that file.

Procedure

1. Select /File List.
2. Select Worksheet, Print, Graph, Other, Active, or Linked.

Active	Lists all active files.
Graph	Lists graph files in the current directory. The type of graph file listed (.CGM or .PIC) depends on the current /Worksheet Global Default Graph setting.
Linked	Lists all files linked by formula references to the current file.
Other	Lists all files in the current directory.
Print	In DOS modes, lists files in the current directory with a .PRN or .prn extension. In UNIX mode, lists all files.
Worksheet	Lists worksheet files in the current directory. The types of worksheet files listed (for example, all files whose extension begins with .WK) depend on the current /Worksheet Global Default Ext List setting.

If 1-2-3 cannot find any files of the specified type and the directory contains no subdirectories, 1-2-3 displays a prompt and enters EDIT mode. Type * and press ENTER to list all files in the current directory.

To list files in a different directory or with a different extension, press EDIT, edit the path or extension, and press ENTER. To clear the extension and directory and enter a new directory, press ESC twice, type a new directory, and press ENTER.

If 1-2-3 lists subdirectories, you can highlight a subdirectory and press ENTER to display a list of files in that subdirectory.

3. Use ↑ ↓ → ← to highlight different file names and display specific information about each file. The information listed for each file depends on what you selected in step 2.

   If you selected Worksheet, Print, Graph, or Other, 1-2-3 displays the name of the highlighted file, the date and time the file was last saved, and the file size in bytes. Figure 2-87 illustrates a list of all files in the current directory with information about the highlighted file.

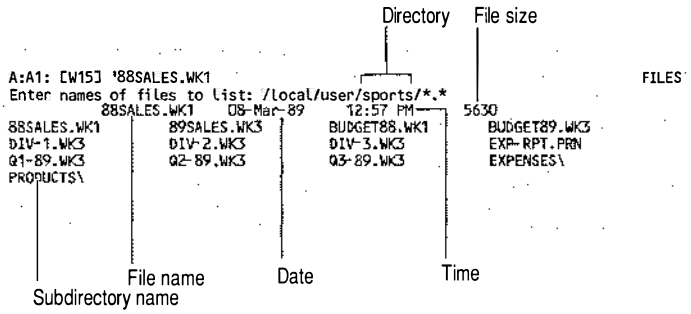


Figure 2-87. *Example of /File List Other*

If you selected Active, 1-2-3 also displays the number of worksheets in the file, MOD or UNMOD to indicate if you have modified the file since you read the file into memory, and RO for read-only if you do not have the file's reservation. If you have the file's reservation, this column will be blank. 1-2-3 displays (no name) for a worksheet that you have never saved. Figure 2-88 illustrates a list of all active files with information about the highlighted file.

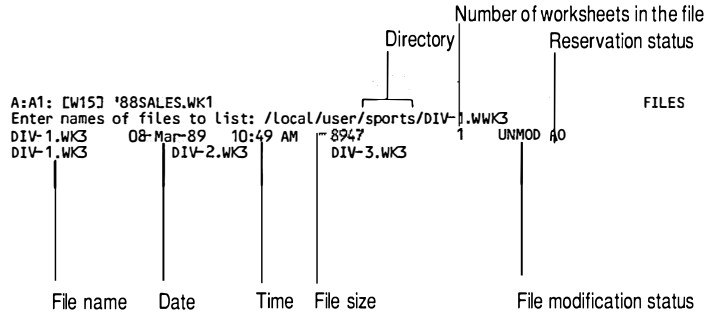


Figure 2-88. *Example of /File List Active*

If you selected Linked, 1-2-3 displays the names of files linked to the current file and includes the path if you entered the path in the formula that linked the files.

4. Press ENTER to return 1-2-3 to READY mode and redisplay the current worksheet.

TIP To create a permanent table of file-related information rather than a temporary list, use /File Admin Table.

/File New

/File New creates a new worksheet file on disk and in memory before or after the current file, and moves the cell pointer to cell A1 in the new file. The new file contains one blank worksheet. You cannot read the new file on disk into memory because it is a place holder for the file and is blank. If you do not save the new file, 1-2-3 deletes the blank file on disk.

When you use /File New, 1-2-3 supplies a default file name for the new file unless you specify another file name. The first default file name is FILE0001.WK3 or file0001.wk3, the next default file name is FILE0002.WK3 or file0002.wk3, and so on; 1-2-3 increases the number in the file name by one for each new file that uses the default name. 1-2-3 will create the new file FILE0001.WK3 if you are currently operating in DOS-upper file mode.

1-2-3 uses .WK3 as the default extension for a new file unless you specified a different extension with /Worksheet Global Default Ext Save. To override the default extension, type a different extension when you name the file.

Procedure

1. Select /File New.
2. Select Before or After.

   Before creates a new active file and places it in front of the current file. After creates a new active file and places it behind the current file.
3. Type a file name and press ENTER or just press ENTER to use the default file name . You cannot use the name of an existing file.

After you enter data in this file, you must use /File Save to create a permanent copy of the file on disk. To password-protect a file created with /File New, save the file with /File Save and a password.

Example

Figure 2-89 shows two active files named SOUTH.WK3 and WEST.WK3. In this example, each file contains one worksheet. You could use /File New Before to create a new file in front of the current file.

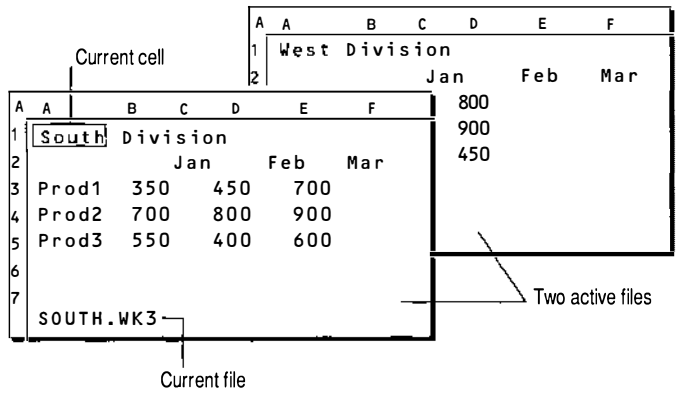


Figure 2-89. *Two active files*

Figure 2-90 shows the results of using /File New Before. The new file, named TOTALS.WK3, is now the current file. By entering formulas in this file, you could add the sales for each month and each product across divisions.

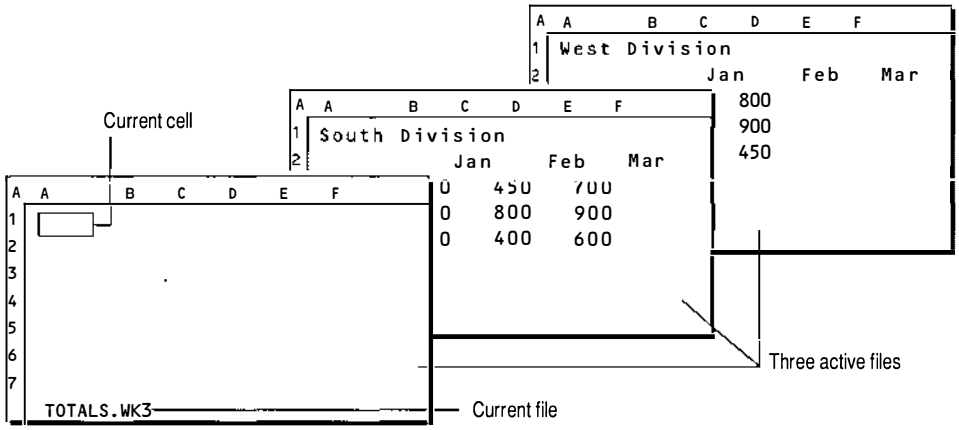


Figure 2-90. *The new blank file in front of two other active files*

/File Open

/File Open reads a worksheet file into memory, places it before or after the current file, and moves the cell pointer to the cell it was in when you saved the file. Use /File Open to work with more than one active file. For example, you can open a macro file and several data files at the same time.

Procedure

1. Select /File Open.
2. Select Before or After.

   Before reads a file from disk into memory and places it in front of the current file. After reads a file from disk into memory and places it behind the current file.
3. Specify the name of the file you want to open.
4. If the file on disk is password-protected, type the password and press ENTER. Remember, 1-2-3 is case-sensitive for passwords, so you must use the same combination of uppercase and lowercase letters that you used when you created the password.
5. If someone else is using the file and has the file reservation, 1-2-3 displays a Yes/No menu. Select Yes to open the file without the reservation or select No if you do not want to open the file without the reservation.

NOTE If you do not get the reservation for a file when you open it, 1-2-3 displays the RO (read-only) indicator at the bottom of the screen. 1-2-3 will not let you save changes to the file using the current file name because someone else is using the file with the reservation. If you need to make changes to the file, either use /File Admin Reservation Get to try to get the reservation, or retrieve the file again later when the reservation may be available.

6. (Optional) When you open a file, 1-2-3 does not automatically update formulas that are linked to other files. If the file contains linked formulas, select /File Admin Link-Refresh to ensure that the formulas are up-to-date.

NOTE If /Worksheet Global Recalc is set to Manual, 1-2-3 does not update links but displays the CALC indicator after you select /File Admin Link-Refresh. Press CALC to update the linked formulas in the current file.

When you use /File Open, 1-2-3 uses the recalculation and window settings in the newly opened file for all active files because these are global settings. These recalculation and window settings may be different from the ones you were using before you opened the file. However, when you save files, 1-2-3 saves the original recalculation and window settings with each file unless you have manually changed them in each file.

Opening 1-2-3 Release 1A and Symphony Files

Although UNIX versions of 1-2-3 can read data from files created with 1-2-3 Release 1A (.WKS)) and Symphony (.WRK and .WR1), it cannot save files in those formats. When 1-2-3 reads a 1-2-3 Release 1A or Symphony file, it creates a new file with the same file name and a .wk3 or .WK3 extension, beeps, and displays a message indicating that the file format and extension were converted.

When 1-2-3 converts a file to Release 3 (.WK3) format, it creates a blank worksheet file on disk with a .WK3 extension and gives you the reservation for the converted file. You cannot read the .WK3 file on disk into memory because it is a

place holder for the converted file and has no data in it. If you do not save the converted file, 1-2-3 deletes the blank .WK3 file on disk.

If you already have a 1-2-3 .WK3 file on disk with the same name as the Release 1A or Symphony file, 1-2-3 opens and converts the Release 1A or Symphony file and makes it read-only.

Example

Figure 2-91 shows the current file, WEST.WK3, which contains one worksheet. The cell pointer is in A:A1. Another file on disk, SOUTH.WK3, also contains one worksheet.

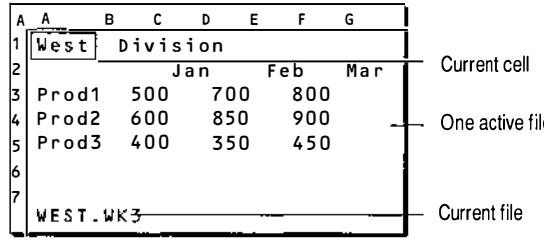


Figure 2-91. *One active file before using /File Open Before*

Figure 2-92 shows the result of using /File Open Before to read SOUTH.WK3 into memory. The file SOUTH.WK3 is now the current file, and the file WEST.WK3 is behind SOUTH.WK3.

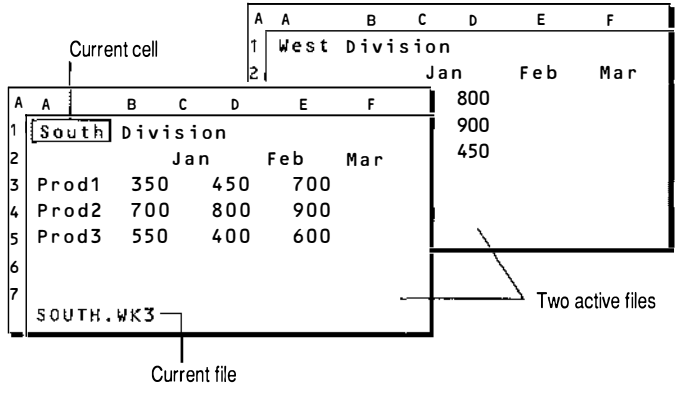


Figure 2-92. *Two active files after using /File Open Before*

TIP To create a new blank active file, use /File New.

/File Retrieve

/File Retrieve reads a worksheet file from disk into memory. The retrieved file replaces the file that was current when you selected /File Retrieve. Use /File Retrieve when you want to work with one file at a time or want to replace the current file with a different file.

Procedure

1. If you want to save the current file, use /File Save before you select /File Retrieve.
2. Select /File Retrieve.
3. Specify the name of the file you want to retrieve.
4. If the file on disk is password-protected, type the password and press ENTER. Remember, 1-2-3 is case-sensitive for passwords, so you must use the same combination of uppercase and lowercase letters that you used when you created the password.
5. If someone else is using the file and has the file reservation, 1-2-3 displays a Yes/No menu. Select Yes to retrieve the file without the reservation or select No if you do not want to retrieve the file without the reservation.

   NOTE If you do not get the reservation for a file when you retrieve it, 1-2-3 displays the RO (read-only) indicator at the bottom of the screen. 1-2-3 will not let you save changes to the file using the same file name because some one else has the reservation and is using the file. If you need to make changes to the file, either use /File Admin Reservation Get to try to get the reservation, or retrieve the file again later when the reservation may be available.

6. (Optional) When you retrieve a file, 1-2-3 does not automatically update formulas that are linked to other files. If the file contains linked formulas, select /File Admin Link-Refresh to ensure that the formulas are up-to-date.

NOTE If /Worksheet Global Recalc is set to Manual, 1-2-3 does not update links but displays the CALC indicator after you select /File Admin Link-Refresh. Press CALC to update the linked formulas in the current file.

When you use /File Retrieve, 1-2-3 uses the recalculation and window settings in the newly retrieved file for all active files because these are global settings. These recalculation and window settings may be different from the ones you were using before you opened the file. However, when you save files, 1-2-3 saves the original recalculation and window settings with each file unless you have manually changed them in each file.

Retrieving 1-2-3 Release 1A and Symphony Files

Although UNIX versions of 1-2-3 can read data from files created with 1-2-3 Release 1A (.WKS) and Symphony (.WRK and .WR1), it cannot save files in those formats. When 1-2-3 reads a 1-2-3 Release 1A or Symphony file, it creates a new file with the same file name and a .WK3 extension, beeps, and displays a message indicating that the file format and extension were converted.

When 1-2-3 converts a file to Release 3 (WK3) format, it creates a blank worksheet file on disk with a .WK3 extension and gives you the reservation for the converted file. You cannot read the .WK3 file on disk into memory because it is a place holder for the converted file and has no data in it. If you do not save the converted file, 1-2-3 deletes the blank .WK3 file on disk.

If you already have a 1-2-3 .WK3 file with the same name on disk, 1-2-3 retrieves and converts the Release 1A or Symphony file and makes it read-only.

TIPS To read a file from disk without replacing the current file, use /File Open.

If you make a mistake in the current file and want to start again with the version of the file on disk, do not save the file. Retrieve the file again, and 1-2-3 will replace the current version of the active file with a copy of the file on disk.

If you want 1-2-3 to read the same file into memory automatically every time you start the program, name the file AUTO123.WK3 and save it in the default directory. 1-2-3 will automatically retrieve a file named AUTO123 with either a .WK3 or .WK1 extension.

/File Save

/File Save saves worksheet data and settings in worksheet files on disk. You use /File Save both to create new files on disk and to update existing files. You can use /File Save to save only the current file or all modified active files simultaneously. If you save only the current file, you can change the file name or extension when you save it. If you save all modified files simultaneously, 1-2-3 saves the files with their existing file names and extensions.

Because 1-2-3 does not automatically save your work, you must use /File Save to make a permanent copy of your work on disk before you erase the worksheet, or end the 1-2-3 session. Also, you should save your files frequently so you do not lose work in the case of a power failure.

Before you use /File Save, note the following:

- When you use /File Save to create a new file, 1-2-3 supplies a default file name for the file unless you specify another file name. The first default file name is FILE0001.WK3, or file0001.wk3, the next default file name is FILE0002.WK3, or file0002.wk3, and so on; 1-2-3 increases the number in the file name by one for each new file you save using the default name.
- 1-2-3 uses .wk3 or .WK3 as the default extension for a new file unless you specified a different extension with /Worksheet Global Default Ext Save. To override the default extension, type a different extension when you name the file. 1-2-3 automatically creates lowercase file extensions (.wk3, .wk1) when you are in UNIX or DOS-lower file modes. 1-2-3 automatically creates uppercase file extensions (.WK3, .WK1) when you are in DOS-upper file mode.
- When 1-2-3 saves a 1-2-3 Release 2 (.WK1) file, it does not automatically convert the file to a Release 3 (.WK3) file. To save a .WK1 file as a .WK3 file, change the extension to .WK3 when you save the file.

Procedure

1. If you have several active files but are saving only one file, make sure the cell pointer is in a worksheet in the file you want to save.
2. Select /File Save.
3. If only one file is active, 1-2-3 displays that file's name. If you are creating a new file, 1-2-3 displays the default file name and extension (for example, file0001.wk3 or FILE0001.WK3).

   - To save the file with the displayed file name, press ENTER.
   - To change the file name or extension, either edit the displayed name or type a new name and press ENTER.

   If more than one file is active, 1-2-3 displays [ALL MODIFIED FILES]. You can save all modified files or only the current file.

   - To save all modified files with their existing file names, press ENTER. If you are saving a file for the first time with other files, 1-2-3 saves the file with the default file name.
   - To save only the current file, press EDIT or ESCAPE. When 1-2-3 displays the current file name, press ENTER to save the file with the existing file name. To change the file name or extension, either edit the name or type a new name and press ENTER.
4. If you are updating files on disk, select Cancel, Replace, or Backup.

Backup	Renames files on disk with the extension .bak or .BAK and saves the active versions of those files with their existing file names.
Cancel	Returns 1-2-3 to READY mode without saving any files.
Replace	Writes over the files on disk with copies of the active files.

TIPS Use /File Save Backup when you need to keep a copy of the last version of a file on disk and do not want to rename the file.

If you want 1-2-3 to read the same file into memory automatically every time you start the program, name the file auto123.wk3 or AUTO123.WK3 and save it in the default directory. In UNIX or DOS-lower file modes, 1-2-3 will automatically retrieve the file auto123 with either a .wk3 or .wk1 extension. In DOS-upper file mode, 1-2-3 will automatically retrieve a file named AUTO123 with either a .WK3 or .WK1 extension.

To save the current file as a text file, use /Print File.

Saving Files in 1-2-3 Release 2 (.WK1) Format

In most cases, you can save a 1-2-3 .wk3 or .WK3 file as a Release 2 (.WK1) file. You can do this by entering .wk1 or .WK1 as the extension when you use /File Save or /File Xtract or by setting the default extension to .WK1 with /Worksheet Global Default Ext Save.

You cannot save a .WK3 file as a .WK1 file, however, if the file contains more than one worksheet or is sealed.

CAUTION Symphony cannot properly calculate new 1-2-3 @functions and existing @functions that have new arguments. Such @functions may cause Symphony releases prior to Symphony Release 2 to fail.

In many cases, you can save a .WK3 file as a .WK1 file even if the file contains new 1-2-3 features. 1-2-3 will save the file and display an error message stating that information was lost when you saved the file. Be sure also to save the file as a .WK3 file if you do not want to lose the information permanently. The following list describes what will happen to 1-2-3 features when saved in a .WK1 file:

- Labels that contain more than 240 characters (the limit in previous releases) are truncated after the 240th character.
- Formulas that contain more than 240 characters are saved in their entirety. However, if you try to edit such a formula in Release 2, Release 2 truncates the formula after 240 characters.

- New 1-2-3 @functions and existing @functions that have new arguments are treated as add-in @functions, which are saved as @? with a list of arguments (if the original formula had arguments) following the ?. Cells that contain these @functions evaluate to NA. If you read a file that contains these @functions back into 1-2-3, the original @functions are restored.

  NOTE Before you use Release 2 to read a .WK1 file that contains new 1-2-3 @functions saved as @?, you must remove from memory any add-in programs you use with Release 2. In addition, if you save the file in Release 2 and then read the file into a version of 1-2-3 based on Release 3, 1-2-3 will no longer evaluate the @functions correctly.

- If the file contains formulas linked to other files, the links are converted to @@("<<filename>>range").
- Formulas that contain undefined range names evaluate to ERR.
- Range name notes and formula annotations are lost.
- All new 1-2-3 /Data, /Graph, /Print, and /Worksheet settings are lost.
- New formats are changed to the default Release 2 formats.

Password-Protection and /File Save

You can limit access to a worksheet file by saving it with a password. When you save a file with a password, no one can read the file without the password. During the /File Save procedure, you can create, change, and delete a password.

Saving a File with a Password

1. Make sure the cell pointer is in the file you want to password-protect.
2. Select /File Save.

   1-2-3 displays the current file name (if you are using one active file) or [ALL MODIFIED FILES] (if you are using more than one active file).
3. If 1-2-3 displays [ALL MODIFIED FILES], press EDIT or ESCAPE. to display the current file name.

4. Press the space bar once to enter a space after the current file name or edit the file name and then press the space bar once.
5. Type p and press ENTER.
6. Type a password and press ENTER.

   A password can include up to 15 characters. 1-2-3 displays an * (asterisk) for each character as you type the password. 1-2-3 is case-sensitive for passwords, so you must remember the exact combination of uppercase or lowercase letters you use when you create the password.

   CAUTION Remember your password. When you save a file with a password, you can read the file into memory again only if you enter the exact password.

7. Type the same password again and press ENTER.
8. If you are updating the file, select Replace to save the file with the password.

Changing a Password

1. Make sure the cell pointer is in the file whose password you want to change.
2. Select /File Save.
3. If 1-2-3 displays [ALL MODIFIED FILES], press EDIT to display the current file name and [PASSWORD PROTECTED].
4. Press BACKSPACE once to clear the [PASSWORD PROTECTED] prompt.
5. Press the space bar once.
6. Follow steps 5 through 8 listed in the procedure above for saving a file with a password.

Deleting a Password

1. Make sure the cell pointer is in the file whose password you want to delete.
2. Select /File Save.

3. If 1-2-3 displays [ALL MODIFIED FILES], press EDIT to display the current file name and [PASSWORD PROTECTED].
4. Press BACKSPACE once to clear the [PASSWORD PROTECTED] prompt and press ENTER.
5. Select Replace to update the file without a password.

/File Xtract

/File Xtract extracts a range of data by copying the data from an active file and saving it in a worksheet file on disk. /File Xtract also saves all settings associated with worksheets in the extracted file and all ranges defined in the file. Use /File Xtract to create a smaller file from one large file. This command does not change the current file.

Before you use /File Xtract, note the following:

- You cannot copy extracted data to a file on disk if someone is using the file and has the file's reservation. If you are using a file and want to replace the version of the file on disk with extracted data, use /File Admin Reservation Release to release the reservation before you use /File Xtract.
- You cannot extract data from a sealed file. If the file is sealed, use /File Admin Seal Disable to unseal the file before using /File Xtract.
- If you extract a formula, be certain that you extract all the data that is referred to by the formula. If all the data is not in the extracted file, then the formula may not produce the results you expected.
- If you extract data in a named range, be certain that you extract the entire named range. If you extract only part of a named range, the range name will appear in the extracted file but it will no longer refer to the correct range.
- Extracting formulas with three-dimensional ranges to files that contain fewer worksheets than are in the three-dimensional ranges may produce unexpected results. For example, if you extract @SUM(A:A1..D:A5) to a file that contains one worksheet, the extracted formula will refer to data only in worksheet A when you read the extracted file into 1-2-3. To ensure the accuracy of your data, use /Range

Value to convert these formulas to values before you use /File Xtract Formulas, or extract the formulas to a file that contains at least as many worksheets as in the original file.

- 1-2-3 assigns the .WK3 extension to files you create with /File Xtract unless you enter a different extension when you name the file, or you specified a different extension with /Worksheet Global Default Ext Save.

Procedure

1. If the CALC indicator appears at the bottom of the screen, press CALC to update formulas before you use /File Xtract Values. If any of the formulas whose values you will be extracting refer to data in files on disk, you also need to select /File Admin Link-Refresh to make sure those values are up-to-date.
2. Select /File Xtract.
3. Select Formulas or Values.

   Formulas extracts a range of data, including formulas, and all worksheet settings. Values extracts a range of data, including only labels and numbers (converts formulas into numbers), and all worksheet settings.
4. Specify a file name for the extracted range.
5. Specify the range of data you want to extract.
6. If you specified a file name that already exists, select Cancel, Replace, or Backup.

Backup	Renames the file on disk with the extension .BAK and saves the extracted range with the existing file name.
Cancel	Returns 1-2-3 to READY mode without extracting the range.
Replace	Writes over the file on disk with the extracted range.
CAUTION	When you select Replace, 1-2-3 erases the file on disk before it saves the extracted data in the file. If 1-2-3 displays a 'Disk full' error message after you select Replace, extract the data to another volume or network node.

1-2-3 puts the extracted range in a file beginning in cell A:A1. If you extracted formulas, 1-2-3 adjusts the cell references in formulas to reflect their new location in the extracted file.

Password-Protection and /File Xtract

You can limit access to a worksheet file by extracting it with a password. When you extract a file with a password, no one can read the file without the password. During the /File Xtract procedure, you can create a password-protected worksheet file when you name the file.

1. Select /File Xtract.
2. Select Formulas or Values.
3. Type a file name for the extracted range.
4. Press the space bar once.
5. Type p and press ENTER.
6. Type a password and press ENTER.

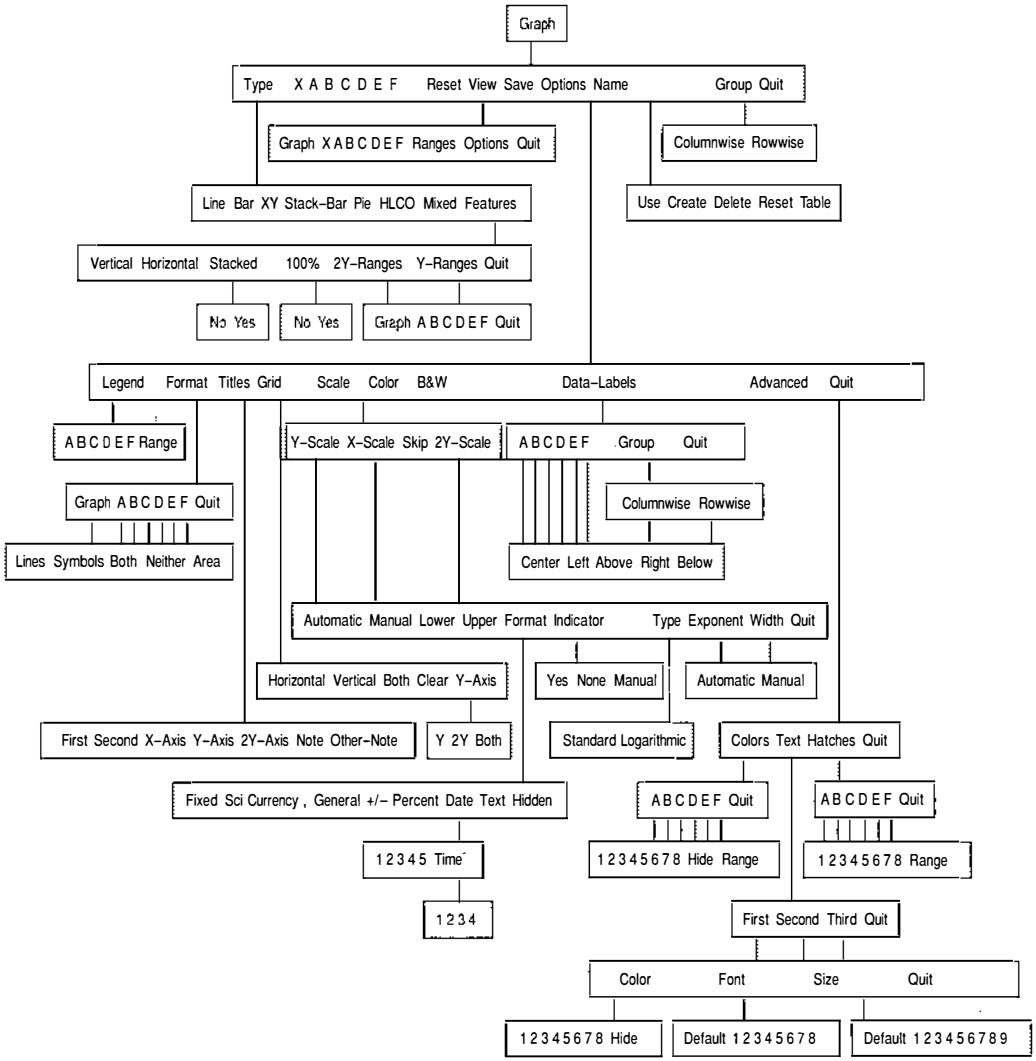
   A password can include up to 15 characters. 1-2-3 displays an * (asterisk) for each character as you type the password. 1-2-3 is case-sensitive for passwords, so you must remember the exact combination of uppercase or lowercase letters you use when you create the password.

   CAUTION Remember your password. When you extract a file with a password, you can read the file into memory again only if you enter the exact password.

7. Type the same password again and press ENTER.
8. Specify the range of data you want to extract.
9. If you specified a file name that does not match an existing file, 1-2-3 saves the extracted range in a password-protected file.

   If you specified a file name that already exists, select Replace if you want to replace the file on disk with the extracted range in a password-protected file, or select Backup to rename the file on disk with the extension .BAK and save the extracted range with the existing file name.

Graph Commands



Graphs are tools for illustrating the relationships between numbers. Because of their visual nature, graphs often convey messages about numbers more quickly and dramatically than the numbers themselves do. You might use a graph to analyze the cost of running your business, to see how the unit price of an item changes with the number of items ordered, to

compare the number of sales calls you made last month with the number of actual sales, and so on.

The Graph commands perform the following tasks:

Command	*Task*
/Graph A — F	Specifies the ranges that contain the numeric data you want to graph.
/Graph Group	Specifies all the graph data ranges at once when the ranges are located in adjacent columns or rows.
/Graph Name	Creates, retrieves, and deletes named graphs in a work sheet file and creates tables of named graphs.
/Graph Options	Adds enhancements such as titles, legends, colors, hatch patterns, and grid lines to a graph and sets the scaling for the graph's axes.
/Graph Quit	Returns 1-2-3 to READY mode.
/Graph Reset	Resets some or all of the current graph settings to the default graph settings.
/Graph Save	Saves the current graph in a graph file for use with other programs.
/Graph Type	Specifies the graph type and related features such as the graph's orientation (vertical or horizontal) and use of the y-axes.
/Graph View	Draws a full-screen view of the current graph.
/Graph X	Specifies the range that contains the x-axis labels, the x-axis values, or the pie-slice labels.

Reading Path

- To create and save graphs, you need to know how to specify ranges and file names, so be sure you have read "Working with Ranges" and "Working with Files" in Chapter 1.
- For hands-on experience with creating 1-2-3 graphs, complete Lessons 7 through 9 in *Tutorial*.
- Read "Graph Types" below to familiarize yourself with the basic graph types you can create with 1-2-3.

- For a quick review of the basic procedures for creating, saving, and printing 1-2-3 graphs, read "Creating a Graph," "Saving the Graphs You Create," and "Printing the Graphs You Create" later in this section.
- For detailed information about any Graph command, refer to the command in "Graph Command Descriptions" later in this section.

Also, remember that you can press **HELP** when you are using any Graph command to get information about the command. In addition, you can refer to "Graphing Data" in *Task Summary* for a summary of the commands you use for specific graphing tasks.

Graph Types

With 1-2-3, you can create seven basic graph types:

- Bar
- High-low-close-open (stock market)
- Line
- Mixed bar and line
- Pie
- Stacked bar
- XY (scatter)

These graph types are explained and illustrated on the following pages.

Bar Graphs

Bar graphs consist of a series of bars, each bar representing a value. You can use bar graphs to compare related data at a given point in time. For example, the bar graph in Figure 2-93 shows five categories of GrandStand Video rentals and compares the number of rentals in each category for the month of January.

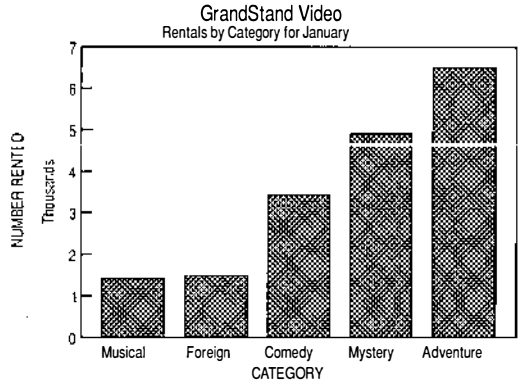


Figure 2-93. *A bar graph*

You can also use bar graphs to track changes in data over time. The bar graph in Figure 2-94 shows GrandStand Video's total rentals and the total number of rentals returned damaged over a three-month period. This type of bar graph is sometimes called a clustered bar graph because it displays a cluster of bars, rather than a single bar, for each x-axis label.

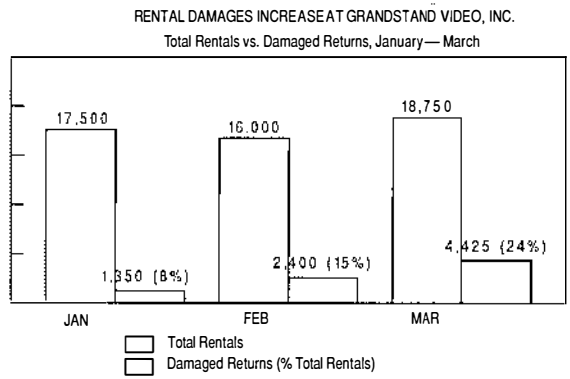


Figure 2-94. *A clustered bar graph*

High-Low-Close-Open (HLCO) Graphs

In the financial world, high-low-close-open (HLCO) graphs are mainly used to track fluctuations in the high, low, closing, and/or opening price of a stock over time. For that reason, HLCO graphs are often called stock market graphs. But you can also use HLCO graphs to track fluctuations in other types of data over time — for example, air temperature, water pressure, or currency exchange rates.

An HLCO graph depicts each set of high, low, close, and open data as one vertical line on the graph. The line extends from the high value to the low value and includes tick marks for the closing and opening values. The tick mark for the closing value extends right from the line; the tick mark for the opening value extends left. The number of vertical lines in the graph depends on the number of time periods for which the high-low-close-open data was recorded.

In addition to the high-low-close-open lines, HLCO graphs can include a series of bars below the HLCO section of the graph and/or a line across the HLCO section. If you are tracking the price changes of a stock over a number of days, for example, you could use the bars to represent the daily volume of trading for the stock (as in Figure 2-95) and the line to show a rolling stock-price average.

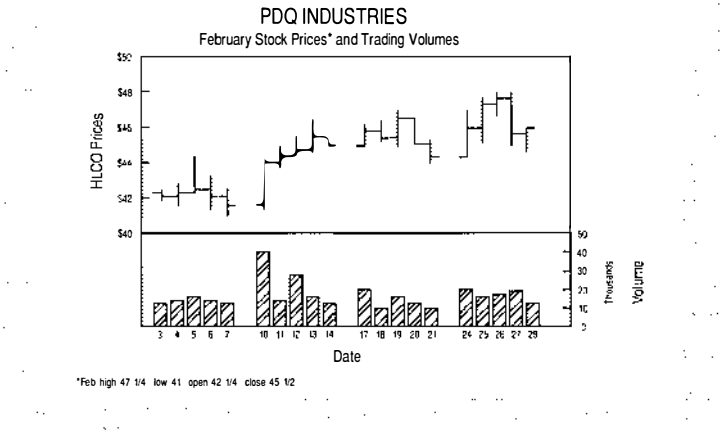


Figure 2-95. *An HLCO graph*

Line Graphs

Line graphs are generally used to plot changes in data over time. Each line in a line graph represents a category of data, and each point along the line represents the data's value at a particular time. The line graph in Figure 2-96, for example, compares circulation figures for a city's three leading newspapers over a five-year period. Because line graphs stress continuity of data over time, they are particularly useful for identifying trends and making projections.

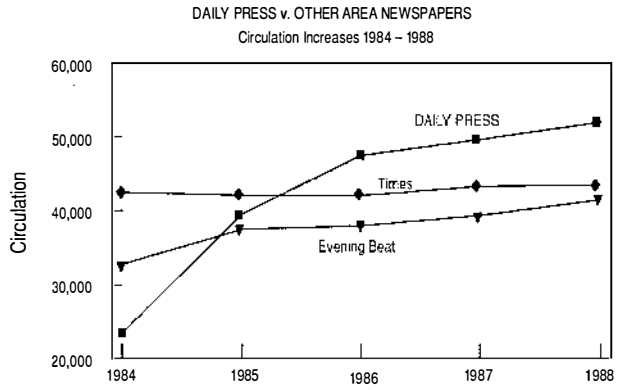


Figure 2-96. *A line graph*

A variation on the basic line graph is the filled line graph, or **area graph,** in which the lines are stacked and the areas between the lines are filled with different colors or hatch patterns. (You create area graphs by specifying Line as the basic graph type and selecting /Graph Options Format Graph Area.) Area graphs are similar in arrangement to stacked bar graphs (described later in this section), but area graphs, like regular line graphs, stress continuity in data over time whereas stacked bar graphs draw attention to the individual sets of data in the graph. For example, compare the area graph shown below (Figure 2-97) with the stacked bar graph shown later in this section. Both graphs are based on the same data, but their visual message is different.

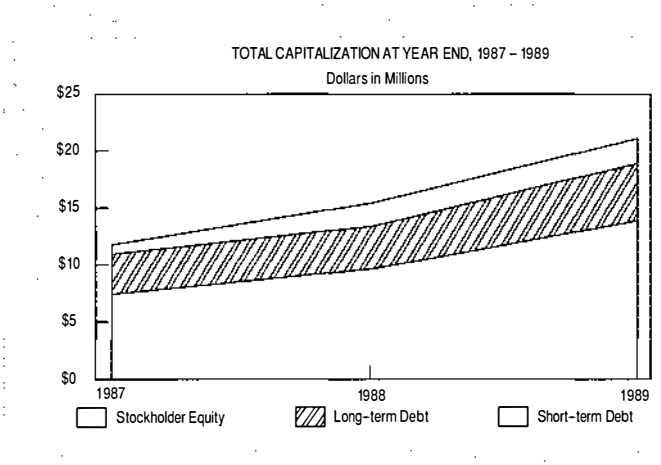


Figure 2-97. *An area graph*

Mixed Graphs

Mixed graphs are combination bar and line graphs. They are useful for plotting different types of data, such as sales volumes and advertising expenditures or trading volumes and stock prices, in the same graph (Figure 2-98). You can use the first y-axis (the y-axis to the left of the graph; called the y-axis) for one set of data and the second y-axis (the y-axis to the right of the graph; called the 2y-axis) for the other set of data. A mixed graph can include up to three sets of bars and three lines.

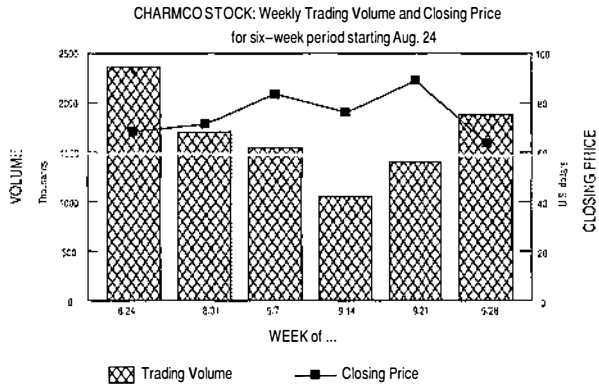


Figure 2-98. *A mixed graph*

Pie Charts

Pie charts relate two or more positive values to one another by representing the values as slices of a pie. The size of each pie slice is proportional to the percentage each value contributes to the sum of the values. For example, in a set of values totaling 80, the pie slice representing the value 40 would be exactly half the size of the pie.

You can emphasize one or more values in a pie chart by **exploding** (separating slightly from the pie) the slices that represent those values. The pie chart in Figure 2-99 shows the cost-per-unit breakdown for a particular model of bicycle, with the slice representing service exploded for emphasis.

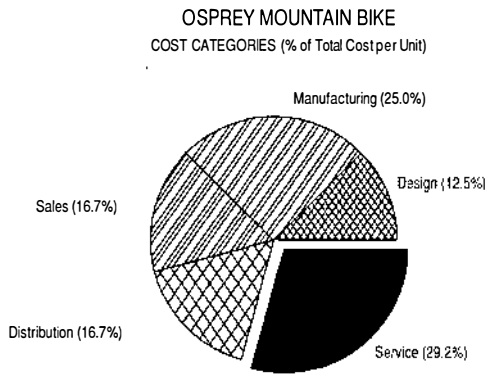


Figure 2-99. *A pie chart*

Stacked Bar Graphs

Stacked bar graphs compare values by stacking them one on top of the previous in a single bar and using colors or hatch patterns to differentiate the parts of the bar. The stacked bar graph in Figure 2-100 compares stockholder equity, long-term debt, and short-term debt for a corporation during a three-year period.

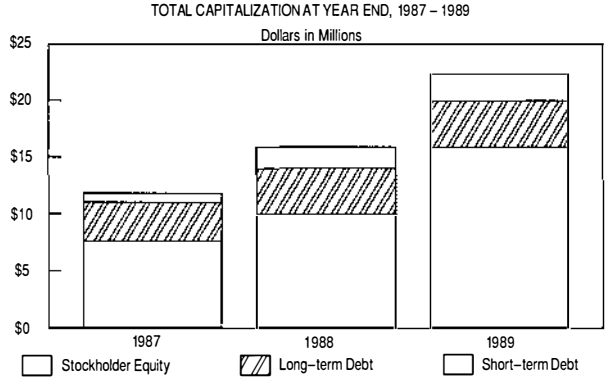


Figure 2-100. *A stacked bar graph*

XY Graphs

XY graphs, also called scatter charts, are used to show correlations between two types of numeric data. You could, for example, use an XY graph to show correlations between sales and profits, purchase quantity and unit price, or golf course use and average daily temperature (Figure 2-101).

XY graphs resemble line graphs in the sense that values are plotted as points in the graph. But unlike line graphs, XY graphs use a numeric scale along the x-axis.

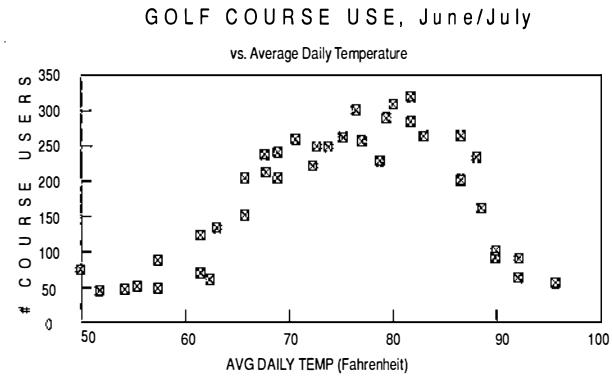


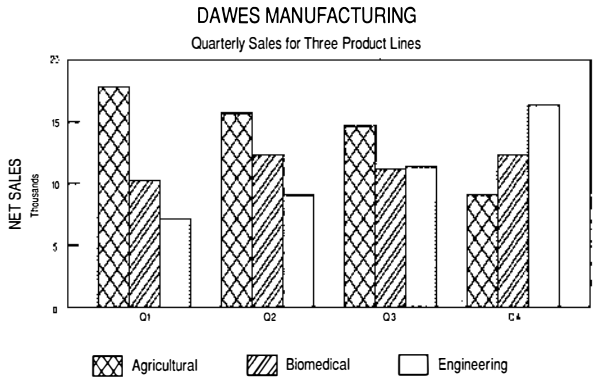
Figure 2-101. *An XY graph*

Creating Variations of the Basic Graph Types

This section has described and given examples of each of the seven basic 1-2-3 graph types. Using /Graph Type Features, you can also create many variations of the basic graph types. For example, /Graph Type Features lets you display graphs horizontally, stack the data in your graphs, graph data as percentages rather than absolute values, and add a second y-axis to your graphs. For details and examples, see /Graph Type.

Creating a Graph

You create 1-2-3 graphs using worksheet data. For example, the clustered bar graph in Figure 2-102, which shows a manufacturing company's quarterly sales for three product lines, was created using the four ranges of data shown in the accompanying worksheet.



A:A1: [W15] 'DAWES MANUFACTURING READY

	A	B	C	D	E	F	G
1	DAWES MANUFACTURING						
2	Quarterly Sales for Three Product Lines						
3							
4							
5		Q1	Q2	Q3	Q4		
6	Agricultural	18,000	15,400	14,500	9,200		
7	Biomedical	10,000	11,500	10,900	11,500		
8	Engineering	7,500	8,900	11,000	16,300		
9							
10							
11							

X-axis data
Agricultural data
Biomedical data
Engineering data

Figure 2-102. *A clustered bar graph and the data it is based on*

Following are two procedures for creating a 1-2-3 graph, "Creating a Graph with the /Graph Menu" and "Creating an Automatic Graph." With the first procedure, you use /Graph X and A — F to specify the graph data. With the second procedure, you use the cell pointer to specify the graph data.

Creating a Graph with the /Graph Menu

1. Use /Graph Type to select a basic graph type: Line (the default graph type), Bar, XY, Stack-Bar, Pie, HLCO, or Mixed.
2. Use /Graph X to specify the graph's X data range. The range can be in any active file; the way 1-2-3 uses its data depends on the type of graph you are creating. See /Graph X for details.
3. Use /Graph A — F to specify the graph's numeric data ranges (the ranges that contain the numbers to be graphed). These ranges can be in any file, active or on disk; the way 1-2-3 uses their data depends on the type of graph you are creating. See /Graph A — F for details.

   NOTE If the X and A — F data ranges are in consecutive columns or rows of a range, you can use /Graph Group instead of /Graph X and A — F to specify the graph data ranges. See /Graph Group for details.

4. View the graph on the full screen window.

   - For a full-screen view of the graph, select /Graph View or press GRAPH. To redisplay the worksheet, press any key.
   - One way to edit worksheet data and see the changes reflected simultaneously in a graph (Figure 2-103) is to use /Worksheet Window Graph. On graphics terminals or consoles, /Worksheet Window Graph splits the current worksheet region into a data region (to the left) and a graph window (to the right). As you continue using Graph commands to change and/or enhance the graph, 1-2-3 automatically updates the graph in the graph window. 1-2-3 also updates the graph automatically whenever you change the data used in the graph. The graph window remains on the screen until you select /Worksheet Window Clear.

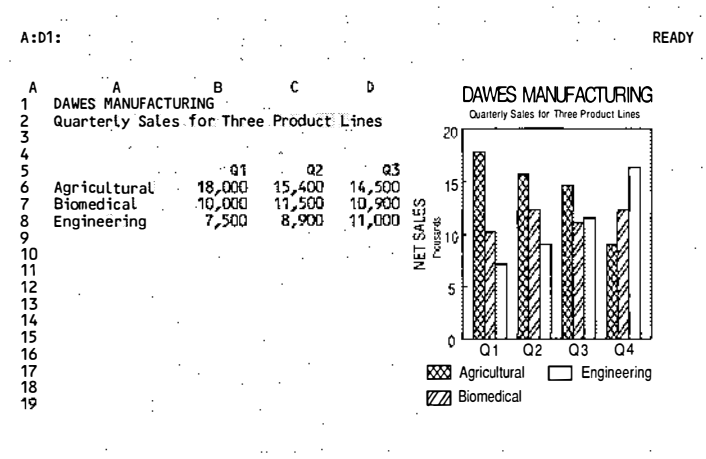


Figure 2-103. *The graph window created with /Worksheet Window Graph*

NOTE You must use /Graph View or GRAPH to view the graph. If you do not have a graphics terminal, the graph window will be blank when you select /Worksheet Window Graph.

5. (Optional) Do either or both of the following:
   - Use /Graph Options to add explanatory text, colors, grid lines, and other enhancements to the basic graph.
   - Use /Graph Type Features to create a variation of the basic type, for example, to change the orientation of the graph from vertical to horizontal.
6. When you have completed the graph and want to return 1-2-3 to READY mode, select Quit from the /Graph menu.

Creating an Automatic Graph

An **automatic graph** is a graph in which the cell-pointer location, not the /Graph X and A — F settings, determines the data in the graph. You can create an automatic graph only when the /Graph X and A — F settings are cleared and the cell pointer is in a range that 1-2-3 can interpret as an automatic graph range.

An **automatic graph range** is any single-sheet range whose data can be divided by columns or rows into the X and A — F data ranges for a graph. The data ranges must be arranged in consecutive columns or rows, with the X data range first, the A data range second, the B data range third, and so on. The cells directly above or to the left of an automatic graph range can contain labels, but otherwise, to produce meaningful results, the automatic graph range must be separated from other data by at least two blank rows and columns.

A3..D9 in Figure 2-104 is an automatic graph range. The first column in the range contains x-axis labels, and the second, third, and fourth columns contain the data to be graphed. Except for the labels used as headings for the data to be graphed, the range is separated from other data by at least two blank rows and columns. A16..D19, however, is not an automatic graph range. The data is not organized appropriately for graphing, and the range is not separated from the data to the right by at least two blank columns. Although 1-2-3 will display an automatic graph when the cell pointer is in this range, the graph will be meaningless.

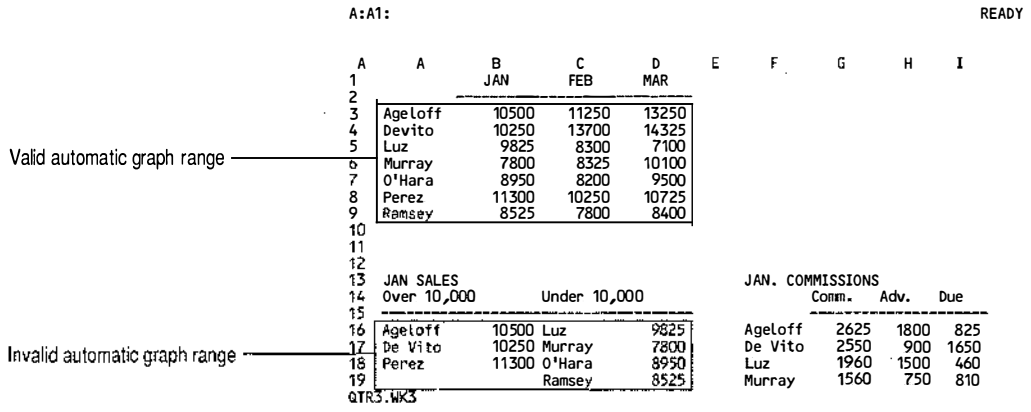


Figure 2-104. *Valid and invalid automatic graph ranges*

To interpret an automatic graph range, 1-2-3 first finds the upper left corner of the range. Then, depending on whether the current /Worksheet Global Default Graph setting is Columnwise or Rowwise, 1-2-3 divides the range into columns or rows, as follows:

- For all graph types except XY, 1-2-3 uses the first column or row that contains numbers as the A data range, starting with the first number in that column or row that is formatted as anything other than Date or Time. For XY graphs, 1-2-3 uses the first column or row that contains numbers as the X data range.
- 1-2-3 uses the immediately subsequent columns or rows as the remaining data ranges (B through F). It stops assigning data ranges after the sixth column or row or at the end of the range, whichever comes first.

  NOTE If any of the columns or rows 1-2-3 uses as the A — F data ranges contain labels as well as numbers, 1-2-3 treats the labels as zeros when it creates the automatic graph.

- For all graph types except XY, if a column or row that consists entirely of labels or of numbers formatted as Date or Time precedes the column or row used as the A data range, 1-2-3 uses this column or row as the X data range. Otherwise, 1-2-3 makes no X data-range assignment.

For example, when /Graph Type is set to Bar, /Worksheet Global Default Graph is set to Columnwise, the graph data-range settings are clear, and the cell pointer is anywhere in range A3..D9 shown in Figure 2-104, pressing GRAPH or selecting /Graph View would produce the bar graph in Figure 2-105. 1-2-3 would use B3..B9 as the A data range, C3..C9 as the B data range, D3..D9 as the C data range, and A3..A9 as the X data range.

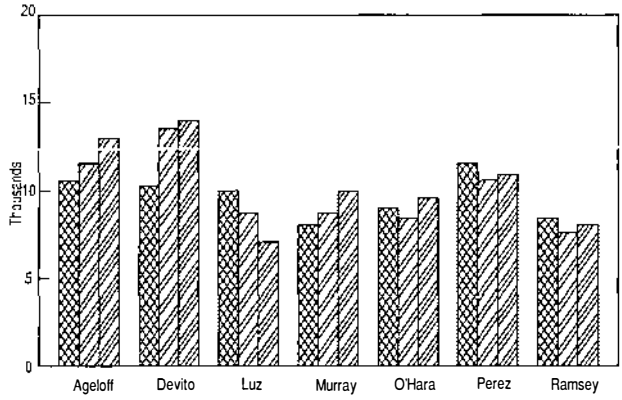


Figure 2-105. *An automatic graph*

Use the automatic graphing feature to look quickly at a particular set of data as a graph or to create a series of graphs using the same settings but different sets of data. To create an automatic graph, follow these steps:

1. Place the cell pointer anywhere within an automatic graph range.
2. If the current /Worksheet Global Default Graph setting is Columnwise (the initial setting) and you want to graph rows of data, select /Worksheet Global Default Graph Rowwise. If the current /Worksheet Global Default Graph setting is Rowwise and you want to graph columns of data, select /Worksheet Global Default Columnwise. (To check the current /Worksheet Global Default Graph setting, use /Worksheet Global Default Status.)
3. If you previously used /Graph X and A — F to specify any of the graph data ranges, use /Graph Reset Ranges to clear those settings.

4. Use /Graph Type to select the type of graph you want to create.

   Be sure the graph type you select is appropriate for the automatic graph range you are graphing. For example, if you select HLCO, the first column or row of numbers in the automatic graph range should be the high values, and the second, third, and fourth columns or rows should be the low, close, and open values, respectively.

5. (Optional) Use /Graph Options and /Graph Type Features to add explanatory text, colors, grid lines, and other enhancements to the basic graph.

6. View the automatic graph: Use /Graph View or GRAPH, as described in step 4 of "Creating a Graph with the /Graph Menu" above.

   NOTE After you use /Graph View or GRAPH to view the automatic graph, the graph will appear in a graph window created with /Worksheet Window Graph.

   NOTE The on-screen colors and fonts that 1-2-3 uses to display your graphs is dependent on the resolution and display characteristics of your terminal or workstation. For more information about display-dependent characteristics in 1-2-3, /Graph View later in this chapter.

To create another automatic graph immediately, move the cell pointer to a different automatic graph range and, if necessary, change any of the settings you specified in steps 2, 4, and 5. Then view the new graph using /Graph View or GRAPH.

To verify that 1-2-3 used the data you expected it to in an automatic graph, select any of the /Graph X and A — F from the Graph menu after creating the graph to see what 1-2-3 highlights as the corresponding data range. Then press ESC to escape out of the selected command.

Saving the Graphs You Create

Whenever you select /Graph View or press GRAPH, 1-2-3 creates a graph based on whatever graph settings are currently specified; this graph is called the current graph. As you use the Graph commands to specify new graph settings, the current graph changes. To preserve the current graph in its present form, you use either /Graph Name Create or /Graph Save, as explained on the next page.

- To store the current graph so you can continue to change graph settings but still be able to display and work with each of the graphs you create, you use /Graph Name Create. /Graph Name Create creates a **named graph** by assigning a name to whatever graph settings exist when you use the command, and stores the named graph in the current file (or in any other active file you specify). To display and work with a named graph, you use /Graph Name Use, which retrieves a named graph to make it the current graph.

  To save the named graphs you create for use in later 1-2-3 sessions, use /File Save to save the worksheet files that contain the named graphs.

- To save the current graph for use with programs other than 1-2-3, you use /Graph Save. /Graph Save creates a graph file in either graphic metafile format or picture file format, depending on the current /Worksheet Global Default Graph setting.

Every file has its own current graph, so as you move between active files the current graph changes. For example, suppose you have three active files. As you move from one file to another, 1-2-3 displays a different graph when you select /Graph View or press GRAPH. If you use Graph commands to change a graph setting, 1-2-3 makes that change for whichever file is current when you display the /Graph menu. Also, if you use /Graph Name Use to retrieve a named graph, the graph you retrieve becomes the current graph for whichever file is current when you select /Graph Name Use.

Printing the Graphs You Create

To print the graphs you create in 1-2-3, use /Print [E,P] Image Current, /Print [E,P] Image Named-Graph, or /Print [E,F,P] Range:

- To print the current graph, use /Print [E,P] Image Current.
- To print named graphs, use /Print [E,P] Image Named-Graph, which prints one named graph, or /Print [E,F,P] Range, which lets you specify any combination of named graphs and worksheet data for printing.

You can also print graphs you create in 1-2-3 with any program that prints graphic metafiles or picture files. Use /Graph Save to save the graph in a graphic metafile or picture file and then import the file into the program you are using.

Graph Command Descriptions

The following sections describe each of the Graph commands in alphabetical order.

Graph A — F

/Graph A, B, C, D, E, and F (/Graph A — F) specify the A — F data ranges, the ranges that contain the numeric data you want to graph.

The way 1-2-3 uses the A — F data ranges depends on the type of graph you create:

- In a bar graph, 1-2-3 uses the A — F data ranges as the sets of bars in the graph. 1-2-3 creates one set of bars for each data range, with each bar representing one value in the range.
- In an HLCO graph, 1-2-3 uses the A data range as the set of high values, the B data range as the set of low values, the C data range as the set of closing values, and the D data range as the set of opening values. 1-2-3 uses the E data range as the set of bars in the lower part of the graph and the F data range as the line in the graph.

  You can use almost any combination of the A — F data ranges for an HLCO graph. For example, you can create a high-low-open graph by specifying only the A, B, and D data ranges. The minimum requirement for an HLCO graph is that you use both the A and B data ranges or, alternatively, the E or F data range.
- In a line graph, 1-2-3 uses the A — F data ranges as the lines in the graph. 1-2-3 creates one line for each data range, with each point along the line representing one value in the range.
- In a mixed graph, 1-2-3 uses the A, B, and C data ranges as the sets of bars in the graph and the D, E, and F data ranges as the lines in the graph.

  You do not have to set the A, B, and C data ranges (data plotted as bars) to set the D, E, and F data ranges (data plotted as lines), and vice versa.

- In a pie chart, 1-2-3 uses positive values in the A data range as the set of pie slices; the B data range to determine the color or hatch pattern of each pie slice (depending on whether graph display is set to color or black and white) and whether the slice explodes (separates slightly) from the rest of the pie or is hidden; and the C data range to determine whether to remove the percent labels from the pie slices. See Pie-Chart Tips below for details.
- In a stacked bar graph, 1-2-3 uses the A — F data ranges as portions of the bars. The portion that represents the A data range appears below the portion that represents the B data range, the portion that represents the B data range appears below the portion that represents the C data range, and so on.
- In an XY graph, 1-2-3 uses the A — F data ranges as the points in the graph. 1-2-3 creates one set of points for each data range you specify.

Procedure

1. Select /Graph A, B, C, D, E, or F.
2. Specify the range you want to use as the A, B, C, D, E, or F data range.

   The range can be in any file, active or on disk. It should include only numeric data (numbers and/or numeric formulas). The range you specify can be three-dimensional and can include any number of columns and rows.

TIPS If your graph data ranges (X and A — F) are in consecutive columns or rows, you can use /Graph Group to specify all the ranges at once.

To attach one or more of the A — F data ranges to the second y-axis in line, bar, stacked bar, mixed, and XY graphs, use /Graph Type Features 2Y-Ranges.

To change stock quotes stored as labels in a worksheet to values that you can use as the A, B, C, and D data ranges in an HLCO graph, use @VALUE. For example, when the label '48 1/4 is in cell H20, @VALUE(H20) returns the value 48.25. For more information on @VALUE, see Chapter 3.

Pie Chart Tips

To assign either colors or hatch patterns to the slices in a pie chart, create a B data range the same size as the A data range and enter a value from 1 to 14 in each cell in the B data range. When graph display is set to color, the B-range values determine the colors of the pie slices; the color each value represents depends on your terminal. When graph display is set to black and white, the B-range values determine the hatch patterns, which are the same for all terminals.

To assign both colors and hatch patterns to the slices in a pie chart, use /Graph B to assign the colors and /Graph Options Advanced Hatches A Range to assign the hatch patterns. (You can also use /Graph Options Advanced Colors A Range to assign the colors, but a B-range setting always has precedence over this setting.)

You can use the B data range to explode one or more slices in a pie chart as well as to assign colors or hatch patterns to the slices. To do so, add 100 to the B-range values that correspond to the slices you want to explode. For example, to explode the slice to which you are assigning color or hatch pattern 4, enter 104 in the corresponding B-range cell.

To hide a pie slice, enter a negative number in the corresponding B-range cell.

To remove the percent labels from pie charts, create a C data range the same size as the A data range. For each percent label you want to remove, enter a zero in the corresponding C-range cell. Leave the rest of the cells in the C data range blank.

/Graph Group

/Graph Group specifies all graph data ranges (X and A — F) at once when the X and A — F data ranges are in consecutive columns or rows of a range.

For example, Figure 2-106 shows /Graph Group being used to specify the X, A, B, and C data ranges, which are in consecutive rows of the range B5..E8.

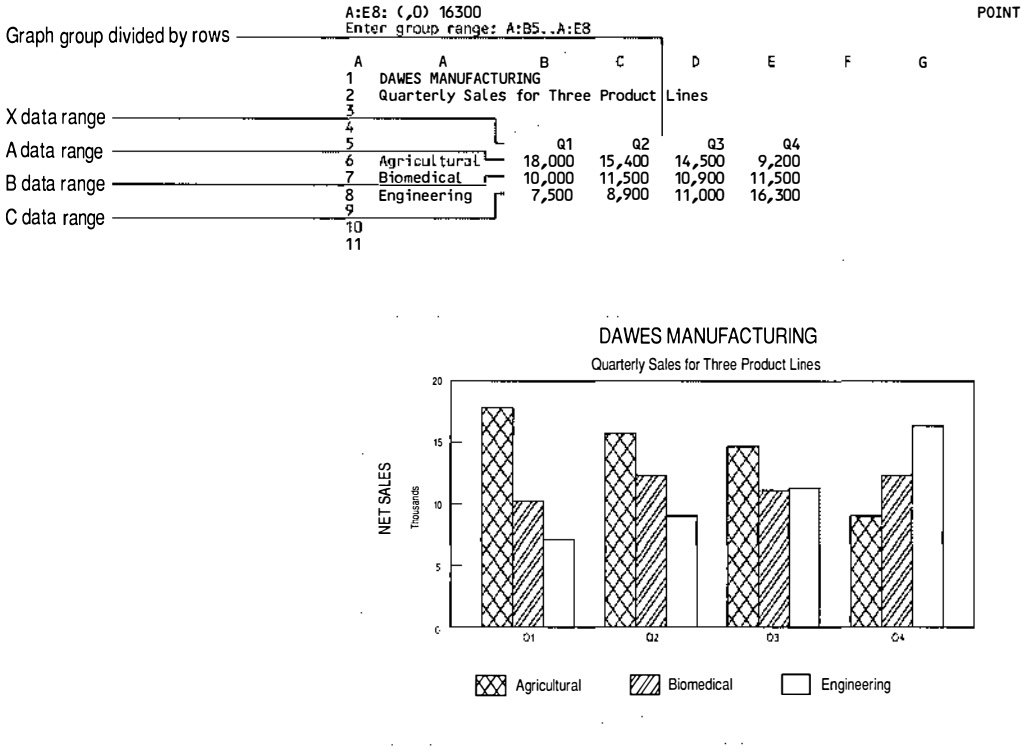


Figure 2-106. *Specifying graph data ranges with /Graph Group*

Procedure

1. Select /Graph Group.
2. Specify the range you want to divide into graph data ranges.
3. Select Columnwise or Rowwise to tell 1-2-3 whether to divide the group range into data ranges by columns or by rows.

1-2-3 uses the first column or row of the group range as the X data range and subsequent columns or rows as the A — F data ranges. If the range includes more than six columns or rows, 1-2-3 stops assigning data ranges after the sixth column or row.

/Graph Name

The /Graph Name commands let you work with any number of graphs during a 1-2-3 session. Once you name a graph, you can retrieve its settings whenever you want to display or change the graph.

The Graph Name commands perform the following tasks:

Command	*Task*
Create	Creates or updates a named graph.
Delete	Deletes one named graph.
Reset	Deletes all named graphs in the current file.
Table	Creates a table of named graphs in the current file.
Use	Retrieves a named graph and displays the graph on the full screen window.

/Graph Name Create

/Graph Name Create creates or updates a named graph by storing the current graph settings with the name you specify. Once you name a graph, you can retrieve it at any time with /Graph Name Use or, in a macro, with the advanced macro command {GRAPHON}.

Procedure

1. Display the current graph using /Graph View, GRAPH, or /Worksheet Window Graph to verify that the graph looks the way you want it to look.
2. Select /Graph Name Create.
3. If you are updating an existing named graph, specify that graph's name. If you are creating a new named graph, specify a new name of up to 15 characters. Be sure you do not use a name that already exists; if you do, you will lose the graph that was previously stored with that name.

   NOTE Unless you use a file reference, 1-2-3 stores a named graph in the file that is current when you select /Graph Name Create. To store the named graph in another active file, use the appropriate file reference when you specify the graph name. For example, suppose file THIS.WK3 is the current file and you want to store a graph named EXAMPLE in file THAT.WK3. You must specify the graph name as <<THAT.WK3>>EXAMPLE.

TIPS To create a named graph that you can use for creating automatic graphs, reset the A — F and X data ranges with /Graph Reset Ranges before you select /Graph Name Create. (If you have a graph window, the window will go blank when you reset the data ranges.)

To save a graph in a graph file for use outside of 1-2-3, use /Graph Save.

/Graph Name Delete

/Graph Name Delete deletes a named graph. Once you delete a named graph, you can no longer retrieve it with /Graph Name Use or {GRAPHON}.

Procedure

1. Select /Graph Name Delete.
2. Specify the named graph you want to delete.

/Graph Name Reset

/Graph Name Reset deletes all named graphs in the current file. Once you delete the graphs, you can no longer retrieve them with /Graph Name Use or {GRAPHON}.

Procedure

1. Make sure the cell pointer is in the file whose named graphs you want to delete.
2. Select /Graph Name Reset.

/Graph Name Table

/Graph Name Table creates a three-column table that alphabetically lists all named graphs in the current file, as well as their types and their titles (Figure 2-107).

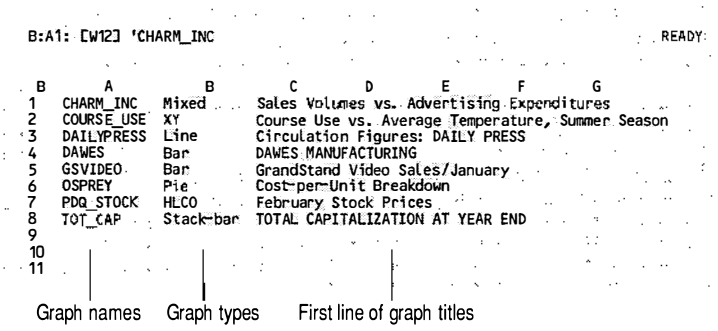


Figure 2-107. *A graph name table*

Procedure

1. Decide on a location for the graph name table. The table can be in any active file. It will occupy three columns and as many rows as there are named graphs plus one blank row.

   CAUTION Make sure the table location is blank or contains unimportant data, because 1-2-3 writes over existing data when it creates the table.

2. Make sure the cell pointer is in the file whose named graphs you want to list.

3. Select /Graph Name Table.
4. Specify the location you decided on in step 1. You need to specify only the first cell of the table's location.

/Graph Name Use

/Graph Name Use retrieves a named graph into the current file, making it the file's current graph and displaying it on the full screen window.

CAUTION When you retrieve a named graph, you lose all of the previous graph settings. To preserve those settings for future use, assign them a name with /Graph Name Create before you use /Graph Name Use.

Procedure

1. Make sure all files that contain data used by the named graph you are retrieving are active. For example, if the named graph is in file A but a cell in file B contains the graph's title, files A and B must both be active when you retrieve the named graph. Otherwise, the title will not appear in the displayed graph.

   The only exception to this rule is that the files that contain the named graph's A — F data ranges and, for an XY graph, the X data range, can either be active or on disk when you retrieve the named graph.
2. Select /Graph Name Use.
3. Specify a named graph. The graph you specify can be in any file, but remember that 1-2-3 retrieves the graph into the current file.
4. Press any key to remove the graph and redisplay the worksheet.

TIP To update a named graph after you retrieve it and make changes to its settings, use /Graph Name Create.

/Graph Options

The Graph Options commands let you add enhancements to graphs. For example, Graph Options commands let you switch between color and black-and-white display for your graphs, add grid lines and data labels to your graphs, and create legends.

The Graph Options commands perform the following tasks:

Command	*Task*
Advanced	Specifies colors, hatch patterns, fonts, and text sizes for a graph.
B&W	Causes 1-2-3 to display and print graphs in black and white. This is the default for monochrome terminals and workstations.
Color	Causes 1-2-3 to display and print graphs in color (assuming you have color equipment), using the default colors or colors you specify with /Graph Options Advanced. This is the default for color terminals and workstations.
Data-Labels	Uses the contents of a range as labels for the points or bars in a graph.
Format	For each line in line, mixed, HLCO, and XY graphs, sets whether 1-2-3 connects the points along the line with lines, uses symbols to mark the points, uses symbols and lines, uses neither symbols nor lines, or fills in the areas between the lines.
Grid	Adds or removes grid lines in a graph.
Legend	Creates legends for the A — F data ranges.
Quit	Returns you to the /Graph menu.
Scale	Determines axis scaling, controls the appearance of the numbers along an axis, and controls the number of x-axis labels 1-2-3 displays.
Titles	Adds graph titles, axis titles, and footnotes to a graph.

/Graph Options Advanced

The /Graph Options Advanced commands let you specify colors and hatch patterns for the A — F data ranges and colors, fonts, and sizes for graph text. The settings you establish with /Graph Options Advanced commands affect both displayed and printed graphs.

You do not need to use the /Graph Options Advanced commands when creating a graph, but they do give you more control over the finished product.

The /Graph Options Advanced commands perform the following tasks:

Command	*Task*
Colors	Specifies colors for or hides the A — F data ranges.
Hatches	Specifies hatch patterns for the A — F data ranges.
Quit	Returns you to the /Graph Options menu.
Text	Specifies colors, fonts, and sizes for graph text.

/Graph Options Advanced Colors specifies colors for the A — F data ranges in a graph or hides the A — F data ranges. 1-2-3 uses the /Graph Options Advanced Colors settings both for graph display (if you have a color terminal) and for printing (if you have a color printer).

Procedure

1. Select /Graph Options Advanced Colors.
2. Select A, B, C, D, E, or F as the data range for which you want to specify colors.
3. Select 1, 2, 3, 4, 5, 6, 7, 8, Hide, or Range.

   1 — 8 Uses the color that corresponds to the selected number for all values in the selected data range.

   The colors that correspond to the numbers 1 through 8 vary according to the type of terminal or workstation that you have. To determine the colors for your terminal or workstation, assign each of the numbers 1 through 8 to a data range and view the graph.

   Similarly, the colors that correspond to the numbers 1 through 8 vary according to the printer you have. To determine the colors for your printer, use /Print Printer Sample.

   Hide Suppresses display of the selected data range regardless of whether the graph is being displayed in color or black and white.

Range — Specifies a color for each individual value in the selected data range. Before you use Range you must set up a colors range. A **colors range** is a range, the same size as the selected data range, that contains values (from 1 to 14) corresponding to the colors you want to use. See the example below.

Note: Although the /Graph Options Advanced Colors menu provides only 8 color choices, you can choose from among 14 colors if you set up a colors range, provided your terminal (or printer) supports 14 colors.

4. If you selected Range, specify the colors range.
5. Repeat steps 2 through 4 to set the color or colors for another data range, or select Quit to return to the /Graph Options Advanced menu.

Example for /Graph Options Advanced Colors A — F Range

Suppose you are graphing the Q1 Totals (column B) in Figure 2-108 as bars, and you want to display the bars representing sales of over $30,000 in color 4 and the remaining bars in color 11. To do so, enter the column of values shown in column C. Then select /Graph Options Advanced Colors A Range (assuming you set B3..B9 as the A data range), and set C3..C9 as the colors range. Now, when you view the graph, 1-2-3 displays the first, second, and sixth bars in color 4 and the remaining bars in color 11.

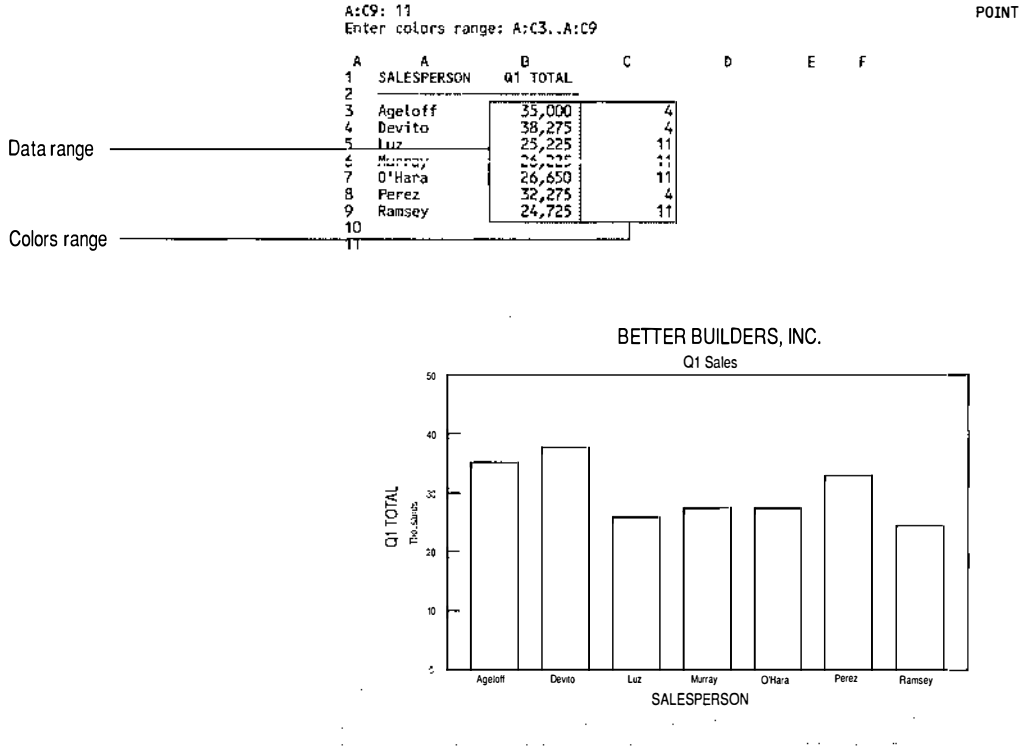


Figure 2-108. *Setting colors with a colors range*

TIPS

The default colors for the A, B, C, D, E, and F data ranges are the colors that correspond to numbers 2, 3, 4, 5, 6, and 7, respectively.

Use a negative number in a colors range to hide the corresponding value in the selected data range.

Use conditional formulas in a colors range to assign colors based on a criterion. For instance, in the example for /Graph Options Advanced Colors A — F Range, you could enter the formula @IF(B3>30000,4,11) in C3 and copy it to C4..C9 to display the bars representing sales more than $30,000 in color 4 and the remaining bars in color 11.

When you use a colors range to specify colors for a data range, 1-2-3 uses the first value in the colors range to determine the color it uses as the legend key for the data range.

1-2-3 uses the /Graph Options Advanced Colors A Range setting for pie charts only when graph display is set to color and you have not specified a B data range.

As with the B range, adding 100 to a value in the colors range explodes the corresponding pie slice.

To set colors for the text in a graph, use /Graph Options Advanced Text [F,S,T] Color.

/Graph Options Advanced Hatches specifies the hatch patterns for the bars in bar, stacked bar, mixed, and HLCO graphs, the slices in pie charts, and the areas between lines in area graphs. 1-2-3 uses these settings for both graph display and printing.

Procedure

1. Select /Graph Options Advanced Hatches.
2. Select A, B, C, D, E, or F as the data range for which you want to specify hatch patterns.
3. Select 1, 2, 3, 4, 5, 6, 7, 8, or Range.

   1 — 8 Uses the hatch pattern that corresponds to number 1, 2, 3, 4, 5, 6, 7, or 8 for all values in the selected data range.

   The hatch patterns that correspond to the numbers 1 through 8 are the same for all terminals: 1 — solid, 2 — fine crosshatching, 3 — fine double hatching, 4 — fine triple hatching, 5 — coarse crosshatching, 6 — coarse double hatching, 7 — coarse single hatching, and 8 — hollow. For printing, however, the hatch patterns that correspond to the numbers 1 through 8 vary according to the printer you have. To determine the hatch patterns for your printer, use /Print Printer Sample.

Range — Sets a hatch pattern for each individual value in the selected data range. Before you use Range you must set up a hatches range. A **hatches range** is a range, the same size as the selected data range, that contains values (from 1 to 14) corresponding to the hatch patterns you want to use. See the example below.

Note: Although the /Graph Options Advanced Hatches menu provides only 8 hatch pattern choices, you can choose from among 14 patterns if you set up a hatches range. The 6 extra selections are gray-scales.

4. If you selected Range, specify the hatches range.
5. Repeat steps 2 through 4 to set the hatch pattern or patterns for another data range or select Quit to return to the /Graph Options Advanced menu.

Example for /Graph Options Advanced Hatches A — F Range

Suppose you are graphing the Q1 Totals (column B) in Figure 2-109 as bars, and you want to display the bars representing sales more than $30,000 in hatch pattern 2 and the remaining bars in pattern 7. To do so, enter the column of values shown in column E. Then select /Graph Options Advanced Hatches A Range (assuming you set B3..B9 as the A data range) and set E3..E9 as the hatches range. Now, when you view the graph, 1-2-3 fills the first, second, and sixth bars with hatch pattern 2 and the remaining bars with pattern 7.

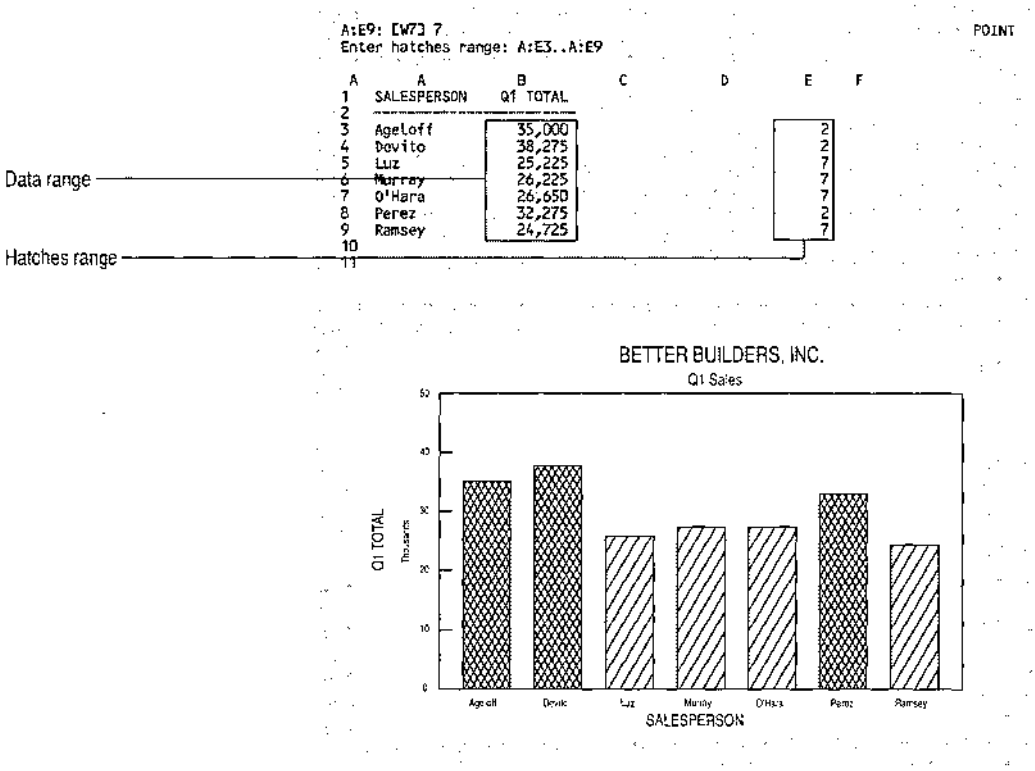


Figure 2-109. *Setting hatch patterns with a hatches range*

TIPS The default hatch patterns for the A, B, C, D, E, and F data ranges are the patterns that correspond to numbers 2, 3, 4, 5, 6, and 7, respectively.

Enter negative numbers in a hatches range to hide the corresponding data in the selected data range.

Use conditional formulas in a hatches range to assign hatch patterns based on some criterion. For example, in the example for /Graph Options Advanced Hatches A — F Range, you could enter the formula @IF(B3>30000,2,7) in E3 and copy it to E4..E9 to display the bars representing sales more than $30,000 in hatch pattern 2 and the remaining bars in pattern 7.

When you use a hatches range to specify hatch patterns for a data range, 1-2-3 uses the first value in the hatches range to determine the hatch pattern it uses as the legend key for the data range.

To color the hatch patterns in a graph, use /Graph Options Advanced Hatches together with /Graph Options Advanced Colors.

1-2-3 uses the /Graph Options Advanced Hatches A Range setting for pie charts only when graph display is set to color or when graph display is set to black and white and you have not specified a B range.

As with the B range, adding 100 to a value in the hatches range explodes the corresponding pie slice.

/Graph Options Advanced Quit returns you to the /Graph Options menu.

Procedure

1. Select /Graph Options Advanced Quit.

/Graph Options Advanced Text selects a graph-text group (first, second, or third) for which to set colors, fonts, and/or sizes.

- The first graph-text group includes the first line of the graph title.
- The second graph-text group includes the second line of the graph title, axes titles, and legend text.
- The third graph-text group includes the scale indicators, axes labels, data labels, and footnotes.

After you select /Graph Options Advanced Text and select a graph-text group, 1-2-3 displays a menu with the following commands:

Command	*Task*
Color	Sets the color for the selected graph-text group.
Font	Sets the font for the selected graph-text group.
Quit	Returns you to the /Graph Options Advanced Text menu.
Size	Sets the size for the selected graph-text group.

NOTE In the following command descriptions, choice of the text group for which to set a color, font, or size appear as [F,S,T] (for First, Second, or Third).

/Graph Options Advanced Text [F,S,T] Color sets the color for or hides the selected graph-text group. 1-2-3 uses this setting in both displayed and printed graphs. For 1-2-3 to use the /Graph Options Advanced Text [F,S,T] Color settings for displayed graphs, you must have a color terminal and graph display must be set to color. For 1-2-3 to use these settings for printed graphs, you must have a color printer and graph display must be set to color.

Procedure

1. Select /Graph Options Advanced Text.
2. Select First, Second, or Third to choose the graph-text group for which you are assigning a color.
3. Select Color.
4. Select 1, 2, 3, 4, 5, 6, 7, 8, or Hide.

   1 — 8 Assigns all text in the selected graph-text group the color that corresponds to number 1, 2, 3, 4, 5, 6, 7, or 8.

   The colors that correspond to the numbers 1 through 8 vary according to the type of terminal you have. To determine the colors for your terminal, view the graph as you experiment with assigning different color numbers.

   Similarly, the colors that correspond to the numbers 1 through 8 vary according to the type of printer you have. To determine the colors for your printer, use /Print Printer Sample.

   Hide Suppresses display of all text in the selected graph-text group.

   If you select Hide, 1-2-3 suppresses display of the text regardless of whether graph display is set to color or black and white.
5. Select Font or Size to set a font or size for the selected graph-text group, or select Quit to return to the /Graph Options Advanced Text menu.

/Graph Options Advanced Text [F,S,T] Font sets the font 1-2-3 uses for the selected graph-text group in printed graphs.

NOTE 1-2-3 provides eight font settings for graph text. However, the variety of fonts available to you depends on your printer. Use /Print Printer Sample to determine the fonts for your printer and the font settings they correspond to.

NOTE In displayed graphs, 1-2-3 uses as many display fonts as are available on your terminal or workstation. If your terminal has only one display font, 1-2-3 will use one font for all graph text, so /Graph Options Advanced Text [F,S,T] Font does not affect graph display unless you use an external utility program to add other display fonts. If your display or workstation supports multiple on-screen fonts, /Graph Options Advanced Text [F,S,T] Font options will be reflected on screen.

Procedure

1. Select /Graph Options Advanced Text.
2. Select First, Second, or Third to choose the graph-text group for which you are assigning a font.
3. Select Font.
4. Select 1, 2, 3, 4, 5, 6, 7, or 8 to assign the font that corresponds to the selected number, or select Default to use the default font setting for the selected graph-text group. For the first graph-text group, 3 is the default font setting. For the second and third graph-text groups, 1 is the default font setting.
5. Select Color or Size to set the color or size for the selected graph-text group, or select Quit to return to the /Graph Options Advanced Text menu.

/Graph Options Advanced Text [F,S,T] Quit returns you to the /Graph Options Advanced Text menu.

Procedure

1. Select /Graph Options Advanced Text [F,S,T] Quit.

/Graph Options Advanced Text [F,S,T] Size sets the text size 1-2-3 uses for the selected graph-text group in printed and displayed graphs.

Procedure

1. Select /Graph Options Advanced Text.
2. Select First, Second, or Third to choose the graph-text group to which you are assigning a size.
3. Select Size.
4. Select 1, 2, 3, 4, 5, 6, 7, 8, or 9 to assign the size that corresponds to the selected number, or select Default to use the default size setting for the selected graph-text group. For the first graph-text group, 8 is the default size setting; for the second graph-text group, 4 is the default size setting; and for the third graph-text group, 2 is the default size setting.

   NOTE The Size menu presents nine text-size settings. However, 1-2-3 displays graph text in only three sizes. Select settings 1 through 3 to display text in the smallest size; settings 4 through 6 to display text in the next-largest size; and settings 7 through 9 to display text in the largest size. The number of text sizes available for printed graphs depends both on your printer and on the text font you select with /Graph Options Advanced Text [F,S,T] Font. Use /Print Printer Sample to determine which text sizes are available on your printer and which combination of /Graph Options Advanced Text [F,S,T] Size and Font settings produces the desired result in your printed graphs.

5. Select Color or Font to set the color or font for the selected graph-text group, or select Quit to return to the /Graph Options Advanced Text menu.

TIPS Both for printed and displayed graphs, 1-2-3 automatically reduces the size of graph text (if a smaller size is available) whenever the text will not fit in the graph in the selected size. If the text still won't fit in the graph, 1-2-3 truncates the text. (The only exception to this rule is graph data labels, which 1-2-3 always displays in the size that is currently selected for the third graph-text group.)

/Graph Options B&W

/Graph Options B&W sets graph display and printing to black and white (monochrome). If you have a monochrome terminal, this is the default setting.

Procedure

1. Select /Graph Options B&W.

TIP If you have a monochrome terminal but a color printer, you must select /Graph Options Color to have 1-2-3 print your graphs in color.

/Graph Options Color

/Graph Options Color sets graph display and printing to color. If you have a color terminal, this is the default setting.

Procedure

1. Select /Graph Options Color.

The next time you view the current graph, 1-2-3 displays it in color.

TIPS If you have a black-and-white non-PostScript printer, 1-2-3 automatically prints graphs in black and white even when graph display is set to color.

If you have a black-and-white PostScript printer, 1-2-3 automatically prints colors as gray scales when graph display is set to color.

/Graph Options Data-Labels

/Graph Options Data-Labels labels the points or bars in a graph. The labels come from the ranges you specify as the A — F **data-label ranges.** Figure 2-110 shows a bar graph with data labels. The graph uses the same range (B3..B9) as the A data range and the A range's data-label range.

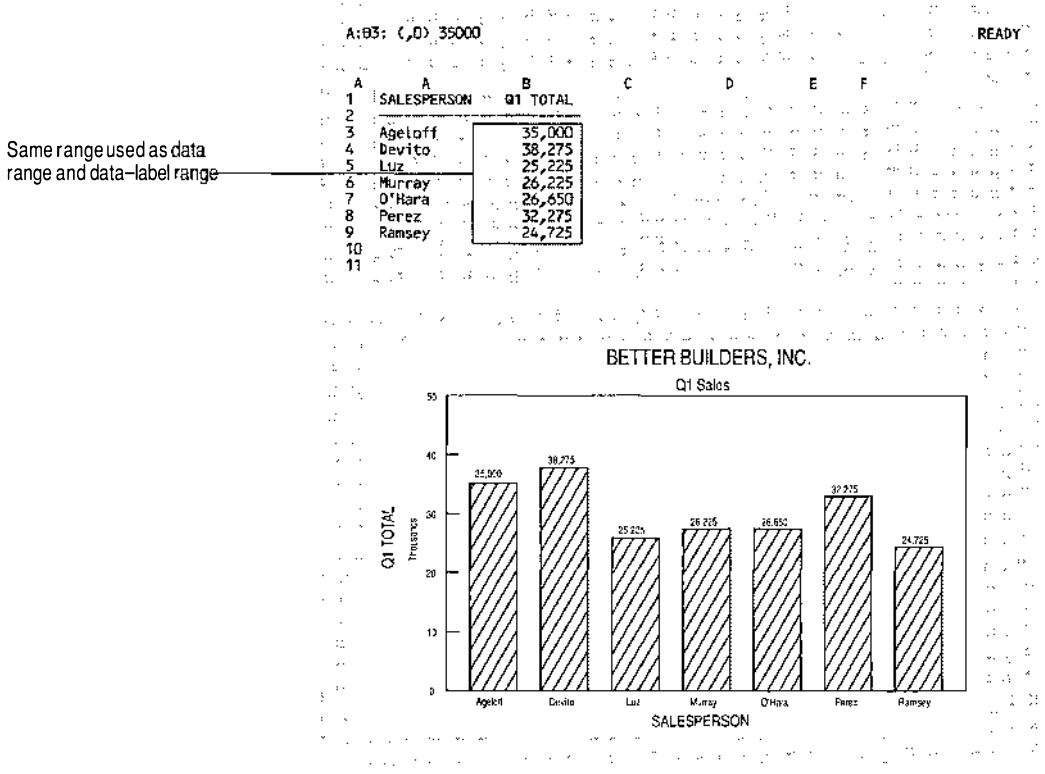


Figure 2-110. *Using data labels in a graph*

Procedure

1. Select /Graph Options Data-Labels.
2. Select A, B, C, D, E, F, or Group.

   A — F assigns the data-label range you specify in step 3 to the selected data range. Group assigns the data-label range you specify in step 3 to all data ranges at once and clears any settings you previously established with /Graph Options Data-Labels A, B, C, D, E, or F.
3. Specify the data-label range.

   If you selected A, B, C, D, E, or F, the data-label range should be the same size as the selected data range. If you selected Group, the data-label range should be the same size as all the data ranges combined. For example, if the graph includes A, B, and C data ranges, each of which

contains 6 values, the group data-label range should include 18 cells (6 each in three consecutive rows or columns).

The data-label range can contain any combination of numbers, labels, or formulas. 1-2-3 uses the current value of a formula as the data label.

4. If you selected Group, select Columnwise or Rowwise to specify whether 1-2-3 should divide the data-label range by columns or by rows.

5. If you are creating data labels for a line, select Center, Left, Above, Right, or Below to specify the placement of the data labels in relation to the points along the line.

   If you are creating data labels for bars, select Above or Below to specify the placement of data labels relative to the bars. (Selecting Center, Left, or Right is equivalent to selecting Above.)

   NOTE With stacked bar graphs, 1-2-3 puts data labels inside the corresponding portion of the stacked bars regardless of the placement you specify.

6. Select Quit to return to the /Graph Options menu.

TIPS If you clear one or more data ranges with /Graph Reset A — F or /Graph Reset Ranges, 1-2-3 automatically clears the corresponding data-label ranges.

The range you specify for /Graph Options Data-Labels must be in an active file for the data labels to appear when you display the graph.

To label the slices in a pie chart, use /Graph X, not /Graph Options Data-Labels.

To label only some of the values in a data range, leave blank the cells in the data-label range that correspond to the values you do not want to label. For example, to label only the first, third, and fifth values in a data range, enter labels in only the first, third, and fifth cells of the data-label range.

To include descriptive text in a line, XY, mixed, or HLCO graph, use /Graph A — F to create a line that positions the descriptive text correctly and create a corresponding data-label range that contains the descriptive text. Then use /Graph Options Format A — F Neither to hide the line that positions the text.

If some of the data labels you specify do not appear in the graph, are truncated, or overlap one another, try using /Graph Options Advanced Text Third Size to set a smaller size for the graph-text group.

/Graph Options Format

/Graph Options Format sets the way 1-2-3 displays lines in line, mixed, HLCO, and XY graphs. 1-2-3 can use symbols to mark the points along a line, connect the points with lines, use both symbols and lines, or use neither symbols nor lines. Or, 1-2-3 can fill in the areas below the lines.

Procedure

1. Select /Graph Options Format.
2. Select A, B, C, D, E, F, or Graph.

   A — F formats the line defined by the specified data range. Graph formats all lines in the graph at once.
3. Select Lines, Symbols, Both, Neither, or Area.

Area	Fills the space between the specified line and the line below it (or, if there is no line below it, between the specified line and the x-axis or zero line) with colors or hatch patterns. *Note:* When you format a line as Area, 1-2-3 treats any negative values in the line as zeros. When two or more lines are formatted as Area, 1-2-3 stacks the lines regardless of the current /Graph Type Features Stack setting.
Both	Displays a symbol at each point along the line and connects the points with lines (the default).
Lines	Connects the points along the line with lines.

Neither	Displays neither symbols nor connecting lines, effectively hiding the data in the graph unless you use /Graph Options Data-Labels to label the specified line.
Symbols	Displays a symbol at each point along the line. 1-2-3 uses a different symbol for each data range.

4. Select Quit to return to the /Graph Options menu.

TIPS /Graph Options Advanced ColorsA — F Hide suppresses display of a data range regardless of the format you select for the range with /Graph Options Format.

To set the colors of the individual connecting lines and symbols in a line graph, use /Graph Options Advanced Colors A — F Range.

/Graph Options Grid

/Graph Options Grid adds or removes grid lines in a graph. All graph types except pie charts can include grid lines.

Procedure

1. Select /Graph Options Grid.
2. Select Horizontal, Vertical, Both, Clear, or Y-Axis.

Both	Draws horizontal and vertical grid lines. Whether the horizontal grid lines originate from the y-axis, the second y-axis, or both depends on the Y-Axis setting.
Clear	Clears all grid lines from the graph, returning the graph to the default display.
Horizontal	Draws grid lines across the graph. Whether the lines originate from the y-axis, the second y-axis, or both depends on the Y-Axis setting.
Vertical	Draws grid lines up the graph, originating from the x-axis.
Y-Axis	Determines whether horizontal grid lines originate from the y-axis (the default), second y-axis, or both.

3. If you selected Y-Axis, select Y to have horizontal grid lines originate from the y-axis, 2Y to have the horizontal grid lines originate from the second y-axis, or Both to have the horizontal grid lines originate from both y-axes.

TIP When you rotate a graph with /Graph Type Features Horizontal, the vertical grid lines still originate from the x-axis, but they are now horizontal. Likewise, the horizontal grid lines still originate from the y-axis and/or second y-axis, but they are now vertical.

/Graph Options Legend

/Graph Options Legend creates legends for the graph's data ranges. The legends, located below the graph, identify the data range represented by each symbol, color, or hatch pattern in the graph. The legends in Figure 2-111 come from worksheet data.

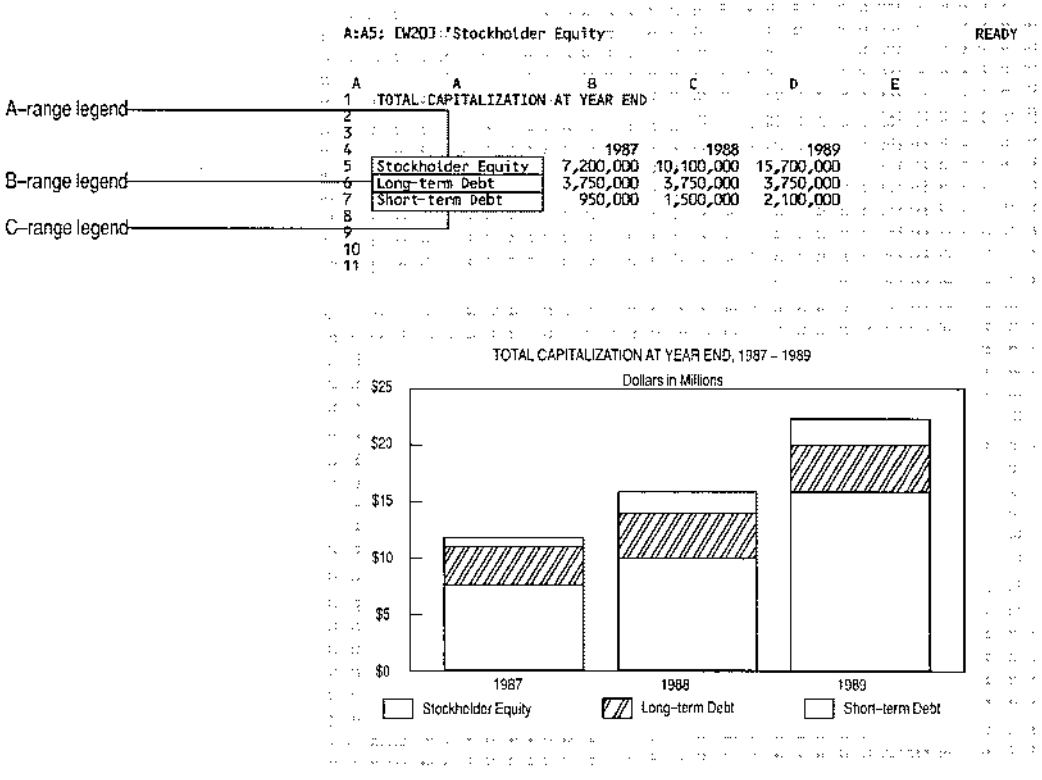


Figure 2-111. *Using worksheet data as graph legends*

Procedure

1. Select /Graph Options Legend.
2. Select A, B, C, D, E, F, or Range.

   A — F assigns a legend to an individual data range. Range assigns legends to all data ranges at once.
3. If you selected A, B, C, D, E, or F, specify the legend for the data range. You can specify a legend in two ways:

   - Type the legend and press ENTER.
   - Press \ (backslash) and specify the cell that contains the legend.

     NOTE If you use this method to specify a legend and a subsequent /Move, /Worksheet Delete, /Worksheet Insert, or /Worksheet Page command moves the cell that contains the legend, 1-2-3 automatically adjusts the cell reference for the legend.

   If you selected Range, specify the **legend range** (the range that contains the legend for each graph data range). For example, if the graph includes A, B, and C data ranges, the legend range will include three entries.

TIP You can use /Graph Options Legend Range to assign legends to the slices in a pie chart (Figure 2-112). 1-2-3 uses the text in the first cell of the legend range as the legend for the first pie slice, the text in the second cell as the legend for the second pie slice, and so on up to six pie slices. If you specify a legend range of more than six cells, 1-2-3 ignores the extra cells.

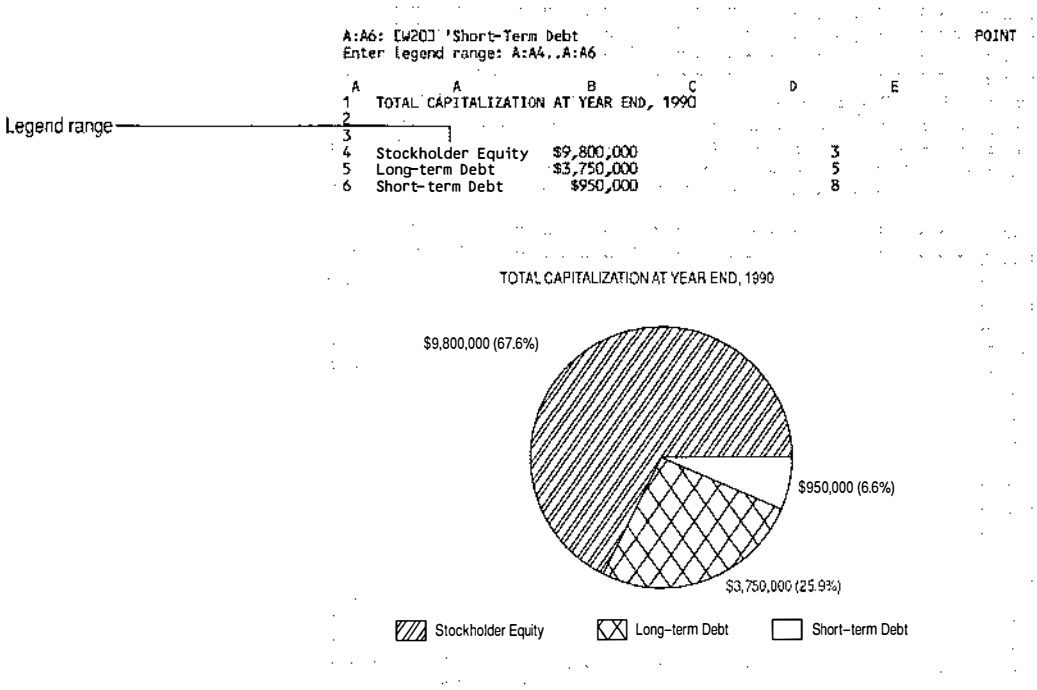


Figure 2-112. *Creating pie-chart legends with /Graph Options Legend Range*

/Graph Options Quit

/Graph Options Quit returns you to the /Graph menu.

Procedure

Select /Graph Options Quit.

/Graph Options Scale

/Graph Options Scale sets the y-axis, second y-axis, and (for XY graphs) x-axis scaling and the format of the numbers that appear along each axis. /Graph Options Scale also sets which X-range data appears along the x-axis in line, bar, stacked bar, mixed, and HLCO graphs.

Procedure

1. Select /Graph Options Scale.
2. Select Y-Scale, X-Scale, or 2Y-Scale to set the scaling for the corresponding axis, or select Skip to set a skip factor for the x-axis labels.

The **skip factor** determines which entries in the X data range 1-2-3 displays along the x-axis. For example, if you set a skip factor of 3, 1-2-3 displays along the x-axis only the first, fourth, seventh, tenth (and so on) entries in the X data range. The skip factor setting does not affect pie charts or XY graphs.

3. If you selected Skip, specify a skip factor.

   If you selected Y-Scale, X-Scale, or 2Y-Scale, select one of the items from the menu 1-2-3 displays. The following table describes the menu items:

Command	*Task*
Automatic	Sets the scaling method for the selected axis to automatic (the default), so 1-2-3 automatically creates a scale that shows all the graph data.
Exponent	Sets the **order of magnitude** for a scale — that is, the power of 10 by which the numbers along the scale must be multiplied to reflect the values you are graphing. For example, if you are graphing values between 1,000 and 10,000, and the numbers along the scale range from 1 to 10, the order of magnitude is 3. When you select Exponent, 1-2-3 displays an Automatic/Manual menu. Select Automatic (the default) to have 1-2-3 choose an order of magnitude automatically. Select Manual to specify any integer from –95 to 95 as the order of magnitude. If the numbers along a scale represent an order of magnitude other than 0, 1-2-3 uses a scale indicator to show the order of magnitude. See Indicator later in this table.
Format	Sets the format in which 1-2-3 displays the numbers along a scale. You can select Comma, Currency, Date, Fixed, General (the default), Hidden, Percent, +/–, Scientific, Text, or Time format. See the table in /Range Format for a description of each format.

(continued)

Command	*Task*
Indicator	Specifies the contents of the **scale indicator**. When 1-2-3 uses an order of magnitude other than 0 for the numbers along a scale, it creates a scale indicator (such as Thousands or Times 1E+15) to identify the order of magnitude. The scale indicator appears between the scale and the axis title. When you select Indicator, 1-2-3 displays a Yes/None/Manual menu. Select Yes (the default) to display the scale indicator as described in the preceding paragraph. Select None to suppress display of the scale indicator entirely. Select Manual to display a different indicator in place of the standard scale indicator. When you select Manual, 1-2-3 prompts you for the indicator text. Specify the text you want to use either by typing the text and pressing **ENTER** or by pressing \ (backslash) and specifying a cell that contains the text.
Lower	Used only when you select /Graph Options Scale Manual. Sets the lower scale limit (the default is 0) for the selected axis. If you specify a formula or a cell address that contains a formula, 1-2-3 uses the current value of the formula. In some instances, 1-2-3 rounds down the limit you specify.
Manual	Sets the scaling method for the selected axis to manual, so 1-2-3 creates a scale using the upper and lower scale limits you specify (or as near to those limits as possible if rounding is necessary). When 1-2-3 draws the graph, it displays only the data that falls within the specified upper and lower limits. *Note:* If you select manual scaling for an axis and specify an upper scale limit that is lower than the lower scale limit, 1-2-3 displays a blank screen when you try to view the graph.
Quit	Returns you to the /Graph Options menu.

(continued)

Command	*Task*
Type	Selects a linear or logarithmic scale for the selected axis. In a **linear scale**, the scale numbers increase by a fixed number of units. In a **logarithmic scale**, the scale numbers increase logarithmically; for example, the scale numbers 10, 100, and 1000 are spaced at equal intervals along the scale. Logarithmic scaling is used most frequently in scientific and engineering applications. When you select Type, 1-2-3 displays a Standard/ Logarithmic menu. Select Standard for a linear scale (the default) or Logarithmic for a logarithmic scale.
Upper	Used only when you select /Graph Options Scale Manual. Sets the upper scale limit (the default is 0) for the selected axis. If you specify a formula or a cell address that contains a formula, 1-2-3 uses the current value of the formula. In some instances, 1-2-3 rounds up the limit you specify.
Width	Sets the maximum width of the scale numbers 1-2-3 displays along the selected axis, in units equal to the width of the 0 character in the graph text font. *Note:* 1-2-3 displays asterisks for any number on a vertical axis that would extend more than a third of the way across the graph's total area, even if the Width setting for that axis permits numbers of that width. When you select Width, 1-2-3 displays an Automatic/Manual menu. Select Automatic (the default) to have 1-2-3 select the maximum width for the scale numbers, or select Manual to specify a width from 1 to 50. When a scale number is wider than the Width setting, 1-2-3 displays asterisks instead of the number. For example, when the scale format is Currency, 2 decimal places and the Width setting is 6, 1-2-3 displays 9 as $9.00 but 9999 (which would appear as $9,999.00) as ******.

/Graph Options Titles

/Graph Options Titles adds graph titles, axis titles, and footnotes to a graph. Figure 2-113 shows each of these components and their locations in a graph.

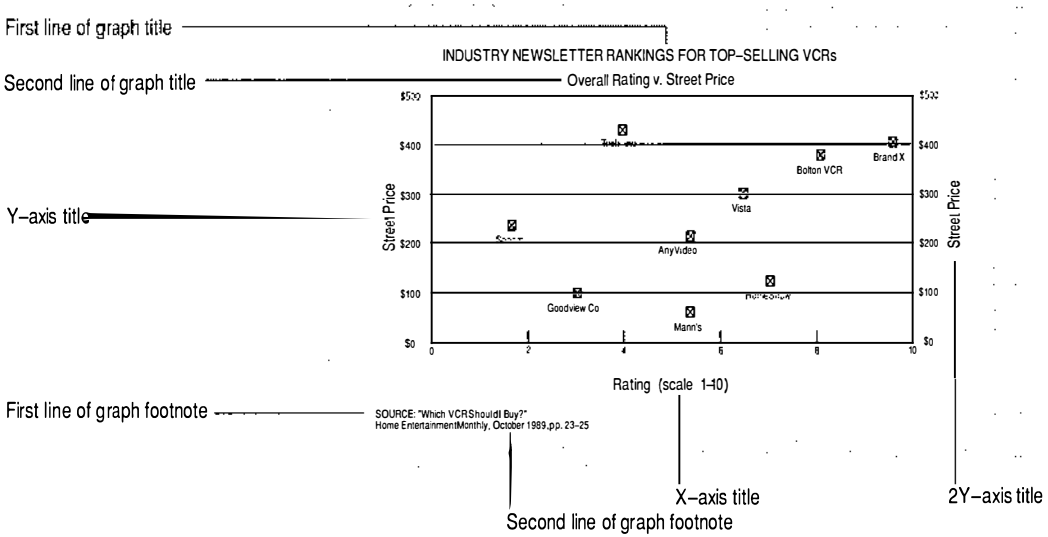


Figure 2-113. ***Graph text you create with /Graph Options Titles***

Procedure

1. Select /Graph Options Titles.
2. Select First, Second, X-Axis, Y-Axis, 2Y-Axis, Note, or Other-Note.

First	Sets the first line of the graph title.
Note	Sets the first line of graph footnotes, which are located in the lower left corner of the graph.
Other-Note	Sets the second line of graph footnotes.
Second	Sets the second line of the graph title.
2Y-Axis	Sets the title for the second y-axis.
X-Axis	Sets the title for the x-axis.
Y-Axis	Sets the title for the y-axis.

3. Specify a title. You can specify a title in two ways:
   - Type the title and press ENTER.
   - Press \ (backslash) and specify the cell that contains the title.

     NOTE If you use this method to specify a title and a subsequent /Move, /Worksheet Delete, /Worksheet Insert, or /Worksheet Page command moves the cell that contains the title, 1-2-3 automatically adjusts the cell reference for the title.
4. Repeat steps 2 and 3 to specify another title.

/Graph Quit

/Graph Quit returns 1-2-3 to READY mode.

Procedure

1. Select /Graph Quit.

/Graph Reset

/Graph Reset resets some or all of the current graph settings, returning them to the default settings.

Uses of /Graph Reset include:

- Resetting one or more graph data-range settings prior to selecting a new graph data range with /Graph A — F or /Graph X.
- Resetting all graph data-range settings prior to creating an automatic graph.
- Resetting all graph settings prior to creating an entirely new graph.

Procedure

1. Select /Graph Reset.
2. Select Graph, X, A, B, C, D, E, F, Ranges, or Options.

A — F	Resets the A, B, C, D, E, or F data-range setting and the corresponding data-label setting, if any.
Graph	Resets all graph settings.
Options	Resets all current /Graph Options settings.

Ranges	Resets all data-range settings (X, A, B, C, D, E, F, and Group) and data-label settings.
X	Resets the X data-range setting.

3. Select Quit to return to the /Graph menu.

TIP Selecting /Graph Reset Options and /Graph Reset Ranges is equivalent to selecting /Graph Reset Graph except that the /Graph Type settings are not reset.

/Graph Save

Saves the current graph in a graph file so you can use the graph with other programs. /Graph Save saves the graph only for use outside 1-2-3. You cannot retrieve a graph file from within 1-2-3.

Procedure

1. If necessary, use /Worksheet Global Default Graph to change the current graph file format setting to the one you want to use.
2. Select /Graph Save.
3. Specify a graph file name.
4. If you enter an existing graph file name, 1-2-3 displays a Cancel/Replace menu. Select Cancel to end the /Graph Save command without saving the current graph. Select Replace to write over the existing graph file with the current graph.

TIPS To store the current graph for future use within 1-2-3, use /Graph Name Create.

To override the default file format you specified in step 1, type an extension for the file name in step 3. For example, if the default file format is graphic metafile but you want to save the current graph in picture file format, use .PIC as the extension. The .PIC graph format is the default graph format for 1-2-3 Release 2.2. Use .CGM as the extension to save the graph in metafile format.

/Graph Type

/Graph Type sets the following:

- The basic type of graph you are creating: bar, HLCO, line, mixed, pie, stacked bar, or XY.
- The graph's orientation: vertical, with the x-axis along the bottom of the graph, or horizontal, with the x-axis along the left side of the graph.
- The way the graph displays corresponding values in the A — F data ranges: independent of one another, as percentages of the total for all values, or stacked one on top of the previous.
- Use of the y-axis and second y-axis.

Procedure

1. Select /Graph Type.
2. Select Line (the default), Bar, XY, Stack-Bar, Pie, HLCO, or Mixed to set a basic graph type or Features to create a variation of a basic graph type.
3. If you selected Features, select one of the items from the menu 1-2-3 displays. The following table describes the menu items.

Command	*Task*
Horizontal	Rotates the graph on the screen so the x-axis runs vertically along the left side of the graph, the y-axis runs horizontally across the top, and the second y-axis runs horizontally across the bottom. See Examples below.
100%	Used with line, bar, mixed, stacked bar, and XY graphs that include two or more data ranges. Displays corresponding values in the data ranges as a percentage of their total value. See Examples below. When you select 100%, 1-2-3 displays a Yes/No menu. Select Yes to graph corresponding values in the data ranges as percentages of their total value, or select No to stop percentage graphing (the default).
Quit	Returns you to the /Graph menu.

(continued)

Command	*Task*
Stacked	Used with line, bar, mixed, and XY graphs that include two or more data ranges. Stacks the corresponding values in the data ranges one on top of the previous. See Examples below.
	When you select Stacked, 1-2-3 displays a Yes/No menu. Select Yes to stack the corresponding values in the data ranges, or select No to stop stacking (the default).
2Y-Ranges	Assigns one or more data ranges to the second y-axis. See Examples below.
	When you select 2Y-Ranges, 1-2-3 displays a Graph/A — F/ Quit menu. Select Graph to assign all data ranges to the second y-axis; A, B, C, D, E, or F to assign an individual data range to the second y-axis; or Quit to return to the /Graph Type Features menu.
Vertical	Orients the graph so the x-axis appears across the bottom of the graph (the default).
Y-Ranges	Reassigns to the y-axis one or more data ranges currently assigned to the second y-axis.
	When you select Y-Ranges, 1-2-3 displays a Graph/ A — F/Quit menu. Select Graph to reassign all data ranges to the y-axis; A, B, C, D, E, or F to reassign an individual data range to the first y-axis; or Quit to return to the /Graph Type Features menu.

Examples

The 100% horizontal stacked bar graph in Figure 2-114 is based on six months of sales commissions. It shows what percentage of the total commissions each salesperson earned per month.

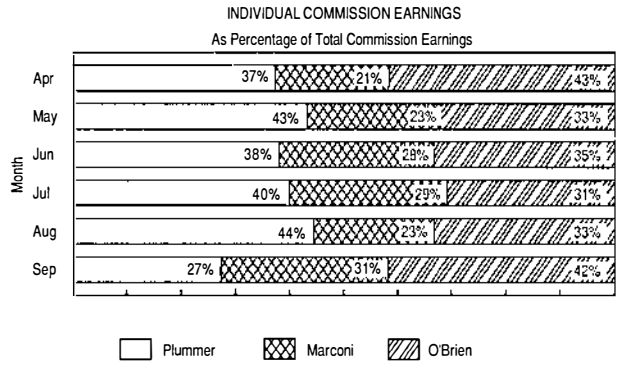


Figure 2-114. *A 100% horizontal stacked bar graph*

The stacked line graph in Figure 2-115 shows what portion of a firm's total monthly professional fees consist of legal and accounting fees. The total line is created by stacking the "other professional fees" line on top of the "legal and accounting professional fees" line (which is formatted as an area line with /Graph Options Format Area). In this graph, all data ranges are assigned to the second y-axis.

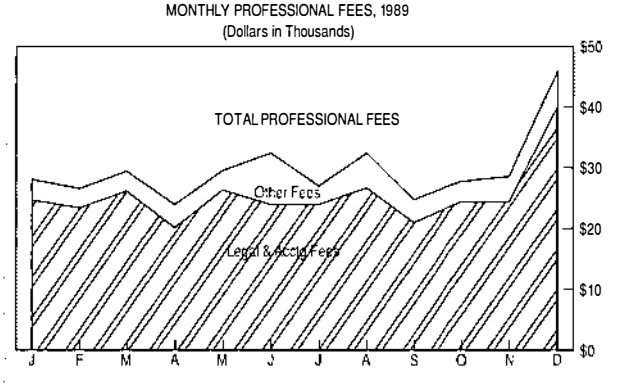


Figure 2-115. *A stacked line graph that uses the second y-axis*

TIPS Settings you establish with /Graph Type Features apply to any of the appropriate graph types. For example, suppose you select /Graph Type Line and use /Graph Type Features to create a 100%, stacked, horizontal line graph with all ranges assigned to the second y-axis. If you then select /Graph Type Bar, 1-2-3 displays a 100%, stacked, horizontal bar graph with all ranges assigned to the second y-axis.

If you used /Graph Type Stack-Bar rather than /Graph Type Features Stacked Yes to create a stacked bar graph, selecting /Graph Type Features Stacked No does not stop the stacking. Select /Graph Type Bar instead.

Unless you explicitly attach one or more data ranges to the second y-axis, 1-2-3 does not display the second y-axis in the graph.

If you attach all data ranges to the second y-axis, 1-2-3 does not display the y-axis.

In an HLCO graph, 1-2-3 automatically assigns the A, B, C, D, and F data ranges to the y-axis and the E data range to the second y-axis. You cannot change these assignments with /Graph Type Features 2Y-Ranges or Y-Ranges.

/Graph View

/Graph View displays the current graph on the full screen of your terminal. If the cell pointer is in an automatic graph range and you have not used /Graph X or /Graph A — F to specify graph data ranges, 1-2-3 displays an automatic graph when you select /Graph View. ("Creating a Graph" earlier in this section contains more information on automatic graphs.)

Procedure

1. Select /Graph View.
2. When you have finished viewing the graph, press any key to close the full screen graph. (If you press a key before 1-2-3 finishes drawing the graph, 1-2-3 redisplays the worksheet without completing the graph.)

If any of the following conditions exists, 1-2-3 cannot display a graph when you select /Graph View. Press any key to return to the worksheet and, if possible, correct the problem.

- Your workstation or graphics terminal cannot display graphs.
- You selected a screen display driver that cannot display graphs even though your terminal can.
- None of the A — F data ranges are specified and the cell pointer is not in an automatic graph range.
- In an HLCO graph, neither the A and B data ranges nor the E or F data range are specified.
- In a pie chart, the A data range is either not specified or contains no positive values.
- In an XY graph, the X data range and one of the A — F data ranges are not specified.
- You selected manual scaling for an axis and the upper scale limit for the axis is lower than the lower scale limit.

TIPS As an alternative to using /Graph View, you can press **GRAPH** from within any menu or when 1-2-3 is in READY mode to view the current or automatic graph. To remove the graph and redisplay the worksheet, press any key.

On graphics terminals, to split the screen vertically and display the worksheet in the left window and the current graph in the right window, use /Worksheet Window Graph.

Each file has its own current graph settings. With the cell pointer in different active files, selecting /Graph View will produce different results.

/Graph X

/Graph X specifies the X data range for a graph. The way 1-2-3 uses the contents of this range depends on the type of graph you create.

- In line, bar, stacked bar, mixed, and HLCO graphs, 1-2-3 uses the contents of the X data range as the x-axis labels. The X data range can contain values or labels.
- In pie charts, 1-2-3 uses the contents of the X data range as the pie-slice labels. These labels appear with the percentage labels 1-2-3 automatically creates. The X data range can contain values or labels.

- In XY graphs, 1-2-3 uses the contents of the X data range to determine the x-axis scale and where along the x-axis scale to plot the data in the A — F data ranges. The X data range must contain numeric values.

NOTE For all graph types except XY, the file that contains the X data range must be active when you view or print the graph.

Procedure

1. Select /Graph X.
2. Specify the range that contains the entries you want to use as the graph's X data range.

TIPS When 1-2-3 uses the contents of the X data range as the x-axis labels (in line, bar, mixed, stacked bar, and HLCO graphs) and the labels are long enough to overlap one another, 1-2-3 automatically staggers the labels.

When numeric values in the X data range are too long to fit along the x-axis, 1-2-3 displays asterisks instead of the numbers. When labels in the X data range are too long to fit along the x-axis, 1-2-3 truncates the labels.

To suppress display of some of the X data range contents in a graph, use /Graph Options Scale Skip.

Move Command

/Move

/Move transfers a range of data, including cell formats and protection status, to another range in the same file. You can use /Move to reorganize data within a file but you cannot use /Move to transfer data between files.

Figure 2-116 shows the result of moving a range of data in a multiple-sheet file.

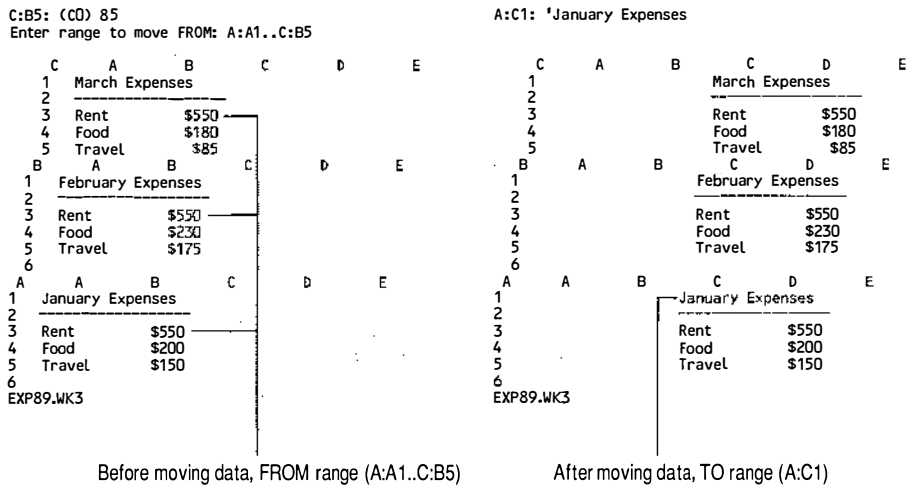


Figure 2-116. *Moving a range of data*

Before you use /Move, read the following sections in Chapter 1:

- "Working with Ranges" explains how to specify a range and describes defined and undefined range names.
- "Using Multiple-Sheet Files" explains how to move the cell pointer between worksheets and how to specify a three-dimensional range.

Procedure

1. (Optional) If you want to highlight the range instead of typing the cell addresses, move the cell pointer to the first cell in the range from which you want to move data.
2. Select /Move.
3. Specify the range you want to move FROM.
4. Specify the range you want to move TO. You need to specify only the first cell in the TO range.

   CAUTION If you move data to a range that already contains data, 1-2-3 replaces the existing data with the moved data.

   If you move data from a three-dimensional range, be sure there are enough worksheets between the first cell of the TO range and the end of the file to hold the data. For example, if you move data from a range that spans worksheets A, B, and C to worksheet D, the file must have at least two more worksheets (E and F) for 1-2-3 to complete the move.

How /Move Affects Ranges and Formulas

Moving data into or out of the first or last cells of a range that is named or referred to in a formula changes the range definition. The following examples illustrate how moving data into or out of ranges affects formulas.

- If you move data out of the first or last cells of a range, 1-2-3 changes the range definition. For example, in Figure 2-117, the formula in A:B6 is @SUM(A1..C4). If you move data from C4 to E4, 1-2-3 expands the range in the formula to A1..E4 and totals any data in that range.

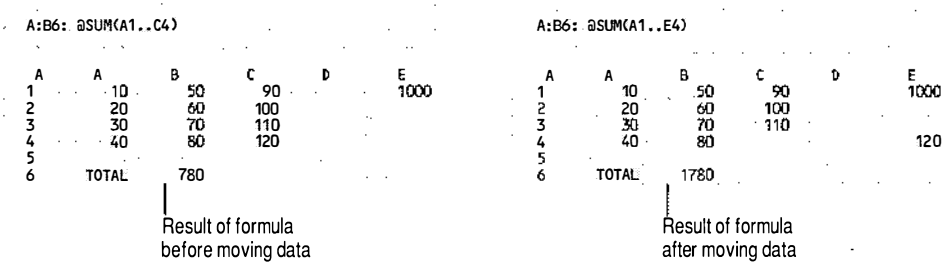


Figure 2-117. *Moving data from the last cell of a range*

- If you move data into the first or last cells of a range referred to by cell addresses in a formula, 1-2-3 changes the range to ERR and formulas that refer to that range evaluate to ERR. For example, in Figure 2-118, the formula in A:B6 is @SUM(A1..C4). If you move data from E1 to A1, 1-2-3 changes the formula to @SUM(ERR) and the formula evaluates to ERR.

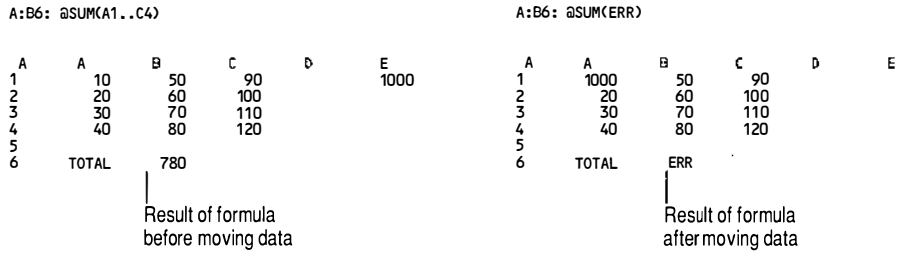
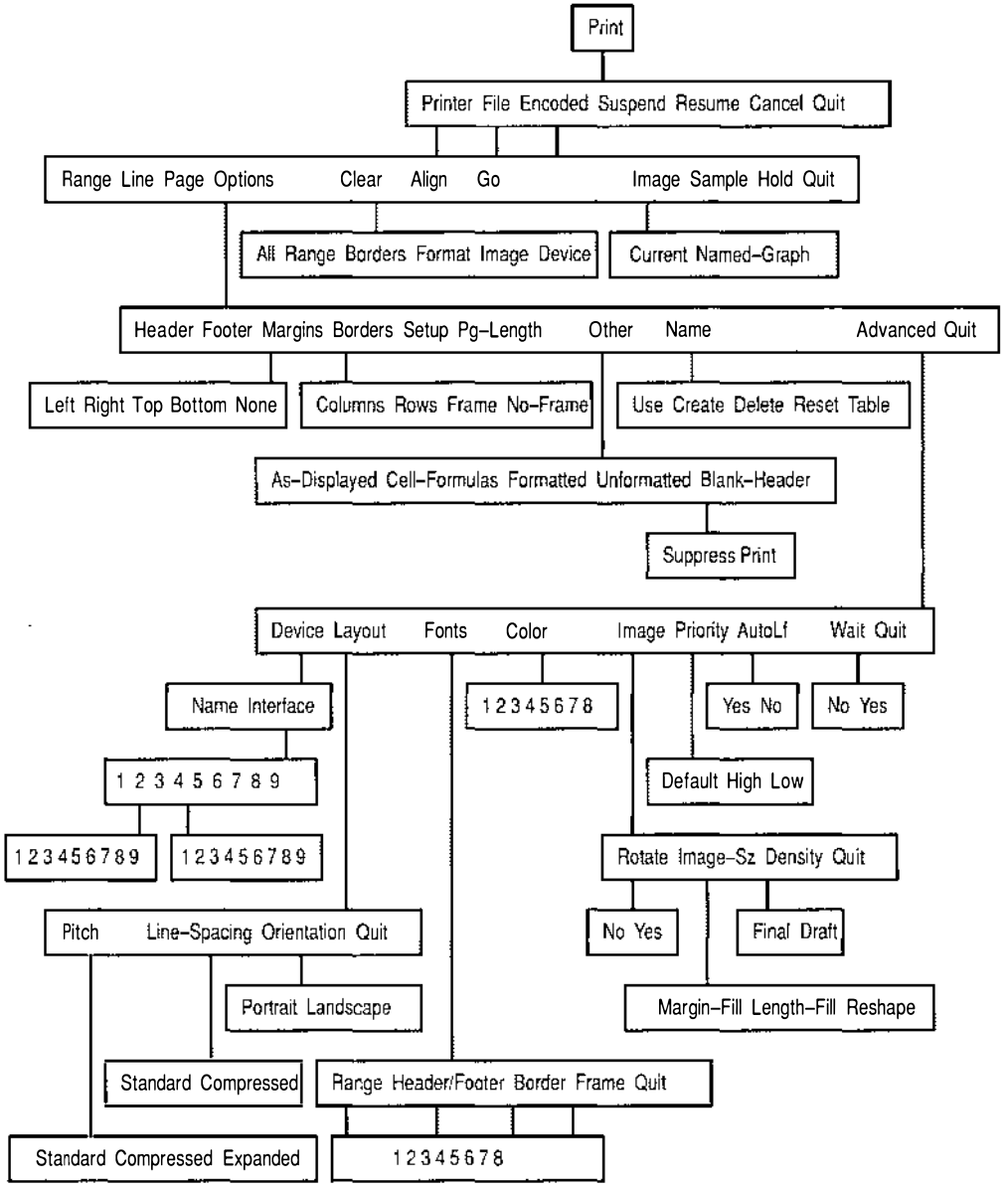


Figure 2-118. *Moving data into the first cell of a range*

- If you move data into the first or last cell of a named range, 1-2-3 retains the range name in the formula but treats it as an undefined range name. The formula evaluates to ERR until you redefine the range name.

Print Commands



The Print commands create printed copies of your work, letting you share your results with others. You can print data and graphs on a printer or to a file.

The Print commands perform the following tasks:

Command	*Task*
/Print Cancel	Is inoperative for UNIX versions of 1-2-3. Use /System to return to UNIX shell and then issue the appropriate command to cancel a print job.
/Print Encoded	Selects an encoded file as the destination for your printing, then lets you select options for your printing.
/Print File	Selects a text file as the destination for your printing, then lets you select options for your printing.
/Print Printer	Selects your printer as the destination for your printing, then lets you select options for your printing.
/Print Quit	Closes the print job and returns 1-2-3 to READY mode.
/Print Resume	Is inoperative for UNIX versions of 1-2-3. Use /System to return to UNIX and then issue appropriate command to continue printing a suspended print job.
/Print Suspend	Is inoperative for UNIX versions of 1-2-3. Use /System to return to UNIX and then issue the appropriate command to temporarily stop printing a print job.

Common Uses for Print Commands

The Print commands control basic printing operations and let you enhance your printed output with options such as colors, fonts, graphs, headers, footers, and varied character pitches (widths) and line spacing. Below are examples of how you can use the Print commands if you are printing a quarterly sales report.

- Include a graph of the sales figures in the printed report (/Print [E,P] Image).
- Change the color or font of portions of the report to highlight those portions (/Print [E,P] Options Advanced Color or Fonts).

- Create a copy of the sales data in a text file so coworkers can import the data into another program (/Print File).
- Leave the /Print menu to make a change to the worksheet and then return to the /Print menu and continue creating the report (/Print [E,F,P] Hold).

Reading Path

- Before you begin working with the Print commands, read "Working with Ranges" and "Working with Files" in Chapter 1.
- To learn about the method 1-2-3 uses to print and to display print error messages, read "Background Printing."
- To learn the basic steps for printing your work in 1-2-3, read "Basic Procedures for Printing in 1-2-3."
- For hands-on experience with printing your work, complete Lessons 6, 9, and 11 of the *Tutorial.*
- Refer to specific commands in "Print Command Descriptions" for more detailed information.

Also, remember that you can press HELP when you are using any Print command to get information about the command. In addition, you can refer to the *Task Summary* to identify the Print command that accomplishes a particular task.

Terms You Need to Know

- A **print job** consists of ranges of data, graphs, and/or blank lines that 1-2-3 sends to a print spooler, a text file, or an encoded file. The print job begins when you use /Print [E,F,P] Go, /Print [E,F,P] Line, or /Print [E,F,P] Page to open the print job. The print job ends when you select /Print [E,F,P] Quit or press ESC or BREAK to leave the /Print [E,F,P] menu.
- **Print settings** are the options you specify for your print job. Special fonts, margins, headers, footers, and line spacing are a few examples of print settings. You can assign a **print settings name** to your print settings so you can use the same settings at another time without having to respecify them.
- The **print destination** is the encoded file, text file, or print spooler that receives your print data.

- A **text file** can contain data but no graphs or special printer codes. You can create a text file to exchange data with other programs.
- The **default printer** is the printer control program that 1-2-3 automatically uses for printing when you start 1-2-3. Initially, the default printer is the first printer your system administrator selected in the **`setup123`** utility.
- The **current printer** is the most recent printer you selected during the current 1-2-3 session. 1-2-3 opens a print job for the current printer when you use /Print Printer Go and generates printer codes for the current printer when you use /Print Encoded Go. If you did not select a printer during the current 1-2-3 session, then the current printer is the same as the default printer.
- **Background printing** is the ability of 1-2-3 to format data for a print job while you continue to work in the worksheet. For more information, see "Background Printing," which follows.
- A **print spooler** manages the queuing and printing of your 1-2-3 print jobs on a UNIX printer. Print spoolers like **`lp`** or **`lpr`** are UNIX programs that 1-2-3 uses as a print destination. Once you close a print job and send it to a print spooler, you must use /System and operating system commands to manage the print job.

Background Printing

When you open a print job, 1-2-3 reads the selected data and formats it for printing on the currently-selected printer. Data for a PostScript printer requires a different format than that for a line printer. 1-2-3 can schedule this formatting in memory so that you can continue to work in the worksheet or add data to the print job. This is called background printing. When you select /Print Printer Quit, 1-2-3 sends the formatted data to the printer control program and closes the open print job.

NOTE When you print to a file, you cannot leave the /Print [E,F,P] menu (the menu that begins with Range) while your print job is printing unless you use /Print [E,F,P] Hold first. You can continue to use the /Print menus, however, so you can change options and print additional ranges or graphs.

TIPS Do not use the Worksheet Global Default Other International commands while a print job is printing or waiting to print. Because 1-2-3 prints in the background, using these commands may change the way 1-2-3 prints your data.

Background Print Error Messages

If a network printer handling one of your print jobs malfunctions, UNIX will not usually interrupt your 1-2-3 session with an error message. To check on the status of your print jobs on network printers, use the /System command to create a new shell and enter a UNIX printer status command like **`lpstat`**.

NOTE If you modify the command string in /Worksheet Global Default Printer Interface or /Print Printer Options Advanced Device Interface to read **`lp -m {site}`**, UNIX will use the mail utility to notify you that the print job has been completed successfully.

Basic Procedures for Printing in 1-2-3

Before you print, be sure to check the status of the print spooler that will manage printing your data. Use the /System command to create a new UNIX shell and enter the UNIX command **`lpstat`**. If the default print spooler is unusually busy or not working, you can specify an alternative print spooler with the command /Print Printer Options Advanced Device Interface.

If you want the data to print on a printer or to an encoded file, be sure you have installed a printer for use with 1-2-3. If you are not sure if you installed a printer, select /Worksheet Global Default Status and see if 1-2-3 displays a printer name. If 1-2-3 does not display a printer name, check with your system administrator.

Creating an Encoded File

Encoded files contain both your data and the printer formatting codes appropriate for the type of printer selected with the /Worksheet Global Default Printer Name or /Print Printer Options Advanced Device Name commands. If your selected printer requires PostScript, 1-2-3 formats your data and

graphs with PostScript codes. An encoded file formatted for a PostScript printer will print on most PostScript compatible devices.

Follow these steps to create an encoded file:

1. Make sure the printer on which you will print the file is current.
2. Select /Print Encoded.
3. Specify a file name.
4. Select Align.

   Selecting Align ensures that the headers, footers, and page breaks will be in the correct spot when you print the file.
5. (Optional) Select Options to specify the print options that you want to use.

   See /Print [E,F,P] Options for a description of available print options. After selecting the options you want to use, select Quit enough times to return to the /Print [E,F,P] menu (the menu that begins with Range). The number of times you select Quit depends on which print options you select.
6. Select Range or Image to specify the range or graph to print.

   See /Print [E,F,P] Range and /Print [E,P] Image for information on specifying a range or graph to print.
7. Select Go to open the print job and begin formatting the data for the encoded file.
8. If you want to include more ranges or graphs in the file, repeat steps 6 through 8. 1-2-3 appends the new data to the same file.
9. If you specified a footer and you want it to appear on the last page of the print job, select Page.
10. Select Quit to finish creating the encoded file on disk and return 1-2-3 to READY mode.

NOTE When you create an encoded file, 1-2-3 does not finish saving the file on disk until you leave the /Print [E,F,P] menu, either by selecting Quit or pressing BREAK or ESC.

TIPS To print an encoded file on a printer, use the UNIX command `lp`.

For more details about UNIX print commands, consult your UNIX user manual or network administrator.

Creating a Text File

Follow these steps to create a text file:

1. Select /Print File.
2. Specify a file name.
3. Select Align.

   Selecting Align ensures that the headers, footers, and page breaks (if included in the file) will be in the correct spot when you print the file.
4. (Optional) Select Options to specify the print options that you want to use.

   See /Print [E,F,P] Options for a description of available print options. After selecting the print options you want to use, select Quit enough times to return to the /Print [E,F,P] menu (the menu that begins with Range). The number of times you need to select Quit depends on which print options you select.
5. (Optional) If you are creating a text file so you can use 1-2-3 data with another program, you probably do not want headers, footers, or page breaks in your file. Select Options Other Unformatted to eliminate headers, footers, and page breaks. Then select Quit to return to the /Print [E,F,P] menu again.

   Similarly, you probably want no left margin and want a right margin appropriate for the other program. Select Options Margins Left and enter 0. Select Margins Right and enter the appropriate right margin for the other program. Then select Quit to return to the /Print [E,F,P] menu.
6. Select Range to specify the range to print.

   See /Print [E,F,P] Range for information on specifying a range to print.

NOTE Although text files cannot include graphs, if you specify a graph to include in a text file, 1-2-3 leaves blank lines in the text file where the graph would have appeared.

7. Select Go to open the print job and begin writing the data to the text file on disk.
8. If you want to include more ranges in the file, repeat steps 6 through 8. 1-2-3 appends the new data to the same file.
9. If you specified a footer and you want it to appear on the last page of the print job, select Page.
10. Select Quit to finish creating the text file on disk and return 1-2-3 to READY mode.

NOTE When you create a text file, 1-2-3 does not finish saving the file on disk until you leave the /Print [E,F,P] menu, either by selecting Quit or pressing **BREAK** or **ESC**.

TIP UNIX text files end each line with a linefeed character. If you intend to transfer a .PRN or .prn file created in a UNIX version of 1-2-3 to MS-DOS, VMS, or Macintosh, you will have to add a carriage return to the end of each line. Some communications packages such as *PC-NFS* have a utility called **unix2dos** that adds carriage returns automatically.

Printing a Range on a Printer

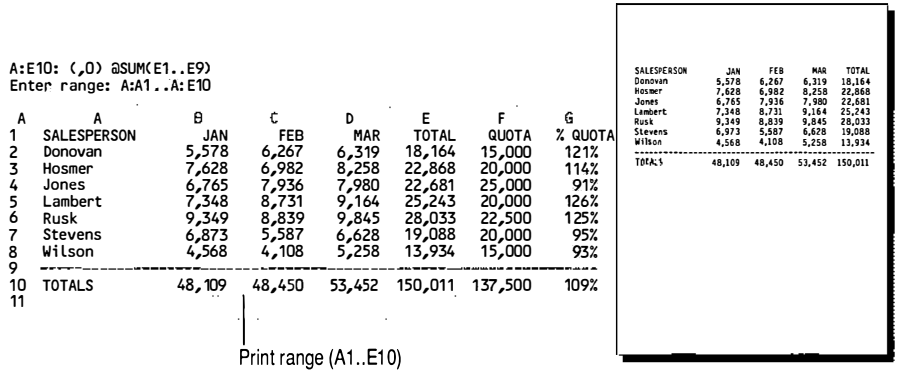


Figure 2-119. *A print range in the worksheet and on paper*

Follow these steps to print a range on a printer:

1. (Optional) Select /Print Printer Options to specify options for your printed range.

   See /Print [E,F,P] Options for a description of available options. Then select Quit enough times to return to the /Print [E,F,P] menu (the menu that begins with Range).

2. Select /Print Printer Range.
3. Specify the range or ranges you want to print.

   The ranges can be in any active file. See /Print [E,F,P] Range for information on specifying ranges to print.

4. Make sure that your print spooler is active and your printer is online.
5. Select Align.

   Selecting Align ensures that the headers, footers, and page breaks will be in the correct spot when you print the range.

6. Select Go to open the print job and begin formatting the data.
7. Select Page to insert the formatting command to begin a new page and print the footer on the last page of the print job, if you specified a footer.

If you do not change the 1-2-3 margins or page length, 1-2-3 uses the following default settings when it prints a range:

Option	*Setting*
Bottom margin	2 lines from the bottom of the paper
Left margin	4 characters from left edge of the paper
Page length	66 lines
Right margin	76 characters from left edge of the paper
Top margin	2 lines from the top of the paper

Printing a Graph on a Printer

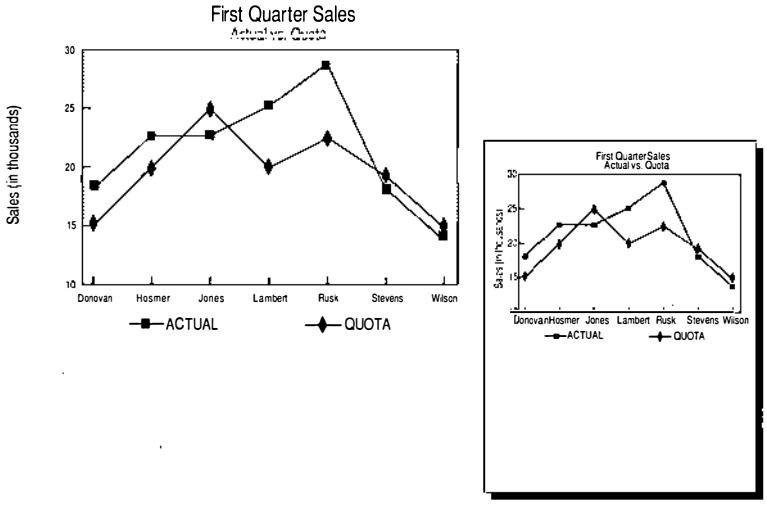


Figure 2-120. *A graph on the terminal and on paper*

Follow these steps to print a graph on a printer:

1. (Optional) Select /Print Printer Options Advanced Image to specify how you want your graph to appear on the page. For a description of available options, see /Print [E,P] Options Advanced Image. Then select Quit enough times to return to the /Print [E,F,P] menu (the menu that begins with Range).
2. Select /Print Printer Image.
3. Select Current or Named-Graph.

   Current selects the current graph (the graph 1-2-3 creates from the current graph settings). Named-Graph selects a named graph in any active file.
4. Make sure that your print spooler is active and your printer is online.
5. Select Align.

Selecting Align ensures that the headers, footers, graph, and page breaks will be in the correct spot when you print the graph.

6. Select Go to open the print job and begin formatting the graph data.

If you do not change any of the graph size settings with /Print [E,P] Options Advanced Image Image-Sz, 1-2-3 creates the largest graph that fits within the left and right margins of a page without changing the default shape of the graph (a rectangle with a width-to-length ratio of four to three).

NOTE As an alternative method of printing graphs, you can select /Print [E,P] Range and then type * (asterisk) followed by the name of a graph. See /Print [E,F,P] Range for details.

Printing a Range and a Graph on the Same Page

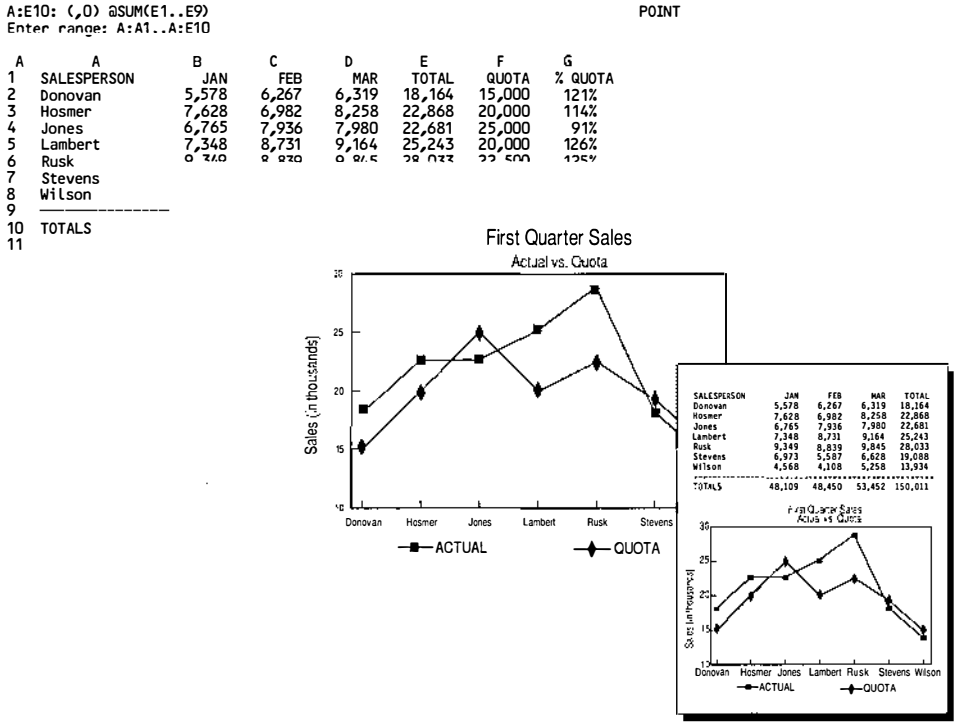


Figure 2-121. *A range and a graph printed on the same page*

Follow these steps to print a range and a graph on the same page:

NOTE This procedure will print the range first and then the graph. If you want to print the graph first, reorder the steps appropriately.

1. (Optional) Select /Print Printer Options to specify options for your printed range.

   For a description of available options, see /Print [E,F,P] Options. Then select Quit enough times to return to the /Print [E,F,P] menu (the menu that begins with Range).

2. Select /Print Printer Range.

3. Specify the range you want to print. The range can be in any active file.

   See /Print [E,F,P] Range for information on specifying a range to print.

4. Make sure that your print spooler is active and your printer is online.

5. Select Align.

   Selecting Align ensures that the headers, footers, graph, and page breaks will be in the correct spot when you print.

6. Select Go to open the print job and begin formatting the graph data.

7. (Optional) Select Options Advanced Image to specify how you want your graph to appear on the page.

   When printing text and graphs on the same page, it may be necessary to use /Print [E,P] Options Advanced Image Image-Sz to size the graph so it fits on the page. For a description of this command and other available options, see /Print [E,P] Options Advanced Image. Then select Quit enough times to return to the /Print [E,F,P] menu.

8. Select Image.

9. Select Current or Named-Graph.

   Current selects the current graph (the graph 1-2-3 creates from the current graph settings). Named-Graph selects a named graph in any active file.

10. Select Go to begin formatting the graph data.

11. If you want to print another range, repeat steps 2 through 4 and 6. If you want to print another graph, repeat steps 8 through 10.

NOTE You can also specify a graph to print with your print range by selecting /Print [E,P] Range and typing * (asterisk) followed by the name of a graph you want to print. See /Print [E,F,P] Range for details.

Print Command Descriptions

The Print command descriptions are organized in the following manner:

First, the seven top-level Print commands appear in alphabetical order. Three of these commands — /Print Encoded, /Print File, and /Print Printer — select your print destination and then let you use menus to select options for your printing.

Next, all the commands on the /Print Encoded, /Print File, and /Print Printer menus (the commands you can use after you select /Print Encoded, /Print File, or /Print Printer) appear in alphabetical order. Commands you can use with any of these destinations appear as /Print [E,F,P]. For example, the command to change margins is /Print [E,F,P] Options Margins because you can change margins whether you print to an encoded or text file or on a printer. Commands you can use with some but not all of the destinations appear with only the appropriate letters. For example, the command to specify a graph to print is /Print [E,P] Image because you can print a graph only to an encoded file or on a printer.

/Print Cancel

/Print Cancel is inoperative in UNIX versions of 1-2-3. Use /System to return to the UNIX shell and then use the appropriate command to cancel a print job for your print spooler.

/Print Encoded

/Print Encoded selects an encoded file on disk as the print destination. The file can include 1-2-3 data, graphs, and printer codes that tell your printer how to format your printing. The printer codes 1-2-3 uses are specific to your current printer. Because printers vary in the way they interpret codes, you probably will not be able to print the encoded file on a different printer. You also cannot read an encoded file back into 1-2-3.

Procedure

1. Select /Print Encoded.

For steps to create and print an encoded file, see "Creating an Encoded File" earlier in the Print commands.

/Print File

/Print File selects a text file on disk as the print destination. You can create text files to share data with other programs. You can also import text files back into 1-2-3 with /File Import.

Procedure

1. Select /Print File.

For steps to create and print a text file, see "Creating a Text File" earlier in the Print commands.

/Print Printer

/Print Printer selects a UNIX print spooler as the print destination.

Procedure

1. Select /Print Printer.

For steps to print on a printer, see "Printing a Range on a Printer," "Printing a Graph on a Printer," and "Printing a Range and a Graph on the Same Page" earlier in the Print commands.

/Print Quit

/Print Quit returns 1-2-3 to READY mode.

Procedure

1. Select /Print Quit.

/Print Suspend

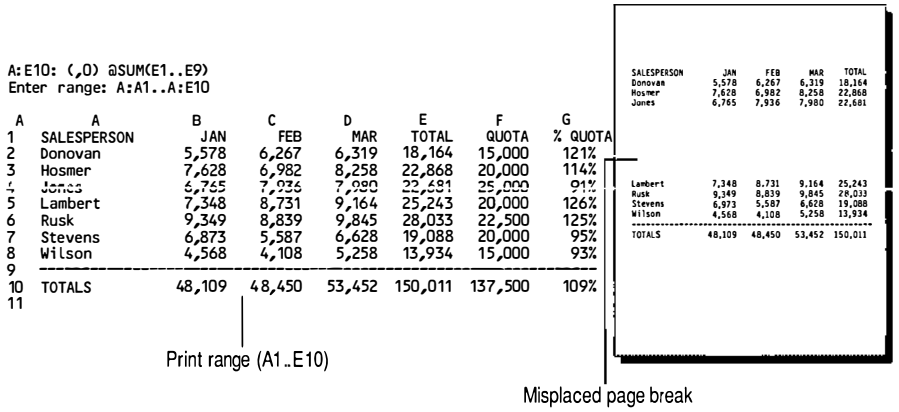
/Print Suspend is inoperative in UNIX versions of 1-2-3. Use /System to return to the UNIX shell and then use the appropriate command to suspend a print job for your print spooler.

/Print [E,F,P] Align

/Print [E,F,P] Align ensures that the headers, footers, graphs, and page breaks will be in the correct spot when you print. /Print [E,F,P] Align resets the page number to 1 and tells 1-2-3 that it is beginning to print at the top of a page.

Procedure

1. Select /Print [E,F,P] Align.
   Before you print, be sure to select /Print [E,F,P] Align. If you do not, 1-2-3 may put page breaks in the wrong place, leaving a gap in the middle of the page. See Figure 2-122.



	A	B	C	D	E	F	G
1	SALESPERSON	JAN	FEB	MAR	TOTAL	QUOTA	% QUOTA
2	Donovan	5,578	6,267	6,319	18,164	15,000	121%
3	Hosmer	7,628	6,982	8,258	22,868	20,000	114%
4	Jones	6,765	7,936	7,980	22,681	25,000	91%
5	Lambert	7,348	8,731	9,164	25,243	20,000	126%
6	Rusk	9,349	8,839	9,845	28,033	22,500	125%
7	Stevens	6,873	5,587	6,628	19,088	20,000	95%
8	Wilson	4,568	4,108	5,258	13,934	15,000	93%
9							
10	TOTALS	48,109	48,450	53,452	150,011	137,500	109%
11							

SALESPERSON	JAN	FEB	MAR	TOTAL
Donovan	5,578	6,267	6,319	18,164
Hosmer	7,628	6,982	8,258	22,868
Jones	6,765	7,936	7,980	22,681
Lambert	7,348	8,731	9,164	25,243
Rusk	9,349	8,839	9,845	28,033
Stevens	6,973	5,587	6,628	19,088
Wilson	4,568	4,108	5,258	13,934
TOTALS	48,109	48,450	53,452	150,011

Figure 2-122. *Incorrectly aligned print range*

/Print [E,F,P] Clear

/Print [E,F,P] Clear resets some or all of your current print settings.

Procedure

1. Select /Print [E,F,P] Clear.
2. Select All, Range, Borders, Format, Image, or Device.

All	Clears the current print range and graph name; clears all borders, headers, and footers; resets all formats and options to their default settings.
Borders	Clears all border settings.
Device	Returns the printer name and interface to the default settings.
Format	Resets margins, page length, layout, fonts, colors, setup strings, and graph settings to their default settings.
Image	Clears the name of the graph you selected to print.
Range	Clears the current print range.

3. Select new settings from the /Print menu or select Quit to return 1-2-3 to READY mode.

/Print [E,F,P] Go

/Print [E,F,P] Go opens a 1-2-3 print job (if one is not already open) and begins formatting your data for an encoded or text file, or a print spooler entry.

Procedure

1. If you are printing on a printer, make sure that your print spooler is active and your printer online.
2. Select /Print [E,F,P] Go.
3. (Optional) To print additional ranges or graphs with different options as part of the same print job, change your options, select the new ranges or graphs, and select Go again.
4. Select Quit.

   Quit closes the print job and returns 1-2-3 to READY mode. If you do not close the print job, the following happens:

   - If you are printing to a file, 1-2-3 does not complete saving the file on disk.
   - If your printer is attached to a network, the printer will not print your data.

   NOTE 1-2-3 also closes your print job when you press BREAK or press ESC enough times to return 1-2-3 to the top-level /Print menu.

/Print [E,F,P] Hold

/Print [E,F,P] Hold lets you leave a print job open and return 1-2-3 to READY mode so you can do any of the following:

- Make changes in the worksheet and then return to the /Print [E,F,P] menu and continue creating the same print job.
- Open a new worksheet file from which to print data and then continue creating the same print job.

Procedure

1. Select /Print [E,F,P] Hold.

The print job remains open until you do one of the following:

- Return to the /Print [E,F,P] menu to complete the print job.
- Select a different print destination (encoded or text file or printer).

If you try to end 1-2-3 with a print job open, 1-2-3 warns you that your printing is not complete. You can then choose to end 1-2-3 anyway or stay in 1-2-3 and complete the print job.

/Print [E,P] Image

/Print [E,P] Image selects the graph you want to print. You can select the current graph or a named graph in any active file.

Procedure

1. Select /Print [E,P] Image.
2. Select Current or Named-Graph.

   Current selects the current graph (the graph 1-2-3 creates from the current graph settings). Named-Graph selects a named graph in any active file.
3. If you selected Named-Graph, specify the name of the graph you want to print.

For detailed steps to print a graph on a printer, see "Printing a Graph on a Printer" earlier in the Print commands.

TIPS If you select /Print [E,P] Image to print graphs and your current printer cannot print graphs, 1-2-3 leaves blank space on the page or in the file where the graphs would have appeared.

1-2-3 remembers the most recent graph you specified, so if you want to print the same graph twice in a row, you can select /Print [E,P] Go without reselecting /Print [E,P] Image.

As an alternative method of printing graphs, you can select /Print [E,P] Range and type * (asterisk) followed by the name of one or more graphs you want to print. See /Print [E,F,P] Range for details.

/Print [E,F,P] Line

/Print [E,F,P] Line inserts a line feed (a blank line) printer control code into the formatting of the current data.

Use /Print [E,F,P] Line to insert blank lines between print ranges or graphs if you are printing several ranges or graphs in the same print job.

Procedure

1. Select /Print [E,F,P] Line.

Each time you select Line, 1-2-3 inserts the printer control codes to insert a new line in printed output (/Print Printer Line) or in a file (/Print Encoded Line, /Print File Line).

/Print [E,F,P] Options

The Print [E,F,P] Options commands perform the following tasks:

Command	*Task*
Advanced	Selects advanced settings for your printed data.
Borders	Sets one or more columns to print on the left of every page and every print range and/or one or more rows to print at the top of every page and above every print range. Also determines whether 1-2-3 prints the worksheet frame (worksheet and columns letters and row numbers) at the top and left of every page and every print range.
Footer	Enters a line of text just above the bottom margin of every page.
Header	Enters a line of text just below the top margin of every page.
Margins	Sets margins for the printed page or clears all margins.

(continued)

Command	*Task*
Name	Creates, selects, and deletes print settings names, and creates a table of print settings names in the current file.
Other	Determines whether 1-2-3 prints the worksheet data or the formulas underlying the data, whether 1-2-3 prints headers and footers and inserts page breaks, and whether 1-2-3 leaves space for headers and footers when you have not specified header and footer text.
Pg-Length	Sets the length of the page.
Quit	Returns you to the /Print [E,F,P] menu.
Setup	Lets you specify additional printer attributes available on your printer.

The following figure shows some of the settings you can select with the Print [E,F,P] Options commands.

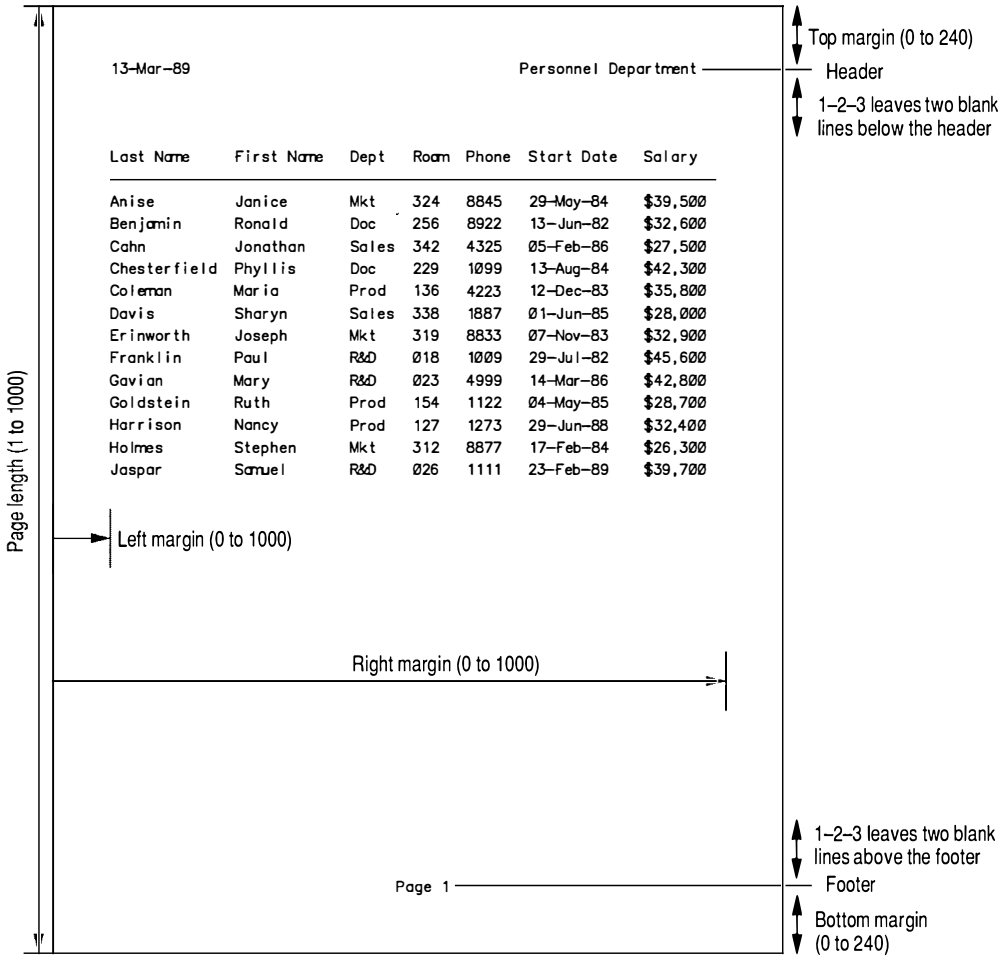


Figure 2-123. *Use /Print [E,F,P] Options to adjust settings such as margins and page length*

1-2-3 sets the default page length at 66 lines. When you print with the default page length, margins, and blank-header setting, 1-2-3 uses the 66 lines as follows:

Lines	*Use*
1 and 2	Top Margin
3	Header (or blank if you did not enter header text)
4 and 5	Blank
6 through 61	Print ranges and graphs
62 and 63	Blank
64	Footer (or blank if you did not enter footer text)
65 and 66	Bottom margin

TIPS If you use two printers and different 1-2-3 settings with each printer, create print settings names for the settings you use with each printer. Each time you change printers, you can use one of the print settings names so you do not have to reset your print settings manually. See /Print [E,F,P] Options Name for information on creating a print settings name.

Select /Worksheet Global Default Status to see the default settings for many of the print options.

/Print [E,P] Options Advanced

The Print [E,P] Options Advanced commands perform the following tasks:

Command	*Task*
AutoLf	Tells 1-2-3 whether your printer inserts a line feed automatically after each line.
Color	Selects a color for your printed text.
Device	Selects the type of printer and the UNIX print spooler to which a formatted print job is sent.
Fonts	Selects fonts for different sections of your printed page.

(continued)

Command	*Task*
Image	Selects formatting, such as rotation, size, shape, and density, for printed graphs.
Layout	Selects layout options for the printed page.
Priority	Determines the relative priority by which 1-2-3 submits print jobs to UNIX print spoolers.
Quit	Returns you to the /Print [E,F,P] Options menu.
Wait	Inoperative in UNIX versions of 1-2-3.

NOTE Not all printers are capable of using all of the advanced options. For instance, many printers cannot print in color or use different fonts. Use /Print [E,P] Sample to print a sample that shows what your printer prints when you select an option.

/Print [E,P] Options Advanced AutoLf tells 1-2-3 whether your printer inserts a line feed automatically after each line. If you indicate that your printer does not insert a line feed, then 1-2-3 inserts a line feed. If you indicate that your printer inserts a line feed, then 1-2-3 does not. This command overrides the default line-feed setting you specify with /Worksheet Global Default Printer AutoLf.

Use /Print [E,P] Options Advanced AutoLf when printing on a printer that uses a different line-feed setting from the default setting.

If you are not sure of the setting for your printer, refer to your printer manual or technical resource person, or print a range to see if your printer displays one of the problems mentioned in Tips below.

Procedure

1. Select /Print [E,P] Options Advanced AutoLf.
2. Select Yes if your printer automatically inserts a line feed after each printed line or select No (default) if your printer does not.

TIPS If the lines in your printout print on top of each other, neither your printer nor 1-2-3 inserted a line feed. Change the AutoLf setting to No.

If the lines in your printout are double spaced, both your printer and 1-2-3 inserted line feeds. Change the AutoLf setting to Yes.

/Print [E,P] Options Advanced Color selects a color for your printed text. 1-2-3 prints the headers, footers, and borders the same color as the print range. You have up to eight colors to choose from, depending on your printer. /Print [E,P] Options Advanced Color does not affect graphs. See /Graph Options Advanced Colors and /Graph Options Advanced Text [F,S,T] Color for information about setting colors for graphs.

Printers vary in their ability to print colors. Use /Print [E,P] Sample to print a sample that shows the available colors for your printer.

NOTE If you selected /Worksheet Global Format Other Color Negative so that 1-2-3 displays negative numbers in red on your terminal, negative numbers will also print in red (if your printer is capable of printing in color).

Procedure

1. Select /Print [E,P] Options Advanced Color.
2. Select the number (1 — 8) that corresponds to the color you want for the specified print range. You can select only one color for each print range.

TIP To print two ranges in different colors, specify your first range (/Print [E,F,P] Range) and the color for the range (/Print [E,P] Options Advanced Color), and select /Print [E,F,P] Go. Then specify your second range and the color for that range, and select /Print [E,F,P] Go again.

/Print [E,P] Options Advanced Device selects the type (brand) of printer to which you spool formatted print data and the print spooler to manage your print jobs.

Procedure

1. Select /Print [E,P] Options Advanced Device.
2. Select Name or Interface.
3. If you selected Name, 1-2-3 lists numbers corresponding to one of the printers your system administrator defined in **setup123**. The names of the printers are displayed in the menu long prompts. Select the number or letter of the type of printer you want to use.

   If you selected Interface, select the name of one of the print spoolers displayed on the menu. These print queues are defined in **setup123**.

TIP When you use /Print [E,P] Options Advanced Device Name to select a printer number (or letter) or /Print [E,P] Options Advanced Device Interface to select a UNIX print spooler, 1-2-3 saves your selections with your file. When you use the same file again, these selections determine the current printer number (or letter) and print spooler.

/Print [E,P] Options Advanced Fonts selects fonts for different sections of your printed page. You have up to eight fonts to choose from, depending on your printer. /Print [E,P] Options Advanced Fonts does not affect graphs. See /Graph Options Advanced Text [F,S,T] Font for information about setting fonts for graph text.

Printers vary in their ability to print fonts. Use /Print [E,P] Sample to print a sample that shows the available fonts for your printer.

Procedure

1. Select /Print [E,P] Options Advanced Fonts.
2. Select Range, Header/Footer, Border, Frame, or Quit.

Border	Selects the font 1-2-3 uses for borders.
Frame	Selects the font 1-2-3 uses for the worksheet frame.
Header/Footer	Selects the font 1-2-3 uses for headers and footers.

Quit	Returns you to the /Print [E,F,P] Options Advanced menu.
Range	Selects the font 1-2-3 uses for a print range.

If you select any option except Quit, 1-2-3 displays a list of numbers from 1 to 8, each corresponding to a font.

3. Select the number that corresponds to the font you want to use.
4. Select Quit to return to the /Print [E,F,P] Options Advanced menu.

NOTE Because the width of printed characters (except numbers) varies from font to font, changing fonts may change the number of characters that 1-2-3 prints. If 1-2-3 prints more or fewer characters than you expected, you can change the width of the columns that contain the characters. 1-2-3 prints more characters when a column is wider and fewer characters when a column is narrower. As an alternative, you can widen or narrow the print range. For more information about printing with proportional fonts, see the NOTE in /Print [E,F,P] Range.

TIP 1-2-3 assigns default font 1 for the range, headers and footers, borders, and the worksheet frame. The font depends on the printer you use, but the following table shows typical font assignments. There are many different serif and sans serif fonts; this table gives examples of a few.

Number	*Font*	*Example*
1	Serif	This is a serif font
2	Bold serif	**This is a bold serif font.**
3	Italic serif	*This is an italic serif font..*
4	Bold italic serif	***This is a bold italic serif font.***
5	San serif	This is a sans serif font.
6	Bold sans serif	**This is a bold sans serif font.**

(continued)

Number	*Font*	*Example*
7	Italic sans serif	*This is an italic sans serif font.*
8	Bold italic sans serif	***This is a bold italic sans serif font.***

To print two ranges in different fonts, specify your first range (/Print [E,F,P] Range), the font for the range (/Print [E,P] Options Advanced Font), and select /Print [E,F,P] Go. Then specify your second range, the font for that range, and select /Print [E,F,P] Go again.

/Print [E,P] Options Advanced Image performs the following tasks:

Command	*Task*
Density	Determines whether 1-2-3 prints graphs in final or draft density.
Image-Sz	Sets the size and shape of a printed graph.
Quit	Returns you to the /Print [E,F,P] Options Advanced menu.
Rotate	Determines whether 1-2-3 rotates your graph so it prints sideways on the page.

/Print [E,P] Options Advanced Image Density lets you print graphs in either final or draft density.

Procedure

1. Select /Print [E,P] Options Advanced Image Density.
2. Select Final (default) to print the graph in final (high) density or select Draft to print the graph in draft (low) density.

NOTE If your printer can print graphs in only one density or 1-2-3 supports only one density on your printer, this command has no effect.

TIP On some printers, graphs print faster in draft density. To save time, select Draft when you experiment to see how your graphs will look on paper. Select Final when you are ready to print your final copy.

/Print [E,P] Options Advanced Image Image-Sz sets the size and shape of your graphs when you print them. Use this command to reduce the size of a graph so it fits on the same page as your text or to expand the size of a graph to make the largest graph that will fit on a blank page.

The default graph shape is a rectangle with a width-to-length ratio of four to three — for every four units in width, there are three units in length.

NOTE When measuring the graph width and length, 1-2-3 includes all titles and legends that are in the graph.

Procedure

1. Select /Print [E,P] Options Advanced Image Image-Sz.
2. Select Margin-Fill (default), Length-Fill, or Reshape.

Length-Fill	Without changing the default graph shape, creates the largest graph possible using the length you enter.
Margin-Fill	Without changing the default graph shape, sizes a graph so it fills the page from the left margin to the right margin.
Reshape	Sizes a graph according to the width and length you enter.

3. If you selected Length-Fill, enter the graph length (the number of standard lines long).

   If you selected Reshape, enter the graph width (the number of standard-size characters wide) and the graph length (the number of standard lines long).

TIPS To print the largest graph that will fit on a blank page, use Reshape and specify dimensions that are larger than the width and length of the page. 1-2-3 reduces the dimensions so the graph fits on a page and then prints the graph on the next blank page.

When you select Length-Fill or Reshape and enter a length longer than a page, 1-2-3 prints the largest graph it can, centering the graph horizontally and vertically on the page. When you select Margin-Fill, 1-2-3 centers the graph horizontally; it does not center the graph vertically.

For information on how /Print [E,P] Options Advanced Image Image-Sz affects rotated graphs, see /Print [E,P] Options Advanced Image Rotate.

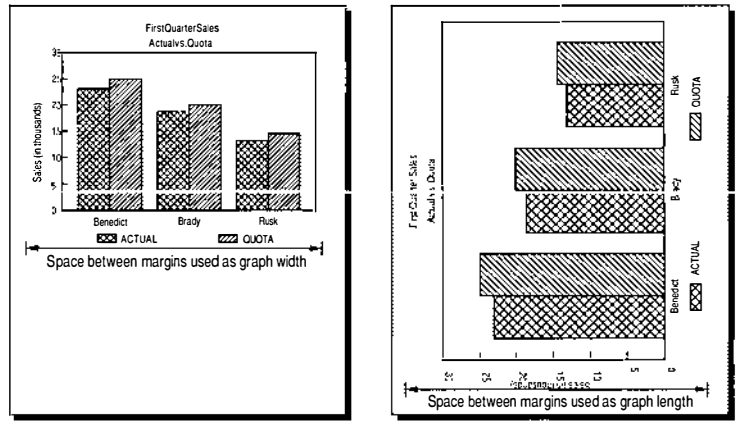
/Print [E,P] Options Advanced Image Quit returns you to the /Print [E,F,P] Options Advanced menu.

Procedure

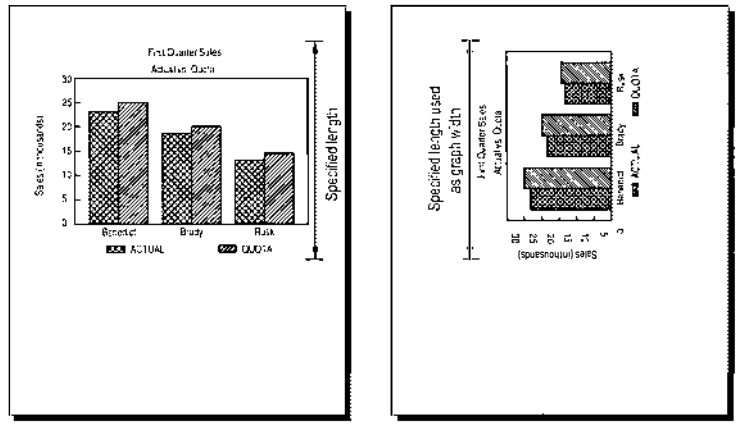
1. Select Print [E,P] Options Advanced Image Quit.

/Print [E,P] Options Advanced Image Rotate determines whether 1-2-3 prints graphs upright or rotated (sideways) on the page. The dimensions of the rotated graph depend on your /Print [E,P] Options Advanced Image Image-Sz setting:

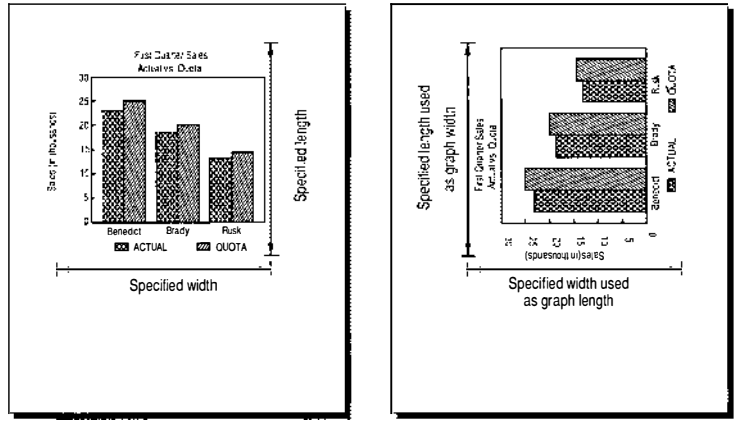
- When you use Margin-Fill (default) for your image size and rotate the graph, the width-to-length ratio of four to three stays the same, but the space between the right and left margins is now considered the length rather than the width. See Figure 2-124.
- When you use Length-Fill for your image size and rotate the graph, the width-to-length ratio of four to three stays the same, but the length you specified is now considered the width. See Figure 2-124.
- When you use Reshape for your image size and rotate the graph, the dimensions of the area in which 1-2-3 draws the graph do not change. The graph rotates within that area. See Figure 2-124.



Graphs created using Margin–Fill as the Image–Sz setting



Graphs created using Length–Fill as the Image–Sz setting



Graphs created using Reshape as the Image–Sz setting

Figure 2-124. ***Upright and rotated graphs using different Image-Sz settings***

NOTE If your printer cannot rotate graphs, /Print [E,P] Options Advanced Image Rotate has no effect.

Procedure

1. Select /Print [E,P] Options Advanced Image Rotate.
2. Select No (default) to print the graph upright on the page or select Yes to rotate the graph 90 degrees counterclockwise.

TIP /Print [E,P] Options Advanced Image Rotate does not affect the way 1-2-3 prints a range of data. To rotate ranges of data as well as graphs, use /Print [E,P] Options Advanced Layout Orientation Landscape, if your printer is capable of landscape printing.

/Print [E,P] Options Advanced Layout performs the following tasks:

Command	*Task*
Line-Spacing	Determines how much space 1-2-3 allocates for each printed line and, therefore, how many lines fit on a printed page.
Orientation	Determines whether 1-2-3 prints in portrait mode or landscape mode, if landscape mode is available on your printer.
Pitch	Determines how much space 1-2-3 allocates for each printed character and, therefore, how many characters fit on a printed line.
Quit	Returns you to the /Print [E,F,P] Options Advanced menu.

/Print [E,P] Options Advanced Layout Line-Spacing determines how much space 1-2-3 allocates for each printed line and, therefore, how many lines fit on a printed page. 1-2-3 offers two line-spacing options: Standard and Compressed. The actual spacing of these options depends on the printer you use. For example, if you use an HP LaserJet printer, standard line spacing is 6 lines per inch (66 lines per page on an 11" piece of paper) and compressed line spacing is 8 lines per inch (88 lines per page on an 11" piece of paper).

Printers vary in their ability to alter line spacing. Use /Print [E,P] Sample to print a sample that shows the line-spacing options available for your printer.

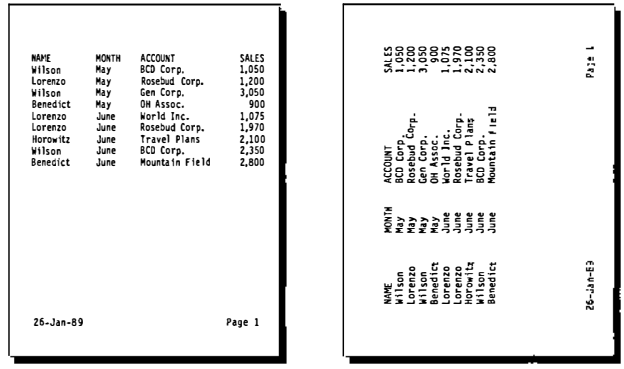
Procedure

1. Select /Print [E,P] Options Advanced Layout Line-Spacing.
2. Select Standard (default) or Compressed.

   Standard returns to the default line spacing for your printer. Compressed prints more lines per page.

TIP When you use /Print [E,P] Options Advanced Layout Line-Spacing, 1-2-3 automatically accommodates for the different number of lines per page. You do not have to change the page-length setting. (When you use a setup string to specify line spacing, you do have to change the page-length setting.)

/Print [E,P] Options Advanced Layout Orientation determines whether 1-2-3 prints in **portrait mode** (across the width of the paper) or **landscape mode** (across the length of the paper), if landscape mode is available on your printer.



NAME	MONTH	ACCOUNT	SALES
Wilson	May	BCD Corp.	1,050
Lorenzo	May	Rosebud Corp.	1,200
Wilson	May	Gen Corp.	3,050
Benedict	May	OH Assoc.	900
Lorenzo	June	World Inc.	1,075
Lorenzo	June	Rosebud Corp.	1,970
Horowitz	June	Travel Plans	2,100
Wilson	June	BCD Corp.	2,350
Benedict	June	Mountain Field	2,800

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NAME	MONTH	ACCOUNT	SALES
Wilson	May	BCD Corp.	1,050
Lorenzo	May	Rosebud Corp.	1,200
Wilson	May	Gen Corp.	3,050
Benedict	May	OH Assoc.	900
Lorenzo	June	World Inc.	1,075
Lorenzo	June	Rosebud Corp.	1,970
Horowitz	June	Travel Plans	2,100
Wilson	June	BCD Corp.	2,350
Benedict	June	Mountain Field	2,800

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Figure 2-125. *A range printed in portrait mode and in landscape mode*

NOTE If your printer cannot print in landscape mode, /Print [E,P] Options Advanced Layout Orientation has no effect.

Procedure

1. Select /Print [E,P] Options Advanced Layout Orientation.
2. Select Portrait (default) or Landscape.

TIPS When you print in landscape mode, change the margin settings and page length to reflect the different page orientation.

When you select Landscape, 1-2-3 prints both text and graphs sideways on the page. If you want to rotate graphs but not text, use /Print [E,P] Options Advanced Image Rotate.

/Print [E,P] Options Advanced Layout Pitch determines how much space 1-2-3 allocates for each printed character and, therefore, how many characters fit on a printed line. 1-2-3 offers three pitch options: Standard, Compressed, and Expanded. The actual character width for each of these options depends on your printer. For example, on an HP LaserJet printer, standard character width is 10 characters per inch (cpi), compressed character width is 17 cpi, and expanded character width is 5 cpi.

Printers vary in their ability to alter pitch. Use /Print [E,P] Sample to print a sample that shows the pitches available for your printer.

Procedure

1. Select /Print [E,P] Options Advanced Layout Pitch.
2. Select Standard (default), Compressed, or Expanded.

Compressed	Prints narrower characters and more characters per line.
Expanded	Prints wider characters and fewer characters per line.
Standard	Returns printing to the default pitch for your printer.

TIP When you use /Print [E,P] Options Advanced Layout Pitch, 1-2-3 automatically accommodates for the different number of characters per line. You do not have to change the margin settings. (When you use a setup string to specify pitch, you do have to change the margin settings.)

/Print [E,P] Options Advanced Layout Quit returns you to the /Print [E,P] Options Advanced menu.

Procedure

1. Select Print [E,P] Options Advanced Layout Quit.

/Print Printer Options Advanced Priority determines the relative priority that 1-2-3 uses in submitting 1-2-3 print jobs to UNIX spoolers.

/Print [E,P] Options Advanced Quit returns you to the /Print [E,F,P] Options menu.

Procedure

1. Select /Print [E,P] Options Advanced Quit.

/Print Printer Options Advanced Wait is inoperative in UNIX versions of 1-2-3.

/Print [E,F,P] Options Borders

/Print [E,F,P] Options Borders sets one or more columns to print to the left of every page and every print range and/or one or more rows to print at the top of every page and above every print range. This command also determines whether to print the **worksheet frame** (worksheet and column letters and row numbers) at the top and the left of every page and every print range.

/Print [E,F,P] Options Borders does not create borders for graphs.

Procedure

1. Select /Print [E,F,P] Options Borders.
2. Select Columns, Rows, Frame, or No-Frame.

Columns	Specifies columns you want to print as vertical headings on the left side of each printed page and every print range.
Frame	Prints the worksheet frame to the left of and above each printed page and every print range.
No-Frame	Cancels printing of the worksheet frame.
Rows	Specifies rows you want to print as horizontal headings at the top of each printed page and above every print range.

3. If you selected Rows or Columns, specify a range that includes the rows or columns you want to use as a border. The range needs to include only one cell from each of the rows or columns you want as a border.

   NOTE Do not include in your print range the rows and columns you specified as borders or 1-2-3 will print those rows and columns twice.

1-2-3 prints borders that correspond only to the rows and columns in your print range. For instance, if you specify D3..D15 as your print range and column A as your border, 1-2-3 prints the entries in cells A3 through A15 as the border.

1-2-3 takes the border columns and rows from the same worksheets that contain the print range. For instance, if you specify A:D3..C:D15 as your print range and column A as your border, 1-2-3 prints A:A3..A:A15 as the border for the range A:D3..A:D15, B:A3..B:A15 as the border for the range B:D3..B:D15, and C:D3..C:D15 as the border for the range C:D3..C:D15.

Examples

Figure 2-126 shows a range printed with no borders and then with three different border settings.

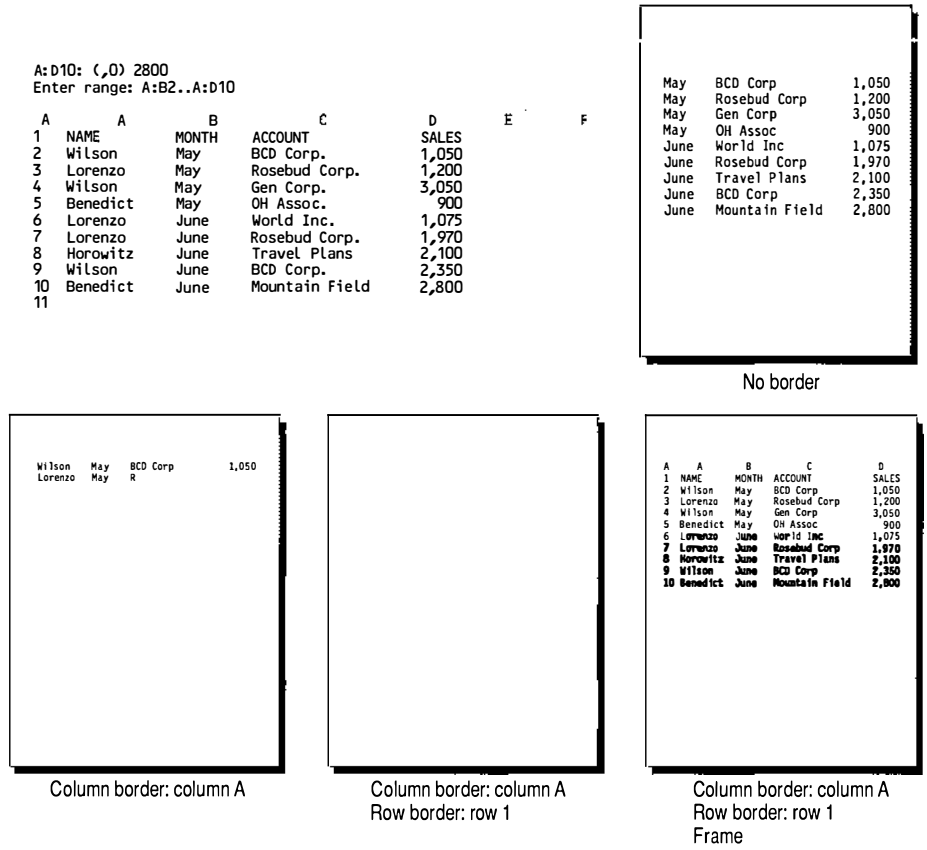


Figure 2-126. *Using column, row, and frame borders*

/Print [E,F,P] Options Footer

/Print [E,F,P] Options Footer creates a **footer**, which is a line of text just above the bottom margin of every page, whether the page contains data, graphs, or both.

A footer can be up to 512 characters long but cannot extend beyond the right margin. 1-2-3 uses five symbols to format footers: # (pound sign), ## (double pound signs), @ (at sign), | (vertical bar), and \ (backslash).

- Use # (pound sign) to include a page number on every printed page. 1-2-3 numbers your pages consecutively, starting with the number 1.
- Use ## (double pound signs) followed by a number to specify a particular number for the first page of your printout. For instance, use ##5 to number pages consecutively starting with the number 5.
- Use @ (at sign) to include the current date on every page of printed data.

  NOTE The date in the footer always prints in the format DD-MM-YY.

- Use | (vertical bar) to separate a footer into left-aligned, centered, and right-aligned segments. 1-2-3 left-aligns footer text you type before one vertical bar, centers footer text you type after one vertical bar, and right-aligns footer text you type after a second vertical bar. If you do not type any vertical bars, 1-2-3 left-aligns the entire footer.
- Use \ (backslash) followed by a cell address or range name to copy to a footer the contents of a cell that the address or range name refers to. For example, \B1 would fill the footer with the contents of cell B1. After you type the backslash, you can use POINT mode to highlight the cell that contains the footer text. When you use this method, the contents of the cell will be the only text in the footer and will be left-aligned.

  NOTE If you specify a range as the address of your footer, 1-2-3 uses the contents of only the first cell of the range.

Figure 2-127 shows three different footers for page 7 of a personal budget printed on January 12, 1989.

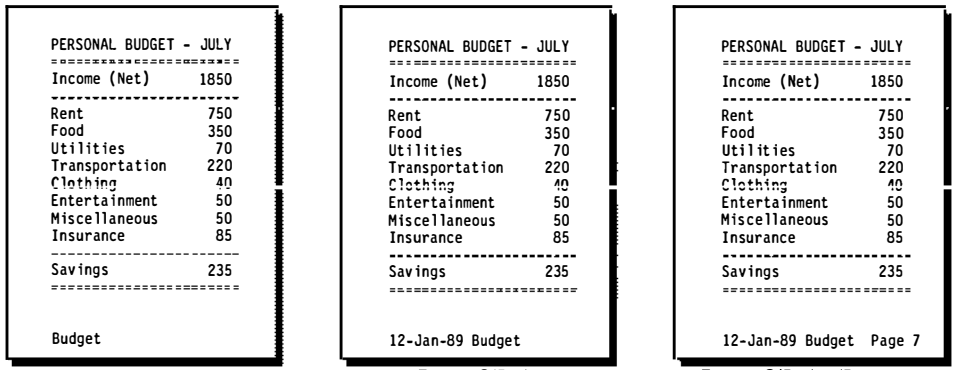


Figure 2-127. *You can left-align, center, or right-align footer text*

Procedure

1. Select /Print [E,F,P] Options Footer.
2. Specify the footer text.

1-2-3 prints the footer on the line above the bottom margin. 1-2-3 always leaves two blank lines between printed data and the footer. For example, if you have a bottom margin of 2, 1-2-3 uses 5 lines at the bottom of each page — 2 between the data and the footer, 1 for the footer, and 2 for the bottom margin. See /Print [E,F,P] Options Other Blank-Header for options when you do not specify footer and header text.

TIP Select /Print [E,F,P] Page after printing a print job that includes footers. 1-2-3 will not print the footer on the last page of the print job unless you select Page.

/Print [E,F,P] Options Header

/Print [E,F,P] Options Header creates a **header**, which is a line of text just below the top margin of every page, whether the page contains data, graphs, or both. 1-2-3 leaves two blanks lines between the header and the beginning of the printed data. You create headers in the same way you create footers. For more details, see /Print [E,F,P] Options Footer.

/Print [E,F,P] Options Margins

/Print [E,F,P] Options Margins sets left, right, top, and bottom margins or clears all margin settings.

Use /Print [E,F,P] Options Margins only if you want to set margins that are different from the default margins settings.

1-2-3 uses the following default margin settings (unless you changed the /Worksheet Global Default Printer margin settings):

Margin	*Setting*
Bottom	2 lines from the bottom of the page
Left	4 characters from the left edge of the page
Right	76 characters from the left edge of the page
Top	2 lines from the top of the page

Procedure

1. Select /Print [E,F,P] Options Margins.
2. Select Left, Right, Top, Bottom, or None.

   1-2-3 displays the current margin setting, unless you selected None. If you selected None, 1-2-3 sets the left, top, and bottom margins to 0 and the right margin to 1000.
3. Enter a margin setting. For Left and Right, you can enter any number from 0 to 1000. For Top and Bottom, you can enter any number from 0 to 240.

TIPS 1-2-3 measures margins in standard-size characters. For instance, if your left margin is 2, 1-2-3 leaves space in the left margin for 2 standard-size characters, even if you use /Print [E,P] Options Advanced Layout Pitch Compressed or Expanded. Because 1-2-3 measures margins in standard-size characters, your margins will always line up, even if you use more than one character pitch on a page.

In addition, you do not have to change your margin settings when you use 1-2-3 commands to change your pitch. For instance, if you select a left margin of 2 and a right margin of 76, each line has room for 74 standard-size characters. If you select /Print [E,P] Options Advanced Layout Pitch Compressed, 1-2-3 automatically accommodates for the number of compressed characters that fit on a line that is 74 standard-size characters wide.

When you use a setup string (/Print [E,P] Options Setup) to specify pitch, 1-2-3 does not measure margins in standard-size characters. You will, therefore, have to change your margin settings to accommodate for the new number of characters per line.

If you select /Print [E,F,P] Options Margins None, be sure to set at least the right margin before you print a graph. Because the size of the graph is determined by the margins, if you do not set the right margin, the graph may not fit properly on your paper.

If you select /Print [E,F,P] Options Margins None and try to print a range that is wider than your printer can print, you will get unexpected results. For instance, your printer might print part of each line on subsequent lines or truncate part of each line.

/Print [E,F,P] Options Name

/Print [E,F,P] Options Name creates, selects, and deletes print settings names and creates a table of print settings names in the current worksheet file. A **print settings name** is a name you assign to the current print settings so you can reuse the same settings without having to respecify them. For example, you might create two print settings names: DRAFT that contains settings you often use with your draft-quality printer and FINAL that contains settings you often use with your high-quality printer. Or you might create a print settings name for print settings (including the print range) you use for a report you print on a regular basis.

The Print [E,F,P] Options Name commands perform the following tasks:

Command	*Task*
Create	Assigns a name to the current print settings.
Delete	Deletes one print settings name.
Reset	Deletes all print settings names in the current file.

(continued)

Command	*Task*
Table	Creates an alphabetical list of print settings names in the current file.
Use	Makes the print settings assigned to the name you specify the current print settings.

/Print [E,F,P] Options Name Create assigns a name to the current print settings. Use this command to create a new print settings name or to change the settings assigned to an existing print settings name. Once you create a print settings name, you can use /Print [E,F,P] Options Name Use to retrieve the settings assigned to the name.

Procedure

1. Use the Print commands to set the print settings the way you want them. For example, if you want 1-2-3 to print a header, select /Print [E,F,P] Options Header and specify a header.
2. Select /Print [E,F,P] Options Name Create.
3. Specify a name for the print settings.

   A print settings name can contain up to 15 characters, including any combination of letters, numbers, and symbols, except << (left double angle brackets).

   CAUTION If you specify an existing print settings name, 1-2-3 replaces the settings previously assigned to that name with the current settings.

TIPS To change the settings assigned to a print settings name, follow these steps:

1. Select /Print [E,F,P] Options Name Use.
2. Specify the print settings name whose settings you want to change.
3. Use the Print commands to change the settings you want.
4. Select /Print [E,F,P] Options Name Create.
5. Specify the same print settings name as in step 2.

1-2-3 assigns the new print settings to the print settings name.

/Print [E,F,P] Options Name Delete deletes one print settings name.

Procedure

1. Select /Print [E,F,P] Options Name Delete.
2. Specify the print settings name you want to delete.

/Print [E,F,P] Options Name Reset deletes all print settings names in the current worksheet file.

Procedure

1. Make sure the cell pointer is in the file whose print settings names you want to reset.
2. Select /Print [E,F,P] Options Name Reset.

/Print [E,F,P] Options Name Table creates an alphabetical list of the print settings names in the current worksheet file.

Procedure

1. Decide on a location for the print settings name table. The table can be anywhere in the current file. The table will occupy one column and as many rows as there are print settings names.

   CAUTION Make sure the table location is blank or contains dispensable data because 1-2-3 writes over existing data when it creates the table.

2. Make sure the cell pointer is in the file whose print settings names you want to list.
3. Select /Print [E,F,P] Options Name Table.
4. Specify the location you decided on in step 1. You need to specify only the first cell of the location.

/Print [E,F,P] Options Name Use makes the print settings assigned to the name you specify the current print settings.

Procedure

1. Select /Print [E,F,P] Options Name Use.
2. Specify the name of the print settings you want to use.

/Print [E,F,P] Options Other

/Print [E,F,P] Options Other determines whether 1-2-3 prints the worksheet data or the formulas underlying the data, whether 1-2-3 prints headers and footers and inserts page breaks, and whether 1-2-3 inserts space in place of headers and footers when you have not specified header or footer text.

Procedure

1. Select /Print [E,F,P] Options Other.
2. Select As-Displayed (default), Cell-Formulas, Formatted (default), Unformatted, or Blank-Header.

As-Displayed	Prints the data as it appears on the screen. Use this option to return to regularly formatted printing after you have selected Cell-Formulas.
Blank-Header	Determines whether 1-2-3 inserts three blank lines at the top and bottom of each page when you have not entered header or footer text.
Cell-Formulas	Prints the following information about each cell in the print range: the cell address; the cell format; the protection status (P or U); the number, formula, or label in the cell; and any annotation in the cell. 1-2-3 does not print borders, even if you specify them.
Formatted	Prints with all formatting options you selected (or the default settings if you selected none), including page breaks, headers, and footers. Use this option to return to regularly formatted printing after you have selected Unformatted.
Unformatted	Prints without page breaks, headers, footers, and top and bottom margins. Use this option if you are printing to a text file and do not want to leave space in the file for page breaks (for example, if you are printing to a file for use with another program).

1-2-3 returns you to the /Print [E,F,P] Options menu after you select any of the options except Blank-Header.

3. If you selected Blank-Header, select Suppress or Print.

   Suppress tell 1-2-3 not to insert three blank lines in place of the header and footer when you specify neither header nor footer text. This command suppresses the blank lines only when the header and footer are both blank.

4. (Optional) If you want to select a combination of options, such as Cell-Formulas and Unformatted, select Other again and then select another option.

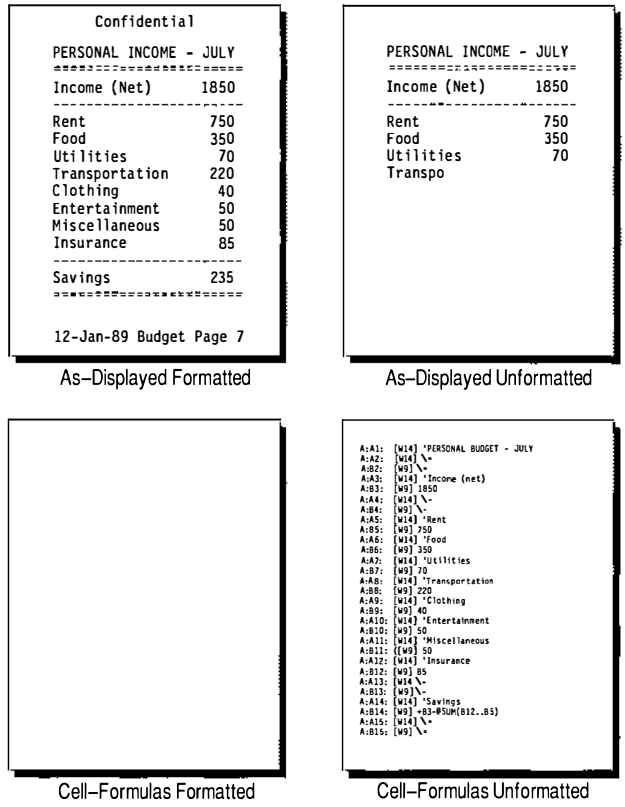


Figure 2-128. *Four formatting options for printing your data*

/Print [E,F,P] Options Pg-Length

/Print [E,F,P] Options Pg-Length sets the length of each page, measured in standard lines. Changing the page length changes the number of lines per page available for printing data and graphs. This command overrides the /Worksheet Global Default Printer Pg-Length setting for the current session.

1-2-3 sets a default page length of 66 lines, which is appropriate for printers that print 6 lines per inch on 11" paper.

Procedure

1. Select /Print [E,F,P] Options Pg-Length.
2. Enter a number from 1 to 1000.

TIPS

1-2-3 measures page length in standard lines. For instance, if you specify a page length of 66, 1-2-3 considers your page length to be 66 standard lines. If you then select /Print [E,P] Options Advanced Layout Line-Spacing Compressed, 1-2-3 automatically accommodates for the number of compressed lines that fit on a page that is 66 standard lines long (usually 88 compressed lines).

When you use a setup string to specify line spacing, 1-2-3 does not measure page length in standard lines. You will, therefore, have to change your page length to accommodate for the new number of lines per page.

Laser printers often have special rules for determining the length of a page. Consult your printer manual for assistance.

/Print [E,F,P] Options Quit

/Print [E,F,P] Options Quit returns you to the /Print [E,F,P] menu.

Procedure

1. Select /Print [E,F,P] Options Quit.

/Print [E,P] Options Setup

/Print [E,P] Options Setup lets you use printer attributes that are not on the 1-2-3 menus, such as underlining and double-strike mode, if the attributes are available on your printer. This command overrides the default setup string you specify with /Worksheet Global Default Printer Setup.

To specify printer attributes not available on the 1-2-3 menus, you must use setup strings. A **setup string** is a series of characters preceded by a \ (backslash). Setup strings represent printer control codes that give instructions to the printer.

NOTE Do not use setup strings and menu commands together for printer attributes. Doing so could cause 1-2-3 to print your data differently from how you intended. Use either all menu commands or all setup strings.

Procedure

1. Select /Print [E,P] Options Setup.
2. Specify a setup string (up to 512 characters).

TIPS You can enter setup strings in cells to switch from one print style to another within a single print range. Enter the setup string in the first column of the print range in a row by itself. Precede the setup string with | | (two vertical bars). The blank rows that contain the setup strings do not print.

Most setup strings work only with the printer model for which they were created. If you change printers or share files with someone who uses a different printer, be sure to change or clear the setup string. To clear the setup string, select /Print [E,P] Options Setup, press ESC, and then press ENTER.

/Print [E,F,P] Page

/Print Printer Page inserts a printer control code for a new page. If you specified a footer, 1-2-3 prints the footer at the bottom of the current page before advancing to the next page.

Procedure

1. Select /Print [E,F,P] Page.

/Print [E,F,P] Quit

/Print [E,F,P] Quit closes the current print job and returns 1-2-3 to READY mode. If you do not close the print job, the following happens:

- If you are printing to a file, 1-2-3 does not complete saving the file on disk.

Procedure

1. Select /Print [E,F,P] Quit.

NOTE 1-2-3 also closes your print job when you press BREAK or press ESC enough times to return to the top-level /Print menu.

TIP To return 1-2-3 to READY mode without closing the current print job, select /Print [E,F,P] Hold before you leave the /Print [E,F,P] menu.

/Print [E,F,P] Range

/Print [E,F,P] Range specifies the print range, which is the data 1-2-3 prints when you select /Print [E,F,P] Go.

Procedure

1. Select /Print [E,F,P] Range.
2. Specify the print range.

   The print range can include any number of ranges and named graphs in any active file.

   - To set a single range as the print range, specify the range.

     If the print range includes a long label, include in the print range the cells the long label overlaps as well as the cell in which you entered the long label. For example, to print a long label entered in A1 that overlaps B1 and C1, be sure you include cells A1, B1, and C1 in the print range.

   - To set multiple ranges as the print range, place an argument separator after each range to separate it from the next range. (Lotus recommends using the semicolon as an argument separator because it remains valid regardless of the current /Worksheet Global Default Other International Punctuation setting.)

For example, specify d1..f12;summary;a:a1..c:b5 to print the range D1..F12 from the current worksheet, then the range named SUMMARY from the current worksheet, and then the range A1..B5 from worksheets A through C.

- To specify a named graph as part of the print range, type an * (asterisk) followed by the name of the graph. For example, type *first_qtr to specify a graph named FIRST_QTR.

If you specify multiple ranges and/or graphs, 1-2-3 prints them below one another in the order you specified them. If any of the ranges you specified is wider than the space between the left and right margins, 1-2-3 prints the data that does not fit within the margins on subsequent pages.

NOTE When you print labels on a printer that supports proportionally spaced fonts, the number of characters your printer prints may differ from the number of characters you expect. This discrepancy occurs because your printer changes the width of the characters (except numbers). Because the characters are a different width, more or fewer characters may fit in the space you specified to print.

For instance, if your column width is 9 and your print range is 1 column wide, your printer prints the number of proportionally spaced characters that fit in a space that is 9 standard-size characters wide. (A standard-size character has the same width as any number.)

To change the number of characters that 1-2-3 prints, do any of the following:

- Change the width of the columns that contain your print range. If the columns are wider, 1-2-3 prints more characters; if the columns are narrower, 1-2-3 prints fewer characters.
- Increase or decrease the area you specify as your print range.

- Select a different font or printer (if available). The width of proportionally spaced characters varies from font to font and printer to printer.

If you use more than one proportionally spaced font in a print job, printed columns may not line up correctly unless the width of the characters is the same for each font.

TIPS When a print range includes hidden columns, 1-2-3 does not print the hidden columns.

1-2-3 remembers the last print range you specified. To print the same range twice in a row, you can select /Print [E,F,P] Go without reselecting /Print [E,F,P] Range.

If you specified multiple ranges, when you select Range again, 1-2-3 displays all of the ranges in the control panel but highlights in the worksheet only the last range you specified. To add another range, type ; (semicolon) and then specify a new range. To delete or edit a range, press EDIT and edit the range address.

/Print [E,F,P] Sample

/Print [E,F,P] Sample prints a sample that shows your current print settings and the capabilities of your printer. The sample includes the following four sections:

- Print settings

  This section lists the current print settings.

- Sample worksheet

  1-2-3 prints a small range using the current print settings (except borders). The worksheet shows you left-aligned, centered, and right-aligned labels, as well as positive and negative values formatted in General and Currency formats.

  NOTE 1-2-3 does not print cell formulas when it prints the sample worksheet, even if you specified /Print [E,F,P] Options Other Cell-Formulas.

- Printer capabilities

  This section shows what your printer prints when you select fonts 1 through 8; colors 1 through 8; standard, compressed, and expanded pitch; and standard and compressed line spacing. If your printer cannot produce an option, the sample shows what your printer does print when you select the option. For instance, if you select /Print [E,P] Options Advanced Layout Pitch Expanded and your printer cannot print expanded characters, the sample text for expanded pitch will be in standard-size characters, which is what your printer prints when you select expanded characters.

- Sample graph and graph text options

Because the purpose of /Print [E,F,P] Sample is to show you the current print settings and your printer's capabilities, the sample that 1-2-3 prints differs from other forms of printing in several ways.

- The worksheet data and graph that 1-2-3 prints are preset. You do not specify a range or graph to print.
- If your margins are too small for 1-2-3 to print the entire width of the sample worksheet on one page, the printout does not overflow onto another page.
- If you have a color printer, 1-2-3 always prints negative numbers in color, even if you have not selected /Worksheet Global Format Other Color Negative.
- If you have a color printer, 1-2-3 always prints the graph in color, even if you selected /Graph Options B&W.
- If you have not selected a color or font for your print range, 1-2-3 uses the default color and font and displays 0 for color and font in the print settings section of the sample.
- The size and font options for text in graphs are always shown at full size.

Procedure

1. Use the Print commands to specify your format settings, such as fonts and margins.
2. Select /Print [E,F,P] Sample.
3. Select Align.
4. Select Go.

If you selected /Print Encoded Sample, 1-2-3 creates an encoded file that contains the sample described above. If you selected /Print File Sample, 1-2-3 creates a text file that contains some of the sample described above. Text files cannot contain graphs or show different printer capabilities. If you selected /Print Printer Sample, 1-2-3 prints the sample described above.

NOTE When using /Print [E,F,P] Sample, do not use a setup string that includes the master reset code for your printer. Doing so could cause unexpected results.

TIPS Print and save the sample as a reference for options available on your printer.

Each time you change your print settings, the print sample reflects the change.

If your printer cannot print graphs, you can select /Print [E,F,P] Options Advanced Image Image-Sz Length-Fill and enter 1 for the length. Doing so reduces the amount of blank space that 1-2-3 leaves for the graph and the graph text options charts.

When you select /Print Sample Go, 1-2-3 always prints the entire sample. If you are interested in only part of the sample, you can select /Print Cancel at any time to stop 1-2-3 from printing the rest of the sample.

Quit Command

/Quit

/Quit ends the current 1-2-3 session and returns you to the UNIX shell, or to the application that invoked 1-2-3, depending on how you started 1-2-3.

Procedure

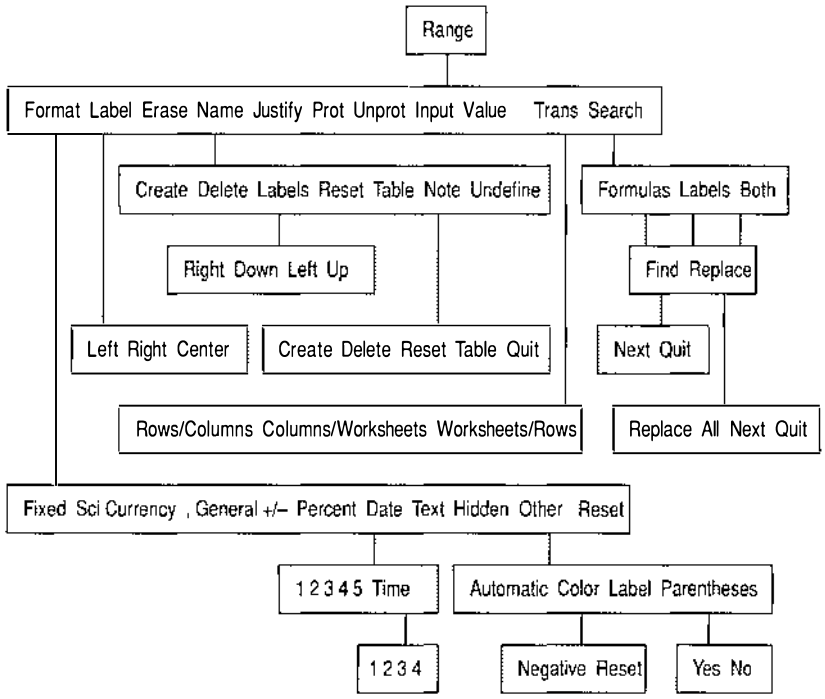
1. Select /Quit.
2. Select No to return 1-2-3 to READY mode or Yes to end the current 1-2-3 session.

   If you selected Yes and have worksheets you have changed but not saved, 1-2-3 displays another No/Yes menu and asks if you want to end the 1-2-3 session anyway.

   - Select No to cancel /Quit so you can save the worksheets.
   - Select Yes to end 1-2-3 without saving the worksheets.

TIP To suspend the 1-2-3 session temporarily so you can use operating system commands without clearing worksheets from memory, use /System.

Range Commands



The Range commands work with ranges. A **range** is any rectangular block of cells — a single cell, a row or column, parts of several rows and columns, or an entire worksheet. The block can be three-dimensional, spanning adjacent worksheets. Figure 2-129 shows several examples of ranges.

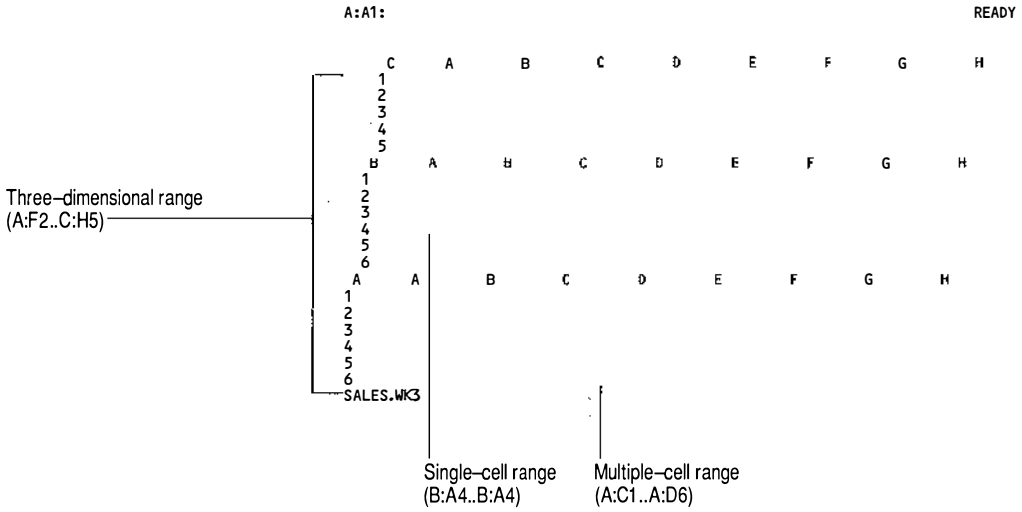


Figure 2-129. *Ranges*

The Range commands perform the following tasks:

Command	*Task*
/Range Erase	Erases data in a range.
/Range Format	Changes the display of data in a range.
/Range Input	Restricts cell-pointer movement to unprotected cells in a range (used in conjunction with /Range Unprot).
/Range Justify	Rearranges a column of labels so the labels fit within a specified width.
/Range Label	Left-aligns, right-aligns, or centers labels in a range.
/Range Name	Creates, deletes, and undefines range names; creates and deletes range name notes; and generates tables of range names and notes.
/Range Prot	Prevents changes to cells in a range when the worksheet or worksheets the range occupies are globally protected (necessary only if you previously unprotected the cells with /Range Unprot).

(continued)

Command	*Task*
/Range Search	Finds or replaces all occurrences of a specified string in a range.
/Range Trans	Copies a range of data, transposing the layout of the copied data and replacing any copied formulas with their current values.
/Range Unprot	Allows changes to cells in a range when the worksheet or worksheets the range occupies are globally protected or during /Range Input or the advanced macro command {FORM}.
/Range Value	Copies a range of data, replacing any copied formulas with their current values.

Common Uses for Range Commands

The Range commands help you work with data quickly and efficiently. They also help you design clear, flexible, and easy-to-use applications. For example, while creating a profit-and-loss projection, you could use the Range commands to do any of the following:

- Display some numbers in Currency format, others in Percent format, and negative numbers in color (/Range Format).
- Right-align row titles and center column titles for the projection (/Range Label).
- Assign names to different ranges in the projection to let you move quickly from one range to another, and document the contents of each named range (/Range Name).
- During experiments with different profit-and-loss figures, copy the values that result from each set of figures for future reference (/Range Value).
- From a series of long labels, create a paragraph that summarizes the projection's contents and assumptions (/Range Justify).

Reading Path

Before you begin working with the Range commands, read "Working with Ranges" in Chapter 1 for an in-depth introduction to ranges. This section explains the different methods you can use to specify a range.

- For hands-on experience with some of the Range commands and with specifying ranges in commands and formulas, complete Lessons 4 through 6 in *Tutorial*.
- Refer to specific commands in "Range Command Descriptions" for more detailed information.

Also, remember that you can press HELP when you are using any Range command to get information about the command. In addition, you can refer to *Task Summary* to identify the Range command that accomplishes a particular task.

Range Command Descriptions

The following sections describe each of the Range commands in alphabetical order.

/Range Erase

/Range Erase erases the data in a range but leaves the cell format(s) for the range intact.

Procedure

1. Select /Range Erase.
2. Specify the range you want to erase.

TIPS To reset a range's cell format to the global cell format, use /Range Format Reset.

To erase all active worksheets and files from memory and replace them with a single blank worksheet, use /Worksheet Erase.

To erase selected worksheets within an active file or an entire active file and close up the space left by the deletion, use /Worksheet Delete Sheet or /Worksheet Delete File.

/Range Format

/Range Format sets the **cell format** (the way 1-2-3 displays data) for a range, overriding the global cell format set with /Worksheet Global Format. In Figure 2-130, the global cell format is General, but cells D9 and D11 have been formatted differently with /Range Format.

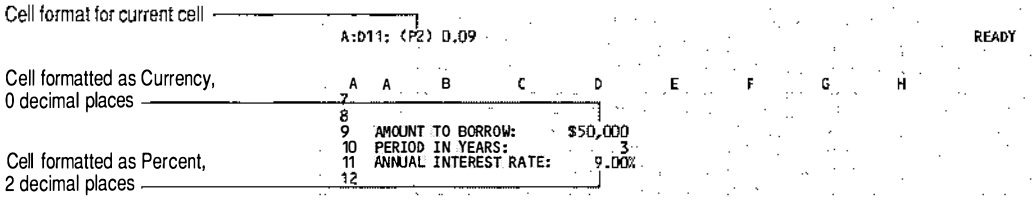


Figure 2-130. *Individual cells formatted with /Range Format*

Before using /Range Format, note the following:

- Most cell formats affect the way 1-2-3 displays only numeric data. Hidden and Text formats, however, also affect the display of labels and/or all formulas.
- Changing a cell's format changes the way 1-2-3 displays data in the cell but not the data itself. You can, for example, choose a cell format that displays 45.123 as $45, but 1-2-3 still stores the value as 45.123 and uses the decimal places when calculating.

Procedure

1. Select /Range Format.
2. Choose the cell format you want from the series of menus and prompts 1-2-3 displays. The table that follows this procedure explains each cell format.
3. Specify the range you want to format.

4. If 1-2-3 displays a cell filled with asterisks after you use /Range Format, it usually means the column is not wide enough to display the entire number in the selected cell format. The column must be one character wider than the width of the number as formatted. To remove the asterisks and redisplay the number, widen the column with /Worksheet Column Set-Width or /Worksheet Global Col-Width.

Whenever the cell pointer is on a cell in the formatted range, 1-2-3 displays in the control panel the first character of the cell format name and (if applicable) the number of decimal places. For example, the notation (C0) means Currency format with 0 decimal places; (P2) means Percent format with 2 decimal places.

The following table describes the /Range Format menu and includes examples of data in each cell format. The examples show the data as it is entered in the third column and the way 1-2-3 displays the data (preceded by the control-panel notation for that format) in the fourth column. For instance, in the description of Currency format, the example 12 (C2) $12.00 shows that when you enter 12 in a cell formatted as Currency, 2 decimal places, 1-2-3 displays $12.00.

		Examples	
Format	*Result*	*Data as entered*	*Data as displayed*
, (Comma)	Displays numbers with thousands separators up to 15 decimal places, parentheses or a minus sign (depending on the /Worksheet Global Default Other International Negative setting) for negatives, and a leading zero for decimal values. Comma format is the same as Currency format without the currency symbol.	8999 –15000 .5532765	(,2) 8,999.00 (,0) (15,000) (,1) 0.6

(continued)

Format	Result	Examples	
		Data as entered	*Data as displayed*
Currency	Displays numbers with a currency symbol, thousands separators, up to 15 decimal places, parentheses or a minus sign (depending on the /Worksheet Global Default Other International Negative setting) for negatives, and a leading zero for decimal values. The currency symbol 1-2-3 uses depends on the current /Worksheet Global Default other International currency setting.	12 –.256 1149.99	(C2) $12.00 (C1) ($0.3) (C0) $1,150
Date	Displays numbers from 1 (the date number for 1 January 1900) to 73050 (the date number for 31 December 2099) as dates, in the Date format you select. 1-2-3 uses the integer part of a number to determine the date the number represents, and ignores the decimal part of the number.	32734.11 32734.99 @DATE (89,8,14) @TODAY @NOW	(D1) 14-Aug-89 (D2) 14-Aug (D3) Aug-89 (D4) 08/14/89 *(if today is 8/14/89)* (D5) 08/14 *(if today is 8/14)*
	There are five Date formats (D1 — D5): DD-MMM-YY, DD-MMM, MMM-YY, Long Intn'l, and Short Intn'l.		
	For numbers less than 1 or more than 73050, displays asterisks.	–2 73052	(D1) ********* (D2) *********
Date Time	Displays numbers as times, in the Time format you select. 1-2-3 uses the decimal part of a number to determine the time the number represents. For positive numbers, 1-2-3 calculates the time number by adding the decimal part of the number to zero. For negative numbers, 1-2-3 calculates the time number by subtracting the decimal part of the number from one.	.5855 –.5855 @TIME(14, 3,7) @NOW	(D6) 02:03:07 PM (D7) 09:56 AM (D8) 14:03:07 (D9) 14:03 (*if it is 2:03 PM)*
	There are four Time formats (D6 — D9): HH:MM:SS (AM/PM), HH:MM (AM/PM), Long Intn'l (24 hour), and Short Intn'l (24 hour).		

(continued)

Format	Result	Examples: Data as entered	Examples: Data as displayed
Fixed	Displays number with up to 15 decimal places, a minus sign for negatives, and a leading zero for decimal values.	12.389 –8152 .56745	(F0) 12 (F2) –8152.00 (F1) 0.6
General	Displays numbers with a minus sign for negatives, no thousands separators, and no trailing zeros to the right of the decimal point.	1650.00 –12.42700	(G) 1650 (G) –12.427
	When the number of digits to the left of the decimal point exceeds the column width minus one, uses scientific notation. When the number of digits to the right of the decimal point exceeds the column width, rounds the number.	130000000000 123.876876	(G) 1.3000E+11 *(when column width is 12)* (G) 123.8769 *(when column width is 9)*
Hidden	Makes data in the range invisible, though the data still exists. The data appears in the control panel unless the cells are protected.	+C22/4.2*B2 12.42738	(H) (H)
Other	Presents more formatting choices: Automatic, Color, Label, and Parentheses, as described below.		
Other Automatic	Displays existing numbers in the formatted range in General format. If a new entry in the range looks like a number formatted as Comma, Currency, Fixed, Percent, or Scientific, 1-2-3 stores the entry as a number and formats the cell according to the entry's format. If a new entry looks like a date formatted as D1, D2, or D4, or a time formatted as any Time format except D9 when configured as HH.MM, 1-2-3 stores the entry as a date or time number and formats the cell according to the entry's Date or Time format. Subsequent entries in the cell inherit the new format.	24.5% 12-Oct-88	(P1) 24.5% *(data stored as 0.245)* (D1) 12-Oct-88 *(data stored as 32428, the date number for 12 October 1988)*
	If a new entry in the range starts with a character that puts 1-2-3 in LABEL mode, stores the entry as a label and formats the cell as Label.	Number Sold % Returned	(L) 'Number Sold (L) '% Returned

(continued)

Format	*Result*	*Examples* *Data as entered*	*Data as displayed*
	If a new entry in the range starts with a number but also includes spaces or non-numeric characters, stores the entry as a label and formats the cell as Label.	5 Forest Dr. 717!222!41	(L) '5 Forest Dr. (L) '717!222!41
	If a new entry in the range is an invalid formula, stores the entry as a label and formats the cell as Label.	+TOT*(INT–.01	(L)'+TOT*(INT–.01
Other Color Negative	Displays negative numbers (including minus sign or parentheses) in a different color or at a brighter intensity	–2450 2450	(–)–2450 *in color* (–)2450
Other Color Reset	The initial Color setting. Turns off Color Negative formatting. Displays negative and non-negative numbers in the same color or intensity.	–2450 2450	–2450 2450
Other Label	Displays existing numbers in the range in General format. Automatically adds the worksheet's global label prefix to all new entries in the range (except for entries you create using Data commands).	02138 +B2*RATE \A	(L) '02138 (L) '+B2*RATE (L) '\A
Other Parentheses No	The initial Parentheses setting. Removes the parentheses added with Parentheses Yes formatting.	12.35 –12.35 Assets	12.35 –12.35 Assets
Other Parentheses Yes	Encloses all numeric values in the range in parentheses, but does not otherwise change the appearance of the values.	12.35 –12.35 Assets	(()) (12.35) (()) (–12.35) (()) Assets
Percent	Displays numbers as percentages (that is, multiplies by 100), with up to 15 decimal places and a percent sign.	12.42738 –.0425	(P1) 1242.7% (P2) –4.25%

(continued)

Format	*Result*	*Examples* *Data as entered*	*Data as displayed*
+/–	Displays a bar of plus or minus signs or a period. The number of plus or minus signs in the bar equals the integer value of the entry. Plus signs indicate a positive value, minus signs indicate a negative value, and a period indicates a number between –1 and 1. If the integer value of the entry exceeds the width of the column the entry is in, 1-2-3 displays asterisks instead of a bar.	5.9 –3 –.024	(+) +++++ (+) --- (+) .
Reset	Resets the range to the global cell format (specified with /Worksheet Global Format).		
Sci (Scientific)	Displays numbers in scientific (exponential) notation, with up to 15 decimal places in the mantissa and an exponent from –99 to +99.	–4.3 12.245 124600000000	(S0) –4E+00 (S1) 1.2E+01 (S2) 1.25E+11
Text	Displays formulas as entered rather than their values (or as much of the formulas as fit within the current column width); displays numbers in General format. For annotated formulas and numbers, displays the annotation as well.	+C22/4.2*B2 +FIRST&LAST 165.00 165.03	(T)+C22/4.2*B2 (T)+FIRST&LAST (T)165 (T)165.03

TIPS The /Worksheet Global Default Other International menu includes several commands that affect the display of numbers, dates, and times. For example, /Worksheet Global Default Other International Negative affects the display of negative numbers in cells formatted as Comma or Currency.

If your default currency symbol (set with /Worksheet Global Default Other International Currency) consists of multiple characters or a multibyte character and precedes numbers, Automatic formatting does not work with Currency format. For example, if your default currency symbol is # (pound-symbol) with a space after it (two characters) and the symbol precedes numbers, you cannot use Automatic formatting to format cells as Currency. The only exception to this

rule is $ (dollar symbol) with a space after it; with this two-character prefix currency symbol, Automatic formatting does work with Currency format.

When you format a range as Hidden, you can avoid accidentally writing over data in the range by protecting the worksheets it occupies with /Worksheet Global Prot Enable. If users need to enter data in the protected worksheets, they can unprotect specific ranges with /Range Unprot.

To redisplay a range of hidden data, select /Range Format Reset or format the range as any format other than Hidden.

When you move data in a formatted range, 1-2-3 moves the cell format with the data. The original range reverts to the global cell format.

When you copy data in a formatted range, 1-2-3 copies the cell format with the data.

When a file is in GROUP mode and you format a range in one worksheet in the file, 1-2-3 formats the same range in all other worksheets in the file as well.

Depending on the number of decimal places you specify when you format a range as Comma, Currency, Fixed, Percent, or Scientific, or the column width when you format a range as General, 1-2-3 may display entries in a rounded-off form. 1-2-3 continues to use the full value of those entries in calculations, however. To use a rounded-off value in a calculation, use @ROUND.

/Range Input

/Range Input limits cell-pointer movement and data entry to unprotected cells in a range so you can enter or edit data in those cells but in no others. This command works in conjunction with /Range Unprot.

In most cases, /Range Input is used for data entry in a fill-in-the-blanks entry form, with the unprotected cells acting as the blanks in the form (Figure 2-131). /Range Input is commonly used in interactive macros.

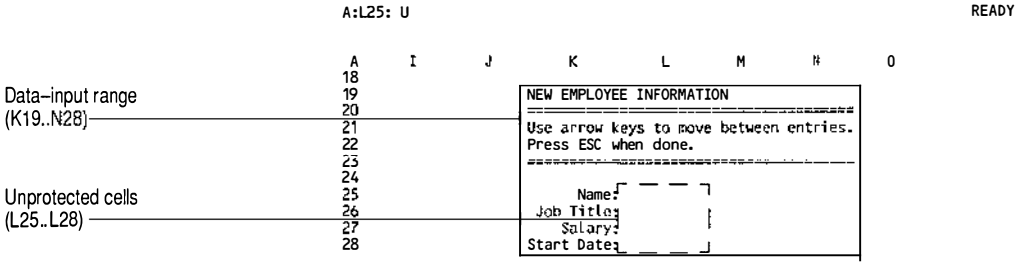


Figure 2-131. *Fill-in-the-blanks entry form for use with /Range Input*

Procedure

1. (Optional) Set up a fill-in-the-blanks entry form. The entry form should include text that will prompt for the information you want entered in the blanks; for example, Name:, Job Title:, Salary:, and Start Date:. It should also include any instructions for filling in the blanks (Figure 2-131).
2. Select /Range Unprot.
3. Specify the cell or cells in which you want to enter or edit data during the /Range Input command. In Figure 2-131, the range L25..L28 is unprotected.
4. Select /Range Input.
5. Specify the data-input range.

   The **data-input range** is any range that includes the cells you unprotected in step 3. In Figure 2-131, the data-input range is K19..N28.

   NOTE If you set up an entry form (step 1), be sure to include the entire entry form — not just the blank cells — in the data-input range.

   1-2-3 moves the data-input range to the upper left corner of the screen, with the cell pointer in the first unprotected cell in the range.
6. Enter or edit data in the unprotected cells. You can move the cell pointer only to the unprotected cells in the data-input range (Figure 2-132).

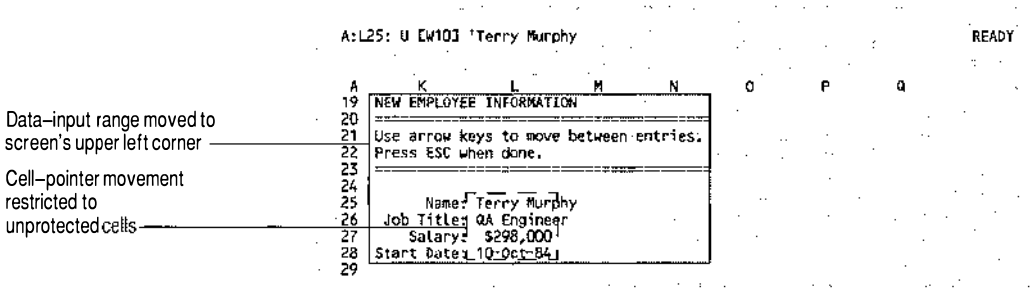


Figure 2-132. *Entry form with data, after selecting /Range Input*

7. To end the /Range Input command, press either ENTER or ESC when 1-2-3 displays READY in the mode indicator.

1-2-3 returns the cell pointer to the cell it was in before you selected /Range Input and restores unrestricted cell-pointer movement.

TIPS When 1-2-3 gets to a /Range Input command in a macro, 1-2-3 suspends the macro until you press ENTER or ESC to end the /Range Input command. At that point 1-2-3 continues executing the macro.

Instead of using /Range Input in a macro, you may prefer to use the advanced macro command {FORM}. {FORM} sets up an entry form just as /Range Input does, but it gives you more control over user input. See {FORM} in Chapter 4.

/Range Justify

/Range Justify rearranges (justifies) a column of labels so the labels fit within a width you specify. To use this command, global protection must be off for the worksheet that contains the column of labels.

Use /Range Justify to equalize the length of a series of labels, to fit text into a specific width for viewing or printing, to create a paragraph in a worksheet, or to rejustify an edited paragraph. Figure 2-133 shows the result of justifying six long labels, in A2..A7, to fit within the width of columns A, B, C, and D.

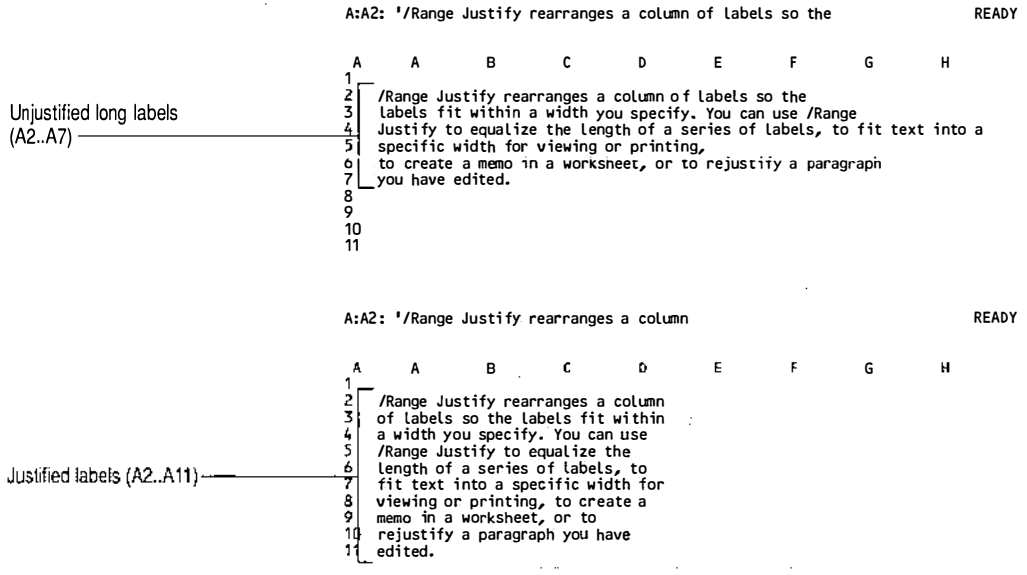


Figure 2-133. *Justifying a column of labels*

Procedure

1. Move the cell pointer to the first cell in the column of labels you want to justify. This positions the cell pointer correctly for specifying the justify range in step 3.
2. Select /Range Justify.
3. Specify the justify range.

   The width and length of the justify range control the way 1-2-3 performs the justification:

   - The total width of the columns in the justify range determines the maximum width of the justified labels (to a limit of 512 characters).
   - The total number of rows in the justify range affects the result of /Range Justify as follows:

   If you specify a single-row justify range, 1-2-3 justifies the entire column of labels to fill the width of the justify range. If the justified labels occupy more rows than the original labels, 1-2-3 moves subsequent data in the column (data below the justified labels) down. If the justified labels occupy fewer rows than the original labels, 1-2-3 moves

subsequent data up (Figure 2-134). Use a single-row justify range only if all cells below the labels you are justifying are blank or if movement of data below the labels is acceptable.

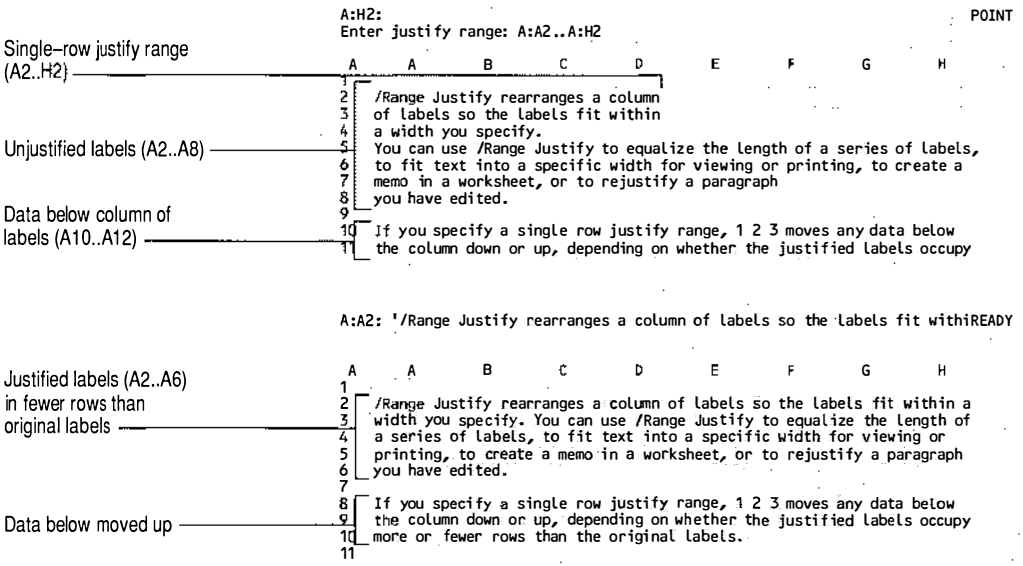


Figure 2-134. *Effect of a single-row justify range*

If you specify a multiple-row justify range, 1-2-3 limits the justification to the specified range and does not move data below the justify range (Figure 2-135). If you use a multiple-row justify range, be sure the range is wide and deep enough to hold the entire series of justified labels.

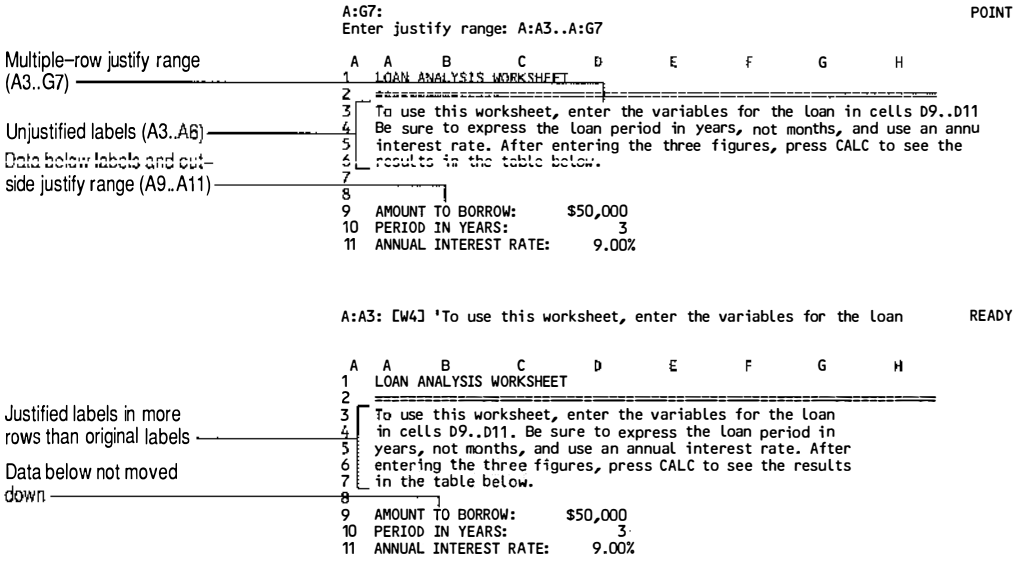


Figure 2-135. *Effect of a multiple-row justify range*

When 1-2-3 performs the justification, it left-aligns all the justified labels and assigns the entire column of justified labels the cell format and protection status of the first cell in the column.

If you specified a three-dimensional justify range, 1-2-3 justifies the column of labels in each worksheet separately.

TIPS

/Range Justify justifies only one column of labels at a time. (A blank cell or numeric value marks the end of a column of labels.)

Using /Range Justify on cells whose contents are used in string formulas most likely will change or invalidate the results of the string formulas.

1-2-3 has some text-editing capabilities, such as search and replace, but it is not a word processing program. To process text that you generate in 1-2-3, use /Print File to store the text in a text file, then use a word processing program to edit the text file. Conversely, to bring text stored in text files into a worksheet, use /File Import Text.

/Range Label

/Range Label changes the alignment of labels in a range by changing their label prefix (' for left-aligned, " for right-aligned, or ^ for centered).

Procedure

1. Select /Range Label.
2. Select Left, Right, or Center.
3. Specify the range of labels whose alignment you want to change.

TIPS Labels that exceed the width of a column appear left-aligned no matter what label prefix they have.

When a file is in GROUP mode, using /Range Label in one worksheet in the file affects the same range in all other worksheets in the file as well.

/Range Name

Range names are names of up to 15 characters that you use instead of cell or range addresses in commands and formulas. For example, if you assign the name SALES to A5..D9, you can move the cell pointer to A5 with GOTO SALES, total the numbers in A5..D9 with the formula @SUM(SALES), and print the data in A5..D9 by specifying SALES as the print range. Range names are generally easier to remember and can be typed more quickly than the addresses to which they correspond.

Range names can be in one of two states: **defined** (associated with a range address) or **undefined** (not associated with a range address). To create a defined range name, you use /Range Name Create or Labels. To create an undefined range name, you use /Range Name Undefine or enter a formula that contains a range name you have not yet defined.

When a range name is defined, you can use it in commands and formulas. When a range name is undefined, you can use it in formulas but not in commands. Formulas that contain undefined range names evaluate to ERR until you define the range names.

The Range Name commands perform the following tasks:

Command	*Task*
Create	Creates defined range names.
Delete	Deletes a defined range name and its note, if the range name has a note.
Labels	Creates defined range names for single-cell ranges, using labels in adjacent cells as the range names.
Note	Creates, deletes, and lists range name notes.
Reset	Deletes all defined range names and range name notes in the current file.
Table	Lists all defined range names in the current file, along with their addresses.
Undefine	Undefines a defined range name by dissociating the name from a range address.

/Range Name Create

/Range Name Create assigns a name to a range. You can create as many range names as system memory can support.

Procedure

1. Select /Range Name Create.
2. Specify a range name of up to 15 characters. 1-2-3 does not distinguish between uppercase and lowercase letters in range names.

   NOTE To prevent confusion when using range names in formulas and advanced macro commands, follow these guidelines when you create range names:

   - Do not create names that look like cell addresses, such as P12 or EX100. In searching for data or performing operations, 1-2-3 assigns a greater priority to cell addresses than to range names. If you ask 1-2-3 to copy a range of cells named T1 to cell address U1, 1-2-3 will first look in the cell address T1, copy data in that cell to U1, and then look no further.
   - Do not use @function names, advanced macro command keywords, or 1-2-3 function key names as range names.

- Do not create range names that begin with a number, such as 20DEC, or consist entirely of numbers, such as 1989. You cannot include such range names in a formula.

3. Specify the range you want to name.

NOTE If 1-2-3 displays a range name instead of an address at the 'Enter range' prompt, it means that the range name you specified is currently assigned to an external table.

If the specified range name formerly was assigned to another range in the same file or to an external table, 1-2-3 reassigns the name to the new range when you complete step 3.

In any formulas that use a range address to refer to the range you named, 1-2-3 automatically replaces the range address with the range name. For example, suppose the formula @SUM(A1..A5) exists when you assign the name TOTALS to A1..A5. 1-2-3 automatically changes @SUM(A1..A5) to @SUM(TOTALS).

NOTE If the range you named consists of a single cell, such as D20, the range name replacement occurs only in formulas that use a range address (that is, D20..D20 as opposed to just D20) to refer to the single-cell range. For example, suppose the formulas @AVG(D20..D20) and +D20*1.2 exist when you assign the name SCORES to D20. 1-2-3 automatically changes the first formula to @AVG(SCORES) but leaves the second formula as +D20*1.2.

TIPS Normally, when you copy formulas that contain range names, 1-2-3 treats the range names as relative references and so replaces the names with addresses in the copied formulas. For example, suppose you enter the formula @SUM(TOTALS) in A10, where TOTALS is the name for A1..A5, and then copy the formula to C10. The copied formula in C10 reads @SUM(C1..C5). To have 1-2-3 treat a range name in a formula as an absolute reference, precede the range name with a $ (dollar sign). For example, if you enter @SUM($TOTALS) in A10 and then copy it to C10, the formula in C10 reads @SUM($TOTALS), where TOTALS still refers to A1..A5.

@SUM($TOTALS) in A10 and then copy it to C10, the formula in C10 reads @SUM($TOTALS), where TOTALS still refers to A1..A5.

When a /Move, /Worksheet Delete, /Worksheet Insert, or /Worksheet Page command moves the first or last cell of a named range, 1-2-3 adjusts the range name's definition.

If, when using /Move, you move data into the first or last cell of a named range, the range name becomes undefined. Formulas that used that range evaluate to ERR.

/Range Name Delete

/Range Name Delete deletes a defined range name (and the range name's note, if it has one) but leaves the data in the range unchanged.

Procedure

1. Select /Range Name Delete.
2. Specify the range name you want to delete.

In any formulas that use the deleted range name, 1-2-3 replaces the range name with the corresponding range address.

TIP /Range Name Delete does not delete range names assigned to external tables with /Data External Use.

/Range Name Labels

/Range Name Labels assigns range names to single-cell ranges, using the labels in adjacent cells as the range names.

Use /Range Name Labels if you want to assign an existing label as the range name for the cell immediately above, below, to the right, or to the left of the label.

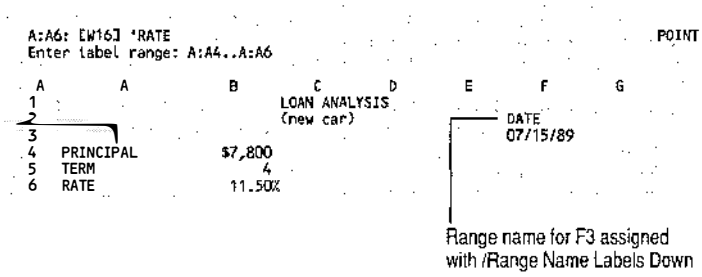


Figure 2-136. *Assigning range names with /Range Name Labels*

Procedure

1. Select /Range Name Labels.
2. Select Right, Down, Left, or Up, depending on the position of the cells you are naming relative to the labels. For example, if the labels are in A4..A6 and the cells you are naming are in B4..B6, select Right.
3. Specify the range that contains the labels you want to use as range names.

   NOTE 1-2-3 uses only the labels in the range as range names; it ignores any numbers or formulas in the range. If any of the labels exceed 15 characters, 1-2-3 uses only the first 15 characters.

   To prevent confusion when using range names in formulas and advanced macro commands, avoid assigning the following types of labels as range names:

   - Labels that start with the character ! or that include spaces, commas, semicolons, periods, or the characters + * – / & > < @ and #.
   - Labels that look like cell addresses, such as P12 or EX100.
   - Labels that duplicate @function names, advanced macro command keywords, or 1-2-3 key names.
   - Labels that begin with a number, such as 20DEC, or consist entirely of numbers, such as 1989. 1-2-3 does not accept such range names in formulas.

If a label in the specified range duplicates a range name that already exists in the same file, 1-2-3 reassigns the range name to the new range. However, if a label in the specified range duplicates an external table range name (assigned with /Data External Create or Use), 1-2-3 ends the /Range Name Labels command with an error message when it reaches that label.

In any formulas that use a range address (for example, B5..B5 as opposed to just B5) to refer to a cell you named with /Range Name Labels, 1-2-3 automatically replaces the range address with the corresponding range name. For example, suppose the formulas @MAX(B5..B5) and +B5/30 exist when you assign the name APRIL to B5. 1-2-3 automatically changes the first formula to @MAX(APRIL), but because the second formula uses a cell address instead of a range address, 1-2-3 leaves that formula as +B5/30.

TIP Use /Range Name Labels Right to assign a macro range name after documenting the range name to the left of the macro's starting cell. See "Creating a Macro" in Chapter 4 for more information on creating, naming, and documenting macros.

/Range Name Note

A **range name note** is a note you attach to a range name to describe the contents of the corresponding named range. For example, you can use a range name note to record when data in a named range was entered and who entered it.

The Range Name Note commands perform the following tasks:

Command	*Task*
Create	Creates a note for a defined range name or lets you edit an existing note.
Delete	Deletes a note for a defined range name.
Quit	Returns 1-2-3 to READY mode.

(continued)

Command	*Task*
Reset	Deletes all range name notes in the current file, including notes for undefined range names.
Table	Lists the defined range names in the current file, along with their addresses and (for those that have notes) range name notes. Also lists any undefined range names with notes.

/Range Name Note Create creates a note for a defined range name or lets you edit an existing note.

Procedure

1. Select /Range Name Note Create.
2. Specify the range name for which you want to create or edit a note.
3. Type a range name note, or edit the displayed note, and press ENTER.

   The note can include up to 512 characters.

The range name note remains attached to the range name for the current session, and if you save the file, for future 1-2-3 sessions as well.

TIPS To edit a note for an undefined range name, redefine the range name with /Range Name Create or Labels and then select /Range Name Note Create.

/Range Name Note Create does not create notes for range names assigned to external tables with /Data External Use.

/Range Name Note Delete deletes a note for a defined range name.

Procedure

1. Select /Range Name Note Delete.
2. Specify the range name whose note you want to delete.

TIP To delete the note for an undefined range name, redefine the range name with /Range Name Create or Labels and then select /Range Name Note Delete.

/Range Name Note Quit returns 1-2-3 to READY mode.

Procedure

1. Select /Range Name Note Quit.

/Range Name Note Reset deletes all range name notes in the current file, including notes for undefined range names.

Procedure

1. Make sure the cell pointer is in the file whose range name notes you want to delete.
2. Select /Range Name Note Reset.

/Range Name Note Table creates a three-column table that alphabetically lists range names in the current file, along with their addresses if defined and range name notes if they have notes (Figure 2-137). The list includes all defined range names and any undefined range names that have notes. If you assigned range names to any external tables with /Data External Use, the list also includes those range names along with the full table names of the corresponding external tables.

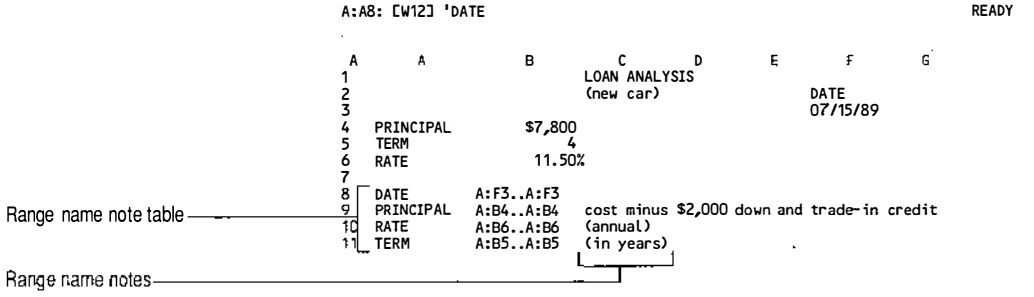


Figure 2-137. *A range name note table*

Procedure

1. Decide on a location for the range name note table. The table can be in any active file. The table will occupy three columns and as many rows as there are range names plus one blank row.

CAUTION Make sure the table location is blank or contains dispensable data because 1-2-3 writes over existing data when it creates the table.

2. Make sure the cell pointer is in the file whose range names and notes you want to list.
3. Select /Range Name Note Table.
4. Specify the location you decided on in step 1. You need to specify only the first cell of the table's location.

TIP If you use /Range Name Note Table frequently, assign a range name to an area of the worksheet that you designate as the table location. Then, when you select /Range Name Note Table, type that range name to specify the table location. This technique saves time and helps avoid the possibility of writing over other data when you create a range name note table.

/Range Name Reset

/Range Name Reset deletes all defined range names in the current file (and their notes, if they have notes) but leaves the data in the named ranges unchanged.

Procedure

1. Make sure the cell pointer is in the file whose range names you want to delete.
2. Select /Range Name Reset.

In formulas that use any of the deleted range names, 1-2-3 replaces the range names with the corresponding range addresses.

TIP /Range Name Reset does not delete range names assigned to external tables with /Data External Use.

/Range Name Table

/Range Name Table creates a two-column table that alphabetically lists the defined range names in the current file and their corresponding addresses (Figure 2-138). If you assigned range names to any external tables with /Data External Use, the list also includes those range names along with the full table names of the corresponding external tables.

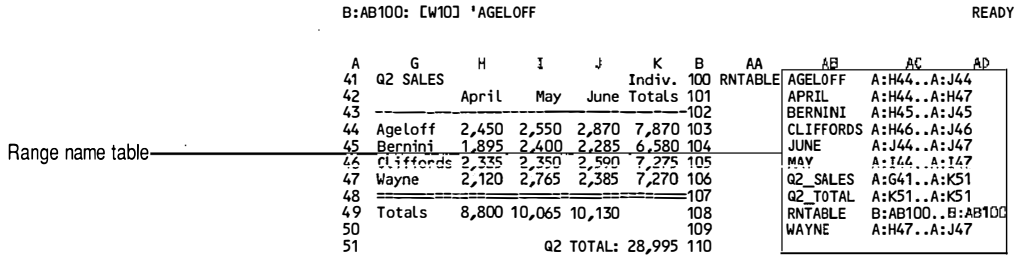


Figure 2-138. *A range name table*

Procedure

1. Decide on a location for the range name table. The table can be in any active file. The table will occupy two columns and as many rows as there are range names plus one blank row.

   CAUTION Make sure the table location is blank or contains dispensable data because 1-2-3 writes over existing data when it creates the table.

2. Make sure the cell pointer is in the file whose range names you want to list.
3. Select /Range Name Table.
4. Specify the location you decided on in step 1. You need to specify only the first cell of the table's location.

If the file whose range names you are listing contains only one worksheet, 1-2-3 uses abbreviated range addresses (omits the worksheet letters) in the range name table. If the file contains two or more worksheets, 1-2-3 uses full range addresses.

TIP If you use /Range Name Table frequently, assign a range name to a worksheet area you designate as the table location. Then, when you select /Range Name Table, type that range name to specify the table location. This technique saves time and helps avoid the possibility of writing over other data when you create a range name table. In Figure 2-138, B:AB100 is the first cell of the table location, and it has the range name RNTABLE.

/Range Name Undefine

/Range Name Undefine creates an undefined range name by dissociating a range name from a range address. The range name continues to exist, but it no longer is associated with a range and 1-2-3 does not include it in range name tables. (If it has a note, however, the range name does continue to appear in range name note tables after being undefined.)

Procedure

1. Select /Range Name Undefine.
2. Specify the range name you want to undefine.

Formulas that use the undefined range name now evaluate to ERR but retain the range name. When you redefine the range name with /Range Name Create or Labels, 1-2-3 evaluates formulas that use the range name according to the data in the new location.

/Range Prot

/Range Prot prevents changes to cells in a range when the worksheet or worksheets the range occupies are globally protected. Use this command only if you previously unprotected cells in the range with /Range Unprot.

Procedure

1. Select /Range Prot.
2. Specify the range containing the unprotected cells you want to protect again.

Now, whenever the worksheets the protected range occupies are globally protected, you cannot alter cells in the protected range. In addition, if you use the protected range as part of a data-input range during /Range Input or the advanced macro command {FORM}, you cannot move the cell pointer to cells in the protected range.

TIPS When a worksheet is globally protected, 1-2-3 displays PR in the control panel when the cell pointer is on a protected cell.

When a file is in GROUP mode and you protect a range in one worksheet in the file, 1-2-3 protects the same range in all other worksheets in the file as well.

/Range Search

/Range Search finds or replaces a specified string in labels and/or formulas within a range.

Procedure

1. Select /Range Search.
2. Specify the range you want 1-2-3 to search.

   NOTE 1-2-3 will search cells in the specified range that are formatted as Hidden. 1-2-3 will not, however, search hidden columns or worksheets in the specified range.

3. Enter the string you want 1-2-3 to search for (the search string).

   NOTE /Range Search is not case-sensitive. Uppercase and lowercase letters are equivalent in a search string.

4. Select Formulas, Labels, or Both.

Both	Tells 1-2-3 to look for the search string in both formulas and labels.
Formulas	Tells 1-2-3 to look for the search string only in formulas.
Labels	Tells 1-2-3 to look for the search string only in labels

5. Select Find or Replace.

   Find highlights occurrences of the search string in the search range. Replace replaces occurrences of the search string with a different (replacement) string.

6. If you selected Find, 1-2-3 highlights the cell containing the first occurrence of the search string and displays a Next/Quit menu. Select Next to highlight the cell containing the next occurrence of the search string, or select Quit to stop the search and return 1-2-3 to READY mode.

   If you selected Replace, enter the replacement string. 1-2-3 highlights the cell containing the first occurrence of the search string and displays a Replace/All/Next/Quit menu.

All	Replaces all remaining occurrences of the search string with the replacement string.
Next	Finds the next occurrence of the search string without replacing the current string.
Quit	Stops the search and returns 1-2-3 to READY mode without replacing the current string.
Replace	Replaces the current string with the replacement string and highlights the cell containing the next occurrence of the search string.

7. When 1-2-3 cannot find any more occurrences of the search string in the search range, it displays an error message. Press ESC or ENTER to return 1-2-3 to READY mode.

TIPS Use /Range Search to find or replace range names in formulas.

/Range Search ends with an error if you attempt a replacement that would cause an entry to exceed the 512-character maximum.

/Range Trans

/Range Trans copies a range of data, transposing the copied data and replacing any copied formulas with their current values.

You can transpose data to a single-sheet range (if the data you are transposing is in a single-sheet range) or to a three-dimensional range. When you transpose data to a single-sheet range, 1-2-3 changes the data from a horizontal arrangement to a vertical arrangement, or vice versa. For example, transposing the range A2..D5 to E7..H10 produces the results shown in Figure 2-139.

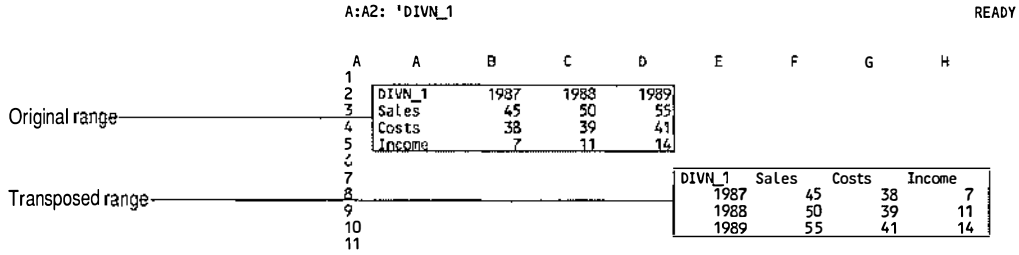


Figure 2-139. */Range Trans with a single-sheet range*

When you transpose data to a three-dimensional range, 1-2-3 performs one of three types of transpositions: rows/columns, columns/worksheets, or worksheets/rows.

- A rows/columns transposition works the same way as a single-sheet transposition except on a series of consecutive worksheets. Worksheet by worksheet, 1-2-3 transposes the data in the FROM range from a horizontal arrangement to a vertical arrangement, or vice versa.
- A columns/worksheets transposition copies the first column in each worksheet of the FROM range to the first worksheet in the TO range, the second column in each worksheet of the FROM range to the second worksheet in the TO range, and so on.
- A worksheets/rows transposition copies the first row in each worksheet of the FROM range to the first worksheet in the TO range, the second row in each worksheet of the FROM range to the second worksheet in the TO range, and so on.

Procedure

1. If the CALC indicator appears at the bottom of the screen, press **CALC** to update your formulas before you use /Range Trans. If any of the formulas whose values you will be transposing refer to data in files on disk, you also need to use /File Admin Link-Refresh to make sure those formulas' values are up-to-date
2. Select /Range Trans.

3. Specify the FROM range (the range whose data you want to transpose).

   The FROM range can be in any file, active or on disk.

4. Specify the TO range (the location for the transposed data). You need to specify only the first cell of the TO range unless you are transposing a single-sheet range of data to a three-dimensional range.

   The TO range must be in an active file. If you are transposing data to a three-dimensional range, be sure there are enough worksheets between the first cell of the TO range and the end of the file to fit the transposed data.

   CAUTION Specifying overlapping FROM and TO ranges may result in data loss.

5. If you specified a three-dimensional FROM or TO range, select Rows/Columns, Columns/Worksheets, or Worksheets/Rows.

Starting in the first cell of the TO range, 1-2-3 creates a transposed copy of the entire FROM range, replacing any formulas with their current values. Each cell in the TO range inherits the cell format and protection status of the corresponding cell in the FROM range.

TIP To copy a range without transposing data or converting formulas to values, use /Copy. To copy a range, converting formulas to values but not transposing data, use /Range Value.

/Range Unprot

/Range Unprot allows changes to a range when the worksheet or worksheets containing the range are globally protected.

Use /Range Unprot in conjunction with /Range Input and the advanced macro command {FORM} to designate the cells in which data can be entered during those two commands.

Procedure

1. Select /Range Unprot.
2. Specify the range to which you want to allow changes.

TIPS 1-2-3 displays data in unprotected cells in color or bright intensity. When the cell pointer is on an unprotected cell, 1-2-3 displays U in the control panel.

To prevent changes to cells you have unprotected with /Range Unprot, reprotect the cells with /Range Prot.

When a file is in GROUP mode and you unprotect a range in one worksheet in the file, 1-2-3 unprotects the same range in all other worksheets in the file as well.

/Range Value

/Range Value copies a range of data, replacing any copied formulas with their current values. For example, if a cell in the specified range contains the formula +A5*B6, which currently results in the value 34, /Range Value copies 34, not the formula +A5*B6.

Procedure

1. If the CALC indicator appears at the bottom of the screen, press CALC to update formulas before you use /Range Value. If any of the formulas whose values you will be copying refer to data in files on disk, you also need to use /File Admin Link-Refresh to make sure those formulas' values are up-to-date.
2. Select /Range Value.
3. Specify the FROM range (the range containing the formulas whose current values you want to copy).

   The FROM range can be in any file, active or on disk.
4. Specify the TO range (the location for the copied values). You need to specify only the first cell of the TO range.

   The TO range must be in an active file. If you are copying a three-dimensional range, be sure there are enough worksheets between the first cell of the TO range and the end of the file to fit the copied data.

   CAUTION If you specify a TO range that already contains data, 1-2-3 writes over the existing data. Formulas that acted on the previous contents of the TO range now act on the new data.

1-2-3 copies the FROM range to the TO range, replacing any formulas in the FROM range with their current values in the TO range. Each cell in the TO range takes on the cell format and protection status of the corresponding FROM range cell.

TIPS To substitute values for formulas in the same range, select /Range Value and specify the same range for the FROM and TO ranges.

To convert a formula to its current value without using /Range Value, move the cell pointer to the cell containing the formula, press EDIT, then press CALC, and then press ENTER.

To copy a range without converting formulas to values, use /Copy.

System Command

/System

/System temporarily suspends 1-2-3 and returns you to a UNIX shell so you can use operating system commands without ending the current 1-2-3 session.

NOTE If you invoked 1-2-3 from some other application or office automation package, you may not be able to return to the operating system.

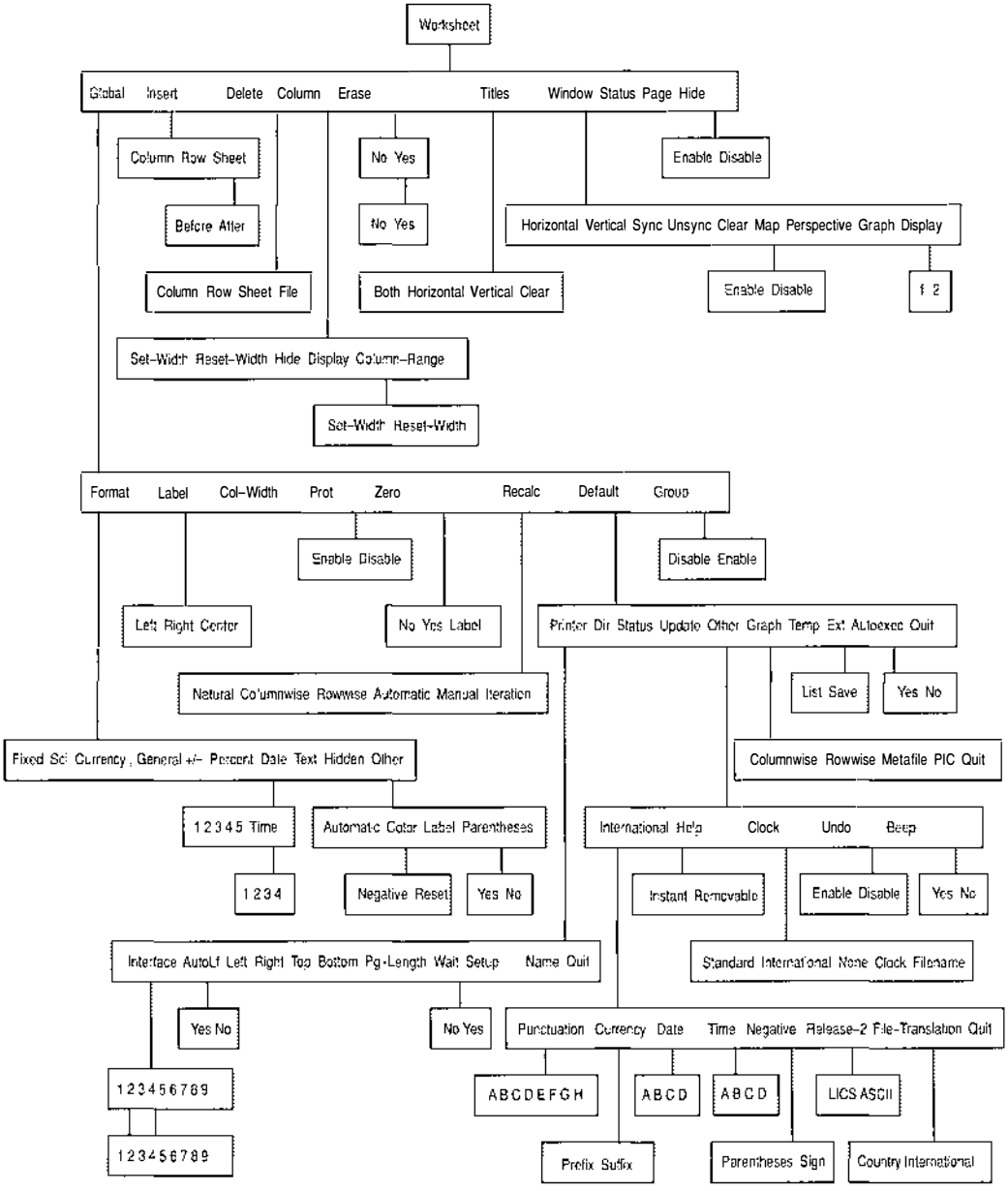
Procedure

1. Before you use /System, use /File Save if you want to save your work on disk.
2. Select /System.

   1-2-3 temporarily replaces the current worksheet with the operating system prompt. You can perform many operating system tasks after using /System, including copying files, creating new directories, or running other programs.
3. To return to the 1-2-3 session, type exit and press ENTER at the operating system prompt.

CAUTION In general, do not perform any task in the new shell that would interrrupt or crash your current session. In this case, you may not be able to resume the 1-2-3 session.

Worksheet Commands



The Worksheet commands control the display and organization of your work. They also change the 1-2-3 **global settings**, settings 1-2-3 uses for entire worksheets and files.

The Worksheet commands perform the following tasks:

Command	*Task*
/Worksheet Column	Sets the width of one or more columns, resets columns to the global column width, and hides and redisplays columns.
/Worksheet Delete	Deletes columns, rows, worksheets, and active files.
/Worksheet Erase	Erases all active worksheets and files from memory.
/Worksheet Global	Sets the global cell format, label alignment, column width, protection status, and zero-display setting for worksheets. Turns GROUP mode on and off for files. Sets the recalculation method for the current session and changes the 1-2-3 configuration settings.
/Worksheet Hide	Hides and redisplays worksheets.
/Worksheet Insert	Inserts blank columns, rows, and worksheets.
/Worksheet Page	Creates page breaks in worksheets, which 1-2-3 uses when printing.
/Worksheet Status	Displays information about global settings, circular references, and hardware configuration.
/Worksheet Titles	Freezes rows and columns along the top and left edges of a worksheet so those rows and columns remain in view as you scroll through the worksheet.
/Worksheet Window	Splits the screen into two windows, creates a perspective view of multiple consecutive worksheets, displays the current graph in a separate window, and creates a map view of a worksheet.

Common Uses for Worksheet Commands

Whenever you use 1-2-3, regardless of the type of work you are doing, you almost certainly will use Worksheet commands. For example, you use Worksheet commands to do the following:

- Insert blank rows and columns (/Worksheet Insert Row and Column).
- Conceal proprietary information (/Worksheet Hide Enable, /Worksheet Column Hide).
- Protect a worksheet from changes (/Worksheet Global Prot Enable).
- Widen columns to make a worksheet more legible or to display numbers instead of asterisks in cells (/Worksheet Global Col-Width, /Worksheet Column Set-Width, /Worksheet Column Column-Range Set-Width).
- When creating a multiple-sheet application, format all worksheets identically while working in one worksheet (/Worksheet Global Group Enable).
- When several files are active, delete one of those files from memory without erasing the corresponding file on disk (/Worksheet Delete File).
- Scan a worksheet to verify that all cells contain the correct type of information (/Worksheet Window Map Enable).
- View changes to a graph as you change data on which the graph is based (/Worksheet Window Graph).
- Permanently change the 1-2-3 default printer settings (/Worksheet Global Default Printer followed by /Worksheet Global Default Update).

Reading Path

- Before you begin working with the Worksheet commands, read "The 1-2-3 Screen," "Entering Data," "Working with Ranges," "Using Multiple-Sheet Files," and "Working with Multiple Files" in Chapter 1 to familiarize yourself with basic worksheet concepts and terminology.
- For hands-on experience with creating worksheets and using Worksheet commands, complete Chapters 1 and 3 of the *Tutorial*.
- Refer to specific commands in "Worksheet Command Descriptions" for more detailed information.

Also, remember that you can press HELP when you are using any Worksheet command to get information about the command. In addition, you can refer to *Task Summary* to identify the Worksheet command that accomplishes a particular task.

Worksheet Command Descriptions

The following sections describe each of the Worksheet commands in alphabetical order.

/Worksheet Column

/Worksheet Column sets the width of one or more columns, resets columns to the global column width, and hides and redisplays columns. Figure 2-140 shows how /Worksheet Column Set-Width and Hide can change a worksheet's appearance.

Original worksheet

```
A:A1: 'INCOME STATEMENT -- ABSOLUTE ENTERPRISES                    READY

 A      A          B          C          D          E          F
 1   INCOME STATEMENT -- ABSOLUTE ENTERPRISES
 2   1 January - 31 December
 3
 4   Item             This year            Last year
 5   ==========================================================
 6   Net Sales     $360,000         100%  $340,000         100%
 7     Cost of Go   200,000          56%   150,000          44%
 8   Gross Profit   160,000          44%   190,000          56%
 9     G&A Expens    53,000          15%    50,500          15%
10     Selling Ex    38,000          11%    32,000           9%
11     Depreciati     8,000           2%     8,000           2%
```

Worksheet with column A widened, columns B and C hidden, and column E narrowed

```
A:A1: [W24] 'INCOME STATEMENT -- ABSOLUTE ENTERPRISES              READY

 A             A                D        E        F          G
 1   INCOME STATEMENT -- ABSOLUTE ENTERPRISES
 2   1 January - 31 December
 3
 4   Item                     Last year
 5   ==================================
 6   Net Sales                $340,000   100%
 7     Cost of Goods Sold      150,000    44%
 8   Gross Profit              190,000    56%
 9     G&A Expenses             50,500    15%
10     Selling Expenses         32,000     9%
11     Depreciation              8,000     2%
```

Figure 2–140. ***Using the Worksheet Column commands***

Procedure

1. Select /Worksheet Column.
2. Select Set-Width, Reset-Width, Hide, Display, or Column-Range.

Column-Range	Sets the column width for one or more columns (overriding the global column width) and resets one or more columns to the global column width.
Display	Redisplays one or more hidden columns.
Hide	Hides one or more columns. *Note:* Hiding a column does not erase the contents of the column. Formulas in hidden columns and formulas that refer to cells in hidden columns continue to work correctly.
Reset-Width	Resets the current column to the global column width.
Set-Width	Sets the column width for the current column, overriding the global column width.

NOTE If the file in which you are using the selected command is in GROUP mode, the command will affect all worksheets in the file.

3. If you selected Set-Width, specify a width for the current column (either by typing a number from 1 to 240 and pressing ENTER or by using ← or → and pressing ENTER).

   If you selected Hide, specify the range of columns you want to hide. (Any columns that are already hidden will not be displayed when you select Hide.)

   If you selected Display, 1-2-3 temporarily redisplays all hidden columns, with asterisks next to their column letters. Specify the range of columns you want to redisplay.

   If you selected Column-Range, select Set-Width or Reset-Width.

- If you select Set-Width, specify the range of columns whose widths you want to set. Then specify the new width (either by typing a number from 1 to 240 and pressing ENTER or by using ← or → and pressing ENTER).
- If you select Reset-Width, specify the range of columns whose widths you want to reset.

TIPS

When you use ← or → to specify a column width during /Worksheet Column Set-Width or Column-Range Set-Width, 1-2-3 adjusts the width of the corresponding column(s) each time you press the key.

After you set the width of a column with /Worksheet Column Set-Width or Column-Range Set-Width, the column's width appears in brackets in the control panel when the cell pointer is anywhere in that column.

Whenever 1-2-3 is in POINT mode, it displays hidden columns with an * (asterisk) next to their column letter. This means you can perform 1-2-3 operations on cells in hidden columns. For example, you can format, unprotect, or copy to or from cells in hidden columns. When creating formulas, you can refer to cells in hidden columns by entering POINT mode and highlighting those cells.

When the screen is split into two windows (with /Worksheet Window Horizontal or Vertical), the Worksheet Column commands affect only the window the cell pointer is in. When you clear the windows with /Worksheet Window Clear, 1-2-3 uses the top or left window's column settings.

/Worksheet Delete

/Worksheet Delete deletes one or more columns, rows, or worksheets in an active file, closing up the space left by the deletion. /Worksheet Delete also deletes an entire active file from memory without erasing the corresponding file on disk.

CAUTION

Before you use /Worksheet Delete to delete columns, rows, or worksheets, be sure those columns, rows, or worksheets do not contain important data. Before you use /Worksheet Delete to delete an active file, save the file on disk.

Procedure

1. Select /Worksheet Delete.
2. Select Column, Row, Sheet, or File.

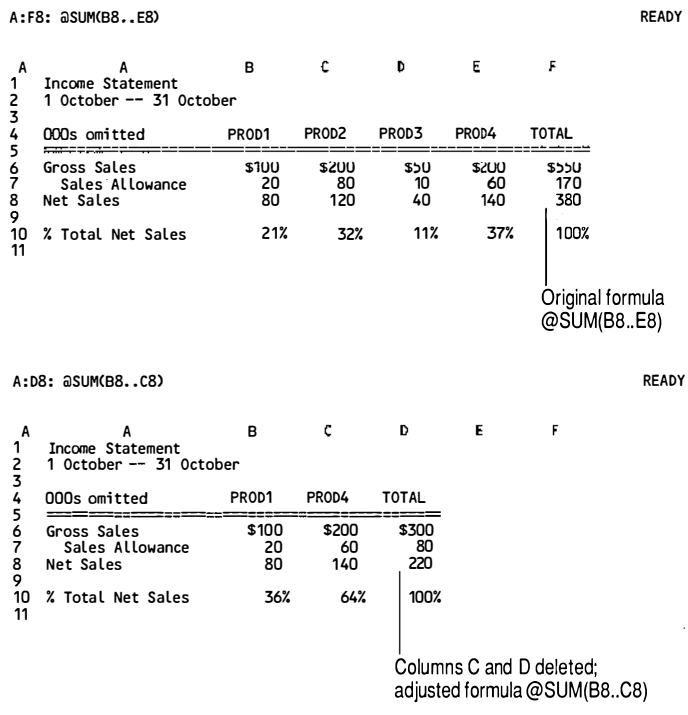
Column	Deletes one or more columns in an active file. If the file is in GROUP mode, deletes the columns from all worksheets in the file.
File	Deletes an entire active file from memory without erasing the corresponding file on disk.
Row	Deletes one or more rows in an active file. If the file is in GROUP mode, deletes the rows from all worksheets in the file.
Sheet	Deletes one or more worksheets in an active file. *Note:* You must leave at least one worksheet in a file from which you delete worksheets.

3. If you selected Column, Row, or Sheet, specify a range that includes at least one cell in each of the columns, rows, or worksheets you want to delete.

   If you selected File, specify the active file you want to delete from memory either by selecting it from the displayed list or by typing the file's name. (If you type the file's name, you must include the path unless the file is in the current directory and you must include the extension if there is more than one active file with the specified name.)

When a column, row, or worksheet deletion moves a cell used in a formula, 1-2-3 adjusts the cell address in the formula. For example, suppose you enter the formula +E6*100 and then delete columns A and B. 1-2-3 changes the formula to +C6*100.

When a column, row, or worksheet deletion moves the first or last cell of a range used in a formula, 1-2-3 adjusts the range address in the formula. For example, suppose you enter the formula @SUM(B8..E8) and then delete columns C and D. 1-2-3 changes the formula to @SUM(B8..C8), as shown in Figure 2-141.



	A	B	C	D	E	F
1	Income Statement					
2	1 October -- 31 October					
3						
4	000s omitted	PROD1	PROD2	PROD3	PROD4	TOTAL
5						
6	Gross Sales	$100	$200	$50	$200	$550
7	Sales Allowance	20	80	10	60	170
8	Net Sales	80	120	40	140	380
9						
10	% Total Net Sales	21%	32%	11%	37%	100%
11						

	A	B	C	D	E	F
1	Income Statement					
2	1 October -- 31 October					
3						
4	000s omitted	PROD1	PROD4	TOTAL		
5						
6	Gross Sales	$100	$200	$300		
7	Sales Allowance	20	60	80		
8	Net Sales	80	140	220		
9						
10	% Total Net Sales	36%	64%	100%		
11						

Figure 2–141. *Formula adjustment after using /Worksheet Delete Column*

Or suppose you enter the formula @SUM(A:B2..C:E5), which uses a three-dimensional range. If you then delete row 1 in worksheet A, 1-2-3 changes the formula to @SUM(A:B1..C:E5) because the deletion moved the range's first cell, A:B2, up one row. Or if you delete row 1 in worksheet C, 1-2-3 changes the formula to @SUM(A:B2..C:E4) because the deletion moved the range's last cell, C:E5, up one row. On the other hand, if you delete row 1 in worksheet B, the formula does not change because neither of the range's end points have moved.

When a column, row, or worksheet deletion moves the first or last cell of a named range, 1-2-3 redefines the named range accordingly. For example, suppose you assign the range name VARIABLES to B:B2..G:M5. If you then delete column A in worksheet B, 1-2-3 redefines VARIABLES as B:A2..G:M5; if you delete row 1 in worksheet G, 1-2-3 redefines VARIABLES as B:B2..G:M4; if you delete worksheet D, 1-2-3 redefines VARIABLES as B:B2..F:M5.

For any three-dimensional range, if you delete the last worksheet of the range, 1-2-3 moves the range's end point up one worksheet. For example, with the range A:F4..C:H8, if you delete worksheet C, 1-2-3 redefines the range as A:F4..B:H8. 1-2-3 also moves a three-dimensional range's end point up one worksheet when the range consists of a single column or row and you delete that column or row in the last worksheet of the range. For example, with the range A:F4..C:F8, if you delete column F in worksheet C, 1-2-3 redefines the range as A:F4..B:F8.

If you delete an entire range whose address is used in a formula, 1-2-3 replaces the address in the formula with the value ERR. If you delete an entire named range whose name is used in a formula, 1-2-3 retains the range name in the formula but treats it as an undefined range name. The formula evaluates to ERR until you redefine the range name.

TIPS To erase a range without closing up the space the erased data occupied, use /Range Erase.

To delete a file on disk rather than from memory, use /File Erase.

/Worksheet Erase

/Worksheet Erase removes all active worksheets and files from memory, replacing them with one blank worksheet. The command also disconnects 1-2-3 from any external databases you are currently using.

CAUTION Before using /Worksheet Erase, be sure to save any important worksheets and files that are currently in memory.

Procedure

1. Select /Worksheet Erase.
2. Select No to return 1-2-3 to READY mode without erasing anything or Yes to erase all active worksheets and files.

   If you selected Yes and any active worksheets have not yet been saved in a file or any active files have changes that have not been saved, 1-2-3 displays another No/Yes menu and asks if you want to erase all your active worksheets and files anyway.

- Select No to cancel /Worksheet Erase and return 1-2-3 to READY mode.
- Select Yes to erase all active worksheets and files.

TIP To erase selected active worksheets or files rather than all active worksheets and files, use /Worksheet Delete.

/Worksheet Global

The /Worksheet Global menu includes some commands that affect only the current worksheet or file and others that affect all active worksheets and files.

Command	*Task*
Col-Width	Sets the global column width for the current worksheet or, with GROUP mode on, for the current file.
Default	Changes the 1-2-3 configuration settings, which affect all active worksheets and files.
Format	Sets the global cell format for the current worksheet or, with GROUP mode on, for the current file.
Group	Turns GROUP mode on and off for the current file.
Label	Sets the global label alignment for the current worksheet or, with GROUP mode on, for the current file.
Prot	Turns global protection on and off for the current worksheet or, with GROUP mode on, for the current file.
Recalc	Sets the recalculation method for all active worksheets and files.
Zero	Sets the display for cells in the current worksheet whose value is zero or, with GROUP mode on, for cells in the current file whose value is zero.

/Worksheet Global Col-Width

/Worksheet Global Col-Width sets the width of all columns in the current worksheet (or, with GROUP mode on, in the current file) except those columns whose widths you set individually with /Worksheet Column.

The minimum column width is 1; the maximum is 240. The initial global column width is 9.

Procedure

1. Select /Worksheet Global Col-Width.
2. Specify a column width (either by typing a number from 1 to 240 and pressing ENTER or by using → or ← and pressing ENTER).

TIPS When you use → or ← to specify a worksheet's global column width, 1-2-3 adjusts column widths in the worksheet as you press the key.

To see the /Worksheet Global Col-Width setting for the current worksheet, select /Worksheet Status.

/Worksheet Global Default

The Worksheet Global Default commands change the default 1-2-3 settings stored in the 1-2-3 configuration file `.123cnf`. The settings in this file take effect automatically whenever you start 1-2-3.

Command	*Task*
Autoexec	Tells 1-2-3 whether to run autoexecute macros when it reads files that contain them.
Dir	Sets the 1-2-3 default directory appropriate for your current file mode.
Ext	Sets the extension 1-2-3 automatically uses when you select a File command that lists or saves worksheet files. Whether 1-2-3 uses an uppercase or lowercase extension depends upon the case of your current file mode: UNIX file mode (select .wk3 or .WK3), DOS-lower (.wk3), or DOS-upper (.WK3).
Graph	Tells 1-2-3 whether to use columns or rows as data ranges in automatic graph ranges and whether to save graphs in graphic metafile or picture file format.
Other	Changes the default Clock, International, Undo, and Beep settings.
Printer	Specifies the type of printer, the UNIX print spooler, and the default page settings that you are using.
Quit	Returns 1-2-3 to READY mode.

(continued)

Command	*Task*
Status	Displays the current /Worksheet Global Default settings.
Temp	Sets the directory (appropriate for your current file mode) in which 1-2-3 saves temporary files.
Update	Saves the current /Worksheet Global Default settings in the 1-2-3 configuration file **`.1123cnf`** for use in future sessions.

Worksheet Global Default Autoexec tells 1-2-3 whether to run autoexecute macros (macros named \0) when it reads .WK3 and .WK1 files that contain them. See "Tips for Creating a Macro" in Chapter 4 for more information on autoexecute macros.

Procedure

1. Select /Worksheet Global Default Autoexec.
2. Select Yes (initial setting) to have 1-2-3 run autoexecute macros or No if you do not want 1-2-3 to run autoexecute macros.
3. To update the 1-2-3 configuration file **`.1123cnf`** so 1-2-3 uses the new Autoexec setting in future sessions, select Update from the /Worksheet Global Default menu.

TIP To see the current /Worksheet Global Default Autoexec setting, select /Worksheet Global Default Status.

/Worksheet Global Default Dir sets the 1-2-3 **default directory**, the directory that starts out as your current directory each time you use 1-2-3. (Your **current directory** is the directory 1-2-3 automatically searches when you save, read, or list files.)

NOTE 1-2-3 uses three different default directory specifications depending on your current file mode: UNIX file mode, DOS-upper, or DOS-lower.

Procedure

1. Select /Worksheet Global Default Dir.
2. Specify the new default directory.

3. To update the 1-2-3 configuration file `.123cnf` so 1-2-3 uses the new default directory setting in future sessions, select Update from the /Worksheet Global Default menu.

- To see the current /Worksheet Global Default Dir setting, select /Worksheet Global Default Status.
- To change the current directory for the current session only, use /File Dir rather than /Worksheet Global Default Dir.

/Worksheet Global Default Ext sets the extension 1-2-3 automatically uses when you select File commands that list or save worksheet files.

Procedure

1. Select /Worksheet Global Default Ext.
2. Select List or Save.

   List sets the extension 1-2-3 automatically uses to list files when you select /File Combine, Erase, List, Open, or Retrieve. The initial List setting is WK?. The ? (question mark) is a wild-card character that represents any single character. In this case it causes 1-2-3 to list all files whose extension begins with the letters WK.

   Save sets the extension 1-2-3 automatically uses to list files when you select /File New, Save, or Xtract. It also sets the extension 1-2-3 automatically assigns when you save a file without specifying an extension. The initial Save setting is WK3.

3. Type an extension and press ENTER.

   For example, if you selected List and want 1-2-3 to search only for 1-2-3 .WK1 files and Symphony .WR1 files when combining, erasing, listing, opening, or retrieving files, enter w?1 as the extension. The ? (question mark) wild-card character, in this case, causes 1-2-3 to list all files with a three-character extension that begins with W and ends with 1.

4. UNIX versions of 1-2-3 use the default extension .wk3 for **UNIX file mode** and **DOS-lower mode,** and .WK3 for **DOS-upper mode.** For more information on file modes and case sensitivity, see "Using Files" in Chapter 1.

5. To update the 1-2-3 configuration file `.l123cnf` so 1-2-3 uses the new Ext settings in future sessions, select Update from the /Worksheet Global Default menu.

TIPS To have 1-2-3 automatically save worksheet files in Release 2 format, specify WK1 as the /Worksheet Global Default Ext Save setting. See /File Save for more information on saving files in Release 2 format.

If you omit the extension from a file reference, 1-2-3 uses the current /Worksheet Global Default Ext Save setting as the extension for that file reference. For example, when WK3 is the Save setting, 1-2-3 treats the file reference <<SALES89>> as <<SALES89.WK3>>; when WK1 is the Save setting, 1-2-3 treats <<SALES89>> as <<SALES89.WK1>>.

To see the current /Worksheet Global Default Ext settings, select /Worksheet Global Default Status.

/Worksheet Global Default Graph sets the following: the direction in which 1-2-3 divides automatic graph ranges into data ranges, the format 1-2-3 uses for graph files you create with /Graph Save, and the extension 1-2-3 searches for when you select /File List Graph or /File Erase Graph.

Procedure

1. Select /Worksheet Global Default Graph.
2. Select Columnwise, Rowwise, Metafile, or PIC.

Columnwise	Tells 1-2-3 to divide an automatic graph range into graph data ranges by columns (the initial setting).
Metafile	Tells 1-2-3 to save graphs in graphic metafile format when you select /Graph Save (the initial setting) and to search for .CGM or .cgm files when you select /File List Graph or /File Erase Graph.
PIC	Tells 1-2-3 to save graphs in picture format when select /Graph Save and to search for .PIC or .pic files when you select /File List Graph or /File Erase Graph.

Rowwise	Tells 1-2-3 to divide an automatic graph range into graph data ranges by rows.

3. Select Quit to return to the /Worksheet Global Default menu.
4. To update the 1-2-3 configuration file **.123cnf** so 1-2-3 uses the new /Worksheet Global Default Graph settings in future sessions, select Update from the /Worksheet Global Default menu.

- To see the current /Worksheet Global Default Graph settings, select /Worksheet Global Default Status.

/Worksheet Global Default Other provides the following command choices:

Command	*Task*
Beep	Turns the terminal's bell on and off during 1-2-3 sessions.
Clock	Sets the display for the file-and-clock indicator.
Help	Changes the Help access setting. 1-2-3 does not use the Help access setting. This command is retained only to ensure compatibility with macros created in earlier 1-2-3 releases.)
International	Sets the punctuation for numbers, the argument separators for @functions and advanced macro commands, the currency symbol, the Intn'l Date and Time formats, the way 1-2-3 displays negative numbers in Comma and Currency formats, the way 1-2-3 reads and saves characters in Release 2 files, and the way 1-2-3 translates characters in text files.
Undo	Turns the undo feature on and off.

/Worksheet Global Default Other Beep sets whether 1-2-3 sounds the terminal's bell when errors occur and when executing {BEEP} commands in a macro.

Procedure

1. Select /Worksheet Global Default Other Beep.
2. Select No to turn the terminal's bell off or Yes (initial setting) to turn the bell on.
3. To update the 1-2-3 configuration file **.1123cnf** so 1-2-3 uses the new Beep setting in future sessions, select Update from the /Worksheet Global Default menu.

TIP To see the current /Worksheet Global Default Other Beep setting, select /Worksheet Global Default Status.

/Worksheet Global Default Other Clock sets the display for the file-and-clock indicator in the lower left corner of the screen. You can create any of the four displays shown in Figure 2-142.

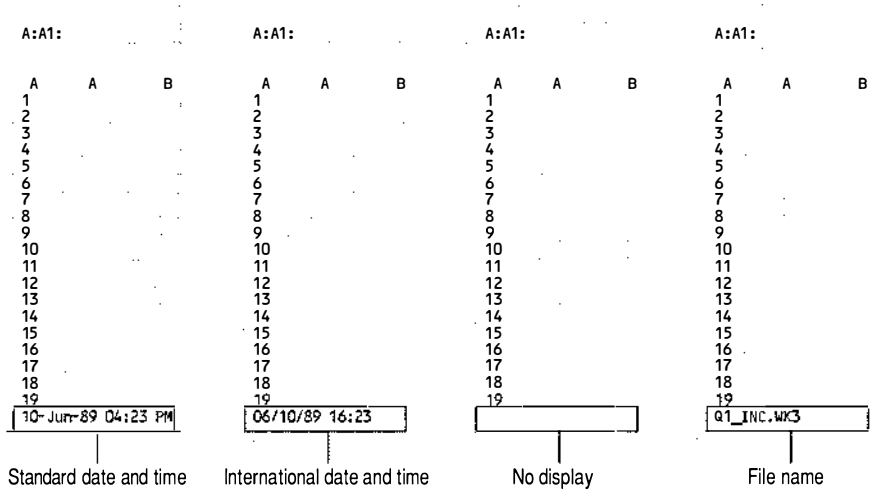


Figure 2–142. *File-and-clock indicator settings*

Procedure

1. Select /Worksheet Global Default Other Clock.
2. Select Standard, International, None, Clock, or Filename.

Clock	Always displays the date and time in the file-and-clock indicator, using Standard or International format.

Filename	If the current worksheet has been saved in a file, displays that file's name in the file-and-clock indicator (the initial Clock setting).
International	Sets the date and time formats for the file-and-clock indicator as Long Intn'l and Short Intn'l respectively. (You set the Intn'l Date and Time formats with /Worksheet Global Default Other International Date and Time.)
None	Removes the file-and-clock indicator from the screen.
Standard	Sets the date and time formats for the file-and-clock indicator as DD-MMM-YY and HH:MM (AM/PM) respectively.

3. To update the 1-2-3 configuration file `.123cnf` so 1-2-3 uses the new file-and-clock indicator display in future sessions, select Update from the /Worksheet Global Default menu.

TIP To see the current /Worksheet Global Default Other Clock setting, select /Worksheet Global Default Status.

/Worksheet Global Default Other Help changes the 1-2-3 Help access setting.

NOTE This command exists in UNIX versions of 1-2-3 only to maintain macro compatibility with earlier releases of 1-2-3. In this release, 1-2-3 always uses Instant Help, regardless of the setting you select with /Worksheet Global Default Other Help.

Procedure

1. Select /Worksheet Global Default Other Help.
2. Select Instant or Removable.

   For previous releases of 1-2-3, selecting Instant causes 1-2-3 to open the Help file the first time you press HELP in a 1-2-3 session and keep the file open for the rest of the session.

For previous releases of 1-2-3, selecting Removable causes 1-2-3 to open the Help file each time you press HELP and close the file again when you press ESC to leave Help. This release always uses Removable Help.

/Worksheet Global Default Other International sets the following: the punctuation for numbers, the argument separators for @functions and advanced macro commands, the currency symbol, the Intn'l Date and Time formats, the way 1-2-3 displays negative numbers in Comma and Currency formats, the way 1-2-3 reads and saves characters in Release 2 files, and the way 1-2-3 translates characters in text files.

Procedure

1. Select /Worksheet Global Default Other International.
2. Select Punctuation, Currency, Date, Time, Negative, Release-2, or File-Translation.

Currency	Sets the currency symbol 1-2-3 uses in cells formatted as Currency and the location of the currency symbol relative to numbers. Initially, 1-2-3 uses $ (dollar sign) as the currency symbol, preceding numbers.
Date	Sets the Intn'l Date format 1-2-3 uses for cells formatted as D4 (Long Intn'l) or D5 (Short Intn'l) and the International date display for the file-and-clock indicator. The options are A (MM/DD/YY) (initial setting), B (DD/MM/YY), C (DD.MM.YY), and D (YY-MM-DD).
File-Translation	Sets whether 1-2-3 uses your country-specific (initial setting) or international character translation table when importing and creating text files.
Negative	Sets whether 1-2-3 uses parentheses (initial setting) or – (minus sign) for negative values in cells formatted as Comma or Currency.

Punctuation	Sets the characters 1-2-3 uses as the decimal point and thousands separator for numbers, and the argument separator for @functions and advanced macro commands. You can choose from eight combinations, listed in order of decimal point, argument separator, and thousands separator: A (.,,) (initial setting), B (,.), C (.;,), D (,;.), E (.,), F (,.), G (.;), and H (,;).
Release-2	Sets the way 1-2-3 reads and saves the characters in Release 2 (.WK1) worksheet files.
Time	Sets the Intn'l Time format 1-2-3 uses for cells formatted as D8 (Long Intn'l) or D9 (Short Intn'l) and the International time display for the file-and-clock indicator. The four options are A (HH:MM:SS) (initial setting), B (HH.MM.SS), C (HH,MM,SS), and D (HHhMMmSSs).

3. If you selected Punctuation, select A, B, C, D, E, F, G, or H.

NOTE If you select B or F, which sets the period as the argument separator, you must always use two periods when you type range addresses.

If you selected Currency, enter the currency symbol and then select Prefix or Suffix. The currency symbol can consist of up to 15 bytes and can include any of the characters in the Lotus Multibyte Character Set (LMBCS).

NOTE With some currency symbols, 1-2-3 does not recognize Currency format for Automatic formatting. See Tips in /Worksheet Global Format for details.

If you selected Date or Time, select A, B, C, or D.

If you selected Negative, select Parentheses or Sign.

If you selected Release-2, select LICS or ASCII. Select ASCII if you are reading or saving Release 2 files that were created with, or will be used with, the Universal Text

Display-ASCII- No LICS text-display driver (available in Release 2.01 and later). Otherwise, select LICS.

If you selected File-Translation, select Country or International. Select Country to have 1-2-3 use the IBM (R) character set supported for your country (for example, Code Page 437 [Extended ASCII] for the U.S.) when translating characters in text files. Select International only if you have configured your system to run the IBM Code Page 850 character set and you want 1-2-3 to translate characters using that character set.

4. Select Quit to return to the /Worksheet Global Default menu.
5. To update the 1-2-3 configuration file **.1123cnf** so 1-2-3 uses the new International settings in future sessions, select Update from the /Worksheet Global Default menu.

TIPS

The /Worksheet Global Default Other International Date setting determines which International format the *date-string* argument can have in @DATEVALUE formulas and which International format you can use to enter date numbers in cells. The /Worksheet Global Default Other International Time setting determines which International format the *time-string* argument can have in @TIMEVALUE formulas and which International format you can use to enter time numbers in cells.

If you read a Release 2 file into memory and 1-2-3 displays different characters from those in the original file, try changing the /Worksheet Global Default Other International Release-2 setting and read the file again.

If you import a text file and 1-2-3 displays different characters from those in the original file, try changing the /Worksheet Global Default Other File-Translation setting and import the file again.

To use a character that is not on the keyboard as part of the default currency symbol, use COMPOSE. For example, to specify the British pound as the default currency symbol, press COMPOSE, type L= and press ENTER. See Appendix A for a list of LMBCS characters and compose sequences.

To see the current /Worksheet Global Default Other International settings, select /Worksheet Global Default Status.

/Worksheet Global Default Other Undo turns the undo feature on or off.

Procedure

1. Select /Worksheet Global Default Other Undo.
2. Select Enable to turn undo on or Disable (initial setting) to turn undo off.

   NOTE You cannot use the undo feature when /Data External Other Refresh is set to Automatic. If you select Enable in this situation, 1-2-3 displays an error message.

3. To update the 1-2-3 configuration file `.1123cnf` so 1-2-3 uses the new Undo setting in future sessions, select Update from the /Worksheet Global Default menu.

TIP To see the current /Worksheet Global Default Other Undo setting, select /Worksheet Global Default Status.

/Worksheet Global Default Printer sets the assumptions 1-2-3 makes about your printer at the start of each 1-2-3 session, including the type of printer you are using, the UNIX print spooler, and the printed-page settings.

NOTE You can use Print commands to override these assumptions for individual print jobs. See Tips following this procedure.

Procedure

1. Select /Worksheet Global Default Printer.
2. Select Interface, AutoLf, Left, Right, Top, Bottom, Pg-Length, Wait, Setup, or Name and choose a setting for the selected item.

AutoLf — Identifies whether your printer automatically inserts line feeds, to determine whether 1-2-3 should insert line feeds. When you select AutoLf, 1-2-3 displays a Yes/No menu. Select Yes if your printer inserts line feeds or No (initial setting) if your printer does not.

Note: To test whether the current AutoLf setting is correct, print a range of at least two rows. If the printing is double-spaced, or if the paper does not advance, set AutoLf to the opposite setting.

Bottom — Sets the bottom margin on the printed page, at a specified number of standard lines. You can specify any number from 0 to 240; the initial setting is 2.

Interface — Specifies the UNIX print spooler. For example, after selecting Interface, you would enter **`lp printfile-name: printer-name.`**

Left — Sets the left margin on the printed page, at a specified number of standard characters from the left edge of the paper. You can specify any number from 0 to 1000, but the number should be smaller than the number you specify as the right-margin setting. The initial left-margin setting is 4.

Name — Selects the printer to use if you specified more than one printer when you installed 1-2-3. The initial setting is the first printer specified in the **`.123set`** file.

When you select Name, 1-2-3 displays a menu of one or more numbers (if you installed more than nine printers). Each number (or letter) corresponds to one of the printers you specified in the **`.123set`** file. When you highlight a number, 1-2-3 displays the name of the corresponding printer in the long prompt.

Pg-Length	Sets the length of each page measured in standard lines. The Pg-Length setting determines where 1-2-3 creates page breaks when printing and the number of printed lines per page. You can specify any number from 1 to 1000; the initial setting is 66. Generally, the Pg-Length setting should equal the number of standard lines per inch for your printer times the length of your paper in inches.
Right	Sets the right margin on the printed page, at a specified number of standard characters from the left edge of the paper. You can specify any number from 0 to 1000, but the number should be greater than the number you specify as the left-margin setting. The initial right-margin setting is 76.
Setup	Lets you enter formatting options, which are a series of characters that control printing. 1-2-3 includes these options in your print job. You can use these options to turn on specific printing modes or to initialize the printer to the standard settings. *Caution:* To avoid complications when printing, do not use setup strings to control print settings that you can control with /Print [E,F,P] Options and /Worksheet Global Default Printer. For example, do not use setup strings to control character spacing (pitch), line spacing, colors, fonts, or margins.
Top	Sets the top margin on the printed page, at a specified number of standard lines. You can specify any number from 0 to 240; the initial setting is 2.
Wait	Is inoperative in UNIX versions of 1-2-3.

3. Select another item from the /Worksheet Global Default Printer menu or select Quit to return to the /Worksheet Global Default menu.

4. (Optional) To update the 1-2-3 configuration file **.1123cnf** so 1-2-3 uses the new /Worksheet Global Default Printer settings in future sessions, select Update from the /Worksheet Global Default menu.

TIPS To see the current /Worksheet Global Default Printer settings, select /Worksheet Global Default Status.

Lotus recommends you use /Print [E,F,P] Options rather than /Worksheet Global Default Printer to specify settings for individual print jobs. The following table lists each /Worksheet Global Default Printer command and the corresponding /Print [E,F,P] Options command.

/WGDP command	*Corresponding /P[E,F,P]O command*
AutoLf	Advanced AutoLf
Interface	Advanced Device Interface
Left, Right, Top, Bottom	Margins Left, Right, Top, Bottom
Name	Advanced Device Name
Pg-Length	Pg-Length
Setup	Setup
Wait	Advanced Wait

NOTE If, after selecting a setting with /Print [E,F,P] Options, you then select a different setting with the corresponding /Worksheet Global Default Printer command, the /Worksheet Global Default Printer setting overrides the /Print [E,F,P] Options setting.

/Worksheet Global Default Quit returns 1-2-3 to READY mode.

Procedure

1. Select /Worksheet Global Default Quit.

/Worksheet Global Default Status displays the current worksheet global default settings in a status screen that overlays the worksheet. Figure 2-143 shows the /Worksheet Global Default Status screen with sample settings.

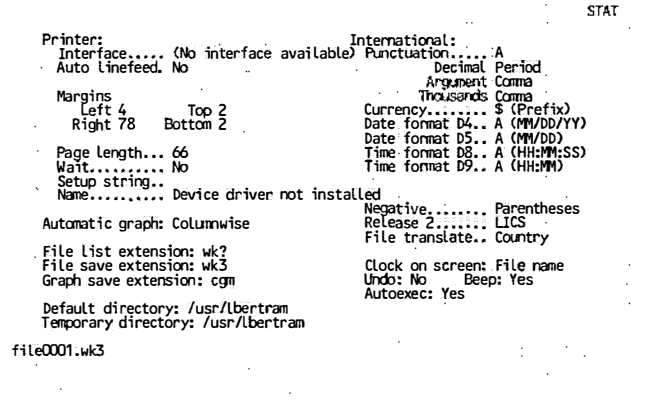


Figure 2–143. *A sample /Worksheet Global Default Status screen*

Procedure

1. Select /Worksheet Global Default Status.
2. When you finish viewing the status screen, press any key to remove it and return to the /Worksheet Global Default menu.

TIP To see information about available memory, recalculation settings, circular references, the processor and coprocessor you are using, and the global column-width, cell-format, label-prefix, and zero-display settings and protection status of the current worksheet, select /Worksheet Status.

/Worksheet Global Default Temp sets the directory in which 1-2-3 saves temporary files when it saves them on disk.

Temporary files, which have the extension .tmp or .TMP, are files 1-2-3 creates during operations such as printing and then deletes when you select /Quit to end the 1-2-3 session. When enough memory is available, 1-2-3 stores temporary files in memory. However, when a temporary file is too large to store in memory, 1-2-3 saves it on disk.

NOTE 1-2-3 creates separate Temp directories corresponding to your current file mode.

Procedure

1. Select /Worksheet Global Default Temp.
2. Specify the new temporary directory

   NOTE Make sure the directory you specify is not a read-only directory; otherwise, 1-2-3 will display an error message when it attempts to create temporary files.

3. To update the 1-2-3 configuration file `.123cnf` so 1-2-3 uses the new Temp setting in future sessions, select Update from the /Worksheet Global Default menu.

TIPS Use /Worksheet Global Default Temp to have 1-2-3 handle temporary files more quickly when you start 1-2-3 from a network. Saving temporary files in a local directory on your own workstation is faster than saving them in the network directory.

To see the current /Worksheet Global Default Temp setting, select /Worksheet Global Default Status.

/Worksheet Global Default Update updates the 1-2-3 configuration file `.123cnf` with the settings you establish with the other Worksheet Global Default commands and with /Data External Other Refresh Interval. The contents of `.123cnf` determine the 1-2-3 configuration when you start 1-2-3.

Procedure

1. Select /Worksheet Global Default Update.

1-2-3 saves the current Worksheet Global Default and /Data External Other Refresh Interval settings in the 1-2-3 configuration file `.123cnf` and immediately returns to the /Worksheet Global Default menu. 1-2-3 will now use these settings each time you start 1-2-3 until you change them and reselect /Worksheet Global Default Update.

/Worksheet Global Format

/Worksheet Global Format sets the global **cell format** for the current worksheet (or, with GROUP mode on, for the current file). This setting determines the way 1-2-3 displays data in the worksheet (or file). Figure 2-144 shows a perspective view of three worksheets that contain the same data but have different global cell formats.

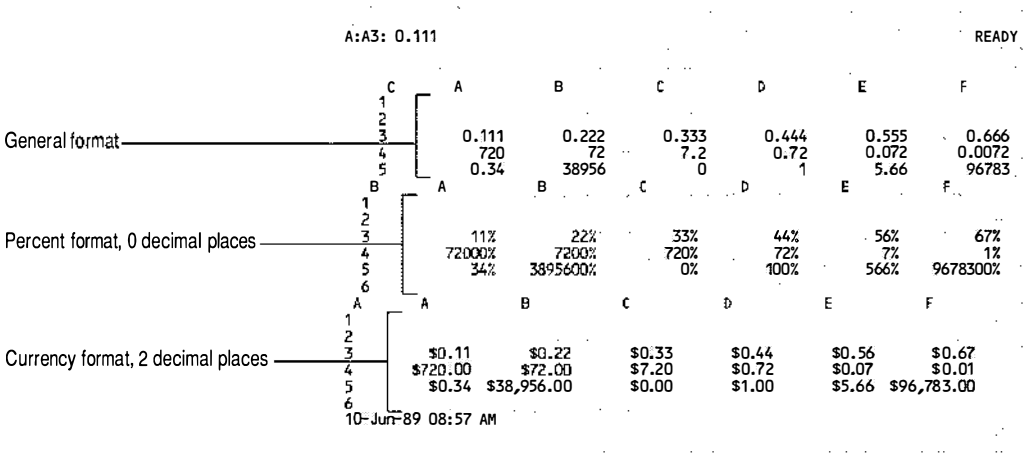


Figure 2–144. *Three worksheets with different global cell formats*

When using /Worksheet Global Format, note the following:

- /Worksheet Global Format does not affect cells formatted with /Range Format.
- Most cell formats affect the way 1-2-3 displays only numeric data. Hidden and Text formats, however, also affect the display of labels and/or string formulas.
- Changing a cell's format changes the way 1-2-3 displays data in the cell but not the data itself. You may, for example, choose a cell format that displays 45.123 as $45, but 1-2-3 still stores the value as 45.123 and uses the decimal places when calculating.

Procedure

1. Select /Worksheet Global Format.
2. Choose the cell format you want from the series of menus and prompts 1-2-3 displays. The table following this procedure explains each cell format.

3. If 1-2-3 displays a cell filled with asterisks after you use /Worksheet Global Format, it usually means the column is not wide enough to display the entire number in the selected cell format. The column must be one character wider than the width of the number as formatted. To remove the asterisks and redisplay the number, widen the column with /Worksheet Column Set-Width or /Worksheet Global Col-Width.

The following table describes the /Worksheet Global Format menu and includes examples of data in each cell format. In the examples, the left column shows some sample data as you would enter it. The right column shows the cell format's notation, which appears in the /Worksheet Status screen, and the sample data as 1-2-3 displays it in that format. For instance, in the description of Currency format, the example 12 (C2) $12.00 shows that when you enter 12 in a worksheet whose global cell format is Currency, 2 decimal places (reported in the /Worksheet Status screen as (C2)), 1-2-3 displays $12.00.

		Examples	
Format	*Result*	*Data as entered*	*Data as displayed*
, (Comma)	Displays numbers with thousands separators up to 15 decimal places, parentheses or a minus sign (depending on the /Worksheet Global Default Other International Negative setting) for negatives, and a leading zero for decimal values. Comma format is the same as Currency format without the currency symbol.	8999 –15000 .5532765	(,2) 8,999.00 (,0) (15,000) (,1) 0.6
Currency	Displays numbers with a currency symbol, thousands separators, up to 15 decimal places, parentheses or a minus sign (depending on the /Worksheet Global Default Other International Negative setting) for negatives, and a leading zero for decimal values. The currency symbol 1-2-3 uses depends on the current /Worksheet Global Default other International currency setting.	12 –.256 1149.99	(C2) $12.00 (C1) ($0.3) (C0) $1,150

(continued)

Format	*Result*	*Examples* *Data as entered*	*Data as displayed*
Date	Displays numbers from 1 (the date number for 1 January 1900) to 73050 (the date number for 31 December 2099) as dates, in the Date format you select. 1-2-3 uses the integer part of a number to determine the date the number represents, and ignores the decimal part of the number.	32734.11 32734.99 @DATE (89,8,14) @TODAY @NOW	(D1) 14-Aug-89 (D2) 14-Aug (D3) Aug-89 (D4) 08/14/89 *(if today is 8/14/89)* (D5) 08/14 *(if today is 8/14)*
	There are five Date formats (D1 — D5): DD-MMM-YY, DD-MMM, MMM-YY, Long Intn'l, and Short Intn'l.		
	For numbers less than 1 or more than 73050, displays asterisks.	–2 73052	(D1) ******** (D5) ********
Date Time	Displays numbers as times, in the Time format you select. 1-2-3 uses the decimal part of a number to determine the time the number represents. For positive numbers, 1-2-3 calculates the time number by adding the decimal part of the number to zero. For negative numbers, 1-2-3 calculates the time number by subtracting the decimal part of the number from one.	.5855 –.5855 @TIME(14, 3,7) @NOW	(D6) 02:03:07 PM (D7) 09:56 AM (D8) 14:03:07 (D9) 14:03 (*if it is 2:03 PM)*
	There are four Time formats (D6 — D9): HH:MM:SS (AM/PM), HH:MM (AM/PM), Long Intn'l (24 hour), and Short Intn'l (24 hour).		
Fixed	Displays number with up to 15 decimal places, a minus sign for negatives, and a leading zero for decimal values.	12.389 –8152 .56745	(F0) 12 (F2) –8152.00 (F1) 0.6
General	Displays numbers with a minus sign for negatives, no thousands separators, and no trailing zeros to the right of the decimal point.	1650.00 –12.42700	(G) 1650 (G) –12.427

(continued)

Format	Result	Examples: Data as entered	Examples: Data as displayed
	When the number of digits to the left of the decimal point exceeds the column width minus one, uses scientific notation. When the number of digits to the right of the decimal point exceeds the column width, rounds the number.	130000000000 123.876876	(G) 1.3000E+11 *(when column width is 12)* (G) 123.8769 *(when column width is 9)*
Hidden	Makes data in the range invisible, though the data still exists. The data appears in the control panel unless the cells are protected.	+C22/4.2*B2 12.42738	(H) (H)
Other	Presents more formatting choices: Automatic, Color, Label, and Parentheses, as described below.		
Other Automatic	Displays existing numbers in the formatted range in General format. If a new entry in the range looks like a number formatted as Comma, Currency, Fixed, Percent, or Scientific, 1-2-3 stores the entry as a number and formats the cell according to the entry's format. If a new entry looks like a date formatted as D1, D2, or D4, or a time formatted as any Time format except D9 when configured as HH.MM, 1-2-3 stores the entry as a date or time number and formats the cell according to the entry's Date or Time format. Subsequent entries in the cell inherit the new format.	24.5% 12-Oct-88	(A) 24.5% *(data stored as 0.245)* (A) 12-Oct-88 *(data stored as 32428, the date number for 12 October 1988; cell formatted as D1)*
	If a new entry in the range starts with a character that puts 1-2-3 in LABEL mode, stores the entry as a label and formats the cell as Label.	Number Sold	(A) 'Number Sold *(cell formatted as Label)*
	If a new entry in the range starts with a number but also includes spaces or non-numeric characters, stores the entry as a label and formats the cell as Label.	5 Forest Dr.	(A) '5 Forest Dr. *(cell formatted as Label)*
	If a new entry in the range is an invalid formula, stores the entry as a label and formats the cell as Label.	+TOT*(INT-.01	(A)'+TOT*(INT-.01 *(cell formatted as Label)*

(continued)

Format	*Result*	*Examples* *Data as entered*	*Data as displayed*
Other Color Negative	Displays negative numbers (including minus sign or parentheses) in a different color or at a brighter intensity	–2450 2450	(–)–2450 *in color* (–)2450
Other Color Reset	The initial Color setting. Displays negative and non-negative numbers in the same color or intensity.	–2450 2450	–2450 2450
Other Label	Displays existing numbers in the range in General format. Automatically adds the worksheet's global label prefix to all new entries in the range (except for entries you create using Data commands).	02138 +B2*RATE \A	(L) '02138 (L) '+B2*RATE (L) '\A
Other Parentheses No	The initial Parentheses setting. Removes the parentheses added with Parentheses Yes formatting.	12.35 –12.35 Assets	12.35 –12.35 Assets
Other Parentheses Yes	Encloses all numeric values in the range in parentheses, but does not otherwise change the appearance of the values.	12.35 –12.35 Assets	(()) (12.35) (()) (–12.35) (()) Assets
Percent	Displays numbers as percentages (that is, multiplies by 100), with up to 15 decimal places and a percent sign.	12.42738 –.0425	(P1) 1242.7% (P2) –4.25%
+/–	Displays a bar of plus or minus signs or a period. The number of plus or minus signs in the bar equals the integer value of the entry. Plus signs indicate a positive value, minus signs indicate a negative value, and a period indicates a number between –1 and 1. If the integer value of the entry exceeds the width of the column the entry is in, 1-2-3 displays asterisks instead of a bar.	5.9 –3 –.024	(+) ++++ (+) – – – (+) .

(continued)

Format	*Result*	*Examples* *Data as entered*	*Data as displayed*
Sci (Scientific)	Displays numbers in scientific (exponential) notation, with up to 15 decimal places in the mantissa and an exponent from –99 to +99.	–4.3 12.245 124600000000	(S0) –4E+00 (S1) 1.2E+01 (S2) 1.25E+11
Text	Displays formulas as entered rather than their values (or as much of the formulas as fit within the current column width); displays numbers in General format. For annotated formulas and numbers, displays the annotation as well.	+C22/4.2*B2 +FIRST&LAST 165.00 165.03	(T)+C22/4.2*B2 (T)+FIRST&LAST (T)165 (T)165.03

TIPS Depending on the number of decimal places you specify when you format a worksheet as Comma, Currency, Fixed, Percent, or Scientific or the column width when you format a worksheet as General, 1-2-3 may display entries in a rounded-off form. 1-2-3 continues to use the full value of those entries in calculations, however. To use a rounded-off value in a calculation, use @ROUND.

The /Worksheet Global Default Other International menu includes several commands that affect the display of numbers, dates, and times. For example, /Worksheet Global Default Other International Negative affects the display of negative numbers in cells formatted as Comma or Currency.

If your default currency symbol (set with /Worksheet Global Default Other International Currency) consists of multiple characters or a multibyte character and precedes numbers, Automatic formatting does not work with Currency format. For example, if your default currency symbol is followed by a space (two characters) and the symbol precedes numbers, you cannot use Automatic formatting to format cells as Currency. (The only exception to this rule is $ with a space after it; with this two-character prefix currency symbol, Automatic formatting does work with Currency format.)

When you select Hidden format, you can avoid accidentally writing over hidden data by protecting the worksheet with /Worksheet Global Prot Enable. If users need to enter data in the protected worksheet, they can unprotect specific cells with /Range Unprot.

To see the /Worksheet Global Format setting for the current worksheet, select /Worksheet Status.

/Worksheet Global Group

/Worksheet Global Group turns GROUP mode on or off for the current file. See "Using GROUP Mode for a File" in Chapter 1 for a description of GROUP mode.

CAUTION When you turn GROUP mode on, 1-2-3 immediately changes the settings for all worksheets in the current file to those of the current worksheet. Turning GROUP mode back off does not restore the settings you lost when you turned it on; you must re-create those settings manually.

CAUTION GROUP mode is a powerful feature that affects settings in all your current worksheets and active files. Before you turn GROUP mode on, consider saving your current active files to disk.

Procedure

1. Select /Worksheet Global Group.
2. Select Disable or Enable.

   Disable (initial setting) turns GROUP mode off for the current file, causing 1-2-3 to treat each worksheet in the current file as a separate entity.

   Enable turns GROUP mode on for the current file, displays the GROUP indicator, and uses the following settings in the current worksheet for all worksheets in the current file: /Range Format, Prot, and Unprot settings; /Worksheet Column settings; /Worksheet Global Col-Width, Format, Label, Prot, and Zero settings; and /Worksheet Titles settings.

   GROUP mode also keeps the cell pointer on the same cell as you move from worksheet to worksheet in the file; and inserting or deleting rows and columns in the current worksheet inserts or deletes the same rows and columns in all worksheets in the file.

TIP When a file is in GROUP mode and you use any of the following commands for one worksheet in the file, all worksheets in the file are affected: /Range Format; /Range Label; /Range Prot; /Range Unprot; /Worksheet Column; /Worksheet Delete Column or Row; /Worksheet Global Col-Width, Format, Label, Prot, or Zero; /Worksheet Insert Column or Row; /Worksheet Page; and /Worksheet Titles.

/Worksheet Global Label

/Worksheet Global Label sets the global label alignment for the current worksheet (or, with GROUP mode on, for the current file). The command affects future entries only; it does not change the alignment of existing labels.

Procedure

1. Select /Worksheet Global Label.
2. Select Left (initial setting), Right, or Center.

TIPS Labels that exceed the width of a column always appear left-aligned no matter what the global label alignment is.

You can override the global label alignment either by entering a label prefix when you enter or edit a label (' for left-aligned, ^ for centered, or " for right-aligned) or by using /Range Label after you enter a label.

To see the /Worksheet Global Label setting for the current worksheet, select /Worksheet Status.

/Worksheet Global Prot

/Worksheet Global Prot turns global protection on or off for the current worksheet (or, with GROUP mode on, for the current file).

Procedure

1. Select /Worksheet Global Prot.
2. Select Enable or Disable.

   Enable turns on worksheet protection for the current worksheet, preventing you from entering or editing data in the worksheet except in cells you have explicitly unprotected with /Range Unprot. Turning on worksheet

protection also prevents you from deleting or inserting rows and columns in the worksheet and from using /Range Justify in the worksheet.

Disable (initial setting) turns off worksheet protection for the current worksheet, letting you enter or edit data in any cell in the worksheet.

TIPS When worksheet protection is on, 1-2-3 displays PR in the control panel when the cell pointer is on a protected cell.

To see the /Worksheet Global Prot setting for the current worksheet, select /Worksheet Status.

/Worksheet Global Recalc

/Worksheet Global Recalc controls when and in what order 1-2-3 recalculates worksheet formulas and how many recalculation passes 1-2-3 performs each time it recalculates the formulas.

The recalculation settings you specify with /Worksheet Global Recalc affect all active worksheets and files. The settings remain in effect until you end the 1-2-3 session or read into memory another file with different recalculation settings. Whenever you read a file into memory with /File Retrieve or /File Open, that file's recalculation settings override the current recalculation settings for the 1-2-3 session.

Procedure

1. Select /Worksheet Global Recalc.
2. Select Natural, Columnwise, Rowwise, Automatic, Manual, or Iteration.

Automatic	Each time you change the contents of a cell, 1-2-3 recalculates any formulas that are affected by the change, displaying the CALC indicator in red (or, on monochrome terminals, in white) as it does so (initial setting). Automatic recalculation occurs in the background, so you can continue to work while 1-2-3 performs the recalculation.

Columnwise	Starting in A:A1 of the first active file, 1-2-3 moves column by column through each worksheet in each active file, recalculating all formulas.
Iteration	Sets the number of recalculation passes (from 1 to 50) 1-2-3 makes for a complete recalculation. The initial setting is 1. 1-2-3 uses the Iteration setting only in these two instances: (1) when the recalculation order is Columnwise or Rowwise, or (2) when the recalculation order is Natural and a circular reference exists.
Manual	1-2-3 recalculates formulas only when you press CALC. When recalculation is set to Manual, 1-2-3 displays the CALC indicator in blue (or, on monochrome terminals, in reverse-video) whenever any entries have changed since the last recalculation. Manual recalculation occurs in the foreground, so you must wait for 1-2-3 to complete it before you can continue with your work.
Natural	Before recalculating a particular formula, 1-2-3 recalculates any other formulas on which that formula depends (initial setting). For example, if the formula in cell B7 depends on the formula in cell C28, 1-2-3 recalculates the formula in C28 before it calculates the one in B7.
Rowwise	Starting in A:A1 of the first active file, 1-2-3 moves row by row through each worksheet in each active file, recalculating all formulas.

3. If you selected Iteration, enter a number from 1 to 50 to specify the number of recalculation passes.

TIPS Use Manual recalculation to speed up macro execution. When a macro is running, 1-2-3 performs Automatic recalculation not in the background but rather between macro instructions. For this reason, Automatic recalculation may slow down macro execution. If you use Manual recalculation when running a macro, you can use {CALC}, {RECALC}, and {RECALCCOL} to control when 1-2-3 recalculates formulas.

The initial setting for recalculation order, Natural, is sufficient for most worksheet recalculations. Set recalculation order to Columnwise or Rowwise only when you need to control the recalculation order explicitly.

To see the current /Worksheet Global Recalc settings, select /Worksheet Status.

/Worksheet Global Zero

/Worksheet Global Zero sets whether 1-2-3 displays a zero, a label, or nothing in cells in the current worksheet that contain either the number zero or a formula that evaluates to zero. (When GROUP mode is on, /Worksheet Global Zero affects all worksheets in the current file.)

Figure 2-145 shows the effect of the different zero settings on the same worksheet. Look at cells B9, B11..C11, and E6..E11:

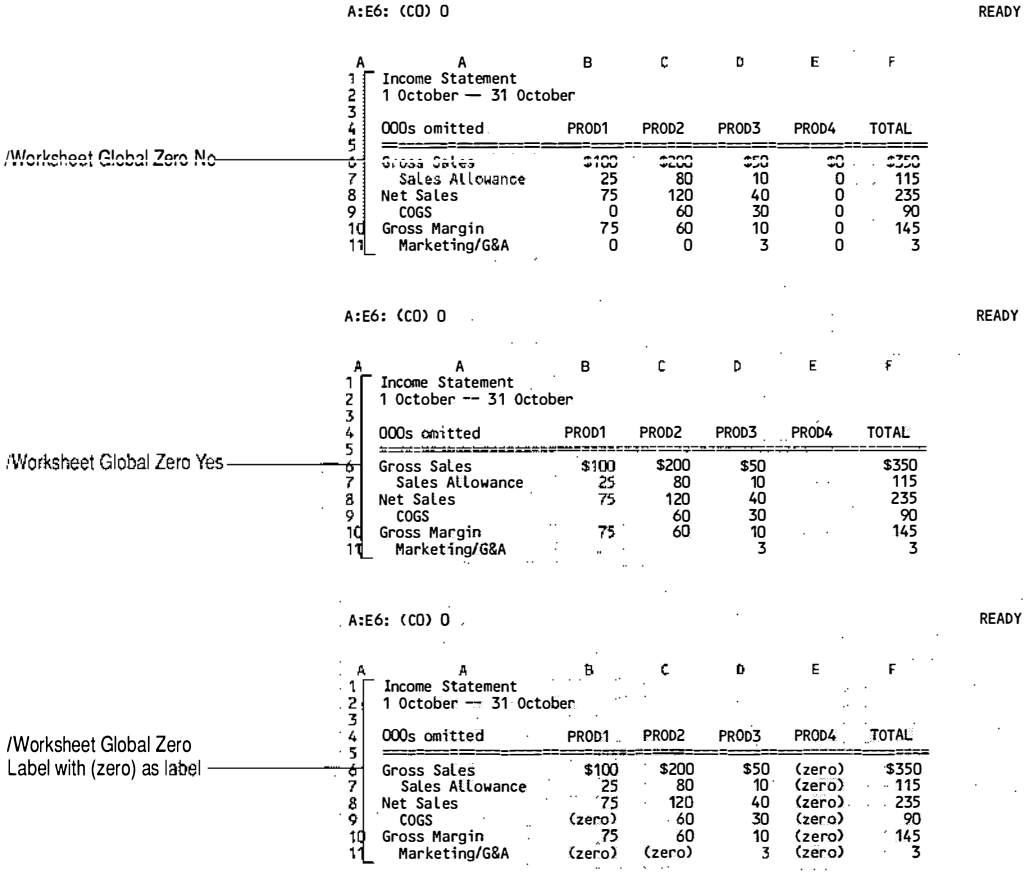


Figure 2–145. *Effects of the three /Worksheet Global Zero settings*

Procedure

1. Select /Worksheet Global Zero.
2. Select No, Yes, or Label.

   Label — Displays a label in cells in the current worksheet whose value is zero. (1-2-3 continues to display the contents of these cells in the control panel.)

   No — Displays zero in cells in the current worksheet whose value is zero (initial setting).

   Yes — Causes cells in the current worksheet whose value is zero to appear blank. (1-2-3 continues to display the contents of these cells in the control panel.)

3. If you selected Label, enter the label you want 1-2-3 to display in cells whose value is zero.

   The label can be any combination of characters. If you want to left-align or center the label in cells, type the appropriate label prefix (' or ^) at the beginning of the label. Otherwise, 1-2-3 right-aligns the label in cells.

TIPS If any zeros remain in the worksheet after you select /Worksheet Global Zero Yes or Label, they represent nonzero values in cells whose format makes them look like zero. For example, if you enter .05 in a cell formatted as Fixed, 0 decimal places, 1-2-3 displays 0 in the cell regardless of the worksheet's global zero setting. (To have the global zero setting affect that cell, use @ROUND to round the number to a true zero.)

To see the /Worksheet Global Zero setting for the current worksheet, select /Worksheet Status.

If you select /Worksheet Global Zero Yes, you may want to turn on worksheet protection with /Worksheet Global Prot Enable so you do not inadvertently write over data in cells that appear empty.

/Worksheet Hide

/Worksheet Hide hides one or more worksheets and redisplays hidden worksheets.

Procedure

1. Select /Worksheet Hide.
2. Select Enable or Disable.

3. If you selected Enable, specify the range of worksheets to hide. (Any worksheets that are already hidden will not be displayed when you select Enable.)

   If you selected Disable, specify the range of worksheets to redisplay. 1-2-3 indicates hidden worksheets with an * (asterisk) next to the worksheet letter in the upper left corner of the worksheet frame. For example, if worksheet A is hidden, 1-2-3 displays A*.

TIPS After you hide a worksheet, you cannot move the cell pointer to the worksheet with the pointer-movement keys or GOTO in READY mode, nor can you enter or edit data in the worksheet. Formulas in the worksheet and formulas that refer to data in the worksheet continue to work correctly, however.

Changes you make to a file in GROUP mode affect the file's hidden worksheets as well as its displayed worksheets.

Whenever 1-2-3 is in POINT mode, it displays hidden worksheets with * (asterisk) next to their worksheet letter. This means you can perform 1-2-3 operations on cells in hidden worksheets. For example, you can format, unprotect, or copy to or from cells in hidden worksheets. When creating formulas, you can refer to cells in hidden worksheets by entering POINT mode and highlighting those cells.

To hide all data in a worksheet but not the worksheet itself, use /Worksheet Global Format Hidden. To hide data in a range, use /Range Format Hidden. To hide columns, use /Worksheet Column Hide.

/Worksheet Insert

/Worksheet Insert inserts one or more blank columns or rows in existing worksheets and creates new, blank worksheets.

The first screen in Figure 2-146 shows the worksheet area in perspective view, with only one worksheet in memory. The second screen shows the worksheet area after inserting two worksheets, one before and one after the original worksheet.

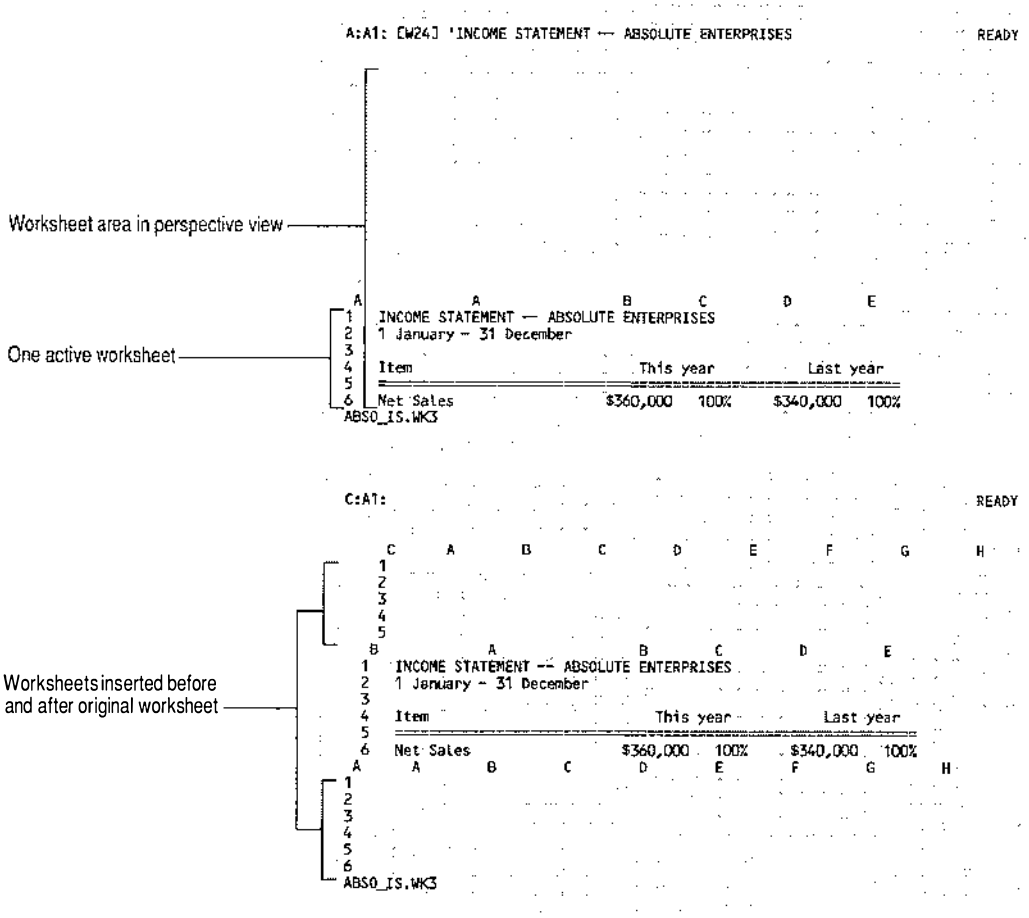


Figure 2–146. *Inserting worksheets with /Worksheet Insert Sheet*

Procedure

1. Select /Worksheet Insert.
2. Select Column, Row, or Sheet.
3. If you selected Column or Row, specify a range that includes at least one cell in each of the columns or rows you are inserting. The range must not include more columns or rows than the number of blank, unformatted columns or rows at the right or bottom edge of the worksheet.

If you selected Sheet, select Before or After depending on whether you are inserting the new worksheets before or after the current worksheet. Then specify the number of worksheets to insert (either by typing a number from 1 to 255 and pressing ENTER or by using → or ← and pressing ENTER). The number you specify must not bring the total number of worksheets in all active files to more than 256.

1-2-3 inserts columns to the left of the first column of the insert range, rows above the first row of the insert range, and worksheets in front of or behind the current worksheet. If the current worksheet is part of a file, the inserted worksheets become part of that file.

When a column, row, or worksheet insertion moves a cell used in a formula, 1-2-3 adjusts the cell address in the formula. For example, suppose you enter the formula +E6*100 and then insert two columns to the left of column E. 1-2-3 changes the formula to +G6*100.

When a column, row, or worksheet insertion moves the first or last cell of a range used in a formula, 1-2-3 adjusts the range address in the formula. For example, suppose you enter the formula @SUM(A:A3..C:C5), which uses a three-dimensional range. If you then insert a row above row 3 in worksheet A, 1-2-3 changes the formula to @SUM(A:A4..C:C5) because the insertion moved the range's first cell, A:A3, down one row. Or if you insert a row above row 3 in worksheet C, 1-2-3 changes the formula to @SUM(A:A3..C:C6) because the insertion moved the range's last cell, C:C5, down one row. On the other hand, if you insert a row above row 3 in worksheet B, the formula does not change because neither of the range's end points have moved.

When a column, row, or worksheet insertion moves the first or last cell of a named range, 1-2-3 redefines the named range accordingly. For example, suppose you assign the range name EXPENSES to A:B1..F:G10 and then insert two worksheets in front of worksheet A. 1-2-3 redefines EXPENSES as C:B1..H:G10.

TIP To insert a new blank file in memory, use /File New.

/Worksheet Page

/Worksheet Page inserts in the current worksheet (or, with GROUP mode on, in all worksheets in the current file) a row containing :: (page-break symbol). This symbol tells 1-2-3 to begin a new page when printing.

Procedure

1. Position the cell pointer in the leftmost column of the range you are printing and the row where you want a new page to start.

   For example, if the print range is C3..N28 and you want the new page to start at row 16, position the cell pointer in C16.

2. Select /Worksheet Page.

1-2-3 inserts a row that contains :: (page-break symbol) in the current cell and moves the remaining rows down, adjusting cell and range addresses in formulas and redefining named ranges as described in /Worksheet Insert. When you print your data, 1-2-3 starts a new page at the row with the page-break symbol.

TIPS Do not enter data to be printed in the same row as the page-break symbol. Except for the page-break symbol, 1-2-3 ignores this row when printing.

As well as using /Worksheet Page to insert a page-break symbol, you can enter a page-break symbol manually. To do so, move the cell pointer to the left-most column in the range you are printing, and enter |:: (the nonprinting label prefix followed by two colons) in the row where you want the new page to start.

To remove a page-break symbol, either use /Range Erase or /Worksheet Delete Row, edit the cell containing the symbol, or write over the symbol with another entry.

/Worksheet Status

/Worksheet Status displays information about memory use, global settings, circular references, hardware options, and file name mode in a status screen that overlays the worksheet. Figure 2-147 shows the /Worksheet Status screen with sample information.

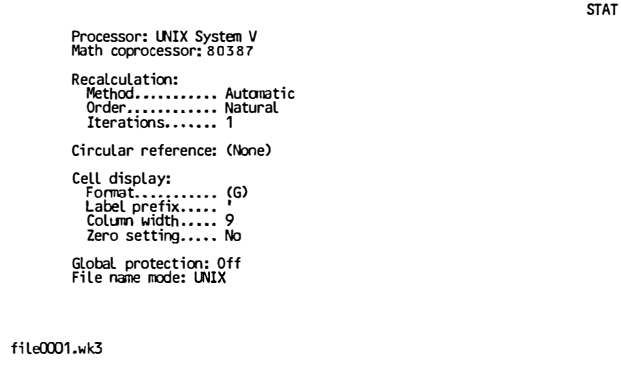


Figure 2–147. *A sample /Worksheet Status screen*

Use /Worksheet Status to check the current worksheet's global worksheet settings or to track down circular references before using /File Open or /File Combine.

Procedure

1. Select /Worksheet Status.
2. When you finish viewing the status screen, press any key to remove it and redisplay the worksheet.

TIP The status screen displays only one circular reference at a time. If you eliminate the displayed circular reference and the CIRC indicator still appears in the status line, select /Worksheet Status again to locate the next circular reference.

/Worksheet Titles

/Worksheet Titles freezes rows and/or columns along the top and left edges of the current worksheet (or, with GROUP mode on, of all worksheets in the current file) so those rows and/or columns remain in view as you scroll through the worksheet (or file).

Figure 2-148 shows how /Worksheet Titles simplifies examination of a mall traffic analysis. The first screen shows how using rows 1 through 8 as titles lets you look at data further down the worksheet without losing column headers. The second screen shows how using columns A and B as titles lets

you examine data in columns F, G, and H without having to look at the data in columns C, D, and E.

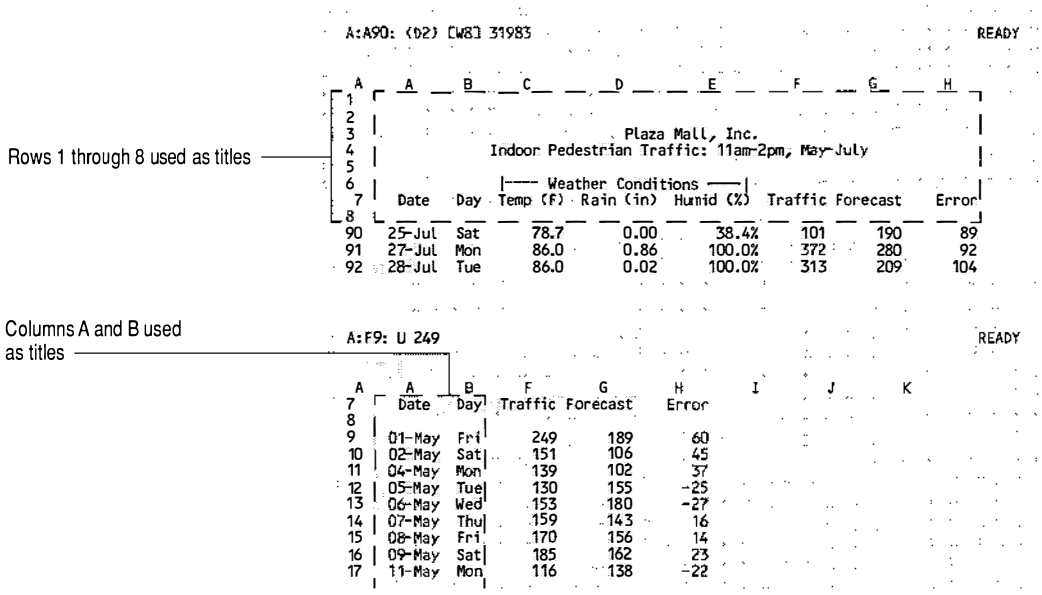


Figure 2–148. *Using columns and rows as titles*

Procedure

1. If you are creating worksheet titles, position the cell pointer as follows:
   - For Horizontal titles, position the cell pointer one row below the rows you want to freeze.
   - For Vertical titles, position the cell pointer one column to the right of the columns you want to freeze.
   - For Both (Horizontal and Vertical) titles, position the cell pointer one row below and one column to the right of the rows and columns you want to freeze.
2. Select /Worksheet Titles.
3. Select Both, Horizontal, Vertical, or Clear.

Both	Both Freezes the rows above the cell pointer and the columns to the left of the cell pointer.

Clear	Unfreezes any rows and columns currently set as titles.
Horizontal	Freezes the rows above the cell pointer.
Vertical	Freezes the columns to the left of the cell pointer.

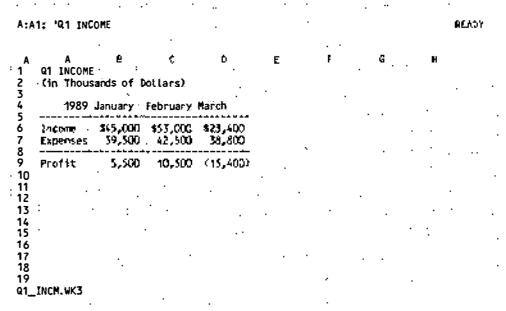
NOTE 1-2-3 automatically clears worksheet titles in any situation in which the cell pointer would not be visible because of the current /Worksheet Titles setting. For example, suppose you set rows 1 through 8 as worksheet titles and then use /Worksheet Window to switch to perspective view, where 1-2-3 displays only the first six rows in each worksheet. 1-2-3 clears your worksheet titles so it can bring the cell pointer into view. Or suppose you retrieve a file in which rows 1 through 24 were set as worksheet titles but your screen displays only 20 rows. 1-2-3 automatically clears the titles when you retrieve the file because otherwise the cell pointer would not be visible on your screen.

TIPS If you use /Worksheet Titles after splitting the screen into two windows with /Worksheet Window Horizontal or Vertical, /Worksheet Titles affects only the current window. When you clear the second window with /Worksheet Window Clear, 1-2-3 uses the top or left window's /Worksheet Title settings.

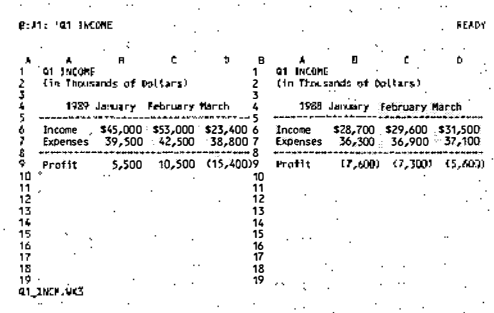
To move the cell pointer to a frozen row or column, press GOTO, and specify the cell you want to go to. 1-2-3 displays a second set of the frozen rows or columns immediately below or to the right of the first set and moves the cell pointer to the specified cell there. To clear the second set of frozen rows or columns, press PGDN and then PGUP (for rows) or BIG RIGHT and then BIG LEFT (for columns).

/Worksheet Window

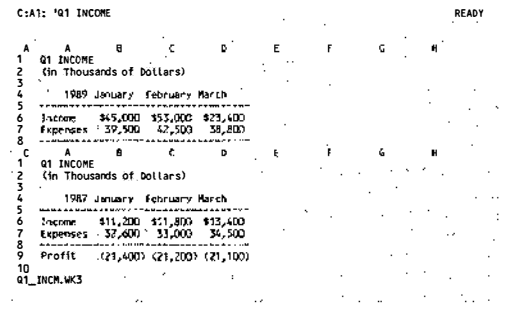
/Worksheet Window lets you view your work in a variety of ways: It lets you split the screen horizontally or vertically into two windows; create a **perspective view** of multiple consecutive worksheets; display the current graph in a split-screen window (on terminals) or in separate, resizeable window (on workstations); and display a **map view** of the current worksheet showing the type of data (number, label, or formula) each cell contains (Figure 2-149).



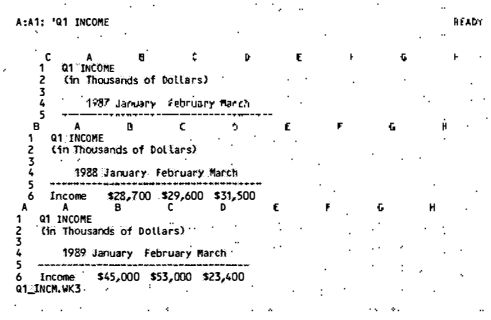
Full–screen view



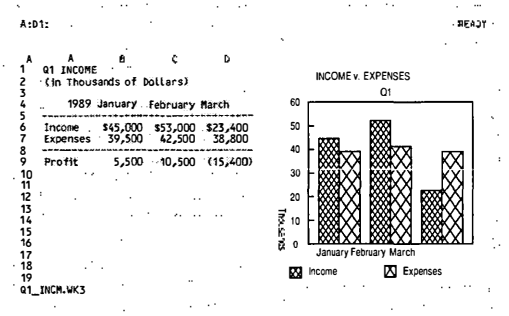
Vertical windows



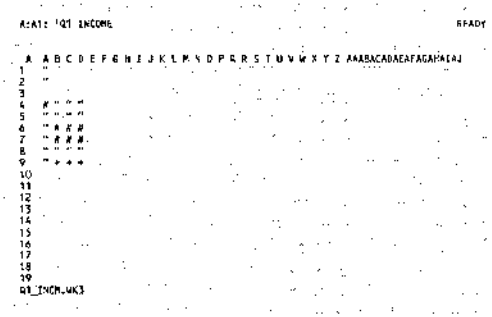
Horizontal windows



Perspective view



Graph window



Map view

Figure 2–149. ***Window types***

Use /Worksheet Window Vertical or Horizontal to view two parts of the same or different worksheets simultaneously. Use /Worksheet Window Perspective to view three or more consecutive worksheets simultaneously. Use /Worksheet Window Graph to watch a graph change as you change its settings and the data it is based on. Use /Worksheet Window Map to track

entries, for example, to make sure you have not written over formulas with numbers.

NOTE Be certain to clear /Worksheet Window Perspective, /Worksheet Window Horizontal, or /Worksheet Window Vertical before opening a graph window with the command /Worksheet Window Graph.

Procedure

1. If you are using /Worksheet Window Horizontal, move the cell pointer to the row you want to use as the top edge of the second window. If you are using /Worksheet Window Vertical move the cell pointer to the column you want to use as the left edge of the second window.
2. Select /Worksheet Window.
3. Select Horizontal, Vertical, Sync, Unsync, Clear, Map, Perspective, or Graph.

Clear	Restores full-screen worksheet display. If a separate graph window was displayed, the graph window is removed. When you switch from one type of window to another (horizontal or vertical), you must use /Worksheet Window Clear before you can create the new window.
Display	Is inoperative for UNIX versions of 1-2-3. UNIX cannot dynamically change display drivers at runtime.
Graph	On terminals, divides the screen vertically at the column the cell pointer is in (except the first column on the screen) and displays the current graph in the right-hand window. If you change the graph data or any other graph settings while the graph is displayed, 1-2-3 updates the graph to reflect the changes.
Horizontal	Creates two windows with the screen split horizontally at the row the cell pointer is in. Use WINDOW to move the cell pointer from one window to the other.

Be sure to remove the graph window (if you are displaying a graph) with /Worksheet Window Clear before using /Worksheet Window Horizontal. You cannot split the screen when you are displaying a graph.

Map

Turns map view on. With map view on, 1-2-3 temporarily makes all columns two characters wide and displays " in cells that contain labels, # in cells that contain numbers, and + in cells that contain formulas or annotated numbers. Also, 1-2-3 temporarily displays hidden columns and worksheets and cells formatted as Hidden.

(For hidden worksheets and for hidden columns lettered A through Z, 1-2-3 displays an asterisk next to their worksheet or column indicator.

Map view is a display mode only. When it is on, you can use any of the pointer-movement keys, **GRAPH**, **HELP**, **WINDOW**, and **ZOOM**, but you cannot enter data or use 1-2-3 commands. To turn map view off so you can continue entering data and using 1-2-3 commands, press **ENTER**, **ESC**, or **BREAK**.

Perspective

Displays three or more windows with consecutive worksheets stacked at a slope up and to the right. The number of windows that appear (from 3, which is the default setting, to 26) is determined by the value you specified with the `-p` command-line option. For example, if you started 1-2-3 with the command `123 -p 12`, 12 windows would appear when you select /Worksheet Window Perspective.

If the current size of your 1-2-3 window is too small to display all the worksheet windows you specified, 1-2-3 will display as many worksheet windows as possible.

Use **WINDOW** to move the cell pointer between the worksheets that are currently displayed in the windows shown in perspective. Use **NEXT SHEET**, and **PREV SHEET** to move other worksheets into the three or more windows.

When you select /Worksheet Window Perspective with fewer than three active worksheets or files, 1-2-3 displays blank windows in place of the nonexistent worksheets.

Be sure to remove the graph window (if you are displaying a graph) with /Worksheet Window Clear before using /Worksheet Window Perspective. You cannot display multiple worksheets when displaying a graph.

Sync — Synchronizes window scrolling (initial setting).

For Horizontal windows, Sync keeps the same columns on the screen in both windows when you scroll through columns in one window. For Vertical windows, Sync keeps the same rows on the screen in both windows when you scroll through rows in one window. For Perspective view, Sync keeps the same part of the three or more worksheets on the screen when you scroll through any one of the worksheets and keeps the cell pointer in the same cell as you move from one worksheet to another.

Unsync — Unsynchronizes window scrolling, allowing windows to scroll independently in all directions.

Vertical — Creates two windows with the screen split vertically at the column the cell pointer is in. Use **WINDOW** to move the cell pointer from one window to the other.

4. If you selected Map, select Enable to turn map view on or Disable to return 1-2-3 to READY mode.

TIPS

When working in a window, press ZOOM to expand the window so it occupies the full screen. Press ZOOM again to return the window to its original size.

With horizontal or vertical windows, when you are viewing the same worksheet (or, with GROUP mode on, the same file) in both windows, most commands that change the worksheet display affect both windows. /Worksheet Column, /Worksheet Global Col-Width, and /Worksheet Titles, however, affect only the current window.

When you clear horizontal or vertical windows, 1-2-3 uses the titles, global and individual column-width settings, and hidden/displayed columns of the top or left window.

/Worksheet Window Graph always creates a separate split-screen window. If, however, you have a display device like a VT100 that is incapable either of drawing graphs or of displaying a graph, the graph window remains blank.

If you create a graph window before creating an automatic graph or using /Graph A — F to set at least one numeric data range, 1-2-3 does not display a graph in the graph window. However, if you then press GRAPH or select /Graph View to create an automatic graph, or use /Graph A — F to set at least one numeric data range, 1-2-3 immediately displays the resulting graph in the graph window when it returns to READY mode.

/Worksheet Window Sync and Unsync change the way the cell pointer behaves in POINT mode when it is unanchored and you move between worksheets. With synchronized scrolling, the cell pointer stays in the same cell as you move from one worksheet to another. With unsynchronized scrolling, the cell pointer goes to whatever cell you last highlighted in the worksheet you move to. (When the cell pointer is anchored, 1-2-3 keeps it in the same cell as you move between worksheets, regardless of whether window scrolling is synchronized or unsynchronized.)

When you change the window settings with /Worksheet Window, 1-2-3 uses the new settings for all active worksheets and files. Likewise, when you read a file into memory, 1-2-3 uses that file's window settings for all active worksheets and files. However, 1-2-3 keeps track of each file's window settings separately, so the settings 1-2-3 saves with a file may differ from the current window settings.

Chapter 3
@Functions

The 1-2-3 **@functions** are built-in formulas that perform a variety of calculations. You can use @functions for financial, statistical, scientific, string, or date-and-time calculations. You can also use @functions to create conditional formulas or perform such tasks as looking up a value in a table.

For example, Figure 3-1 shows that instead of adding a list of values with the formula +B1+B2+B3+B4, you can use the formula @SUM(B1..B4) to produce the same result.

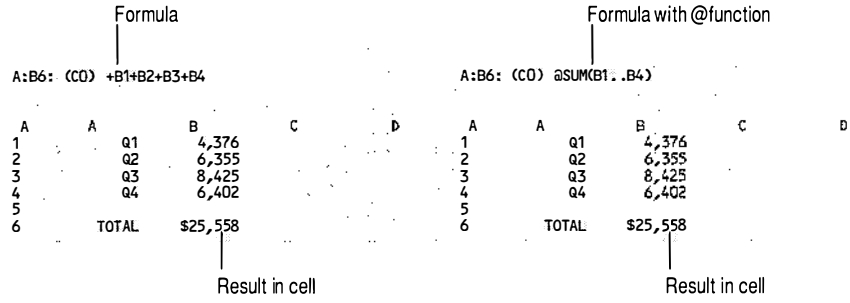


Figure 3-1. *Using @SUM to add a series of values*

Or, instead of counting the number of characters in a label, you can use the string function @LENGTH. For example, in Figure 3-2, the formula @LENGTH(A3) counts the number of characters in the label located in A3.

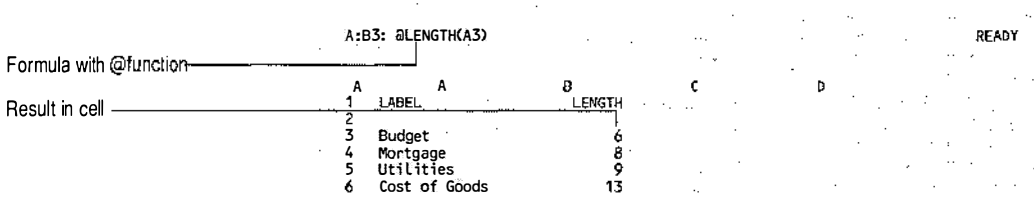


Figure 3-2. *Using @LENGTH to count characters*

The logical function @IF evaluates a condition and then takes one of two actions, depending on whether the result of the condition is true or false. The @IF formula in Figure 3-3 enters the account balance if that balance is 0 or positive; if the balance is negative, the @IF formula enters the word Overdrawn.

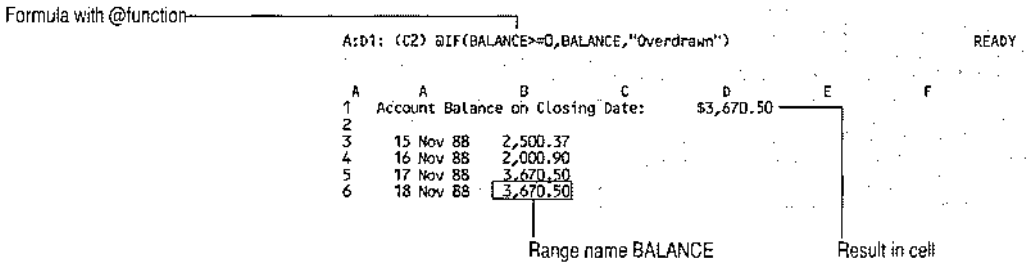


Figure 3-3. *Using @IF to display an account balance*

How to Use this Chapter

This chapter is divided into four main sections:

- "Types of @Functions" lists the 1-2-3 @functions by category.
- "Syntax of @Functions" explains the rules for writing @functions.
- "Guidelines for Using @Functions" provides rules and tips specific to each category of @function.
- "@Function Descriptions" contains descriptions and examples of each @function, arranged alphabetically.

Types of @Functions

1-2-3 @functions can be grouped in eight categories: database, date and time, financial, logical, mathematical, special, statistical, and string.

- Database @functions perform statistical calculations and queries in database tables in both worksheets and external databases.
- Date and time @functions calculate values that represent dates and times.
- Financial @functions calculate loans, annuities, and cash flows.
- Logical @functions calculate the results of conditional (logical) formulas. See "Working with Formulas" in Chapter 1 for information about logical formulas.
- Mathematical @functions perform calculations with values.
- Special @functions perform tasks, such as looking up a value in a table or providing information about a specific cell.
- Statistical @functions perform calculations on lists of values.
- String @functions calculate with **strings** — labels, string formulas, or **literal strings** (any sequence of letters, numbers, and symbols enclosed in quotation marks).

The following tables list the @functions by category and briefly describe each @function. For a more complete description of the @functions and examples of how they work, see "@Function Descriptions" later in this chapter.

Database @functions	
@DAVG	Averages values in a field of a database table, based on certain criteria.
@DCOUNT	Counts nonblank cells in a field of a database table, based on certain criteria.
@DGET	Finds a value or label in a field of a database table, based on certain criteria.

(continued)

Database @functions	
@DMAX	Finds the largest value in a field of a database table, based on certain criteria.
@DMIN	Finds the smallest value in a field of a database table, based on certain criteria.
@DQUERY	Sends a command to an external database management program.
@DSTD	Calculates the population standard deviation of values in a field of a database table, based on certain criteria.
@DSTDS	Calculates the sample standard deviation of values in a field of a database table, based on certain criteria.
@DSUM	Sums values in a field of a database table, based on certain criteria.
@DVAR	Calculates the population variance of values in a field of a database table, based on certain criteria.
@DVARS	Calculates the sample variance of values in a field of a database table, based on certain criteria.
Date and time @functions	
Date calculations:	
@DATE	Calculates the date number for a set of year, month, and day values. For example, @DATE(89,1,7) returns 32515, the date number for January 7, 1989.
@DATEVALUE	Converts a string that looks like a date into its equivalent date number. For example, @DATEVALUE("7-Jan-89") returns the date number 32515.
@DAY	Calculates the day of the month in a date number. For example, @DAY(32515) returns the value 7 because 32515 is the date number for January 7, 1989.
@D360	Calculates the number of days between two date numbers, based on a 360-day year. For example, @D360(32560,32572) returns the value 14.

(continued)

Date and time @functions	
@MONTH	Calculates the number of the month in a date number. For example, @MONTH(32515) returns the value 1 because 32515 is the date number for January 7, 1989.
@YEAR	Calculates the number of the year in a date number. For example, @YEAR(32515) returns the value 89 because 32515 is the date number for January 7, 1989.
Time calculations:	
@HOUR	Calculates the hour in a time number (based on a 24-hour format). For example, @HOUR(0.604745) returns the value 14 because 0.604745 is the time number for 2:30:50 p.m.
@MINUTE	Calculates the minutes in a time number. For example, @MINUTE(0.604745) returns the value 30 because 0.604745 is the time number for 2:30:50 p.m.
@SECOND	Calculates the seconds in a time number. For example, @SECONDS(0.604745) returns the value 50 because 0.604745 is the time for 2:30:50 p.m.
@TIME	Calculates the time number for a set of hours, minutes, and seconds values. For example, @TIME(14,30,50) returns 0.604745, the time number for 2:30:50 p.m.
@TIMEVALUE	Converts a string that looks like a time into its equivalent time number. For example, @TIMEVALUE("02:30:50 PM") returns the time number 0.604745.
Current date and time calculations:	
@NOW	Calculates the value that corresponds to the current date and time in system memory. For example, @NOW returns the value 32515.604745 at 2:30:50 p.m. (the time number 0.604745) on January 7, 1989 (the date number 32515).

(continued)

Date and time @functions	
@TODAY	Calculates the date number that corresponds to the current date in system memory. For example, @TODAY returns the value 32515 on January 7, 1989.
Financial @functions	
Capital-budgeting tools:	
@IRR	Calculates the internal rate of return for a series of cash flows.
@NPV	Calculates the net present value of a series of cash flows.
Depreciation:	
@DDB	Calculates the double-declining balance depreciation allowance of an asset.
@SLN	Calculates the straight-line depreciation allowance of an asset for one period.
@SYD	Calculates the sum-of-the-years'-digits depreciation allowance of an asset.
@VDB	Calculates depreciation using the double-declining balance method and allows the percentage of straight-line depreciation to be values other than 200%.
Ordinary annuities:	
@FV	Calculates the future value of a series of equal payments.
@PMT	Calculates the amount of the periodic payment needed to pay off a loan.
@PV	Calculates the present value of a series of equal payments.
@TERM	Calculates the number of payment periods of an investment.
Single-sum compounding:	
@CTERM	Calculates the number of compounding periods necessary for an investment to grow to a future value.
@RATE	Calculates the periodic interest rate necessary for an investment to grow to a future value.

(continued)

Logical @functions	
@FALSE	Returns the logical value 0 (false).
@IF	Takes one action if a condition is true; another, if the condition is false. For example, @IF(SALES>COSTS,SALE-COSTS, "No profit") returns the result of SALES minus COSTS if sales are greater than costs, or the string No profit if sales are less than or equal to costs.
@ISERR	Returns 1 (true) for the value ERR (error); 0 (false) for any other entry.
@ISNA	Returns 1 (true) for the value NA (not available); 0 (false) for any other entry.
@ISNUMBER	Returns 1 (true) for a value or a blank cell; 0 (false) for a string.
@ISRANGE	Returns 1 (true) for a defined range name or valid range address; 0 (false) for any other entry.
@ISSTRING	Returns 1 (true) for a string; 0 (false) for a value or a blank cell.
@TRUE	Returns the logical value 1 (true).
Mathematical @functions	
General:	
@ABS	Calculates the absolute (positive) value of a value.
@EXP	Calculates the number *e* raised to a specified power.
@INT	Returns the integer portion of a value.
@LN	Calculates the natural logarithm (base *e*) of a value.
@LOG	Calculates the common logarithm (base 10) of a value.
@MOD	Calculates the remainder (modulus) of two values.
@RAND	Generates a random value between 0 and 1.
@ROUND	Rounds a value to a specified number of decimal places.

(continued)

Mathematical @functions	
@SQRT	Calculates the positive square root of a value.
Trigonometric:	
@ACOS	Calculates the arc cosine of a value.
@ASIN	Calculates the arc sine of a value.
@ATAN	Calculates the arc tangent of a value.
@ATAN2	Calculates the four-quadrant arc tangent of two values.
@COS	Calculates the cosine of an angle.
@PI	Returns the value (calculated at 3.14159265358979).
@SIN	Calculates the sine of an angle.
@TAN	Calculates the tangent of an angle.
Special @functions	
Cell and range information:	
@@	Returns the contents of the cell whose name or address another cell contains.
@CELL	Returns information about a cell or its contents. For example, @CELL("type",B5) returns v if B5 contains a value, b if B5 is blank, and l if B5 contains a label.
@CELLPOINTER	Returns information about the current cell or its contents. For example, @CELLPOINTER("type") returns v if the current cell contains a value, b if the current cell is blank, or l if the current cell contains a label.
@COLS	Counts the columns in a range.
@COORD	Creates an absolute, mixed, or relative cell address from values provided as arguments.
@ROWS	Counts the rows in a range.
@SHEETS	Counts the worksheets in a range.
Error trapping:	
@ERR	Returns the value ERR (error).
@NA	Returns the value NA (not available).

(continued)

Special @functions	
Lookup calculations:	
@CHOOSE	Finds a specified value or string in a list of values and/or strings.
@HLOOKUP	Finds the contents of a cell in a specified row in a horizontal lookup table.
@INDEX	Finds the value of the cell in a specified row, column, and worksheet (optionally) in a range.
@VLOOKUP	Finds the contents of the cell in a specified column in a vertical lookup table.
System and session information:	
@INFO	Returns system information for the current session.
Statistical @functions	
@AVG	Averages a list of values.
@COUNT	Counts the nonblank cells in a list of ranges.
@MAX	Finds the maximum value in a list of values.
@MIN	Finds the minimum value in a list of values.
@STD	Calculates the population standard deviation of a list of values.
@STDS	Calculates the sample standard deviation of a list of values.
@SUM	Sums a list of values.
@SUMPRODUCT	Sums the products of corresponding elements in multiple ranges.
@VAR	Calculates the population variance of a list of values.
@VARS	Calculates the sample variance of a list of values.
String @functions	
@CHAR	Returns the character that a Lotus Multibyte Character Set (LMBCS) code produces.
@CLEAN	Strips non-printing characters from a specified string or cell.

(continued)

String @functions	
@CODE	Returns the LMBCS code that corresponds to the first character in a string.
@EXACT	Returns 1 (true) if two strings are the same; 0 (false) if the strings are different.
@FIND	Calculates the position of the first character of one string within another string.
@LEFT	Returns the first *n* characters in a string.
@LENGTH	Counts the characters in a string.
@LOWER	Converts all the letters in a string to lowercase.
@MID	Returns a number of characters in a string, starting at a specified character.
@N	Returns the value in the first cell in a range or 0 if the cell contains a label or is blank.
@PROPER	Converts the first letter in each word in a string to uppercase and the rest of the letters in each word to lowercase.
@REPEAT	Duplicates a string a specified number of times.
@REPLACE	Replaces characters in one string with characters from a different string.
@RIGHT	Returns the last *n* characters in a string.
@S	Returns the label in the first cell in a range or an empty (null) string if the cell contains a value.
@STRING	Converts a value into a label with a specified number of decimal places.
@TRIM	Removes leading, trailing, and consecutive spaces from a string.
@UPPER	Converts all the letters in a string to uppercase.
@VALUE	Converts a string that looks like a number into a value.

Syntax of @Functions

Each @function has a specific structure, or **syntax**. Unless you follow this syntax exactly, 1-2-3 cannot interpret the @function. Figure 3-4 shows the syntax of @functions.

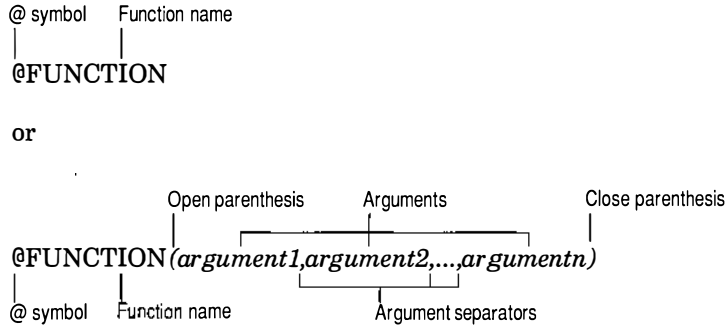


Figure 3-4. *Syntax of @functions*

- **@FUNCTION** represents the name of the @function. It tells 1-2-3 which calculation to perform.
- ***argument1,argument2...,argumentn*** represent the data 1-2-3 uses in the @function calculations.

Arguments

Arguments supply the information 1-2-3 needs to complete the @function calculation. For example, when 1-2-3 encounters the function @SUM(B4..B25), the argument B4..B25 tells 1-2-3 to add the values in the range B4..B25.

The arguments in an @function can be any length, providing the total number of characters in the cell that contains the @function does not exceed 512.

NOTE 1-2-3 calculates values to a precision of 15 significant digits unless the magnitude of the calculated value differs widely from one or more arguments used in the calculation.

@Functions use four types of information as arguments: values, strings, locations, and conditions.

- For value arguments, you can use a number, a numeric formula, or the range name or address of a cell that contains a number or numeric formula.
- For string arguments, you can use a literal string (any sequence of letters, numbers, and symbols enclosed in quotation marks), a string formula, or the range name or address of a cell that contains a label or string formula.

  NOTE Every literal string used as a string argument should be enclosed in quotation marks. This prevents 1-2-3 from interpreting the literal string as a number, formula, address, or range name. It also prevents 1-2-3 from interpreting commas, semicolons, or periods within the literal string as argument separators.

- For location arguments, you can use a range name, address, or any formula that evaluates to a range name or address.
- For condition arguments, you typically use a **logical formula** (a formula that uses one of the logical operators < > = <> >= <= #NOT# #AND# #OR#) or the range name or address of a cell that contains a logical formula. However, you can also use any numeric or string formula, number, literal string, or cell reference as a condition argument.

Basic Rules of Syntax

Use these general guidelines when you enter @functions:

- Begin every @function with the @ symbol.
- You can type @functions in either uppercase or lowercase letters; 1-2-3 displays them in uppercase letters.
- Do not include spaces between the @function name and its arguments. For example, @AVG(B6..B12) is correct while @AVG (B6..B12) is not.
- Always enclose an @function's arguments in parentheses. For example, in @INT(@SUM(A5..A11)), the argument for @INT is (@SUM(A5..A11)), and the argument for @SUM is (A5..A11).

- If an @function includes two or more arguments, separate the arguments from one another with argument separators. Initially, commas and semicolons are the valid argument separators for @functions, but you can use /Worksheet Global Default Other International Punctuation to set semicolons only or semicolons and periods as the valid argument separators.
- You can use an @function by itself as a formula, combine it with other @functions and formulas, or use it in a macro. (See "Creating a Macro" in Chapter 4 to learn how to write 1-2-3 macros.) In any case, the total number of characters in the cell that contains the formula or macro instructions must not exceed 512.
- 1-2-3 assigns the value 0 to blank cells whose addresses are used as arguments in financial, logical, and mathematical @functions.
- You can use single-sheet or three-dimensional ranges as arguments in any @function that accepts a range address or range name as an argument, except for database @functions, @HLOOKUP, and @VLOOKUP. You cannot use three-dimensional ranges for the database @functions, @HLOOKUP, or @VLOOKUP.
- If, after entering an @function that uses a range address as an argument, you assign a name to that range, 1-2-3 automatically replaces the address in the @function with the range name you assigned. For example, if you enter @SUM(E5..H7) and later assign E5..H7 the name ALL_COSTS, 1-2-3 automatically changes @SUM(E5..H7) to @SUM(ALL_COSTS). Note that this automatic replacement occurs only for range addresses. For example, if you assign a range name to C10, 1-2-3 updates @AVG(C10..C10) and @AVG(!C10) but not @AVG(C10). (Typing an exclamation point in front of a single-cell address, as in @AVG(!C10), is equivalent to using a range address.)
- You can add a comment to an @function by beginning the comment with a ; (semicolon).

Guidelines for Using @Functions

This section lists rules and tips for each category of @functions.

Database @Functions

- Database @functions scan a database table, select the records that match the criteria in the criteria range, and then perform calculations on the selected values or labels in the field you specify. See "Database Tables" in Chapter 2 for information about setting up a database table.
- With the exception of @DQUERY, all database @functions use three arguments: *input*, *field*, and *criteria*.
  - *input* is the range or ranges that contain the database table.

    input can be the address or name of a single-sheet range that contains a database table or the name of an external table. For information on specifying external tables, see /Data External in Chapter 2.

    You can use more than one *input* range in a database @function. To do so, separate each argument with a valid argument separator. When 1-2-3 calculates a database @function, it reads the arguments from right to left. 1-2-3 uses the last argument in the @function as the *criteria* range, the next to last argument as the *field*, and the remaining arguments as *input* ranges.

    @DAVG(GOTHAM,MAYFAIR,"COST",BATHS) has a *criteria* range (BATHS), a *field* name ("COST"), and an *input* range (GOTHAM), for example.

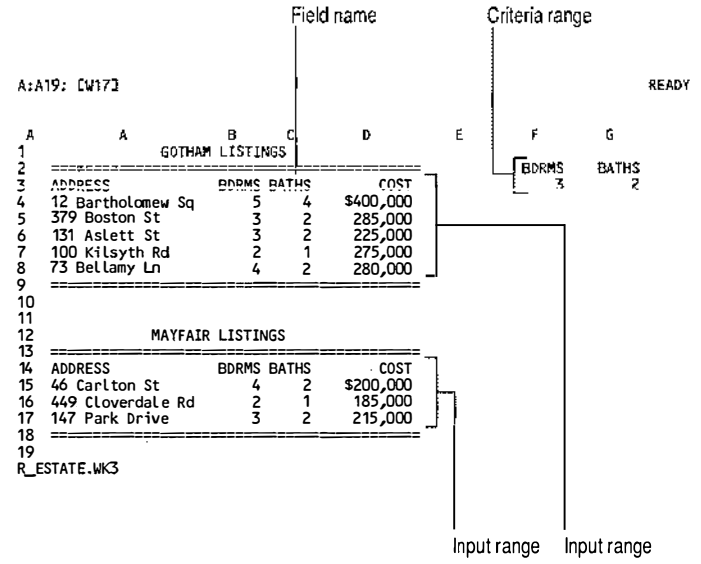


Figure 3-5. *Database @function arguments*

NOTE There is no limit to the number of *input* ranges you can use as long as the total number of characters in the cell does not exceed 512.

- *field* is the field name or the field's offset number. A **field name** is a label in the first row of a database table that identifies the contents of each field. A field's **offset number** corresponds to the position of the column the field occupies in the *input* range. The first field of the *input* range has an offset number of 0, the second field has an offset number of 1, and so on. If the value you provide as the field's offset number is larger than the number of columns in the database table minus 1, database @functions return the value ERR. For example, if there are 5 columns in an *input* range, the largest valid offset number is 4.

  If you use just one *input* range, *field* can be a field name from the database table enclosed in quotation marks; a positive integer or 0; or a cell address that contains a valid field name, a positive integer, or 0.

  If you use more than one *input* range, *field* must be a field name from the database table enclosed in quotation marks.

If you use an *input* range from an external database table, *field* must be a field name from the external database table enclosed in quotation marks.

NOTE If you use more than one *input* range (either in the worksheet or from an external database table) and *field* is not a unique field name (it appears in more than one of the *input* ranges), *field* must be the name of the *input* range followed by a period and the field name enclosed in quotation marks. For example, if the field name COST appears in both GOTHAM and MAYFAIR, "GOTHAM.COST" refers to the field name COST in the *input* range GOTHAM.

- *criteria* is a range you create to specify selection requirements. Each *criteria* range must include field names from the *input* range and the criteria you want 1-2-3 to use. You must enter the criteria directly below their corresponding field names.

  criteria can be a range address or a range name.

Date and Time @Functions

- Date @functions calculate with **date numbers**, consecutive integers that correspond to dates from January 1, 1900 (the date number 1) through December 31, 2099 (the date number 73050). Time @functions calculate with **time numbers**, consecutive decimal values that correspond to times from midnight (the time number 0.000000) through 11:59:59 p.m. (the time number 0.999988).

- To format date and time numbers so 1-2-3 displays them as actual dates and times, use /Range Format Date or /Worksheet Global Format Date.

  For example, @DATE(89,1,7) returns the date number 32515. You can format this number to appear on the screen as 07-Jan-89, 07-Jan, Jan-89, or in an International Date format, such as 01/07/89. The function @TIME(14,30,50) returns the time number 0.604745. You can format this number to appear on the screen as 02:30 PM, 02:30:50 PM, or in an International Time format, such as 14:30.

- If you enter a date number that contains decimal places as an argument, 1-2-3 uses only the integer part of the number. For example, 1-2-3 calculates both @YEAR(31790.5) and @YEAR(31790) as 87.

Financial @Functions

- Within an @function, you need to express the term and the interest rate in the same unit of time. For example, in @PMT(1000,.05/12,36) the term is 36 months, so the annual interest rate is divided by 12 to produce a monthly interest rate.
- 1-2-3 accepts interest rates as either percentages or decimal values. For example, you can enter 15.5% either as .155 or as 15.5%. 1-2-3 automatically converts all percentages to decimal values.
- The financial @functions assume that annuities are ordinary annuities. An annuity is a series of equal payments made at regular intervals. An ordinary annuity is an annuity in which the payments are made at the end of each time interval.

Logical @Functions

- You can use @ISERR and @ISNA to test for the values ERR (error) and NA (not available). These values cause a ripple-through effect. A **ripple-through effect** exists when a formula evaluates to ERR or NA and other formulas refer to the cell that contains the formula. A formula that refers to a cell that contains the values ERR or NA also evaluates to ERR or NA. For example, if a formula in G12 evaluates to ERR, @AVG(G10..G35) and +E12+F12+G12 also evaluate to ERR, because both refer to G12.

  You can use @ISERR and @ISNA in @IF formulas to stop the ripple-through effect. For example, you want to divide the value in G12 by the value in K12. The value in G12 is the result of a complex formula and you want to be sure the formula has not evaluated to ERR before you use G12 in other calculations. @IF(@ISERR(G12),0,G12/K12) returns 0 if G12 contains the value ERR; this prevents 1-2-3 from evaluating the G12/K12 formula if G12 contains the value ERR. If G12 does not contain the value ERR, the @IF formula returns the result of G12/K12.
- You can use @ISNUMBER and @ISSTRING to prevent errors that would occur if a cell used in a formula contained the wrong type of data. For example, @IF(@ISNUMBER(G12),@AVG(A12..K12),"Label") returns the result of @AVG(A12..K12) if G12 contains a value. If G12 contains a label, the @IF formula returns the word Label.

- You can use @ISRANGE to determine if a range name is defined or undefined — that is, if the range name is currently assigned to a range address.

Mathematical Functions

- You must express angles you enter as arguments for @SIN, @COS, and @TAN in radians. To convert degrees to radians, multiply the number of degrees by @PI/180.
- @ASIN, @ACOS, @ATAN, and @ATAN2 produce angle values in radians. To convert radians to degrees, multiply the number of radians by 180/@PI.

Special @Functions

- @ERR and @NA mark cells that contain formulas with errors (@ERR) or unavailable values (@NA). They assign the same value to every cell that depends on formulas that contain ERR or NA, creating a ripple-through effect.

  For example, you want to use the formula @SUM(Q_1,Q_2,Q_3,Q_4) to calculate annual travel expenses but do not have figures for the fourth quarter. Enter @NA in the cell named Q_4 to show that the value is not yet available. The @SUM formula will also evaluate to NA until you replace @NA with a value for fourth-quarter expenses.

Statistical @Functions

- All statistical @functions perform calculations on lists of values, which are represented by the argument named *list*. The values in *list* can be entered as one or more numbers, numeric formulas, references to ranges that contain values, or any combination of numbers, formulas, and references to ranges.

  NOTE @SUMPRODUCT is the only statistical @function that requires all entries in *list* to be references to ranges.

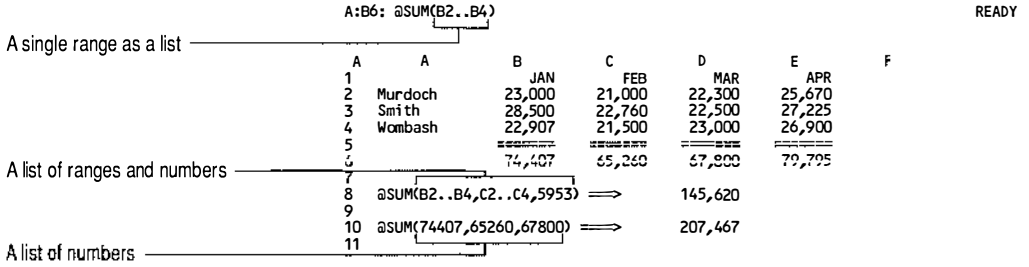


Figure 3-6. *Ways to enter values in list arguments*

- Labels within ranges in *list* will not cause statistical @functions to evaluate to ERR. With the exception of @COUNT, 1-2-3 assigns the value 0 to all labels in a range and includes them in calculations. For example, if you use @AVG to calculate the average of the values in a range and the range contains a label, 1-2-3 considers the label to have the value 0 when it calculates the average.

  Always check for labels in the ranges you use in *list* to guard against unexpected results.

- The statistical @functions ignore blank cells in ranges in *list*. For example, if you use @AVG to average the values in a range that spans eight cells, and the range contains a blank cell, 1-2-3 divides the sum by seven to find the correct average.

- With the exception of @SUMPRODUCT, each of the statistical @functions has an equivalent database @function. For example, you use @AVG to average values in a range; you use @DAVG to average values in a field of a database table that meet certain criteria.

String @Functions

- Some string @functions calculate with offset numbers, which locate the position of a character in a string. The first offset number is always 0.

  For example, the string "Red Shoes" contains 9 characters. The R is at position 0, the first e is at position 1, and so on. The last offset number is always one less than the length of the string.

- Uppercase and lowercase letters have different LMBCS codes. For example, @CODE("A") returns the code 65, but @CODE("a") returns the code 97. See Appendix A for information on LMBCS.
- If you use blank cells as arguments in string @functions, 1-2-3 returns the value ERR. For example, @LENGTH(D9) returns the value ERR if D9 is a blank cell.
- If a cell contains one of the label prefixes " ' | ^ \ but contains no text, 1-2-3 treats it as an **empty string,** a string with a length of 0. The cell looks blank, but 1-2-3 will not return the value ERR when you use it as an argument in a string @function.

@Function Descriptions

In the section that follows, each @function is listed alphabetically.

Conventions for Descriptions

As you read through the @function descriptions, keep in mind the following conventions:

- @Functions, advanced macro command keywords, cell addresses, and range names appear in uppercase letters, but they need not be entered that way. 1-2-3 does not distinguish between uppercase and lowercase letters in these cases.
- Argument names appear in italics, but actual arguments used in examples are not italicized.
- [ ] (brackets) around an argument mean the argument is optional. For example, in @INDEX(*range,column,row, [worksheet]*), @INDEX works even if you do not specify a worksheet.

@@

@@(*location*) returns the contents of the cell whose name or address is specified in *location*. The *location* you provide as an argument acts as a pointer to another cell, whose contents @@ returns.

location must be the name or address of a single-cell range. If you specify a multiple-cell range for *location*, @@ evaluates to ERR.

Example

Figure 3-7 shows a simple sales commission chart. The @@(A11) formula entered in C4 returns the contents of C8, which is the cell specified in A11. A11 contains an @IF formula that enters one of two cell addresses, depending on which product code you enter in C3. If you enter anything in C3 other than one of the two product codes, both the @IF and @@ functions will evaluate to ERR.

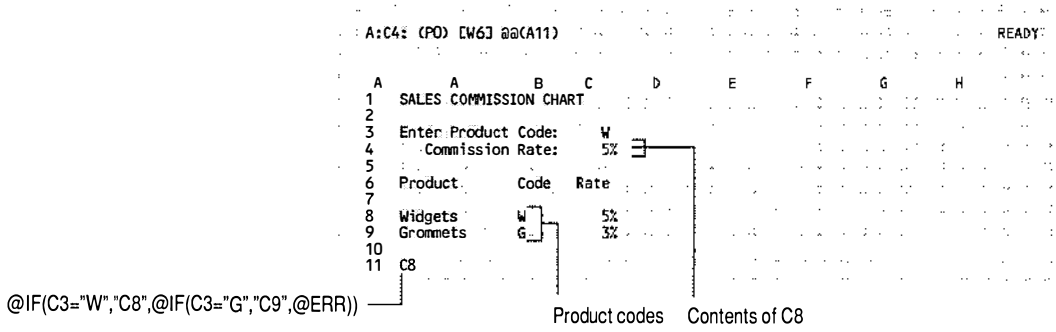


Figure 3-7. *Determining a commission rate with @@*

NOTE When *location* refers to a cell that contains a formula, you must press CALC to update the @@ formula after automatic recalculation. If you do not press CALC, the @@ formula evaluates to 0.

@ABS

@ABS(*x*) calculates the absolute (positive) value of *x*.

x can be any value.

Use @ABS when printing certain negative numbers in a report, such as percentage differences between actual and budgeted values, or when you want to find the absolute difference between values in a list of positive and negative values.

Example

You collected data on the temperatures of samples at the beginning and end of several experiments. You want to calculate the temperature differences as absolute values. In Figure 3-8, the formula @ABS(A4-B4) (copied down column C) calculates the differences between the starting temperatures in column A and the ending temperatures in column B; @ABS calculates each difference as a positive value.

A:C4: @ABS(A4 B4) READY

	A	B	C	D
1	Starting	Ending		
2	Temperature	Temperature	Difference	
3				
4	100	-567	667	
5	45	-10.5	55.5	
6	0	4.4	4.4	
7	15	23	8	
8	450	-34	484	
9	0	-25	25	
10	27	55	28	
11	19	10	9	

Figure 3-8. *Calculating absolute values with @ABS*

@ACOS

@ACOS(x) calculates the arc cosine of a value. The arc (or inverse) cosine is the angle, measured in radians, whose cosine is x. The result of @ACOS is a value from 0 to π.

x can be any value from –1 to 1.

NOTE To convert radians to degrees, multiply by 180/@PI.

Examples

@ACOS(.3) displays 1.266104 (radians)

@ACOS(.5)*180/@PI displays 60 (degrees)

@ASIN

@ASIN(x) calculates the arc sine of a value. The arc (or inverse) sine is the angle, measured in radians, whose sine is x. The result of @ASIN is a value from $\pi/2$ to $-\pi/2$.

x can be any value from –1 to 1.

NOTE To convert radians to degrees, multiply by 180/@PI.

Examples

@ASIN(-.246) displays –0.24855 (radians)

@ASIN(1)*180/@PI displays 90 (degrees)

@ATAN

@ATAN(x) calculates the arc tangent of a value. The arc (or inverse) tangent is the angle, measured in radians, whose tangent is x. The result of @ATAN is a value from $\pi/2$ to $-\pi/2$.

x can be any value.

NOTE To convert radians to degrees, multiply by 180/@PI.

Examples

`@ATAN(1)` displays 0.785398 (radians)

`@ATAN(@SQRT(3))*180/@PI` displays 60 (degrees)

@ATAN2

@ATAN2(x,y) calculates the four-quadrant arc tangent of y/x. The four-quadrant arc (or inverse) tangent is the angle, measured in radians, whose tangent is y/x.

x and y can be any values. If y is 0, @ATAN2 returns 0; if both x and y are 0, @ATAN2 returns the value ERR.

NOTE @ATAN2 differs from @ATAN in that the result of @ATAN2 is a value from $-\pi$ to π. The table below lists the value ranges for @ATAN2.

x	*y*	*@ATAN2(x,y) results*
Positive	Positive	From 0 to $\pi/2$
Negative	Positive	From $\pi/2$ to π
Negative	Negative	From $-\pi$ to $-\pi/2$
Positive	Negative	From $-\pi/2$ to 0

NOTE To convert radians to degrees, multiply by 180/@PI.

Examples

`@ATAN2(1.5,2)` displays 0.927295 (radians)

`@ATAN2(-1.5,2)*180/@PI` displays 126.8699 (degrees)

@AVG

@AVG(*list*) averages the values in *list*.

list can contain one or more numbers, numeric formulas, references to ranges that contain numbers or numeric formulas, or any combination of numbers, formulas, and references to ranges.

Examples

`@AVG(20,30,67,78,90)` displays 57

In Figure 3-9, @AVG(C1..C3) entered in E5 returns 48 and @AVG(C1..C3,D1..D3) entered in E6 returns 38.

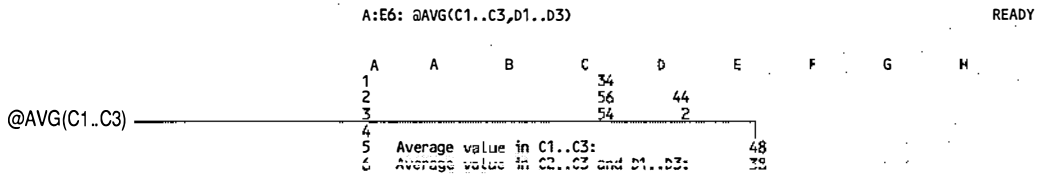


Figure 3-9. *Averaging lists of values with @AVG*

@CELL

@CELL(*attribute,location*) returns information about an *attribute* for the first cell in *location.*

NOTE @CELL evaluates the first cell in *location* as it was last recalculated; be sure to recalculate your work before you use @CELL.

attribute can be any of the 14 strings in the following table. *attribute* can be entered as a literal string, a string formula, or a reference to a cell that contains a label.

location can be any range name or address.

Attribute	*Returns*
address	The absolute cell address in abbreviated form (column letter and row number only)
col	The column letter, as a value from 1 to 256 (1 for column A, 5 for column E, and so on)
color	1 if the cell is formatted for color 0 if the cell is not formatted for color
contents	The contents of the cell
coord	The absolute cell address in full form (worksheet letter, column letter, and row number)
filename	The name of the file that contains the cell
format	The cell format: C0 to C15 if Currency, 0 to 15 decimal places F0 to F15 if Fixed, 0 to 15 decimal places G if General P0 to P15 if Percent, 0 to 15 decimal places S0 to S15 if Sci (Scientific), 0 to 15 decimal places ,0 to ,15 if , (Comma), 0 to 15 decimal places + if +/– format

(continued)

Attribute	*Returns*
	D1 if DD-MMM-YY D2 if DD-MMM D3 if MMM-YY D4 if MM/DD/YY, or DD/MM/YY, or DD.MM.YY, or YY-MM-DD D5 if MM/DD, or DD/MM, or DD.MM, or MM-DD D6 if HH:MM:SS AM/PM D7 if HH:MM AM/PM D8 if HH:MM:SS (24 hour), or HH.MM.SS (24 hour), or HH,MM,SS (24 hour), or HHhMMmSSs (24 hour) D9 if HH:MM (24 hour), or HH.MM (24 hour), or HH,MM (24 hour), or HHhMMm (24 hour)
	T if Text H if Hidden L if Label A if Automatic - if Color () if Parentheses
parentheses	1 if the cell is formatted for parentheses 0 if the cell is not formatted for parentheses
prefix	The label prefix:
	' if the cell contains a left-aligned label " if the cell contains a right-aligned label ^ if the cell contains a centered label \ if the cell contains a repeating label | if the cell contains a nonprinting label Blank (no label prefix) if the cell is blank or contains a value
protect	The protection status:
	1 if the cell is protected 0 if the cell is not protected
row	The row number, from 1 to 8192
sheet	The worksheet letter, as a value from 1 to 256 (1 for worksheet A, 5 for worksheet E, and so on)

(continued)

Attribute	*Returns*
type	The type of data in the cell: b if the cell is blank v if the cell contains a numeric value or a formula l if the cell contains a label
width	The column width from 1 to 240

Example
You can use @CELL to check input during a macro to guard against certain types of entries; you can also use it to check if a particular cell contains data, with the result directing a macro subroutine branch.

For example, in the macro instructions

```
{IF @CELL("type",C5)="b"}{BEEP}{INDICATE "Fill!"}
```

if C5 is blank, @CELL("type",C5) returns `b`; 1-2-3 then beeps and the mode indicator changes to `Fill!`

@CELLPOINTER

@CELLPOINTER(*attribute*) returns information about an *attribute* for the current cell.

attribute can be any of the 14 *attribute* arguments for @CELL. *attribute* can be entered as a literal string, a string formula, or a reference to a cell that contains a label. See the table in @CELL for a list of attributes.

1-2-3 automatically updates @CELLPOINTER only when you make an entry. To make @CELLPOINTER return information about the current cell if you have simply moved the cell pointer to it, you must recalculate the worksheet.

Example
@CELLPOINTER is useful in macros when you need to test the cell pointer's current location or when you need to evaluate a formula based on the contents of the current cell.

For example, the macro instructions

```
{IF @CELLPOINTER("type")="b"}{BEEP 2} {QUIT}
```

use @CELLPOINTER to evaluate the contents of the current cell. If the current cell is blank, 1-2-3 beeps and ends the macro.

@CHAR

@CHAR(*x*) returns the character that the LMBCS code *x* produces. See Appendix A for information on LMBCS.

x can be any integer that is a valid LMBCS code.

If your terminal or workstation cannot display the character that corresponds to *x*, 1-2-3 displays a character that resembles the desired character when possible. If no displayable character approximates the character, 1-2-3 displays nothing.

@CHAR is useful for entering foreign language characters and mathematical symbols. Whether a character prints or not depends on your printer's capabilities.

Examples

`@CHAR(130)` displays the letter é

`+"Champs-"&@CHAR(144)&"lys"&@CHAR(130)&"es"` displays Champs–Élysées

@CHOOSE

@CHOOSE(*offset,list*) finds the value or string in *list* that is specified by *offset*.

offset represents an offset number. An offset number corresponds to the position an item occupies in *list*. The first item has an offset number of 0, the second item has an offset number of 1, and so on. *offset* can be 0 or any positive integer that is less than or equal to the number of items in *list* minus 1. For example, if *list* contains 50 items, the largest number you can use for *offset* is 49. If you use a reference to a blank cell, @CHOOSE returns the value 0.

list can contain one or more values, strings, references to ranges that contain values or strings, or any combination of values, strings, and range references.

Use @CHOOSE to enter a list of lookup values without setting up a lookup table.

Example

The worksheet in Figure 3-10 contains a list of labels (in A1..A4) and their offset numbers (in B1..B4). @CHOOSE(B3,A1,A2,A3,A4) entered in D6 returns Accounting, the label in A3, which is the item whose offset number is 2 (2 is the value in B3) in *list*.

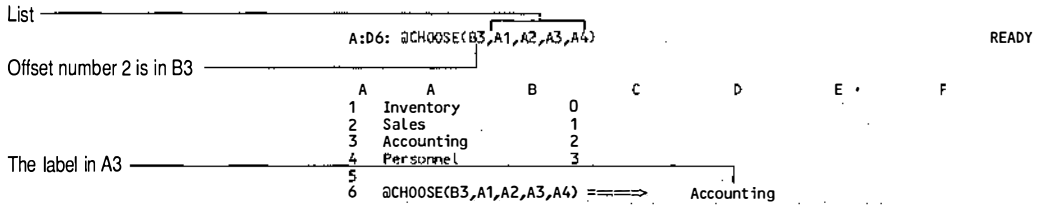


Figure 3-10. *Using @CHOOSE to select an item from a list of labels*

@CLEAN

@CLEAN(*string*) removes any nonprintable ASCII characters contained in *string*.

string can be a literal string (containing both printable and nonprintable ASCII characters), a reference to a cell that contains a label or a formula that evaluates to a string.

Examples

@CLEAN is often used to prevent embedded nonprintable characters and control codes from interfering with your analysis of printable ASCII data. Suppose you download files regularly from a network. The communications programs that manage file transfers can introduce control characters into your copy of the text file (USERLIST.TXT) that did not exist in the original version of the file. If a macro evaluates the contents of a cell A1 containing these nonprintable characters, you may get unpredictable results. @CLEAN(A1) removes all nonprintable ASCII characters from cell A1 so that macros and @functions analyzing cell A1 work properly. Similarly, if a one-cell range called NODE_NAME contains labels imported from a word processing program, @CLEAN(NODE_NAME) removes nonprintable characters from the label in the cell.

You can also use @CLEAN(*string*) to remove nonprintable characters from the output of another function. @CLEAN(@TRIM(NODE_NAME)) removes nonprintable characters from the output of @TRIM(NODE_NAME). This combination of @TRIM and @CLEAN removes all trailing spaces and nonprintable characters from the specified cell or string.

@CODE

@CODE(*string*) returns the LMBCS code that corresponds to the first character in *string*. See Appendix A for information on LMBCS.

string can be a literal string, a reference to a cell that contains a label, or a formula or @function that evaluates to a string. If *string* is a cell address or range name that refers to a blank cell or a value, @CODE returns the value ERR.

Examples

`@CODE("A")` displays 65

`@CODE(C5)` displays 77 if C5 contains the label Ms. Jones, because 77 is the LMBCS code for M.

@COLS

@COLS(*range*) counts the number of columns in *range*.

range can be any range name or address.

Use @COLS to determine the width of a range in order to set appropriate margins when printing a report.

Example

`@COLS(EMPLOYEES)` displays 20 if EMPLOYEES is the range name for B3..U75.

@COORD

@COORD(*worksheet,column,row,absolute*) creates a cell address from values that correspond to *worksheet*, *column*, and *row*.

worksheet and *column* can be any integers from 1 to 256. *worksheet* and *column* correspond to the worksheet and column letters (1 for column A, 2 for column B, and so on).

row can be any integer from 1 to 8192. *row* corresponds to the row number.

absolute can be any integer from 1 to 8.

@COORD creates a relative, absolute, or mixed cell address, according to the value in *absolute*. The following table shows each possible value of *absolute* and its effect on the cell address.

Value	*Worksheet*	*Column*	*Row*	*Example*
1	Absolute	Absolute	Absolute	$A:$A$1
2	Absolute	Relative	Absolute	$A:A$1
3	Absolute	Absolute	Relative	$A:$A1
4	Absolute	Relative	Relative	$A:A1
5	Relative	Absolute	Absolute	A:$A$1
6	Relative	Relative	Absolute	A:A$1
7	Relative	Absolute	Relative	A:$A1
8	Relative	Relative	Relative	A:A1

Example

`@COORD(2,4,15,8)` displays the relative cell address B:D15.

@COS

@COS(*x*) calculates the cosine of angle *x* measured in radians. The result of @COS is a value approximately from –1 to 1.

x can be any value from $-2^{32}*\pi$ to $2^{32}*\pi$.

NOTE To convert degrees to radians, multiply by @PI/180.

Examples

`@COS(.523598)` displays 0.866026

`@COS(45*@PI/180)` displays 0.707107

@COUNT

@COUNT(*list*) counts the nonblank cells in a *list* of ranges.

list can be any combination of ranges. Keep the following in mind about the *list* argument for @COUNT:

- If *list* contains only blank ranges, @COUNT evaluates to 0.
- Entering a single cell address rather than a multiple cell range address in *list* increases the count by one, even if the cell is blank. For example, if A2 is blank, @COUNT(A2) equals 1. If you name a single cell, however, and include the range name in *list*, @COUNT will evaluate to 0 if the cell is blank. For example, if you name cell A2 SAMPLE, and A2 is blank, @COUNT(SAMPLE) equals 0.
- @COUNT considers cells that contain labels, as well as those that contain values, to be nonblank. If you want to keep an accurate count of values in a range, make sure the range does not contain any labels, such as column headings.
- @COUNT considers cells that evaluate to ERR or NA to be nonblank.

Examples

`@COUNT(B5..B11)` displays 7 if none of the cells are blank.

`@COUNT(C5..C10,D5,E5..E10)` displays 1 if all the cells are blank because D5 is a single cell address.

Use @COUNT to stop a macro when the cell pointer reaches a blank row. For example,

```
{IF @COUNT(WORK)=0}{QUIT}
```

stops the macro when the range WORK is a blank row.

@CTERM

@CTERM(*interest*,*future-value*,*present-value*) calculates the number of compounding periods it takes for an investment (*present-value*) to grow to a *future-value*, earning a fixed *interest* rate per compounding period.

interest can be any value greater than –1 except 0.

future-value and *present-value* can be any values, but must be the same sign — that is, both must be positive or negative.

@CTERM uses the following formula to calculate the compounding period:

$$\frac{\ln(fv/pv)}{\ln(1 + int)}$$

where: *fv* = future value
pv = present value
int = interest rate
ln = natural logarithm

Example

You just deposited $10,000 in an account that pays an annual interest rate of 10% (.10), compounded monthly. You want to determine how many years it will take to double your investment.

`@CTERM(.10/12,20000,10000)/12` displays 6.960313; in other words, it will take about 7 years to double the original investment of $10,000.

NOTE Because @CTERM calculates the total number of compounding periods, you may need to include the number of periods for which the *interest* rate is compounded in order to express the term and interest rate in the same unit of time. In the example above, the annual interest rate of 10%, compounded monthly, is entered as .10/12 (*interest* divided by the number of compounding periods).

@DATE

@DATE(*year*,*month*,*day*) calculates the date number for the specified *year*, *month*, and *day*. See "Date and Time @Functions" earlier in this chapter for an explanation of date numbers.

year can be any integer from 0 (the year 1900) to 199 (the year 2099).

month can be any integer from 1 (January) to 12 (December).

day can be any integer from 1 to 31. The value you use for *day* must be a valid day for *month*. For example, you cannot use 31 for *day* if you use 4 (April) for *month*.

If *year*, *month*, or *day* is not a value, @DATE returns the value ERR.

Use @DATE to sort by date or to set up search criteria using dates.

NOTE Even though February 29, 1900 did not exist (it was not a leap year), 1-2-3 assigns a date number to this day. This does not invalidate any of your date calculations unless you use dates between January 1, 1900 and March 1, 1900. If you are using dates within that period, subtract 1 from any results within the period.

Example

In Figure 3-11, dates of employees' last reviews were entered in column E with @DATE so that formulas in column F, which calculate whether an employee is due for a review, can calculate with the date numbers. Columns D and E are formatted with /Range Format Date 3 to display month and year.

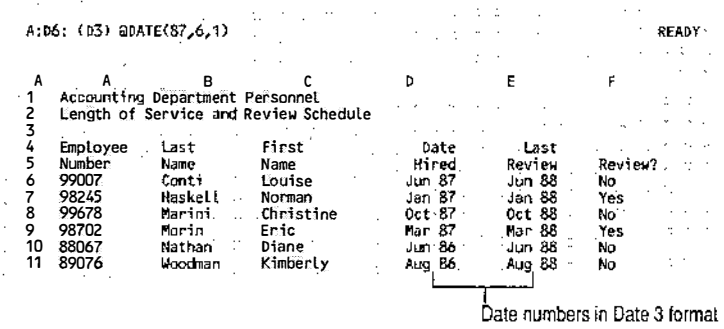


Figure 3-11. *Entering dates with @DATE*

@DATEVALUE

@DATEVALUE(*string*) calculates the date number for a *string* that looks like a date. See "Date and Time @Functions" earlier in this chapter for an explanation of date numbers.

string can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string. *string* must be in one of the Date formats. See /Range Format in Chapter 2 for a description of the Date formats.

Use @DATEVALUE when you want to convert dates entered as labels to date numbers so that you can use the dates in calculations. @DATEVALUE is also useful with data that has been imported from another program, such as a word processing program.

Example

In Figure 3-12, dates are entered as labels in column A. @DATEVALUE(A1) entered in C1 returns the date number 26842. The formula is copied down column C, and the date numbers are copied to column E, where they are formatted with /Range Format Date 3.

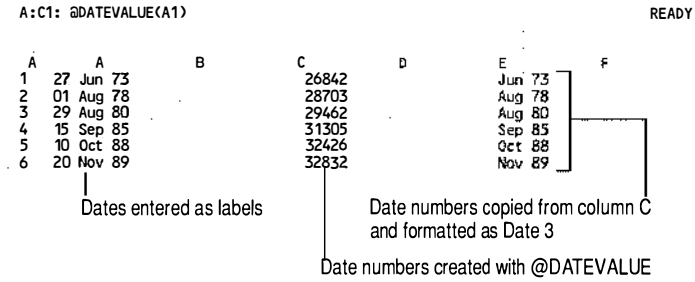


Figure 3-12. *Changing labels to date numbers with @DATEVALUE*

@DAVG

@DAVG(*input,field,criteria*) averages values in a *field* of the *input* range that meet criteria in the *criteria* range. See "Database @Functions" earlier in this chapter for an explanation of the way database @functions work.

Example

You created a database table of your expenses for a recent trip to Canada. You want to determine the average amount you spent on gas in Toronto. In Figure 3-13, **@DAVG(EXPENSES,"GAS",CRIT_RANGE)** searches the *input* range EXPENSES for records that match the criteria in the *criteria* range CRIT_RANGE, and then averages the selected values in the *field* named GAS.

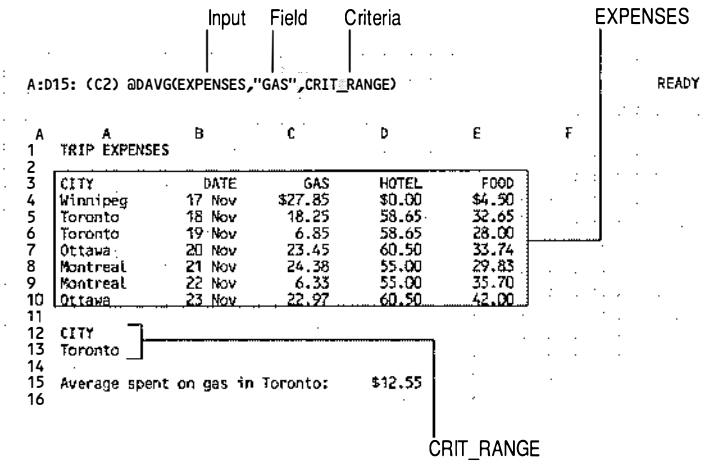


Figure 3-13. *Finding an average amount spent with @DAVG*

@DAY

@DAY(*date-number*) calculates the day of the month (an integer from 1 to 31) in *date-number*. See "Date and Time @Functions" earlier in this chapter for an explanation of date numbers.

date-number can be any integer from 1 (January 1, 1900) to 73050 (December 31, 2099). Usually another date @function supplies *date-number*.

Example

@DAY(@TODAY) displays the current day of the month.

@DCOUNT

@DCOUNT(*input,field,criteria*) counts nonblank cells in a *field* of the *input* range that meet criteria in the *criteria* range. See "Database @Functions" earlier in this chapter for an explanation of the way database @functions work.

Example

You created a database table of your expenses during a recent trip to Canada. You want to determine how many days you spent more than $20.00 on gas. In Figure 3-14, @DCOUNT(EXPENSES,"GAS",CRIT_RANGE) searches the *input* range EXPENSES for records that match the criteria in the *criteria* range CRIT_RANGE, and then counts the selected values in the *field* named GAS.

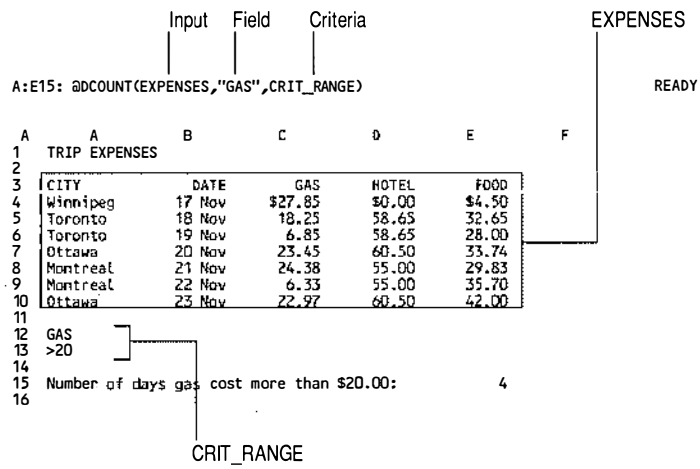


Figure 3-14. *Finding the number of days gas cost more than $20 with @DCOUNT*

@DDB

@DDB(*cost*,*salvage*,*life*,*period*) calculates the depreciation allowance of an asset for a specified *period*, using the double-declining balance method.

cost represents the amount paid for the asset. *cost* can be any value greater than or equal to *salvage*.

salvage represents the estimated value of the asset at the end of its useful life. *salvage* can be any value.

life represents the number of periods it will take to depreciate the asset to its salvage value. *life* can be any value greater than 2.

period represents the time period for which you want to find the depreciation allowance. *period* can be any value greater than or equal to 1.

The double-declining balance method accelerates the rate of depreciation, so that more depreciation expense occurs (and can be written off) in earlier periods than in later ones.

Depreciation stops when the book value of the asset — that is, the total cost of the asset minus its total depreciation over all prior periods — reaches the salvage value.

NOTE If the salvage value of an asset is relatively low, @DDB may not fully depreciate the asset by the end of the estimated useful life. You may want to use @VDB, which always fully depreciates the asset within the estimated life.

@DDB uses the following formula to calculate the double-declining balance depreciation for any period:

$$\frac{(bv * 2)}{n}$$

where: bv = book value in that period
n = life of the asset

Example

You just purchased an office machine for $10,000. The useful life of this machine is eight years, and the salvage value after eight years is $1200. You want to calculate the depreciation expense for the fifth year, using the double-declining balance method.

In Figure 3-15, @DDB(10000,1200,8,5) entered in D5 returns $791.02, the depreciation expense for the fifth year of the asset's life.

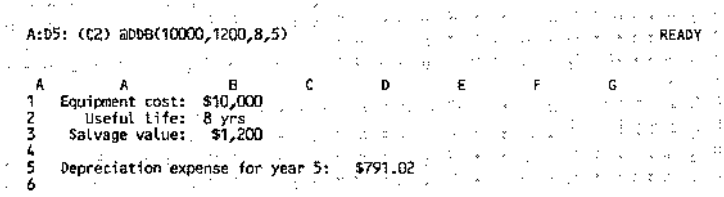


Figure 3-15. *Calculating depreciation expense with @DDB*

@DGET

@DGET(*input,field,criteria*) extracts a value or label from a *field* in the *input* range that meets the criteria in the *criteria* range. See "Database @Functions" earlier in this chapter for an explanation of the way database @functions work.

NOTE If *criteria* does not specify exactly one record from the *input* range, @DGET returns the value ERR.

Example

You created a database table of your expenses during a recent trip to Canada. You want to determine how much you spent on food on November 22. In Figure 3-16, @DGET(EXPENSES,"FOOD",CRIT_RANGE) searches the *input* range EXPENSES for records that match the criteria in the *criteria* range CRIT_RANGE, and then selects the appropriate value from the *field* named FOOD.

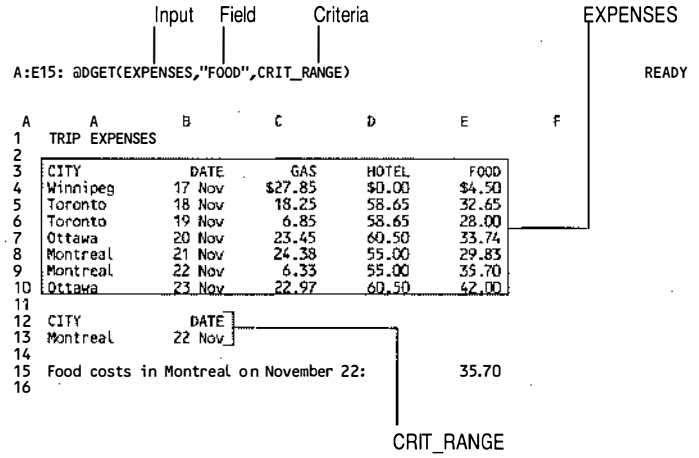


Figure 3-16. *Using @DGET to find food costs for a specified day*

@DMAX

@DMAX(*input*,*field*,*criteria*) finds the largest value in a *field* of the *input* range that meets the criteria in the *criteria* range. See "Database @Functions" earlier in this chapter for an explanation of the way database @functions work.

Example

You created a database table of your expenses for a recent trip to Canada. You want to determine the last day you spent in Montreal. @DMAX(EXPENSES,"DATE",CRIT_RANGE) in Figure 3-17 searches the *input* range EXPENSES for records that match the criteria in the *criteria* range CRIT_RANGE, and then selects the largest value in the *field* named DATE.

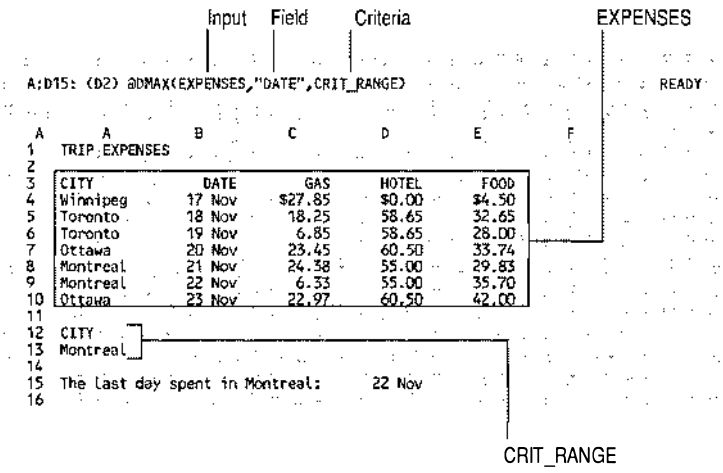


Figure 3-17. *Using @DMAX to determine the last day spent in Montreal*

@DMIN

@DMIN(*input,field,criteria*) finds the smallest value in a *field* of the *input* range that meets the criteria in the *criteria* range. See "Database @Functions" earlier in this chapter for an explanation of the way database @functions work.

Example

You created a database table of your expenses for a recent trip to Canada. You want to determine the first day you spent in Ottawa. @DMIN(EXPENSES,"DATE",CRIT_RANGE) in Figure 3-18 searches the *input* range EXPENSES for records that match the criteria in the *criteria* range CRIT_RANGE, and then selects the smallest value in the *field* named DATE.

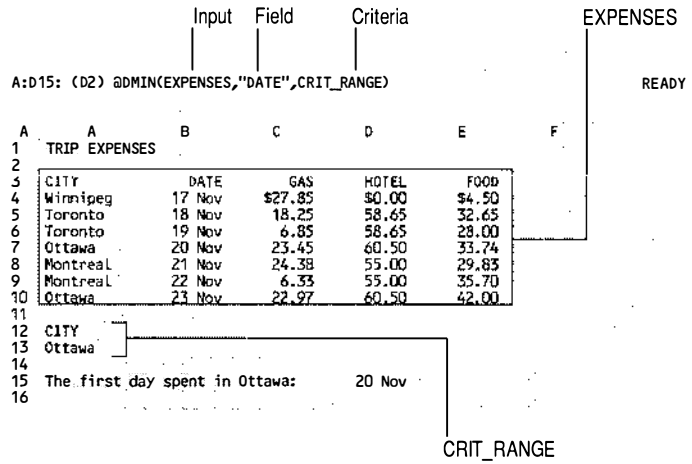


Figure 3-18. *Using @DMIN to determine the first day spent in Ottawa*

@DQUERY

@DQUERY(*function,ext-arguments*) sends a command to an external database management program. See /Data External in Chapter 2 for information about external databases.

function represents the name of a command in the external database management program. *function* can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string.

ext-arguments represents the series of arguments the external command requires.

The cell in which you enter @DQUERY displays *function* as a label. For example, if you enter @DQUERY("PRODUCT",5,7) in B2, B2 displays the label PRODUCT.

Use @DQUERY only in a criteria range to select specific records from an external table.

NOTE 1-2-3 calculates @DQUERY only when you select /Data Query Del, /Data Query Extract, /Data Query Modify Extract, or /Data Query Unique.

Example
An external database management program has a function called LITERS that converts gallons to liters. The function requires a single argument, the number of gallons to convert. To use the function in 1-2-3, you would enter the formula @DQUERY("LITERS",10) in a criteria range to extract records from an external table that match the quantity in liters equivalent to 10 gallons.

@DSTD

@DSTD(*input*,*field*,*criteria*) calculates the population standard deviation of the values in a *field* of an *input* range that meet the criteria in the *criteria* range. See "Database @Functions" earlier in this chapter for an explanation of the way database @functions work.

Standard deviation measures the degree to which individual values in a list vary from the mean (average) of all values in the list. The lower the standard deviation, the less individual values vary from the mean, and the more reliable the mean. A standard deviation of 0 indicates that all values in the list are equal.

@DSTD produces most accurate results when the number of observations is large.

NOTE Standard deviation is the square root of the variance of all individual values from the mean.

@DSTD uses the n method (biased) to calculate the standard deviation of population data, which uses the following formula:

$$\sqrt{\frac{\Sigma\ (v_i - avg)^2}{n}}$$

where: n = number of items in list
v_i = the ith item in list
avg = average of values in list

Example
The database table in Figure 3-19 contains test scores for high school students in several cities. You want to determine the standard deviation of test scores for 16-year-olds. @DSTD(REGION,"SCORE",CRIT_RANGE) searches the *input* range for records that match the criteria in the *criteria* range CRIT_RANGE, and then calculates the standard deviation of the selected values from the *field* named SCORE.

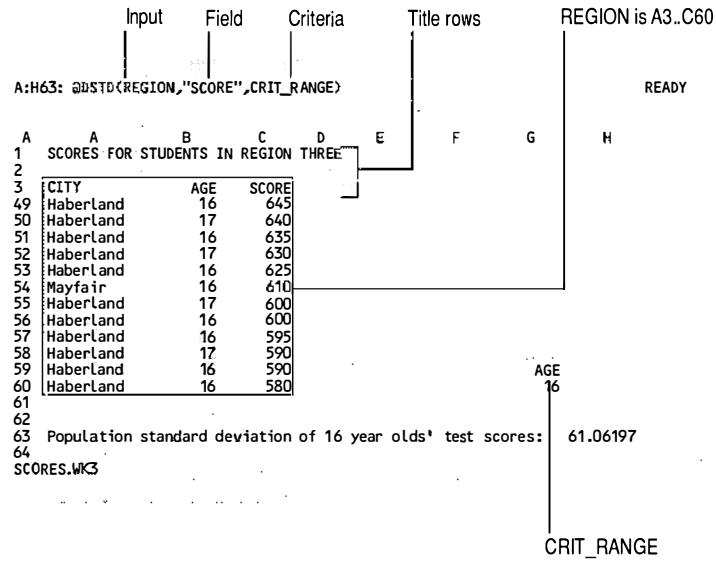


Figure 3-19. *Calculating a population standard deviation of test scores with @DSTD*

@DSTDS

@DSTDS(*input,field,criteria*) calculates the sample standard deviation of values in a *field* of an *input* range that meet the criteria in the *criteria* range. See "Database @Functions" earlier in this chapter for an explanation of the way database @functions work.

Standard deviation measures the degree to which individual values in a list vary from the mean (average) of all values in the list. The lower the standard deviation, the less individual values vary from the mean, and the more reliable the mean. A standard deviation of 0 indicates that all values in the list are equal.

@DSTDS produces more accurate results than @DSTD when the number of observations is small.

@DSTDS uses the n-1 method (unbiased) to calculate the standard deviation of population data. @DSTDS uses the following formula:

$$\sqrt{\frac{\Sigma\ (v_i - avg)^2}{n - 1}}$$

where: n = number of items in list
v_i = the ith item in list
avg = average of values in list

Example

The database table in Figure 3-20 contains test scores for students in the city of Mayfair. You want to determine the sample standard deviation of test scores for 17-year-olds. @DSTDS(MAYFAIR,"SCORE",CRIT_RANGE) searches the *input* range MAYFAIR for records that match the criteria in the *criteria* range CRIT_RANGE, and then calculates the sample standard deviation of the selected values from the *field* named SCORE.

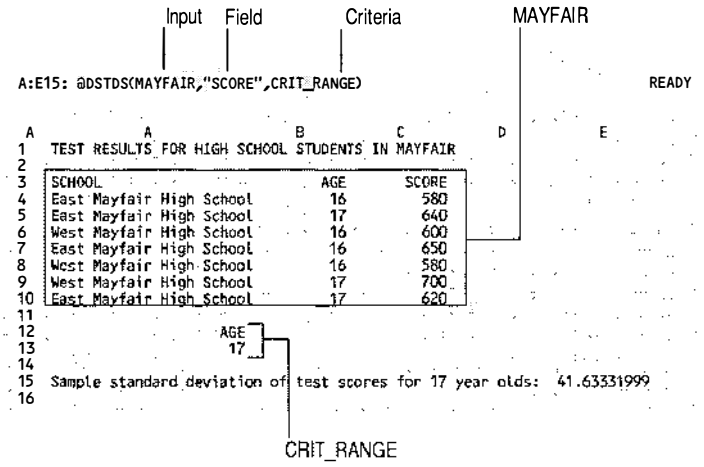


Figure 3-20. ***Calculating a sample standard deviation of test scores with @DSTDS***

@DSUM

@DSUM(*input*,*field*,*criteria*) sums the values in a *field* of an *input* range that meet the criteria in the *criteria* range. See "Database @Functions" earlier in this chapter for an explanation of the way database @functions work.

Example

You created a database table of your expenses for a recent trip to Canada. You want to determine the total amount you spent on hotels in Montreal. In Figure 3-21, the formula @DSUM(EXPENSES,"HOTEL",CRIT_RANGE) searches the *input* range EXPENSES for records that match the criteria in the *criteria* range CRIT_RANGE, and then adds the selected values from the *field* named HOTEL.

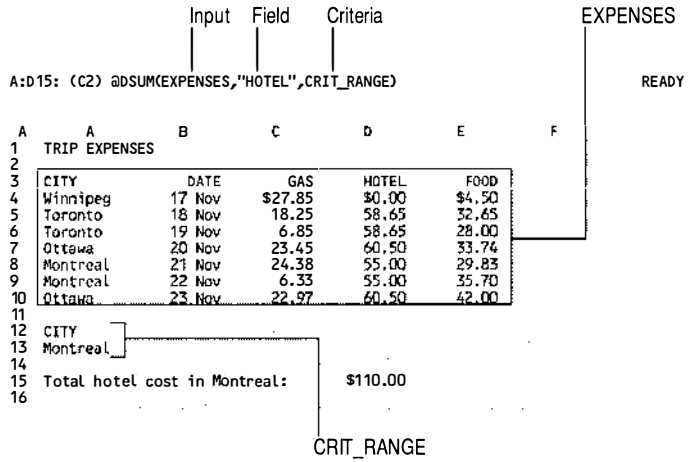


Figure 3-21. ***Using @DSUM to calculate the total spent on hotels in Montreal***

@D360

@D360(*start-date*,*end-date*) calculates the number of days between two date numbers, *start-date* and *end-date*, based on a 360-day year (12 months, each with 30 days). See "Date and Time @Functions" earlier in this chapter for an explanation of date numbers.

start-date and *end-date* can be any integers from 1 (January 1, 1900) to 73050 (December 31, 2099).

Example

Figure 3-22 shows an accounts receivable database table. Column C contains the dates on which payment is due from customers (produced with @DATE and formatted with /Range Format Date 2). The formula

```
@IF(@D360(C3,@TODAY)>=60,"Yes","No")
```

copied down column D uses @D360 to subtract the date due (in column C) from the current date (@TODAY). This formula calculates whether the account is 60 days or more past due.

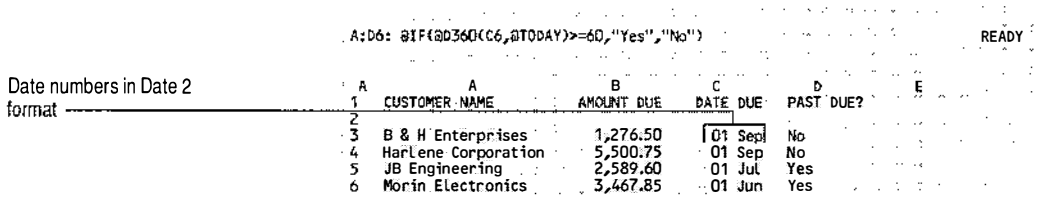


Figure 3-22. *Using @D360 in a conditional formula*

@DVAR

@DVAR(*input,field,criteria*) calculates the population variance of the values in a *field* of an *input* range that meet the criteria in the *criteria* range. See "Database @Functions" earlier in this chapter for an explanation of the way database @functions work.

Variance is a measure of the degree to which individual values in a list vary from the mean (average) of all the values in the list. The lower the variance, the less individual values vary from the mean, and the more reliable the mean. A variance of 0 indicates that all values in the list are equal.

@DVAR produces most accurate results when the number of observations is large.

NOTE Variance is the square of standard deviation.

@DVAR uses the n (biased) method to calculate variance with the following formula:

$$\frac{\Sigma\ (v_i - avg)^2}{n}$$

where: n = number of items in list
v_i = the ith item in list
avg = average of values in list

Example

The database table in Figure 3-23 contains test scores for high school students in several cities. You want to determine the population variance of test scores for students from the city of Haberland. @DVAR(REGION,"SCORE",CRIT_RANGE) searches the *input* range for records that match the criteria in the *criteria* range CRIT_RANGE, and then calculates the population variance of the selected values from the *field* named SCORE.

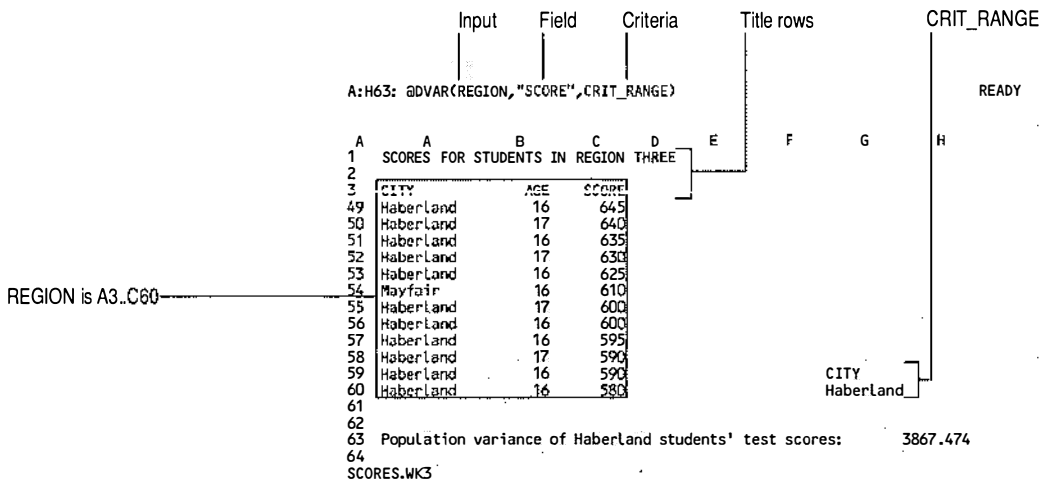


Figure 3-23. *Calculating the population variance of test scores with @DVAR*

@DVARS

@DVARS(*input,field,criteria*) calculates the sample variance of values in a *field* of an *input* range that meet the criteria in the *criteria* range. See "Database @Functions" earlier in this chapter for an explanation of the way database @functions work.

Variance is a measure of the degree to which individual values in a list vary from the mean (average) of all the values in the list. The lower the variance, the less individual values vary from the mean, and the more reliable the mean. A variance of 0 indicates that all values in the list are equal.

@DVARS produces more accurate results than @DVAR when the number of observations is small.

@DVARS uses the n-1 (unbiased) method to calculate variance with the following formula:

$$\frac{\Sigma\ (v_i - avg)^2}{(n - 1)}$$

where: n = number of items in list
v_i = the ith item in list
avg = average of values in list

Example

The database table in Figure 3-24 contains test scores for students in the city of Mayfair. You want to determine the sample variance of test scores for 17-year-olds. @DVARS(MAYFAIR,"SCORE",CRIT_RANGE) searches the

input range MAYFAIR for records that match the criteria in the *criteria* range CRIT_RANGE, and then calculates the sample variance of the selected values from the *field* named SCORE.

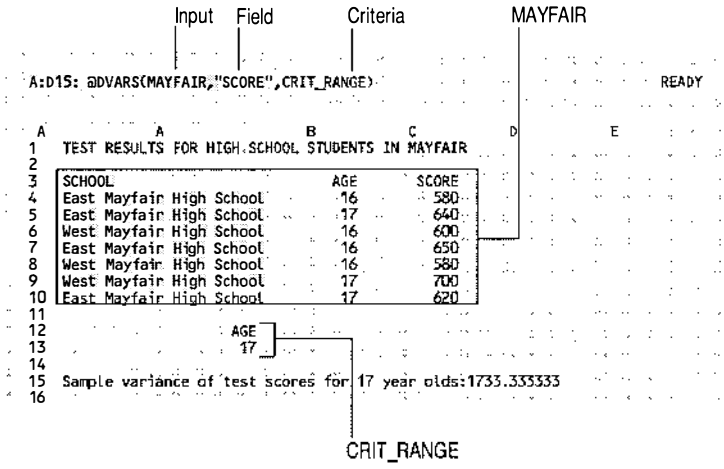


Figure 3-24. *Calculating the sample variance of test scores with @DVARS*

@ERR

@ERR returns the value ERR (error).

ERR is a special value in 1-2-3 that indicates an error in a formula. ERR has a ripple-through effect on formulas. @ERR is seldom used by itself, but is often used with @IF to indicate an ERR value only under certain conditions.

NOTE You cannot substitute the label ERR for the value ERR in formulas. For example, the formula +A2+34 = ERR if A2 contains @ERR, but equals 34 if A2 contains the label ERR.

Example

`@IF(B14>3,@ERR,B14)` displays ERR when the value in B14 is greater than 3.

@EXACT

@EXACT(*string1*,*string2*) tests whether *string1* and *string2* are the same. If the two strings match exactly, @EXACT returns 1 (true); if the two strings are not the same, @EXACT returns 0 (false).

string1 and *string2* can be literal strings, references to cells that contain labels, or formulas that evaluate to strings.

@EXACT provides a more precise alternative to the equal operator (=) in a string formula. @EXACT distinguishes between uppercase and lowercase letters, between letters with and without accent marks, and between strings that contain leading or trailing spaces and those that do not.

You can use @EXACT in a macro to check user input against a required entry before the macro continues processing.

Examples

`@EXACT("Debit",B2)` displays 0 (false) when B2 contains the label DEBIT or debit, but returns 1 (true) when B2 contains the label Debit.

`@IF(@EXACT(A6,"Posted"),A25,@NA)` displays the value in A25 if A6 contains the label Posted. If A6 contains anything else, the formula returns the value NA.

@EXP

@EXP(*x*) calculates the number *e* (approximately 2.718282) raised to the power *x*. *e* is the constant used as the base in natural logarithms.

x can be any value from approximately –708.3964 to approximately 709.7827.

If *x* is larger than approximately 709.7827 or smaller than approximately –708.3964, the calculation is too large for 1-2-3 to store, and @EXP returns the value ERR. If *x* is smaller than approximately –227.956 or larger than approximately 230.259, 1-2-3 can calculate and store the value of @EXP, but cannot display it (the cell displays a series of asterisks).

Examples

`@EXP(1.25)` displays 3.490343

`@EXP(-1.25)` displays 0.286505

@FALSE

@FALSE returns the logical value 0 (false).

Use @FALSE with macros or @functions such as @IF that require a logical value of 0 (false). You can use either @FALSE or the value 0 in formulas that evaluate logical conditions, but @FALSE makes the formula easier to read.

Example

`@IF(A6>=500,@TRUE,@FALSE)` displays 0 when A6 contains a value less than 500.

@FIND

@FIND(*search-string*,*string*,*start-number*) calculates the position in *string* at which 1-2-3 finds the first occurrence of *search-string*. @FIND begins searching *string* at the position indicated by *start-number*. If 1-2-3 does not find *search-string* in *string*, @FIND returns the value ERR.

search-string and *string* can be literal strings, references to cells that contain labels, or formulas that evaluate to strings.

start-number represents an offset number of a character in *string*. *start-number* can be any positive integer or 0.

@FIND is case-sensitive; for example, @FIND will not find *search-string* pay in *string* PAYMENT.

@FIND is often used with @LEFT, @MID, @REPLACE, or @RIGHT to locate and extract or replace a string. (See the second example below.)

Examples

`@FIND("P","Accounts Payable",0)` displays 9 because *search-string* P is at position 9 in *string* Accounts Payable.

The first and last names in each record of a database table are in the same cell. You want to list the customers by last names only in another database table.

In Figure 3-25, the formula

```
@MID(A2,@FIND(" ",A2,0)+1,@LENGTH(A2)-@FIND
(" ",A2,0))
```

uses @FIND(" ",A2,0)+1 to determine where the last name starts in A2. *search-string* is the space between the first and last names.

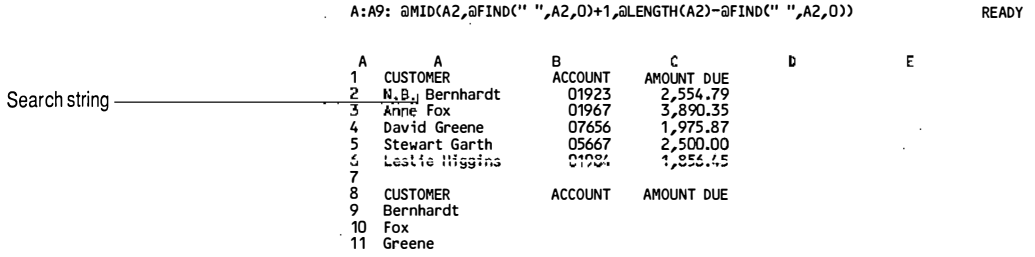


Figure 3-25. ***Using @FIND with @MID to extract last names from a database table***

@FV

@FV(*payments,interest,term*) calculates the future value of an investment, based on a series of equal *payments*, earning a periodic *interest* rate over the number of payment periods in *term.*

payments and *term* can be any values.

interest can be any value greater than –1.

1-2-3 assumes that calculations made with @FV use an investment that is an ordinary annuity (having payments at the end of each period).

@FV uses the following formula to calculate future value:

$$pmt * \frac{(1 + int)^n - 1}{int}$$

where: *pmt* = periodic payment
int = periodic interest rate
n = number of periods

Example

You plan to deposit $2,000 each year for the next 20 years into an individual retirement account. The account pays 7.5% interest, compounded annually; interest is paid on the last day of each year. You want to calculate the value of your account in 20 years. You make each year's contribution on the last day of the year.

In Figure 3-26, @FV(B1,B2,B3) entered in D5 returns $86,609, the value of your account at the end of 20 years.

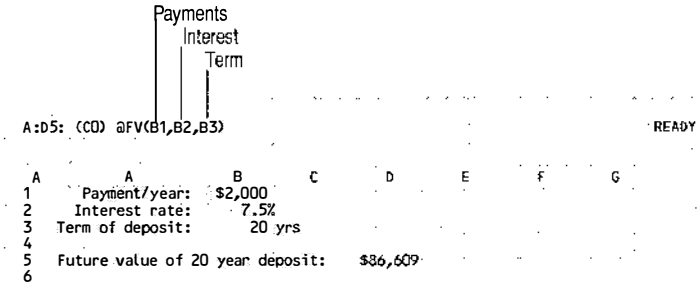


Figure 3-26. *Calculating a future value with @FV*

NOTE If you make each year's contribution on the first day of the year, you would calculate the amount for an annuity due. To calculate the future value of an annuity due, use the following formula: @FV(*payments*,*interest*,*term*)*(1+*interest*).

For example, @FV(2000,0.075,20)*(1+0.075) displays $93,105, the value of your account in 20 years if you make each deposit on the first day of each year.

@HLOOKUP

@HLOOKUP(*x*,*range*,*row-offset*) finds the contents of a cell in the specified row of a horizontal lookup table. A **horizontal lookup table** is a range with value information in ascending order in the top row.

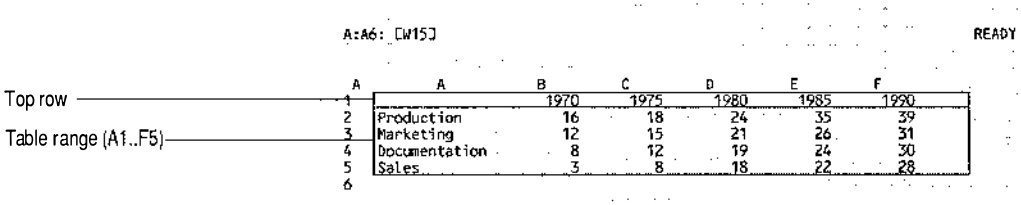


Figure 3-27. *A horizontal lookup table*

@HLOOKUP compares the value *x* to each cell in the top row of the table. When 1-2-3 locates a cell in the top row that contains the value *x* (or the value closest to, but not larger than, *x*), it moves down that column the number of rows specified by *row-offset* and returns the contents of that cell as the answer.

x can be any value greater than or equal to the first value in *range*. If *x* is smaller than the first value in *range*, @HLOOKUP returns the value ERR. If *x* is larger than the last value in *range*, @HLOOKUP stops at the last cell in the row and returns the contents of that cell as the answer.

range represents the location of the horizontal lookup table. *range* can be any range name or address. You cannot use three-dimensional ranges for @HLOOKUP.

row-offset represents an offset number. An offset number corresponds to the position the row occupies in *range*. The top row has an offset number of 0, the second row has an offset number of 1, and so on. *row-offset* can be 0 or any positive integer that is less than or equal to the number of rows in *range* minus 1. For example, if *range* contains 20 rows, the largest number you can use for *row-offset* is 19.

Use @HLOOKUP to locate entries in a table, such as a tax table or a sales commissions table.

Examples

The table in Figure 3-28 contains the number of employees in various departments of a company during a 20-year period.

@HLOOKUP(1975,B3..F7,3) entered in D9 returns 12, the number of employees in the Documentation department in 1975.

@HLOOKUP(1981,B3..F7,1) entered in D11 returns 24. 1981 does not appear in the top row of the table, so @HLOOKUP stops at column D, because 1980 is the value closest to, but not larger than, 1981.

A:D9: @HLOOKUP(1975,B3..F7,3) READY

	A	B	C	D	E	F
1			COMPANY GROWTH			
2						
3		1970	1975	1980	1985	1990
4	Production	16	18	24	35	39
5	Marketing	12	15	21	26	31
6	Documentation	8	12	19	24	30
7	Sales	3	8	18	22	28
8						
9	@HLOOKUP(1975,B3..F7,3) ======>			12		
10						
11	@HLOOKUP(1981,B3..F7,1) ======>			24		

Figure 3-28. *Locating table entries with @HLOOKUP*

@HOUR

@HOUR(*time-number*) calculates the hour, an integer from 0 (midnight) to 23 (11:00 p.m.), in a *time-number*. See "Date and Time @Functions" earlier in this chapter for an explanation of time numbers.

time-number is a decimal value from .000000 (midnight) to .999988 (11:59:59 p.m.). Usually another time @function supplies *time-number*.

Examples

`@HOUR(.51565)` displays 12 because .51565 is the time number for 12:22:32 p.m.

`@HOUR(@TIME(13,45,18))` displays 13 (1:00 p.m.) because 13 is the *hour* argument for @TIME(13,45,18).

@IF

@IF(*condition,x,y*) evaluates *condition* as true or false and takes one of two actions, depending on the result of the evaluation. If *condition* is true, @IF returns *x*; if *condition* is false, @IF returns *y*.

condition is usually a logical formula or a reference to a cell that contains a logical formula. However, you can use any formula, number, literal string, or cell reference as *condition*. 1-2-3 evaluates any *condition* that does not equal zero as true and any *condition* that does equal zero as false. Blank cells, strings, and ERR and NA values all equal zero when used as *condition*.

x and *y* can be any values or strings.

Examples

@IF(BID>=2500,BID,"Too Low") returns the contents of the cell BID if it contains a value greater than or equal to 2,500. If BID contains a value less than 2,500, a label, or the value ERR or NA, the formula returns the string Too Low.

You want to determine the commissions earned by your sales team this month. In Figure 3-29, @IF(B7<4000,0.05,0.08) entered in C7 returns a commission rate of 5% when B7 contains a value less than 4000, and a commission rate of 8% when B7 contains a value greater than or equal to 4000.

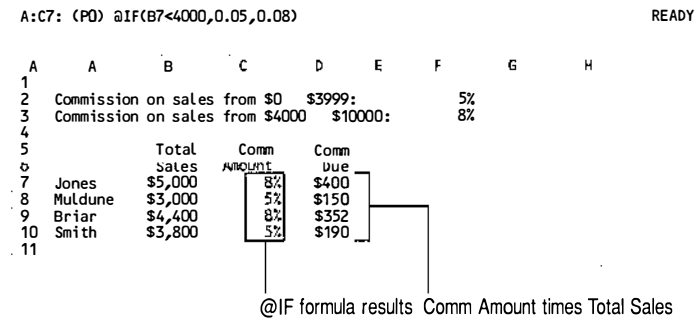


Figure 3-29. *Determining a commission rate with @IF*

You can nest @IF functions to create a complex condition. For example, @IF(SALES>=10000,SALES*.15,@IF(SALES>=5000, SALES*.10,SALES*.02)) nests two @IF functions to create a formula that determines a commission rate based on three levels of sales: sales greater than or equal to $10,000, sales from $5,000 to $9,999, and sales less than $5,000.

@INDEX

@INDEX(*range,column-offset,row-offset,[worksheet-offset]*) finds the value in the cell located at a specified *column-offset*, *row-offset*, and *worksheet-offset* of *range*.

range can be any range name or address.

column-offset, *row-offset*, and *worksheet-offset* represent offset numbers. An offset number corresponds to the position the column, row, or worksheet occupies in *range*. The first column, row, or worksheet has an offset number of 0, the second column, row, or worksheet has an offset number of 1, and so on.

column-offset can be 0 or any positive integer that is less than or equal to the number of columns in *range* minus 1. For example, if *range* contains 20 columns, the largest number you could use for *column-offset* is 19.

row-offset can be 0 or any positive integer that is less than or equal to the number of rows in *range* minus 1. For example, if *range* contains 20 rows, the largest number you could use for *column-offset* is 19.

worksheet-offset can be 0 or any positive integer that is less than or equal to the number of worksheets in *range* minus 1. For example, if *range* contains 20 worksheets, the largest number you could use for *worksheet-offset* is 19. *worksheet-offset* is an optional argument; if you do not specify a *worksheet-offset* argument, @INDEX uses only the first worksheet in *range*.

Use @INDEX instead of @HLOOKUP or @VLOOKUP when you want to use a lookup table but need to use the relative positions of the rows or columns, instead of specified values, to find an entry.

Example

The table in Figure 3-30 shows the number of children enrolled in kindergarten through third grade at an elementary school.

@INDEX(SCHOOL,3,4) entered in D11 returns 114, the number of students in the third grade (*row-offset* number 4) in 1986 (*column-offset* number 3).

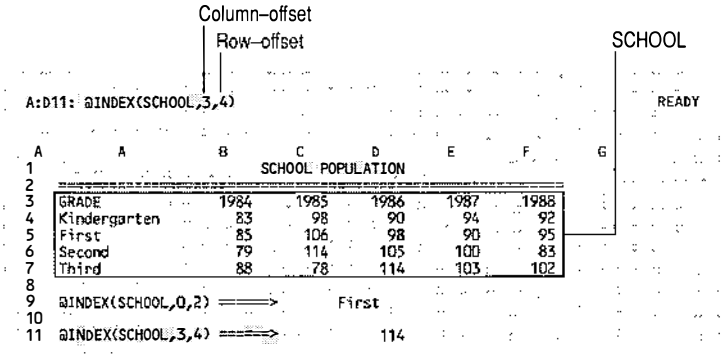


Figure 3-30. *Finding a value with @INDEX*

@INFO

@INFO(*attribute*) returns system information for the current session.

attribute can be any of the strings in the following table. *attribute* can be entered as a literal string, a string formula, or a reference to a cell that contains a label.

Attribute	*Returns*
directory	The current directory
mode	The current mode: 0 WAIT 1 READY 2 LABEL 3 MENU 4 VALUE 5 POINT 6 EDIT 7 ERROR 8 FIND 9 FILES 10 HELP 11 STAT 13 NAMES 99 All other modes (such as LDE or user-defined)
numfile	The current number of active files
origin	The cell in the top left corner of the screen (as an absolute address) at the time of the most recent recalculation
osreturn-code	The value returned by the most recent /System command or {SYSTEM} advanced macro command
osversion	The current operating system version
recalc	The current recalculation mode as one of the two strings "Automatic" or "Manual"
release	The release number for the 1-2-3 product being used consisting of three parts: major release number, upgrade level, and revision number
system	The name of the operating system

Examples

`@INFO("numfile")` displays 2 if you have two active files.

`@INFO("system")` displays "systemv".

@INT

@INT(*x*) returns the integer portion of *x*, without rounding the value.

x can be any value.

NOTE Use /Range Format Fixed 0 or /Worksheet Global Format Fixed 0 if you want to display values as integers in the worksheet but want 1-2-3 to calculate the values to their full precision. Do not use @INT.

Examples

`@INT(35.67)` displays 35

`@INT(@NOW)` displays the date number for the current date in system memory without the time because the time portion is a decimal value.

@IRR

@IRR(*guess,range*) calculates the internal rate of return expected from a series of cash flows generated by an investment. The internal rate of return is the percentage rate at which the present value of an expected series of cash flows is equal to the present value of the initial investment.

1-2-3 assumes the cash flows are received at regular, equal intervals.

guess represents your estimate of the internal rate of return. *guess* can be any value.

range can be the name or address of the range that contains the cash flows. 1-2-3 considers negative numbers as cash outflows and positive numbers as cash inflows. Normally, the first cash flow in *range* is a negative number representing the investment.

@IRR uses a series of approximations to calculate the internal rate of return. Because @IRR uses approximations, you enter a guess as the first argument. Enter a guess that you think is reasonable for the internal rate of return. In most cases, your guess should be a percentage between 0 (0%) and 1 (100%). Because more than one solution may be possible, try another guess if the result is less than 0 or greater than 1.

If @IRR cannot approximate the result to within 0.0000001 after 30 calculation iterations, the formula evaluates to ERR. If your guesses continue to return ERR, use @NPV to determine a better guess. If @NPV returns a positive value, your guess is too low. If @NPV returns a negative value, your guess is too high. @NPV returns 0 if your guess is accurate.

NOTE @IRR assigns the value 0 to all blank cells in *range* and includes them in the calculation.

Example

In Figure 3-31, @IRR(A2,B2..B14) entered in B16 returns 6.11% over a 12-month term; the initial investment is $1000 (in B2) and the 12 cash flows are each $120 (in B3..B14). @IRR(D2,E2..E14) entered in E16 returns 7.09% over a 12-month term; the initial investment is $1000 (in E2) and the 12 cash flows are those shown in E3..E14.

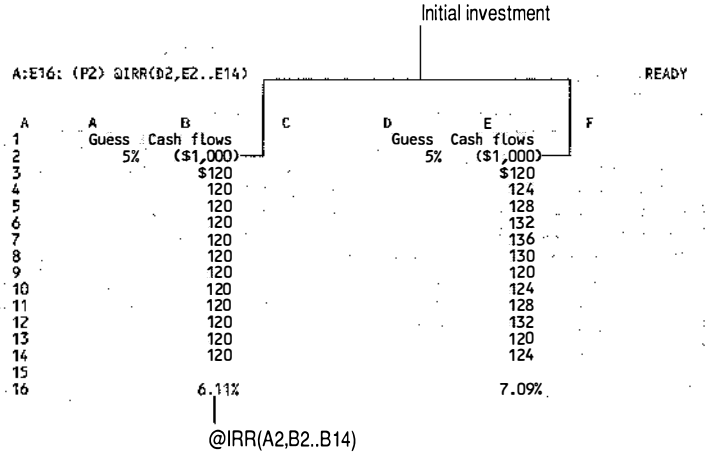


Figure 3-31. *Calculating internal rate of return with @IRR*

@ISERR

@ISERR(*x*) tests *x* for the value ERR. If *x* is the value ERR, @ISERR returns 1 (true); if *x* is not the value ERR, @ISERR returns 0 (false).

x can be any string, value, location, or condition.

Use @ISERR to stop the ripple-through effect of the value ERR. See "Logical @Functions" earlier in this chapter for an explanation of the ripple-through effect.

Example
@ISERR is frequently used to to block errors that arise from division by 0. For example, @IF(@ISERR(A1/A2),0,A1/A2) tests the result of the division A1/A2. If the result is the value ERR, the formula returns 0. If the result is any other value, the formula returns that result.

@ISNA

@ISNA(*x*) tests *x* for the value NA. If *x* is the value NA, @ISNA returns 1 (true); if *x* is not the value NA, @ISNA returns 0 (false).

x can be any string, value, location, or condition.

Use @ISNA to stop the ripple-through effect of the value NA. See "Logical @Functions" earlier in this chapter for an explanation of the ripple-through effect.

Example
`@ISNA(B1)` displays 1 if B1 contains the value NA; @ISNA(B1) displays 0 if B1 contains any other entry.

@ISNUMBER

@ISNUMBER (*x*) tests *x* for a value. If *x* is a value or a blank cell, @ISNUMBER returns 1 (true); if *x* is a string, @ISNUMBER returns 0 (false).

x can be any string, value, location, or condition.

@ISNUMBER is often used in macros to make sure a user enters the correct type of information (values or labels).

Example
In the macro instructions

```
{IF @ISNUMBER(C6)=0}{BEEP}{QUIT}
```

@ISNUMBER returns 0 if C6 contains a label; 1-2-3 then beeps and ends the macro.

@ISRANGE

@ISRANGE(*range*) tests *range* for a **defined range name** (a range name associated with a range address) or a valid range address (a range address with worksheet and column letters from A to IV and row numbers from 1 to 8192) in an active file. If *range* is a defined range name or valid range address in an active file, @ISRANGE returns 1 (true); if *range* is not a defined range name or valid range address in an active file, @ISRANGE returns 0 (false).

range can be any text or range address.

Examples

@ISRANGE(PROFIT) returns 0 if PROFIT is not a defined range name in the current file. If you use /Range Name Create to assign the range name PROFIT to a range in the current file, @ISRANGE(PROFIT) returns 1.

@ISRANGE(<<SALES_89.WK3>>PROFIT) returns 1 if PROFIT is a defined range name in the file SALES_89.WK3.

@ISRANGE(A:A1..A:IZ3) returns 0 because IZ is not a valid column letter.

@ISSTRING

@ISSTRING(*x*) tests *x* for a string. If *x* is a literal string or reference to a cell that contains a label, @ISSTRING returns 1 (true); if *x* is a value or blank cell, @ISSTRING returns 0 (false).

x can be any string, value, location, or condition.

NOTE @ISSTRING returns 1 even if a cell contains only a label prefix or space.

@ISSTRING is often used in macros to make sure a user enters the correct type of information (values or labels).

Example

In the macro instructions

```
{IF @ISSTRING(C6)=0}{BEEP}{QUIT}
```

@ISSTRING returns 0 if C6 contains a value or is blank; 1-2-3 then beeps and ends the macro.

@LEFT

@LEFT(*string,n*) returns the first *n* characters in *string*.

string can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string.

n can be any positive integer or 0. If *n* is 0, the result of @LEFT is an empty string. If *n* is larger than the length of *string*, @LEFT returns the entire *string*.

1-2-3 counts punctuation and spaces as characters in @LEFT.

@LEFT is useful for copying only part of a label to another cell.

Examples

@LEFT("Condominium",5) returns the string Condo.

In Figure 3-32, the formula @LEFT(A4,3)&D4 entered in B4 generates an account number by combining the first three letters of a customer's last name (in A4) with her zip code (entered as a label in D4).

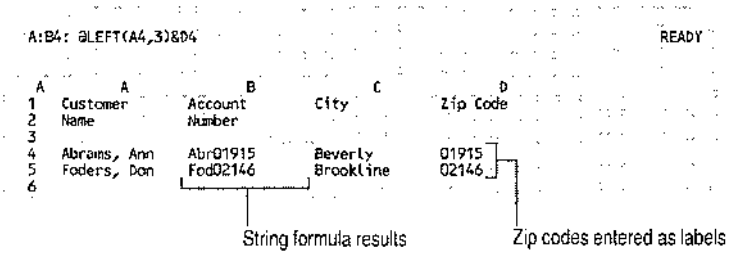


Figure 3-32. *Generating an account number with @LEFT*

@LENGTH

@LENGTH(*string*) counts the number of characters in *string*.

string can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string.

1-2-3 counts punctuation and spaces as characters in @LENGTH.

Examples

Use @LENGTH to determine the total length of a line before printing. For example, if you are printing a range that contains columns A through D of a worksheet, @LENGTH(A1&B1&C1&D1) calculates the total length in characters of the first line.

Use @LENGTH with @TRIM to find the length of a string without including leading, trailing, or consecutive spaces. For example,

@LENGTH(@TRIM(" Mr.Jones ")) displays 9

@LN

@LN(*x*) calculates the natural logarithm of *x*. Natural logarithms use the number *e* (approximately 2.718282) as a base.

x can be any value greater than 0.

Examples

`@LN(2)` displays 0.693147

`@LN(@EXP(1))` displays 1 because @EXP(1) displays 2.718282.

@LOG

@LOG(*x*) calculates the common logarithm (base 10) of *x*.

x can be any value greater than 0.

Examples

`@LOG(4)` displays 0.60206

`@LOG(1.0E+14)` displays 14 because @LOG is the reciprocal of scientific notation.

@LOWER

@LOWER(*string*) converts all the letters in *string* to lowercase.

string can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string.

Examples

`@LOWER("EXPENSES")` displays expenses

`@LOWER(B2)` displays e.e. cummings if B2 contains the label E.E. Cummings.

@MAX

@MAX(*list*) finds the largest value in *list*.

list can contain one or more numbers, numeric formulas, references to ranges that contain numbers or numeric formulas, or any combination of numbers, formulas, and references to ranges.

Examples

`@MAX(55,39,50,28,67,43)` displays 67

`@MAX(A1..C10)` returns the largest value in A1..C10.

@MID

@MID(*string*,*start-number*,*n*) returns *n* characters in *string*, beginning with the character at *start-number*.

string can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string.

start-number can be any positive integer or 0. *start-number* represents the offset number of a character in string. If *start-number* is greater than the length of *string*, the result of @MID is an empty string.

n can be any positive integer or 0. If *n* is 0, the result of @MID is an empty string.

NOTE Use a large number for *n* if you do not know the length of *string*; 1-2-3 will ignore the extra spaces and return the entire *string* beginning with *start number*.

1-2-3 counts punctuation and spaces as characters in @MID.

Use @MID when you need to extract part of a label that is not located at the beginning or end of the label. If you need to extract part of a label but you do not know its *start-number*, use @MID with @FIND. (See the second example below.)

Examples

`@MID("Daily Account Balance",6,7)` displays Account

The first and last names in each record of a database table are in the same cell. You want to list the customers by last names only in another database table. In Figure 3-33, the formula

`@MID(A2,@FIND(" ",A2,0)+1,@LENGTH(A2)-@FIND(" ",A2,0))`

returns the last-name portion of the label in A2. *start-number* is the position of the first letter of the last name (`@FIND(" ",A2,0)+1`). *n* is the remaining characters in the cell (`@LENGTH(A2)-@FIND(" ",A2,0)`).

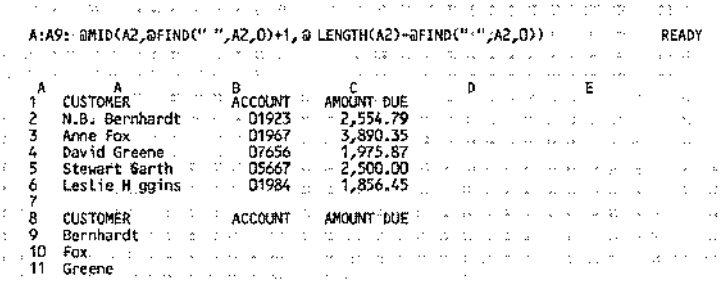


Figure 3-33. *Using @MID with @FIND to extract last names from a database table*

@MIN

@MIN(*list*) finds the smallest value in *list*.

list can contain one or more numbers, numeric formulas, references to ranges that contain numbers or numeric formulas, or any combination of numbers, formulas, and references to ranges.

Examples

`@MIN(55,39,50,28,67,43)` displays 28

`@MIN(A1..C10)` returns the smallest value in A1..C10.

@MINUTE

@MINUTE(*time-number*) calculates the minutes, an integer from 0 to 59, in *time-number*. See "Date and Time @Functions" earlier in this chapter for an explanation of time numbers.

time-number can be any decimal value from .000000 (midnight) to .999988 (11:59:59 p.m.). Usually another time @function supplies *time-number*.

Examples

`@MINUTE(0.333)` displays 59 because 0.333 is the time number for 7:59:31.

`@MINUTE(@TIME(11,15,45))` displays 15 because 15 is the *minutes* argument for @TIME(11,15,45).

@MOD

@MOD(x,y) calculates the remainder (modulus) of x/y.

x can be any value. If x is 0, @MOD returns 0. The sign (+ or –) of x determines the sign of the result.

y can be any value except 0.

@MOD uses the following formula to calculate the modulus:

$x–(y*@INT(x/y))$

Examples

`@MOD(9,4)` displays 1

You can use @MOD to calculate the day of the week by entering a date number as x and 7 (the number of days in a week) as y. 1-2-3 assigns a number to each day of the week: 0 for Saturday, 1 for Sunday, 2 for Monday, up to 6 for Friday. If you use @MOD to divide the date number by 7, the

remainder will always be the day of the week. For example, `@MOD(@DATE(85,11,18),7)` displays 2; November 18, 1985 was a Monday.

@MONTH

@MONTH(*date-number*) calculates the month, an integer from 1 (January) to 12 (December) in *date-number*. See "Date and Time @Functions" earlier in this chapter for an explanation of date numbers.

date-number can be any integer from 1 (January 1, 1900) to 73050 (December 31, 2099). Usually another date @function supplies *date-number*.

Examples

`@MONTH(20181)` displays 4 because 20181 is the date number for April 2, 1955.

`@MONTH(@TODAY)` displays the current month.

@N

@N(*range*) returns the entry in the first cell in *range* as a value. If the cell contains a value, @N returns that value; if the cell contains a label, @N returns the value 0.

range can be any range name or address.

Use @N in error-trapping routines in macros to prevent errors that would result if a cell used in formulas contained the wrong type of data.

Example

In the macro instructions

```
{IF @N(B6)=0}{BEEP}{INDICATE "ENTRY MUST BE
NUMERIC"}
```

@N returns 0 if B6 contains a label; 1-2-3 then beeps and changes the mode indicator to ENTRY MUST BE NUMERIC.

@NA

@NA returns the value NA (not available).

NA is a special value in 1-2-3 that indicates a value needed to complete a formula is not available. NA has a ripple-through effect on formulas.

Use @NA when you are building a worksheet that will contain data that you have not yet determined. You can use @NA in cells where you will enter that data; formulas that refer to those cells will have the value NA until you supply the data.

NOTE You cannot substitute the label NA for the value NA in formulas. For example, the formula +A2+34 = NA when A2 contains @NA, but equals 34 when A2 contains the label NA.

Example

`@IF(B14="",@NA,B14)` displays the value NA when B14 is blank.

@NOW

@NOW calculates the value that corresponds to the current date and time in system memory. This includes both a date number (integer portion) and a time number (decimal portion). See "Date and Time @Functions" earlier in this chapter for an explanation of date numbers and time numbers.

You can format the value of @NOW in any Date or Time format. If you format @NOW as a date, 1-2-3 displays only the date (integer) portion of the date and time number; if you format @NOW as a time, 1-2-3 displays only the time (decimal) portion of the date and time number. In both cases, 1-2-3 continues to calculate with the entire date and time number.

@NOW recalculates each time you recalculate your work. If you set recalculation to Automatic, 1-2-3 recalculates @NOW whenever it recalculates another value.

Example

In Figure 3-34, column E contains dates of employees' last reviews as date numbers (produced with @DATE and formatted with /Range Format Date 3). The formula

```
@IF((@NOW-E6)>=180,"Yes","No")
```

in F6, which subtracts the date of an employee's last review from the current date, is copied down column F. This formula calculates whether the employee is due for a review.

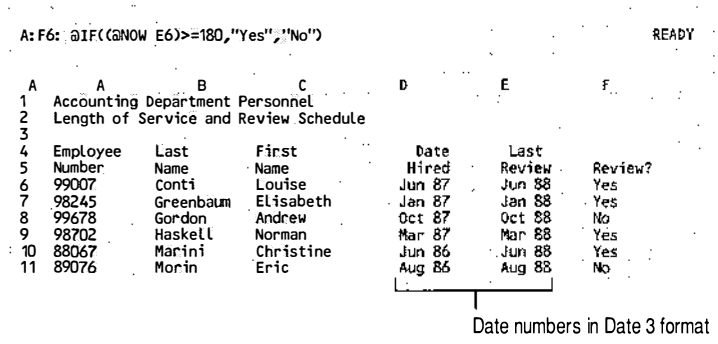


Figure 3-34. *Using @NOW in a conditional formula*

@NPV

@NPV(*interest,range*) calculates the net present value of a series of future cash flows discounted at a fixed, periodic *interest* rate.

1-2-3 assumes that the cash flows occur at equal time intervals, that the first cash flow occurs at the end of the first period, and subsequent cash flows occur at the end of subsequent periods.

interest can be any value greater than –1.

range can be the name or address of the range that contains the cash flows.

NOTE @NPV is similar to @PV, except that with @PV all cash flows are equal amounts.

@NPV calculates the net present value using the following formula:

$$\sum_{i=1}^{n} \frac{v_i}{(1 + int)^i}$$

where: $v_i...v_n$ = series of cash flows in range
int = interest rate
n = number of cash flows
i = the current iteration (1 through n)

Example

In Figure 3-35, @NPV(B2,D2..D6) entered in B5 returns $6,707.90, the net present value of the cash flows in D2..D6.

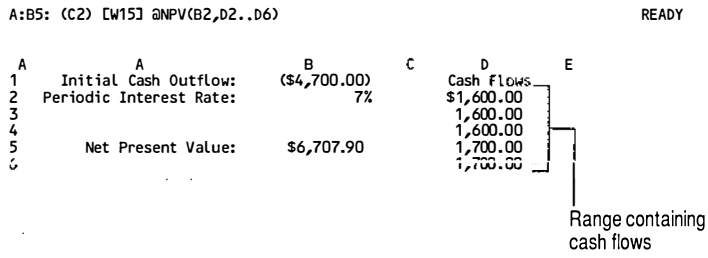


Figure 3-35. *Calculating net present value with @NPV*

NOTE To determine the net present value of an investment where you make an initial cash outflow immediately, followed by a series of future inflows, you must factor the initial outflow separately because it is not affected by the interest. For example, +INITIAL+@NPV(RATE,SERIES) displays $904.07 when INITIAL is the initial cash outflow, RATE is the interest rate, and SERIES is the series of future cash inflows.

@PI

@PI returns the value π (calculated at 3.14159265358979). π is the ratio of the circumference of a circle to its diameter.

Example

`@PI*4^2` displays 50.26548, the area of a circle with a radius of 4.

@PMT

@PMT(*principal*,*interest*,*term*) calculates the amount of the periodic payment needed to pay off a loan, given a specified periodic *interest* rate and number of payment periods. 1-2-3 assumes your calculations are for payments you make at the end of each payment period (an ordinary annuity).

principal represents the value of the loan. *principal* can be any value.

interest represents the periodic interest rate. *interest* can be any value greater than –1.

term represents the number of payment periods. *term* can be any value except 0.

Enter *interest* and *term* in the same units of time. For example, if you are calculating a monthly payment, enter the interest and term in monthly increments. (See the example below.)

@PMT uses the following formula to calculate periodic payment:

$$prin * \frac{int}{1 - (int + 1)^{-n}}$$

where: *prin* = principal
int = periodic interest rate
n = term

Examples

You are considering taking out an $8,000 auto loan for 3 years at an annual interest rate of 14%, compounded monthly. You want to determine your monthly payment. In Figure 3-36, @PMT(B1,B2/12,B3) entered in B5 returns $273.42, the monthly payment.

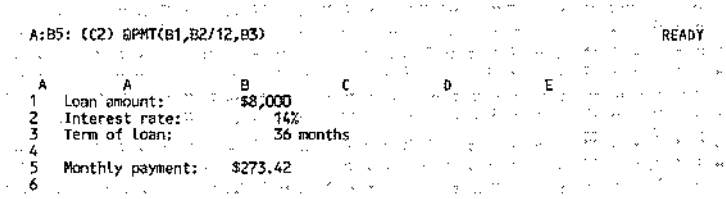


Figure 3-36. *Calculating a monthly payment with @PMT*

NOTE If you make payments at the beginning of each month, you would calculate the amount for an annuity due. To calculate the amount of the periodic payment on an annuity due, use the formula @PMT(*principal*,*interest*,*term*)/(1+*interest*). For example, @PMT(8000,0.14/12,36)/(1+0.14/12) displays $270.27, the monthly payment.

@PROPER

@PROPER(*string*) converts the letters in *string* to proper capitalization: the first letter of each word uppercase, and the remaining letters in each word lowercase.

string can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string.

Use @PROPER when you combine data from several sources and want labels to be consistent throughout your worksheet.

Examples

`@PROPER("354-a babcock")` displays 354-A Babcock

`@PROPER(A7&";"&G7)` returns Morton Smith; Athens, Georgia if A7 contains the label MORTON SMITH, and G7 contains the label Athens, georgia. Note that the ; (semicolon) is in quotation marks and is therefore treated as a literal string instead of an argument separator.

@PV

@PV(*payments,interest,term*) calculates the present value of an investment. @PV calculates the present value based on a series of equal investments (*payments*), discounted at a periodic *interest* rate over the number of periods in *term*.

payments and *term* can be any values.

interest can be any value greater than –1.

@PV calculates present value with the following formula:

$$pmt * \frac{1 - (1 + int)^{-n}}{int}$$

where: *pmt* = periodic payment
int = periodic interest rate
n = term

Examples

You won $1,000,000. You can receive either 20 annual payments of $50,000 at the end of each year, or a single lump-sum payment of $400,000 instead of the $1,000,000 annuity. You want to find out which option is worth more in today's dollars.

If you were to accept the annual payments of $50,000, you assume that you would invest the money at a rate of 8%, compounded annually.

In Figure 3-37, @PV(D1,D2,D3) entered in E6 returns $490,907, which tells you that the $1,000,000 paid over 20 years is worth $490,907 in today's dollars.

```
A:E6: (C0) [W14] @PV(D1,D2,D3)                                        READY

 A    A       B       C        D            E           F         G
 1          Annuity payment:  $50,000
 2          Interest rate:         8%
 3          Term of annuity:       20 yrs
 4
 5    Lump sum payment:                        $400,000
 6    Present value of annuity payment:        $490,907
```

Figure 3-37. *Calculating the present value of an annuity with @PV*

NOTE If you received the annual payments at the beginning of each year, you would calculate the amount for an annuity due. To calculate the present value of an annuity due, use the formula @PV(*payments, interest,term*)*(1+*interest*). @PV(50000,0.08,20)*(1+0.08), for example, displays $530,180 (the value of $1,000,000 paid over 20 years as an annuity due in today's dollars).

@RAND

@RAND generates a random value between 0 and 1. Each time 1-2-3 recalculates your work, @RAND generates a new random value.

@RAND is useful for generating test data for simulations.

To generate random values in different numeric intervals, multiply @RAND by the size of the interval. (See the second and third examples below.)

Examples

`@RAND` displays 0.419501 or any value between 0 and 1.

`@RAND*10` displays 6.933674 or any value between 0 and 10.

`@INT(@RAND*50)+1` displays 49 or any integer from 1 to 51.

@RATE

@RATE(*future-value,present-value,term*) calculates the periodic interest rate necessary for an investment (*present-value*) to grow to a *future-value* over the number of compounding periods in *term*.

future-value can be any value.

present-value and *term* can be any values except 0.

@RATE uses the following formula to calculate the periodic interest rate:

$$\left(\frac{fv}{pv}\right)^{1/n} - 1$$

where: fv = future value
pv = present value
n = term

Example
You invested $10,000 in a bond. The bond matures in five years and has a maturity value of $18,000. Interest is compounded monthly. You want to determine the periodic interest rate for this investment.

In Figure 3-38, @RATE(D4,D2,D3) entered in D6 returns 0.984%, the periodic (monthly) interest rate. To determine the annual interest rate, use the formula ((1+@RATE(18000, 10000,60))^12)–1 . This yields an annual interest rate of 12.47%.

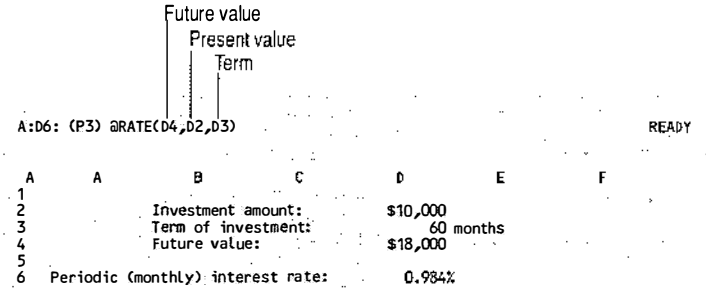


Figure 3-38. *Calculating periodic interest rate with @RATE*

@REPEAT

@REPEAT(*string*,*n*) duplicates *string* *n* times.

string can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string.

n can be any positive integer.

NOTE @REPEAT differs from the repeating label prefix \ (backslash) in that the repeating label prefix repeats a label only as many times as will fill the current cell. @REPEAT duplicates the string as many times as you specify; it is not limited by the current column width.

Examples

`@REPEAT("Hello ",3)` displays Hello Hello Hello

`@REPEAT("x",10)` displays xxxxxxxxxx

@REPLACE

@REPLACE(*original-string*,*start-number*,*n*,*new-string*) replaces *n* characters in *original-string*, beginning at *start-number*, with *new-string*.

original-string and *new-string* can be literal strings, references to cells that contain labels or formulas that evaluate to strings.

start-number can be any positive integer or 0. *start-number* represents the offset number of a character in *original-string*.

n can be any positive integer or 0.

You can perform several procedures with @REPLACE:

- By making *n* equal the number of characters in *original-string*, you can replace the entire *original-string* with *new-string*.
- By specifying a position immediately beyond the end of *original-string* as *start-number*, you can append *new-string* to *original-string*.
- By making *n* equal 0, you can insert a new string.
- By making *new-string* an empty string, you can delete a string.

1-2-3 counts punctuation and spaces as characters in @REPLACE. If you use @REPLACE to append or insert strings, remember to include the necessary spaces.

Examples

`@REPLACE("January",0,3,"Febr")` displays February

`@REPLACE("January",10,0," February")` displays January February

`@REPLACE(CELL,@FIND("-",CELL,0),1,"/")` copies the label in CELL, 4-24, as 4/24.

@RIGHT

@RIGHT(*string,n*) returns the last *n* characters in *string*.

string can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string.

n can be any positive integer or 0. If *n* is 0, the result of @RIGHT is an empty string. If *n* is larger than the length of *string*, @RIGHT returns the entire *string*.

1-2-3 counts punctuation and spaces as characters in @RIGHT.

@RIGHT is useful for copying only part of a label to another cell.

Examples

`@RIGHT("Average Daily Balance",7)` displays Balance

`@RIGHT(B3,5)` displays Sales when B3 contains the label January Sales.

@ROUND

@ROUND(*x,n*) rounds the value *x* to *n* places.

x can be any value.

n can be any integer from –100 to 100.

If *n* is positive, 1-2-3 rounds *x* to *n* digits to the right of the decimal point.

If *n* is negative, 1-2-3 rounds *x* to the positive *n*th power of 10. For example, if *n* is –2, 1-2-3 rounds *x* to the nearest hundred.

If *n* is 0, 1-2-3 rounds *x* to an integer.

NOTE Use /Range Format Fixed or /Worksheet Global Format Fixed if you want to display values with a specific number of decimal places but want 1-2-3 to calculate those values to their full precision. Do not use @ROUND.

Examples

`@ROUND(134.578,2)` displays 134.58

`@ROUND(134.578,0)` displays 135

`@ROUND(134.578,-2)` displays 100

@ROWS

@ROWS(*range*) counts the number of rows in *range*.

range can be any range name or address.

Use @ROWS to find the length of a range you want to print.

Example

`@ROWS(SCORES)` displays 43 if SCORES is the range B3..B45.

@S

@S(*range*) returns the entry in the first cell in *range* as a label. If the cell contains a label, @S returns that label; if the cell contains a value, @S returns an empty string.

range can be any range name or address.

Use @S in error-trapping routines in macros to prevent errors that would result if a cell used in formulas contained the wrong type of data.

Example

In the macro instructions

```
{IF @S(B6)=""}{BEEP}{INDICATE "ENTRY MUST BE A LABEL"}
```

@S returns an empty string if B6 contains a value; 1-2-3 then beeps and changes the mode indicator to ENTRY MUST BE A LABEL.

@SECOND

@SECOND(*time-number*) calculates the seconds, an integer from 0 and 59, in *time-number*. See "Date and Time @Functions" earlier in this chapter for an explanation of time numbers.

time-number can be any decimal value from .000000 (midnight) to .999988 (11:59:59 p.m.). Usually another time @function supplies *time-number*.

Examples

`@SECOND(0.333)` displays 31 because 0.333 is the time number for 7:59:31.

`@SECOND(@TIME(11,15,45))` displays 45 because 45 is the seconds argument for @TIME(11,15,45).

@SHEETS

@SHEETS(*range*) counts the number of worksheets in *range*.

range can be any range name or address.

Example
`@SHEETS(Q_2)` displays 4 if Q_2 is the range B:B3..E:C45 (worksheets B, C, D, and E).

@SIN

@SIN(x) calculates the sine of angle x measured in radians.

x can be any value approximately from $-2^{32}*\pi$ to $2^{32}*\pi$.

NOTE To convert degrees to radians, multiply by @PI/180.

Examples
`@SIN(.883)` displays 0.772647

`@SIN(35*@PI/180)` displays 0.573576

@SLN

@SLN(*cost,salvage,life*) calculates the straight-line depreciation allowance of an asset for one period.

cost represents the amount paid for the asset. *cost* can be any value.

salvage represents the estimated value of the asset at the end of its life. *salvage* can be any value.

life represents the number of periods it will take to depreciate the asset to its salvage value. *life* can be any value except 0.

Straight-line depreciation divides the depreciable cost (the actual cost minus the salvage value) evenly over the useful life of an asset. The useful life is the number of periods (typically years) over which an asset is depreciated.

@SLN uses the following formula to calculate straight-line depreciation:

$$\frac{(c - s)}{n}$$

where: c = cost of the asset
s = salvage value of the asset
n = useful life of the asset

Example
You have an office machine worth $10,000. The useful life of this machine is 10 years, and the salvage value in 10 years will be $1200. You want to calculate yearly depreciation

expense, using the straight-line method. In Figure 3-39, @SLN(D2,D3,D4) entered in cell D6 returns $880, the yearly depreciation allowance.

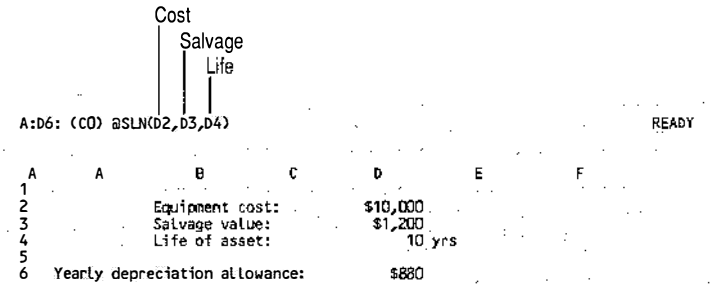


Figure 3-39. *Calculating straight-line depreciation with @SLN*

@SQRT

@SQRT(*x*) calculates the positive square root of *x*.

x can be any positive value or 0.

Examples

`@SQRT(@INT(25.768))` displays 5 because @INT(25.768) displays 25.

`@SQRT(-2)` displays ERR because x is negative.

@STD

@STD(*list*) calculates the population standard deviation of the values in *list*.

list can contain one or more numbers, numeric formulas, references to ranges that contain numbers or numeric formulas, or any combination of numbers, formulas, and references to ranges.

Standard deviation measures the degree to which individual values in a list vary from the mean (average) of all values in the list. The lower the standard deviation, the less individual values vary from the mean, and the more reliable the mean. A standard deviation of 0 indicates that all values in the list are equal.

Population standard deviation is most accurate when the number of observations is large.

NOTE Standard deviation is the square root of the variance of all individual values from the mean.

@STD uses the n (biased) method to calculate standard deviation of population data with the following formula:

$$\sqrt{\frac{\Sigma\ (v_i - avg)^2}{n}}$$

where: n = number of items in *list*
v_i = the ith item in *list*
avg = average of values in *list*

Example

In Figure 3-40, @STD(C3..C43) displays 40.03, the population standard deviation of the test scores in C3..C43

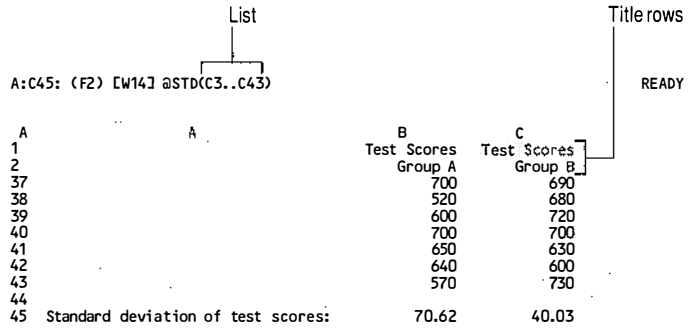


Figure 3-40. *Calculating population standard deviation of test scores with @STD*

@STDS

@STDS(*list*) calculates the sample standard deviation of the values in *list*.

list can contain one or more numbers, numeric formulas, references to ranges that contain numbers or numeric formulas, or any combination of numbers, formulas, and references to ranges.

Standard deviation measures the degree to which individual values in a list vary from the mean (average) of all values in the list. The lower the standard deviation, the less individual values vary from the mean, and the more reliable the mean. A standard deviation of 0 indicates that all values in the list are equal.

Sample standard deviation produces more accurate results than population standard deviation when the number of observations is small.

@STDS uses the n–1 (unbiased) method to calculate standard deviation of sample population data with the following formula:

$$\sqrt{\frac{\Sigma\,(v_i - avg)^2}{n}}$$

where: n = number of items in *list*
v_i = the ith item in *list*
avg = average of values in *list*

Example

In Figure 3-41, @STDS(B3..B7) displays 2.70, the standard deviation of the values in B3..B7.

```
A:B10: (F2) [W7] @STDS(B3..B7)                                    READY

A                        A                B      C      D      E
1                                       1985   1986   1987   1988
2
3                            April        34     38     51     45
4                              May        35     40     47     46
5                             June        37     39     45     46
6                             July        36     40     32     47
7                           August        30     23     25     48
8
9
10  Standard deviation of values:       2.70   7.31  11.00   1.14
11
```

Figure 3-41. ***Calculating sample standard deviation with @STDS***

@STRING

@STRING(x,n) converts the value x into a string with n decimal places.

x can be any value.

n can be any integer from 0 to 15.

NOTE: @STRING ignores any formatting characters included in x. For example, if A7 contains the formatted value $45.23, @STRING(A7,2) returns the string 45.23.

Examples

`@STRING(1.23587,0)` displays the string 1

`@STRING(20%,1)` displays the string 0.2

`@STRING(B3, 0)&" "&B4` returns the string 100 Kilsyth Road if B3 contains the value 100 and B4 contains the label Kilsyth Road.

@SUM

@SUM(*list*) adds the values in *list*.

list can contain one or more numbers, numeric formulas, references to ranges that contain numbers or numeric formulas, or any combination of numbers, formulas, and references to ranges.

Example
In Figure 3-42, @SUM(B5..B9) entered in B11 displays 86, the sum of the values in B5..B9.

```
A:B11: [W7] @SUM(B5..B9)                                         READY

 A          A               B      C      D      E      F
 1                   Projected Company Growth
 2
 3                       1989   1990   1991   1992
 4
 5            Production   34     38     40     45
 6             Marketing   15     17     20     24
 7         Documentation    9     12     15     18
 8               Finance    8     10     12     15
 9                 Sales   20     25     28     35
10
11 Total number of employees:  86    102    115    137
```

Figure 3-42. *Adding a list of values with @SUM*

@SUMPRODUCT

@SUMPRODUCT(*list*) multiplies the values in corresponding cells in multiple ranges and sums the products.

list can be any combination of ranges that contain values and are the same size and shape. If the ranges in *list* are not the same size and shape, @SUMPRODUCT returns the value ERR.

Example
In Figure 3-43, @SUMPRODUCT(B1..B4,C1..C4) entered in E6 returns 300, the sum of the products of the corresponding cells in column B and column C. The values in column D (which @SUMPRODUCT does not enter — they are in this example to help you see how @SUMPRODUCT works) result from multiplying corresponding values in column B and column C. The sum of the values in column D is the same as the result of the @SUMPRODUCT formula in E6.

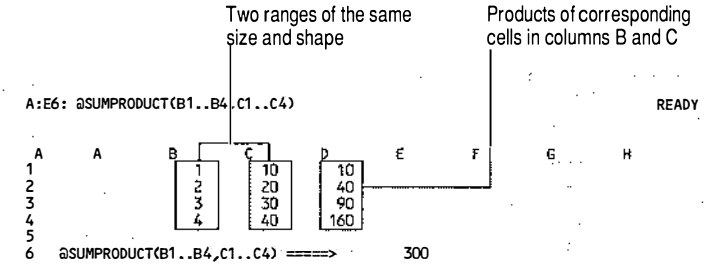


Figure 3-43. *Using @SUMPRODUCT with two ranges*

@SYD

@SYD(*cost,salvage,life,period*) calculates the sum-of-the-years'-digits depreciation allowance of an asset for a specified *period.*

cost represents the amount paid for the asset. *cost* can be any value.

salvage represents the value of the asset at the end of its life. *salvage* can be any value.

life represents the number of periods (typically years) it will take to depreciate the asset to its salvage value. *life* can be any value greater than or equal to 1.

period represents the time period for which you want to find the depreciation allowance. *period* can be any value greater than or equal to 1.

The sum-of-the-years'-digits method accelerates the rate of depreciation so that more depreciation expense occurs and can be written off in earlier periods than in later ones. The depreciable cost is the actual cost minus the salvage value.

@SYD uses the following formula to calculate depreciation using the sum-of-the-years'-digits method:

$$\frac{(c - s) * (n - p + 1)}{(n * (n + 1)/2)}$$

where: c = cost of the asset
s = salvage value of the asset
n = calculated useful life of the asset
p = period for which depreciation

Example

You have an office machine worth $10,000. The useful life of the machine is 10 years, and the salvage value in 10 years will be $1200. You want to calculate depreciation expense for the fifth year, using the sum-of-the-years'-digits method. In Figure 3-44, @SYD(D2,D3,D4,5) entered in D6 returns $960, the depreciation allowance for the fifth year.

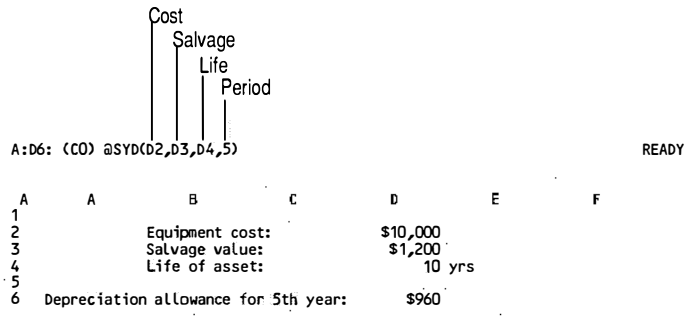


Figure 3-44. *Calculating sum-of-the-year's-digits depreciation with @SYD*

@TAN

@TAN(x) calculates the tangent of angle x measured in radians.

x can be any value from $-2^{32}*\pi$ to $2^{32}*\pi$.

NOTE To convert degrees to radians, multiply by @PI/180.

Examples

`@TAN(.52)` displays 0.572562

`@TAN(35*@PI/180)` displays 0.700208

@TERM

@TERM(*payments,interest,future-value*) calculates the number of payment periods in the term of an investment necessary to accumulate a *future-value*, assuming *payments* of equal value, when the investment earns a periodic *interest* rate.

payments can be any value except 0.

interest can be any value greater than –1.

future-value can be any value.

1-2-3 assumes that calculations made with @TERM use an investment that is an ordinary annuity (having payments at the end of each period).

@TERM uses the following formula to calculate the payment term:

$$\frac{\ln(1 + (fv * int/pmt))}{\ln(1 + int)}$$

where: *pmt* = periodic payment
fv = future value
int = periodic interest rate
ln = natural logarithm

Examples

You deposit $2,000 at the end of each year into a bank account. Your account earns 7.5% a year, compounded annually. You want to determine how long it will take to accumulate $100,000. In Figure 3-45, @TERM(D2,D3,D4) entered in D6 returns 21.5, the number of years it will take to accumulate $100,000 in your account.

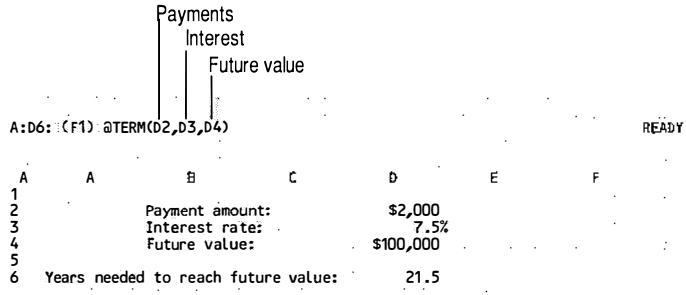


Figure 3-45. *Calculating the number of payment periods in an annuity with @TERM*

NOTE If you made payments at the beginning of each year, you would calculate the amount for an annuity due. To calculate the number of payment periods in an annuity due, use the formula @TERM(*payment*, *interest*,*future value*/(1+*interest*)). For example, @TERM(2000,0.075,100000/(1+0.075)) displays 20.8, the number of years it would take to accumulate $100,000 if you made deposits at the beginning of each year.

NOTE You can calculate the term necessary to pay back a loan by using @TERM with a negative *future value*. For example, you want to know how long it will take to pay back a $10,000 loan at 10% yearly interest, making payments of $1,174.60 per year. @ABS(@TERM(1174.6,0.1,–10000)) displays 20 years to pay back the loan.

@TIME

@TIME(*hour*,*minutes*,*seconds*) calculates the time number for the specified *hour*, *minutes*, and *seconds*. See "Date and Time @Functions" earlier in this chapter for an explanation of time numbers.

hour can be any integer from 0 (midnight) to 23 (11:00 p.m.).

minutes and *seconds* can be any integers from 0 to 59.

Use @TIME to enter times as time numbers that 1-2-3 can use in time-arithmetic calculations — for example, to keep track of elapsed times.

NOTE Use /Range Format Date Time to format time numbers.

Example

You want to determine a consultant's payment. The formula

```
(@TIME(13,0,0)-@TIME(9,15,0))*95*24
```

calculates the amount due on a given day by subtracting the start time (9:15 a.m.) from the stop time (1:00 p.m.) and multiplying the result by an hourly rate of $95.00. The result is $356.25.

@TIMEVALUE

@TIMEVALUE(*string*) calculates the time number for a *string* that looks like a time. See "Date and Time @Functions" earlier in this chapter for an explanation of time numbers.

string can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string. *string* must be in one of the Time formats. See /Range Format in Chapter 2 for a description of the Time formats.

Use @TIMEVALUE when you want to convert times entered as labels to time numbers so that you can use the times in calculations. @TIMEVALUE is useful with data that has been imported from another program, such as a word processing program.

NOTE Use /Range Format Date Time to format time numbers.

Example
In Figure 3-46, times are entered as labels in column A. @TIMEVALUE(A1) entered in C1 returns the time number 0.885717593. The formula is copied down column C. The time numbers are then copied to column E, where they are formatted with /Range Format Date Time 2.

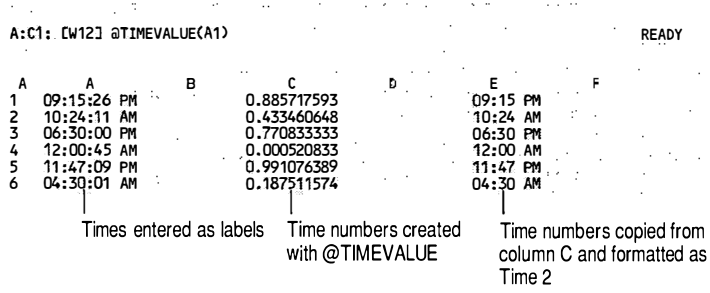


Figure 3-46. ***Changing labels to time numbers with @TIMEVALUE***

@TODAY

@TODAY calculates the date number for the current date in system memory. See "Date and Time @Functions" earlier in this chapter for an explanation of date numbers.

Use @TODAY in place of @NOW when you need to calculate with only the current date and not both the current date and time.

Example
`@TODAY` displays 32688 on June 29, 1989.

@TRIM

@TRIM(*string*) removes leading, trailing, and consecutive spaces from *string* while preserving single spaces within a string.

string can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string.

Use @TRIM to control spacing during data entry or to combine strings that have unknown spacing.

Examples

@TRIM(A1) displays a b c d if A1 contains the label a b c d.

@TRIM(" 45 3/8") displays 45 3/8

@TRIM("500 South St.") displays 500 South St.

@TRUE

@TRUE returns the logical value 1 (true).

Use @TRUE with macros or @functions such as @IF and @CHOOSE that require a logical value of 1 (true). You can use either @TRUE or the value 1 in formulas that evaluate logical conditions, but @TRUE makes the formula easier to read.

Example

@IF(A6>500,@TRUE,@FALSE) displays 1 when A6 contains a value greater than 500.

@UPPER

@UPPER(*string*) converts all the letters in *string* to uppercase.

string can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string.

Examples

@UPPER("Account Number") displays ACCOUNT NUMBER

@UPPER(B2) displays WARNING if B2 contains the label warning.

@VALUE

@VALUE(*string*) converts a number entered as a *string* to its corresponding numeric value.

string can be a literal string, a reference to a cell that contains a label, or a formula that evaluates to a string. *string* must contain only numbers or the symbols + – @ . (or $ (assuming $ is the default currency symbol); *string* can resemble a standard number (456.7), a number in scientific format (4.567E2), a mixed number (45 7/8), or a formatted number ($32.85).

If *string* is a blank cell or empty string, @VALUE returns 0. If *string* contains non-numeric characters, @VALUE returns the value ERR.

@VALUE ignores leading and trailing spaces in *string*; however, if *string* contains spaces separating symbols from the numbers (such as $ 32.85 or £56.20), @VALUE returns the value ERR.

NOTE You cannot do calculations within a *string* argument in @VALUE; however, you can create a formula with several @VALUE functions. (See the third example below.)

Use @VALUE when you want to convert a string that contains numbers into values that can be used in mathematical calculations.

Examples

`@VALUE(B3)` displays 49.75 if B3 contains the label 49 3/4.

`@VALUE("85%")` displays .85

`@VALUE("22"+"20")` displays 0, but `@VALUE("22")+@VALUE("20")` displays 42

@VAR

@VAR(*list*) calculates the population variance of the values in *list*.

list can contain one or more numbers, numeric formulas, references to ranges that contain numbers or numeric formulas, or any combination of numbers, formulas, and references to ranges.

Variance is a measure of the degree to which individual values in a list vary from the mean (average) of all the values in the list. The lower the variance, the less individual values vary from the mean, and the more reliable the mean. A variance of 0 indicates that all values in the list are equal.

The results of @VAR are most accurate when the number of observations is large.

NOTE Variance is the square of standard deviation.

@VAR uses the n (biased) method to calculate variance with the following formula:

$$\frac{\Sigma\ (v_i - avg)^2}{n}$$

where: n = number of items in *list*
v_i = the ith item in *list*
avg = average of values in *list*

Example
In Figure 3-47, **@VAR(B3..B43)** entered in B45 returns 963.44, the population variance of the test scores in B3..B43

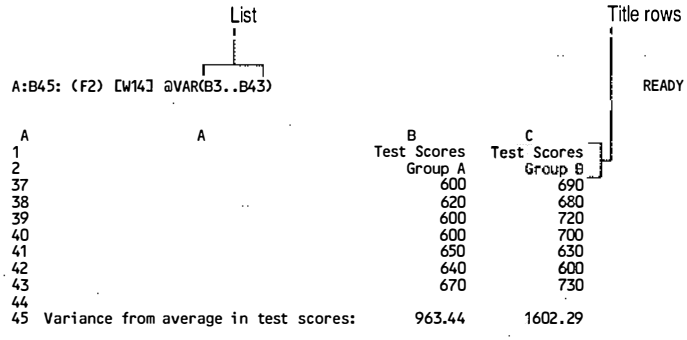


Figure 3-47. *Calculating the population variance of test scores with @VAR*

@VARS

@VARS(*list*) calculates the sample variance of the values in *list*.

list can contain one or more numbers, numeric formulas, references to ranges that contain numbers or numeric formulas, or any combination of numbers, formulas, and references to ranges.

Variance is a measure of the degree to which individual values in a list vary from the mean (average) of all the values in the list. The lower the variance, the less individual values vary from the mean, and the more reliable the mean. A variance of 0 indicates that all values in the list are equal.

The results of @VARS are most accurate when the number of observations is small.

@VARS uses the n–1 (unbiased) method to calculate variance with the following formula:

$$\frac{\Sigma\ (v_i - avg)^2}{(n - 1)}$$

where: n = number of items in *list*
v_i = the ith item in *list*
avg = average of values in *list*

Example
In Figure 3-48, @VARS(B3..B7) entered in B10 returns 7.30, the sample variance of the values in B3..B6

```
A:B10: (F2) [W7] @VARS(B3..B7)                                          READY

 A                  A                   B      C      D      E
 1                                    1985   1986   1987   1988
 2
 3                           April      34     38     51     45
 4                             May      35     40     47     46
 5                            June      37     39     45     46
 6                            July      36     40     32     47
 7                          August      30     23     25     48
 8
 9
 10  Variance from average (April   August):  7.30  53.50 121.00   1.30
 11
```

Figure 3-48. *Calculating sample variance with @VARS*

@VDB

@VDB(*cost,salvage,life,start-period,end-period,[depreciation-factor],[switch]*) calculates the depreciation allowance of an asset for a length of time specified by *start-period* and *end-period.* @VDB uses the double-declining balance method if no optional arguments are entered. An optional *depreciation-factor* argument lets you calculate depreciation for rates other than double-declining balance. An optional *switch* argument can make @VDB never switch to an ongoing straight-line depreciation calculation, even when that depreciation is greater than the declining-balance calculation.

The double-declining balance method (where the depreciation rate is 200% of the straight-line rate) accelerates the rate of depreciation so that more depreciation expense occurs (and can be written off) in earlier periods than in later ones.

cost represents the amount paid for the asset. *cost* can be any value greater than *salvage.*

salvage represents the value of the asset at the end of its life. *salvage* can be any value.

life represents the number of periods it will take to depreciate the asset to its salvage value. *life* can be any value greater than 0.

start-period represents the point in the asset's life when you want to begin calculating depreciation. *start-period* can be any value greater than or equal to 0, but cannot be greater than *life.*

end-period represents the point in the asset's life when you want to stop calculating depreciation. *end-period* can be any value greater than *start-period.*

start-period and *end-period* correspond to the asset's life, relative to the fiscal period. For example, if you want to find the first year's depreciation of an asset purchased at the beginning of the second quarter of a fiscal year, *start-period* would be 0 and *end-period* would be 0.75 (1 minus 1/4 of a year). You can use @VDB for multiple-period depreciation calculations (see the example below).

@VDB allows for the use of an initial-period option to calculate depreciation for the period the asset is placed in service. @VDB uses the fractional part of *start-period* and *end-period* to determine the initial-period option. If both *start-period* and *end-period* have fractional parts, then @VDB uses *start-period*'s fractional part.

depreciation-factor is an optional argument you include to specify the percentage of straight-line depreciation you want to use as the depreciation rate. If you do not specify a depreciation rate, 1-2-3 uses 200%, which is the double-declining balance rate. *depreciation-factor* can be any value greater than or equal to 0, although commonly used rates are 1.25, 1.50, 1.75, and 2.

switch is an optional argument you include if you do not want @VDB to switch to straight-line depreciation for the remaining useful life. Normally, declining-balance switches to such a straight-line calculation when it is greater than the declining-balance calculation.

switch can be either 0 or 1. If *switch* is 0 (the default), @VDB automatically switches to straight-line depreciation when that is greater than declining-balance depreciation. If *switch* is 1, @VDB never switches to straight-line depreciation.

@VDB uses the following formula to calculate double-declining balance depreciation:

$$\frac{(bv * d)}{n}$$

where: bv = book value in that period
d = percentage of straight-line depreciation
n = useful life of the asset

@VDB uses the following formula to calculate straight-line depreciation:

$$\frac{(bv - s)}{r}$$

where: bv = book value in that period
s = salvage value of the asset
r = remaining useful life of the asset

Examples

You purchased an investment in the middle of the first quarter of the fiscal year. It cost $10,000 and will be worth an estimated $600 in 10 years. You want to determine each year's depreciation over the asset's life, assuming that tax laws limit you to 150% depreciation of the declining balance.

In Figure 3-49, cells C1 through C10 contain the results of @VDB calculations for each of the 10 years of the asset's life.

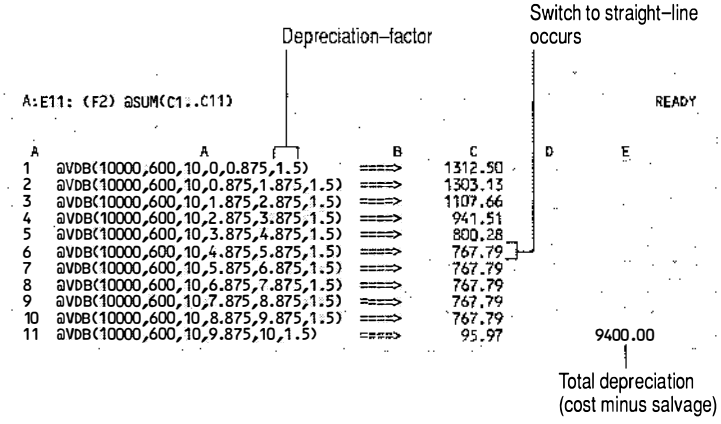


Figure 3-49. *Determining depreciation over an asset's life with @VDB*

@VLOOKUP

@VLOOKUP(*x,range,column-offset*) finds the contents of the cell in a specified column of a vertical lookup table. A **vertical lookup table** is a range with value information in ascending order in the first column.

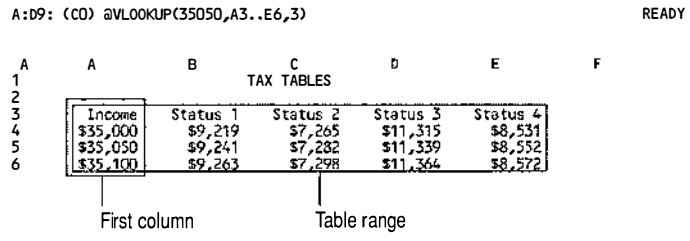


Figure 3-50. *A vertical lookup table*

@VLOOKUP compares the value *x* to each cell in the first column of the table. When 1-2-3 locates a cell in the first column that contains the value *x* (or the value closest to, but not larger than, *x*), it moves across that row the number of columns specified by *column-offset* and returns the contents of that cell as the answer.

x can be any value greater than or equal to the first value in *range*. If *x* is smaller than the first value in *range*, @VLOOKUP returns the value ERR. If *x* is larger than the last value in *range*, @VLOOKUP stops at the last cell in the column and returns the contents of that cell as the answer.

range represents the location of the vertical lookup table. *range* can be any range name or address. You cannot use three-dimensional ranges for @VLOOKUP.

column-offset represents an offset number. An offset number corresponds to the position the column occupies in *range*. The first column has an offset number of 0, the second column has an offset number of 1, and so on. *column-offset* can be 0 or any positive integer that is less than or equal to the number of columns in *range* minus 1. For example, if *range* contains 20 columns, the largest number you can use for *column-offset* is 19.

Use @VLOOKUP to locate entries in a table, such as a tax table or a sales commissions table.

Examples

Figure 3-51 shows a tax table. @VLOOKUP(35050,A3..E6,3) entered in D9 returns $11,339, the amount of tax you would pay if your income were $35,050 and you were a Status 3 taxpayer.

@VLOOKUP(35150,A3..E6,1) entered in D11 returns $9,263, the amount of tax you would pay if your income were $35,150 and you were a Status 1 taxpayer. $35,150 does not appear in the first column of the table, so @VLOOKUP stops at row 6, because $35,100 is the value closest to, but not larger than, $35,150.

```
A:D9: (C0) @VLOOKUP(35050,A3..E6,3)                                READY

A     A           B          C          D          E          F
1                          TAX TABLES
2
3     Income     Status 1   Status 2   Status 3   Status 4
4    $35,000     $9,219     $7,265    $11,315     $8,531
5    $35,050     $9,241     $7,282    $11,339     $8,552
6    $35,100     $9,263     $7,298    $11,364     $8,572
7
8
9   @VLOOKUP(35050,A3..E6,3) =====>    $11,339
10
11  @VLOOKUP(35150,A3..E6,1) =====>     $9,263
```

Figure 3-51. *Calculating tax payments with @VLOOKUP*

@YEAR

@YEAR(*date-number*) calculates the year, an integer from 0 (1900) to 199 (2099), in *date-number*. See "Date and Time @Functions" earlier in this chapter for an explanation of date numbers.

date-number can be any integer from 1 (January 1, 1900) to 73050 (December 31, 2099).

Examples

`@YEAR(20181)` displays 55 because 20181 is the date number for April 2, 1955.

`@YEAR(@DATE(91,2,14))` displays 91 because 91 is the *year* argument in @DATE(91,2,14).

`@YEAR(@TODAY)` displays the current year.

NOTE: Add 1900 to the result of an @YEAR calculation to convert it into a four-digit year. For example, @YEAR(20181)+1900 returns 1955.

Chapter 4
1-2-3 Macros

A **macro** is a series of 1-2-3 commands and keystrokes that you create to perform a 1-2-3 task. You enter the macro as one or more labels in a column and assign it a range name. Whenever you run the macro — (with the **ALT** or **RUN** key, depending on the macro's range name) — 1-2-3 reads through the commands and keystrokes in the macro and performs them automatically.

Working on personal tasks, macros expedite your work in a 1-2-3 session. They save time that would otherwise be spent performing simple but repetitive tasks, and they streamline complex procedures. Macros can also guide users who are unfamiliar with 1-2-3 through specific 1-2-3 applications. Running 1-2-3 as part of a networked workgroup, you can develop sophisticated macros that manage complex tasks in your group.

Figure 4-1 shows two macros, named \A and RIGHTNOW. The macros are in column B. Their range names are documented in column A and the tasks they perform — automatically entering a company's name and creating a time-and-date stamp for a file — are documented in column C.

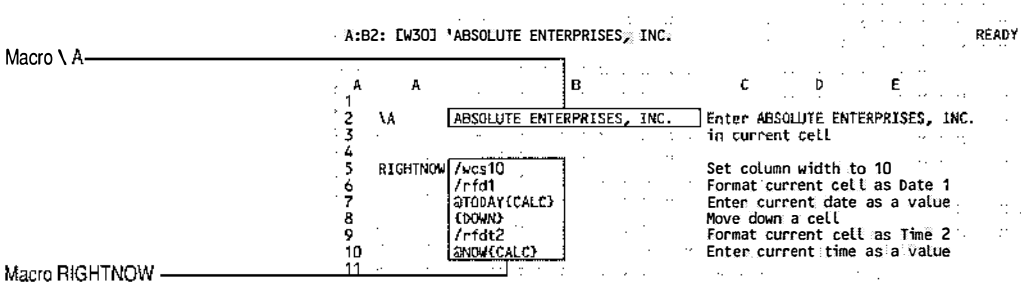


Figure 4-1. *Two macros*

How to Use this Chapter

This chapter works in conjunction with Chapter 5 of the *Tutorial*, which teaches basic macro concepts. If you have never created a macro, go through the *Tutorial* lessons first. Then read this chapter, which provides additional information about 1-2-3 macros. The information is presented in three sections:

- "Creating a Macro" reviews the basic procedures for writing and running a macro, as taught step-by-step in Chapter 5 of the *Tutorial*. It also presents some tips for creating macros that are not included in the *Tutorial*.
- "Using the Record Feature for Macros" explains how to create a macro by performing a task and then copying the recorded keystrokes to a worksheet. It also explains how to play back recorded keystrokes to repeat a task.
- "Advanced Macro Commands" explains how to use the 1-2-3 built-in programming language in a macro and describes the advanced macro commands in detail.

  The section also discusses the /X macro commands. These are programming commands included in 1-2-3 Release 1A that you can still use in 1-2-3 Release 3 and UNIX versions of 1-2-3, although all have corresponding advanced macro commands. To understand and apply the information in this section, some knowledge of programming concepts is helpful.

NOTE Appendix B describes several basic and sophisticated sample macros that illustrate the syntax and usage of the macro commands described in this chapter.

Creating a Macro

Creating a macro involves the following steps:

1. Planning the macro
2. Entering the macro in a worksheet
3. Naming the macro
4. Documenting the macro
5. Running the macro
6. If necessary, debugging (correcting problems in) the macro
7. Saving the macro by saving the file

Explanations of the seven steps follow.

Planning a Macro

To create a macro, you must first identify the steps of the 1-2-3 task you are automating.

For example, suppose you want a macro that inserts a new worksheet after the current worksheet and sets the width of column B in the new worksheet to 30. To create the macro, you must know that the task involves these steps:

1. Select /Worksheet Insert Sheet After and press ENTER to insert the new worksheet.
2. Press → to move the cell pointer to column B in the new worksheet.
3. Select /Worksheet Column Set-Width, type 30 as the column width, and press ENTER to complete the command.

In some cases, identifying the steps means performing the task once manually, noting each key that you press. In other cases, mapping out the procedure with a flow chart may help you work out the steps of the task.

Entering a Macro

After planning a macro, you enter the macro in a worksheet. When you enter a macro, you need to know two things: where you will put the macro and how to write the macro instructions. Both of these topics are discussed below.

Choosing a Macro Location

Use the following information to help you select a worksheet location for the macros you create:

- You can enter macros in a file with other data or you can enter them in a file that contains only macros (a **macro library**). If you plan to use a macro with only one data file, the simplest approach is to enter the macro in that data file. If you plan to use the macro with a number of data files, you may want to enter it in a macro library that you read into memory along with the files in which you want to use the macro. See Appendix B for more information on creating and using macro libraries.
- If you enter macros in a data file, you should enter them in a separate worksheet from the data. This keeps you from writing over data when you enter the macros or damaging the macros when you insert or delete rows and columns in the data area. In GROUP mode, separating macros by worksheet will not guarantee that insertions or deletions made to the columns or rows in one worksheet will not affect the worksheet containing your macros.
- If you do enter macros in the same worksheet as data, enter the macros below and to the right of the data. For example, if the data occupies the range A1..Z240, put the macro below row 240 and to the right of column Z. Again, this avoids the possibility of damaging the macros when you insert or delete rows and columns in the data area.

Macro Instructions

Macro instructions are like program code or shell commands — they tell 1-2-3 what actions to perform. The following set of macro instructions tells 1-2-3 to insert a new worksheet after the current worksheet and widen column B in the new worksheet to 30:

```
/wisa~{RIGHT}/wcs30~
```

All the macro instructions in this example are keystroke instructions. **Keystroke instructions** represent keys on the keyboard, and they cause 1-2-3 to perform as it does when you press those keys. (The other type of macro instructions, **advanced macro commands**, causes 1-2-3 to perform built-in programming functions. See "Advanced Macro Commands" later in this chapter.)

Keystroke instructions can be divided into two groups: those that consist of a single character, such as / (slash), w, and ~ (tilde), and those that consist of a key name within { } (braces), such as {RIGHT}.

The single-character keystroke instructions represent the typewriter keys. Most of these instructions duplicate the character on the key they represent. For example, the keystroke instruction that displays the main menu is / (slash); the keystroke instruction that selects Worksheet from the main menu is w, and so on.

The ENTER Keystroke Instruction

The only single-character keystroke instruction not identical to the key it represents is the ~ (tilde). The tilde is the keystroke instruction for ENTER. In the example above, the first tilde inserts one worksheet to complete the /Worksheet Insert Sheet After command, and the second tilde enters the specified column width to complete the /Worksheet Column Set-Width command.

The keystroke instructions that consist of a key name within { } (braces) represent the pointer-movement keys, function keys, and a few other keys. The following table lists the keystroke instructions that consist of a key name within braces.

1-2-3 Key	*Macro instruction*
↓	{DOWN} or {D}
↑	{UP} or {U}
←	{LEFT} or {L}
→	{RIGHT} or {R}
ABS	{ABS}
ADDIN	{ADDIN} or {APP4}
APP1	{APP1}
APP2	{APP2}
APP3	{APP3}
BACKSPACE	{BACKSPACE} or {BS}
BIG LEFT	{BIGLEFT}
BIG RIGHT	{BIGRIGHT}

(continued)

1-2-3 Key	*Macro instruction*
CALC	{CALC}
DEL	{DELETE} or {DEL}
EDIT	{EDIT}
END	{END}
GRAPH	{GRAPH}
ESC	{ESCAPE} or {ESC}
FILE	{FILE}
FIRST CELL	{FIRSTCELL} or {FC}
FIRST FILE	{FIRSTFILE}, {FF}, or {FILE}{HOME}
GOTO	{GOTO}
HELP	{HELP}
HOME	{HOME}
INS	{INSERT} or {INS}
LAST CELL	{LASTCELL} or {LC}
LAST FILE	{LASTFILE}, {LF}, or {FILE}{END}
NEXT FILE	{NEXTFILE}, {NF}, or {FILE}{NS}
NEXT SHEET	{NEXTSHEET} or {NS}
PGUP	{PGUP}
PGDN	{PGDN}
PREV FILE	{PREVFILE}, {PF}, or {FILE}{PS}
PREV SHEET	{PREVSHEET} or {PS}
QUERY	{QUERY}
TABLE	{TABLE}
WINDOW	{WINDOW}
ZOOM	{ZOOM}
/(slash) or < (less-than symbol)	/, <, or {MENU}
~	(tilde){~}
{	(open brace){ { }
}	(close brace){ } }

NOTE 1-2-3 does not have macro key names for the following 1-2-3 function keys: **RECORD**, **RUN**, and **UNDO**. Therefore, you cannot use these keystrokes in a macro.

NOTE The 1-2-3 keys **ADDIN**, **APP1**, **APP2**, and **APP3** do not execute add-in applications in versions of 1-2-3 that do not support Release 3 add-ins. The corresponding macro instructions {ADDIN}, {APP1}, {APP2}, and {APP3} can be used in conjunction with other advanced macro commands such as {GET} to evaluate cell contents or keyboard input.

Guidelines for Entering a Macro

Once you know what steps the macro involves, where to enter the macro, and how to write the instructions, you can go ahead and enter the macro in the worksheet. When entering a macro, observe the following guidelines:

- Macro instructions are entered as labels. You can either include the entire set of macro instructions (up to a total of 512 characters) in one label or divide the instructions among a series of labels in consecutive cells in a column.

  The two sets of macro instructions in Figure 4-2 define the same task: they both insert a worksheet after the current worksheet and widen column B in the new worksheet to 30. The only difference is that the first set of macro instructions is all in one label, while the second set is divided among three labels.

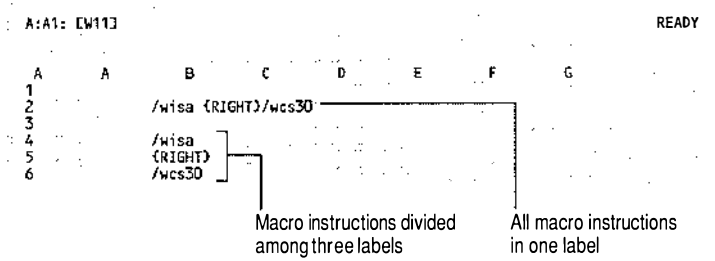


Figure 4-2. *Macro instructions as one label and as three labels*

- Unless the macro is very short, divide the macro instructions among a series of labels. Doing this makes the macro easier to read and debug.
- If you divide the macro instructions among a series of labels, enter the labels in consecutive cells in a column. 1-2-3 reads a macro by starting at the first cell and moving down the column until it reaches a blank cell, a cell that contains a numeric value, or the advanced macro command {QUIT}.
- When a macro label begins with /, \, <, or a number or any other character that puts 1-2-3 in VALUE mode, such as + – @ . or #, type one of the label prefixes ' ^ or " before typing the label.
- Begin and end any instruction in { } (braces), such as {DOWN}, in the same cell. Splitting such an instruction between two or more cells results in an error.
- You can type any macro instruction in braces, such as {DOWN}, in uppercase or lowercase letters. 1-2-3 is not case-sensitive for keystroke instructions in braces. For example, {DOWN}, {down}, and {DoWn} all produce the same result. When you specify a file name as part of an argument to a macro instruction, be aware that 1-2-3 interprets file names according to your current file mode: UNIX, DOS-upper, or DOS-lower.
- Macros frequently move the cell pointer from one worksheet location to another; enter data in the worksheet; copy, move, or delete existing data; and perform other tasks that operate on cells or ranges. When specifying a cell or range in a macro, use a file reference unless the cell or range is in the file that will be current when you run the macro. A **file reference** is a file name and extension enclosed in << >> (double angle brackets); it precedes the cell or range specification.

  For example, the macro /cA:A1~C:F6~ copies A:A1 in the current file to C:F6 in the current file. The results depend on which file is current when you run the macro. The macro /c<<SALES.WK3>>A:A1~<<SALES.WK3>>C:F6~ always copies A:A1 in file SALES.WK3 to C:F6 in file SALES.WK3. The results do not depend on which file is current when you run the macro.

For more information on file references, see "Specifying Cells and Ranges in Other Files" in Chapter 1.

NOTE This section has presented the guidelines for entering a macro directly in the worksheet. You can also use RECORD to enter a macro. See "Using the Record Feature for Macros" later in this chapter.

Naming a Macro

After you enter a macro, assign the macro a range name. You use the range name to run the macro.

When deciding on a macro range name, be aware of the following:

- Macro range names can consist of any combination of up to 15 characters. Like any other range name, however, they should not duplicate cell addresses; they should not start with ! (exclamation point) or include spaces, commas, semicolons, or periods; and they should not duplicate @function names, advanced macro command keywords, or 1-2-3 key names. By following these range-name guidelines, you prevent confusion when the range names are used in advanced macro commands and formulas. For a more complete explanation of the guidelines, see /Range Name Create in Chapter 2.
- When a macro range name consists of a backslash and a single letter, such as \N, you can use the ALT key to run the macro. (To run the macro named \N, press the ALT key and then N.) Using ALT is the simplest way to run a macro.
- When a macro range name consists of any other combination of characters, such as NEW_SHEET, you must use RUN to run the macro.

Use /Range Name Create to assign the range name to the macro: select /Range Name Create; specify the macro's name as the range name; and specify the first cell of the macro as the range to name.

Naming a Branch or Subroutine Location

If you use branching and subroutine calls in a macro (see {*subroutine*}, {BRANCH}, and {FOR} in "Advanced Macro Commands" later in this chapter), it is good practice to assign range names to the branch locations and subroutines as well

as to the main macro. You can use any valid range names; there is no advantage to using backslash-letter range names for branch locations and subroutines.

Documenting a Macro

After completing the steps of entering and naming a macro, it is good practice to document both the macro's range name and the macro instructions. This documentation has several functions: it quickly identifies which range name belongs to the macro (particularly useful in a file that contains many named ranges); clarifies the macro's purpose; and describes the steps of the macro procedure. Documentation can be extremely helpful when you or someone else needs to revise the macro or when you are trying to figure out what a macro does a year after you last used it. Follow these guidelines:

- Document the macro's range name by entering the name as a label to the left of the macro's first cell. If the name starts with a backslash, such as \N, be sure to type a label prefix (' " or ^) before you type the name, or 1-2-3 will interpret the backslash as the repeating label prefix.
- Document the macro instructions by entering comments to the right of the cell or cells containing the macro. (Do not enter documentation in the same cell as macro instructions. 1-2-3 considers anything in a cell within a macro to be part of the macro and thus will try to run the documentation as part of the macro.)

Figure 4-3 shows the documented version of the second macro in Figure 4-2 (macro NEW_SHEET). The macro is in column B, the macro's range name is documented in column A, and the macro instructions are documented in column C.

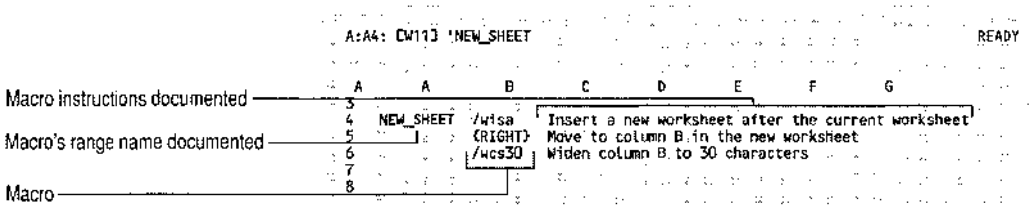


Figure 4-3. *A documented macro*

Running a Macro

After you have entered the macro instructions, named the macro, and documented it, try running the macro to see if it works as planned.

NOTE Before you run the macro, use /File Save to save any files that will be affected by the macro. That way, if the macro produces unexpected results, you can easily retrieve the original versions of those files.

You run a macro in one of two ways: with ALT or with RUN. The method you use depends on the macro's name.

- If the macro's name consists of a backslash and a single letter (for example, \N), you can use the ALT key to run the macro.
- If the macro's name consists of any other combination of characters (for example, NEW_SHEET), you must use RUN to run the macro.

If, when you run the macro, it performs as you expected it to, you can go ahead and use the macro at any time during the current session. To use the macro in future sessions, save the file that contains the macro.

Running a Macro with the ALT key

1. Make sure the file containing the macro you want to run is active. If the file that contains the macro is not the current file, make sure no other active file contains a macro with the same range name.
2. Press the ALT key and then press the letter in the macro range name. For example, to run a macro named \N, press the ALT key and then N. If you get a beep from your terminal, it is possible that you pressed the ALT key and the macro letter simultaneously.

Running a Macro with RUN

1. Make sure the file that contains the macro is active.
2. Press RUN.

   1-2-3 displays a list of range names in the current file and the names of other active files. To display a full-screen list, press NAME.

3. Specify the macro to run, using any of the following methods:

   Type the macro range name or address and press ENTER. If the macro is in another active file, precede the range name or address with a file reference.

   Highlight the macro range name in the displayed list of range names and press ENTER. To have 1-2-3 list the range names in another active file, highlight the name of that file and press ENTER.

   Press ESC to enter POINT mode, move the cell pointer to the first cell of the macro, and press ENTER.

TIP If you are developing macros for use in a workgroup or across a network, you cannot expect other users to guess whether a particular range name is a macro range or a conventional range when they press RUN. To ensure that workgroup macros can be recognized as such, develop a common naming convention such as beginning macros with unusual characters (# ' _) so they can be recognized immediately.

Debugging a Macro

If, when you run a macro, it does not perform as you expected it to, or if 1-2-3 does not finish running it because of an error, you need to debug the macro — find out which macro instructions are causing the problem and edit them.

Sometimes you can identify the faulty instructions just by looking at the results of the macro. For example, if a macro makes a typographical error when entering a label in a cell, look for the same typographical error in the macro instructions.

In many instances, however, it is more difficult to identify the problem. In these instances, use the following troubleshooting checklist to determine possible problems. If you still cannot figure out the problem, go through the macro in STEP mode, as explained in "Debugging a Macro in STEP Mode" following the checklist.

Troubleshooting Checklist

If 1-2-3 displays an error message when you run a macro, press HELP while the error message is on the screen to get an explanation of the message. Then press ESC or ENTER to clear

the error message, move to the macro, and look for the problem. Here are some common mistakes made when entering macro instructions:

- Spelling errors in a macro key name, advanced macro command keyword, or range name, such as {DLETE} instead of {DELETE}, {WINDOWOFF} instead of {WINDOWSOFF}, or PROFT instead of PROFIT
- Spaces where there should not be any, as between arguments in an @function or advanced macro command, or at the end of a command sequence
- Missing tildes in a command sequence, for example, /rfp0~ instead of /rfp0~~
- Missing steps in a command sequence, such as /rf0~~ instead of /rfp0~~
- Square brackets or parentheses instead of braces around a key name or advanced macro command, for example, [up] or (up) instead of {up}
- Incorrect cell or range references, for example, A1..VV3 (a nonexistent range) or RANGES when RANGES is an undefined range name
- Range names without file references when the named range is not in the current file
- Range names that duplicate macro key names or advanced macro command keywords, such as NAME, HELP, or QUIT
- In macros that include advanced macro commands, misspelled keywords, missing arguments, arguments of the wrong type, or misplaced or missing argument separators
- In advanced macro commands that use literal strings as arguments, missing quotation marks around the strings

Macro error messages often include the location of the instruction 1-2-3 was executing at the time it encountered the error. Check the cell cited in the error message for typographical errors, missing braces or tildes, or anything else listed in the troubleshooting checklist.

If you find no problems in the referenced cell, determine whether a macro instruction in a cell above it could have caused the problem. For example, if 1-2-3 reports an error in a

cell that apparently contains none, but the cell does contain a range name assigned at an earlier point in the macro, check the cell that contains the range-name assignment instructions to see whether you spelled the range name the same way in both places.

When you find the error, move the cell pointer to the appropriate cell, press EDIT, correct the error, and press ENTER.

Debugging a Macro in STEP Mode

The instructions that cause an error in a lengthy or complicated macro may not be easy to find. To help you diagnose problems in a macro, 1-2-3 has a feature called STEP mode. **STEP mode** lets you run a macro one instruction at a time until you locate the error.

Procedure

1. With 1-2-3 in READY mode, press RECORD and select Step to turn on STEP mode.

   The STEP indicator appears at the bottom of the screen.

2. Start the macro (see "Running a Macro" earlier in this chapter).

3. Press a key (the space bar is recommended, but you can press any key) to execute the first macro instruction.

4. Repeat step 3 as many times as necessary until you find the error.

   Each time you press a key, 1-2-3 executes another instruction in the macro. In between each instruction, an SST indicator (for Single-STep) replaces the STEP indicator at the bottom of the screen, signifying that STEP mode is on and the macro is in process.

5. Once you find the error, end the macro and then edit it. To end the macro, press BREAK and then press ESC or ENTER.

   When you end the macro to edit it, the STEP indicator replaces the SST indicator to remind you that STEP mode is still on. You do not need to turn off STEP mode before you edit the macro.

6. After editing the macro, run through it in STEP mode again if there are other problems you need to locate.

7. To turn off STEP mode in order to run the macro normally, press RECORD when 1-2-3 is in READY mode and select Step again.

NOTE You can turn STEP mode on or off when 1-2-3 is in READY mode, and you can also turn STEP mode on or off during a macro. To do so, press RECORD when 1-2-3 is waiting for input during an interactive command. 1-2-3 automatically turns STEP mode on or off without displaying the Record menu.

Saving a Macro

When the macro is running correctly, save it for future use: select /File Save and save the file in which you entered the macro. Then, any time the file is active, you can run the macro.

Tips for Creating a Macro

The following tips expand on information presented in the preceding sections.

- When entering instructions in { } (braces) such as {PGUP} and {DOWN}, specify two or more repetitions of the same instruction with a number following the key name within the braces. For example, {PGUP 5} tells 1-2-3 to scroll the worksheet up five times. Separate the number from the key name with a space.

  Or, instead of a number, include a cell reference (address or range name) after the key name. For example, {DOWN SOME} moves the cell pointer down the number of rows specified by the value in cell SOME.

- To enter a macro instruction in braces, type the left brace and then press NAME. 1-2-3 lists all macro instructions in braces (key names and advanced macro commands). Highlight the appropriate instruction and press ENTER. 1-2-3 automatically types the instruction in the control panel.

- Although it is possible to use cell addresses when specifying worksheet locations in a macro, Lotus recommends you use range names instead. If you move a range (for example, if you insert some rows above the range), a macro that refers to the range by name will continue to work correctly, but a macro that refers to the range by address will no longer work correctly.

- You can use { } (open and close braces with nothing inside them) as place holders in a macro. 1-2-3 ignores these braces when executing a macro.
- To have 1-2-3 recalculate data only when it reaches a {CALC} instruction or {RECALC} or {RECALCCOL} command, run the macro with worksheet recalculation set to Manual. When you run a macro with worksheet recalculation set to Automatic, 1-2-3 automatically recalculates formulas whenever the macro changes worksheet data, with the following exception. Sixteen of the advanced macro commands and /X commands that change cell contents do not cause an automatic recalculation: {CONTENTS}, {DEFINE}, {FILESIZE}, {FOR}, {GET}, {GETLABEL}, {GETNUMBER}, {GETPOS}, {LET}, {LOOK}, {ONERROR}, {PUT}, {READ}, {READLN}, /XL, and /XN. (You can force a recalculation after any of these commands by using ~ (tilde) or {CALC} as the next macro instruction.)
- If you put macros in a data file that contains other named ranges, start all the macro range names in the file, including multiple-character macro range names, with \ (backslash). This lets you quickly distinguish your macro range names from the other range names in the file when 1-2-3 displays them all together in range-name lists; for example, when you select /Range Name Create or press RUN.
- Use /Range Name Note Create to create descriptive notes for macro range names. Then, to refresh your memory about the macros in the current file, use /Range Name Note Table to list the range names and notes in a table. See /Range Name Note in Chapter 2.
- If you create a number of macros at the same time, you can name them all at once. Enter the macros in the same column (with at least one blank cell between them), and enter the name of each macro to the left of the macro's starting cell. Then use /Range Name Labels Right to assign the names to all the macros at once.
- Create an autoexecute macro for a file by naming the macro \ 0 (backslash zero). An **autoexecute macro** is a macro that 1-2-3 runs automatically if the /Worksheet Global Default Autoexec setting is Yes (the default setting) when you read the file that contains it into memory. 1-2-3 runs autoexecute macros in .WK3 files and .WK1 (1-2-3 Release 2) files only.

NOTE When you run a macro that performs a /File Open command and the file to be opened contains an autoexecute macro, the result depends on whether the current /Worksheet Global Default Autoexec setting is Yes or No. If the current setting is Yes, 1-2-3 terminates the original macro and runs the autoexecute macro. If the current setting is No, 1-2-3 opens the file and then continues with the original macro.

- For any macro with a backslash-letter name, you can run the macro with ALT when 1-2-3 prompts you for information during a command. For example, suppose the macro

  ```
  ABSOLUTE ENTERPRISES, INC. ~
  ```

  is named \A. After selecting /Print Printer Options Header, you can run the macro, using ALT, to specify ABSOLUTE ENTERPRISES, INC. as the document header.

- To interrupt a macro while it is running — that is, to stop the macro before 1-2-3 has completed all the macro instructions — press BREAK. Then press ESC to clear the error message and return 1-2-3 to READY mode. In some cases you may need to press BREAK more than once.

  NOTE If you are designing an application for other users, you may not want them to interrupt a macro while it is running. The advanced macro commands {BREAKOFF} and {BREAKON} let you disable and re-enable BREAK. See {BREAKOFF} and {BREAKON} in "Advanced Macro Commands" later in this chapter.

- Create a macro library by entering a number of macros in one or more worksheets and saving the worksheets together as a file. Then, when you read the macro library into memory, you can use the macros in the library with any active file. For details on macro libraries, see Appendix B.

Abbreviated Addresses and Missing File References in a Macro

Because you can run a macro in one active file while working in another file, it is important to understand how 1-2-3 interprets abbreviated addresses (addresses without a worksheet letter) and addresses or range names without a file reference in a macro.

- When the current task involves a 1-2-3 operation (for example, when 1-2-3 is erasing a range or completing a {GOTO} instruction), 1-2-3 interprets an abbreviated address as being in the current worksheet (the worksheet containing the cell pointer) and an address or range name without a file reference as being in the current file. For example, **/reA21~** erases cell A21 in the current worksheet regardless of what worksheet or file the macro is in. **{GOTO}C:A21~** moves the cell pointer to C:A21 in the current file regardless of what file the macro is in.
- When the current task redirects the flow of control in a macro (for example, when 1-2-3 is performing a {BRANCH} command), 1-2-3 interprets an abbreviated address as being in the same worksheet as the macro and an address or range name without a file reference as being in the same file as the macro. See "Types of Advanced Macro Commands" later in this chapter for commands that redirect macro flow of control.

Using the Record Feature for Macros

"Debugging a Macro in STEP Mode" in the previous section explained the use of RECORD to turn STEP mode on and off for macros. RECORD also gives you access to the **record buffer,** a 512-byte area of computer memory in which 1-2-3 records your keystrokes. With RECORD, you can create a macro by copying keystrokes from the buffer into the worksheet. You can also play back keystrokes from the buffer directly to repeat a task automatically without actually creating a macro. This section describes both procedures.

Before you continue to the procedures, read the following information about 1-2-3 keystroke recording.

- The record buffer has a fixed size of 512 bytes. When the buffer fills up, 1-2-3 discards keystrokes from the beginning of the buffer (the keystrokes you made earliest in the session or since you last erased the buffer) to make room for the most recent keystrokes.
- 1-2-3 records keystrokes in macro-instruction format. For example, when you press GOTO, type d:a5, and press ENTER, 1-2-3 records {GOTO}d:a5~.

- To fit the maximum number of command sequences and data entries in the record buffer, 1-2-3 uses the shortest possible form to record keystrokes. For example, even when you select a menu item by highlighting it with the menu pointer and pressing ENTER, 1-2-3 records the menu selection as the first character of the menu item's name. 1-2-3 records pointer-movement keystrokes in their shortest form, for example {D} instead of {DOWN}. It records consecutive duplicate keystrokes with a repetition number, for example {D 4} instead of {D}{D}{D}{D}.
- 1-2-3 does not record the following keys in the record buffer: COMPOSE (but it does record composed characters), BREAK, INS, RECORD, RUN, and UNDO. When you use BREAK to leave a menu, 1-2-3 records the equivalent number of {ESC} keystrokes instead of {BREAK}.
- When you use the ALT key to start a macro named \A — \Z, 1-2-3 records the action as {\A}, {\B}, {\C}, and so on. 1-2-3 does not record the actions performed by the macro, however.
- 1-2-3 uses one keystroke in the record buffer that you cannot type at the keyboard: {CE} (short for {CLEAR-ENTRY}). {CE} is a 1-2-3 keystroke that clears the current data from the edit line in EDIT mode.

Entering a Macro with the Record Feature

The section on entering a macro in "Creating a Macro" explains how to enter a macro by typing the appropriate series of macro instructions in the worksheet. You can also enter a macro by performing the task you want to automate and then using RECORD to copy the keystrokes from the record buffer into the worksheet. To do so, follow these steps:

1. Move the cell pointer to the cell where you will start the task.
2. Press RECORD and select Erase.

   This step clears the record buffer of its current keystrokes, to simplify step 5.
3. Perform the task you want to automate.

NOTE The number of characters required to record the task in the record buffer cannot exceed 512 bytes. In most cases, each character used to record a keystroke uses one byte. The keystroke sequence {GOTO}D:A5~, for example, uses 11 bytes: 6 to record GOTO, and 5 more to record the address and ENTER.

4. Press RECORD and select Copy.

   1-2-3 displays the contents of the record buffer in the control panel, enters EDIT mode, and prompts you for the keystrokes to copy.

5. Select the keystrokes to copy by moving the cursor to the beginning or end of the keystrokes and pressing TAB to anchor the cursor. Then use the pointer-movement keys to highlight the keystrokes, and press ENTER.

   NOTE Before or after you anchor the cursor, you can edit the keystrokes in the record buffer the same way you edit data in a cell. For example, suppose you formatted a range as Currency but you want the macro to format ranges as Fixed. You can change the C (for Currency) in the record buffer to an F (for Fixed).

6. Specify the range to which you want to copy the selected record buffer keystrokes.

   The width of the specified range determines the width of the labels 1-2-3 creates when it copies the keystrokes to the worksheet. For example, if you specify D10 as the range and column D is 15 characters wide, 1-2-3 enters in column D a series of labels approximately 15 characters wide, starting in D10. If you specify D10..F10 as the range and the total width of columns D, E, and F is 40, 1-2-3 enters in column D a series of labels approximately 40 characters wide, starting in D10.

   The number of rows in the specified range is inconsequential. 1-2-3 uses as many consecutive cells in the first column of the range as are needed to hold the entire set of copied keystrokes.

   CAUTION Make sure the range you specify is blank or contains dispensable data because 1-2-3 writes over existing data when it copies record buffer keystrokes to the worksheet.

Example

In this example, you use RECORD to create a macro that totals a column of numbers and enters the total below the column, as shown in Figure 4-4. (In Figure 4-4, the worksheet's global format is Comma, 0 decimal places.)

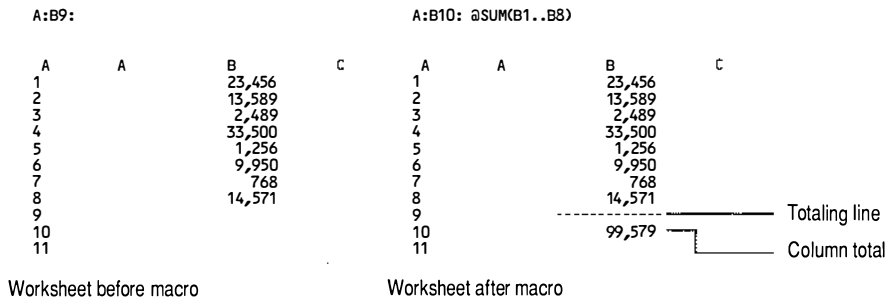


Figure 4-4. *The worksheet before and after totaling a column of numbers*

1. Position the cell pointer in the cell immediately below a column of numbers. In the example, the cell pointer is in cell A:B9.
2. Press RECORD and select Erase to clear the record buffer.
3. Total the column of numbers as follows:
   - Type \ – and press ENTER to enter a dashed line across the current cell.
   - Press ↓ to move to the next cell.
   - Type @SUM(to start the @SUM formula.
   - Press ↑ ↑ to move the cell pointer to the last number in the column, press . (period) to anchor the cell pointer, and press END ↑ to expand the highlight to the first number in the column.
   - Type) to end the @SUM formula, and press ENTER.
4. Press RECORD and select Copy.

   1-2-3 prompts you for the keystrokes to copy and displays the current contents of the record buffer in the control panel (Figure 4-5).

```
A:B10: @SUM(B1..B8)                                                    EDIT
Press TAB to anchor cursor, then highlight keystrokes to copy:
\  {D}@SUM(A:B8..A:B1)
```

Figure 4-5. *Control panel after selecting Copy from the Record menu*

5. Notice that although you used the pointer-movement keys to specify the range of numbers to total, 1-2-3 recorded the range address in the @SUM formula. To make this macro useful for adding any column of numbers, you need to replace the address with pointer-movement keystrokes:
   - Change @SUM(A:B8..A:B1) to @SUM({UP 2}.{END}{UP}) as shown in Figure 4-6.

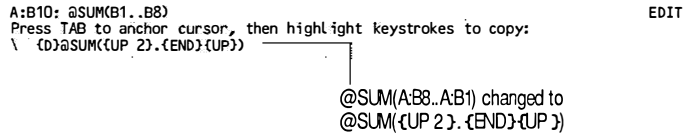


Figure 4-6. *Edited keystrokes in record buffer*

6. Having edited the @SUM formula, select the keystrokes to copy:
   - Press **END** to move the cursor to the end of the buffer and then press **TAB** to anchor the cursor.
   - Press **HOME** to highlight the keystrokes to copy.
   - Press **ENTER** to complete the keystroke selection.
7. Specify the range that will hold the copied keystrokes. In this example, the range is A:D11..A:E11.

1-2-3 copies the contents of the record buffer to the worksheet, starting in the first cell of the specified range. In this example, the record buffer keystrokes fit within the combined width of columns D and E (30 characters), so 1-2-3 copies them all to A:D11 (Figure 4-7).

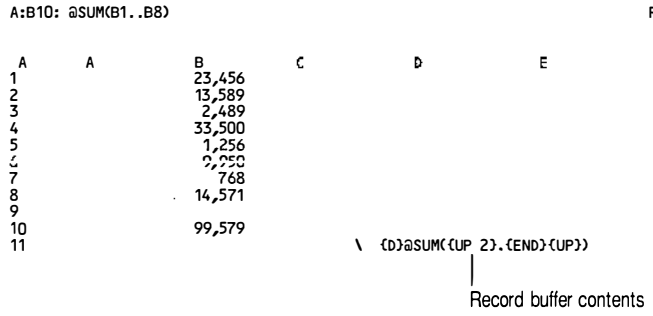


Figure 4-7. *Record buffer contents copied to the worksheet*

Playing Back Keystrokes with the Record Feature

Use this procedure to perform a repetitive task, such as changing global settings for a series of worksheets or copying data in one range to several other ranges.

1. Move the cell pointer to the cell where you will start the task.
2. Press RECORD and select Erase.

   This step clears the record buffer of its current keystrokes to simplify step 6.
3. Perform the task or series of tasks you want to repeat.
4. If necessary, move the cell pointer to the location where you will repeat the task. For example, if you changed several global settings in one worksheet and want to change them in another worksheet, move the cell pointer to the other worksheet.
5. Press RECORD and select Playback.

   1-2-3 displays the contents of the record buffer in the control panel and enters EDIT mode.
6. Select the keystrokes to play back: move the cursor to the beginning or end of the keystrokes you want to repeat and press TAB to anchor the cursor. Then use the pointer-movement keys to highlight the keystrokes, and press ENTER.

NOTE Before or after you anchor the cursor, you can edit the keystrokes in the record buffer the same way you edit the data in a cell. For example, suppose you copied data to S32 and now want to copy the data to G85. To do so, change S32 to G85 in the record buffer.

As soon as you press ENTER, 1-2-3 repeats the highlighted keystrokes.

Example

In this example, you use /Copy to copy A1..B5 to one location and then use RECORD to copy A1..B5 to a second location. When you have completed the example, your worksheet will look like Figure 4-8.

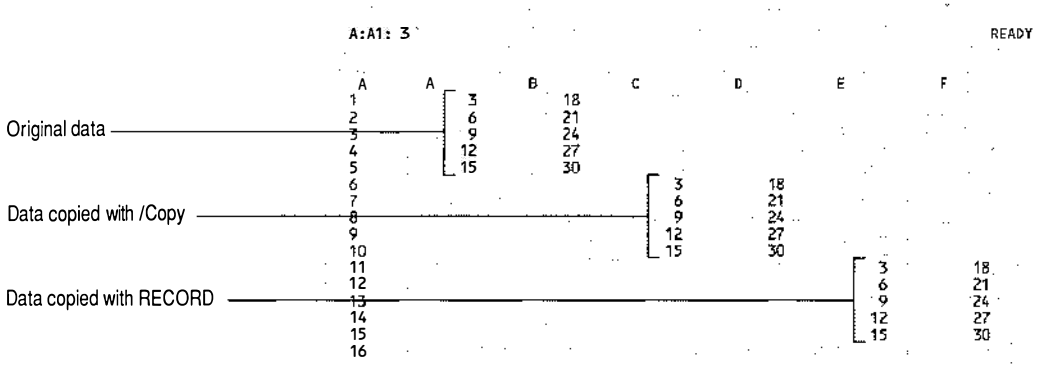


Figure 4-8. *Data copied with /Copy and* RECORD

To begin the example, start with a blank worksheet and enter some data in A1..B5. Then complete the following steps:

1. Move the cell pointer to A1.
2. Press RECORD and select Erase.
3. Copy A1..B5 to C6..D10:
   - Select /Copy.
   - Specify the FROM range by typing a1..b5 and pressing ENTER.

NOTE Be sure to type the FROM range address rather than highlighting the range. If you highlight the range, 1-2-3 records the cell-pointer movements rather than the range address; the FROM range specification depends on the cell-pointer location when you play back the recorded keystrokes.

- Specify the TO range by typing c6 and pressing ENTER.

4. Press RECORD and select Playback.

   1-2-3 prompts you for the keystrokes to play back and displays the current contents of the record buffer in the control panel (Figure 4-9).

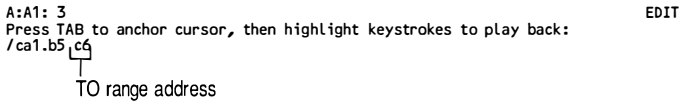


Figure 4-9. *Control panel after selecting Playback from the Record menu*

5. Change the TO range address in the record buffer from c6 to e11, as shown in Figure 4-10.

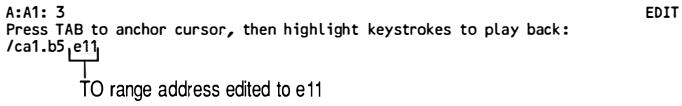


Figure 4-10. *Control panel after editing TO range address*

6. Select the keystrokes to play back:
   - Press HOME to move the cursor to the beginning of the record buffer and then press TAB to anchor the cursor.
   - Press END to highlight the keystrokes to play back.
   - Press ENTER to complete the selection.

1-2-3 repeats the /Copy command, this time copying A1..B5 to E11..F15.

Advanced Macro Commands

An **advanced macro command** is a macro instruction that tells 1-2-3 to perform a built-in programming function. For example, the advanced macro command {LET} tells 1-2-3 to enter a label or number in a cell. The advanced macro command {BRANCH} tells 1-2-3 to go to another location for further macro instructions. The advanced macro command {BEEP} tells 1-2-3 to sound the terminal's bell.

This section deals with advanced macro commands and contains the following information:

- A list of advanced macro commands by types
- Guidelines for writing advanced macro commands
- Detailed descriptions of the advanced macro commands, including examples that illustrate their use in macros

This section also includes information on the /X commands, macro commands originally included in 1-2-3 Release 1A. You can use the /X commands in more recent versions of 1-2-3, although each one has a corresponding advanced macro command.

You will be able to use the information in this section most effectively if you have some programming experience or at least some familiarity with programming concepts (conditional processing, subroutines, and **`for`** loops, for example). See the *Glossary* for definitions of terms used in this section.

Types of Advanced Macro Commands

Advanced macro commands can be grouped in five command categories: data manipulation, file manipulation, flow-of-control, interactive, and screen control. These are described below.

- Data-manipulation commands enter data, edit existing entries, erase entries, and recalculate formulas.
- File-manipulation commands work with text files. **Text files,** also called print files or ASCII files, are files on disk in the ASCII or ISO Latin-1 formats. You can use the file-manipulation commands to create a new text file, copy data from a text file to a worksheet, or copy data from a worksheet to a text file.

- Flow-of-control commands direct the path of macro execution so you can create a macro that includes branches, subroutine calls, "for loops", and conditional processing.
- Interactive commands suspend macro execution for keyboard input, control the timing of macro execution, and prevent undesired changes to a worksheet file while a macro is running.

  NOTE Interactive commands require user input. This makes them inappropriate for batch applications in 1-2-3.

- Screen-control commands control different parts of the screen display, change the contents of the mode indicator, and sound the terminal's bell.

The following tables list the advanced macro commands by category and briefly describe each command. For a more complete description of the commands and examples of how they work, see the next two sections, "Syntax of Advanced Macro Commands" and "Advanced Macro Command Descriptions."

Data manipulation	*Explanation*
{APPENDBELOW}	Copies data in one range to the bottom of another range, automatically extending the second range to include the copied data.
{APPENDRIGHT}	Copies data in one range to the right of another range, automatically extending the second range to include the copied data.
{BLANK}	Erases a cell or range.
{CE}	Clears the current data from the edit line when 1-2-3 is in EDIT mode.
{CONTENTS}	Copies the contents of one cell to another cell as a label. Usually used to store a numeric value as a string so you can use it in a string formula.
{LET}	Enters a label or number in a cell.
{PUT}	Enters a label or number in a range.

(continued)

Data manipulation	*Explanation*
{RECALC}	Recalculates formulas in a range row by row.
{RECALCCOL}	Recalculates formulas in a range column by column.
File manipulation	*Explanation*
{CLOSE}	Closes the open text file.
{FILESIZE}	Records in a cell the number of bytes in the open text file.
{GETPOS}	Records in a cell the location in the open text file at which data is read from or written to.
{OPEN}	Opens a new or existing text file so you can work with that text file using the other file-manipulation commands.
{READ}	Copies a series of bytes from the open text file to a cell.
{READLN}	Copies an entire line from the open text file to a cell.
{SETPOS}	Changes the location in the open text file at which data is read from or written to.
{WRITE}	Writes a string to the open text file.
{WRITELN}	Writes a string to the open text file and adds an end-of-line sequence.
Flow-of-control	*Explanation*
{*subroutine*}	Performs a subroutine call: executes the subroutine at the specified location before continuing down the current column of instructions.
{BRANCH}	Performs a branch: transfers macro control from the current column of macro instructions to another location.
{DEFINE}	Evaluates and stores information that you pass to a subroutine in a {*subroutine*} command.
{DISPATCH}	Performs an indirect branch by directing 1-2-3 to a cell that contains the name or address of the branch location.
{FOR}	Creates a "for loop": repeats a subroutine a specified number of times.

(continued)

Flow-of-control	*Explanation*
{FORBREAK}	Cancels a "for loop".
{IF}	Sets up a condition that 1-2-3 evaluates to determine whether to continue with the macro instructions that follow {IF} in the same cell or to go directly to the instructions in the next cell.
{ONERROR}	Performs a branch if an error occurs while a macro is running, so macro execution continues instead of ending at the error.
{QUIT}	Ends a macro, returning keyboard control to the user.
{RESTART}	Used in subroutines. Keeps 1-2-3 from returning to the location from which the subroutine call was issued after completing the instructions in a subroutine.
{RETURN}	Used in subroutines. If a {*subroutine*} command called the subroutine, {RETURN} ends the subroutine immediately and returns macro control to the instruction following the {*subroutine*} command. If a {FOR} command called the subroutine, {RETURN} ends the current repetition immediately and starts the next repetition.
{SYSTEM}	Temporarily suspends the 1-2-3 session and passes a command to the UNIX shell interpreter. When the shell command is completed, the 1-2-3 session automatically resumes and continues the macro.
Interactive	*Explanation*
{?}	Suspends macro execution to let you move the cell pointer or enter data.
{BREAKOFF}	Disables BREAK while a macro is running, protecting the macro from interruption.
{BREAKON}	Restores use of BREAK, reversing {BREAKOFF}.

(continued)

Interactive	*Explanation*
{FORM}	Suspends macro execution so you can enter data in a specified range. Similar to /Range Input, but gives you more control over the allowable keystrokes.
{GET}	Suspends macro execution until you press a key, then records that key in a cell.
{GETLABEL}	Displays a prompt in the control panel, waits for a response to the prompt, and enters the response as a label in a cell.
{GETNUMBER}	Displays a prompt in the control panel, waits for a response to the prompt, and enters the response as a number in a cell.
{LOOK}	Checks the typeahead buffer (the buffer in which 1-2-3 stores keystrokes during noninteractive parts of a macro) and records the first keystroke in the buffer (if any) in a cell.
{MENUBRANCH}	Displays a customized menu in the control panel, waits for you to select a menu item, then branches to the macro instructions associated with that menu item.
{MENUCALL}	Displays a customized menu in the control panel, waits for you to select a menu item, and then executes the macro instructions associated with that menu item as a subroutine. (In other words, after completing those instructions, returns to the location from which the {MENUCALL} command was issued, and continues the macro there.)
{WAIT}	Suspends macro execution until a specified time.
Screen control	*Explanation*
{BEEP}	Sounds the terminal's bell.
{BREAK}	During data entry or selection of a 1-2-3 command, returns 1-2-3 to READY mode.
{FRAMEOFF}	Turns off display of the worksheet frame (worksheet letter, column letters, and row numbers).

(continued)

Screen control	*Explanation*
{FRAMEON}	Restores display of the worksheet frame, reversing {FRAMEOFF}.
{GRAPHOFF}	Removes a graph displayed by {GRAPHON} and redisplays the worksheet.
{GRAPHON}	Without suspending macro execution, creates a full-screen view of the current graph or makes a named graph the current graph (with or without displaying the graph).
{INDICATE}	Changes the mode indicator in the upper right corner of the screen.
{PANELOFF}	Freezes the control panel either in its current state or after clearing it.
{PANELON}	Unfreezes the control panel, reversing {PANELOFF}.
{WINDOWSOFF}	Freezes the worksheet area of the screen.
{WINDOWSON}	Unfreezes the worksheet area of the screen, undoing {WINDOWSOFF}.

Syntax of Advanced Macro Commands

Each advanced macro command has a specific structure or syntax. Unless you follow this syntax exactly, 1-2-3 cannot interpret the command. Figure 4-11 shows the syntax of advanced macro commands.

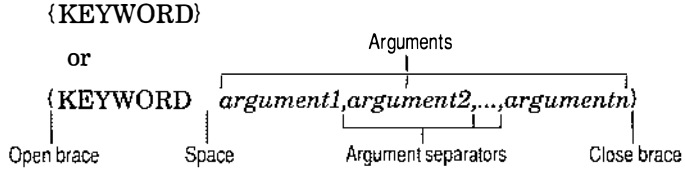


Figure 4-11. *Syntax of advanced macro commands*

- The first word in an advanced macro command is the keyword. The **keyword** is the verb in the command — it tells 1-2-3 what action to perform. The words inside braces in the "Types of Advanced Macro Commands" tables are the advanced macro command keywords.
- Most advanced macro commands also include one or more arguments. **Arguments** supply the information 1-2-3 needs to complete the command. For example, in the {LET} command {LET TOTAL,@SUM(EXPENSES)}, the first argument, TOTAL, tells 1-2-3 where to enter the data (in cell TOTAL), and the second argument, @SUM(EXPENSES), tells 1-2-3 what data to enter (the result of the @SUM formula).

Arguments

Advanced macro commands use four types of information as arguments: numbers, strings, locations (cells or ranges), and conditions (usually logical formulas). These are described below.

- For **number arguments,** you can use a number, a numeric formula (including an @function), or the range name or address of a cell that contains a number or numeric formula.
- For **string arguments,** you can use a **literal string** (any sequence of letters, numbers, and symbols enclosed in quotation marks), a string formula (including an @function), or the range name or address of a cell that contains a label or string formula.

  NOTE Every literal string used as a string argument should be enclosed in quotation marks. This prevents 1-2-3 from interpreting the literal string as a number, formula, address, or range name. It also prevents 1-2-3 from interpreting commas, semicolons, or periods within the literal string as argument separators, or colons within the literal string as argument-type specifiers (see "Declaring Argument Types" in the {DEFINE} command later in this chapter).

- For **location arguments,** you can use a range name, address, or any formula (including an @function) that evaluates to a range name or address.

- For **condition arguments**, you typically use a **logical formula** (a formula that uses one of the logical operators (< > = <> >= <= #NOT# #AND# and #OR#) or the range name or address of a cell that contains a logical formula. However, 1-2-3 also accepts other things as condition arguments, as stated in the descriptions of the advanced macro commands that use these arguments.

Basic Rules of Syntax

To include an advanced macro command in a macro, follow these guidelines:

- Start and end the advanced macro command in the same cell.
- Start the command with { (open brace) and end it with } (close brace).
- Immediately after the open brace, type the keyword. You can type it in uppercase or lowercase letters.
- If the command includes arguments, separate the keyword from the first argument with one space.
- If the command includes two or more arguments, separate the arguments from one another with argument separators. Initially, semicolons and commas are the valid argument separators for advanced macro commands, but you can use /Worksheet Global Default Other International Punctuation to set semicolons only or semicolons and periods as the valid argument separators.
- If the command has several optional arguments and you skip one of them but include a subsequent one, enter an argument separator as a place holder for the skipped argument. For example, if you skip the optional *width* argument in a {CONTENTS} command but include the optional *cell-format* argument, use the following syntax: {CONTENTS *target,source,,cell-format*}. The extra comma between the *source* and *cell-format* arguments is a place holder for the missing *width* argument.

- The only space in the command syntax occurs between the keyword and the first argument. Do not include any other spaces in the command, unless they are part of an argument (for example, the prompt in a {GETLABEL} command can include spaces between the words in the prompt). If the command takes no arguments, the command should include no spaces.
- You can include any combination of advanced macro commands and keystroke instructions in the same cell as long as the total number of characters does not exceed 512.

Advanced Macro Command Descriptions

This section lists the advanced macro commands alphabetically by keyword. The {*subroutine*} command is listed first because it does not have a standard keyword.

Brief descriptions of the /X commands follow the descriptions of the advanced macro commands. The /X commands are also listed alphabetically.

Conventions for the Descriptions

As you read through the advanced macro command descriptions, keep in mind the following conventions:

- Advanced macro command keywords, @functions, cell addresses, and range names appear in uppercase letters, but they need not be entered that way. 1-2-3 is not case-sensitive for these elements of advanced macro commands.
- [ ] (brackets) around an argument mean the argument is optional. For example, {BEEP [*tone-number*]} means the {BEEP} command works even if you don't specify a tone number. {PANELOFF [clear]} means you can use either {PANELOFF} or {PANELOFF clear} as a command.
- When an argument is italicized, it means you must substitute something else when you write the command. For example, {BRANCH *location*} means you must include an actual location in the command. When an argument is not italicized, you must include that exact word as the argument in the command. For example, {PANELOFF [clear]} means you must type the command as {PANELOFF clear}.

- Following the description of each advanced macro command is one or more examples that illustrate the use of that command. The examples include several lines of macro instructions (indented) followed by an explanation of the instructions. In some instances a range name (such as \A or LOOP) precedes a line of macro instructions to identify a particular component of the example.
- Some of the command examples use ... (ellipses) to indicate omission of macro instructions preceding or following the instruction(s) in the example.

{subroutine}

{*subroutine* [*arg1*],[*arg2*],...[*argn*]} performs a subroutine call. A **subroutine** is a discrete unit of macro instructions. A **subroutine call** causes 1-2-3 to complete the instructions in the specified subroutine before continuing down the current column of macro instructions.

When 1-2-3 encounters a {subroutine} command, it does the following:

1. Shifts macro control from the current column of macro instructions to the specified subroutine. (*subroutine* is the range name or address of the subroutine's starting cell.)
2. Passes any included arguments to the {DEFINE} command in the subroutine for evaluation and storage (see {DEFINE}).
3. Executes the instructions in the subroutine.
4. When it reaches a {RETURN} command or a blank or numeric cell in the subroutine, returns to the original macro location and continues the macro at the instruction immediately following the {*subroutine*} command.

The {*subroutine*} command corresponds to the /XC command (see "The /X Commands" later in this section).

NOTE Although you can use a cell address as the *subroutine* argument, you should use a range name. That way, if you move the subroutine, the {*subroutine*} command will still work correctly. You can assign any range name to a subroutine. However, do not assign a 1-2-3 function key name (such as CALC or END) to a subroutine. 1-2-3 always performs a keystroke, never a subroutine call, when it encounters a 1-2-3 function key name in braces.

You can include up to 31 optional arguments (*arg1, arg2,...argn*) in the {*subroutine*} command as information for the subroutine to use. These arguments can be anything: numbers, labels, formulas, or cell references. If you do include optional arguments, you must include a {DEFINE} command in the subroutine you are calling. {DEFINE} evaluates and stores the arguments so they can be used in the subroutine. See {DEFINE} for further information on {*subroutine*} command arguments.

Examples

NOTE These examples illustrate {*subroutine*} commands without arguments. See {DEFINE} for examples of {*subroutine*} commands that include arguments.

```
{GOTO}ONE~{SUBR1}
{GOTO}TWO~{SUBR1}
{GOTO}THREE~{SUBR1}
{GOTO}MESSAGE_CELL~
All done! ~
```

Executes subroutine SUBR1 three times in three different cells. After the third time, 1-2-3 enters the message "All done!" in cell MESSAGE_CELL.

```
{SUBR1}{SUBR2}{SUBR3}{QUIT}
```

Executes three subroutines in succession. When 1-2-3 completes SUBR3, the macro ends.

```
{IF AGE<21}{MINOR}{QUIT}
{MAJOR}...
```

If the value of cell AGE is less than 21, 1-2-3 executes subroutine MINOR, then ends the macro. If the value of cell AGE is greater than or equal to 21, 1-2-3 executes subroutine MAJOR, then continues with any further macro instructions.

Creating a Subroutine Stack

If 1-2-3 encounters a subroutine call while executing a subroutine, it immediately performs the second subroutine before completing the instructions in the first subroutine. Putting subroutine calls within other subroutines is called **nesting** subroutines, or creating a **subroutine stack.** To clear a subroutine stack, use {RESTART}.

{?}

{?} suspends macro execution to let you move the cell pointer or menu pointer, complete part of a command, or enter data for the macro to process. When you press ENTER, the macro continues.

NOTE Pressing ENTER to end the {?} command only tells 1-2-3 to continue the macro. To have 1-2-3 enter what you typed while macro execution was suspended, follow the {?} command with a ~ (tilde).

Examples

```
'/rfc2~{?}~
...
```

Selects /Range Format Currency 2 decimal places and then pauses to let you specify the range to format. When you press ENTER, 1-2-3 formats the specified range as Currency, 2 decimal places and continues the macro.

```
'/ppoh{?}~
...
```

Selects /Print Printer Options Header and pauses to let you specify a page header. When you press ENTER, 1-2-3 enters the specified header and continues the macro.

```
{GOTO}ERR_MSG~
{?}
```

Moves the cell pointer to cell ERR_MSG, which contains an error message, and pauses to let you read the message. When you press ENTER, the macro continues.

{APPENDBELOW}

{APPENDBELOW *target-location,source-location*} copies the contents of *source-location* to the rows immediately below *target-location* (Figure 4-12). In addition, it expands any defined ranges that begin or end in the last row of *target-location* to include the rows that contain the appended data. Use {APPENDBELOW) in conjunction with /Range Input or {FORM} to transfer records from an entry form to a database table.

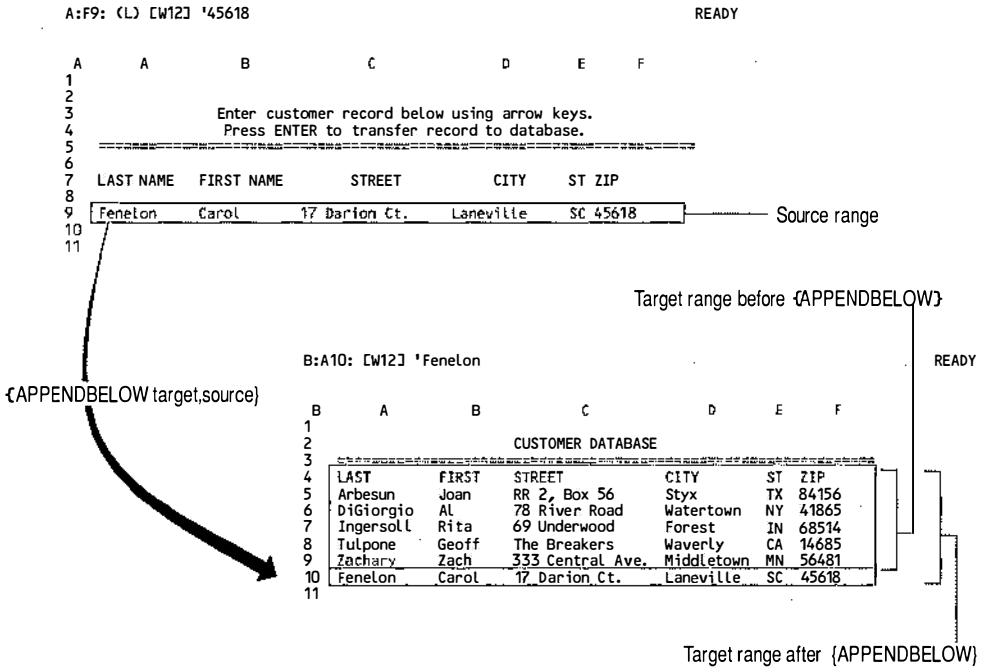


Figure 4-12. ***{APPENDBELOW} copies one range to the bottom of another***

source-location and *target-location* can be ranges of any size. However, in the following situations {APPENDBELOW} fails, and the macro ends with an error:

- When the number of rows in *source-location* exceeds the number of rows in the worksheet below *target-location*
- When appending *source-location* to *target-location* would write over data

When *source-location* contains formulas, {APPENDBELOW} copies the current values of the formulas to *target-location*, not the formulas themselves.

Example

```
{FORM CUSTFORM}
{APPENDBELOW CUSTDB,NEWCUST}
```

Suspends macro execution to let you enter new customer information in an unprotected range named NEWCUST in an entry form named CUSTFORM. Then appends the

information in NEWCUST to the customer database table named CUSTDB and expands CUSTDB to include the new record.

{APPENDRIGHT}

{APPENDRIGHT *target-location,source-location*} copies the contents of *source-location* to the columns immediately to the right of *target-location*. In addition, it expands any defined ranges that begin or end in the rightmost column of *target-location* to include the columns that contain the appended data. Use {APPENDRIGHT} to add a new field to a database table or a column of data to a spreadsheet application.

source-location and *target-location* can be ranges of any size. However, in the following situations {APPENDRIGHT} fails and the macro ends with an error:

- When the number of columns in *source-location* exceeds the number of columns in the worksheet to the right of *target-location*
- When appending *source-location* to *target-location* would write over data

When *source-location* contains formulas, {APPENDRIGHT} copies the current values of the formulas to *target-location*, not the formulas themselves.

Example

```
{APPENDRIGHT MONTHTOTALS,JULTOTALS}
```

In a sales record-keeping system, copies the July sales totals (range JULTOTALS) to the right edge of the monthly sales totals range (MONTHTOTALS), and expands the range address of MONTHTOTALS to include the appended totals.

{BEEP}

{BEEP [*tone-number*]} sounds the terminal's bell if your terminal has a bell and it is enabled. Use {BEEP} to signal the end of a macro or of a waiting period within a macro (see {WAIT}), to alert a user to an on-screen message, or to signal the beginning of an interactive command.

The optional *tone-number* argument (1, 2, 3, or 4) specifies the tone of the bell. If you use a number other than 1, 2, 3, or 4 for *tone-number*, 1-2-3 interprets the number modulo 4 (divides it by 4 and uses the remainder). For example, {BEEP 7} is equivalent to {BEEP 3}. {BEEP} without an argument is equivalent to {BEEP 1}.

Examples

```
{BEEP}{BEEP 4}
{?}
```

Sounds the bell twice, using two different tones, to draw your attention to the subsequent interactive command.

```
{GOTO}ERR_MSG~
{BEEP TONE}
```

Sounds the bell to alert you to the information displayed in cell ERR_MSG. The tone of the bell depends on the value in cell TONE.

```
...
{BEEP 3}{BEEP 3}{BEEP 3}{QUIT}
```

Sounds the bell three times to signal the end of a macro.

NOTE {BEEP} does not produce a tone when the terminal bell is turned off with /Worksheet Global Default Other Beep No.

NOTE Some terminals and workstations may not support multiple tones. If your terminal supports only one tone, a macro command like {BEEP 3}{BEEP2}{BEEP} will simply sound the bell in its one tone three times.

{BLANK}

{BLANK *location*} erases the contents of *location*. *location* can be a cell or a range. {BLANK} does not change the cell format of the cells in *location*.

Examples

```
{BLANK DATARANGE}
```

Erases the contents of range DATARANGE.

```
{BLANK @CELLPOINTER("coord")}
/rfr~
```

Erases the current cell and then resets the cell to the worksheet's global cell format.

{BRANCH}

{BRANCH *location*} transfers macro control from the current column of macro instructions to *location* for further macro instructions. Use {BRANCH} in conjunction with {IF} to implement "if-then-else" processing — that is, to have a macro do different things depending on the current data. You can also use {BRANCH} to create an **infinite loop** (a series of macro instructions that repeats indefinitely, which only BREAK can

interrupt). {BRANCH} corresponds to the /XG command (see "The /X Commands" later in this section).

You can specify a cell or a range as *location*. If you specify a range, 1-2-3 branches to the first cell in the range.

NOTE {BRANCH} produces different results from {*subroutine*}. {*subroutine*} (a subroutine call) executes the specified subroutine and then returns control to the original column of macro instructions. {BRANCH}, on the other hand, transfers macro control to the new location permanently. Control does not return to the original column of macro instructions when 1-2-3 completes the instructions in the branch location.

Also, note the difference between {BRANCH} and {GOTO} in a macro. {GOTO} moves the cell pointer to another cell. {BRANCH} transfers macro control to another location.

Examples

```
{IF HEIGHT>100}{BRANCH TALL}
{BRANCH SHORT}
```

Transfers macro control to location TALL or SHORT, depending on whether the value in cell HEIGHT is greater than 100.

```
{BRANCH @CELLPOINTER("coord")}
```

If the macro is in the current file, transfers macro control to the current cell. If the macro is in a different file, transfers macro control to the cell in that file that corresponds to the current cell.

```
\A          {?}{DOWN}
            {BRANCH \A}
```

Creates an infinite loop for data entry. Enters the data you supply during the {?} command in subsequent cells down a column until you press BREAK to end the macro.

{BREAK}

When data is being entered or edited, or during selection of a 1-2-3 command, {BREAK} clears the current data, menu, or prompt from the control panel and returns 1-2-3 to READY mode. In any other situation, {BREAK} has no effect.

Example

```
\H              {BREAK}{GOTO}HELP_SCREEN~
```

Macro \H displays a range named HELP_SCREEN, which contains information on how to use the current application. The {BREAK} command at the beginning of the macro ensures that the macro will work even if a user runs it while entering data or selecting a 1-2-3 command.

{BREAKOFF} and {BREAKON}

{BREAKOFF} disables **BREAK** while a macro is running. Normally, you can stop a macro at any time by pressing **BREAK**. While {BREAKOFF} is in effect, however, you cannot use **BREAK** to stop the macro.

{BREAKON} restores use of **BREAK**, undoing a {BREAKOFF} command.

You can use {BREAKOFF} to prevent users from stopping a macro to alter data or look at restricted data.

{BREAKOFF} stays in effect until canceled with {BREAKON} or until the macro ends.

CAUTION Add {BREAKOFF} commands to a macro only after you have thoroughly tested the macro. If {BREAKOFF} is in effect and the macro goes into an infinite loop, the only way to stop the macro is to close the workstation terminal window or to end your terminal session.

Example

In the following example, assume subroutine PAYROLL_INPUT opens a payroll file, pauses for a user to enter new data, then saves the file and deletes it from memory.

```
{BREAKOFF}
{PAYROLL_INPUT}
{BREAKON}
...
```

Disables **BREAK** before starting the PAYROLL_INPUT subroutine, thereby preventing a user from stopping the macro with the payroll file open to gain access to proprietary information. When the PAYROLL_INPUT subroutine ends, restores use of **BREAK**.

{CE}

{CE} clears the current data from the edit line when 1-2-3 is in EDIT mode, that is, during a command that prompts you for information or after you press **EDIT** to edit an entry. {CE} works similarly to {ESC}, but with the following differences:

- While you sometimes need more than one {ESC} instruction to clear all prompted data from the edit line during a command, one {CE} instruction clears the edit line of all data.
- When the edit line contains no data, an {ESC} instruction returns 1-2-3 to the previous command level or to READY mode. In the same situation, a {CE} instruction keeps 1-2-3 in EDIT mode.

Example

As an example of how {CE} works, assume directory **/usr/apps/new_sheets** is your current file directory, so 1-2-3 automatically searches that directory whenever you select /File Retrieve. To have 1-2-3 search directory **/net/bingo/usr/** sheets for the file to retrieve, you could use the following macro:

```
/fr{CE}
/net/bingo/usr/sheets~
```

NOTE 1-2-3 uses {CE} in the record buffer to indicate any editing of a default file specification or string. Suppose you press EDIT to change the entry QUARTER 3 to QTR_3. Regardless of what keys you use to edit the entry (← → BACKSPACE, DEL, and so on), 1-2-3 records the task as {EDIT}{CE}QTR_3~.

{CLOSE}

{CLOSE} closes the open text file if one is open. After executing a {CLOSE} command, 1-2-3 goes directly to the next cell in the macro. Any macro instructions that follow the {CLOSE} command in the same cell are never executed.

NOTE If a text file is already open when 1-2-3 executes an {OPEN} command, 1-2-3 automatically closes the currently open file before opening the new one — you do not need a {CLOSE} command before the {OPEN} command. However, 1-2-3 does not automatically close a text file that is open when a macro ends. To close the last-opened text file in a macro, you must use a {CLOSE} command.

Examples

```
{OPEN STOCKS.PRN,A}
{WRITELN +"Volume for "&TODAYS_DATE&": "&VOLUME}
{CLOSE}
{QUIT}
```

Opens a text file named STOCKS.PRN with append access, adds a line to the file reporting the day's volume for a stock, and closes the file before the end of the macro. Without the {CLOSE} command, STOCKS.PRN would remain open at the end of the macro, so in a subsequent macro you could continue processing STOCKS.PRN without using an {OPEN} command.)

{CONTENTS}

{CONTENTS *target-location,source-location,*[*width*],[*cell-format*]} copies the contents of *source-location* to *target-location* as a label. Use {CONTENTS} to store a numeric value as a string so you can use it in a string formula.

For both *source-location* and *target-location*, you can specify either a cell or a range. If you specify a range, 1-2-3 uses the first cell of the range.

If you include the optional *width* argument, 1-2-3 creates a label of the specified width. If you include the optional *cell-format* argument, 1-2-3 creates a label or value with the specified format.

width can be a number, numeric formula, or reference to a cell that contains a number or numeric formula whose absolute value is from 1 to 240.

cell-format must be one of the code numbers from the following table, a formula that evaluates to a code number, or a reference to a cell that contains a code number. For a description of each cell format, see /Range Format in Chapter 2.

Code number	*Correspoinding cell format*
0 to 15	Fixed, 0 to 15 decimal places
16 to 31	Scientific, 0 to 15 decimal places
32 to 47	Currency, 0 to 15 decimal places
48 to 63	Percent, 0 to 15 decimal places
64 to 79	Comma, 0 to 15 decimal places
112	+/–
113	General
114	D1 (DD-MMM-YY)
115	D2 (DD-MMM)

(continued)

Code number	*Correspoinding cell format*
116	D3 (MMM-YY)
117	Text
118	Hidden
119	D6 (HH:MM:SS AM/PM)
120	D7 (HH:MM AM/PM)
121	D4 (Long Intn'l)
122	D5 (Short Intn'l)
123	D8 (Long Intn'l)
124	D9 (Short Intn'l)
127	Worksheet's global cell format (specified with /Worksheet Global Format)

You can include a *cell-format* argument without a *width* argument. To do so, use this syntax:

{CONTENTS *target-location*,*source-location*,,*cell-format*}

The extra argument separator between the *source-location* and *cell-format* arguments tells 1-2-3 you skipped the *width* argument. See the final example below.

If you do not include the optional *width* and *cell-format* arguments, the label 1-2-3 creates in *target-location* has the same width and format as *source-location*.

Although {CONTENTS} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {CONTENTS} command when worksheet recalculation is set to Automatic. To force a recalculation after a {CONTENTS} command, follow the command with ~ (tilde) or {CALC}.

Examples

In the examples that follow, assume cell INCOME contains the formula +GROSS-EXP, which evaluates to 167.24. Cell INCOME is formatted as Currency, 2 decimal places, and its column width is 9.

```
{CONTENTS REPORT,INCOME}
+"Today we earned"&REPORT~
```

Enters the 9-character label "$167.24" in cell REPORT, then creates the sentence **Today we earned $167.24** and enters it in the current cell.

```
{CONTENTS REPORT,INCOME,11,117}
+"The formula we use to calculate earnings is:
"&REPORT~
```

Enters the label **+GROSS-EXP** in REPORT (because 117 formats the cell as Text), then creates the sentence **The formula we use to calculate earnings is: +GROSS-EXP** and enters it in the current cell.

```
{CONTENTS REPORT,INCOME,3,113}
```

Places the 3-character label *** in REPORT because the specified width is not wide enough to display the number 167.24 in General format.

```
{CONTENTS REPORT,INCOME,,113}
```

Places the 9-character label **164.24** in REPORT.

Although {CONTENTS} is used primarily to convert numeric values to labels, you can also use it to create a shorter or longer version of an existing label. For example, assume cell NAME contains the label **Martin Piper.**

{CONTENTS ABBR,NAME,8} puts the label **Martin P** in cell ABBR (assuming ABBR is at least 8 characters wide). {CONTENTS NAME,NAME,15} replaces **Martin Piper** with **Martin Piper** in cell NAME (assuming NAME is at least 15 characters wide).

NOTE The number of decimal places calculated for the *cell-format* in a given cell is dependent upon the precision of your system's floating point emulation. A typical Intel 80386 PC can support only 15-digit precision under UNIX so no cell will contain more than 15 calculated digits.

{DEFINE}

{DEFINE *location1,location2,...locationn*} stores arguments passed to a subroutine in a {*subroutine*} command so those arguments can be used later in the subroutine. You must include a {DEFINE} command in any subroutine to which you pass arguments, and the {DEFINE} command must come before the point in the subroutine where the arguments are used.

Each *location* argument in a {DEFINE} command specifies the storage location for one argument in a {*subroutine*} command. Therefore, the {DEFINE} command must have the same number of arguments as the {*subroutine*} command. Otherwise, when 1-2-3 reaches the {DEFINE} command, the macro terminates with an error.

For each *location* argument, you can specify either a cell or a range. If you specify a range, 1-2-3 uses the first cell of the range as the storage location.

Although {DEFINE} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {DEFINE} command when worksheet recalculation is set to Automatic. To force a recalculation after a {DEFINE} command, follow the command with ~ (tilde) or {CALC}.

Declaring Argument Types

You can add one of two suffixes — :string or :value (or an abbreviation of string or value, as long as the first letter is s or v, respectively) — to each *location* argument in a {DEFINE} command. The suffix tells 1-2-3 how to process the corresponding argument in the {*subroutine*} command. Omitting the suffix is equivalent to specifying :string.

The :string suffix tells 1-2-3 to store the argument as a left-aligned label, even if the argument looks like a number, formula, or cell or range reference.

The :value suffix tells 1-2-3 to evaluate the argument before storing it. If the argument is a number, 1-2-3 stores it as a number. If the argument is a formula, 1-2-3 evaluates the formula and stores the result either as a left-aligned label (for a string formula) or a number (for a numeric formula). If the argument is a cell address or range name, 1-2-3 evaluates the contents of the referenced cell and stores the result as a label or number.

Examples

```
\A          {SUBR1 @TODAY,+"Closing"&"
            Price:",CLOSING}
...


SUBR1       {DEFINE ONE,TWO,THREE}
            {LET @CELLPOINTER("coord"),ONE{R}
            {LET @CELLPOINTER("coord"),TWO}{R}
            {LET @CELLPOINTER("coord"),THREE}
```

The {*subroutine*} command in macro \A passes three arguments to SUBR1. The {DEFINE} command at the beginning of SUBR1 stores the label @TODAY in cell ONE, the label **+"Closing"&" Price:"** in cell TWO, and the label CLOSING in cell THREE. The {LET} commands then enter those labels in three consecutive cells.

```
\A          {SUBR1 @TODAY,+"Closing"&" Price:",
            CLOSING}
...
SUBR1       {DEFINE ONE:V,TWO:V,THREE:V}
            /rfd2~{LET @CELLPOINTER("coord"),
            ONE}{R}
            /wcs14~{LET @CELLPOINTER("coord"),
            TWO}{R}
            /rfc2~~{LET @CELLPOINTER("coord"),
            THREE}
```

The {*subroutine*} command in macro \A passes three arguments to SUBR1. The {DEFINE} command at the beginning of SUBR1 evaluates all three arguments before storing them. Thus, it stores the value of the first argument, today's date, as a number in cell ONE; the value of the second argument, the string Closing Price:, as a label in cell TWO; and the value of the third argument, the contents of cell CLOSING (presumably, the closing stock price), as a number in cell THREE.

The macro then formats the current cell as Date 2 and enters in that cell the number stored in cell ONE; moves right one cell, sets the cell's column width to 14, and enters in the cell the label stored in cell TWO; and again moves right one cell, formats the cell as Currency, 2 decimal places, and enters in the cell the number stored in cell THREE.

{DISPATCH}

{DISPATCH *location*} performs an indirect branch by transferring macro control to the cell whose name or address is entered in *location*. Use {DISPATCH} to have 1-2-3 branch to one of several possible macro routines, depending on the contents of *location* when 1-2-3 executes the {DISPATCH} command. See the example.

location must be a single cell. If *location* is a multiple-cell range, 1-2-3 branches to *location* instead of to the cell whose name or address is entered in the first cell of *location*.

Example

```
...
{IF YOURS>MINE}{LET SWITCH,"YOU_OWE"}
{IF YOURS<MINE}{LET SWITCH,"I_OWE"}
{IF YOURS=MINE}{LET SWITCH,"NEITHER_OWES"}
{DISPATCH SWITCH}
```

This excerpt from a macro includes a series of {IF} commands that determine which range name (YOU_OWE, I_OWE, or NEITHER_OWES) 1-2-3 enters in cell SWITCH. When 1-2-3 gets to the {DISPATCH} command, it transfers macro control to the routine whose range name is in SWITCH.

{FILESIZE}

{FILESIZE *location*} enters a number in *location*. This number reports the number of bytes in the open text file. After executing a {FILESIZE} command, 1-2-3 goes directly to the next cell in the macro, skipping any further instructions in the same cell as the {FILESIZE} command.

You can specify a cell or a range as *location*. If you specify a range, 1-2-3 enters the number in the first cell of the range.

NOTE You must open a text file with {OPEN} before using {FILESIZE}. If no text file is open, 1-2-3 ignores a {FILESIZE} command and continues to the next macro instruction in the same cell.

Although {FILESIZE} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {FILESIZE} command when worksheet recalculation is set to Automatic. To force a recalculation after a {FILESIZE} command, start the next line in the macro with ~ (tilde) or {CALC}.

Example

```
{FILESIZE BYTES}{BRANCH NO_OPEN_FILE}
{READ BYTES,FILECONTENTS}
```

If a text file is open, 1-2-3 enters in cell BYTES the number of bytes in the text file and then, with the {READ} command, copies the contents of the text file into cell FILECONTENTS. If a text file is not open, 1-2-3 branches to cell NO_OPEN_FILE for further instructions.

{FOR}

{FOR *counter,start-number,stop-number,step-number,subroutine*} creates a **for loop** — it repeatedly performs a subroutine call to *subroutine*. The *start*, *stop*, and *step* numbers determine the total number of repetitions, and *counter* keeps a running count of the repetitions.

When 1-2-3 encounters a {FOR} command, it does the following:

1. Enters *start-number* in *counter* (*counter* is a cell in any active worksheet.)
2. Compares the number in *counter* with *stop-number*. If the number in *counter* is less than or equal to *stop-number*, performs a subroutine call to *subroutine* and goes to step 3.

   If the number in *counter* is greater than *stop-number*, does not perform a subroutine call to *subroutine*. Instead, returns to the location of the {FOR} command and continues the macro at the instruction following {FOR}.
3. Increases the number in *counter* by *step-number* and returns to step 2.

Although {FOR} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {FOR} command when worksheet recalculation is set to Automatic. To force a recalculation after a {FOR} command, start the subroutine called by the {FOR} command with ~ (tilde) or {CALC}.

Examples

```
{FOR REP_NUM,1,10,1,FORMAT}
```

Repeats subroutine FORMAT 10 times, keeping track of the repetitions in a cell named REP_NUM.

```
{FOR REP_NUM,1,10,2.5,FORMAT}
```

Repeats subroutine FORMAT four times.

```
{FOR REP_NUM,10,1,-2,FORMAT}
```

Repeats subroutine FORMAT five times.

```
{FOR REP_NUM,1,10,0,FORMAT}
```

Repeats subroutine FORMAT indefinitely because the step number is 0 so the value of REP_NUM never reaches the stop number.

```
{FOR REP_NUM,10,1,2,FORMAT}
```

Never performs subroutine FORMAT because the start number (10) is larger than the stop number (1), and the step number (2) is positive.

NOTE 1-2-3 stores the start, stop, and step values internally. You cannot have the subroutine modify these values once it starts.

{FORBREAK}

{FORBREAK} ends a for loop created by a {FOR} command. Macro execution continues at the instruction immediately following the {FOR} command.

CAUTION Use {FORBREAK} only within a for loop. Using {FORBREAK} anywhere else causes the macro to terminate with an error.

Examples

```
\A          {BLANK ROSTER}
            {GOTO}ROSTER~
            {FOR I,1,10,1,ENTRY}
            ...

ENTRY       {GETLABEL"Enter name: ",
            @CELLPOINTER("coord")}
            {IF @CELLPOINTER("contents")=""}{FORBREAK}
            {DOWN}
```

The {FOR} command in macro \A causes 1-2-3 to repeat subroutine ENTRY up to 10 times to let you enter names in a roster. If you press ENTER at the {GETLABEL} command instead of typing a name, the {FORBREAK} command terminates the for loop and 1-2-3 continues immediately to the instructions following the {FOR} command.

```
...
{IF @ISERR(TOTAL)}{FORBREAK}
{IF TOTAL>500}{RETURN}
...
```

In this excerpt from a for loop, {FORBREAK} is used as one of three alternatives. If cell TOTAL contains the value ERR, 1-2-3 ends the subroutine immediately. If cell TOTAL contains a value greater than 500, 1-2-3 begins the next repetition of the for loop without completing the current repetition (see the {RETURN} command). Otherwise, 1-2-3 continues executing the current repetition of the for loop.

{FORM}

{FORM *input-location*,[*call-table*],[*include-list*],[*exclude-list*]} suspends macro execution temporarily so you can enter and edit data in the unprotected cells in *input-location*. {FORM} works similarly to /Range Input, but the three optional arguments (*call-table*, *include-list*, and *exclude-list*) give you more control over user input than /Range Input allows.

For *input-location*, you can specify a range of any size, but the range must include at least one cell you have unprotected with /Range Unprot and it cannot include any hidden columns or worksheets.

call-table is a two-column range. Each cell in the first column contains the macro name of a keyboard or 1-2-3 function key. Each adjacent cell in the second column contains a set of macro instructions that 1-2-3 performs when you press the key listed in the first column.

include-list is a range containing a list of allowable keystrokes. *exclude-list* is a range containing a list of keystrokes to ignore.

You can use any of the optional arguments without using the ones that precede it, as follows:

- To use an include list but not a call table, use this syntax: {FORM *input-location*,,*include-list*} (two argument separators between the *input-location* and *include-list* arguments).
- To use an exclude list but not an include list, use this syntax: {FORM *input-location*,*call-table*,,*exclude-list*} (two argument separators between the *call-table* and *exclude-list* arguments).
- To use an exclude list but not a call table or include list, use this syntax: {FORM *input-location*,,,*exclude-list*} (three argument separators between the *input-location* and *exclude-list* arguments).

When 1-2-3 encounters a {FORM} command in a macro, it moves the cell pointer to the first unprotected cell in *input-location*, suspends macro execution, and waits for you to press a key. What happens when you press a key depends on whether the {FORM} command uses the optional arguments.

- If the {FORM} command does not use optional arguments, 1-2-3 processes keystrokes exactly the same way it does during a /Range Input command. You can press any keyboard key and any of the following pointer-movement and function keys: **ENTER**, **ESC**, **HELP**, **EDIT**, **HOME**, **END**, ↑ ↓ → and ←, while typing or editing an entry, **BACKSPACE** and (if the entry is a value) **CALC**. If *input-location* is a three-dimensional range, you can also use **NEXT SHEET** and **PREV SHEET**. If you are typing or editing a formula, you can use **ABS** and **NAME**.

  When you end the {FORM} command (by pressing either **ENTER** or **ESC** when the mode indicator displays READY), 1-2-3 continues the macro, leaving the cell pointer wherever it was when you pressed **ENTER** or **ESC**.

- If the {FORM} command includes one or more optional arguments, 1-2-3 proceeds as follows:

  1. If the {FORM} command uses a *call-table* argument, 1-2-3 checks the first column of the call table. If the keystroke is listed, 1-2-3 executes the instructions in the second column as a subroutine, then returns to the {FORM} command and waits for you to press another key.

  NOTE Including {ESC} or ~ (tilde) in a *call-table* subroutine at a point in the subroutine when the mode indicator displays READY lets you move the cell pointer out of *input-range*'s unprotected area and use all 1-2-3 keys for their standard functions for the rest of the subroutine. When the *call-table* subroutine ends, 1-2-3 moves the cell pointer back to wherever it was when the *call-table* subroutine started (unless the cell pointer is within *input-range*'s unprotected area when the subroutine ends, in which case 1-2-3 leaves the cell pointer where it is) and reinstates use of 1-2-3 keys as defined by the {FORM} command.

  To end a macro from within a *call-table* subroutine, use {RESTART} or {QUIT} in the subroutine. To end a {FORM} command from within a *call-table* subroutine but continue the macro, use {RESTART} (to leave the {FORM} command) and then {BRANCH} (to transfer macro control to wherever the macro continues). See the example below.

2. If the keystroke is not in the call table and the {FORM} command uses an *include-list* argument, 1-2-3 checks the include list. If the keystroke appears in the include list, 1-2-3 performs the keystroke. Otherwise, 1-2-3 ignores the keystroke.

   The include list can include any keyboard key or any of the pointer-movement and function keys listed above.

NOTE If you use an include list, be sure to include ~ (tilde) and {ESC} in the list so you can use ENTER or ESC to end the {FORM} command.

3. If there is no *include-list* argument and the {FORM} command uses an *exclude-list* argument, 1-2-3 checks the exclude list. If the keystroke appears in the exclude list, 1-2-3 ignores the keystroke. Otherwise, 1-2-3 performs the keystroke.

NOTE When you use an include list, 1-2-3 ignores an *exclude-list* argument.

Call tables, include lists, and exclude lists are case-sensitive for letters typed at the keyboard. For example, if your include list contains an uppercase B but not a lowercase b, 1-2-3 allows only uppercase B during the {FORM} command; lowercase b is ignored.

Example

The {FORM} command in the following example, which uses a call table and an exclude list, lets you enter inventory orders in a database table using the entry form shown in Figure 4-13.

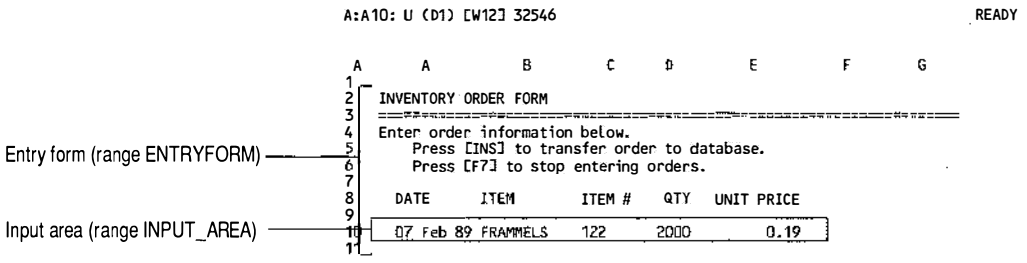


Figure 4-13. *The entry form for the {FORM} command*

The {FORM} command and its call table and exclude list are shown in Figure 4-14. Notice the extra argument separator in the {FORM} command (between SIGKEYS and BADKEYS), which indicates that an include list has not been used.

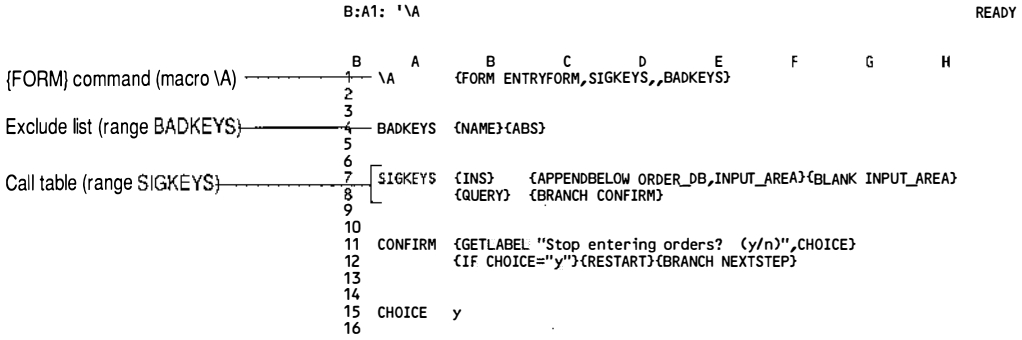


Figure 4-14. *The {FORM} command, call table, and exclude list*

{FORM ENTRYFORM,SIGKEYS,,BADKEYS} stops the macro temporarily so you can enter an order in the entry form. The call table, SIGKEYS (B:B7..B:C8), includes two key names: {INS} and {QUERY}.

- If you press **INS** during the {FORM} command, 1-2-3 appends the data in INPUT_AREA to the order database table (ORDER_DB), erases INPUT_AREA, and returns to the {FORM} command.
- If you press **QUERY** during the {FORM} command, 1-2-3 branches to routine CONFIRM, which uses a {GETLABEL} command to confirm that you want to stop entering orders. If you enter y or Y at the {GETLABEL} prompt, the {RESTART} {BRANCH} sequence ends the {FORM} command and continues the macro at NEXTSTEP. If you enter any other letter, 1-2-3 returns to the {FORM} command.

  The exclude list, BADKEYS (B:B4), contains two key names: {NAME} and {ABS}. If you press **NAME** or **ABS** during the {FORM} command, 1-2-3 ignores the keystroke.

{FRAMEOFF} and {FRAMEON}

{FRAMEOFF} suppresses display of the worksheet frame (worksheet letter, column letters, and row numbers). The worksheet frame remains hidden until 1-2-3 reaches a {FRAMEON} command or the macro ends.

Figure 4-15 shows a screen without the worksheet frame and with a {PANELOFF clear} command in effect.

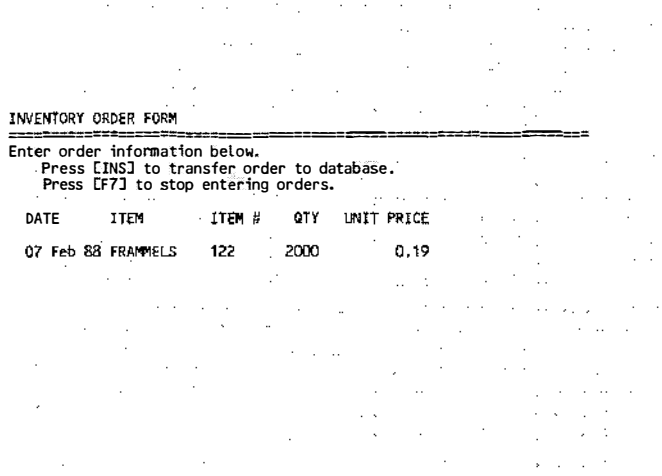


Figure 4-15. *The 1-2-3 screen without the worksheet frame*

{FRAMEON} redisplays the worksheet frame hidden by a {FRAMEOFF} command.

Example

```
{FRAMEOFF}{PANELOFF clear}
{FORM ORDERFORM}
{PANELON}{FRAMEON}
```

Turns off display of the worksheet frame, control panel, and status line during a {FORM} command to avoid distracting the user; then redisplays the worksheet frame, control panel, and status line.

NOTE If a {WINDOWSOFF} command was executed earlier in the macro, be sure to precede {FRAMEOFF} or {FRAMEON} with a {WINDOWSON} command. The effects of {FRAMEOFF} or {FRAMEON} will not be visible until you turn screen redrawing back on.

{GET}

{GET *location*} suspends macro execution until you press a key, and then records your keystroke as a left-aligned label in *location*. You can press any keyboard key or any of the keys listed in the table in "Entering a Macro" earlier in this chapter. See the second NOTE below for cases in which 1-2-3 requires two {GET} commands to record a keystroke.

You can specify a cell or a range as *location*. If you specify a range, 1-2-3 records the keystroke in the first cell in the range.

Although {GET} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {GET} command when worksheet recalculation is set to Automatic. To force a recalculation after a {GET} command, follow the command with ~ (tilde) or {CALC}.

Example

```
\A      {GOTO}EXPENSES~
        {INDICATE "Choose (D)aily or (M)onthly"}
        {GET CHOICE}
        {IF CHOICE="d"}{BRANCH DAYS}
        {IF CHOICE="m"}{BRANCH MONTHS}
        {BEEP}{BRANCH \A}
```

Prompts you to make a choice by typing D or M, and stores your keystroke in cell CHOICE. If the keystroke in CHOICE is D or M, 1-2-3 branches to DAYS or MONTHS, accordingly. If the keystroke is anything else, 1-2-3 beeps and starts the macro again.

NOTE {GET} does not record APP1, APP2, or APP3 keystrokes.

NOTE You must use two {GET} commands to record any of the following keystrokes: FIRST FILE, LAST CELL, LAST FILE, NEXT FILE, and PREV FILE.

{GETLABEL}

{GETLABEL *prompt,location*} displays *prompt* in the control panel and suspends macro execution while you type a response. When you press ENTER, 1-2-3 stores whatever you typed as a left-aligned label in *location* and continues the macro. {GETLABEL} corresponds to the /XL command (see "The /X Commands" later in this section).

You can use any literal string, with as many characters as fit within the control panel edit line, as *prompt*. (The maximum number of characters 1-2-3 displays is a few characters less than the full screen width.) *prompt* can also be the range name

or address of a cell that contains the prompt string, or a string formula that evaluates to the prompt string.

You can specify a cell or a range as *location*. If you specify a range, 1-2-3 stores your response in the first cell of the range.

The response to the prompt can include up to 512 characters. If you press ENTER without typing anything, 1-2-3 enters an apostrophe label prefix in *location*.

NOTE The {GETLABEL} prompt and your response appear in the control panel even after a {PANELOFF} command.

Although {GETLABEL} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {GETLABEL} command when worksheet recalculation is set to Automatic. To force a recalculation after a {GETLABEL} command, follow the command with ~ (tilde) or {CALC}.

Examples

```
{GETLABEL "Type your first name: ",FIRST}
{GETLABEL "Now type your last name: ",LAST}
```

Prompts you for your first name, enters it in cell FIRST, then prompts you for your last name and enters it in cell LAST.

```
{GETLABEL ZIP_PROMPT,ZIP}
```

If ZIP_PROMPT contains a label, 1-2-3 displays the label as the prompt; if ZIP_PROMPT contains a string formula, 1-2-3 displays the result of the formula as the prompt. If ZIP_PROMPT contains a number or numeric formula, 1-2-3 displays the string ZIP_PROMPT as the prompt. Then 1-2-3 enters your response as a label in cell ZIP.

{GETNUMBER}

{GETNUMBER *prompt,location*} displays *prompt* in the control panel and suspends macro execution while you type a response. When you press ENTER, 1-2-3 evaluates your response, stores the resulting number in *location*, and continues the macro. {GETNUMBER} corresponds to the /XN command (see "The /X Commands" later in this section).

You can use any literal string, with as many characters as fit on the control panel edit line, as *prompt*. (The maximum number of characters 1-2-3 displays is a few characters less than the full screen width.) *prompt* can also be the range name or address of a cell that contains the prompt string, or a string formula that evaluates to the prompt string.

You can specify a cell or a range as *location*. If you specify a range, 1-2-3 enters the number in the first cell of the range.

The response to the prompt must be a number, a numeric formula, or a reference to a cell containing a number or numeric formula. The response can include up to 512 characters. If you enter a label, string formula, or reference to a cell containing a label or string formula as the response, 1-2-3 enters ERR in *location*. 1-2-3 also enters ERR if you press ENTER without typing anything.

NOTE The {GETNUMBER} prompt and your response appear in the control panel even after a {PANELOFF} command.

Although {GETNUMBER} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {GETNUMBER} command when worksheet recalculation is set to Automatic. To force a recalculation after a {GETNUMBER} command, follow the command with ~ (tilde) or {CALC}.

Examples

```
{GETNUMBER "Age: ",@CELLPOINTER("coord")}
```

Prompts you for your age, then enters your response in the current cell.

```
{GETNUMBER "How much was it? ",SPENT}
{IF @ISERR(SPENT)}{BRANCH WARNING}
{LET BAL,BAL-SPENT}
```

Stores your response to "How much was it?" in cell SPENT, then checks the contents of SPENT. If SPENT contains ERR (which means you typed a non-numeric response to the prompt), the macro branches to WARNING. If SPENT contains a number, subtracts the number from the current value of BAL and stores the result in BAL.

{GETPOS}

{GETPOS *location*} enters a number in *location*. This number reports the current byte-pointer position (the position at which data is read from or written to) in the open text file. After executing a {GETPOS} command, 1-2-3 goes directly to the next cell in the macro, skipping any further instructions in the same cell as the {GETPOS} command.

You can specify a cell or a range as *location*. If you specify a range, 1-2-3 enters the number in the first cell in the range.

NOTE You must open a text file with the {OPEN} command before using {GETPOS}. If no file is open, 1-2-3 ignores a {GETPOS} command and continues to the next macro instruction in the same cell.

NOTE The first position in a text file is reported as 0, not 1. Thus, if the byte pointer is on the first byte in the file, {GETPOS} enters 0 in *location*; if the byte pointer is on the tenth byte, {GETPOS} enters 9, and so on.

Although {GETPOS} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {GETPOS} command when worksheet recalculation is set to Automatic. To force a recalculation after a {GETPOS} command, start the next line in the macro with ~ (tilde) or {CALC}.

Example

```
{GETPOS POINTER}{BRANCH NO_GO}
...
```

If a text file is open, records the current position of the byte pointer in cell POINTER and goes immediately to the next cell for further instructions. If a text file is not open, branches to location NO_GO.

{GRAPHOFF} and {GRAPHON}

{GRAPHON [*named-graph*],[nodisplay]} displays the current graph or a named graph.

{GRAPHON} has three possible results depending on the syntax you use:

- {GRAPHON} with no arguments displays a full-screen view of the current graph while the macro continues to run. When 1-2-3 reaches one of the following conditions, 1-2-3 removes the graph and redisplays the worksheet:
  - {GRAPHOFF}, {INDICATE}, or {?} command
  - {GRAPHON} command that uses a nodisplay argument
  - A command that displays a prompt or menu in the control panel ({GETLABEL}, {GETNUMBER}, {MENUCALL}, {MENUBRANCH}, /XL, /XM, or /XN)
  - End of the macro

- {GRAPHON *named-graph*} makes *named-graph* the current graph and displays it in a full-screen view while the macro continues to run. When 1-2-3 reaches one of the following condition, it removes *named-graph* from the screen and redisplays the worksheet:
  - {GRAPHOFF}, {INDICATE}, or {?} command
  - {GRAPHON} command that uses the nodisplay argument
  - A command that displays a prompt or menu in the control panel
  - End of the macro
- {GRAPHON *named-graph*,nodisplay} makes *named-graph* the current graph settings without displaying the graph.

{GRAPHOFF} removes a graph displayed by a {GRAPHON} command and redisplays the worksheet.

Examples

```
\A          {GRAPHON}
LOOP        {WAIT @NOW+@TIME(0,0,1)}
            {LOOK KEY}
            {IF KEY=""}{BRANCH LOOP}
            {GRAPHOFF}
            {GET KEY}
            ...
```

Displays the current graph and waits 1 second, then performs a {LOOK} {IF} sequence to determine whether the user pressed a key (as a signal to remove the graph from the screen). If the user did not press a key, waits another second and then repeats the {LOOK} {IF} sequence. If the user pressed a key, removes the graph, clears the user's keystroke from the typeahead buffer, and continues the macro.

```
{GRAPHON LINE}
{WAIT @NOW+@TIME(0,0,2)}
{GRAPHON BAR}
{WAIT @NOW+@TIME(0,0,2)}
{GRAPHON PIE}
{WAIT @NOW+@TIME(0,0,2)}
{GRAPHOFF}
```

Displays three consecutive graphs (LINE, BAR, and PIE) at 2-second intervals and then redisplays the worksheet.

{IF}

{IF *condition*} evaluates *condition* as true or false. If *condition* is true, 1-2-3 continues to the macro instruction immediately following the {IF} command in the same cell. If *condition* is false, 1-2-3 goes immediately to the next cell in the column, skipping any further instructions in the same cell as the {IF} command. The {IF} command corresponds to the /XI command (see "The /X Commands" later in this section).

Typically, *condition* is a logical formula or a reference to a cell that contains a logical formula. However, you can use any formula, number, literal string, or cell reference as *condition*. 1-2-3 evaluates any *condition* that does *not* equal zero as true and any *condition* that does equal zero as false. Blank cells, strings, and ERR and NA values all equal zero when used as *condition*.

NOTE If you use {IF} to implement if-then-else processing in a macro, be sure to include a {BRANCH} or {QUIT} command at the end of the "then" instructions (the instructions that follow the {IF} command in the same cell). This keeps 1-2-3 from continuing to the "else" instructions (the instructions that start in the cell below the {IF} command). See the first example.

Examples

```
{IF DATE>21011#AND#DATE<31968}/rvDATE~~{QUIT}
{BRANCH INVALID_DATE}
```

If the value of cell DATE is between 21011 and 31968 (the date numbers for 10 July 1957 and 10 July 1987, respectively), the macro copies the value of DATE to the current cell and ends. Otherwise the macro continues to the {BRANCH} command in the cell below.

```
{IF TESTVAL}{RTN1}
{RTN2}
```

If cell TESTVAL contains a true logical formula (or any entry that does not evaluate to zero), the macro executes subroutine {RTN1} and subroutine {RTN2}. Otherwise the macro executes only subroutine {RTN2}.

```
\A  {IF @CELLPOINTER("type")="b"}{BRANCH PRINT}
     {MAKE_A_LABEL}
     {DOWN}{BRANCH \A}
```

Creates mailing labels from the records in a database table. First, checks to see whether the current cell is blank. (A blank cell indicates the end of the database table). If so, branches to

the printing routine. If not, calls subroutine MAKE_A_LABEL, which contains the macro instructions for creating a mailing label. Then moves the cell pointer down one cell and repeats macro \A from the beginning.

{IFKEY}

{IFKEY *string*} evaluates whether *string* is the name of one of the 1-2-3 keystroke instructions listed in "Entering a Macro," If *string* is the name of a 1-2-3 keystroke instruction, 1-2-3 continues to the instruction that immediately follows the {IFKEY} instruction. If *string* is not the macro name of a 1-2-3 keystroke instruction, 1-2-3 ignores any further instructions on the line containing the {IFKEY} command and skips to the macro instructions in the cell below.

string can be a string, string formula, or reference to a cell containing a formula or string formula.

Examples

```
{IFKEY PGUP}{BEEP}{BEEP}
{DOWN}
```

Because the string "PGUP" is the name of a 1-2-3 keystroke instruction, 1-2-3 executes the commands on the same line as the {IFKEY} instruction.

```
{IFKEY TEST}{BEEP}{BEEP}
{DOWN}
```

If the cell named TEST contains any of the words or symbols listed in the table "Entering a Macro," 1-2-3 beeps twice and then skips the next cell in the column (the {RIGHT} command). If the cell TEST contains anything else, or if there is no cell named TEST, 1-2-3 ignores the two {BEEP} instructions nd skips down to the next cell containing the {RIGHT} command.

{INDICATE}

{INDICATE [*string*]} displays *string* as the mode indicator. The indicator continues to display *string* until 1-2-3 reaches another {INDICATE} command or until you retrieve another file, select /Worksheet Erase Yes, or end the 1-2-3 session.

For *string* you can use any literal string, with as many characters as fit within the first line of the control panel. You can also use a reference to a cell that contains the indicator string, or a string formula that evaluates to the indicator string. Using an empty string as *string* ({INDICATE ""}) removes the mode indicator from the control panel entirely.

{INDICATE} with no argument restores standard operation of the mode indicator. The indicator displays READY, EDIT, WAIT, LABEL, VALUE, and so on, depending on the current operation.

Examples

```
{INDICATE "Database Maintenance Macro"}
```

Displays Database Maintenance Macro in the mode indicator, whose width expands to 26 characters.

```
{INDICATE "1"}
```

Displays 1 in the mode indicator, whose width shrinks to one character.

```
{INDICATE MSG }
```

Displays the contents of cell MSG in the mode indicator.

```
{INDICATE}
```

Restores standard operation of the mode indicator. The indicator displays READY, EDIT, WAIT, LABEL, VALUE, and so on, depending on the current operation.

{LET}

{LET *location,entry*} enters a number or left-aligned label in *location*.

You can specify a cell or a range as *location*. If you specify a range, 1-2-3 enters the number or label in the first cell of the range. *entry* can be a number, literal string, formula, or reference to a cell that contains a number, label, or formula. If you use a formula for *entry*, 1-2-3 evaluates the formula and enters the result in *location*. {LET} does not enter formulas.

Although {LET} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {LET} command when worksheet recalculation is set to Automatic. To force a recalculation after a {LET} command, follow the command with ~ (tilde) or {CALC}.

Examples

```
{LET QTR_2,1.5*QTR_1}
```

If a cell named QTR_1 exists, enters the result of 1.5 times the value of cell QTR_1 in cell QTR_2. Otherwise, enters 1.5*QTR_1 as a label in cell QTR_2.

```
{LET QTR_2,"1.5*QTR_1"}
```

Enters 1.5*QTR_1 as a label in cell QTR_2.

```
{LET CUSTOMER,+"Ms. "&LASTNAME}
```

If a cell named LASTNAME exists, enters the result of the string formula `+"Ms. "&LASTNAME` in cell CUSTOMER. Otherwise, enters `+"Ms. "&LASTNAME` as a label in cell CUSTOMER.

NOTE You can add a :string or :value suffix to *entry* to tell 1-2-3 explicitly whether to treat the argument as a literal string (enter the argument verbatim) or to evaluate the argument before entering it. See "Declaring Argument Types" in {DEFINE}.

```
{LET QTR_2,1.5*QTR_1:s}
```

Enters 1.5*QTR_1 as a label in cell QTR_2 even if a cell named QTR_1 exists and contains a number. The `:s` suffix tells 1-2-3 the argument is a literal string, not a formula.

```
{LET CUSTOMER,+"Ms. "&LASTNAME:v}
```

If a cell named LASTNAME exists, enters the result of the string formula `+"Ms. "&LASTNAME` in cell CUSTOMER. Otherwise, the macro ends with an error message.

{LOOK}

{LOOK *location*} checks the typeahead buffer for keystrokes, and records the first keystroke (if any) in *location* as a left-aligned label. If the buffer is empty, 1-2-3 enters an apostrophe label prefix in *location*.

The **typeahead buffer** is the place 1-2-3 stores keystrokes you make during noninteractive parts of a macro. It contains all the keystrokes you made since the last interactive command (if there was one) or since the macro began. 1-2-3 uses the contents of the typeahead buffer in the next {?}, {FORM}, {GET}, {GETLABEL}, or {GETNUMBER} command.

You can specify a cell or a range as *location*. If you specify a range, 1-2-3 records the keystroke in the first cell of the range.

Although {LOOK} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {LOOK} command when worksheet recalculation is set to Automatic. To force a recalculation after a {LOOK} command, follow the command with ~ (tilde) or {CALC}.

Examples

```
\A          Enter your name after the message
            {WAIT @NOW+@TIME(0,0,2)}{ESC}
            {LET ENDTIME,@NOW+@TIME(0,0,5)}
LOOP        {LOOK IN_CHAR}
            {IF IN_CHAR<>""}{BRANCH NEXT_STEP}
            {IF @NOW<ENDTIME}{BRANCH LOOP}
            {BEEP}You took too long!
            {WAIT@NOW+@TIME(0,0,2)}{ESC}{QUIT}
```

Displays an instruction in the control panel for two seconds, then gives you five seconds to start typing after it clears the instruction. During those five seconds, 1-2-3 constantly checks the typeahead buffer to see if you typed anything. If you did, 1-2-3 goes on to the macro instructions that start at cell NEXT_STEP. If you did not type anything within five seconds, 1-2-3 beeps and displays: **You took too long!** and ends the macro.

NOTE {LOOK} does not record APP1, APP2 and APP3 keystrokes.

NOTE 1-2-3 does not remove a keystroke it records with {LOOK} from the typeahead buffer, so a subsequent {LOOK} command will record the same keystroke. To remove the first keystroke from the typeahead buffer, follow the {LOOK} command with a {GET} command. For example, the sequence {LOOK LOC1}{GET LOC2}{LOOK LOC2} records the first keystroke in the typeahead buffer in cell LOC1, removes that keystroke from the typeahead buffer, and records the next keystroke in the typeahead buffer in cell LOC2.

CAUTION The {LOOK} command is highly dependent upon the keyboard characteristics of your terminal, workstation, or PC terminal emulation package. {LOOK} does not perform uniformly across a network supporting heterogeneous hardware. If the terminals and workstations running 1-2-3 are on a heavily loaded network, the {LOOK} command may be delayed in finding characters in the typeahead buffer.

{MENUBRANCH} and {MENUCALL}

{MENUBRANCH *location*} displays in the control panel the macro menu that starts in the first cell of *location*, waits for you to select an item from the menu, and then branches to the macro instructions associated with the menu item you select. {MENUBRANCH} corresponds to the /XM command (see "The /X Commands" later in this section).

{MENUCALL *location*} displays in the control panel the macro menu found at *location*, waits for you to select an item from the menu, and then performs a subroutine call to the macro instructions associated with the menu item you select.

A **macro menu** is a menu you set up for use during a macro (the setup procedure is described below). Macro menus work just like 1-2-3 menus — when the menu is activated, the menu items appear in the second line of the control panel and the description of the highlighted menu item appears in the third line of the control panel. You select a menu item either by moving the menu pointer to the item and pressing ENTER or by pressing the first character of the item's name. A macro menu can include up to eight items. Figure 4-16 shows a macro menu in a range named FILE_CHOICE; the macro menu is part of macro \M. Figure 4-17 shows the control panel when the menu is activated with the command {MENUBRANCH FILE_CHOICE} in macro \M.

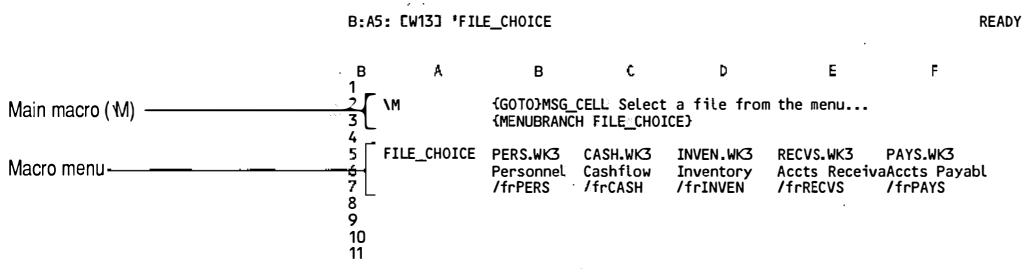


Figure 4-16. *A macro menu in a range*

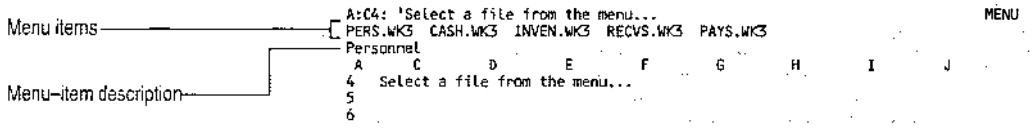


Figure 4-17. *The activated macro menu*

Creating a Macro Menu

1. Decide on a location for the macro menu. The menu need not be in the same file as the macro that uses it, but the file it is in must be active when you run the macro that uses it. (If you do put the menu in a different file from the macro that uses it, remember to include a file reference in the {MENUBRANCH} or {MENUCALL} *location* argument.)

2. Enter up to eight menu items in consecutive cells in the first row of the menu location. Leave the cell after the final menu item blank.

   You can enter labels, numbers, or formulas as the menu items. (If you enter a formula, 1-2-3 displays the formula's result as the menu item.)

   Make sure each menu item starts with a different letter or number so you can select an item by pressing the first character. If two or more menu items have the same first character, 1-2-3 selects the first item (reading from left to right) when you press that character.

   Also, try to make each menu item a single word. If you use multiple-word items, connect the words with a - (hyphen), for example, First-Quarter. Otherwise, a user might think the words are separate menu items.

   Each menu item can include up to 512 characters. However, if the total characters in all the menu items, plus the spaces on either side of each item, exceed the screen width, 1-2-3 displays as many of the menu items as possible and uses an arrow at the end of the menu line to indicate that more items are off to the right. Also, if the number of characters in any single menu item exceeds the screen width, 1-2-3 truncates the item when displaying the menu.

3. Enter the description for each menu item in the cell directly below the menu item. You can enter labels, numbers, or formulas as menu-item descriptions.

   A menu-item description can include up to 512 characters. However, you should limit the description to the screen width because 1-2-3 truncates descriptions whose length exceeds the screen width.

4. Immediately below the menu-item descriptions (that is, starting in the third row of the macro menu range), enter the macro instructions that 1-2-3 performs if you select that menu item. Or, enter a {BRANCH} or {*subroutine*} command that directs 1-2-3 to a set of macro instructions.

5. Use /Range Name Create to assign a range name to the first cell of the macro menu.

After you select an item from a macro menu that {MENUBRANCH} activated, macro control branches to the associated macro instructions in the third line of the macro menu. Because this is a branch, macro control does not return to the original macro location when 1-2-3 completes the macro menu instructions.

After you select an item from a macro menu that {MENUCALL} activated, 1-2-3 performs the associated macro instructions as a subroutine; macro control returns to the original macro location when 1-2-3 completes the instructions.

NOTE Pressing ESC when a macro menu appears in the control panel cancels the {MENUBRANCH} or {MENUCALL} command that activated the menu. Macro control returns to the location from which the {MENUBRANCH} or {MENUCALL} command was issued, and the macro continues at the instruction that follows the {MENUBRANCH} or {MENUCALL} command.

A macro menu appears in the control panel even after a {PANELOFF} command.

Examples

```
{MENUBRANCH MACROMENU}
{BEEP}
```

Displays the macro menu that starts in cell MACROMENU. When you select one of the menu items, 1-2-3 branches to the macro instructions associated with that item. 1-2-3 performs

the {BEEP} command only if you press ESC instead of selecting a menu item.

```
{MENUCALL MACROMENU}
/fs~r
{QUIT}
```

Displays the macro menu that starts in cell MACROMENU. When you select one of the menu items, 1-2-3 performs a subroutine call to the macro instructions associated with that menu item. When it completes those instructions, 1-2-3 saves the revised file, and then the macro ends. If you press ESC instead of selecting a menu item, 1-2-3 saves the file and the macro ends.

{ONERROR}

{ONERROR *branch-location*,[*message-location*]} traps and handles errors that occur while a macro is running.

Normally, when an error occurs while a macro is running, 1-2-3 displays an error message and, except for background errors, changes the mode indicator to ERROR and ends the macro. However, if an {ONERROR} command is in effect when the error occurs, 1-2-3 returns to READY mode and branches to *branch-location* for further macro instructions. If the {ONERROR} command includes the optional *message-location* argument, 1-2-3 records the error message in *message-location* (in most cases, excluding the ' — press HELP' portion of the message).

For both *branch-location* and *message-location* you can specify either a cell or a range. If you specify a range, 1-2-3 goes to the first cell in the range.

Here are some additional points about {ONERROR}:

- An {ONERROR} command remains in effect until an error occurs (each {ONERROR} command can handle only one error), a subsequent {ONERROR} command supersedes it, or the macro ends. Use {ONERROR} at any point in a macro where an error is possible.
- {ONERROR} traps all types of errors except macro syntax errors (typing errors in macro instructions that prevent 1-2-3 from interpreting the instructions). When 1-2-3 encounters a macro syntax error, it ends the macro and displays an error message that describes the error.

- {ONERROR} clears the subroutine stack. This means that if the error occurs in a subroutine, 1-2-3 does not return to the location from which the subroutine call was issued after completing the instructions in the {ONERROR} *branch-location*.
- When you are using {ONERROR} to trap an error other than the one that results from pressing **BREAK**, you may want to precede the {ONERROR} command with {BREAKOFF}.
- Although {ONERROR} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing an {ONERROR} command when worksheet recalculation is set to Automatic. To force a recalculation after an {ONERROR} command, follow the command with ~ (tilde) or {CALC}.

Example

```
\A          {ONERROR FILEERR,ERRMSG}
            {GETLABEL "File to retrieve: ",FNAME}
            /fr{FNAME}~

FNAME       file name from {GETLABEL} command
            {RETURN}

FILEERR     {BEEP}{GOTO}ERRMSG~
            {GETLABEL "Try again? (Y/N)",KEY}
            {IF KEY="Y"}{BRANCH \A}
            {QUIT}
```

Macro \A prompts you for a file name and enters the name in cell FNAME. It then attempts to retrieve the file whose name you specified (using a subroutine call to cell FNAME). If an error occurs during file retrieval, 1-2-3 enters the associated error message in cell ERRMSG and branches to location FILEERR, which contains a routine that causes 1-2-3 to beep, display the contents of ERRMSG, and let you attempt another file retrieval.

{OPEN}

{OPEN *file-name,access-type*} opens a text file for read-only processing or for read-and-write processing, depending on the type of access you specify. You must open a file with {OPEN} before you can use any of the other file-manipulation commands.

NOTE Only one text file can be open at a time. If a text file is open when 1-2-3 performs an {OPEN} command, 1-2-3 automatically closes that text file before opening the new one.

If 1-2-3 succeeds in opening the specified file, it goes directly to the next cell in the macro, skipping any further instructions in the same cell as the {OPEN} command. If 1-2-3 does not succeed in opening the file (that is, the {OPEN} command fails), it continues to the next macro instruction in the same cell.

file-name is the full name of a text file, or a reference to a cell that contains a text file name. Unless the text file is in the current directory, you must specify the path as part of *file-name* and enclose the argument in quotation marks.

In UNIX file mode, 1-2-3 does not automatically add a file extension to the file name you specify. In DOS-mode, 1-2-3 adds a .PRN or .prn extension automatically. All of the following are examples of valid *file-name* specifications:

```
PASTDUE
PASTDUE.PRN
"PASTDUE.PRN"
"/usr/worksheets/pastdue.prn"
```

access-type is one of the four characters r, w, m, or a (in uppercase or lowercase), or a reference to a cell that contains one of those characters. The character specifies the type of access you have to the file once it is opened:

- r (read access) opens an existing file for reading only, placing the byte pointer at the beginning of the file. You can use {READ} and {READLN} but not {WRITE} and {WRITELN} with a file opened with read access. If you try to open a new file with read access, the {OPEN} command will fail.
- w (write access) opens a new file for reading and writing. You can use {READ}, {READLN}, {WRITE}, and {WRITELN} with a file opened with write access.

  CAUTION If you open an existing file with write access, 1-2-3 erases the current contents of the file when it opens the file. To open an existing file for writing and retain the existing file contents, use modify or append access.

- m (modify access) opens an existing file for reading and writing, placing the byte pointer at the beginning of the file. You can use {READ}, {READLN}, {WRITE}, and {WRITELN} with a file opened with modify access. If you try to open a new file with modify access, the {OPEN} command will fail.

- a (append access) opens an existing file for reading and writing, placing the byte pointer at the end of the file. You can use {READ}, {READLN}, {WRITE}, and {WRITELN} with a file opened with append access. If you try to open a new file with append access, the {OPEN} command will fail.

NOTE When opening a new file (a file that does not yet exist in the specified directory), you must use write access only.

NOTE If a text file is open when a macro ends, 1-2-3 does not automatically close the text file. You must include a {CLOSE} command in the macro to close the file.

Examples

```
{OPEN "/usr/wk/accounts/DUE.PRN",w}{BRANCH PLANB}
{WRITELN FULLNAME}
{CLOSE}{QUIT}
```

Opens a new text file named DUE.PRN in directory **/usr/wk/accounts**, enters the contents of cell FULLNAME as the first line of the file, closes the file, and the macro ends. If directory **/usr/wk/accounts** does not exist, 1-2-3 branches to PLANB for further instructions.

```
{OPEN "/usr/wk/accounts/DUE.PRN",a}{BRANCH PLANB}
{WRITE FULLNAME}
{CLOSE}{QUIT}
```

If a file named DUE.PRN exists in directory **/usr/wk/accounts**, 1-2-3 opens the file, adds the contents of cell FULLNAME to the end of the file, closes the file, and the macro ends. If a file named DUE.PRN does not exist in the **/usr/wk/accounts** directory, 1-2-3 branches to PLANB for further instructions.

```
{OPEN DUE.PRN,r}{BRANCH PLANB}
{READLN FULLNAME}
{CLOSE}{QUIT}
```

If a file named DUE.PRN exists in the current directory, 1-2-3 opens the file with read access, enters the first line of the file in cell FULLNAME, closes the file, and the macro ends. If a file named DUE.PRN does not exist in the current directory, 1-2-3 branches to PLANB for further instructions.

```
{OPEN DUE.PRN,m}{BRANCH PLANB}
{WRITE "Hello"}
{CLOSE}{QUIT}
```

If a file named DUE.PRN exists in the current file directory, 1-2-3 opens the file, writes over the first five bytes in the file with the string Hello, closes the file, and the macro ends. If a file named DUE.PRN does not exist in the current directory, 1-2-3 branches to PLANB for further instructions.

{PANELOFF} and {PANELON}

{PANELOFF [clear]} freezes the control panel and status line until 1-2-3 encounters a {PANELON} command or the macro ends. If you include the optional clear argument, 1-2-3 clears the control panel and status line (except the SST indicator in the status line when a macro is running in STEP mode) before freezing them. Use {PANELOFF} in interactive macros to suppress activity in the control panel and status line that might be distracting to users.

{PANELON} unfreezes the control panel and status line.

NOTE {PANELOFF} suppresses control-panel activity that results only from keystroke instructions. The advanced macro commands and /X commands that cause changes in the control panel — {MENUBRANCH}, {MENUCALL}, {GETLABEL}, {GETNUMBER}, {INDICATE}, /XL, /XM, and /XN — override a {PANELOFF} condition.

Example

```
{PANELOFF}
{GOTO}DATA_RANGE~
/reDATA_RANGE~
{PANELON}
```

Freezes the control panel so you do not see the series of prompts and menus that normally appear during the GOTO and /Range Erase commands.

{PUT}

{PUT *location,column-offset,row-offset,entry*} enters a number or left-aligned label in a cell within *location*. {PUT} is a variant of {LET}. In a {LET} command, you specify the target cell by its name or address. In a {PUT} command, you identify the target cell by its row-and-column position within a range.

location can be a two-dimensional range of any size, as long as it contains the cell in which you are entering data.

column-offset and *row-offset* are numbers that identify the column and row position of the data-entry cell within *location*. The first column and row of the range have the offset number 0, the second column and row have the offset number 1, the third column and row have the offset number 2, and so on. If the data-entry cell is in the third column and fifth row of *location*, for example, *column-offset,row-offset* is 2,4.

entry can be a number, literal string, formula, or reference to a cell that contains a number, label, or formula. If *entry* is a string formula, precede it with a + (plus sign).

Although {PUT} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {PUT} command when worksheet recalculation is set to Automatic. To force a recalculation after a {PUT} command, follow the command with ~ (tilde) or {CALC}.

Examples

In the following examples, assume range COSTS occupies the range A:A1..A:D5 in the current file.

```
{PUT COSTS,3,2,45}
```

Places the number 45 in cell A:D3.

```
{PUT COSTS,2,0,MONTH}
```

Copies the contents of cell MONTH to cell A:C1. If cell MONTH contains a formula, copies the current value of the formula to cell A:C1.

```
{PUT COSTS,0,8,500}
```

Results in an error. Range COSTS has only five rows, so a row-offset number of 8 is invalid.

{QUIT}

{QUIT} ends a macro immediately, returning keyboard control to the user. Any instructions that follow a {QUIT} command in a macro are never executed. {QUIT} corresponds to the /XQ command (see "The /X Commands" later in this section).

NOTE Even if you use {QUIT} in a subroutine, the command ends the entire macro, not just the subroutine.

Examples

```
{IF YEAR=1999}{QUIT}
...
```

If cell YEAR has the value 1999, the macro ends. Otherwise, 1-2-3 continues to the next cell for further macro instructions.

```
{IF YEAR<1999}{BRANCH EARLIER}
{QUIT}
```

If cell YEAR has a value less than 1999, 1-2-3 goes to cell EARLIER for further macro instructions. Otherwise, the macro ends.

{READ}

{READ *byte-count,location*} starts at the current byte-pointer position in the open text file, copies the specified number of bytes (*byte-count*) to *location*, and advances the byte pointer *byte-count* bytes. After executing a {READ} command, 1-2-3 goes directly to the next cell in the macro, skipping any further instructions in the same cell as the {READ} command.

byte-count can be a number, numeric formula, or reference to a cell that contains a number or numeric formula whose value is from 0 to 511. If the value of *byte-count* is greater than the number of bytes remaining in the file, 1-2-3 copies all of the remaining bytes to *location*. Using a negative number or a number greater than 511 as *byte-count* is equivalent to using 511.

You can specify a cell or range as *location*. If you specify a range, 1-2-3 enters the data in the first cell of the range.

NOTE You must open a text file with {OPEN} before you use {READ}. If a text file is not open, 1-2-3 ignores a {READ} command and continues to the instruction immediately following the {READ} command.

{READ} copies the line-feed character at the end of text lines. If you do not want to copy the line-feed character, use {READLN}.

Although {READ} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {READ} command when worksheet recalculation is set to Automatic. To force a recalculation after a {READ} command, start the next line in the macro with ~ (tilde) or {CALC}.

Examples

Assume the open text file contains these two lines:

```
Total Sales
for the Year Ending 1988
```

and the byte pointer is on the T in Total (position 0).

```
{READ 8,CHARS}
```

Enters the left-aligned label Total Sa (the first 8 bytes in the file) in cell CHARS and advances the byte pointer to position 8 (the l in Sales).

```
{READ 15,CHARS}
```

Enters in cell CHARS a 15-character, left-aligned label that starts with the T in Total and ends with the r in for, and advances the byte pointer to the space after the r in for. The 12th character in the label represents the line-feed character at the end of the first line.

{READLN}

{READLN *location*} starts at the current byte-pointer position in the open text file, copies the remainder of the current line to *location*, and advances the byte pointer to the beginning of the next line in the file. After executing a {READLN} command, 1-2-3 goes directly to the next cell in the macro, skipping any further instructions in the same cell as the {READLN} command.

You can specify a single cell or a range as *location*. If you specify a range, 1-2-3 enters the data in the first cell of the range.

NOTE You must open a text file with {OPEN} before you use {READLN}. If a text file is not open, 1-2-3 ignores the {READLN} command and continues to the instruction immediately following the {READLN} command.

With {READLN}, 1-2-3 does not copy the end-of-line characters (carriage returns or line-feed characters) to the worksheet. To copy those characters to the worksheet, use {READ}.

Although {READLN} changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a {READLN} command when worksheet recalculation is set to Automatic. To force a recalculation after a {READLN} command, start the next line in the macro with ~ (tilde) or {CALC}.

Examples

Assume the open text file contains these two lines:

```
Total Sales
for the Year Ending 1988
```

and the byte pointer is on the S in Sales (position 6).

```
{READLN FIRST}
{READLN SECOND}
```

Enters the left-aligned label Sales in cell FIRST and the left-aligned label for the Year Ending 1988 in cell SECOND.

```
{READLN LINE}
{READLN LINE}{BEEP}
{GETPOS POS}
```

Enters the left-aligned label Sales in cell LINE, immediately writes over it with the left-aligned label for the Year Ending 1988, and enters 39 in cell POS (the current position of the byte pointer, which is the beginning of the next line of the file). The {BEEP} command in the second line of the macro is never executed because the {READLN} command succeeded, and 1-2-3 skipped immediately to the next cell.

{RECALC} and {RECALCCOL}

{RECALC *location*,[*condition*],[*iterations*]} recalculates the values in *location*, proceeding row by row. Use {RECALC} to recalculate formulas located below and to the left of cells on which they depend.

{RECALCCOL *location*,[*condition*],[*iterations*]} recalculates the values in *location*, proceeding column by column. Use {RECALCCOL} to recalculate formulas located above and to the right of cells on which they depend.

Use these commands only if recalculation is set to Manual (with /Worksheet Global Recalc Manual).

The optional *condition* argument tells 1-2-3 to repeat the recalculation until *condition* is true. The optional *iterations* argument tells 1-2-3 to perform the specified number of recalculation passes. When you include both optional arguments, 1-2-3 repeats the recalculation until *condition* is true or until it has performed the specified number of recalculation passes, whichever happens first.

location can be any cell or range. *condition* is typically a logical formula or reference to a cell containing a logical formula, but it can also be a numeric or string formula, number, or refer-

ence to any cell. (A numeric formula or number is considered a "true" *condition* unless its value is zero; a string formula is always a true *condition*; and a reference to a cell that contains the value ERR or NA, a string formula, or a label is always a true *condition*. A reference to a blank cell is always a "false" *condition*.) *iterations* can be a number, numeric formula, or reference to a cell that contains a number or numeric formula.

NOTE If *condition* is a reference to a cell that contains a formula, and the formula needs to be recalculated for the {RECALC} or {RECALCCOL} command to work correctly, be sure the referenced cell is inside *location*.

You can use the *iterations* argument without the *condition* argument. To do so, use this syntax: {RECALC *location,,iterations*} or {RECALCCOL *location,,iterations*}. The extra argument separator between the *location* and *iterations* arguments tells 1-2-3 you skipped the *condition* argument.

CAUTION When 1-2-3 recalculates a range with {RECALC} or {RECALCCOL}, it does not update formulas outside the range. To ensure that all your formulas are up-to-date at the end of a macro that uses {RECALC} or {RECALCCOL}, do one of the following: include a {CALC} instruction in the macro, change worksheet recalculation to Automatic, or press CALC when the macro ends.

Examples

Assume the macro changes a value in cell D4 and the formula in cell A8 depends on cell D4. Both of these cells are in a range named RANGE_1.

```
{RECALC RANGE_1}
```

Because recalculation proceeds row by row, 1-2-3 recalculates cell D4 before cell A8, and the result is accurate.

```
{RECALCCOL PAYMENT,VAL<100,50}
```

Continuously recalculates range PAYMENT, column by column, until the value in cell VAL falls below 100 or the number of recalculation passes equals 50.

{RESTART}

{RESTART} is used in subroutines to clear the subroutine stack. When 1-2-3 encounters a {RESTART} command, it continues to the end of the current subroutine, but instead of

returning to the original macro location after it completes the subroutine, the macro ends.

Examples

In the first two examples, the {*subroutine*} command {CHECKS} called the subroutine.

```
CHECKS      ...
            {IF CHK="bad"}{RESTART}
            ...
            {RETURN}
```

If cell CHK contains the label "bad" or a string formula that evaluates to "bad", the macro ends after 1-2-3 completes the remainder of subroutine CHECKS. If cell CHK contains anything else or is blank, macro control returns to the location from which the subroutine call {CHECKS} was issued after 1-2-3 completes the remainder of the subroutine.

```
CHECKS      ...
            {IF CHK="bad"}{RESTART}{BRANCH NOTIFY}
            ....
            {RETURN}
```

If cell CHK contains the label "bad" or a string formula that evaluates to "bad", 1-2-3 clears the subroutine stack and branches to location NOTIFY. If cell CHK contains anything else or is blank, macro control returns to the location from which the subroutine call {CHECKS} was issued after 1-2-3 completes the remainder of the subroutine.

Without the {RESTART} command, 1-2-3 would branch to location NOTIFY if cell CHK contains "bad". After completing the instructions there, it would return to the location from which the subroutine call {CHECKS} was issued.

In the next example, the command {FOR N,1,10,1,BALCALC} called the subroutine.

```
BALCALC     {GETNUMBER "Next purchase? ",PURCHASE}
            {LET BAL,BAL-PURCHASE}
            {IF BAL<=0}{RESTART}{BRANCH BROKE}
```

Stores the number you enter in cell PURCHASE, then enters the new balance in cell BAL. If the new balance is zero or less, clears the subroutine stack and branches to location BROKE. Otherwise, repeats subroutine BALCALC (to a total of 10 times) and returns to the {FOR} command location.

{RETURN}

{RETURN} affects flow of control in subroutines. In a subroutine called by {*subroutine*}, /XC, or {MENUCALL}, {RETURN} immediately returns macro control from the subroutine to the location from which the {*subroutine*}, /XC, or {MENUCALL} command was issued. In a subroutine called by a {FOR} command, {RETURN} ends the current iteration of the subroutine and immediately starts the next iteration. The {RETURN} command corresponds to the /XR command (see "The /X Commands" later in this section).

When used in the main body of macro instructions rather than in a subroutine, {RETURN} is equivalent to {QUIT}; it ends the macro immediately.

Examples

In this example, the command {FOR N,1,10,1,ENTRY} called the subroutine.

```
ENTRY {GETLABEL "Name: ",@CELLPOINTER("coord")}
    {IF @CELLPOINTER("contents")<>""}{D}{RETURN}
       {QUIT}
```

Subroutine ENTRY uses {GETLABEL} to create a list of up to 10 names. If you enter a name during the {GETLABEL} command, 1-2-3 enters the name in the current cell, then moves the cell pointer down one cell and repeats subroutine ENTRY from the beginning. If you press ENTER instead of typing a name during the {GETLABEL} command, the macro ends.

In this example, the {*subroutine*} command {SAVE} called the subroutine.

```
SAVE        {GETLABEL "Save file :Y/N):",INPUT}
            {IF INPUT="n"}{RETURN}
            {IF INPUT="y"}/fs~r{RETURN}
            {BRANCH SAVE}
```

Subroutine SAVE prompts you to type a letter. If you type N or n, 1-2-3 returns immediately to the location from which the subroutine call {SAVE} was issued. If you type Y or y, 1-2-3 saves the current version of the file and then returns to the location from which the subroutine call {SAVE} was issued. If you type any other character, 1-2-3 repeats subroutine SAVE from the beginning.

{SETPOS}

{SETPOS *offset-number*} positions the byte pointer in the open text file *offset-number* bytes from the first byte in the file. After executing a {SETPOS} command, 1-2-3 goes directly to the next cell in the macro, skipping any further instructions in the same cell as the {SETPOS} command.

offset-number can be a number, numeric formula, or reference to a cell that contains a number or numeric formula. The argument specifies the position of the byte pointer relative to the first byte in the file, which is at position 0. Using a negative *offset-number* is the same as using 0.

NOTE You must open a text file with {OPEN} before you use {SETPOS}. If no text file is open, 1-2-3 ignores the {SETPOS} command and continues to the next macro instruction in the same cell.

CAUTION 1-2-3 does not prevent you from placing the byte pointer past the end of a file. If necessary, use {FILESIZE} to determine the size of a file before using {SETPOS}.

Examples

In the following examples, assume the open text file consists of the following sentence (created with a {WRITE} command): "This is a report on the state of macros. The file is 40 bytes long."

```
{SETPOS 10}
```

Moves the byte pointer to the first r in the word report.

```
{SETPOS 0}
```

Moves the byte pointer to the T in This.

```
{SETPOS 100}
```

Moves the byte pointer to position 100, which is beyond the end of the file. You can write data to the file starting at this position, but the contents of the file between position 39 (the period at the end of the sentence) and position 100 will depend on what was previously stored at those locations on the disk.

```
{FILESIZE COUNT}
{SETPOS COUNT}
```

Enters the value 40 in cell COUNT, then sets the byte pointer immediately after the period at the end of the sentence.

```
{SETPOS 20}{BRANCH CLOSED}
{READ 9,RECORD}
```

Enters the nine-character string "the state" in cell RECORD. If no text file were open, the macro would have branched to location CLOSED.

{SYSTEM}

{SYSTEM *command*} temporarily suspends the 1-2-3 session and executes the specified UNIX shell command. When the command is completed, the 1-2-3 session automatically resumes and the macro continues. {SYSTEM} is designed primarily for starting applications that have their own input-output managers or non-interactive processes that do not require input from users or displayed output.

command can be any UNIX shell command or shell script enclosed in quotation marks, a string formula that evaluates to a UNIX shell command, or a reference to a cell that contains either a UNIX shell command or a string formula that evaluates to one. You can run the specified command as a background task if you append an & (ampersand) symbol to the command string. Once the UNIX shell spawns the background task, it returns control to 1-2-3.

CAUTION Do not use {SYSTEM} to execute tasks that may cause a session crash or process failure. If you do so, you may not be able to resume 1-2-3.

Examples

```
{SYSTEM "ls -al /net/alcuin/newfiles > newlut"}
...
```

Suspends the 1-2-3 session executes the `ls -al` command, redirects output to the file `newlist` in the directory from which you started 1-2-3, returns to 1-2-3, and continues the macro.

NOTE If *command* sets an error level, you can test for successful completion of *command* by following {SYSTEM} with @INFO("osreturncode"). See @INFO in Chapter 3.

NOTE To suspend the 1-2-3 session temporarily without specifying an operating system command, use the System command (/S) in the macro instead of {SYSTEM}.

{WAIT}

{WAIT *time-number*} suspends macro execution and displays WAIT as the mode indicator until the time specified by *time-number*. When the specified time arrives, 1-2-3 removes the WAIT indicator and continues the macro.

time-number can be a number, numeric formula, or reference to a cell that contains a number or numeric formula. The number must represent a future moment in time. If the number represents a time that has already passed, 1-2-3 ignores the {WAIT} command and continues to the next macro instruction. In most cases you will use date and time @functions to specify *time-number*. See the following examples.

During a {WAIT} command, the only keystroke 1-2-3 responds to is BREAK. If you press BREAK during a {WAIT} command, 1-2-3 ends the macro immediately (unless you used {BREAKOFF} earlier in the macro to disable use of BREAK).

Examples

```
{WAIT @NOW+@TIME(0,0,10)}
```

Suspends macro execution for ten seconds.

```
{BEEP}PAY ATTENTION!
{WAIT @NOW+@TIME(0,0,5)}
{ESC}
```

Beeps and displays a message in the control panel. After five seconds, removes the message.

```
{WAIT @NOW+@TIMEVALUE(INTERVAL)}
```

Suspends macro execution for the amount of time specified by the @TIMEVALUE formula.

NOTE 1-2-3 uses the operating system's date and time settings to keep track of time. Be sure these settings are correct before you use {WAIT}.

{WINDOWSOFF} and {WINDOWSON}

{WINDOWSOFF} freezes the worksheet area of the screen during macro execution. The area does not redisplay until 1-2-3 encounters a {WINDOWSON} command, or the macro ends. Use {WINDOWSOFF} in noninteractive parts of a macro to suppress the flashing in the worksheet area and to speed up macro execution (updating the screen display takes time).

{WINDOWSON} restores normal updating of the worksheet area, undoing a {WINDOWSOFF} command.

Example

```
{WINDOWSOFF}
...
{WINDOWSON}
{?}~
{WINDOWSOFF}
...
```

Freezes the worksheet area of the screen during a noninteractive part of a macro. Then unfreezes the worksheet area so that when the user moves the cell pointer around the worksheet during the {?} command, the cell-pointer movements will be visible. After the {?} command, refreezes the worksheet area and continues the macro.

{WRITE}

{WRITE *string*} copies *string* to the open text file, starting at the current byte-pointer position. After executing a {WRITE} command, 1-2-3 goes directly to the next cell in the macro, skipping any further instructions in the same cell as the {WRITE} command.

string can be a literal string, string formula, or reference to a cell that contains a label or string formula.

1-2-3 evaluates *string* and converts the result from LMBCS codes (the codes 1-2-3 uses to represent characters) to the codes the operating system uses to represent characters. It then copies the converted result to the file, starting at the current position of the byte pointer, and advances the byte pointer to the position just beyond the last character written. If necessary, 1-2-3 extends the length of the file to accommodate the incoming string. A subsequent {WRITE} or {WRITELN} command begins writing where this command stopped unless you change the position of the byte pointer with a {SETPOS} command.

NOTE {WRITE} works only if a text file was opened with write, append, or modify access (see {OPEN}). If no text file is open, or if the open text file was opened with read access, 1-2-3 ignores the {WRITE} command and goes to the next macro instruction in the same cell.

Examples

```
{WRITE "One"}{BRANCH FAILED}
{WRITE "Two"}
{WRITE "Three"}
```

Writes the character string **OneTwoThree** to the open text file. If no text file is open, or if the open text file was opened with read access, branches to location FAILED for further macro instructions.

```
{WRITE+"One"&" "&"Two"&" "&"Three"}
```

Writes the character string **One Two Three** to the open text file (assuming the file was opened with write, append, or modify access).

```
{WRITE FULLNAME}
```

If FULLNAME contains a label, writes the label to the open text file (assuming the file was opened with write, append, or modify access). If FULLNAME contains a string formula such as **+"FIRST"&" "&"LAST"**, evaluates the formula and writes the resulting string to the file. If FULLNAME contains a number or numeric formula, 1-2-3 ends the macro with an error message. If the range name FULLNAME does not exist, writes the string FULLNAME to the file.

{WRITELN}

{WRITELN *string*} works the same way {WRITE} does, except that it adds an end-of-line character (line feed) to the string it writes to the file. After executing a {WRITELN} command, 1-2-3 goes directly to the next cell in the macro, skipping any further instructions in the same cell as the {WRITELN} command.

As with {WRITE}, *string* can be a literal string, string formula, or reference to a cell that contains a label or string formula. If you use an empty string (" ") as *string*, 1-2-3 simply writes a line feed to the text file.

NOTE {WRITELN} works only if a text file was opened with write, append, or modify access (see {OPEN}). If no text file is open, or if the open text file was opened with read access, 1-2-3 ignores the {WRITELN} command and goes to the next macro instruction in the same cell as the {WRITELN} command.

Examples

```
{WRITELN "One"}{BRANCH FAILED}
{WRITELN "Two"}
{WRITELN "Three"}
```

Writes three separate lines to the open text file. If no text file is open, or if the open text file was opened with read access, branches to location FAILED.

```
{WRITE "This is a line."}
{WRITELN ""}
{WRITELN "This is another line."}
```

Writes a sentence to the open text file, adds a line feed to start a new line, and then writes another sentence, ending with a line feed.

The /X Commands

In addition to the advanced macro commands, 1-2-3 has another group of macro commands: the /X ("slash X") commands. The /X commands were originally included in 1-2-3 Release 1A. They have been retained in later releases of 1-2-3 for compatibility, although each one has a corresponding advanced macro command (see the table below).

CAUTION Generally, /X commands should be executed within a macro only from READY mode. Starting a /X command between steps of another 1-2-3 command may produce unexpected results.

The table below summarizes the /X commands. A detailed description of each command follows the table.

/X command	Function	Corresponding advanced macro command
/XC*location*~	Calls the subroutine at *location*.	{*subroutine*}
/XG*location*~	Branches to *location*.	{BRANCH *location*}
/XI*condition*~...	If *condition* is true, performs the next instruction in the same cell. Otherwise, skips to the next cell for further instructions.	{IF *condition*}
/XL*prompt*~[*location*]~	Displays *prompt* in the control panel. Enters your response as a label in *location*.	{GETLABEL *prompt*,*location*}
/XM*location*~	Activates the macro menu at *location*.	{MENUBRANCH *location*}
/XN*prompt*~[*location*]~	Displays *prompt* in the control panel. Enters your response as a number in *location*.	{GETNUMBER *prompt*,*location*}
/XQ	Ends the macro.	{QUIT}
/XR	Returns control from the current subroutine to the main macro, or ends the current loop through the subroutine and starts the next loop.	{RETURN}

NOTE In /X commands, you can use formulas as *location* arguments only if you follow the formulas with {CALC}. For example, @CELLPOINTER("coord") is not a valid *location* argument for /XC, but @CELLPOINTER("coord"){CALC} is valid as the /XC *location* argument.

/XC

/XC *location*~ calls the subroutine that starts in the first cell of *location*. /XC differs from {*subroutine*} only in that /XC does not pass arguments to the specified subroutine.

Example

```
/XCSUBR1~
/XCSUBR2~
/XCSUBR3~
```

Performs three subroutine calls in succession.

/XG

/XG*location*~ transfers macro control (branches) from the current column of macro instructions to the first cell of *location*. /XG produces the same result as {BRANCH}.

Example

```
...
/XGBIG~
```

Branches to the first cell of range BIG.

/XI

When 1-2-3 encounters /XI*condition*~ in a macro, it evaluates *condition* as either true or false. If *condition* is true, 1-2-3 continues to the macro instructions that follow the /XI command in the same cell. If *condition* is false, 1-2-3 skips any further macro instructions in the same cell and goes immediately to the cell below the /XI command. /XI produces the same result as {IF}.

In most cases, *condition* is a logical formula or reference to a cell that contains a logical formula. However, you can use any formula, number, literal string, or cell reference as *condition*. 1-2-3 evaluates any *condition* that does not equal zero as true and any *condition* that does equal zero as false. Blank cells, strings, and ERR and NA values all equal zero when used as *condition*.

Examples

```
/XIENTRY>=100~/cENTRY~~/XQ
...
```

If the value of cell ENTRY is greater than or equal to 100, 1-2-3 copies the contents of ENTRY to the current cell, and the macro ends. If the value of cell ENTRY is less than 100, 1-2-3 goes to the next line for further macro instructions.

```
/XITESTVAL~/XGRTN1~
/XGRTN2~
```

If cell TESTVAL contains a logical formula that is true, any number except zero, or a numeric formula that does not evaluate to zero, the macro branches to location RTN1. Otherwise, the macro branches to location RTN2.

/XL

/XL*prompt*~[*location*]~ displays *prompt* (which can be a literal string, string formula, or reference to a cell that contains a label or string formula) in the control panel and then pauses for your response. You can type any combination of up to 512 characters as the response. When you press ENTER, 1-2-3 stores the response as a left-aligned label in the first cell of *location*.

If you do not include the *location* argument, 1-2-3 enters the response in the current cell. If you press ENTER without typing any characters, 1-2-3 enters an apostrophe label prefix in *location*. /XL produces the same result as {GETLABEL}.

Although /XL changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a /XL command when worksheet recalculation is set to Automatic. To force a recalculation after a /XL command, follow the command with ~ (tilde) or {CALC}.

Example

```
/XLType your first name: ~FIRST~
/XLType your social security number: ~~
```

Enters your first name in cell FIRST. Enters your social security number as a label in the current cell.

/XM

/XM *location*~ displays the macro menu that starts in the first cell of *location* and suspends macro execution so you can select an item from the menu. The macro then branches according to your selection. For instructions on creating a macro menu, see "Creating a Macro Menu" in {MENUBRANCH} and {MENUCALL}.

/XM produces the same result as {MENUBRANCH}. Note that {MENUCALL} has no /X command equivalent.

Example

```
/XMTOP_MENU~
{BEEP}
```

Displays the menu that starts in cell TOP_MENU and pauses to let you select one of the menu items. Then branches to the location associated with the menu item you selected.

If you press ESC instead of selecting a menu item, 1-2-3 beeps. Otherwise, 1-2-3 never executes the {BEEP} command.

/XN

/XN*prompt*~[*location*]~ displays *prompt* (which can be a literal string, string formula, or reference to a cell that contains a label or string formula) in the control panel and then pauses for your response. The response can be a number, numeric formula, or reference to a cell that contains a number or numeric formula. When you press ENTER to enter the response, 1-2-3 stores it as a number in the first cell of *location*. If you do

not include the *location* argument, 1-2-3 enters the number in the current cell. /XN produces the same result as {GETNUMBER}.

If you attempt to enter a string or if you simply press ENTER in response to the /XN prompt, 1-2-3 displays an error message. Press ESC or ENTER to clear the error message, and enter a numeric response. (In this error situation, 1-2-3 goes into EDIT mode rather than ending the macro when you clear the error message.)

If you enter a string formula or specify a cell that contains a label or string formula in response to the /XN prompt, 1-2-3 enters ERR in the first cell of *location*.

Although /XN changes the contents of cells, 1-2-3 does not automatically recalculate formulas after performing a /XN command when worksheet recalculation is set to Automatic. To force a recalculation after a /XN command, follow the command with ~ (tilde) or {CALC}.

Example

```
/XNAGE: ~AGE~
```

Prompts you for your age. If you enter a number in response to the prompt, enters that number in cell AGE. If you enter a string in response to the prompt, displays an error message.

/XQ

/XQ stops the macro and returns 1-2-3 to READY mode. /XQ produces the same result as {QUIT}.

Examples

```
/XIYEAR=1999~/XQ
...
```

If cell YEAR has the value 1999, the macro ends. Otherwise, 1-2-3 continues to the next cell for further macro instructions.

```
/XIYEAR<1999~/XGNEXT~
/XQ
```

If cell YEAR has a value less than 1999, 1-2-3 branches to location NEXT for further macro instructions. Otherwise, the macro ends.

/XR

/XR directs the flow of macro control in a subroutine. When 1-2-3 encounters /XR in a subroutine called by /XC, {*subroutine*}, or {MENUCALL}, it returns immediately to the location from which the /XC, {*subroutine*}, or {MENUCALL} command was issued. When 1-2-3 encounters /XR in a subroutine called by a {FOR} command, it returns to the beginning of the subroutine and starts the next loop. /XR produces the same result as {RETURN}.

NOTE /XR in the main macro is equivalent to /XQ and {QUIT}.

Examples

In the following example, the command /XCNEWNAME~ called this subroutine:

```
NEWNAME     /XLEnter name: ~YOURNAME~
            /XIYOURNAME="Smith"~/XR
            ...
```

Prompts you for a name and enters your response in cell YOURNAME. If cell YOURNAME contains the entry Smith, 1-2-3 returns to the location from which the /XC command was issued. If cell YOURNAME contains any other entry, 1-2-3 goes to the next instruction in the subroutine.

In the following example, the command {FOR COUNTER, 1,3,1,CODE_ENTRY} called this subroutine:

```
CODE_ENTRY /XNEnter your code number: ~CODE~
           /XICODE<>007~/XR
           ...
```

Prompts you for a code number and allows you three chances to enter the correct one (007). If you enter it incorrectly the first two times, the entry routine starts over. If you enter it incorrectly the third time, 1-2-3 returns to the location from which the {FOR} command was issued. If you enter the correct code the first, second, or third time, the subroutine continues.

Appendix A
The Lotus Multibyte Character Set (LMBCS)

1-2-3 uses LMBCS to display, store, and print characters. You can use LMBCS codes to produce characters that are not on your keyboard.

The tables that follow list the LMBCS codes for UNIX versions of 1-2-3 and the characters they produce.

LMBCS codes are divided into a number of different groups. LMBCS codes 32 through 255 comprise Group 0 and are listed in the first table below. These characters represent Code Page 850 characters 32 to 255.

LMBCS codes 256 through 511 comprise Group 1 and produce characters previously available in the Lotus International Character Set (LICS) as well as other characters available in Code Page 437. The second table below lists the first 127 of these; the remaining Group 1 LMBCS codes duplicate Group 0 codes.

LMBCS codes 512 and above comprise other groups of characters not displayable or printable in 1-2-3 Release 3.

Displaying Characters

You can produce any LMBCS character with @CHAR and the LMBCS code for the character. For example, to produce an up arrow (↑), you would find the LMBCS code for the up arrow, 280, in the Group 1 table, and enter @CHAR(280) in your worksheet. You can also produce characters using compose sequences or extended compose, as described below.

Compose Sequences

A compose sequence is a series of keystrokes you use to enter a character that is not on your keyboard. The tables below list the compose sequences for the characters that have them.

You can enter these characters by pressing COMPOSE and the appropriate keystrokes. For example, to enter the character £, press COMPOSE and type **L=**. Most of the compose sequences are not order-sensitive; however, you must enter those that appear in bold in the order presented.

Extended Compose

You can use extended compose to produce any LMBCS character. The exact sequence of keystrokes you use for extended compose depends on the character's group number.

To use extended compose with characters listed in the Group 0 table, press COMPOSE twice, 0 (the character's group number), - (hyphen), and the three-digit LMBCS code. If the LMBCS code for that character has only two digits, precede it with a 0.

To use extended compose to produce characters listed in the Group 1 table, press COMPOSE twice, 1 (the character's group number), - (hyphen), and the three-digit key code for that character, listed in the second column in the table. For example, to enter an ellipsis, which is in Group 1 and has a key code of 040, press COMPOSE COMPOSE **1-040**.

NOTE If your monitor or printer cannot represent a LMBCS character, a **fallback character** will appear. Fallback characters represent the closest match between the display of a LMBCS character and a character that your terminal can display.

LMBCS Tables

The table for Group 0 LMBCS characters and Group 1 LMBCS characters appear below.

Group 0

This section defines the Group 0 LMBCS characters.

NOTE Codes 1 through 31 are not LMBCS codes. Using @CHAR with the number 1 through 31 will produce the character for LMBCS codes 257 through 287, listed in the Group 1 table.

Group 0

LMBCS code	Compose sequence	Description	Character
32		Space	Space
33		Exclamation point	!
34		Double quotes	"
35	+ +	Pound sign	#
36		Dollar sign	$
37		Percent	%
38		Ampersand	&
39		Close single quote	'
40		Open parenthesis	(
41		Close parenthesis	)
42		Asterisk	*
43		Plus sign	+
44		Comma	,
45		Minus sign	-
46		Period	.

(Continued)

Group 0

LMBCS code	Compose sequence	Description	Character
47		Slash	/
48		Zero	0
49		One	1
50		Two	2
51		Three	3
52		Four	4
53		Five	5
54		Six	6
55		Seven	7
56		Eight	8
57		Nine	9
58		Colon	:
59		Semicolon	;
60		Less than	<
61		Equal sign	=
62		Greater than	>
63		Question mark	?
64	a a or A A	At sign	@
65		A, uppercase	A
66		B, uppercase	B
67		C, uppercase	C
68		D, uppercase	D
69		E, uppercase	E
70		F, uppercase	F
71		G, uppercase	G
72		H, uppercase	H
73		I, uppercase	I
74		J, uppercase	J
75		K, uppercase	K
76		L, uppercase	L
77		M, uppercase	M
78		N, uppercase	N
79		O, uppercase	O
80		P, uppercase	P
81		Q, uppercase	Q
82		R, uppercase	R
83		S, uppercase	S

(Continued)

Group 0

LMBCS code	Compose sequence	Description	Character
84		T, uppercase	T
85		U, uppercase	U
86		V, uppercase	V
87		W, uppercase	W
88		X, uppercase	X
89		Y, uppercase	Y
90		Z, uppercase	Z
91	((	Open bracket	[
92	/ /	Backslash	\
93	))	Close bracket	]
94	v v	Caret	^
95		Underscore	_
96		Open single quote	‘
97		a, lowercase	a
98		b, lowercase	b
99		c, lowercase	c
100		d, lowercase	d
101		e, lowercase	e
102		f, lowercase	f
103		g, lowercase	g
104		h, lowercase	h
105		i, lowercase	i
106		j, lowercase	j
107		k, lowercase	k
108		l, lowercase	l
109		m, lowercase	m
110		n, lowercase	n
111		o, lowercase	o
112		p, lowercase	p
113		q, lowercase	q
114		r, lowercase	r
115		s, lowercase	s
116		t, lowercase	t
117		u, lowercase	u
118		v, lowercase	v
119		w, lowercase	w

(Continued)

Group 0

LMBCS code	Compose sequence	Description	Character
120		x, lowercase	x
121		y, lowercase	y
122		z, lowercase	z
123	(-	Open brace	{
124	∧ /	Bar	|
125	) -	Close brace	}
126	- -	Tilde	~
127		Delete	⌂
128	C ,	C cedilla, uppercase	Ç
129	u "	u umlaut, lowercase	ü
130	e '	e acute, lowercase	é
131	a ∧	a circumflex, lowercase	â
132	a "	a umlaut, lowercase	ä
133	a ‘	a grave, lowercase	à
134	a *	a ring, lowercase	å
135	c ,	c cedilla, lowercase	ç
136	e ∧	e circumflex, lowercase	ê
137	e "	e umlaut, lowercase	ë
138	e ‘	e grave, lowercase	è
139	i "	i umlaut, lowercase	ï
140	i ∧	i circumflex, lowercase	î
141	i ‘	i grave, lowercase	ì
142	A "	A umlaut, uppercase	Ä
143	A *	A ring, uppercase	Å
144	E '	E acute, uppercase	É
145	a e	ae diphthong, lowercase	æ
146	A E	AE diphthong, uppercase	Æ
147	o ∧	o circumflex, lowercase	ô
148	o "	o umlaut, lowercase	ö
149	o ‘	o grave, lowercase	ò
150	u ∧	u circumflex, lowercase	û
151	u ‘	u grave, lowercase	ù
152	y "	y umlaut, lowercase	ÿ
153	O "	O umlaut, uppercase	Ô
154	U "	U umlaut, uppercase	Ü
155	o /	o slash, lowercase	ø

(Continued)

Group 0

LMBCS code	Compose sequence	Description	Character
156	L = l = L - or l -	British pound sterling symbol	£
157	O /	O slash, uppercase	Ø
158	x x or X X	Multiplication sign	×
159	f f	Guilder	ƒ
160	a '	a acute, lowercase	á
161	i '	i acute, lowercase	í
162	o '	o acute, lowercase	ó
163	u '	u acute, lowercase	ú
164	n ~	n tilde, lowercase	ñ
165	N ~	N tilde, uppercase	Ñ
166	a _ or A _	Feminine ordinal indicator	ª
167	o _ or O _	Masculine ordinal indicator	º
168	? ?	Question mark, inverted	¿
169	R O r o R 0 or r 0	Registered trademark symbol	®
170	-]	End of line symbol/Logical NOT	¬
171	1 2	One half	½
172	1 4	One quarter	¼
173	! !	Exclamation point, inverted	¡
174	< <	Left angle quotes	«
175	> >	Right angle quotes	»
176		Solid fill character, light	▒
177		Solid fill character, medium	▓
178		Solid fill character, heavy	▓
179		Center vertical box bar	│
180		Right box side	┤
181	A '	A acute, uppercase	Á
182	A ^	A circumflex, uppercase	Â
183	A `	A grave, uppercase	À
184	C O c o C 0 or c 0	Copyright symbol	©
185		Right box side, double	╣
186		Center vertical box bar, double	║
187		Upper right box corner, double	╗
188		Lower right box corner, double	╝
189	c | c / C | or c /	Cent sign	¢
190	Y = y = Y - or y -	Yen sign	¥
191		Upper right box corner	┐

(Continued)

Group 0

LMBCS code	Compose sequence	Description	Character
192		Lower left box corner	└
193		Lower box side	┴
194		Upper box side	┬
195		Left box side	├
196		Center horizontal box bar	─
197		Center box intersection	┼
198	a ~	a tilde, lowercase	ã
199	A ~	A tilde, uppercase	Ã
200		Lower left box corner, double	╚
201		Upper left box corner, double	╔
202		Lower box side, double	╩
203		Upper box side, double	╦
204		Left box side, double	╠
205		Center horizontal box bar, double	═
206		Center box intersection, double	╬
207	X O x o X 0 or x 0	International currency sign	¤
208	d -	Icelandic eth, lowercase	ð
209	D -	Icelandic eth, uppercase	Ð
210	E ^	E circumflex, uppercase	Ê
211	E "	E umlaut, uppercase	Ë
212	E `	E grave, uppercase	È
213	i <space>	i without dot, lowercase	ı
214	I '	I acute, uppercase	Í
215	I ^	I circumflex, uppercase	Î
216	I "	I umlaut, uppercase	Ï
217		Lower right box corner	┘
218		Upper left box corner	┌
219		Solid fill character	█
220		Solid fill character, lower half	▄
221	/ <space>	Vertical line, broken	¦
222	I `	I grave, uppercase	Ì
223		Solid fill character, upper half	▀
224	O '	O acute, uppercase	Ó
225	s s	German sharp, lowercase	ß
226	O ^	O circumflex, uppercase	Ô
227	O `	O grave, uppercase	Ò

(Continued)

Group 0

LMBCS code	Compose sequence	Description	Character
228	o ~	o tilde, lowercase	õ
229	O ~	O tilde, uppercase	Õ
230	/ u	Greek mu, lowercase	µ
231	p -	Icelandic thorn, lowercase	þ
232	P -	Icelandic thorn, uppercase	Þ
233	U '	U acute, uppercase	Ú
234	U ^	U circumflex, uppercase	Û
235	U `	U grave, uppercase	Ù
236	y '	y acute, lowercase	ý
237	Y '	Y acute, uppercase	Ý
238	^ -	Overline character	¯
239		Acute accent	´
240	- =	Hyphenation symbol	-
241	+ -	Plus or minus sign	±
242	- - or = =	Double underscore	‗
243	3 4	Three quarters sign	¾
244		Paragraph symbol	¶
245		Section symbol	§
246	: -	Division sign	÷
247	, ,	Cedilla accent	¸
248	^ 0	Degree symbol	°
249		Umlaut accent	¨
250	^ .	Center dot	·
251	^ 1	One superscript	¹
252	^ 3	Three superscript	³
253	^ 2	Two superscript	²
254		Square bullet	■
255		Null	

Group 1

This section defines the Group 1 LMBCS characters.

Group 1

LMBCS code	Key code	Compose sequence	Description	Character
256	(000)		Null	
257	(001)		Smiling face	☺
258	(002)		Smiling face, reversed	☻
259	(003)		Heart suit symbol	♥
260	(004)		Diamond suit symbol	♦
261	(005)		Club suit symbol	♣
262	(006)		Spade suit symbol	♠
263	(007)		Bullet	•
264	(008)		Bullet, reversed	◘
265	(009)		Open circle	○
266	(010)		Open circle, reversed	◙
267	(011)		Male symbol	♂
268	(012)		Female symbol	♀
269	(013)		Musical note	♪
270	(014)		Double musical note	♫
271	(015)		Sun symbol	☼
272	(016)		Forward arrow indicator	►
273	(017)		Back arrow indicator	◄
274	(018)		Up-down arrow	↕
275	(019)		Double exclamation points	!!
276	(020)	! p or ! P	Paragraph symbol	¶
277	(021)	S O s o S 0 or s 0	Section symbol	§
278	(022)		Solid horizontal rectangle	▬
279	(023)		Up-down arrow, perpendicular	↨
280	(024)		Up arrow	↑
281	(025)		Down arrow	↓
282	(026)		Right arrow	→
283	(027)	**m g**	Left arrow	←
284	(028)		Right angle symbol	∟
285	(029)		Left-right symbol	↔
286	(030)	**b a**	Solid triangle	▲
287	(031)	**e a**	Solid triangle inverted	▼
288	(032)	" <**space**>	Umlaut accent, uppercase	¨

(Continued)

Group 1

LMBCS code	Key code	Compose sequence	Description	Character
289	(033)	~ <space>	Tilde accent, uppercase	~
290	(034)		Ring accent, uppercase	°
291	(035)	^ <space>	Circumflex accent, uppercase	^
292	(036)	` <space>	Grave accent, uppercase	`
293	(037)	´ <space>	Acute accent, uppercase	´
294	(038)	" ^	High double quotes, opening	"
295	(039)		High single quote, straight	'
296	(040)		Ellipsis	...
297	(041)		En mark	–
298	(042)		Em mark	—
299	(043)		Null	
300	(044)		Null	
301	(045)		Null	
302	(046)		Left angle parenthesis	<
303	(047)		Right angle parenthesis	>
304	(048)	<space> "	Umlaut accent, lowercase	¨
305	(049)	<space> ~	Tilde accent, lowercase	~
306	(050)		Ring accent, lowercase	°
307	(051)	<space> ^	Circumflex accent, lowercase	^
308	(052)	<space> ‘	Grave accent, lowercase	`
309	(053)	<space> ’	Acute accent, lowercase	´
310	(054)	" v	Low double quotes, closing	,,
311	(055)		Low single quote, closing	,
312	(056)		High double quotes, closing	"
313	(057)	_ <space>	Underscore, heavy	_
314	(058)		Null	
315	(059)		Null	
316	(060)		Null	
317	(061)		Null	
318	(062)		Null	
319	(063)		Null	
320	(064)	O E	OE ligature, uppercase	Œ
321	(065)	o e	oe ligature, lowercase	œ
322	(066)	Y "	Y umlaut, uppercase	Ÿ
323	(067)		Null	
324	(068)		Null	

(Continued)

Group 1

LMBCS code	Key code	Compose sequence	Description	Character
325	(069)		Null	
326	(070)		Left box side, double joins single	╞
327	(071)		Left box side, single joins double	╟
328	(072)		Solid fill character, left half	▌
329	(073)		Solid fill character, right half	▐
330	(074)		Null	
331	(075)		Null	
332	(076)		Null	
333	(077)		Null	
334	(078)		Null	
335	(079)		Null	
336	(080)		Lower box side, double joins single	╨
337	(081)		Upper box side, single joins double	╤
338	(082)		Upper box side, double joins single	╥
339	(083)		Lower single left double box corner	╙
340	(084)		Lower double left single box corner	╘
341	(085)		Upper double left single box corner	╒
342	(086)		Upper-single left double box corner	╓
343	(087)		Center box intersection, vertical double	╫
344	(088)		Center box intersection, horizontal double	╪
345	(089)		Right box side, double joins single	╡
346	(090)		Right box side, single joins double	╢
347	(091)		Upper single right double box corner	╖
348	(092)		Upper double right single box corner	╕
349	(093)		Lower single right double box corner	╜

(Continued)

Group 1

LMBCS code	Key code	Compose sequence	Description	Character
350	(094)		Lower double right single box corner	╕
351	(095)		Lower box side, single joins double	╧
352	(096)	**i j**	ij ligature, lowercase	ij
353	(097)	**I J**	IJ ligature, uppercase	IJ
354	(098)	**f i**	fi ligature, lowercase	fi
355	(099)	**f l**	fl ligature, lowercase	fl
356	(100)	**' n**	n comma, lowercase	'n
357	(101)	**l .**	l bullet, lowercase	l·
358	(102)	**L .**	L bullet, uppercase	L·
359	(103)		Null	
360	(104)		Null	
361	(105)		Null	
362	(106)		Null	
363	(107)		Null	
364	(108)		Null	
365	(109)		Null	
366	(110)		Null	
367	(111)		Null	
368	(112)		Single dagger symbol	†
369	(113)		Double dagger symbol	‡
370	(114)		Null	
371	(115)		Null	
372	(116)		Null	
373	(117)		Null	
374	(118)	**T M T m or t m**	Trademark symbol	™
375	(119)	**l r**	Liter symbol	ℓ
376	(120)		Null	
377	(121)		Null	
378	(122)		Null	
379	(123)		Null	
380	(124)	**K R K r or k r**	Krone sign	Kr
381	(125)	**- [**	Start of line symbol	⌐
382	(126)	**L l L i or l i**	Lira sign	₤
383	(127)	**P T P t or p t**	Peseta sign	Pt

Appendix B
Sample Macros

This appendix presents several short macros available in the SAMPMACS.WK3 file and, in addition, a standalone illustration of a project-scheduling macro in the file SMPSCHED.WK3. These macros provide examples of concepts presented earlier in Chapter 4. Although the macros are short and simple, they illustrate programming techniques that you can apply to any macro you create.

The sample macros include the following:

Name	*Purpose*
\G	Moves the cell pointer to a different range
\S	Shifts the current row to the top of the screen
\D	Enters today's date in the current cell
\R	Rounds a column of values to the number of decimal places you specify
\C	Creates a macro menu of column-related commands
\I	Inserts a formatted record into a scheduling database

Goto Macro (\G)

In a large file that has different data areas (such as an income statement that includes a balance sheet and various cost analyses), using the pointer-movement keys to move from one area to another can be time consuming. If you assign range names to the different areas, you can use macro \G, shown in Figure B-1, to move the cell pointer more quickly from area to area.

```
A:A1: [W11] '\G                                              READY

 A      A        B       C      D      E       F       G      H
1   \G        {GOTO}{NAME 2}        Press GOTO then NAME twice to list ra
2
3
```

Figure B-1. *Macro \G*

Explanation of Macro \G

{GOTO}{NAME 2} presses GOTO and then NAME twice to display a full-screen list of range names in the current file and the names of other active files. Specify the name of the range you want to move to.

Row-Shifting Macro (\S)

Macro \S, shown in Figure B-2, moves the row that contains the cell pointer to the top of the screen.

```
A:A4: [W11] '\S                                              READY

 A      A        B       C      D      E       F       G      H
3
4   \S        {D 19}{U 19}          Shift current row to top of screen
5
```

Figure B-2. *Macro \S*

Explanation of Macro \S

{D 19}{U 19} moves the cell pointer down 19 rows and then back up 19 rows, shifting to the top of the screen the row the cell pointer was in when you started the macro. (The macro instructions {D} and {U} are equivalent to {DOWN} and {UP}.)

NOTE The trick to moving a row to the top of the screen is to move the cell pointer down more rows than remain on the screen, so the repetition factor of 19 in this macro suffices for 20-row screens. If your screen displays more than 20 rows, increase the repetition factor to the number of rows your screen displays minus 1. For example, if your screen displays 38 rows, the macro should read {D 37}{U 37}.

Date Macro (\D)

Macro \D, shown in Figure B-3, enters today's date in the current cell by converting the result of @TODAY to a value. Use the macro to document the data in a worksheet, insert the date in a memo, or create an entry to be used as a print header or footer.

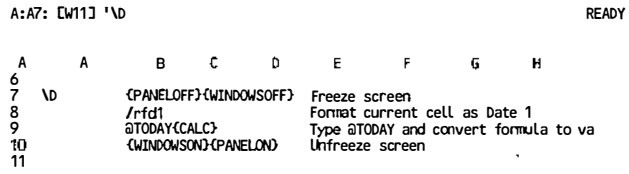


Figure B-3. *Macro \D*

Figure B-4 shows a date entered in cell B:B2 with macro \D.

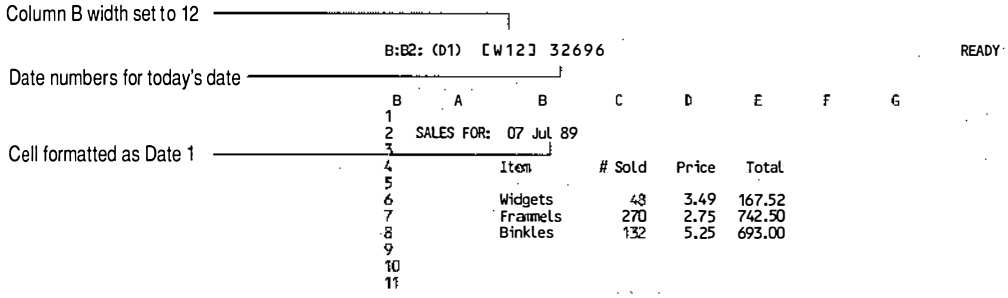


Figure B-4. *Today's date entered with macro \D*

Explanation of Macro \D

{PANELOFF}{WINDOWSOFF} freezes the control panel and worksheet area, preventing flashing on the screen as the macro executes and allowing the macro to work at maximum speed.

/rfd1~ formats the current cell as Date 1 format.

@TODAY{CALC}~ types @TODAY, converts @TODAY to its current value, and enters the value in the current cell.

{WINDOWSON}{PANELON} unfreezes the control panel and worksheet area prior to ending the macro.

NOTE When you use this macro, 1-2-3 displays asterisks instead of the date if the current cell's column width is less than 10. (Displaying a value in Date 1 format requires a column width of 10 or more). To remove the asterisks and display the date, use /Worksheet Global Column-Width, /Worksheet Column Set-Width, or the column macro described later in this section to widen the column to 10 or more. (Or modify this macro to have it check the current column width with @CELLPOINTER("width") and, if necessary, widen the column.)

Rounding Macro (/R)

Macro \R, shown in Figure B-5, rounds a column of values by converting the values to @ROUND formulas, using the number of decimal places you specify.

```
A:A13: [W11] '\R                                                    READY

A       A         B      C      D       E       F       G       H
12
13  \R          {GETLABEL "Round to what place? ",<<SAMPMACS.WK3>>PLACE}
14  R_LOOP      {EDIT}{HOME}@ROUND(
15              {END},{PLACE})
16              {DOWN}
17              {IF @CELLPOINTER("type")="v"}{BRANCH R_LOOP}
18              {QUIT}
19
20  PLACE       1
21              {RETURN}
22
```

Figure B-5. *Macro \R*

Before you start the macro, you must move the cell pointer to the first cell in the column of values you are rounding. Figure B-6 illustrates how a column of values would look before and after the macro \R rounded them to 1 decimal place.

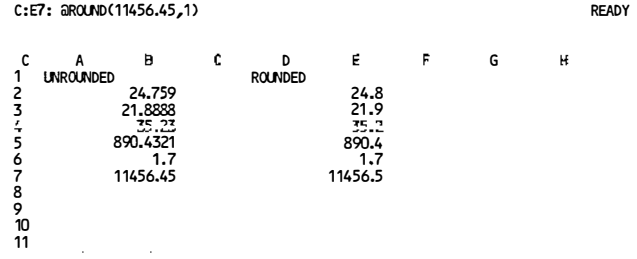


Figure B-6. *Values before and after rounding*

Explanation of Macro \R

The {**GETLABEL "Round to . . .**} expression prompts you for the number of decimal places to which you want to round the values, waits for you to type a number and press ENTER, and then enters that number as a label in cell PLACE for use later in the macro. The <<SAMPMACS.WK3>> file reference is necessary; without it, 1-2-3 will assume cell PLACE is in the file that is current when you run macro \R.

The next part of the macro is the rounding loop. It converts the value in the current cell to an @ROUND formula — for example, 24.759 to @ROUND(24.759,1) — as follows:

{**EDIT**}{**HOME**}**@ROUND(** presses EDIT to begin editing the current cell's contents, moves the cursor to the beginning of the entry, and inserts @ROUND(in front of the entry.

{**END**}, moves the cursor to the end of the entry and types a comma.

{**PLACE**} calls subroutine PLACE (in this example, located in cells B20..B21). Subroutine PLACE contains two macro instructions. The first instruction is the number you specified in the {GETLABEL} command, so the macro types that number as the decimal-place argument in the @ROUND formula. (In the Figure B-5 example, the number is 1.) {**RETURN**} ends the subroutine, so macro control shifts back to the main macro where)~ completes and enters the @ROUND formula.

{**DOWN**} moves the cell pointer down one cell.

{**IF @CELLPOINTER("type")="v"**} tests the new cell's contents. If the cell contains a value, the macro continues to the next instruction following {IF} in the same cell; in this case the instruction is {**BRANCH R_LOOP**}, which branches macro control back to cell R_LOOP (the second cell in the macro). The macro then repeats the value-to-@ROUND-formula conversion.

If the cell is blank or contains a label, the macro skips the {BRANCH R_LOOP} instruction and goes immediately to the next cell in the column of macro instructions, where {**QUIT**} ends the macro.

Column Macro (\C)

1-2-3 has a number of commands that deal with columns. Remembering which command to select for which type of column change can be confusing. You can use macro \C, shown in Figure B-7, to change the width of individual columns, change the worksheet's global column width, reset columns to the global column width, hide and redisplay columns, and/or insert and delete columns, all from one macro menu.

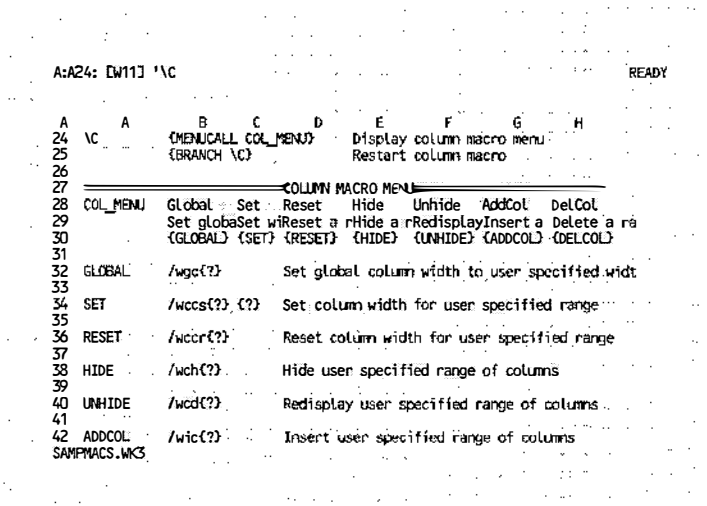


Figure B-7. *Macro \C, macro menu, and menu subroutines*

1-2-3 displays when you start macro \C is shown in Figure B-8.

```
A:A24: [W11] '\C                                                    MENU
Global  Set  Reset  Hide  Unhide  AddCol  DelCol  Quit
Set global column width for current worksheet
```

Figure B-8. *The macro menu for \C*

Explanation of Macro \C

{**MENUCALL COL_MENU**} displays the macro menu stored in range COL_MENU. The range has three rows:

- The first row contains the items that appear in the second line of the control panel: Global, Set, Reset, Hide, Unhide, AddCol, DelCol, and Quit.
- The second row contains the menu-item descriptions that 1-2-3 displays in the third line of the control panel as you highlight each menu item: Set global column width for current worksheet, Set width of a range of columns, Reset a range of columns to global column width, Hide a range of columns, Redisplay a range of hidden columns, Insert a range of columns, Delete a range of columns, and End macro, respectively.
- The third row contains the macro instructions 1-2-3 performs after you select a menu item. For the first seven items, the third row contains a subroutine call to subroutine GLOBAL, SET, RESET, HIDE, UNHIDE, ADDCOL, or DELCOL. The {QUIT} command for the eighth menu item ends the macro.

Subroutine	*Explanation*
GLOBAL	**/wgc** selects /Worksheet Global Column-Width. {**?**} suspends the macro to let you specify a column width, and ~ completes the command.
SET	**/wccs** selects /Worksheet Column Column-Range Set-Width. {**?**}~{**?**}~ suspends the macro twice to let you specify a range of columns and a column width (the tildes enter your specifications and complete the command).

(continued)

Subroutine	*Explanation*
RESET	**/wccr** selects /Worksheet Column Column-Range Reset-Width. {**?**} suspends the macro to let you specify the range of columns whose width you want to reset, and ~ completes the command.
HIDE	**/wch** selects /Worksheet Column Hide. {**?**} suspends the macro to let you specify the range of columns to hide, and ~ completes the command.
UNHIDE	**/wcd** selects /Worksheet Column Display. {**?**} suspends the macro to let you specify the range of columns to redisplay, and ~ completes the command.
ADDCOL	**/wic** selects /Worksheet Insert Column. {**?**} suspends the macro to let you specify the range of columns to insert, and ~ completes the command.
DELCOL	**/wdc** selects /Worksheet Delete Column. {**?**} suspends the macro to let you specify the range of columns to delete, and ~ completes the command.

After 1-2-3 completes the selected subroutine, it returns to the instruction following the {MENUCALL} command; in this case, {**BRANCH \C**}, which causes 1-2-3 to redisplay the column-macro menu. To end macro \C, you must select Quit from the macro menu.

Insert Record Macro (\I)

1-2-3 also provides tools to support standalone applications for accounting, database management, forecasting, and so on. The following macro illustrates how the @functions @SUM, @MIN, @MAX, @ABS, and @REPEAT can build a rudimentary, project-scheduling application. As a standalone macro application, this set of formulas and macros for project-scheduling are in a separate worksheet file called SMPSCHED.WK3.

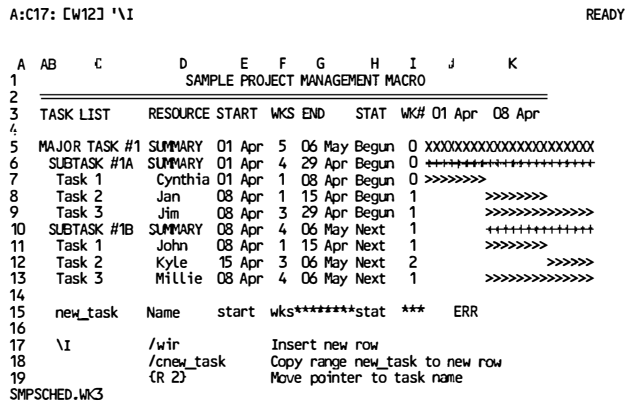


Figure B-9. *The worksheet for project scheduling*

Figure B-9 contains several fields of information relevant to tasks, durations, task status, and charts:

- The **task lists** in C5..C13 contain the titles of major tasks and minor tasks.
- The **resource assignments** in D5..D13 record the resource (group or person) responsible for completing the task.
- The **start and end dates** in E5..E13 and G5..G13 contain the dates that each task starts and ends. Typically, you need to specify the start date for a task; 1-2-3 calculates the end date based upon the start date and the duration of the task.
- The **task durations** in F5..F13 contain the number of weeks that each task is scheduled to take.
- The **task status** in H5..H13 record the current status of each task. In this illustration the STATUS field must be entered manually. 1-2-3 can use an @function like @NOW to calculate the status of the task automatically by comparing the scheduled END date with the current date.
- The **Gantt chart** in J5..P13 is a graphical representation of all tasks measured against a time line (J3..P3). In Figure B-9, the Gantt chart measures each task in weeks against a time line starting on April 1, 1990.

Project scheduling applications require that you specify some values (task names, start dates, resource names, durations) before it calculates related values (end date, status, Gantt lines). The formulas and macro explained in the next section automate the process of calculating end dates, graphing tasks in a Gantt chart, and inserting new task records.

Explanation of Formulas and the Macro \I

1-2-3 stores all dates as numbers. The start date for this sample schedule is April 1, 1990. 1-2-3 stores this date as the number 32964. If you want 1-2-3 to calculate the first day of the following week (April 8, 1990), you need to increment the value of the start date (32964) by 7. The time line in range J3..P3 is built with a value of 32964 in cell J3 and the formula +J3+7 copied to cells K3..P3. To have this range and all scheduling ranges displayed as dates, use the command /Range Format Date 2.

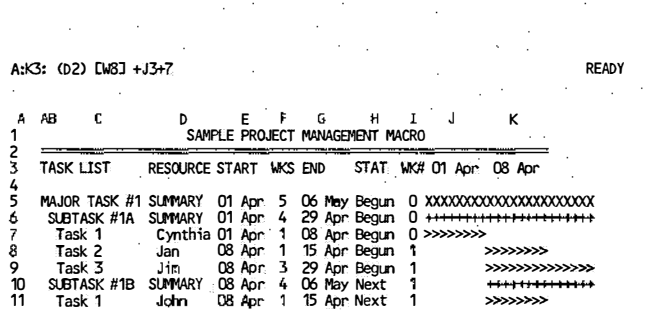


Figure B-10. *Building a time line*

To calculate END dates for each task you can use the formula that augments the START date for each task by the number of weeks in the DURATION field. To calculate the END date in cell G9, for example, 1-2-3 multiplies the number of weeks in cell F9 by 7 (to obtain days) and then adds it to the START date in cell E9. The formula is +E9+(+F9*7).

```
A:G9: (D2) [W8] +E9+(F9*7)                                         READY

 A  AB     C          D       E    F    G       H     I    J       K
 1                    SAMPLE PROJECT MANAGEMENT MACRO
 2  ==================================================================
 3  TASK LIST        RESOURCE START  WKS END     STAT  WK# 01 Apr  08 Apr
 4
 5  MAJOR TASK #1  SUMMARY  01 Apr  5  06 May Begun  0 XXXXXXXXXXXXXXXXXXXXXX
 6   SUBTASK #1A   SUMMARY  01 Apr  4  29 Apr Begun  0 ++++++++++++++++++++++
 7    Task 1        Cynthia 01 Apr  1  08 Apr Begun  0 >>>>>>>>
 8    Task 2        Jan     08 Apr  1  15 Apr Begun  1         >>>>>>>>
 9    Task 3        Jim     08 Apr  3  29 Apr Begun  1         >>>>>>>>>>>>>>
10   SUBTASK #1B   SUMMARY  08 Apr  4  06 May Next   1         ++++++++++++++
11    Task 1        John    08 Apr  1  15 Apr Next   1         >>>>>>>>
```

Figure B-11. *Calculating END dates*

The SUMMARY values in the records for major tasks and subtasks uses @MIN to calculate the earliest date in column E and @MAX to calculate the latest date in the appropriate column G.

```
A:E6: (D2) [W7] @MIN(E7..E9)                                        READY

 A  AB     C          D       E    F    G       H     I    J       K
 1                    SAMPLE PROJECT MANAGEMENT MACRO
 2  ==================================================================
 3  TASK LIST        RESOURCE START  WKS END     STAT  WK# 01 Apr  08 Apr
 4
 5  MAJOR TASK #1  SUMMARY  01 Apr  5  06 May Begun  0 XXXXXXXXXXXXXXXXXXXXXX
 6   SUBTASK #1A   SUMMARY  01 Apr  4  29 Apr Begun  0 ++++++++++++++++++++++
 7    Task 1        Cynthia 01 Apr  1  08 Apr Begun  0 >>>>>>>>
 8    Task 2        Jan     08 Apr  1  15 Apr Begun  1         >>>>>>>>
 9    Task 3        Jim     08 Apr  3  29 Apr Begun  1         >>>>>>>>>>>>>>
10   SUBTASK #1B   SUMMARY  08 Apr  4  06 May Next   1         ++++++++++++++
11    Task 1        John    08 Apr  1  15 Apr Next   1         >>>>>>>>
```

Figure B-12. *Calculating SUMMARY dates*

Before 1-2-3 can build a Gantt chart depicting the sequence of tasks in the schedule, it needs to assign a number to the week in which the task starts. The START date for the project serves as the baseline. The formula @ABS((+E9–32964)/7) in cell I9 calculates the difference between the START date for that task (32971 in cell E9) and the first START date for the project (32964) to derive the offset number of days and divides the remainder number of days by 7 to derive the offset week from the project START date. In this case, the new task begins in the first week of the project.

```
A:I9: (F0) [W3] @ABS((+E9 32964)/7)                                    READY

 A  AB    C          D       E   F   G      H   I    J      K
1                        SAMPLE PROJECT MANAGEMENT MACRO
2 ==========================================================================
3  TASK LIST      RESOURCE START  WKS END     STAT  WK# 01 Apr  08 Apr
4
5  MAJOR TASK #1 SUMMARY  01 Apr  5  06 May Begun  0 XXXXXXXXXXXXXXXXXXXXXX
6   SUBTASK #1A  SUMMARY  01 Apr  4  29 Apr Begun  0 ++++++++++++++++++++++
7    Task 1       Cynthia 01 Apr  1  08 Apr Begun  0 >>>>>>>>
8    Task 2       Jan     08 Apr  1  15 Apr Begun  1         >>>>>>>>
9    Task 3       Jim     08 Apr  3  29 Apr Begun  1         >>>>>>>>>>>>>>
10  SUBTASK #1B  SUMMARY  08 Apr  4  06 May Next   1         ++++++++++++++
11   Task 1       John    08 Apr  1  15 Apr Next   1         >>>>>>>>
```

Figure B-13. *Calculating START weeks*

When 1-2-3 calculates the offset week in cell I9 and the duration of the task in cell F9, it plots a string of characters in cell J9 representing the task. The first part of the formula in cell J9 multiples the string of spaces "   " by the offset week in cell I9. If the task starts in the third week of the project, the formula builds a string containing 24 spaces. The second part of the formula in cell J9 concatenates a series of Gantt symbols corresponding to the duration of the task specified in cell F9.

If the task is scheduled for two weeks, the formula builds a string consisting of 16 > (greater-than) symbols. The complete formula @REPEAT("   ")&@REPEAT(">>>>>>>>") builds a long label in cell I9 that displays the appropriate start date and duration for the task against the master timeline. Formulas calculating summary tasks in this illustration use @REPEAT and + (plus) sign or X for the differentiation of major and minor tasks.

```
A:J9: [W8] @REPEAT("        ",I9)&@REPEAT(">>>>>>>>",F9)            READY

 A  AB    C          D       E   F   G      H   I    J      K
1                        SAMPLE PROJECT MANAGEMENT MACRO
2 ==========================================================================
3  TASK LIST      RESOURCE START  WKS END     STAT  WK# 01 Apr  08 Apr
4
5  MAJOR TASK #1 SUMMARY  01 Apr  5  06 May Begun  0 XXXXXXXXXXXXXXXXXXXXXX
6   SUBTASK #1A  SUMMARY  01 Apr  4  29 Apr Begun  0 ++++++++++++++++++++++
7    Task 1       Cynthia 01 Apr  1  08 Apr Begun  0 >>>>>>>>
8    Task 2       Jan     08 Apr  1  15 Apr Begun  1         >>>>>>>>
9    Task 3       Jim     08 Apr  3  29 Apr Begun  1         >>>>>>>>>>>>>>
10  SUBTASK #1B  SUMMARY  08 Apr  4  06 May Next   1         ++++++++++++++
11   Task 1       John    08 Apr  1  15 Apr Next   1         >>>>>>>>
```

Figure B-14. *Calculating Gantt symbols*

To add new records or tasks to the schedule, you must perform two operations. First, insert an empty row in the worksheet. This creates a blank space in the worksheet, but the blank cells do not contain the formulas that you need to calculate dates or the Gantt string. Second, fill the empty cells with the formulas contained in the range called new task in cells A15..J15. The macro \I automates the task of inserting a new record that contains the appropriate formulas.

```
A:D17: [W9] '/wir                                                        READY

 A  AB     C          D       E    F    G      H    I    J       K
1                      SAMPLE PROJECT MANAGEMENT MACRO
2   ==================================================================
3   TASK LIST      RESOURCE START  WKS END     STAT  WK# 01 Apr  08 Apr
4
5   MAJOR TASK #1  SUMMARY  01 Apr  5  06 May Begun  0 XXXXXXXXXXXXXXXXXXXXXX
6    SUBTASK #1A   SUMMARY  01 Apr  4  29 Apr Begun  0 ++++++++++++++++++++++
7     Task 1        Cynthia 01 Apr  1  08 Apr Begun  0 >>>>>>>>
8     Task 2        Jan     08 Apr  1  15 Apr Begun  1         >>>>>>>>
9     Task 3        Jim     08 Apr  3  29 Apr Begun  1         >>>>>>>>>>>>>>
10   SUBTASK #1B   SUMMARY  08 Apr  4  06 May Next   1         ++++++++++++++
11    Task 1        John    08 Apr  1  15 Apr Next   1         >>>>>>>>
12    Task 2        Kyle    15 Apr  3  06 May Next   2                 >>>>>>
13    Task 3        Millie  08 Apr  4  06 May Next   1         >>>>>>>>>>>>>>
14
15    new_task     Name     start  wks********stat  ***    ERR
16
17    \I           /wir            Insert new row
18                 /cnew_task      Copy range new_task to new row
19                 {R 2}           Move pointer to task name
SMPSCHED.WK3
```

Figure B-15. *Automating record insertion with \I*

Using Sample Macro Files

The sample macros \G, \S, \D, \R, and \C presented in this appendix are in a macro library file called SAMPMACS.WK3. The sample application for project scheduling and the \I macro are in a worksheet file called SMPSCHED.WK3. "Running the Macros in SAMPMACS.WK3" explains the procedure for reading SAMPMACS.WK3 into memory with your other files so you can use the macros in the library as you work in the other files.

NOTE Before you can retrieve these files into 1-2-3, you must copy them from the installation directory (which contains the sample tutorial and macro files) to a local working directory to which you have write access. For more information on copying these sample files to a local directory, see the instructions in Chapter 1 of the *1-2-3 Tutorial*.

Running the Macros in SAMPMACS.WK3

SAMPMACS.WK3 is a useful illustration of a macro library file. One of the benefits of having multiple-sheet files and multiple files in memory in the 1-2-3 Release 3 family is that you do not need to keep your macros in the same worksheet or file your data is in.

For example, suppose you are working with a customer's database table file and a sales report file simultaneously. After reading SAMPMACS.WK3 into memory along with the other two files, you can use \C macro to adjust the column widths in any of the files active in memory. See the macro library file in Figure B-16.

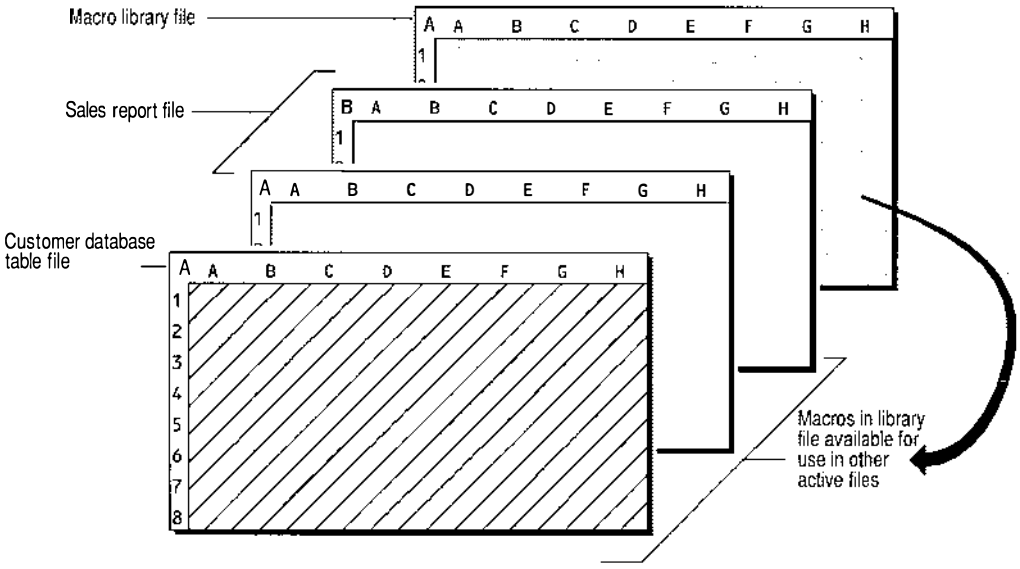


Figure B-16. *A macro library in memory with other files*

The following procedure applies to any macro library you create. Substitute the macro library name for SAMPMACS.WK3.

If the file(s) you want to work with is in memory, you can use /File Open to read SAMPMACS.WK3 into memory.

To run one of the macros in the library, move the cell pointer to the location in the file in which you want to run the macro.

1. Press RUN

   1-2-3 lists the names of all macros in the current file and the names of other active files.

2. Highlight <<SAMPMACS.WK3>> and press ENTER.

   1-2-3 lists the names of all macros in SAMPMACS.WK3.

3. Highlight the name of the macro you want to run and press ENTER.

   1-2-3 runs the specified macro in the current file.

NOTE Because all the macros in SAMPMACS.WK3 are named with a \ (backslash) and a single letter, you can also use ALT to start any of the macros in this library, as long as no other active files contain a range with the same name. To start a macro with the ALT key, press the ALT key and then press the letter of the macro's name. For example, to run macro \G, press the ALT key and then g.

Tips for Using a Macro Library

- In macros in a macro library, cell addresses and range names not preceded by a file reference refer to the current file, unless they specify a branch or subroutine location, in which case they refer to the macro library file (or whichever file contains the macro instructions currently being executed). For example, suppose the following macro is in a macro library:

  ```
  /rfc~TOTALS~
  {BRANCH NEXT_TASK}
  ```

  If you run the macro in file SALES, 1-2-3 looks for TOTALS in file SALES and NEXT_TASK in the macro library file.

- If you use a macro library with a specific .WK3 or .WK1 file, create in that file an autoexecute macro (a macro named \ 0) that selects /File Open and specifies the macro library as the file to open. For example, to read SAMPMACS.WK3 into memory whenever you retrieve a file named SALES, create the following macro in file SALES and name the macro \ 0:

  ```
  /foa{CE}SAMPMACS.WK3~
  ```

To have 1-2-3 read a macro library file into memory automatically whenever you start the program, name the file AUTO123.WK3 (for DOS-upper file mode) or auto123.wk3 (for UNIX or DOS-lower file mode) and save the file in the directory that 1-2-3 uses as its default file directory. (To check which directory is the 1-2-3 default directory, use /Worksheet Global Default Status.) You can also specify an autoexecute file on the UNIX command line with the command-line option -w. For more information about using the -w command-line option, see "Command-Line Options" in *Quick Reference*.

Using Macro Applications on a Network

The sample project schedule in SMPSCHED.WK3 illustrates a standalone macro application that is suitable for other users on a network. Often a work group uses the same data tables or reference files (like a project schedule) in the course of a week. One of the advantages of running 1-2-3 on a multiuser system is that a work group can open a copy of a project schedule along with other active files and refer to it as needed. The user or users with write-access can update the schedule each day so all members of the work group can refer to a current version of the shared document.

Appendix C
The Undo Feature

When the undo feature is on, you can use UNDO to reverse the effects of the most recent 1-2-3 operation that changed worksheet data and/or settings. This appendix describes the 1-2-3 undo feature and explains how to use it to cancel mistakes you make as you work.

If you press UNDO when 1-2-3 is in READY mode, 1-2-3 displays a No/Yes menu. Select No to return 1-2-3 to READY mode without undoing anything. Select Yes to undo the most recent 1-2-3 operation that changed worksheet data and/or settings, in other words, to restore whatever worksheet data and settings existed prior to that operation.

For example, suppose you accidentally write over a complicated formula by entering a number in the same cell as the formula. If the undo feature is on, using UNDO immediately after you enter the number erases the new entry and restores the formula in the cell. Or suppose you want to delete a particular range name but instead of selecting /Range Name Delete you inadvertently select /Range Name Reset, which deletes all range names in the current file. If the undo feature is on, you can instantly recover the deleted range names by using UNDO immediately after selecting /Range Name Reset.

UNDO is a valuable tool. Before you use UNDO, however, be sure to read the rest of this appendix, which provides details on how the undo feature works. If you are unfamiliar with these details, you may get unexpected results when you use UNDO.

Basic Information About Undo

The following list contains important information about the undo feature. Read this information carefully.

- Initially, the undo feature is off when you start 1-2-3. To turn the undo feature on so you can use UNDO to cancel mistakes, select /Worksheet Global Default Other Undo Enable. To start 1-2-3 with the undo feature on in future sessions, use /Worksheet Global Default Update after selecting /Worksheet Global Default Other Undo Enable.
- UNDO is not a toggle key. Using UNDO twice in a row does not restore the changes you undid the first time you used it.
- If you use UNDO after making a series of entries or edits during a command such as /Range Input or /Data Query Find, 1-2-3 undoes the entire series of changes, not just the final change.
- Any series of 1-2-3 commands performed after you press / (slash) to start using the 1-2-3 menus and before 1-2-3 returns to READY mode is treated as a single operation. So if you use UNDO immediately afterwards, 1-2-3 undoes the entire series of commands.

  For example, suppose you select /Graph, complete a series of Graph commands without leaving the /Graph menu, and then return 1-2-3 to READY mode. Using UNDO at this point undoes the entire series of Graph commands you completed. Similarly, if you select /Data Query, specify the input, criteria, and output ranges, and then extract data, all without leaving the /Data menu, pressing UNDO when you return 1-2-3 to READY mode undoes not only the data extraction but also the input, criteria, and output range specifications.
- If you use UNDO after running a macro that changes worksheet data and/or settings, 1-2-3 returns your data and settings to the state they were in prior to running the macro, regardless of how many individual changes the macro made.

- UNDO does not undo the following: changes made to files on disk with commands such as /Data External Create, /File Erase, /Graph Save, and /Worksheet Global Default Update; printer activity initiated with commands such as /Print Resume and /Print [E,F,P] Go, Align, and Line; cell-pointer movements made with the pointer-movement keys and GOTO; and formula recalculation caused by pressing CALC, entering data, or selecting /File Admin Link-Refresh.

- If you use UNDO after an operation that makes no changes to worksheet data or settings (for example, after /Worksheet Status or /File Xtract, after a macro that moves the cell pointer, or after pressing CALC), 1-2-3 goes back to the last operation that did change worksheet data or settings and undoes that operation.

  For example, suppose you perform a /Data Fill command, which changes worksheet data and settings, and then perform several /File Xtract commands, which make no changes to worksheet data or settings. If you then use UNDO, 1-2-3 undoes the /Data Fill command.

- The effect of using UNDO after you press ESC or BREAK to escape out of a command or macro depends on whether the command or macro changed any worksheet data or settings before you escaped out of it. If it did, 1-2-3 undoes those changes. If it did not, 1-2-3 undoes the previous operation.

  For example, in /Data Fill, specifying the fill range changes a worksheet setting. Therefore, if you escape out of a /Data Fill command after specifying the fill range and then use UNDO, 1-2-3 undoes the fill-range specification. On the other hand, if you escape out of a /Data Fill command before specifying the fill range and then use UNDO, 1-2-3 undoes the last operation you completed before selecting /Data Fill.

- UNDO does not undo commands or operations that you issue to a graphical window manager because UNDO does not keep a record on events that are not intrinsic to the 1-2-3 command set.

Turning Off Undo During a 1-2-3 Operation

When undo is on and you perform an operation that can be undone, 1-2-3 creates an undo history (a temporary backup copy of all data and/or settings affected by the operation) so it can restore your work to its previous state if you press UNDO. If, while undo is on, 1-2-3 runs out of available memory during an operation, 1-2-3 displays a 'Memory full' error message and erases the current undo history. The undo feature remains on, but you cannot use it to cancel an operation you performed prior to the 'Memory full' error message.

Memory-full errors related to the use of the undo feature usually occur during long macros and 1-2-3 commands that affect large amounts of data and worksheet settings, such as /File Open, /File Retrieve, /Worksheet Erase Yes, and /Data Fill (with a large fill range). If 1-2-3 displays a 'Memory full' error message during an operation for which it creates an undo history, try turning undo off and repeating the operation. Turning undo off increases the amount of memory available to 1-2-3 as it performs the operation.

Glossary

abbreviated cell address
A cell address that contains a cell's column letter and row number but not its worksheet letter. You use an abbreviated cell address to refer to a cell in the current worksheet.

absolute cell address
See absolute reference.

absolute range name
See absolute reference.

absolute reference
In a formula, a cell address that always refers to the same cell, or a range name or address that always refers to the same range, even if you copy or move the formula. In an absolute cell address, a $ (dollar sign) precedes the worksheet letter, column letter, and row number (for example, $A:$A$4). In an absolute range name, a $ (dollar sign) precedes the range name (for example, $INTEREST). For example, to calculate with a constant interest rate and varying principal amounts, you can create a formula that uses an absolute cell address to refer to the cell that contains the interest rate.

active area
The area bounded by A1 and the lowest and rightmost nonblank cell in the current worksheet.

active file
A 1-2-3 worksheet file in memory.

add-ins
Special programs created by Lotus and other software developers that you can use with 1-2-3 to extend its capabilities. Using the Add-In commands, you can attach an add-in when you need to use it and detach it when you need more memory for other tasks.

address
See cell address and range address.

advanced macro command
A macro instruction that tells 1-2-3 to perform a built-in programming function. Each advanced macro command consists of a keyword and its arguments (if any) enclosed in braces. {BRANCH TOTALS} is an example of an advanced macro command. See also macro, macro instruction, and autoexecute macro.

AIX
See Advanced Interactive eXecutive.

Advanced Interactive eXecutive (AIX)
AIX is a version of the UNIX operating system from IBM that runs on 80386-based PS/2 and RT personal computers and IBM's 370 mainframe series, which includes the 9370, 4381 and 3090 series. AIX is based on AT&T's UNIX System V with Berkeley extensions.

American Standard Code for Information Interchange (ASCII)
A standard character set many computers and communications devices use. LMBCS includes the ASCII character set.

anchor cell
The cell in which you begin to highlight a range in POINT mode.

application (software)
Software designed to perform specific tasks such as determining pension plan eligibility, cost analysis, spreadsheet operations, or database management.

area graph
A line graph in which a different hatch pattern or color fills the area between each line.

argument
A string, value, location (range name or range or cell address), or condition that you provide for an @function or advanced macro command. Arguments are what keywords and @functions act on. @Function arguments follow the @function name in parentheses and are separated by argument separators, for example, @SUM(B3..B25,D3..D25). Advanced macro command arguments follow the keyword and are separated by argument separators, for example, {GETLABEL "Monthly Totals",B2}.

argument separator
A punctuation mark that sets off one argument from another in an @function or advanced macro command and one range from another in some commands. Commas and semicolons are the initial valid argument separators.

arithmetic operator
See operator.

ASCII
See American Standard Code for Information Interchange.

ASCII file
A file that contains only ASCII characters. See also text file and American Standard Code for Information Interchange.

automatic graph
A graph 1-2-3 creates if you do not specify the graph data ranges with /Graph X and /Graph A — F. Cell-pointer location determines the data ranges graphed in an automatic graph.

autoexecute macro
A macro that 1-2-3 executes automatically after reading a worksheet file from disk. The range name \0 (zero) functions as the autoexecute macro in a worksheet file.

background printing
A feature that lets you continue working in a worksheet while 1-2-3 prints a graph or range.

background task
An active application or process that is not sending data to the terminal or current desktop window. This is also known as a noninteractive task.

background recalculation
A feature that lets you continue working in a worksheet while 1-2-3 recalculates formulas.

backup file
A file 1-2-3 creates when you save a file with /File Save or /File Xtract and specify an existing file name. 1-2-3 renames the copy of the file on disk with a .BAK extension and saves the active file with the current file name and extension.

bar graph
A graph that shows numeric data as a set of evenly spaced bars along the X axis. Each bar represents a value in the data range you are graphing.

batch program
An application that performs a task without requiring you to input data. The task is completed automatically. See also background task.

batch processing
An application or operating system architecture that allows a series of commands or procedures to be executed and managed by your system without your direct intervention. Often batch processes are run by your system at regular time intervals and perform routine maintenance or data processing tasks.

blank cell
A cell that contains no data and contains no formatting specifications other than the global settings in the worksheet.

border
See print border.

Bourne shell
A UNIX command processor that interprets your keyboard commands. See C shell and shell script.

branch
A macro command that permanently transfers control to a specified location. Unlike subroutine calls, branches do not return control to the original location.

broadcast message
An unsolicited message from the operating system that interrupts the current screen display. Generally these are informational messages.

browse
To scan a screen display as it scrolls vertically. Using the browse mode (in some systems), the user can display and edit fields horizontally as well as vertically.

byte pointer
A place marker in a text file that moves in increments of a byte to a new location in that file. 1-2-3 uses the byte pointer in some of the file-manipulation advanced macro commands.

C shell
A UNIX command processor that interprets your keyboard commands and includes many of the conventions available in the C programming language. See also shell.

cancel
To abandon a command before completing it.

case-sensitive
Describing a system or program where lowercase letters are distinguishable from uppercase letters. For example, XYZ.PIC and xyz.pic are two distinct files. The UNIX system is variously case-sensitive.

cell
The basic unit of the worksheet in which you enter data. The intersection of a column and a row forms a cell.

cell address
The location of a specific cell in a file identified by a worksheet letter, column letter, and row number (for example, A:A25 or L:BC36). See also abbreviated, mixed cell address, and absolute and relative reference.

cell format
The way 1-2-3 displays values on the screen. A number's cell format may differ from its value as entered; for example, the entry 25.451 may appear as $25.45, 2545%, or 25.4, depending on its cell format.

cell pointer
The rectangular highlight that indicates the current cell.

cell reference
The address or the range name of a cell used in a formula. Cell references can be absolute, relative, or mixed.

character set
The set of letters, numbers, and special characters available for use in a program. The 1-2-3 Release 3 family uses LMBCS. See also Lotus Multibyte Character Set.

circular reference
The result of a formula that refers to itself, either directly or indirectly. For example, a circular reference occurs if you enter the formula +B1+1 in cell B1.

clear
To reset a setting or range to the value or condition previously held before last change.

clipboard
A temporary storage buffer for objects that you delete or copy from a graphical desktop application.

clustered bar graph
A bar graph that displays more than one bar for each x-axis item. A number of bars, each representing a value in a different data range, appears for each item on the x-axis.

collating sequence
The sorting order 1-2-3 uses for letters, numbers, blank cells, and symbols when you sort using the Data commands.

column
A vertical block of 8192 cells in a worksheet. A column is one cell wide and runs the entire length of the worksheet. For example, column B contains cells B1 through B8192. A worksheet contains 256 columns.

column letters
The letters A through IV in the horizontal part of the worksheet frame. Each letter or pair of letters identifies one column (for example, column A or column BC).

column width
The number of characters that 1-2-3 can display in a column. The initial column width is 9 characters, but you can assign a column any width from 1 to 240 characters.

command
An instruction you give 1-2-3. To issue a command, you choose that command from the menu that appears in the control panel after you press / (slash) or < (less-than symbol), or you run a macro.

command line
The line following the operaitng system prompt on which you type commands you want to run.

command menu
See menu.

command processor
An operating system program that interprets commands that you type at the keyboard. A special character such as $ or # appears indicating that the command processor is ready to receive your next command.

command script
A file that contains commands that the operating system command processor executes.

compose sequence
A series of keystrokes beginning with COMPOSE that you use to produce a character that is not on your keyboard. For example, a bullet requires a compose sequence. You can use a compose sequence to produce any character in LMBCS.

computer graphics metafile
One of the two graph file formats available in 1-2-3. You can use a 1-2-3 graph in another program if you save it in graphic metafile format. A saved graph has the file-name extension .CGM.

concatenate
To join text with a string formula. The string formula +"Sales "&"Totals" concatenates the text inside the quotation marks to produce the label Sales Totals.

configuration settings
The default settings that control how 1-2-3 communicates with printers and disk drives and how it performs standard procedures. 1-2-3 stores configuration settings in the 1-2-3 configuration file `.1123.cnf`.

control codes
See printer control codes.

control panel
The top three lines of the 1-2-3 screen. The control panel displays the address of the current cell and its contents, the current mode, menus, prompts, and your responses to prompts.

criteria
Data you enter in a criteria range that 1-2-3 uses to select records from a database table during a Data Query or Data External Create command. You can use matching criteria, in which records must match the criteria you set, or formula criteria, in which records must match the results of logical formulas and @functions. See also criteria range, input range, and output range.

criteria range
The range you specify to contain criteria. The criteria range must contain exact copies of the field names from the input range. See also criteria, input range, and output range.

.cshrc
A file of default settings and aliases read by the C shell when setting up a new shell.

current cell
The cell that contains the cell pointer in READY mode and the cursor in POINT mode; its cell address appears in the control panel.

current directory
The directory that 1-2-3 automatically uses when you save, read, or list files. You set the current directory with /Worksheet Global Default Dir, which specifies the default directory; /File Dir changes the default directory for that session.

current file
The file that contains the cell pointer. See also cell pointer and current cell.

current graph
The graph that appears when you press **GRAPH** or select /Graph View or /Worksheet Window Graph.

current mode
The mode whose name appears in the upper right corner as you work in 1-2-3. See also mode and mode indicator.

current printer
The most recent printer you selected in a 1-2-3 session. You select a current printer with /Worksheet Global Default Printer Name, which specifies the default printer, or with /Print [E,P] Options Advanced Device Name, which changes the default printer for that session.

current worksheet
The worksheet that contains the cell pointer. See also cell pointer and current cell.

cursor
The blinking underscore that shows the position of the next character to be typed when you are entering data or editing an entry in the control panel. The cursor always appears in the current cell in READY and POINT modes.

data
Information you enter in a worksheet. You can enter two types of data in 1-2-3: labels and values. See also formula, label, and value.

database
A collection of database tables. See also database table.

database management program
A program that creates and manipulates database tables. For example, Sybase or Oracle is a database management program.

database table
A range of related data organized in rows and columns. The columns in the range are fields, each of which contains a specific type of information. The rows in the range are records, which contain an entry for each field. For example, a company's employee database table might contain fields such as Last Name, First Name, Job Title, and so on. Each record contains information about one employee.

data-input range
A range of unprotected cells into which you can enter data during a /Range Input command. Not synonymous with input range.

data labels
The labels you assign to bars or points in a graph.

Date format

The ways in which 1-2-3 can display a date on the screen. The following table lists the four Date formats:

	Date format	*Example*
1	DD-MMM-YY	18-Nov-89
2	DD-MMM	18-Nov
3	MMM-YY	Nov-89
4	Long Intn'l	11/18/89

See also date number.

date number

A number from 1 to 73050 that 1-2-3 assigns in sequence to each date from January 1, 1900 through December 31, 2099. Date numbers are used in calculations.

debug

To locate and make corrections in a macro so it performs correctly.

default

A value or setting provided by the system or user-defined that the user accepts by not entering a substitute value.

default directory

The directory 1-2-3 automatically uses when you save read and list files. You can specify a default directory with /Worksheet Global Default Dir. You can change the default directory used during a session with /File Dir. See also current directory.

default printer

The printer 1-2-3 automatically uses for printing when you start 1-2-3. Initially, 1-2-3 uses the printer you specified when you ran **`setup123`**, but you can change the default printer with /Worksheet Global Default Printer Name. You can change the printer used for a session with /Print Printer Options Advanced Device Name. See also current printer.

default setting
A setting 1-2-3 automatically uses until you change it. For example, the default column width (9) remains the same until you change it with /Worksheet Global Col-Width.

defined range name
A range name assigned to a range. See also undefined range name.

delimited text file
A text file that contains rows of numbers, literal strings, or both, with each number or literal string set off by delimiters. A delimiter is a , (comma), : (colon), ; (semicolon), or space. You can import a delimited text file into 1-2-3.

desktop window
A frame or panel created by a graphical desktop system.

directory
A subdivision of a disk. You can create and name a directory and store related files in it when you save the files on a disk; this makes the files easier to find. See also directory name.

directory name
The name of a directory. In UNIX versions of 1-2-3, a / (slash) separates the directory names in a path from each other and from the file name. For example, in **`/usr/apps/budget.wk3`** the directory names are **`/usr`** and **`/apps`**, and the file name is **`budget.wk3`**. See also directory.

disk drive
A piece of computer hardware that holds a disk that reads data stored on a disk into memory and saves new data from memory on a disk.

diskette
A magnetic storage medium for your files such as a 5.25" or 3.5" disk.

DOS-lower file mode
A feature in UNIX versions of 1-2-3 that lets users list, retrieve, or save worksheet files stored in lowercase characters in the MS-DOS file-naming convention (8.3, filename.ext).

DOS-upper file mode
A feature in UNIX versions of 1-2-3 that lets users list, retrieve, or save worksheet files stored in uppercase in the MS-DOS file-naming convention (8.3 filename.ext).

drive name
The two characters (a letter and a colon) that identify an MS-DOS disk drive. For example, C: is the name of drive C, a hard disk drive on an MS-DOS computer.

driver
A program that tells 1-2-3 how to communicate with a piece of computer hardware, such as a printer or terminal, or how to perform specific tasks, such as reading data in an external table. You select drivers with the **setup123** program.

driver configuration file
A file that contains an index of the drivers 1-2-3 uses. You create the file, which has a file-name extension of .DCF, when you use the **setup123** program.

dynamic linking
See spreadsheet.

Encapsulated PostScript file (EPS)
A file that is saved in EPS format, which is a subset of Adobe's PostScript standard. This file has an extension .EPS.

encoded file
A file created with /Print Encoded that can contain text, graphs, and special formatting characters for a specific printer. 1-2-3 gives encoded files the extension .ENC when you save them unless you provide a different extension with the file name.

entry
Data entered in a cell. Every entry is a label or a value.

environment variable
The definition of a command equivalency for the UNIX command shell.

EPS
See Encapsulated PostScript file.

error message
A message that appears in the lower left corner of the screen when 1-2-3 detects a mistake or cannot perform a task.

escape sequence
A string of ASCII characters beginning with the "escape" characters. Keyboards, devices, and communications programs use escape sequences to communicate.

extension
A . (period) followed by up to three characters at the end of a file name. When 1-2-3 creates a file, it automatically adds the extension .WK3 to worksheet files, .CGM to graph files, .PRN to text files, .ENC to encoded files, .BAK to backup files, and .TMP to temporary files. Except for backup and temporary files, you can override these extensions by entering your own extension when you save a file.

external database
A database maintained with a database management program other than 1-2-3. See also database and database management program.

external table
A database table in an external database. For example, a database table in *Sybase* or *Oracle* is an external table. See also database and external database.

field
A labeled column in a database table that contains the same kind of information for each record. For example, the Last Name field contains all the last names in a database table. See also database table and record.

field names
The labels in the first row of a database table that identify the contents of each field. For example, an employee database table usually contains field names such as First Name, Last Name, and Employee Number. See also field, record, and database table.

file
A named collection of data saved on disk. With 1-2-3, you can save a single worksheet or a number of worksheets in a worksheet file; text in ASCII format in a text file; graphs in a graph file; and text, formatting, and graphs in an encoded file.

file name
The name you give to a file when you save it to or read it from a disk. A file name can also include an extension.

file permissions
A set of permissions (or authorizations) assigned to each file and directory that determines which users have access to read, write, and execute its contents.

file reference
A file name and extension, with or without a path, enclosed in << >> (double angle brackets) and used in formulas and commands to refer to data in a file that is not current.

file system
The way the operating system collects, organizes, and stores its files in memory. For example, the UNIX system has hierarchical file management structures (directories and subdirectories).

first cell
The cell in the first row of the first column of the first worksheet of a range.

flow of control
The way in which control passes from one location to another during a macro. You use a flow-of-control advanced macro command to direct the transfer of control of a macro.

font
A typeface that 1-2-3 uses in printing files or graph text and for displaying graph text on screen.

footer
A line of text 1-2-3 prints above the bottom margin of each page.

foreground task
An active application or process that sends data to the terminal or current desktop window. This is otherwise known as an interactive task.

formula
An expression that performs a calculation on values in a worksheet. A 1-2-3 formula can include @functions and can be a numeric formula, a string formula, or a logical formula.

frame
See worksheet frame.

@function
A built-in formula that performs a specialized calculation. For example, the formula @SUM(B2..B15) uses the @SUM function to add the numbers in cells B2 through B15.

function keys
Keys on your keyboard that perform special 1-2-3 functions when used individually or in combination with the ALT key.

global setting
A setting 1-2-3 uses for entire worksheets or files.

graph file
A file where you store a graph for use outside of 1-2-3. 1-2-3 automatically gives graph files the .CGM extension when you save them, but you can override this extension by using /Worksheet Global Default Graph to select .PIC, or by including your own extension when you enter the file name.

graph settings
The options you specify when creating a graph, such as its type, orientation, scaling, and data ranges. You can save graph settings as a group to use again with new data.

graphical desktop
A window-based user interface that lets you execute and manipulate multiple applications running in separate windows.

group
Users who are identified as a group in their activities and have an assigned group name recognized by the system. Their access to files, applications, and permissions is determined by this identification.

hard disk
A permanent magnetic storage medium that has a much greater storage capacity than removable diskettes and is integrated with a computer system.

hatch pattern
The pattern that distinguishes one data range from another in bar and area graphs and one slice from another in pie charts.

header
A line of text that 1-2-3 prints below the top margin of each page.

Help
A series of context-sensitive screens that describe 1-2-3. To get help with the 1-2-3 feature you are using at any time, press **HELP**.

highlight
A distinctly colored background on the screen. In POINT mode, you expand the highlight with the pointer-movement keys and press ENTER to specify a range. The cell pointer, menu pointer, and indicators are also highlights. Highlight also means to position the menu pointer on a menu item or the cell pointer on a cell, or to expand the highlight in POINT mode.

high-low-close-open (HLCO) graph
A graph that tracks a measurable quantity that fluctuates during a specific period of time. You might use a high-low-close-open graph to track daily stock price fluctuations or weekly air temperature. Also called stock market graph.

HLCO graph
A high-low-close-open graph.

home directory
The default or login directory for the user to log into. The home directory is used primarily for personal files and other directories.

horizontal graph
A graph with a horizontal y-axis. In a horizontal graph, the usual orientation of the axes is rotated clockwise 90 . You can create a horizontal bar, HLCO, line, mixed, stacked bar, or XY graph.

icon
A pictorial representation of an object or concept. In onscreen displays, an icon can substitute for a verbal description, menu item, or file. A mouse is generally used to select an icon.

iconic interface
A user interface that displays icons to be selected by the user. See icon.

if-then-else
Processing that directs the flow of control in a macro according to whether a specified condition is true or false.

indicator
A highlighted word that provides information about program or special-key status. Status indicators appear at the bottom of the screen. Mode indicators appear in the upper right corner of the control panel.

initial settings
The default settings that come with 1-2-3. You can change most of these with 1-2-3 commands.

input cell
A cell in which 1-2-3 temporarily stores values while it performs calculations for creating a data table.

input range
The range you specify for 1-2-3 to search during a query. Not synonymous with data-input range.

International Standards Organization
An organization established in 1946 to promote the development of international standards for production and communication in broad areas of science and technology.

inverse video
See reverse video.

ISO
See International Standards Organization.

iterations
The number of times 1-2-3 recalculates formulas during a {RECALC} or {RECALCCOL} advanced macro command when the recalculation method is set to Rowwise or Columnwise, or when the worksheet contains a circular reference.

julian date
A date format in which the day (and month) of the year is represented by a number ranging from 1 to 366. Numeric positions in the format to designate a year can also be allotted.

kernel
In the UNIX operating system, the program that is always resident in memory and manages operations.

keyboard focus
The graphical desktop window currently displaying and interpreting what you type on the keyboard.

keyboard template
An overlay for a keyboard that indicates the key functions for specific operations.

keystroke instruction
A macro instruction that represents a key on the keyboard and duplicates its effect. When 1-2-3 reads a keystroke instruction in a macro, it performs as it would if you had pressed the corresponding key.

keyword
The first word in an advanced macro command. The keyword tells 1-2-3 what action to perform. In the command {INDICATE Parsing}, INDICATE is the keyword; it tells 1-2-3 to display the word Parsing as the mode indicator.

Korne shell
A UNIX command processor that combines the syntax and functions of both the Bourneshell and C shell.

label
An entry you begin with a letter or a label prefix.

label alignment
The way a label appears in a cell: left-aligned, right-aligned, centered, or repeating across the cell. Label prefixes control label alignment.

label prefix
One of the four characters that control label alignment or the character | (vertical bar) that suppresses printing of the cell's contents. You use label prefixes to indicate that you are entering a label and to specify its alignment. You must use a label prefix with label entries that begin with a number or with + $ (# . @ or $ (when the default currency symbol is $) if you want 1-2-3 to treat them as labels. The following table lists the label prefixes.

Label placement	*Alignment*	*Placement in cell*
'	Left-aligned	LABEL
^	Centered	LABEL
"	Right-aligned	LABEL
\	Repeating	LABELLABEL
|	Suppressed print	(not printed)

legend
The explanation of the patterns, symbols, or colors used to identify data ranges in a graph. The legends, patterns, symbols, or colors that appear beneath the graph.

LICS (Lotus International Character Set)

The 256 codes (0 to 255) Symphony and 1-2-3 Release 2 use to display, store, and print characters. LICS codes 32 through 127 are equivalent to ASCII and LMBCS codes 32 through 127.

line graph

A graph that represents numeric values as points along a line. A line graph is useful for showing change over time.

line printer

A text printer that produces documents at high speed.

linked files

Any two files, one of which (the target file) contains a formula that refers to data in the other (the source file).

literal string

Text (including letters, numbers, punctuation marks, spaces, and special characters) enclosed in quotation marks and used in string formulas, @functions, and macros.

LMBCS

See Lotus Multibyte Character Set.

logical formula

A formula that evaluates a condition by using a logical operator or a logical @function. A logical formula results in a value that you can use in other calculations (1 for true, 0 for false). For example, the formula +A2>8 returns 1 (true) when the value in A2 is greater than 8; it returns 0 (false) when the value in A2 is 8 or less.

logical operator

An operator you use in a logical formula to evaluate equality or inequality. The following table lists the logical operators.

Logical operator	*Meaning*
=	Equal to
<	Less than
>	Greater than
<=	Less than or equal to

(continued)

Logical operator	*Meaning*
>=	Greater than or equal to
<>	Not equal to
#AND#	Logical AND
#NOT#	Logical NOT

log in
The process of gaining access to a system by entering a user name or ID that is recognized by the system. A password is optionally required for the recognition process.

log out
The process of exiting your current user id.

long label
A label that is longer than a cell's column width. If the cells to the right are blank, the long label appears to extend into the next columns. If the cells to the right are not blank, 1-2-3 displays only as many characters as fit within the column width. When it cannot display the entire label, 1-2-3 stores the entire label.

loop
A set of macro instructions that executes repeatedly. You can use the advanced macro commands {FOR} and {BRANCH} to create a loop in a macro.

Lotus Multibyte Character Set (LMBCS)
The character set used in 1-2-3 Release 3, 1-2-3/M, 1-2-3 for VAX/VMS, 1-2-3 for ALL-IN-1, 1-2-3 for Sun, and 1-2-3 for System V. LMBCS includes all the characters contained in LICS, ASCII, and most other international character sets.

macro
A set of instructions for automating a 1-2-3 task. Macros include keystroke instructions and advanced macro commands. You can use a macro to enter data or to perform a series of 1-2-3 commands that will format worksheets or files, guide users through specific applications, calculate complex formulas with variable data, extract database table records for use in a report, and so on.

macro instruction
A keystroke instruction or an advanced macro command in a macro.

main macro
The macro that initiates a subroutine call, branch, or loop.

main menu
The first menu that appears in the control panel after you press / (slash) or < (less-than symbol) in READY mode. The main menu contains the top-level 1-2-3 commands.

mathematical expression
An arithmetic formula or algorithm that describes a relationship between two or more variables.

mathematical function
See mathematical expression.

memory
See RAM and virtual memory.

menu
A set of commands that appears in the control panel after you press / (slash) or < (less than) while in READY mode, or press RECORD.

menu pointer
The highlight you use to select a menu item and display its description.

mixed cell address
In a formula, a cell address that is part relative and part absolute. A $ (dollar sign) precedes the part of the address (worksheet letter, column letter, or row number) that is absolute. For example, if a formula in cell B:B2 contains the cell address A:A$1 and you copy the formula to cell G:G8, the cell address becomes F:F$1.

mixed graph
A graph that includes both lines and bars. A mixed graph can include up to three lines and three sets of bars.

mixed reference
See mixed cell address.

mode
A 1-2-3 condition in which you can perform a particular process. For example, when 1-2-3 is in READY mode you can type entries or commands. When 1-2-3 is in POINT mode you can specify a range by expanding the highlighted area and pressing **ENTER**. 1-2-3 uses the following modes: EDIT, FILES, HELP, MENU, POINT, STAT, WAIT, ERROR, FIND, LABEL, NAMES, READY, and VALUE.

mode indicator
The indicator, located in the upper-right corner of the control panel, that tells you the current mode.

monitor
A bitmapped or character video display of the screen images. Monitor also refers to the master program that controls the computer system operation.

monochrome
A black and white video display as contrasted with a color display.

Motif
An X-Windows graphical user interface developed by the Open Software Foundation and supported by several vendors for UNIX, VMS, and Ultrix workstations.

mouse
A hand-held mechanical or optical device that when moved on a grid pad controls the position of the pointer on the video screen display.

mouse-button
A button located on the workstation pointing device called the mouse. Typically mouse-buttons are referred to as LEFT-BUTTON, RIGHT-BUTTON, or MIDDLE-BUTTON. A mouse can operate mechanically (using a tracking ball) or optically (using an LED and mouse pad).

MS-DOS (Microsoft-Disk Operating System)
MS-DOS is the operating system developed by Microsoft Corporation that runs on IBM-compatible personal computers.

multitasking
A system's capability of simultaneously scheduling and processing more than one job.

multiuser
A system's capability of simultaneously handling the input and applications of more than one user.

named graph
A set of graph settings to which you have assigned a name. You can retrieve and display a named graph from any file and print a named graph from any active file. When you retrieve a named graph, its settings become the current graph settings.

nesting subroutines
Putting subroutine calls in subroutines is known as nesting subroutines. If 1-2-3 encounters a subroutine call while executing a subroutine, it transfers control to the subroutine specified in the subroutine call, performs the instructions there, returns to the first subroutine, finishes the instructions there, and finally returns to the main macro.

network administrator
The person in charge of performing administrative tasks on a network.

NFS
See Network File System.

Network File System (NFS)
A protocol developed by Sun Microsystems that permits users to gain transparent access to files on other systems on a network. The version of NFS running on PC-compatible systems is called PC-NFS.

nonblank cell
A cell that contains formatting that differs from the global settings in the worksheet and/or data.

noninteractive task
See background task.

numeric formula
A mathematical expression that uses arithmetic operators and/or @functions and results in a number.

numeric value
A number or numeric formula.

1-2-3 error
Any action that causes 1-2-3 to display an error message in the lower-left corner of the screen and change the mode indicator to ERROR.

100% graph
A graph that displays corresponding values in each data range as a percentage of the sum of all values.

Open Look
A graphical user interface style developed jointly by AT&T and Sun Microsystems.

Open Software Foundation (OSF)
An organization funded and technologically supported by IBM, DEC, Apollo, Hewlett-Packard, Siemens AG, Nixdorf AG, and Group Bull of France, whose charter is to develop an open and standard version of UNIX.

Open System Interconnection
A seven-layer model developed by the International Standards Organization to be a standard approach to network design for communications systems worldwide. The layers are named (from the outermost to the innermost): Application, Presentation, Session, Transport, Network, Link, Physical. See also the International Standards Organization.

operating system
A collection of programs that manages memory and the way application programs (such as 1-2-3) run on your computer.

operator
A symbol you use in a formula to indicate the relationship between two values or the operation to be performed. 1-2-3 uses logical operators, the string operator (&), and the standard arithmetic operators: + (addition), – (subtraction), * (multiplication), / (division), and ^ (exponentiation).

optimal recalculation
A 1-2-3 feature that speeds up recalculation by recalculating only those formulas that are in new worksheets or that have been affected by a change in a file.

orientation
The placement of the y-axis in a graph as either vertical (default) or horizontal, or the placement of a printed range on a page in either portrait mode or landscape mode.

OSF
See Open Software Foundation.

OSI
See Open System Interconnection.

output range
The range into which 1-2-3 places records it extracts from a database table during a /Data Query command.

overlay
See keyboard template.

path
The root directory and all the subdirectories in which you save a file. In **`/usr/apps/budget.wk3`**, **`/usr/apps`** is the path for the file **`budget.wk3`**.

PC-NFS
Personal Computer Network File System. See Network File System.

perspective view
A screen display in which three or more consecutive worksheets appear stacked at a slope up and to the right.

picture file format (.PIC)
One of two graph file formats available in 1-2-3. You can print a graph with the PrintGraph program (in 1-2-3 Release 2 and Release 1A) if you save it in picture file format.

pie chart
A graph that compares parts to the whole. In a pie chart, each value in the A data range is a slice of the pie. The size of each slice corresponds to the percentage of the total each value represents.

pipe
A connection between the output of one function or program and the input of another. The pipe symbol in a command line is a split vertical line (|). A pipe is also called a pipe connection.

point
See byte pointer, cell pointer, and menu pointer.

pointer-movement keys
Keys that control the movement of the cell pointer, menu pointer, and cursor. These keys include ← → ↑ ↓ PGUP, PGDN, HOME, and the combination pointer-movement keys that you use by using these keys in combination with control keys and END to move around active files.

POSIX
(Portable Operating System Interface for uniX) An IEEE standard that defines the language interface between application programs and the UNIX operating system. Use of the standard in the development of UNIX programs ensures their compatibility when they are moved from one UNIX computer to another

PostScript
Adobe PostScript is a programming language designed to convey a description of virtually any desired page layout to a printer.

precedence number
A number that represents the order in which 1-2-3 performs operations in a formula. The lower the precedence number, the earlier 1-2-3 performs the operation.

precision
The degree of discrimination with which a quantity is stated. The more digits, the greater the precision.

presentation graphics
In computer graphics, high quality graphics that visually present complex relationships to aid in understanding and decision making.

print border
Rows or columns that 1-2-3 prints on every page above and/or to the left of each print range.

printer control codes
A code that tells a printer to print in specialized ways. To send a printer control code to a printer with 1-2-3, you use /Print [E,P] Options Setup and enter a setup string or a number of setup strings. You must consult your printer manual for the printer control codes that work with your printer.

printer queue
A temporary lineup of print jobs waiting to print on a specific printer.

print file (.PRN)
A text file you create with /Print File. Print files contain data, but not graphs or formatting codes. You can print a print file on screen and on most printers from the operating system. Print files have the file-name extension .PRN.

print job
Ranges of data, graphs, and/or blank lines that 1-2-3 sends to a print spooler, text file, or encoded file.

print settings
The options you specify for a print job. Special fonts, margins, headers, and character spacing might be included in a print job's print settings. If you save print settings as a group with a print settings name, you can use them again with different print jobs without having to respecify them.

print spooler
A program that stores data you select to print until you complete a print job, which the spooler then prints.

process control
The automatic control of a process by a computer system as in manufacturing or scientific research.

prompt
A message 1-2-3 displays in the control panel that requests information necessary to complete a command.

protect
To prevent changes to a range, worksheet, or file.

RAM (random access memory)
The temporary storage area in which your computer holds both programs and data.

range
A cell or rectangular or cubic group of adjoining cells within a file.

range address
The location of a range in a file. A range address consists of the cell addresses of any two diagonally opposite corner cells of the range, separated by two periods (for example, A:A12..M:C20).

range name
A name you create with /Range Name Create or /Range Name Labels to identify a range. A range name can be up to 15 characters long. You can use range names in formulas and commands to refer to cells. See also defined range name and undefined range name.

raster graphics
A form of computer graphics in which the image is composed of a matrix of dots (pixels) on a screen grid (raster).

read
To copy a file from disk into memory.

read-only
A file access setting that permits a user to read a file, but not write to it or save it.

read permission
A file setting that permits a user to read a file, but not write to it or save it.

read-write
A file setting that permits a user to read a file and write or save to it.

recalculation
Re-evaluation of formulas in active files using the latest cell values.

recalculation method
One of two ways 1-2-3 can recalculate formulas in active files. Automatic recalculates formulas every time you enter data in a cell, and Manual recalculates formulas only when you press CALC.

recalculation order
One of three orders 1-2-3 uses to recalculate formulas in active files. Natural recalculates any values on which a specific formula depends before recalculating that formula, Column-wise recalculates by column, and Rowwise recalculates by row.

record
A one-row collection of information about one item in a database table. The first row of a database table contains field names; all other rows contain records.

record buffer
A 512-byte area in memory where 1-2-3 stores the keystrokes you use during a 1-2-3 session.

record feature
A feature that lets you use keystrokes from the record buffer to automate entering data and creating macros.

refresh rate
In computer graphics, the rate per unit of time it takes to regenerate (or refresh) a screen display image.

relational

relative cell address
See relative reference.

relative reference
In a formula, a reference to a cell or a range that changes when you copy the formula. The reference can be an address or range name. A relative cell address refers to the relative positions of the original cell to the original formula. In cell D1, the cell address A1 refers to the value in the cell three columns to the left. If you copy the cell address to cell E2, 1-2-3 still uses the value in the cell three columns to the left — cell B2. If you do not want a cell or range address to change when you copy it, use an absolute reference. See also mixed cell address.

repeating label
A label that repeats across the entire width of a cell. You create a repeating label with the \ (backslash) label prefix. For example, entering \- in a cell prints a succession of hyphens across the cell.

reservation
A guarantee that a user who has changed a file can save the changes to the file on disk.

reserved word
A word in a programming language specifying an action or function and restricted to that use. The word cannot be employed by a user for any other use.

reset
To clear a setting or restore default settings.

retrieve
To read a 1-2-3 file from a disk into memory, making it the current file. Retrieving a file replaces the previously current file.

reverse video
A display mode that reverses the contrast between the screen background and the text. If background is light and text is dark, you can reverse this by making the screen dark and the text light. This applies to both monochrome and color screens.

ripple-through effect
When one formula depends on another formula that evaluates to ERR or NA, the first formula will also result in ERR or NA. This is called the ripple-through effect. When you correct the formula that evaluates to ERR or provide the unavailable value to the formula that contains NA, the results of dependent formulas also change.

root
The name of the user account that has all privileges.

root directory
The top level of the system directory hierarchy.

row
A horizontal block of 256 cells in a worksheet. A row is one cell high and runs across the entire width of the worksheet. For example, row 4 contains cells A4..IV4. There are 8192 rows in a worksheet.

row numbers
The numbers 1 through 8192 in the vertical part of the worksheet frame, each identifying a row.

save
To copy a file or new worksheets from memory to disk.

screen
What appears on the monitor during a 1-2-3 session, including the worksheet area, the control panel, and the status line. Screen also refers to the part of the terminal's monitor through which you view your data.

scrolling
Moving a worksheet horizontally or vertically through a screen, or moving the cell pointer from one worksheet to another. To scroll through a worksheet, use , , , , PGUP, PGDN, BIG RIGHT, and BIG LEFT. To scroll through a number of worksheets, use NEXT SHEET and PREV SHEET. To scroll through files, use NEXT FILE and PREV FILE.

SCSI
See Small Computer System Interface.

sealed file
A file that was sealed with /File Admin Seal to prevent changes from being made to some of its graph, print, range, worksheet, and reservation settings.

search path
A list of directories that UNIX searches for commands and applications. The search path is usually located in a `.cshrc`, `.profile`, or `.login` file.

security
The establishment and application of safeguards to protect data from activity by unauthorized users.

select
To choose a menu item by highlighting it with the menu pointer and pressing ENTER or by pressing the first character of the item.

serial port
The port (connection) where you plug in serial a cable.

setup string
A series of characters preceded by a \ (backslash). One or a number of setup strings represent a printer control code.

shell
The system interface of UNIX that interprets the commands. The shell command interpreter is the default environment under which UNIX systems operate. The shell can interpret commands directly from the terminal or from command files. You can access the UNIX shell from within 1-2-3 by using the /System command.

shell script
A file containing commands and procedures to be intrepreted by the UNIX C shell, Bourne shell, or Korne shell.

Small Computers System Interface
An interface standard for a personal computer that connects up to seven peripheral devices.

sort
To arrange the records in a database table in a particular order, determined by the contents of one or more fields. For example, you can sort records in an employee database table alphabetically by last name or chronologically by date of hire. 1-2-3 sorts data in ascending (A through Z, 0 through 9) or descending (Z through A, 9 through 0) order.

source cell
A cell that contains data to which a formula in another cell (the target cell) refers. When a formula refers to a source cell in a different file, the files are linked.

source file
A file that contains the cell or range that a formula in another file (the target file) refers to (and therefore links); also, the file you translate into another file format using the Translate utility.

specify
To delineate (ranges, column widths, and so on) by typing, highlighting, or selecting with the menu pointer and pressing ENTER.

spreadsheet
A tool used in financial analysis and modeling that establishes mathematical and logical relationships among numbers and formulas that appear in rows and columns. The 1-2-3 worksheet can be used as an electronic spreadsheet.

spreadsheet window
A division of the screen that displays part of the current worksheet or a graph. 1-2-3 Release 3 can display two horizontal or vertical windows that contain different worksheets, different parts of the same worksheet, or a worksheet and a graph. It can also display three windows in perspective view.

SQL
See Structured Query Language.

stacked bar graph
Like a bar graph, a stacked bar graph displays bars at evenly spaced intervals for each item on the x-axis. Each bar is composed of differently hatched or colored sections, each of which represents a value in one of the data ranges.

status indicator
An indicator that appears at the bottom of the screen and describes a program state or special-key condition. For example, the CIRC indicator tells you that a circular reference exists, and the END indicator tells you that you pressed the END key.

status line
The last line of the 1-2-3 screen, which displays information about the current file and program status.

stock market graph
See high-low-close-open graph.

string
A literal string, string formula, label, or reference to a cell that contains a label.

string formula
A formula that calculates using strings. The string formula +"Yearly "&"Sales" combines the text inside the quotation marks to produce the label Yearly Sales.

string operator
The & (ampersand) is the only string operator. It combines, or concatenates, two strings in a formula.

Structured Query Language (SQL)
A standard computer language for defining and accessing relational databases.

subdirectory
A subdivision of another directory.

subroutine
A discrete set of macro instructions executed from the macro. When the main macro calls the subroutine, control passes to the subroutine. After 1-2-3 completes the instructions in the subroutine, control returns to the main macro.

subroutine call
A macro instruction that transfers control to a subroutine and completes it before going on to the next macro instruction.

summary worksheet
A worksheet you create that consolidates related information from other worksheets.

super user
An individual who interacts with the computer at an application program level and has special privileges to perform functions that the ordinary user does not have the authorization to perform.

system administrator
The person in charge of performing administrative tasks on a system.

target cell
A cell that contains a formula that refers to another cell (the source cell).

target file
A file that contains a formula that refers to a cell (the source cell) or range in another file (the source file); also, the file you create when you use the Translate utility to translate a file into another file format.

temporary file (.TMP)
A file that 1-2-3 creates and uses for the current session only. A file that 1-2-3 creates when memory is full and a print job cannot fit in memory is an example of a temporary file. If 1-2-3 has to store the temporary file on disk, it uses the .TMP extension.

terminal emulation mode
The type of dumb terminal that your personal computer emulates when it is running terminal emulation software. If you are running a VT102 version of KERMIT on your IBM PC, your system is emulating the keyboard and display characteristics of a Digital VT102 terminal.

text collation
See collating sequence.

text file
A file that contains only ASCII characters. To create a text file in 1-2-3, use /Print File. See also print file.

~ (tilde)
The keyboard character that represents ENTER in macros.

Time format
One of the four ways 1-2-3 can display a time on the screen. The Time formats set the display of time numbers. The following table lists the four Time formats:

Time format		*Example*
1	HH:MM:SS AM/PM	8:45:23 PM
2	HH:MM AM/PM	8:45 PM
3	Long Intn'l	20:45:23
4	Short Intn'l	20:45

time number
A decimal from 0.000000 to 0.999988 that 1-2-3 assigns in sequence to each moment in the 24 hours from midnight through 11:59:59, for use in calculations.

title
Rows or columns frozen in place on the top and/or left of the worksheet, which always remain in view as you scroll through the worksheet.

2y-axis
A second y-axis you create in a graph.

typeahead buffer
The buffer in which 1-2-3 stores keystrokes you make during noninteractive parts of a macro.

undefined range name
A range name not assigned to a range.

UNIX
A multiuser, multitasking, time-sharing operating system that runs on a wide variety of computer systems and was developed by American Telephone & Telegraph.

UNIX file mode
A feature in Unix versions of 1-2-3 that lets users list, retrieve, or save any worksheet file saved with a valid Unix filename.

update
To modify data in a file or database. Updating implies file maintenance, in which records are added, changed, and deleted.

user name
Unique set of characters that identifies the user to the system.

utility
A program or subroutine developed to support the operation of the computer. Utilities perform generic processing jobs such as sorting and ordering of data.

value
A number or the result of a formula.

variable
A part of a formula for which other values can be substituted.

vector
A line designated by its end points (x-y or x-y-z coordinates).

virtual memory
A combination of the random access memory and memory-to-disk swap space available on workstations and large systems.

VTxxx
A class of terminals designed and built by Digital Equipment Corp. These terminals conform to ANSI standards for terminal displays and keyboards and can be used with any computer that requires ANSI compatibility.

what-ifs
Calculations that test the effect of using a number of different values in formulas to determine potential outcomes of different situations.

wild-card character
The * (asterisk) or the ? (question mark) in a file name, used to represent any single character (?) or any number of sequential characters (*) when listing files.

window
A division of the screen that displays part of the current worksheet or a graph. 1-2-3 Release 3 can display two horizontal or vertical windows that contain different worksheets, different parts of the same worksheet, or a worksheet and a graph. It can also display three windows in perspective view.

windowing environment
A computer that is running a graphical user interface that permits the display of (and user interaction with) multiple windows on screen.

worksheet
The electronic spreadsheet of 1-2-3. A worksheet contains 256 columns and 8192 rows. You use the worksheet to enter and manipulate spreadsheet data and database table entries.

worksheet file
A 1-2-3 file that is made up of one or more worksheets. Unless you provide a different extension, 1-2-3 gives worksheet files the .WK3 extension (in Release 3), the .WK1 extension (in Release 2), or the .WKS extension (in Release 1A).

worksheet frame
The part of the 1-2-3 screen that contains the current worksheet letter, the column letters (A through IV), and the row numbers (1 through 8192).

worksheet letter
The part of the cell address that identifies the worksheet. In E:C7, for example, the worksheet letter is E. The current worksheet letter appears in the upper left corner of the worksheet frame.

write permission
A file setting for a specific file that allows any user to write to that specific file.

/X commands
Macro commands that 1-2-3 Release 3 supports to provide compatibility with prior releases. Each /X command has a corresponding advanced macro command.

XENIX
Microsoft Corporation's version of the UNIX operating system that runs on IBM compatible PCs. XENIX conforms to AT&T's System V Interface Definition (SVID) with additional enhancements such as graphics and networking.

X Windows
A graphical user interface standard developed by the Massachusetts Institute of Technology and distributed to vendors of graphical workstations.

XY (scatter) graphs
Similar to line graphs, XY graphs show how values change in relationship to other values; XY graphs, however, use a scaled x-axis as well as a scaled y-axis.

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