HP 95LX User's Guide



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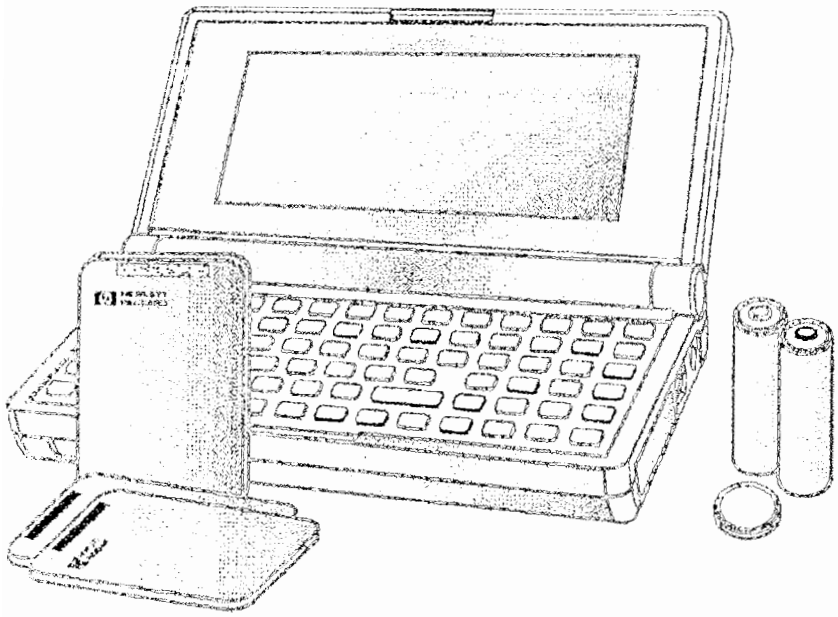
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Part 1

Getting Started



1 Getting Started

Before You Begin

Before you can use your HP 95LX, the batteries that came in the package with it must be installed. If you haven't already done so, follow the battery-installation instructions (along with the instructions for adjusting the display contrast, setting the time and date, and filling out the business card) at the beginning of the *HP 95LX Quick Start Guide*.

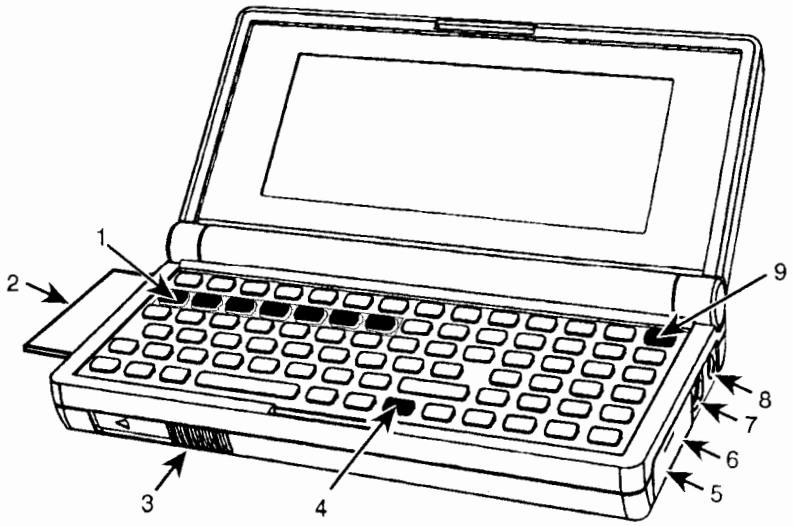
How to Use This Manual

This manual is divided into five parts and a set of appendixes:

- Part 1: Getting Started
- Part 2: Lotus 1-2-3
- Part 3: The Personal Information Manager
- Part 4: The HP Financial Calculator
- Part 5: Data Communications
- Appendixes:
  - A. Support, Batteries, and Service
  - B. MS-DOS Commands
  - C. Printing
  - D. Using RPN with the Calculator
  - E. HP 95LX Character Set
  - F. Lotus International Character Set (LICS)
  - G. TigerFox

Whenever you need information on a particular topic, go to the appropriate part of the manual. In addition to the table of contents at the beginning of this manual, there is a detailed subject index in the back of the manual to help you find information quickly and easily.

1 A Look at the HP 95LX



1. **Application keys**
2. **Plug-in card slot** (drive A:)
3. **Card-eject slide switch**
4. **Menu key**
5. **Backup battery cover**
6. **I/R port** (I/R radiates through the plastic)
7. **Serial port**
8. **AC adapter**
9. **ON key**

Hardware Features

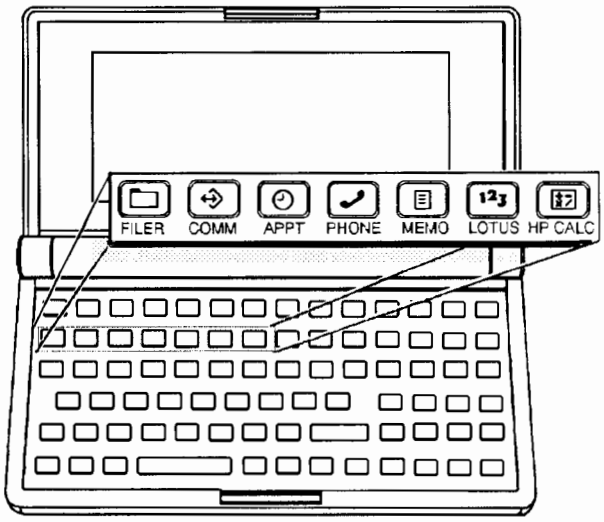
Your HP 95LX is a powerful, yet portable computer. It is so portable that it fits in the palm of your hand, enabling you to do your computing anytime, anywhere. Among its hardware features are:

- A rugged "clamshell" design, which protects the keyboard and display when you're on the go.
- A large, 40×16 display.

- A plug-in card slot, which enables you to use plug-in cards just like you would floppy disks on your PC.
- An Infrared (I/R) port for wireless HP 95LX to HP 95LX communications.
- A serial port for HP 95LX communications to a PC, a printer, or other serial devices.
- A typewriter keyboard layout with a "sticky" shift key—you don't need to hold down ⇧ while you press another key; you press it once to activate it and then press the other key. Shifted key definitions are shown in yellow on the keyboard.
- A separate numeric keypad for fast and easy numeric entry.

Software Features

The second row on the HP 95LX keyboard contains a set of blue application keys. These keys enable you to run the HP 95LX built-in applications.



- Pressing ▭ starts the Filer application, which lets you manipulate directories and files, including the transfer of files to and from another PC (chapter 20).

- Pressing [→] starts the Data Communications application, which lets you use your HP 95LX as a terminal (chapter 31).
- Pressing [🕐] starts the Appointment Book, which enables you to schedule and track appointments and "to do" list items (chapter 17).
- Pressing [☎] starts the Phone Book, which allows you to store and retrieve names, phone numbers, and other pertinent information (chapter 18).
- Pressing [📄] starts the Memo Editor, which enables you to create and edit memos, notes, letters, and other documents (chapter 19).
- Pressing [1 2 3] runs Lotus® 1-2-3® (chapters 2 through 16).
- Pressing [+ −] runs the Financial Calculator (chapters 22 through 30).
- Pressing [SET UP] ([⌂] [▭]) starts the Setup utility, which you use to configure various aspects of your system (chapter 21).

Note



Keep in mind as you learn about and use the built-in HP 95LX applications that help is always available within any of the applications by simply pressing the [F1] key ([CTRL]-[F1] in Datacomm).

A special feature of the HP 95LX software is the ability to switch from one application to another without having to close the first application. That makes it easy to interrupt your work temporarily and then find your place again with a minimum of disruption. For example, you could find yourself in the middle of editing a 1-2-3 worksheet when you want to check an appointment and phone number. You would simply press [🕐] to get into the Appointment Book to check your appointment; then press [☎] to get into the Phone Book; and then when you're done, press [1 2 3] to get back into 1-2-3 *exactly where you left off*.

Managing HP 95LX Memory

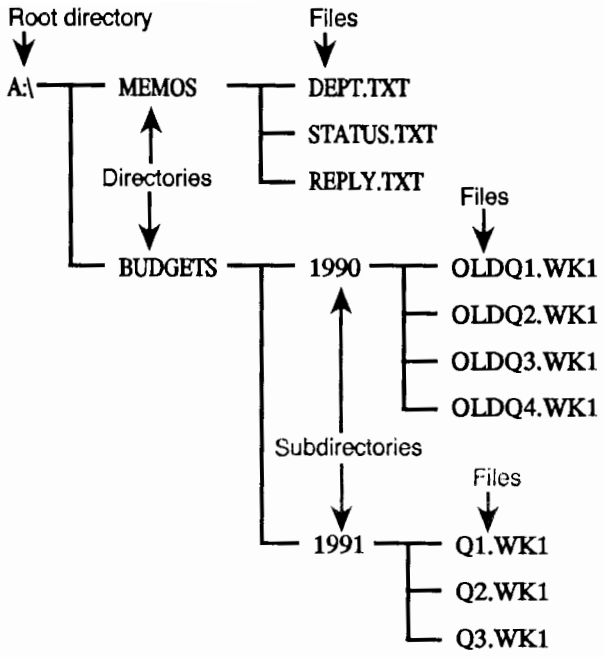
Lotus 1-2-3, the Financial Calculator, and the other built-in applications reside in ROM (Read-Only Memory). You can't erase or overwrite ROM—it's permanent. The temporary type of memory that you can erase and overwrite is called RAM (Random-Access Memory). In RAM you store programs, data files (for example, 1-2-3 worksheets), text files, etc.

When you're running an application, the part of RAM being used as your work area is called **system RAM**.

When you're finished working and want to save the file you worked on, you can save it to another part of RAM called the **RAM disk**, or you can save it to a plug-in **RAM card**.

- The RAM disk is designated drive C:, and you use it like you use a hard disk on a PC. When your HP 95LX was shipped, the size of the RAM disk was set to 254K bytes. (You can change the size of the RAM disk by following the instructions in chapter 21.)
- The plug-in RAM card is designated drive A:, and you use it like you use a floppy disk on a PC (see "Using RAM Cards" later in this chapter).

If you find your files on the RAM disk or RAM card become cluttered and keeping track of them difficult, you can divide them into directories and subdirectories for a more logical order. For example, a RAM card directory structure might look like this:



To save a new 1-2-3 worksheet called Q4.WK1 in the above structure, you would respond to the 1-2-3 Save prompt with `A:\BUDGETS\1991\Q4.WK1`. That would put the Q4.WK1 file with the other 1991 budget files in the subdirectory 1991, which is in the directory BUDGETS, which is on drive A:.

Note



Your HP 95LX was shipped with a directory on the RAM disk called _DAT. You should not remove or rename this directory because it is automatically used by several of the built-in applications.

MS-DOS directory- and file-naming conventions and limitations are described in appendix B.

Using RAM Cards

A RAM card plugged into your HP 95LX is designated drive A:, and you use it just like you would use a floppy disk on your PC. The previous example showed how you might save a worksheet to a file named Q4.WK1 on a RAM card.

Caution

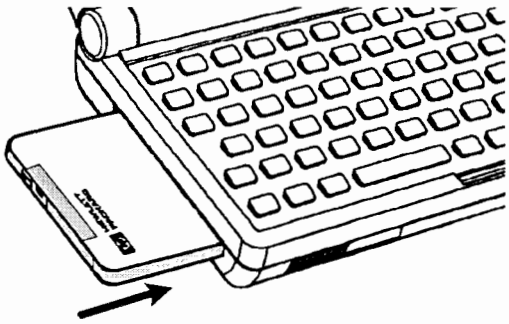


RAM cards supplied by Hewlett-Packard for the HP 95LX conform to the PCMCIA 1.0 and JEIDA 4.0 standards. Other suppliers' RAM cards may also conform to these standards, yet they could significantly shorten battery life in your HP 95LX. Therefore, we recommend that you use only HP RAM cards to ensure high quality, safe performance, and long battery life.

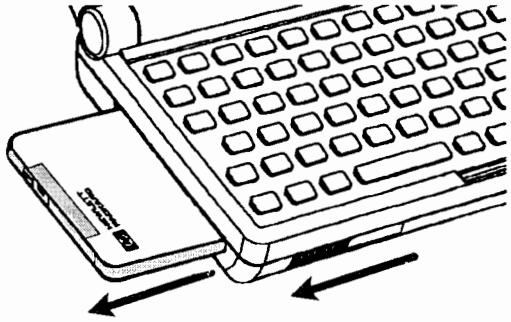
The HP 95LX supports RAM cards of up to 2 megabytes.

Inserting and Removing RAM Cards

To insert a card, hold it with the HP logo on top and push it in the slot on the left side of the HP 95LX until you feel that it won't go in any further. A fully-inserted card is almost flush with the HP 95LX case.



To remove a card, slide the card eject switch to the left and pull the card out:

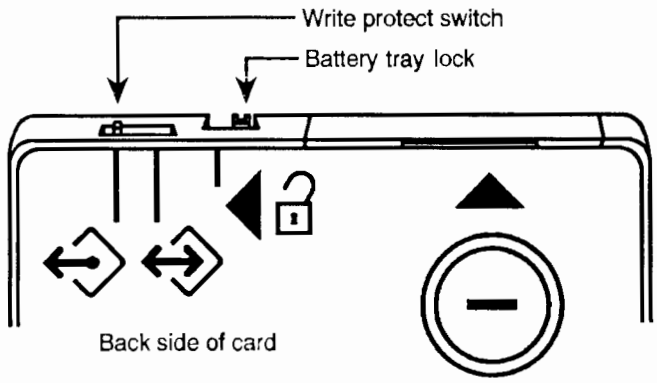


Preparing a RAM Card for Use

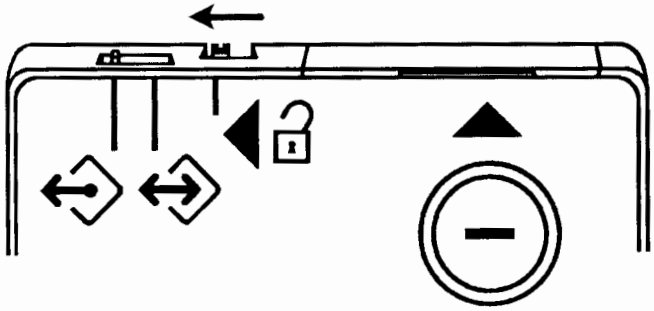
Before you can use a new RAM card, you must prepare it for use. (The following instructions are for *new* RAM cards. If you need to change the battery in a RAM card you've used before, refer to "Changing a RAM Card Battery" in appendix A.)

Installing the Battery in a New RAM Card. To install the battery in a new RAM card:

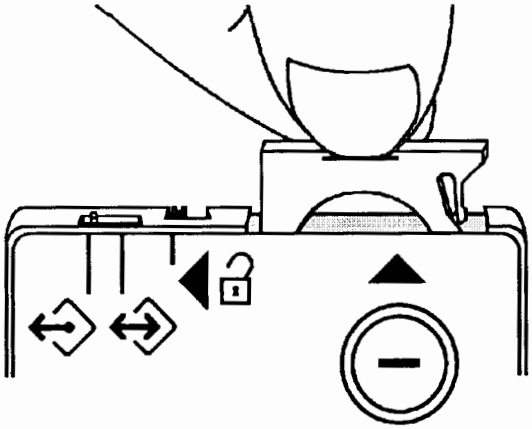
1. Locate the battery tray lock on the RAM card.



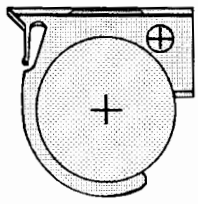
2. Unlock the RAM card battery tray.



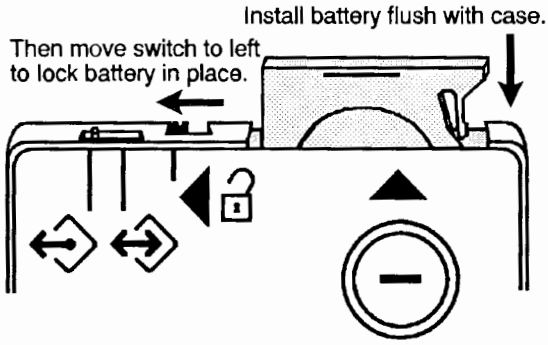
3. Pull the battery tray out of the card.



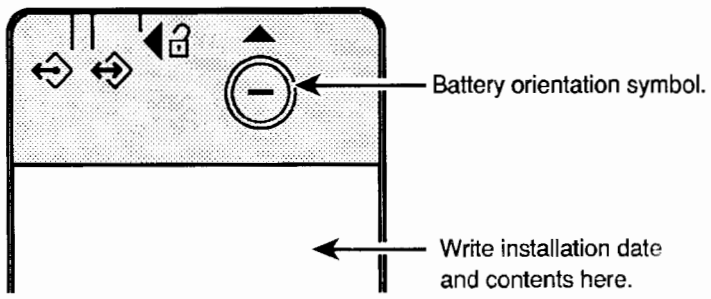
4. Insert the 3-volt CR2025 coin cell into the battery tray. Be sure the "+" on the battery is on the same side as the "+" on the battery tray.



5. Insert the battery tray back into the card—be sure the "+" side faces the front of the RAM card—and relock the battery holder.



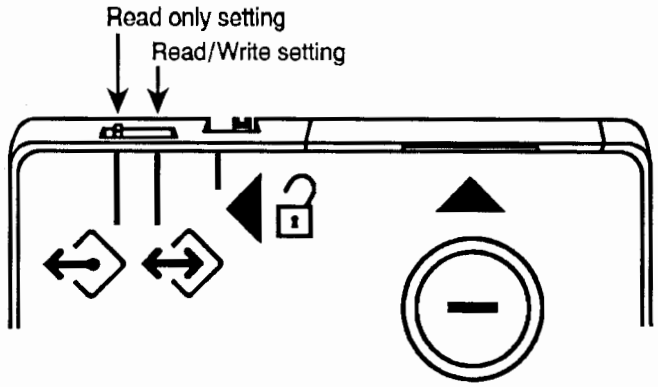
6. Write the date on the back of the card using a fine-point, permanent marker. The date is important because you should replace the RAM card battery a year after you install it.



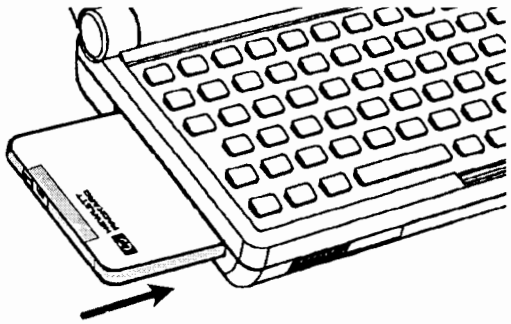
Setting the Write-Protect Switch. The write-protect switch lets you protect the contents of the RAM card from being accidentally overwritten or erased. The switch is located next to the battery lock and has two positions:

- Read-only. The contents of the RAM card can be read, but cannot be changed or erased.
- Read/write. You can write information to the RAM card and erase its contents.

Set the switch to the position you want. (For a new card you need to set it to read/write for formatting.) You can operate the write-protect switch while the card is installed; however, the switch labels are not visible. It might help you to remember that the position closest to the side of the card protects your data (read-only).



Inserting the Card into the HP 95LX. Holding the RAM card with the HP logo on top, insert it into the plug-in slot until you feel that it won't go in any further. A fully-inserted card is almost flush with the HP 95LX case.



Formatting the RAM Card. The last step before using a RAM card is formatting it.

1. Make sure the write-protect switch is set to read/write.
2. Press (SET UP).
3. Select Format and follow the instructions on the screen. (If you want to exit this screen without formatting the card, press (CTRL)-(C) or (CTRL)-(BREAK).)

4. When the formatting is complete, select Quit to exit the Setup utility.

At this point, the RAM card is ready for use.



Resetting Your HP 95LX

If your HP 95LX fails to respond to keystrokes or otherwise behaves unusually, you should reset it by doing a **system reset**. You perform a system reset by pressing CTRL, ALT, and DEL at the same time.

Caution



Resetting the system erases the contents of system RAM (but not the RAM disk). Therefore, any files or changes to files not already saved will be lost.

If a system reset doesn't work, as a last resort you can attempt a **hard reset** by pressing CTRL, ⇧, and ON at the same time. You will be asked whether or not you want to initialize the RAM disk, which erases its contents. If you type y (for yes) and press ENTER, a hard reset will occur; if you type n (for no) and press ENTER, a system reset is attempted and the time and date are reset.

Caution



A hard reset erases the contents of system RAM *and* the RAM disk. Therefore, you should use this procedure with the understanding that any open files as well as any files saved on the RAM disk will be lost.

Also, a hard reset causes any HP 95LX settings you changed via the Setup Utility to revert to their default states.

1

Activating Password Protection

You can protect your HP 95LX from being used by other people by setting a **password**. You can implement the password so that it operates in one of two ways:

- **Auto-lock mode**: Whenever the HP 95LX is turned off, times out, or is reset by a system reset, you must enter the password before you use it.
- **Manual-lock mode**: While holding down (ALT), press and release (OFF) to activate password protection. When the HP 95LX times out, is reset, or is turned off by just pressing (OFF), you *do not* need to enter the password to use the machine.

When password protection is activated and you turn on your HP 95LX, you must respond to the prompt by typing your password and pressing (ENTER) before you can use the unit.

A password can contain any combination of up to 12 characters (except control characters). Also, a distinction is made between uppercase and lowercase letters—for example, John as a password is different than JOHN, JoHn, or even john.

Caution



Take care that you remember your password. If you forget it, the only way to regain use of your HP 95LX is to remove the main batteries and backup battery and then reinstall them. *Removing all the batteries at once causes all files saved on the RAM disk to be lost.*

To set or change a password:

1. Close all open applications (use (MENU) Quit).
2. Press (▭) to start the Filer.
3. Select (MENU) System to get the MS-DOS command prompt.
4. Type PASSWORD and press (ENTER).
5. Follow the instructions on the screen. (Remember to press (ENTER) after each response to a prompt.)

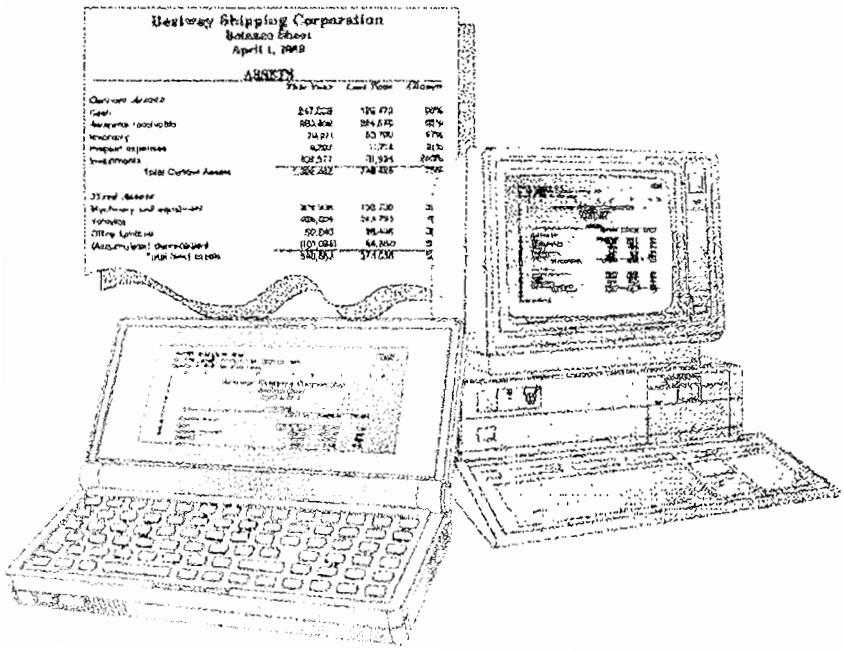
When you first set a password, it is automatically implemented in manual-lock mode—password protection is activated only when you press (ALT)-(OFF) to turn the machine off. You can change this to auto-lock mode, or deactivate password protection altogether, by following the next procedure.

To change the mode or deactivate password protection:

1. Close all open applications (use MENU Quit).
2. Press ▭ to start the Filer.
3. Select MENU System to get the MS-DOS command prompt.
4. Do one of the following:
   a. Type PASSWORD /A to implement auto-lock mode.
   b. Type PASSWORD /M to implement manual-lock mode.
   c. Type PASSWORD /D to deactivate password protection.
5. Press ENTER. (If you're deactivating password protection, you'll need to enter the password at this point.)

Part 2

Lotus 1-2-3



2

Using 1-2-3

This chapter explains the basic concepts you need to know to work with Lotus 1-2-3. For example, the chapter explains how to move around a 1-2-3 worksheet, enter data, select commands from 1-2-3 menus, specify ranges for commands and formulas, and work with 1-2-3 files—enough information to get you started quickly using 1-2-3.

Press [1²3] to start your 1-2-3 session.

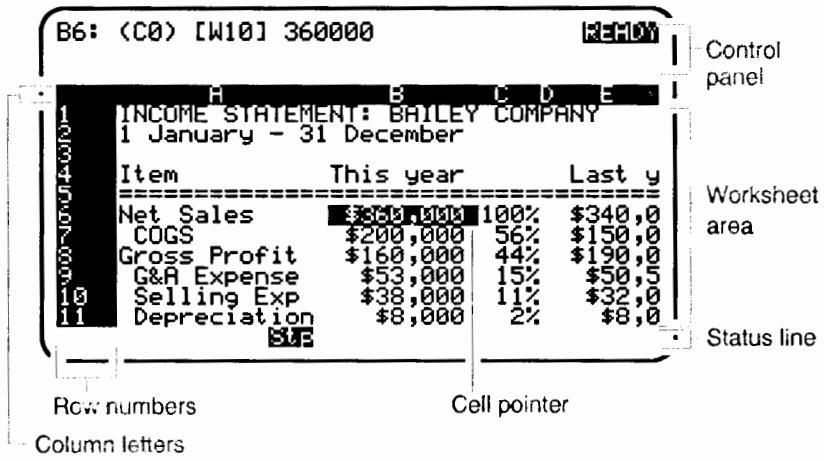
Note



Throughout the 1-2-3 documentation we direct you to press slash (/) to access 1-2-3 commands. The most convenient slash is probably the key labeled [MENU] (with the / printed below it) on the bottom of the HP 95LX keyboard. However, you can also use the divide key on the number pad. (You may also access 1-2-3 commands by pressing [<]).

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 HP 95LX screen displays 40 characters across and 16 rows of text; this is different from the 80 by 25 display that is common on a PC.

Note



Some macros that were written assuming an 80 x 25 display may exhibit unexpected behavior on the HP 95LX. (For example, {PGUP}, {PGDN}, {BIGLEFT}, and {BIGRIGHT} commands assume an 80 column display and may not function properly in a macro on the HP 95LX.)

The following sections describe each area of the screen.

The Worksheet Area

The **worksheet area**, which occupies the largest section of the screen, is where you enter and calculate data. It displays the section of the worksheet you are currently working on. In the screen above, the worksheet area displays part of an income statement.

The **worksheet** is a grid with a maximum size of 8,192 rows and 256 columns. Each intersection of a row and column forms a cell, in which you can store information.

A **row number** identifies a row in the worksheet. The number (from 1 to 8192) appears in the left border of the worksheet.

A **column letter** identifies a column in the worksheet. Columns are lettered A-Z, then AA-AZ, then BA-BZ, and so on to IV (letters appear in the top border of the worksheet).

A **cell** is a unit of the worksheet that stores data—formed by the intersection of a column and a row.

The **cell pointer** is a rectangular highlight that appears on one cell in the worksheet, identifies it as the current cell, and can move to any cell in the worksheet.

The **current cell** contains the cell pointer and indicates your location on the worksheet.

Note

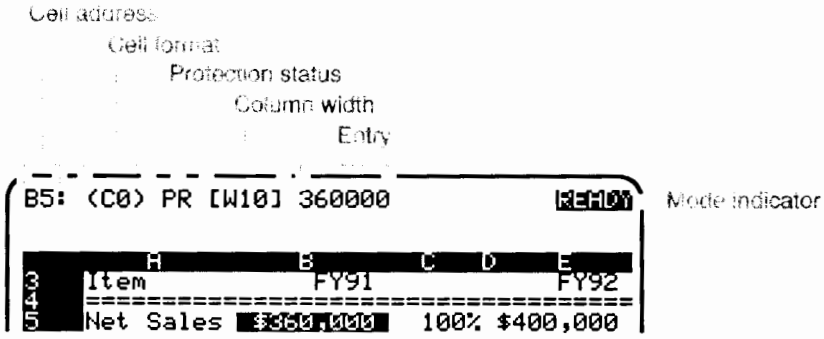


Error messages appear in a box in the center of the screen when 1-2-3 detects a mistake or cannot perform a task. If an error message appears, press HELP (F1) for a description of the error message and why it occurs; or press ESC or ENTER to clear the error and continue work.

The Control Panel

The **control panel** consists of three lines of information.

The first line of the control panel displays information about the current cell and the **mode**, or state, of 1-2-3. At the far left of the first line of the control panel, 1-2-3 displays the address of the current cell.



A **cell address** consists of the column letter and row number of a single cell. For example, B5 is the address for the cell at the intersection of column B and row 5.

After the cell address, 1-2-3 displays the following settings information for the current cell, from left to right:

2

- The **cell format**, which controls the way 1-2-3 displays values in the cell (if you used /Range Format to change the default cell format).
- The cell's **protection status** (if any), which determines whether you can make changes to the cell when worksheet protection is on. 1-2-3 displays U if you used /Range Unprot to unprotect the cell. 1-2-3 displays PR if you used /Worksheet Global Protection Enable to turn worksheet protection on.
- The cell's **column width**, which determines the number of characters 1-2-3 displays in the cell (if you used /Worksheet Column to change the default column width).

After the settings information, 1-2-3 displays the entry in the current cell, if any.

Our example shows cell B5 formatted as Currency with 0 decimal places, worksheet protection on, and a column width of 10. The cell contains the entry 360000.

At the far right of the first line of the control panel, 1-2-3 displays the **mode indicator**, which tells you what **mode**, or state, 1-2-3 is currently in. For example, when 1-2-3 is waiting for you to type or select a command, 1-2-3 is in READY mode and the mode indicator displays READY. For a complete list of the various 1-2-3 modes, see "Mode Indicators" later in this chapter.

Note

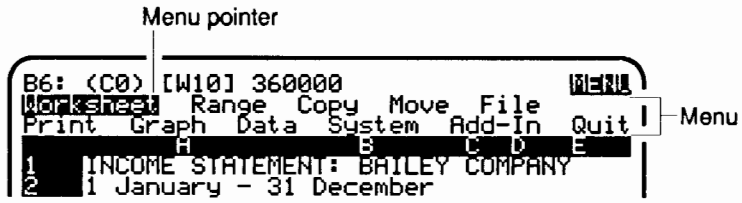


1-2-3 also uses the mode indicator to display indicators you create with the advanced macro command {INDICATE}. (For more information, see {INDICATE} in chapter 15.)

The second line of the control panel displays the current entry (when you are creating or editing it), or it displays menus (a list of commands that appear when you press MENU in READY mode).

Note

Because the HP 95LX screen is narrower than a full-size PC, 1-2-3 on the HP 95LX uses two lines for the menu choices.

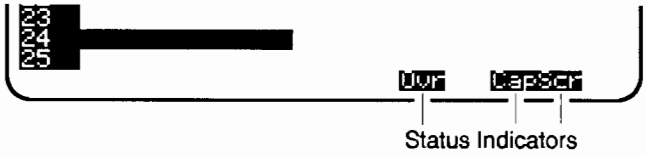


The rectangular highlight that appears on one of the commands in the menu is called the **menu pointer**. The second line of the control panel may also display **prompts**, or requests for information that 1-2-3 needs to complete the command you have selected.

The third line of the control panel displays more menu selections or may be empty.

The Status Line

The **status line** is the last line of the screen. 1-2-3 uses the status line to display various status indicators.



A **status indicator** appears on the screen when you use certain 1-2-3 keys and when a particular program condition exists. For example, the CAP indicator tells you that CAPS lock is on. For a complete list of indicators, see "Status Indicators" later in this chapter.

1-2-3 Indicators

An **indicator** is a highlighted word that 1-2-3 displays to provide you with information about the program or special keys. 1-2-3 has two types of indicators: mode and status.

2

Mode Indicators

During a 1-2-3 work session, a **mode indicator** is always visible at the far right of the first line of the control panel. It tells you what mode, or state, 1-2-3 is currently in. The various 1-2-3 modes are described below.

Mode Indicator	Meaning
EDIT	You pressed EDIT (F2) to edit an entry.
ERROR	1-2-3 is displaying an error message. Press HELP (F1) to display a Help screen that describes the error; or press ESC or ENTER to clear the error message.
FILES	1-2-3 is displaying a menu of file names in the control panel. Press NAME (F3) to display a full-screen menu of file names.
FIND	You selected /Data Query Find, or pressed QUERY (F7) to repeat the last /Data Query Find you specified, and 1-2-3 is highlighting a database record that matches your criteria.
FRMT	You selected /Data Parse Format-Line Edit to edit a format line.
HELP	You pressed HELP and 1-2-3 is displaying a Help screen.
LABEL	You are entering a label.
MENU	You pressed slash (MENU) and 1-2-3 is displaying a menu of commands.
NAMES	1-2-3 is displaying a menu of range names, graph names, or attached add-in 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	You selected /Worksheet Status or /Worksheet Global Default Status and 1-2-3 is displaying the corresponding status screen.
VALUE	You are entering a value (a number or formula).
WAIT	1-2-3 is completing a command or process.

Status Indicators

Status indicators appear in the status line at the bottom of your screen when you use certain 1-2-3 keys and when a particular program condition exists. The various 1-2-3 status indicators are described below.

Status Indicator	Meaning
Calc	Formulas in the worksheet need to be recalculated; press CALC ([F9]).
Cap	The [CAPS] lock key is on.
Circ	The worksheet contains a formula that refers to itself (occurs only when the recalculation order is Natural, which is the default setting). You can use /Worksheet Status to get information about the circular reference.
Cmd	1-2-3 is pausing during a macro.
End	The [END] key is on.
Learn	You pressed LEARN ([ALT]-[F5]) to turn on the learn feature and 1-2-3 is recording your keystrokes in the learn range.
Mem	The amount of computer memory available for entering new data has fallen below 4096 bytes. If you continue to enter data without first increasing the amount of available memory, you may get a `Memory full` error. For ways to increase available memory, see chapter 1.

Ovr	The INS key is off. Instead of inserting the character you type to the left of the cursor, 1-2-3 writes over (called overstriking) the character at the cursor.
Ro	The worksheet has read-only status (you cannot save any changes you make unless you save the worksheet with a new file name).
Scr	The SCRL lock key is on. Using the pointer-movement keys scrolls the worksheet in the direction indicated, instead of moving the cell pointer.
Sst	A macro being executed in single-step mode is waiting for user input.
Stp	Single-step mode has been turned on; once invoked, macros are processed one step at a time.
Undo	You can press UNDO (ALT-F4) to cancel any changes made to your worksheet since 1-2-3 was last in READY mode.

1-2-3 Keys

This section contains descriptions of all the keys you can use in 1-2-3: keys for moving around (pointer-movement keys), function keys, and special keys.

Key Conventions

The 1-2-3 documentation uses the following conventions when indicating keys for you to press:

- When there is a hyphen between two keys, such as ALT-F3, press and hold down the first key, press the second key, and then release both keys.
- When two keys are separated by a space, such as END HOME, press the first key, release it; press the second key, and release it.

Keys for Moving Around

The **pointer-movement keys** allow you to move around in 1-2-3. These keys have different effects depending on the 1-2-3 mode. In READY and POINT modes, for example, you use the pointer-movement keys to move the cell pointer around the worksheet. In EDIT mode, however, you use the pointer-movement keys to move the cursor in the second line of the control panel so you can edit an entry.

The pointer-movement keys and the effect of pressing these keys in a particular mode are described below.

Name	Mode	Description
◀	READY and POINT	Moves cell pointer left one column.
	MENU and HELP	Moves menu pointer left one item. If menu pointer is highlighting first item in a menu or Help screen, pressing ◀ moves it to last item.
	FILES and NAMES	Moves menu pointer left to next name.
	EDIT	Moves cursor left one character.
	VALUE	When pressed after typing + − / ^ (or * in a formula, switches 1-2-3 to POINT mode.
▶	READY and POINT	Moves cell pointer right one column.
	MENU and HELP	Moves menu pointer right one item. If menu pointer is highlighting last item in a menu or Help screen, pressing ▶ moves it to first item.
	FILES and NAMES	Moves menu pointer right to next name.
	EDIT	Moves cursor right one character.
	VALUE	When pressed after typing + − / ^ (or * in a formula, switches 1-2-3 to POINT mode.

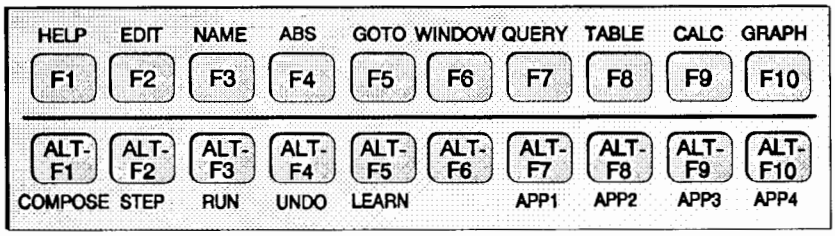
Name	Mode	Description
▲	READY and POINT	Moves cell pointer up one row.
	HELP	Moves menu pointer up one topic.
	FILES and NAMES	Moves menu pointer up to previous line of names.
	EDIT	Completes editing and moves cell pointer up one row.
	VALUE	When pressed after typing + − / ^ (or * in a formula, switches 1-2-3 to POINT mode.
	FIND	Moves cell pointer to previous record that meets criteria.
▼	READY and POINT	Moves cell pointer down one row.
	HELP	Moves menu pointer down one topic.
	FILES and NAMES	Moves menu pointer down to next line of names.
	EDIT	Completes editing and moves cell pointer down one row.
	VALUE	When pressed after typing + − / ^ (or * in a formula, switches 1-2-3 to POINT mode.
	FIND	Moves cell pointer to next record that meets criteria.
⏮	READY	Moves cell pointer left one screen.
	FILES and NAMES	Moves menu pointer to first name in current line.
	EDIT	Moves cursor left five characters.
BIG LEFT (CTRL)-◀	READY and POINT	Moves cell pointer left one screen.
	FILES and NAMES	Moves menu pointer to first name in current line.
	EDIT	Moves cursor left five characters.

Name	Mode	Description
BIG RIGHT (CTRL-▶)	READY and POINT	Moves cell pointer right one screen.
	FILES and NAMES	Moves menu pointer to last name in current line.
	EDIT	Moves cursor right five characters.
END	READY and POINT	Must be used in combination with another pointer-movement key.
	MENU	Moves menu pointer to last item.
	HELP	Moves menu pointer to last topic.
	FILES and NAMES	Moves menu pointer to last name.
	EDIT	Moves cursor to end of entry.
	FIND	Moves cell pointer to last record that meets criteria.
END-◀	READY and POINT	Moves cell pointer left to intersection of a blank and a nonblank cell.
END-▶	READY and POINT	Moves cell pointer right to intersection of a blank and a nonblank cell.
END-▲	READY and POINT	Moves cell pointer up to intersection of a blank and a nonblank cell.
END-▼	READY and POINT	Moves cell pointer down to intersection of a blank and a nonblank cell.
END-HOME	READY and POINT	Moves cell pointer to lower right corner of the worksheet.

Name	Mode	Description
HOME	READY and POINT	Moves cell pointer to cell A1.
	MENU	Moves menu pointer to first item.
	HELP	Moves menu pointer to first topic.
	FILES and NAMES	Moves menu pointer to first name.
	EDIT	Moves cursor to first character of entry.
	FIND	Moves cell pointer to first record that meets criteria.
PG DN	READY and POINT	Moves cell pointer down one screen.
	FILES and NAMES	Moves menu pointer down one line; or moves it down one screen in a full-screen menu.
	EDIT	Completes editing and moves cell pointer down one screen.
PG UP	READY and POINT	Moves cell pointer up one screen.
	FILES and NAMES	Moves menu pointer up one line; or moves it up one screen in a full-screen menu.
	EDIT	Completes editing and moves cell pointer up one screen.
⏭	READY	Moves cell pointer right one screen.
	FILES and NAMES	Moves menu pointer to last name in the current line.
	EDIT	Moves cursor right five characters.

Function Keys

You use the function keys on your keyboard to perform special operations. Each function key, except F6, performs two operations: one when you press only the function key, and another when you hold down ALT and then press the function key.



Name	Mode	Description
ABS	POINT and EDIT	Cycles a cell or range address between relative, absolute, and mixed.
APP1	READY	Activates add-in program assigned to key, if any.
APP2	READY	Activates add-in program assigned to key, if any.
APP3	READY	Activates add-in program assigned to key, if any.
APP4	READY	If no add-in program is assigned to key, displays the Add-In menu. Otherwise, activates add-in assigned to key.
CALC	READY	Recalculates all formulas in worksheet.
	VALUE and EDIT	Converts a formula to its current value.
COMPOSE	READY, EDIT, and LABEL	When used in combination with alphanumeric keys, creates international characters and other characters you cannot enter directly from keyboard.

Name	Mode	Description
EDIT	READY	Puts 1-2-3 in EDIT mode and displays contents of the current cell in control panel, so you can edit entry.
	EDIT	Switches between EDIT and LABEL modes, if entry displayed in control panel is a label; or EDIT and VALUE modes, if entry displayed in control panel is a value.
GOTO	READY	Moves cell pointer directly to cell or named range you specify.
GRAPH	READY	Displays current graph.
HELP		Displays a 1-2-3 Help screen related to task you are performing.
	HELP	Displays first Help screen you viewed.
	ERROR	Displays a Help screen that explains error message.
LEARN		Turns on learn feature and records subsequent keystrokes in learn range. Press LEARN again to turn off learn feature.
NAME	POINT	Displays a menu of named ranges.
	FILES and NAMES	Switches between displaying a menu of names in third line of control panel and displaying a full-screen menu of names.
	VALUE	When pressed after typing + − / ^ (or * in a formula, displays a menu of named ranges.
QUERY	READY	Repeats last /Data Query you specified.
	FIND	Switches 1-2-3 between FIND mode and READY mode.
RUN	READY	Displays a list of range names so you can select the name of the macro you want to run. If you press ESC after pressing RUN, 1-2-3 switches to POINT mode so you can highlight the first cell of the macro you want to run.
STEP		Turns on STEP mode, which executes macros one step at a time for debugging. Press STEP again to turn off STEP mode.

Name	Mode	Description
TABLE	READY	Repeats last /Data Table you specified.
UNDO	READY	Cancels any changes made to worksheet since 1-2-3 was last in READY mode. Press UNDO again to restore changes.
WINDOW	READY	Moves cell pointer between the two windows created with /Worksheet Window.
	MENU	Turns off display of settings sheets. Press WINDOW again to redisplay settings sheets.

Special Keys

There are other keys on your keyboard that have important uses in 1-2-3.

Name	Mode	Description
ALT	READY	Runs a macro when used in combination with a single-letter macro name.
← (Backspace)	POINT	If cell pointer is not anchored, pressing ← returns cell pointer to wherever it was before 1-2-3 entered POINT mode. If cell pointer is anchored, pressing ← removes highlighting, unanchors cell pointer, and returns cell pointer to wherever it was before 1-2-3 entered POINT mode.
	HELP	Displays previous Help screen.
	FILES	Displays a menu of subdirectories within displayed directory.
	EDIT	Erases character to left of cursor.
CAPS		Makes letter keys produce uppercase letters.
CTRL		When used in combination with certain keys, changes their functions.
CTRL-BREAK		Cancels current procedure.
DEL	EDIT	Erases character at cursor.

Name	Mode	Description
ENTER		Completes an entry, a command, or part of a command.
	ERROR	Clears error message from screen.
ESC	POINT	If cell pointer is anchored, pressing ESC removes highlighting and unanchors cell pointer.
	MENU	Returns you to previous menu or command step.
	HELP	Leaves Help system and returns you to the point in 1-2-3 where you were when you originally pressed HELP.
	FILES	Erases default extension 1-2-3 displays. Pressing ESC a second time erases displayed default drive and directory. Pressing ESC a third time returns you to previous menu.
	EDIT, VALUE, and LABEL	Cancels current entry.
	ERROR	Clears error message from screen.
INS	EDIT	Switches between inserting new text (to left of cursor) and writing over existing text.
<	READY	Displays 1-2-3 main menu.
.	POINT	If cell pointer is unanchored, pressing . (period) anchors cell pointer. If cell pointer is already anchored, pressing . changes position of free cell in highlighted range.
SCRL		Switches pointer-movement keys between moving cell pointer and scrolling entire worksheet.
⇧		When used in combination with another key on typewriter section of keyboard, produces upper symbol on key.

Name	Mode	Description
(MENU) ((/))	READY	Displays 1-2-3 main menu.
(Spacebar)	LABEL, VALUE, and EDIT	Inserts a space in an entry.
	MENU	Moves menu pointer right one item. If menu pointer is highlighting last item in a menu, pressing (Spacebar) moves menu pointer to first item.

Using 1-2-3 Menus

To tell 1-2-3 what you want to do, select a series of commands from menus. You can select commands by highlighting or by typing.

Selecting a Command by Highlighting

When you press / ((MENU)) to display the 1-2-3 main menu, a rectangular highlight called the menu pointer appears in the second line of the control panel. You can select a command by moving the menu pointer to the command you want (highlighting it) and then pressing (ENTER).

1. Press (MENU). (The 1-2-3 main menu appears.)
2. Use any of the following keys to move the menu pointer to the command you want to select:

◄	Moves the menu pointer left one item. If menu pointer is highlighting the first command in the menu, moves it to the last command in the menu.
►	Moves the menu pointer right one item. If menu pointer is highlighting the last command in the menu, moves it to the first command in the menu.
(HOME)	Moves the menu pointer to the first command in the menu.
(END)	Moves the menu pointer to the last command in the menu.

3. Press (ENTER) to select the highlighted command. (1-2-3 may then require you to select a command from a submenu or respond to a prompt.)

Selecting a Command by Typing

Selecting a command by typing is faster than the highlighting method. You will find this method useful once you are familiar with the 1-2-3 menus.

1. Press (MENU). (The 1-2-3 main menu appears.)
2. Type the first letter (uppercase or lowercase) or character of the command you want to select. (To complete the command, 1-2-3 may require that you select a command from a submenu or respond to a prompt.)

Canceling a Command

When selecting commands, if you change your mind or realize that you have made a mistake, press (ESC) to back up one menu level or command step at a time.

If you want to completely stop a procedure and return to READY mode, press (CTRL)-(BREAK).

Responding to Prompts

Often when you select a command, 1-2-3 requires you to supply more information—through additional menu choices or **prompts**. You may enter specific information in the second line of the control panel in several ways:

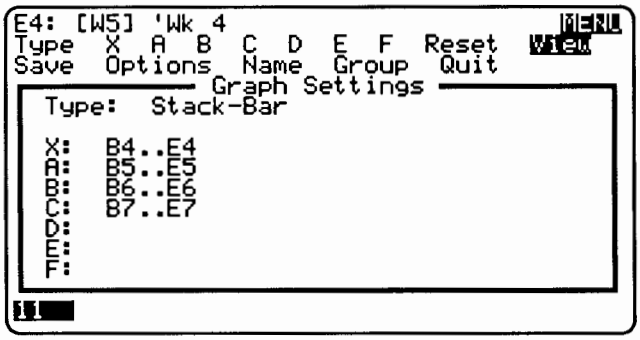
- If 1-2-3 displays a menu of names (for example, when you select /File Retrieve), move the menu pointer to the name you want to select (or type your selection) and press (ENTER).
- If 1-2-3 suggests a response to the prompt (for example, when you select /File Save), press (ENTER) to accept the suggested response. Alternatively, type a new response and press (ENTER). (You may, however, need to press (ESC) one or more times to clear the suggested response before you can type a new one.)

- If 1-2-3 does not display a menu or suggest a response (for example, when you select /Print Printer Options Header), type the necessary information and press ENTER.
- If 1-2-3 displays a prompt asking you to enter a range (for example, when you select /Copy), specify a range using one of the methods described in "Specifying a Range" later in this chapter.



Settings Sheets

Some 1-2-3 commands, such as /Graph, require you to select lower-level commands to specify a number of settings. In such cases, 1-2-3 displays a settings sheet.



A settings sheet is a status screen that shows you the current settings for all the options associated with a task. You cannot directly change settings in the settings sheet. You must change settings by selecting the appropriate commands from the menu that appears above the settings sheet.

For instance, you might want to create a bar graph with labels along the axes, titles, a legend, grid lines, and more. You specify each one of these settings by selecting a separate command from the /Graph menu. As you do this, your selections (or changes) appear in the graph settings sheet immediately.

Entering and Editing Data

When you enter data in a cell, 1-2-3 classifies every entry as one of two types: labels or values. **Labels** are text entries. **Values** are number and formula entries.

To enter data in a cell, follow this procedure:

1. Move the cell pointer to the cell in which you want to enter data.
2. Type the data you want to enter in the cell, up to 240 characters.
3. Do one of the following:
   - Press (ENTER) to complete the entry (the cell pointer remains in the same cell).
   - Press one of the pointer-movement keys to simultaneously complete the entry and move the cell pointer. The cell pointer moves to another cell, just as it does when you use the pointer-movement key in READY mode.
   - Press (ESC) if you want to cancel the entry.

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, one of the label prefixes ' " ^ \, or |, or a special character such as { } & ! or *, 1-2-3 displays LABEL in the mode indicator. If the first character is a number (0 through 9) or one of the numeric symbols + − @ . (# or $, 1-2-3 changes the mode indicator to VALUE.

As you type an entry, 1-2-3 displays the characters in the second line of the control panel. When you press (ENTER) or one of the pointer-movement keys to complete the entry, 1-2-3 checks the data before entering it in the worksheet to make sure you typed a valid label or value.

If the entry is valid, 1-2-3 enters the data in the current cell. If the entry is not valid, 1-2-3 switches to EDIT mode and displays the data in the second line of the control panel for editing. For information on editing data, see "Editing an Entry" later in this section.

Labels

A label is a text entry. It can include any combination of characters in the Lotus International Character Set (LICS), including numbers and numeric symbols. For example, Caroline Wilson, 1620 Hill Road, 606-999-0001, and $19,803 can all be entered as labels.

Use the following guidelines when entering labels:

- To create a label that begins with a number (0 through 9) or one of the numeric symbols + − @ . (# or $, precede the entry with one of the label prefixes described in the next section, "Label Prefixes."

  For example, to enter the label 1620 Hill Road, you must type a label prefix before typing the actual entry. Otherwise, 1-2-3 assumes you are entering a value (the mode indicator displays VALUE).
- Even if an entry does not begin with a number or numeric symbol, you may want to precede the entry with a label prefix to change the way 1-2-3 positions the label in the cell or to control whether 1-2-3 prints the label.

  For example, to center the label Wilson in the cell, you must type the label prefix ^ before typing the actual entry, or 1-2-3 will automatically use the default (left justified). 1-2-3 does not display the label prefix in the cell but does display it in the control panel when you highlight that cell.
- The entry cannot be longer than 240 characters.

Label Prefixes

Besides allowing you to enter labels that 1-2-3 would usually recognize as values, label prefixes also allow you to control the way 1-2-3 aligns labels in cells and to control whether or not 1-2-3 prints a label. Each label prefix produces a different result.

The following table lists the label prefixes and their effects on labels.

Prefix Key	Result
'	Aligns the label with the left edge of the cell (default 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.

The split vertical bar (|) is also a label prefix. It is used primarily for embedded setup strings and /Data Parse format lines (see chapter 5). If used as a label prefix for a label that is located at the beginning of a row of data, the | tells 1-2-3 not to print the row. If, however, the label is located elsewhere in a row (such as between other labels), the label will be left-aligned and will print.

Long Labels

When a label is longer than the cell's column width, it is called a **long label** and 1-2-3 displays as much of the label as it can.

- 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 does not display the overlapping part of the label.

Values

A **value** is an entry that begins with a number (0 through 9) or one of the numeric symbols + − @ . (# or $. The entry can be a number or a formula.

Numbers

You can enter any number from 10^{-99} to 10^{99}. The number of significant digits 1-2-3 displays in a cell depends on the cell format, column width, and the magnitude of the number. If you enter a number with more digits than 1-2-3 can display, 1-2-3 rounds the number.

Use the following guidelines when entering numbers:

- Begin the entry with a number (0 through 9) or one of the numeric symbols + − @ . (# or $.

  If you begin a number with a $, 1-2-3 enters the number but does not display the $. You must change the format of the cell to include a currency symbol. See "Displaying Values in the Worksheet" later in this chapter.
- Do not include spaces or commas in the entry. (Later you can change the format of the cell to include commas. See "Displaying Values in the Worksheet" later in this chapter.)
- Do not type more than one decimal point.

- The entry cannot be longer than 240 characters.

It is possible to enter numbers in scientific notation. For example, to enter 602000 you can type 6.02E05. The correct format for entering a number in scientific notation is to type a positive or negative number followed by an e or E, and an exponent from -99 to 99.

Formulas

A formula is an entry that performs a calculation. You can enter several types of formulas in 1-2-3: numeric formulas, string formulas, and logical formulas. These types of formulas and methods for entering formulas are described in detail in "Working with Formulas" later in this chapter.

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, 1-2-3 calculates the value to a precision of 15 decimal places (unless you use @ROUND to specify a different precision). For more information, see @ROUND in chapter 14.

Displaying Values in the Worksheet

1-2-3 always right aligns numeric values in cells. Unlike labels, you cannot change their alignment. You can, however, 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, $2.47, 247%, or 2.47E+00, depending on the cell format you specify. We've listed various format possibilities below:

2.47	General
2	Fixed, 0 decimal places
2.47	Fixed, 2 decimal places
2.470	Fixed, 3 decimal places
$2	Currency, 0 decimal places
$2.47	Currency, 2 decimal places
247%	Percent, 0 decimal places
247.0%	Percent, 1 decimal place
247.00%	Percent, 2 decimal places
2E+00	Scientific, 0 decimal places
2.4700E+00	Scientific, 4 decimal places

For details on formatting values and cell-format choices, see /Range Format in chapter 11 or /Worksheet Global Format in chapter 13.

Long Values

A **long value** is a displayed value that is wider than the cell's column width minus 1. For example, in a cell with a column width of 9 that has been formatted as Currency with 2 decimal places, 1500 is a long value because it contains nine characters ($1,500.00).

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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. For example, in a nine-character-wide cell, the value 123456789.99 appears as 1.2E+08.
- If the cell is formatted as anything other than General or is not wide enough to display the value in scientific notation, 1-2-3 displays asterisks across the cell instead of the value. To display the value, widen the column with /Worksheet Column Set-Width or /Worksheet Global Column-Width (chapter 13).

Entering Dates

Entering a date in 1-2-3 requires two steps:

- Entering a date number (a value that corresponds to the date).
- Assigning the cell a date format.

1-2-3 assigns an integer to each of the 73,050 days from January 1, 1900 to December 31, 2099, inclusive. These integers (1 through 73050, consecutively) are called date numbers. For example, the integer 5 corresponds to January 5, 1900; the integer 34235 corresponds to September 23, 1993.

You can enter a date number using a date @function, which calculates the date number for a date you specify as the argument for the @function. For example, to enter the date number for September 23, 1993, you could enter @DATE(93,9,23) in the worksheet. 1-2-3 calculates the date number automatically, in this case, 34235. For information on date @functions, see "Date and Time @Functions" in chapter 14.

To display the date rather than the date number, use /Range Format Date to change the cell's format to one of the five date formats. For example, if you format the cell as Date 1, 1-2-3 displays the date number 34235 as 23-Sep-93. Or, if you format the cell as Date 3, 1-2-3 displays Sep-93.

The advantage of using a date @function to enter a date is that you can change the format in which the date is displayed at any time, and you can use date arithmetic to calculate differences between dates.

Entering Times

Entering a time in 1-2-3 requires two steps:

- Entering a time number (a value that corresponds to the time).
- Assigning the cell a time format.

1-2-3 assigns a decimal number to each second from midnight to 11:59:59 PM inclusive. These decimal numbers are called **time numbers**. For example, the decimal number .5 corresponds to 12:00:00 PM (noon); the decimal number .999305 corresponds to 11:59:00 PM. You can enter a time number using a time @function (which calculates the time number for a time you specify as the argument for the @function). For example, to enter the time number for 11:59 PM, enter @TIME(23,59,0) in the worksheet. 1-2-3 calculates the time number automatically, in this case, .999305. For information on date @functions, see "Date and Time @Functions" in chapter 14.

To display the time rather than the time number, use /Range Format Date Time to change the cell's format to one of the four time formats. For example, if you format the cell as Time 1, 1-2-3 displays the time number .999305 as 11:59:00 PM. Or, if you format the cell as Time 3, 1-2-3 displays 23:59:00.

Editing an Entry

Editing an entry means altering existing data rather than replacing it with entirely new data. You can edit an entry either as you type it or after you have entered it in a cell.

Editing As You Type

You can edit an entry in three ways as you type it:

- To erase characters to the left of the cursor, press ⌫.
- To erase everything you typed and start again, press ESC.
- To change part of what you typed, press EDIT (F2) to enter EDIT mode and use the editing keys in the table that follows.

Editing a Completed Entry

2

- Move the cell pointer to the cell and press EDIT (F2).
- Use the editing keys to change the entry, and then press ENTER, ▲, ▼, PG UP, or PG DN to save the changes.

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

Key	Description
▶	Moves cursor right one character.
◀	Moves cursor left one character.
▲	Completes editing and moves cell pointer up one row.
▼	Completes editing and moves cell pointer down one row.
⌫	Erases character to left of cursor.
TAB	Moves cursor right five characters.
⇧-TAB	Moves cursor left five characters.
DEL	Erases current character.
END	Moves to last character in entry.
ENTER	Completes editing.
ESC	Erases all characters in entry.
HOME	Moves to first character in entry.
INS	Switches between inserting text (INS mode), and writing over existing text (OVR mode).
PG UP	Completes editing and moves cell pointer up one screen.
PG DN	Completes editing and moves cell pointer down one screen.

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, as long as all the cells are adjacent to one another.

Use ranges to perform operations on more than one cell at the same time. To use a range in a command or formula, you need to specify the range.

Specifying a Range

You can specify a range in three ways: type the range address, use a range name, or highlight the range.

Typing a Range Address

A **range address** consists of the cell addresses of the two most distant cells in the range, separated by one or two periods. This address tells 1-2-3 where the range begins and ends and follows these guidelines:

- If a range is a group of adjoining cells in a single column or row, the range address consists of the cell addresses of the two opposite ends of the range, for example, B3..B9 or A1..D1.
- If a range is a group of adjoining cells that spans several columns or rows, the range address consists of the cell addresses of two diagonally opposite corners of the range. 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 and then press (ENTER).
- If a range is a single cell, the range address consists of that cell address as both the starting and ending point of the range. To specify a single cell range, however, you only need to type the cell address once. For example, to specify the range B3..B3, you could type B3 and press (ENTER).

You can use either uppercase or lowercase letters when typing the range address, but after you enter the range address 1-2-3 always displays it in uppercase letters. Also (unless it's a formula), regardless of which set of corner cells you use and whether you type one or two periods, 1-2-3 displays the range address as the upper left and lower right corner cells of the range, separated by two periods.

Using a Range Name

/Range Name Create and /Range Name Labels assign a name to a specified range. You can use 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 name or address as an argument; for example, to calculate the sales total, you can use @SUM(*SALES*).

Whenever a command prompts you for a range, you can specify a range name by typing the range name and pressing ENTER. Alternatively, you can press NAME (F3) to display a menu of range names that exist in the current worksheet, and then select a range name by highlighting it and pressing ENTER.

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 pressing . (period). This cell is now the anchor cell.

Some commands that prompt you for ranges (such as /Copy, /Move, and /Range Format) automatically anchor the cell pointer in the current cell. When 1-2-3 asks you to specify a range, you can tell if the cell pointer is anchored by looking at the prompt in the control panel. A single cell address (such as B3) means the cell pointer is not anchored, while a range address (B3..B3) means it is anchored.

If 1-2-3 automatically anchors the cell pointer and you want to highlight a range that starts somewhere else, press ESC to unanchor the cell pointer, move the cell pointer to the appropriate cell, and press . (to make it the anchor cell).

Once a corner of the range you want to highlight is anchored, use the pointer-movement keys to expand the highlight until it covers the range. As you expand the highlight, 1-2-3 displays the address of the highlighted area in the control panel. When you have highlighted the entire range, press ENTER to complete the range specification.

If you change your mind and want to highlight a different range, press ⊡ to remove highlighting from the range, unanchor the cell pointer, and return the cell pointer to wherever it was before 1-2-3 entered POINT mode; or, press ESC to remove highlighting and unanchor the cell pointer without moving it.

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

Key	Unanchored Range	Anchored Range
.	Makes current cell the anchor cell.	Moves anchor cell clockwise from one corner of highlighted range to next.
⊡	Returns cell pointer to wherever it was before 1-2-3 entered POINT mode.	Removes highlighting, unanchors cell pointer, and returns cell pointer to wherever it was before 1-2-3 entered POINT mode.
ESC	If you are using a command, returns you to previous menu or prompt; if you are entering a formula, returns 1-2-3 to EDIT mode.	Removes highlighting and unanchors cell pointer.

Remembered Ranges

With some commands, such as /Print [Printer or File] Range and /Data Fill, 1-2-3 "remembers" the most recent range you specified. The next time you select the same command, 1-2-3 automatically highlights the range you last specified and displays its address in the control panel. Press ENTER to accept that range, or press ESC or ⊡ to clear the remembered range and specify a different range using one of the three ways previously described.

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, 1-2-3 displays the value that results from the calculation in the cell. For example, if you enter the formula 25+5, 1-2-3 displays the value 30 in the cell. When the cell pointer is in the cell, however, 1-2-3 displays 25+5 in the first line of the control panel. (To display formulas in cells instead of their results, use /Range Format Text or /Worksheet Global Format Text.)

You can use range addresses and range names in formulas to include worksheet data in your calculations. When you create a formula this way, 1-2-3 automatically changes the value of the formula if you change any value in the referenced cells. For example, suppose you enter the formula +B2+C2 in cell C4. When B2 and C2 contain the values 25 and 5, the formula results in the value 30. 1-2-3 automatically changes the result of the formula, however, if you change the entry in either B2 or C2. For more information, see "Using Cell and Range References in Formulas" later in this section.

Types of Formulas

1-2-3 lets you enter three types of formulas: numeric, string, and logical. You can also enter **@functions**, which are built-in formulas in 1-2-3 that perform numeric, string, or logical calculations. For a complete description of the 1-2-3 @functions, see chapter 14.

- **Numeric formulas** calculate numeric values using one or more of the arithmetic operators (+ − * / and ^) and/or @functions. 1-2-3 can calculate any numeric formula whose value is between 10^{-308} and 10^{308}, but the value must be between 10^{-99} and 10^{99} for 1-2-3 to display it in the worksheet. When a formula's value is less than 10^{-99} or greater than 10^{99}, 1-2-3 displays asterisks across the cell that contains the formula.

  The formula 2*H16 calculates a numeric value by multiplying the value in cell H16 by 2.

The formula @SUM(H16..H32)/2 calculates a numeric value by dividing the sum of the values in H16..H32 by 2.

- **String formulas** calculate string values, using the string operator ampersand (&) and/or @functions.

  If D4 contains the label *Robinson*, the formula +"Dear Mr. and Mrs. "&D4 produces the string value *Dear Mr. and Mrs. Robinson* by concatenating the text in quotation marks (called a literal string) with the contents of D4.

  If F16 contains the label *1989 NET PROFITS*, the formula @LOWER(F16) returns the string value *1989 net profits* by converting the contents of F16 to lowercase.

- **Logical formulas** are statements that return either 1 (the statement is true) or 0 (the statement is false). Logical formulas use the logical operators = < > <= >= <> #AND# #OR# and #NOT# and/or @functions.

  The formula +A12>=500 returns 1 (true) if cell A12 contains a value greater than or equal to 500; otherwise, the formula returns 0 (false).

  The formula @ISSTRING(J26) returns 1 if cell J26 contains a string value; otherwise, the formula returns 0.

Entering Formulas

Use the following guidelines when entering a formula:

- A formula can begin with a number or one of the numeric symbols + − @ . (or $. In addition, the # symbol can be used to begin a logical formula.
- When the first element in a formula is a cell address, range name, or file reference, begin the formula with + − (or $. For example, +B7/B8, −B7*B8, $SALES/12, (*SALES-EXPENSES*), and +<<BUDGET.WK1>>B7 are all valid formulas.
- When a string formula starts with a literal string, begin the formula with + or (. For example, +"Ms. "&LAST and ("Ms. "&LAST) are both valid formulas.
- A formula cannot contain spaces except within literal strings in string formulas (as shown in the previous item).
- A formula can contain up to 240 characters.

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

- Numbers (for example 450, −92, 7.1E12, date numbers, and time numbers).
- Literal strings (for example, *Budget for* or *TOTAL*).
- @Functions (for example, @SUM(A4..A8)).
- Cell and range addresses (for example, B12, FF23..FH35).
- Range names (for example, *JANSALES*, *BUDGET_90*).

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
− or +	Identification of value as negative or positive	2
* or /	Multiplication or division	3
+ or −	Addition or subtraction	4
= or <>	Equal-to or not-equal-to tests	5
< or >	Less-than or greater-than tests	5
<=	Less-than-or-equal-to test	5
>=	Greater-than-or-equal-to test	5
#NOT#	Logical-NOT test	6
#AND# or #OR#	Logical-AND or logical-OR tests	7
&	String concatenation	7

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. You can nest one set of parentheses inside another set and create as many nesting levels as you want.

Using Cell and Range References in Formulas

The primary reason for using formulas in 1-2-3 is to perform calculations with worksheet data. Use either of the following methods to include a cell or range reference in a formula:

- Type the cell address, range address, or range name in the formula.

  For example, to add the values in cells B1 and C1, you can enter +B1+C1 or @SUM(B1..C1). If B1 and C1 have the range names *INSTOCK* and *ONORDER*, you can also enter +INSTOCK+ONORDER.

  If the cell you are referencing is in another file, precede the cell's address or range name with a file reference (see "Linking Files" later in this chapter). For example, to create a formula in the current worksheet that uses the value in D25 in a worksheet named *BALANCES.WK1*, you enter +<<BALANCES.WK1>>D25.
- Highlight the cell or range while typing the formula.

  After typing + − / ^ (or * in a formula, you can press ◀, ▶, ▲, or ▼ to enter 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.

  To enter the formula +B3+D3 in J22, you would move the cell pointer to J22, type +, press ◀ to enter POINT mode, move the cell pointer to B3, type +, press ▶ to enter POINT mode, move the cell pointer to D3, and press ENTER to complete the formula. 1-2-3 automatically returns the cell pointer to J22.

  To create the formula @SUM(B3..D3), you would type @sum(and then press ◀ to enter POINT mode, move the cell pointer to B3, type . to anchor the cell pointer, highlight the range B3..D3, type), and press ENTER to complete the formula.

If the specified cell or range in a formula has a range name, 1-2-3 automatically substitutes the name for the address in the formula. If the specified cell or range has more than one range name, 1-2-3 displays the range name that is alphabetically first.

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. Each type of reference is described in the following sections.

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, simply type the address or range name, such as B1, D25..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 to the contents of the cell two rows above."

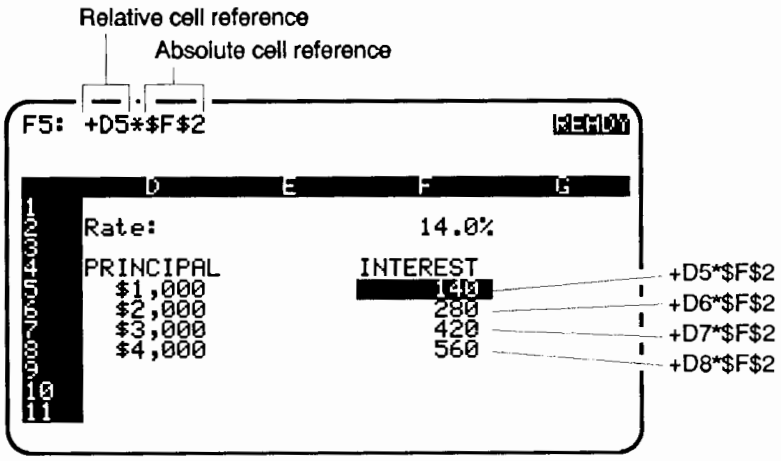
If you copy the formula +B1+B2 from B4 to C4, 1-2-3 still interprets the formula as "add the contents of the cell three rows above to the contents of the cell two rows above." Therefore, 1-2-3 adjusts the relative cell references so the formula becomes +C1+C2.

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 keep the original cell or range reference in a formula, regardless of where that formula is copied, you use an absolute reference.

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

For example, calculate the interest on a series of principal values.



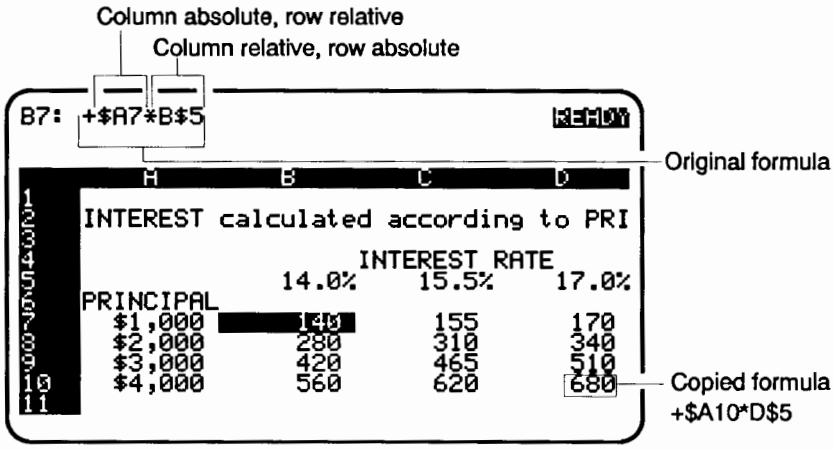
Cell F2 contains the interest rate and cells D5..D8 contain the principal values. To perform the calculations, you enter the formula +D5*$F$2 (to multiply the value in D5 by the interest rate in F2) in F5, and then copy that formula to cells F6..F8. When you copy the formula from F5 to cells F6..F8, 1-2-3 keeps the F2 reference in each formula because it is an absolute reference. It does, however, change the D5 reference to D6, D7, and D8, respectively, because D5 is a relative reference.

Mixed References

Sometimes when you copy a formula that references a cell, you 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 and the row number to change. You do this by using a mixed cell address in the formula.

Mixed references can be created only with addresses, not with range names. To create a mixed reference, precede the absolute part of the address (the column letter or the row number) with a $ (for example, $C4 or C$4).

The table (B7..E10) in our next illustration calculates a series of interest amounts depending on the principal value and interest rate. To create the table, 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, 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 letter changes, but row number 5 remains the same (all interest rates are in row 5).

Using ABS (F4) to Change Reference Types

When entering or editing a formula, press ABS when the cursor is on or immediately to the right of a cell address or range address. 1-2-3 cycles the address through the different reference types—in the same order, regardless of whether the original address type is relative, absolute, or mixed.

The following table shows how pressing (ABS) changes the address C5 after you type +C5.

Control panel display	Press (ABS) to get
+C5	$C$5 (absolute address)
+$C$5	C$5 (mixed address with absolute row reference)
+C$5	$C5 (mixed address with absolute column reference)
+$C5	C5 (relative address)

A range name is a relative reference unless you type a $ in front of the name. For example, if you are using the range name *SALES* in a formula and you want it to be an absolute reference, type $SALES. You cannot create a mixed reference with a range name.

Working with Files

To keep a permanent record of the work you do during a 1-2-3 session, you must **save** your worksheet. You can save your file on the built-in RAM, on a plug-in card, or on a peripheral.

Unless you save a worksheet in a file, your work is preserved only as long as the worksheet remains in memory. (If you select /Quit and have not saved the worksheet in a file, 1-2-3 will ask you if you want to do so before you end the session.)

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

Note



You can easily transfer files between another computer and the HP 95LX with the HP F1001A Connectivity Pack. For more information see chapter 20.

Types of Files

In addition to creating worksheet files in 1-2-3, you can create text, graph, and backup worksheet files.

Text or print files, which you create with /Print File, store worksheet data in text or ASCII format. For details, see /Print File in chapter 9.

Graph files, which you create with /Graph Save, store 1-2-3 graphs in a picture format for use with other programs. For details, see /Graph Save in chapter 7.

Backup files store previous versions of worksheets. When you select /File Save or /File Xtract, specify the name of an existing worksheet file, and then select Backup from the menu 1-2-3 displays. 1-2-3 creates a backup file of the version of the worksheet stored on disk before writing over the existing worksheet (.WK1) file with your changes. For details, see /File Save or /File Xtract in chapter 6.

Specifying a File

When you use a 1-2-3 command that prompts you for a file name, 1-2-3 displays a list of files in the current directory (the directory specified with /File Directory or /Worksheet Global Default Directory) that are of the appropriate type. For example, if you select /File Retrieve, 1-2-3 displays a menu of worksheet files in the current directory; or if you select /Graph Save, 1-2-3 displays a menu of graph files in the current directory. To see a full-screen menu of file names instead of just one line, press NAME (F3).

You can specify a file to use by highlighting a file name and pressing ENTER to select it or by typing a file name.

If you want to use a file in another directory, you need to specify a path. To specify a worksheet file named *BOSTON* that is stored on drive C in the subdirectory named *1989* in the directory named *BUDGETS*, type

```
C:\BUDGETS\1989\BOSTON.WK1
```

For more information on how to specify paths, see the sections that follow.

Path

The **path** supplies two pieces of information: the drive name and the directory name where the file is located.

The drive name tells 1-2-3 where the file is located. A drive name always consists of a letter followed by a colon, for example, A: or C:. If the file is located on the current drive, you do not need to specify a drive name. For example, if drive C is the current drive, you can specify the file using the path `\BUDGETS\1989\BOSTON.WK1`.

Note



- Drive C: is the internal RAM disk.
- Drive A: is the plug-in card.
- Drive B: refers to a peripheral.

The directory name tells 1-2-3 in which directory the file is located. If the file you are specifying is in a subdirectory (a directory included in another directory), the path will include more than one directory name. You must use a backslash (\) to separate each directory name from the next. In addition, you must use a \ to separate the last directory name from the file name.

If the file is located in the current directory, you do not need to specify a directory name. For example, if *C:\BUDGETS* is the current directory but *1989* is not the current subdirectory, you can specify the file by typing `1989\BOSTON.WK1`.

File Name

Every file in a directory has a unique name, which you assign when you first create the file. It is a good idea to try to use file names that are descriptive so you can easily remember them.

- Use any combination of letters, numbers, underscores (_), and hyphens (-) in file names. Upper and lowercase letters are equivalent.
- Do not use more than eight characters to name a file (1-2-3 ignores the extra characters).
- Do not use the names AUX, CON, COM1, COM2, LPT1, NUL, or PRN. (These names are reserved by the system: see the MS-DOS reserved names table in appendix B.)
- Do not include spaces in a file name.

You can include extended Lotus International Character Set (LICS) characters in a file name. Be aware, however, that the codes for extended LICS characters are not the same as for extended code page 850 characters. For example, the LICS code for ä is 228 and the code page 850 code for the same character is 132. File names containing extended LICS characters will be displayed differently by 1-2-3 and by your operating system. In addition, your operating system will convert file names to uppercase based on the extended code page 850 characters, not the extended LICS characters.

File Extension

A file extension is an optional suffix you can add to a file name. It consists of a period (.) followed by one to three characters. File extensions let you group files into categories by giving more information about what is in a file. If you do not provide your own extension, 1-2-3 automatically adds an extension to the file name depending on the file type:

File Type	Extension
Backup worksheet file	.BAK
Print or text file	.PRN

File Type	Extension
Graph file	.PIC
Worksheet file	.WK1

Using Wild Card Characters in File Names and Extensions

When 1-2-3 prompts you for a file name, you can display a menu of files with similar names or extensions by including wild card characters (* and ?) in your response to the prompt.

The asterisk (*) wild card 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 *.WKS*, you would type `*.wks` at the file name prompt and press (ENTER). To have 1-2-3 list all files that begin with *B* and have the extension .wk1, you would type `b*.wk1` at the file name prompt and press (ENTER).

The question mark (?) wild card character represents any single character in a file name or extension. For example, to have 1-2-3 list all worksheet files with names that begin with *LOT*, have any single character in the next position, end with *DEPT*, and have the default 1-2-3 Release 2.2 extension *.WK1*, you would type `lot?dept.wk?` at the file name prompt and press (ENTER). Some possible files listed could be *LOT1DEPT.WK1*, *LOTXDEPT.WK1*, and *LOT8DEPT.WK1*.

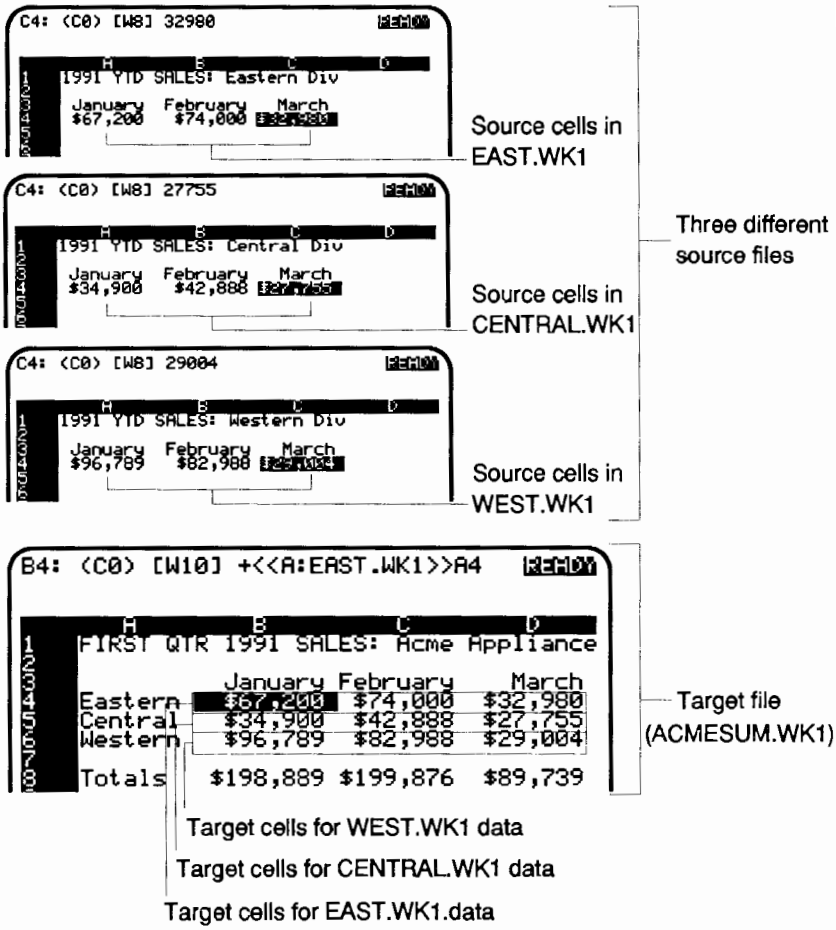
Linking Files

The 1-2-3 file linking feature allows you to use values from cells in other worksheets in the **current worksheet** (the worksheet file currently in memory). You create a link between two files by entering a linking formula in one file that refers to a cell in the other file. The file in which you enter the formula is called the **target file** because it receives the data. The file that the formula refers to is called the **source file** because it supplies the data.

Once the two files are linked, 1-2-3 copies the value of the cell in the source file (the **source cell**) to the cell in the target file (the **target cell**). The value of the target cell is automatically updated whenever you retrieve the target file (or select /File Admin Link-Refresh while you are working on the target file).

When you use /File Directory, 1-2-3 will update any linking formula in which the source file reference does not include a path.

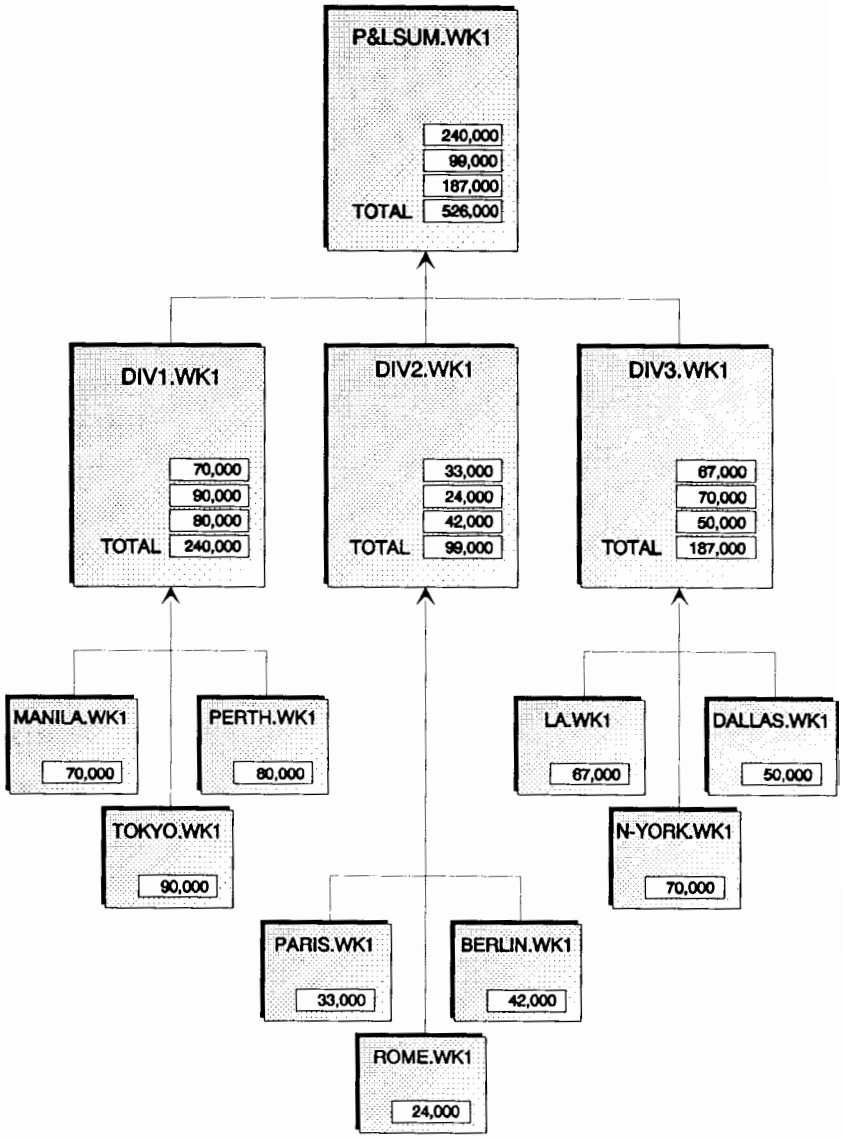
File linking saves you the effort of manually updating every worksheet affected by a change in another worksheet. One of the most useful applications of file linking is the consolidation of data from a number of worksheets in a summary worksheet. The illustration below shows an example of how you can use file linking to consolidate data from different worksheet files.



The file *ACMESUM.WK1* contains links to three cells (A4, B4, and C4) in the worksheet for each division: *EAST.WK1*, *CENTRAL.WK1*, and *WEST.WK1*. This results in a summary worksheet that contains nine links that consolidate the sales data for the different divisions.

If you change the data in any of the worksheets for the divisions, the values in *ACMESUM.WK1* will be automatically updated the next time you retrieve the file or select /File Admin Link-Refresh.

You can also use the linking feature to create links to cells that depend on other linked cells. For example, suppose your company has three divisions and that each division has three operating subsidiaries. Right now each subsidiary maintains its own profit-and-loss statement. In addition to these profit-and-loss statements, however, you want each division to maintain a profit-and-loss statement (subconsolidations) and you want a consolidated company profit-and-loss statement. Note the following chart.



It is important to be aware that if the data you are linking to depends on other linked cells, you can get incorrect results unless you update the files in an "upward" order. That is, if you think of the linked files

being organized in a hierarchical structure like the one shown above, you must always start updating at the level where you are making changes and work to the top level. For example, if you want to change data in the Paris profit-and-loss statement, you must do the following to make sure the values in the consolidated company profit-and-loss statement are correct:

1. Use /File Retrieve to retrieve *PARIS.WK1*.
2. Make the necessary changes and then save the file under the same name using /File Save Replace.
3. Use /File Retrieve to retrieve *DIV2.WK1* and save the file under the same name using /File Save Replace. (This updates the subconsolidation worksheet for Division 2.)
4. Use /File Retrieve to retrieve *P&LSUM.WK1* and save the file under the same name using /File Save Replace.

This updates the consolidated company profit-and-loss statement.

Creating a Link

A link is created through the use of a **linking formula**, a formula that refers to a cell in another file. To create the linking formula, use the following format:

+<<*file reference*>>*cell reference*

The file and cell reference can be entered in either uppercase or lowercase letters, but 1-2-3 will always display them in all uppercase letters.

Follow these steps when entering the formula:

1. Move the cell pointer to the target cell.
2. Type a + (plus) to begin the formula.
3. Enter a file reference enclosed in << >> (double angle brackets).

   A file reference must always include the name of the source file. In some cases it may also be necessary for you to supply other information:

   - If the source file does not have the default file extension *.WK1*, you must include the appropriate file extension. (For example, if the source file is a 1-2-3 Release 1A worksheet named *UKSALES.WKS*, you would enter the file reference +<<UKSALES.WKS>>.

- If the source file is not in the default directory (the directory specified with /File Directory), you must include a directory name to tell 1-2-3 where to look for the file. For example, if the current directory is *C:\123* and the file you want to link to, *UKSALES.WK1*, is stored in a directory named *C:\123DATA*, you could enter the file reference +<<C:\123DATA\UKSALES>>.
- If the source file is not in the default drive (the drive specified with /File Directory), you must include a drive name to tell 1-2-3 where to look for the file. For example, if the current drive is C: and the file you want to link to, *UKSALES.WK1*, is in the root directory on a RAM card in drive A, you could enter the file reference +<<A:\UKSALES>>.

4. Enter a cell reference: either the address of the source cell or its range name.
   - If you enter a range address, 1-2-3 uses only the cell in the upper left corner of the range as the source cell. For example, if you enter the formula +<<C:\123DATA\UKSALES>>A5..J16, 1-2-3 changes the formula to +<<C:\123DATA\UKSALES>>A5 when you press (ENTER).
   - If you enter a range name that represents a multiple cell range in the source file, 1-2-3 uses only the cell in the upper left corner of the range as the source cell although it always displays the range name in the formula. For example, if you enter the formula +<<USSALES>>QTR1 and *QTR1* defines the range A24..F24 in the source file, 1-2-3 uses only A24 as the source cell.
5. Press (ENTER) to complete the formula. When you press (ENTER) to complete the linking formula, 1-2-3 checks to make sure the source file you referenced exists. If any of the following conditions exist, 1-2-3 displays an error message and will not enter the formula in the worksheet:
   - The source file and/or directory do not exist.
   - The specified drive is not ready.
   - The specified range name does not exist in the source file.
   - The source file is a password-protected worksheet.
   - The data in the file cannot be read by 1-2-3.

   If 1-2-3 is able to locate the source file and cell, it copies the value of that cell into the target cell.
6. In order to make a link permanent, use /File Save to save the worksheet.

Computer Museum

Restrictions for Linking Files

You should be aware of the following restrictions before you try to link files:

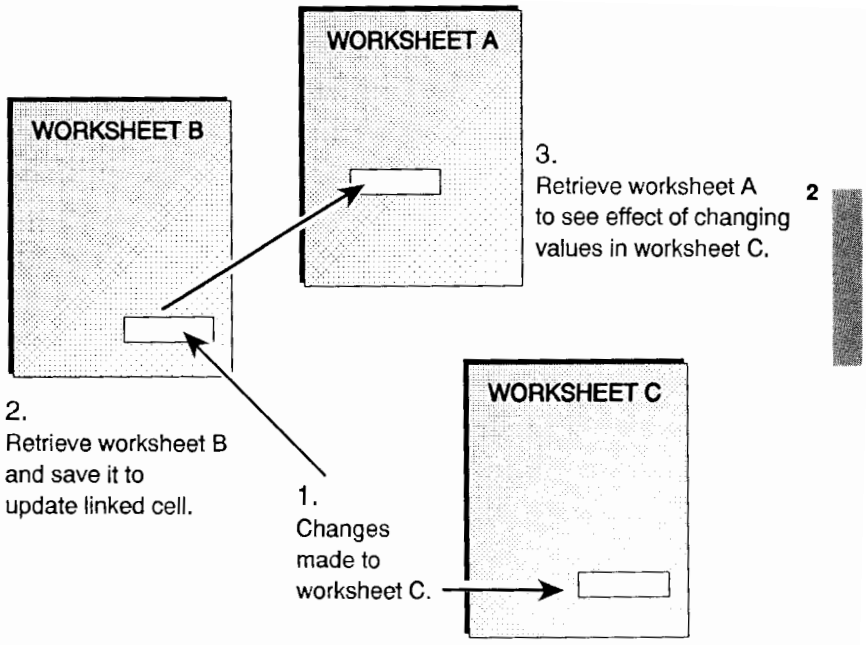
- 1-2-3 expects the source file you reference in a linking formula to have a specific internal file format and order. If you are trying to reference a file created with another program and the file will not link correctly, retrieve the file in 1-2-3 (/File Retrieve) and then use /File Save to save the file in the proper file format.
- You cannot include a linking formula in another formula.
- If the source cell contains a formula, 1-2-3 copies the value of the formula to the target cell rather than the formula itself.
- If you did not include a path as part of the file reference and the source file is no longer in the default directory (for example, if you used /File Directory or /Worksheet Global Default Directory to change the default directory), 1-2-3 displays ERR in the target cell.
- If you erase or rename the source file referenced in a linking formula, 1-2-3 displays ERR in the target cell the next time you retrieve the target file.
- If you delete or reset a range name referenced in a linking formula, 1-2-3 displays ERR in the target cell the next time you retrieve the target file.
- If you reference a cell address in a linking formula, and you subsequently move the source cell to a different location in the source file, 1-2-3 does not adjust the linking formula. For example, if you enter the formula +<<BALANCE.WK1>>C15 and then move the data in C15 to J6, when you retrieve the target file, 1-2-3 will display the value of C15 and not J6.

  (For this reason, it is good practice to use /Range Name Create to name the source cell and then use that range name as the cell reference in the linking formula. This will maintain the correct link if you move the source cell.)
- If you enter a linking formula in a cell and later enter the identical linking formula in another cell, 1-2-3 displays the value of the first formula rather than retrieving the current value of the source cell. For example, if you enter the formula +<<UKSALES.WK1>>QTR3 in cell A5 and later enter +<<UKSALES.WK1>>QTR3 in cell J50, 1-2-3 displays the value of A5 in J50. If you select /File Admin Link-Refresh, 1-2-3 will update both formulas with the value of the source cell.

Tips for Linking Files

The following tips provide additional information to help you link files:

- The linking formulas you enter in a Release 2.2 worksheet can refer to source cells in 1-2-3 Release 2.0 or 2.01 worksheet files (.WK1 files), 1-2-3 Release 1A worksheet files (.WKS files), or Symphony Release 1.1, 1.2, or 2.0 worksheet files (.WRK and .WR1 files). Just include the appropriate file reference and cell reference in the linking formula. For example, the formula +<<INCOME89.WKS>>B16 refers to cell B16 in a 1-2-3 Release 1A file.
- You can use absolute, relative, and mixed reference cell references in a linking formula (see "Using Cell and Range References in Formulas" earlier in this chapter). If you copy the linking formula to another location in the target file, 1-2-3 will adjust cell references in the copied formulas properly.
- If you have a large number of links in a worksheet, it may take a little longer than usual to retrieve the file because 1-2-3 must update each link.
- A linking formula uses 32 bytes of memory. If the source cell referenced in a linking formula contains a numeric value, no additional memory is used. If, the source cell contains a label or string formula, 1-2-3 uses 32 bytes of memory for the link, the number of bytes (characters) in the label or string, plus 1 byte. In addition, each unique range name included in a linking formula uses 16 bytes of memory, the number of bytes (characters) in the range name, plus one byte.
- If 1-2-3 runs out of memory while updating linking formulas, the program displays a Memory full error message. 1-2-3 updates as many linking formulas as it can before it runs out of memory. Any linking formulas that still need to be updated evaluate to ERR. To resolve this condition, you must free up some memory.
- If the data you are linking to depends on linked cells, you can get incorrect results. For example, if worksheet A depends on worksheet B, and worksheet B depends on worksheet C, the changes you make in worksheet C are not reflected when you retrieve worksheet A. You must retrieve and save worksheet B before you retrieve worksheet A.



Using the Clipboard with 1-2-3

The Clipboard enables you to copy and paste text in 1-2-3. Once on the clipboard, data can also be pasted to other applications or data from other applications can be pasted to 1-2-3. To display the Clipboard keys, in READY mode press (CTRL). The function key names will temporarily overwrite the status line at the bottom of the screen.

Follow these steps to copy worksheet data:

1. In READY mode, press (CTRL).
2. Press COPY ((CTRL)-(F2)). 1-2-3 invokes POINT mode.
3. Move the cell pointer cell by cell in the worksheet to specify the range you wish to copy. Please note the following when you specify a range:
   - Row and column headings cannot be copied.

- Each row of 1-2-3 information is copied as one line of text even if it traverses data in cells in multiple columns.
- There is no utility for viewing the Clipboard contents separately.

4. Press ENTER. (The original range remains on the screen, and a copy is stored in the Clipboard buffer.)
5. Move the cell pointer to the upper-left corner of the destination location, either in the same worksheet or in another file.

Caution



Make sure the area is empty or contains unimportant data. The Clipboard contents overwrite any data in the destination location.

6. Press PASTE (CTRL-F4).

Note



The Clipboard contents will be written as text; to convert the pasted numbers to values, use /Data Parse.

Using the UNDO Feature

When the undo feature is on, you can press UNDO (ALT-F4) when 1-2-3 is in READY mode to cancel the most recent operation that changed worksheet data and/or settings. In addition, if you change your mind about what you just undid, you can press UNDO again and 1-2-3 will undo the effect of the undo operation! Remember, UNDO must be turned on if you want to use it.

Initially the UNDO feature is off. You can turn it on with /Worksheet Global Default Other Undo Enable.

Note



UNDO consumes memory, so turning it off if you don't need it permits you to have a larger worksheet in memory.

You can tell whether or not you can use the undo feature by looking for the Undo indicator on the status line at the bottom of your screen. If the Undo indicator is not displayed, pressing UNDO will have no effect.

The undo feature is an important safeguard against time-consuming mistakes. 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, you can cancel the mistake by pressing UNDO (ALT-F4) immediately after entering the number; 1-2-3 erases the new entry and restores the formula in the cell.

What You Need to Know to Use UNDO

Although the undo feature is a valuable tool, you should not use it until you read the remainder of this section. This section provides important details about how the undo feature works; unless you are familiar with these details, you may get unexpected results when you use UNDO.

- UNDO works only when you are working in 1-2-3 and 1-2-3 is in READY mode.
- Initially, the UNDO feature is off, but you can turn it on with /Worksheet Global Default Other Undo Enable. If you then use /Worksheet Global Default Update to modify the 1-2-3 configuration file, UNDO will automatically be turned on whenever you start 1-2-3.
- Any series of 1-2-3 commands performed after you press slash (/) to display the main menu and before 1-2-3 returns to READY mode is a single undoable operation. For example, if you select /Graph, complete a series of Graph commands without leaving the /Graph menu and then return 1-2-3 to READY mode, pressing UNDO cancels the entire series of Graph commands you completed.
- If you press UNDO after running a macro, 1-2-3 returns your worksheet data and settings to the state they were in prior to running the macro, regardless of how many individual changes the macro made. If you did not run the macro from READY mode, 1-2-3 returns the worksheet data and settings to the state they were in when you last left READY mode, before running the macro.
- If you press UNDO immediately after 1-2-3 finishes running an autoexecute (\0) macro, 1-2-3 undoes the effects of the macro and the /File Retrieve operation.

- In order to undo your last operation, 1-2-3 must reserve a portion of memory to keep a copy of the worksheet. This reduces the amount of available memory.
- If you turn off the UNDO feature, retrieve a worksheet or attach an add-in, and then try to turn on UNDO, you will not be able to do so if any part of the UNDO buffer is in conventional memory. 1-2-3 cannot reserve the memory it needs for the UNDO buffer once you have retrieved a worksheet or attached an add-in. To turn on UNDO in this situation, save the worksheet with /File Save, erase it with /Worksheet Erase or detach the add-in with /Add-In Detach, turn on UNDO with /Worksheet Global Default Other Undo Enable, and then retrieve the worksheet or attach the add-in again.

When Does 1-2-3 Back Up the Worksheet?

1-2-3 creates a temporary backup copy of the worksheet (this includes worksheet data, range names, and settings) when you press any key that might lead to a worksheet change. This allows 1-2-3 to restore your work to its previous state if you press UNDO ([ALT]-[F4]). For example, 1-2-3 backs up the worksheet when you press [/] to display the main menu, press a character that begins a label or value, or press TABLE ([F8]) or QUERY ([F7]). 1-2-3 does not wait for you to complete a command or cell entry before backing up the worksheet. Therefore, if you press [/] to select a new command but then press [ESC] because you decide you want to undo your previous operation, you will not be able to because 1-2-3 backed up the worksheet again as soon as you pressed [/].

1-2-3 does not back up the worksheet when the key you press cannot lead to worksheet changes. For example, 1-2-3 does not back up the worksheet when you press a pointer-movement key (such as [◀] or [PG UP]) or when you press a function key that cannot change the worksheet, such as GOTO ([F5]).

In addition to the pointer-movement keys (see "Keys for Moving Around" earlier in this chapter), 1-2-3 *does not* back up the worksheet if you press any of the following keys in READY mode:

ABS (F4)	ESC	LEARN (ALT-F5)
←	GOTO (F5)	NAME (F3)
CTRL-BREAK	GRAPH (F10)	STEP (ALT-F2)
DEL	HELP (F1)	WINDOW (F6)
ENTER	INS	

1-2-3 also does not back up the worksheet if you press APP1 (ALT-F7), APP2 (ALT-F8), or APP3 (ALT-F9) and there is no add-in program assigned to the key.

What Operations Can't You Undo?

Some 1-2-3 commands (such as /File Save and /File Erase) create, modify, or delete files on disk. When you press UNDO to undo one of these commands, 1-2-3 undoes any changes to the state of the worksheet (this includes worksheet data, range names, and settings). 1-2-3 cannot, however, undo the changes the command made to files on disk. Similarly, if you press UNDO after using /Print Printer Go, 1-2-3 undoes any changes you made to 1-2-3 print settings with the Print [Printer or File] commands, but it cannot undo any changes the command had on your printer's internal settings.

Although you can press UNDO to undo the changes you make to most 1-2-3 settings, there are a few exceptions:

- The default directory setting (/File Directory and /Worksheet Global Default Directory).
- The Help access method (/Worksheet Global Default Other Help).
- The current file's reservation status, if you use /File Admin Reservation Get or Release to change it.

1-2-3 will restore the previous settings but will not undo any other changes made by the command.

There are also certain commands that you cannot undo:

- /Worksheet Global Default Other Undo Enable.
- Any command that attaches or detaches an add-in.
- Invoking an add-in, depending on what the add-in does.
- /System or {SYSTEM}.

Using the 1-2-3 Help System

1-2-3 provides Help screens that you can view any time during a 1-2-3 session by pressing HELP (F1). The 1-2-3 Help system is context-sensitive—when you press HELP, 1-2-3 displays a screen that describes what you are currently doing in the program.

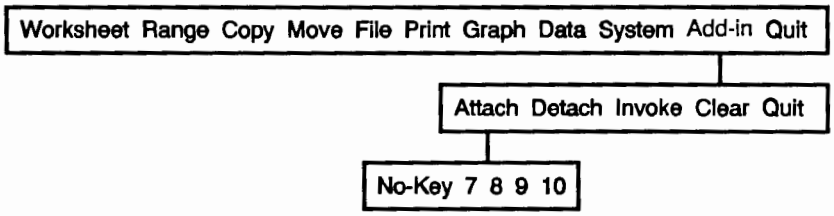
Each Help screen includes additional Help topics that are displayed with a cursor (pointer). Use the pointer-movement keys to select a topic, and press ENTER. You can select as many screens as you need. When you finish using HELP, press ESC to return to the worksheet at the same place you left it.

The following table lists the keys you use to move through Help topics and to other Help screens.

Name	Description	Name	Description
▲	Moves pointer up one topic.	END	Moves pointer to the last topic.
▼	Moves pointer down one topic.	ENTER	Displays Help screen for highlighted topic.
◄	Moves pointer left one topic.	HELP	Displays Help screen you saw when you first pressed HELP.
►	Moves pointer right one topic.	HOME	Moves pointer to first topic.
↩	Displays previous Help screen.		

3

The Add-In Commands



The Add-In commands let you use 1-2-3 add-in applications. **Add-ins** are programs, created by Lotus and other software developers, that you can run while you are using 1-2-3 and that provide 1-2-3 with additional capabilities. You never have to leave the worksheet to use an add-in. The program actually becomes part of 1-2-3.

You cannot undo /Add-In Attach, Clear or Detach.

Remember that you can press HELP (F1) *to get information about the command you are using.*

The Add-In commands are described in the following sections.

Add-In Command Descriptions

The following section describes the individual commands.

/Add-In Attach

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Use /Add-In Attach to load an add-in program into memory. Add-ins remain in memory until you detach them with /Add-In Detach, /Add-In Clear, /Worksheet Global Default Other Add-In Cancel, or until you end the current 1-2-3 session.

An attached add-in is not activated until you select /Add-In Invoke or press the key you have assigned to the add-in.

Follow these steps to load an add-in program into memory:

1. Select Add-In Attach.

   1-2-3 displays a menu of files with an .ADN extension in the root directory (C:\).
2. If you want to display files in a different drive and/or directory, press (ESC) to clear the file names, edit the drive and/or directory name, and then press (ENTER).
3. Specify the file name of the add-in you want to attach and press (ENTER).
4. Select the key you want to use to invoke the add-in:

7	Assigns the add-in to APP1 ((ALT)-(F7)).
8	Assigns the add-in to APP2 ((ALT)-(F8)).
9	Assigns the add-in to APP3 ((ALT)-(F9)).
10	Assigns the add-in to APP4 ((ALT)-(F10)).
no key	Does not assign the add-in to any key. (You invoke it using /Add-In Invoke.)

   Once you assign an add-in to a key, that key will no longer appear in the menu during the current 1-2-3 session unless you detach the add-in.

/Add-In Clear

Use /Add-In Clear to remove all attached add-in programs from memory, freeing the memory they occupied. (You cannot remove add-in @functions until you end the 1-2-3 session.)

/Add-In Detach

Use /Add-In Detach to remove an attached add-in program from memory, freeing the memory it occupied.

Note



You cannot detach add-in @functions. Once attached, they remain in memory until you end the 1-2-3 session. (For more information, see your add-in documentation.)

Follow these steps when using /Add-In Detach:

1. Select /Add-In Detach.

   1-2-3 displays a menu of all attached add-ins.
2. Specify the file name of the add-in you want to detach and press ENTER.

/Add-In Invoke

Use /Add-In Invoke to activate an add-in program that you have attached with /Add-In Attach. If you assigned the add-in to a key, you can also use that key to invoke the add-in.

1. Select /Add-In Invoke.

   1-2-3 displays the names of all attached add-ins.
2. Specify the name of the add-in you want to invoke and press ENTER.

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The Copy Command

Worksheet Range Copy Move File Print Graph Data System Add-in Quit

The Copy command lets you copy single cell entries to other cells or ranges; copy ranges to ranges; and copy formulas to other cells or ranges. Cell formats are copied along with the data.

Before you use /Copy to copy formulas, be sure that the cell reference in the formula corresponds to the type of copy you intend: relative, absolute, or mixed.

- If a formula contains relative cell references, 1-2-3 adjusts the references in the copied formula to refer to the new worksheet location.
- If a formula contains absolute cell references, 1-2-3 retains the specific cell or range address.
- If a formula contains mixed cell references, as it copies the formula, 1-2-3 adjusts the relative part of the cell reference and retains the absolute part.

Range names may be either relative or absolute—they cannot contain mixed references.

Remember that you can press HELP (F1) *to get information about the command you are using.*

Follow these steps to copy data:

1. Select /Copy
2. Specify the range you want to copy FROM and press ENTER.
3. Specify the range you want to copy TO and press ENTER.

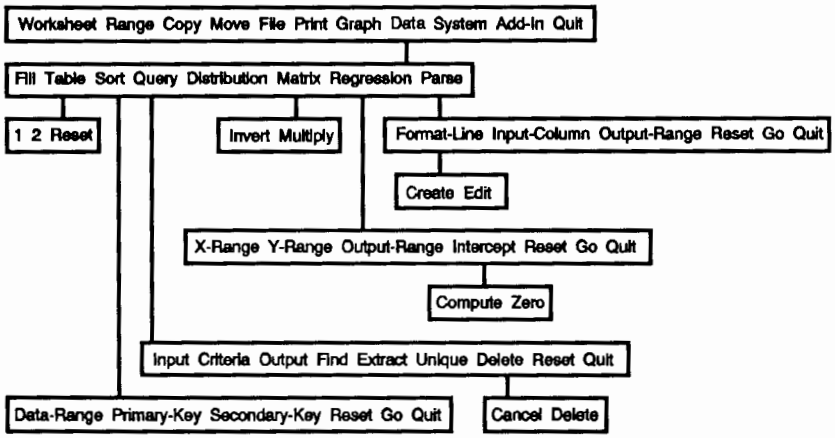
Consider these things when you specify a TO range:

- If you are copying a range from one location to another, you need to specify only the upper left cell in the TO range.
- If your TO and FROM ranges overlap, you may get unexpected results.
- If the FROM range is one cell and the TO range is larger than one cell, 1-2-3 makes multiple copies of the same data.
- The TO range can be any unprotected area of the worksheet.

Because 1-2-3 writes over existing data when it copies to your specified range, make sure that the TO location is blank or contains unimportant data. To avoid possible data loss from writing over existing data, save the worksheet before using /Copy. If you make a mistake when copying data and the undo feature is on, press UNDO (ALT-F4).

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Data Commands



The Data commands let you sort, compile, analyze, and manipulate groups of similarly organized data in a worksheet. You can use the Data commands to do any of the following:

- Enter values in a range in a specified sequence (/Data Fill).
- Perform "what-if" analysis on a table of data to show the results of a formula when the data the formula depends on changes, such as possible mortgage payments given a range of interest rates (/Data Table).
- Locate all the entries in a mailing list with an address in a specified city (/Data Query).
- Find out the frequency of sales over a certain figure in a database of sales records (/Data Distribution).
- Convert an imported text file into accurate cell entries, distinguishing values from labels (/Data Parse).

Note



To avoid possible data loss from writing over existing data, save your worksheet before using the Data commands. If you make a mistake and the undo feature is on, press UNDO ([ALT]-[F4]) immediately to restore the worksheet to its original state.

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Remember that you can press HELP ([F1]) to get information about the command you are using.

1-2-3 Databases

A 1-2-3 **database** is a range of related data organized in rows and columns in a worksheet. A worksheet can contain many different databases.

A **field** is a category (column head) that each record in the database has in common.

A **record** is a single row collection of information about one item in a database.

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

When you create a database, remember these rules:

- The first row of the database 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.
- A database can contain up to 256 fields and 8,191 records.

Data Command Descriptions

The following section describes the Data commands.

/Data Distribution

Use /Data Distribution to calculate 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).

1. You must create a values range and a bin range in the worksheet before you select /Data Distribution.
2. 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. Cells containing ERR (error) and NA (not available) will be counted at the top and bottom of the distribution range.
3. To create a bin range, find two empty adjacent columns. In the first column you must enter the values, or intervals, you want 1-2-3 to use to distribute the data. You will specify this first column as the bin range. 1-2-3 will use the empty adjacent column to the right to enter the frequency distribution when you select the command. You can use any values (including formulas) in the bin range, providing each value within the range is unique, and providing the values are in ascending order, with the smallest value at the top. Do not include labels, blank cells, or formulas that result in ERR or NA in the bin range or you may get unexpected results.
4. Select /Data Distribution.
5. Specify the values range and press (ENTER).
6. Specify the bin range and press (ENTER).

   1-2-3 places the frequency values 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. (To create a bin range with equal intervals, use /Data Fill.)

/Data Fill

Use /Data Fill to enter a sequence of equally spaced values in a specified range.

These are the terms you need to know:

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- The **fill range** is the range that you want 1-2-3 to fill with sequential values.
- The **start value** is the first value 1-2-3 enters in the fill range.
- The **step value** is the increment between each of the values in the sequence.
- The **stop value** is the value 1-2-3 uses as a limit for the sequence.

1-2-3 enters the start value in the first cell of the fill range. The program 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 to right.

Follow these steps to use /Data Fill:

1. Select /Data Fill.
2. Specify the fill range and press (ENTER).
3. Specify the start value and press (ENTER).

   The start value can be any value (including a formula), a cell, or a range name 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 and press (ENTER).

   The step value can be any value (including a formula), a cell, or a range name 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.
5. Specify the stop value and press (ENTER).

   The stop value can be any value (including a formula), a cell, a range address, or a range name 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 positive step value, you must specify a stop value that is greater than the start value. If you specify a negative step value, you must specify a stop value that is less than the start value. (If 1-2-3 reaches the stop value

before it fills the range, 1-2-3 erases the remaining cells in the range.)

/Data Matrix

Use /Data Matrix to invert or multiply matrices so you can solve simultaneous equations.

/Data Matrix Invert

Use /Data Matrix Invert to create the inverse of a square matrix. If you attempt to use /Data Matrix Invert with a matrix that has no inverse, 1-2-3 displays an error message.

1. Select /Data Matrix Invert.
2. Specify the matrix range you want to invert and press (ENTER).

   The matrix range must have the same number of columns and rows, and can contain up to 80 columns and 80 rows.
3. Specify the output range (the range in which you want 1-2-3 to enter the results of the inversion) and press (ENTER).

   You can specify either the entire range or only the upper left cell of the range.

/Data Matrix Multiply

Use /Data Matrix Multiply to multiply the columns of one matrix with the rows of a second matrix and create a third matrix that contains the results of the multiplication. When you multiply matrices, there must be the same number of columns in the first matrix as there are rows in the second matrix.

Although 1-2-3 performs various calculations when you select /Data Matrix Multiply, 1-2-3 does not actually create and store the formulas in the worksheet when you select the command.

Follow these steps when you use /Data Matrix Multiply:

1. Select /Data Matrix Multiply.
2. Specify the first range you want to multiply and press (ENTER). (1-2-3 can multiply any matrix of values up to a maximum of 256 rows by 256 columns.)
3. Specify the second range you want to multiply and press (ENTER).

4. Specify the output range (the range in which you want 1-2-3 to enter the results of the multiplication) and press (ENTER). (You can specify either the entire range or only the upper left cell of the range.)

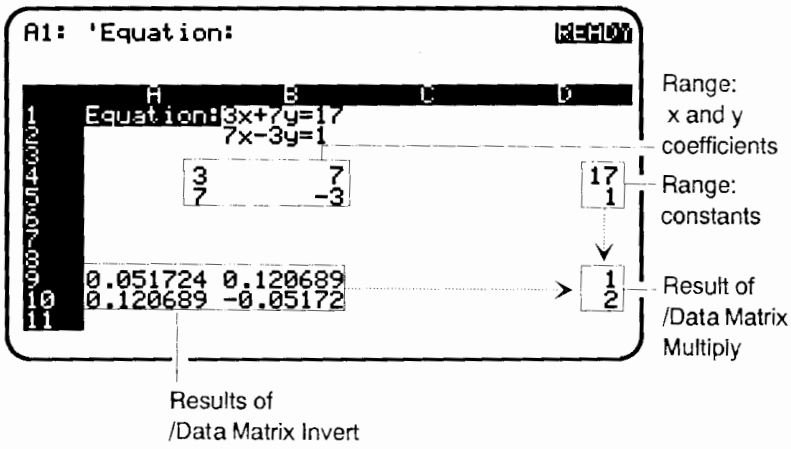
Example: Solving Simultaneous Equations with /Data Matrix. You can use both Data Matrix commands to solve simultaneous equations in 1-2-3. The equations should contain the x and y on one side of the =, and the constants on the other side. For example, use the following procedure to solve these equations:

$$3x+7y=17$$

$$7x-3y=1$$

1. Create two matrices: one that corresponds to the x and y coefficients in your equations (the numbers 3 and 7 in both the equations above), and one that corresponds to the constants (17 and 1 in the equations above).
2. Select /Data Matrix Invert.
3. Specify the matrix that corresponds to the x and y coefficients as the range you want to invert and press (ENTER). (In the illustration, A4..B5 is the range you want to invert.)
4. Specify an output range and press (ENTER). (In the illustration, the output range is A9.) 1-2-3 performs a matrix inversion.
5. Select /Data Matrix Multiply.
6. Specify the inverted matrix as the first range to multiply and press (ENTER). In our example the inverted matrix is A9..B10.
7. Specify the range containing the constants as the second range to multiply and press (ENTER). In our illustration, D4..D5 contains the constants.
8. Specify an output range and press (ENTER). The output range we show is D9..D10.

Computer Museum



The result of the matrix multiplication is the solution to the equations. In our example, $x=1$ and $y=2$.

/Data Parse

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. /Data Parse is best used with similarly structured data that can easily be separated into columns and rows.

If the data in the text file contains quotes around labels and separates numbers with commas, you do not need to use /Data Parse after you import the file. For further information, see /File Import Numbers.

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 cell entries with /Data Parse.

When you select /Data Parse, 1-2-3 displays a settings sheet listing the location of the input column and the output range. These are the ranges 1-2-3 will use when you are ready to parse the data with /Data Parse Go. You enter the ranges by selecting /Data Parse Input-Column and /Data Parse Output-Range.

Format Lines

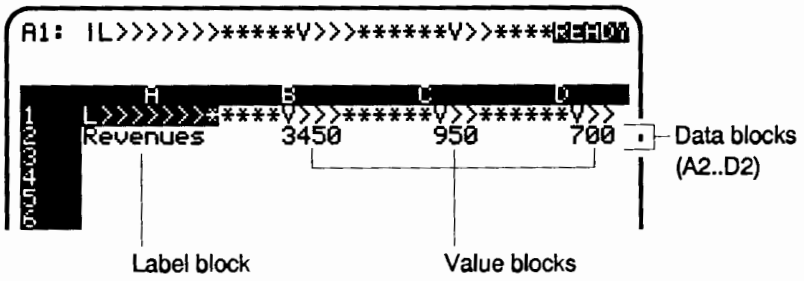
A **format line** determines the way 1-2-3 parses the label below the format line into individual entries, separating the label wherever there are one or more spaces. For example, 1-2-3 would parse the three-word label Average Monthly Sales into three separate pieces, because the spaces after Average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

The pieces into which 1-2-3 breaks up the label are called **data blocks**. The format line is a label, preceded by the split vertical bar (|) label prefix. The characters in the format line indicate the data type and the width of each data block in the **long label** below it. A long label is a cell entry that appears to occupy several columns but actually is a single cell entry whose contents extend into adjacent columns. The **data type** is the type of data—label, value, date, or time—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 immediately 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 the example below, 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 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:



If you select /Data Parse Go with the format line shown in the previous illustration, 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.

Remember to include as many character symbols (> or *) as the longest label in any one block, or you may lose data.

Follow these steps when using /Data Parse:

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, creates a format line in the cell that contains the cell pointer, and moves the range of data down one row. The characters in the format line reflect the data type and width of each of the data blocks in the cell below it. 1-2-3 uses the format line to guess how it should 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: value, date, time, or label.

   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 value comes before date in the order of precedence.

3. If you select Format-Line Edit to edit the format line, follow the procedure for editing a format line, which follows step 9.

   You need to edit the format line if any of these conditions exist:
   - 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.
   - Any of the block widths or data type characters is incorrect. In the example 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.
4. If you need to create additional format lines, select Quit to return 1-2-3 to READY mode, position the cell pointer in the next cell 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 of these conditions exist:
   - 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 entire single column range that contains the format lines 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.
9. Select Go.

Follow these steps to edit 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 enters OVR (overstrike) mode.
3. Edit the format line.

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

Key	Description
▲	Scrolls the unparsed labels below the format line up one row at a time so you can compare each label with the format line.
▼	Scrolls the unparsed labels below the format line down one row at a time so you can compare each label with the format line.
CTRL-BREAK	Cancels edits you made to the format line and returns 1-2-3 to READY mode.
ESC	Erases the format line; or, if pressed repeatedly, returns the format line to its previous state.
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	Scrolls the unparsed labels below the format line down by the number of rows on the screen so you can compare each label with the format line.
PGUP	Scrolls the unparsed labels below the format line up by the number of rows on the screen so you can compare each label with the format line.

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

/Data Parse Format-Line

Use /Data Parse Format-Line to create or edit the format line that controls the way 1-2-3 divides a long label into blocks of data. The long label will become individual entries, one per column.

1. When creating a format line, position the cell pointer in the cell that contains the first long label you want to parse. When editing a format line, position the cell pointer in the cell that contains the format line.
2. Select /Data Parse Format-Line.
3. Select one of the following options:

Create	1-2-3 analyzes the long label, inserts an appropriate format line at the cell pointer, and moves the data below down one row.
Edit	1-2-3 displays the format line and allows you to edit it.

/Data Parse Go

Use /Data Parse Go to parse the labels in the input column and place them in the output range.

1. Specify an input column, format line, and output range.
2. Select /Data Parse Go.

/Data Parse Input-Column

Use /Data Parse Input-Column to specify the single column range that contains both the format line and the data you want to parse.

1. Specify the format line.
2. Select /Data Parse Input-Column.
3. Specify the entire column containing the long labels you want to parse, including the format line at the top.

/Data Parse Output-Range

Use /Data Parse Output-Range to specify the range in which you want 1-2-3 to place the parsed data. If you specify one cell, 1-2-3 uses that cell as the upper left cell in the output range.

1. Move the cell pointer to an empty part of the worksheet.
2. Select /Data Parse Output-Range.

3. Specify an output range. You need only specify one cell. 1-2-3 will use that cell as the upper left corner of the output range and will create a range large enough to hold the output data.

/Data Parse Quit

Use /Data Parse Quit to return 1-2-3 to READY mode.

/Data Parse Reset

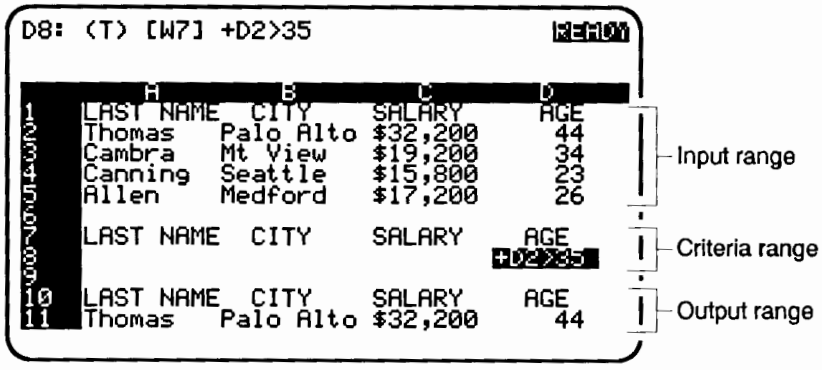
Use /Data Parse Reset to clear the range address settings for the input column and the output range.

/Data Query

The Data Query commands let you locate and edit selected records in a database. You can also use QUERY ([F7]) to repeat your last query operation.

Before You Use /Data Query

Before you use /Data Query, you need to create three ranges: an input range, a criteria range, and an output range. (If you want to highlight or delete matching records with /Data Query Find or /Data Query Delete, an output range is not required.)



Our illustration shows an example of a 1-2-3 database with an input range, criteria range and output range after using /Data Query Extract. (Cell D8 is formatted with /Range Format Text so you can see the formula in the cell.)

The /Data Query Settings Sheet

5

When you select /Data Query, 1-2-3 displays a settings sheet listing the location of the input range, the criteria range, and the output range. Enter the ranges in the settings sheet by selecting /Data Query Input, /Data Query Criteria, and /Data Query Output.

Required /Data Query Ranges

Before you can use /Data Query to locate records in a data base, you need to create the following three ranges.

The Input Range. Use /Data Query Input to specify the range that contains the database records you want 1-2-3 to search when you select a Data Query command.

Use the following guidelines when you create an input range:

- The first row of the range must include the field names. Subsequent rows contain all of the records in the database that you want to query.
- Do not use any separator, such as a dashed line or blank row, between the first row containing the field names and the second row containing the first record in the database.

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

Use the following guidelines when you create a criteria range:

- Choose an area of the worksheet that does not overlap the input range (for example, several rows below it). To add records to the database, use /Worksheet Insert Row.
- In the first row of the criteria range, copy the field names from the input range exactly as they appear. Use /Copy to ensure a correct first row of the criteria range. Although you need to copy only the names of the fields you want 1-2-3 to search, copying all the field

names makes it easier to change criteria (using any fields) whenever you want. 1-2-3 only uses fields that contain entries in the criteria range. You can include up to 32 field names in the criteria range.

- In the second (and subsequent) rows of the criteria range, enter your criteria below the appropriate field names. You can enter labels, values, or formulas in the cells. 1-2-3 will search for the records that match your criteria.

The Output Range. Use /Data Query Output to specify the area to which 1-2-3 copies the results of /Data Query Extract or /Data Query Unique.

Like the criteria range, the first row of the output range must contain copies of the field names from the input range you want 1-2-3 to search. Use /Copy to create the the first row of the output range from the first row of the input range to ensure an accurate copy of the field names. 1-2-3 uses the remaining rows of the output range to copy the selected records.

Use the following guidelines when you create an output range:

- Choose an area in the worksheet that does not overlap your input or criteria ranges.
- If you specify a **single row output range** consisting of just the row containing the field names, 1-2-3 will erase all data in the columns below the field names to the bottom row of the worksheet. Then 1-2-3 will use as many rows as it needs to copy data below the field names.
- If you specify a **multiple row output range** consisting of the field names in the first row and a number of blank rows below it, 1-2-3 will use only the range you have specified to copy data below the field names, even if there are more records that match the criteria than will fit into the specified 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.

Writing Criteria

Criteria are cell entries that 1-2-3 interprets as tests for the records in a database. The criteria determine whether or not a /Data Query command affects a particular record. You can write criteria that match label or value entries in the database and you can use more than one criteria.

Searching for Labels. To search for exact matches, enter labels exactly as they appear in the input range. (If you selected the ASCII collating sequence in the Setup utility, 1-2-3 distinguishes between uppercase and lowercase letters when searching for labels.)

- The ? 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.
- The * matches all characters to the end of a label. For example, cat* matches cat, catsup, and category, but not cart.
- Preceding a label with a tilde (~) searches for all labels except that one. For example, ~Smith matches all records with an entry in that field other than Smith.

Combine the label-matching symbols to create label criteria. For example, ~S* matches all records with an entry in that field that do not begin with S. 1-2-3 never matches a label criterion with blank cells in the input range.

Searching for Values. To search for exact value matches, enter the value as the criterion. The format does not need to match the format of the value in the database. For example, $23 matches 23, 23.000, and 2.30E+01.

You can enter one or more formulas linked by logical operators to search for values that meet a condition you set, such as all entries greater than 1500. Enter the condition as a logical expression in the criteria range, using the cell address of the corresponding field of the first record in the database. Use any of the operators listed below in your formula to compare a cell entry to some value.

Operator	Operation	Operator	Operation
^	Exponentiation	<	Less-than test
-	Identification of value as negative	>	Greater-than test
+	Identification of value as positive	<=	Less-than-or-equal-to test
*	Multiplication	>=	Greater-than-or-equal-to test
/	Division	#NOT#	Logical-NOT test
+	Addition	#AND#	Logical-AND test
-	Subtraction	#OR#	Logical-OR test
=	Equal-to test	&	String concatenation
<>	Not-equal-to test		

Use relative cell addresses in formulas that refer to database fields in the input range. Use absolute cell addresses to refer to values outside the input range. For example, use the criterion +B2<>C2 to search for records whose entry in the B field is not equal to its entry in the C field. Use +B2<>$J$2 to search for records whose entry in the B field is not equal to the value in J2 outside the database.

Note



When you use a database @function in a formula in a criteria range, make sure the database @function does not refer to that criteria range. Such a database @function results in a circular reference, causing 1-2-3 to display an error message.

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#.

- 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.
- 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#.

- Do not include a blank row in a multiple row criteria range. 1-2-3 will select all the records.
- Use the logical operators #AND#, #NOT#, or #OR# in formulas to create criteria that match more than one condition in the same field. Using the example on page 5-14, the formula +C2>15000#AND#+C2<25000 would search for all records with SALARY entries greater than 15000 but less than 25000. For further information on logical operators and formulas, see "Working with Formulas" in Chapter 2.

/Data Query Criteria

Use /Data Query Criteria to specify the criteria range, which contains the selection criteria for records in the database. You must use /Data Query Criteria before you can complete any data query operation.

1. Select /Data Query Criteria.
2. Specify the criteria range and press ENTER. (The criteria range must include a top row containing the field names of the fields you want to query, and one or more rows below containing the criteria.)

/Data Query Delete

/Data Query Delete lets you delete the records in the input range that match your criteria and shrink the input range to remove the blank rows. As a safety precaution, 1-2-3 prompts you for confirmation before it deletes the records.

1. Before you use /Data Query Delete, you must specify an input range and a criteria range.
2. Select /Data Query Delete.
3. Select one of the following options:

Cancel	Returns you to the /Data Query menu without deleting any records.
Delete	Deletes all records in the input range that match the criteria in the criteria range.

Use /Data Query Find to preview the records that 1-2-3 will delete before 1-2-3 deletes the records. If you make a mistake and the UNDO feature is on, press UNDO (ALT-F4) immediately to restore the deleted records.

/Data Query Extract

Use /Data Query Extract to copy to the output range the records in the input range that match your criteria.

- Before you use /Data Query Extract, you must specify an input range, a criteria range, and an output range.
- Select /Data Query Extract.

Note



If you specify a single row output range, 1-2-3 will erase all data in the columns below the field names to the bottom row of the worksheet. Then 1-2-3 creates an output range that contains as many rows as needed to contain the data. If you make a mistake when extracting records and the undo feature is on, press UNDO (ALT-F4) immediately to restore the worksheet to its original state.

/Data Query Find

Use /Data Query Find to locate the records in the input range that match the criteria you specified or to locate records that you want to edit.

1. Before you use /Data Query Find, you must specify an input range and a criteria range.
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	Description
▲	Moves the cell pointer up 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.
▼	Moves the cell pointer down 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.
◀	Moves the cursor left one field within a highlighted record.
▶	Moves the cursor right one field within a highlighted record.
EDIT (F2)	Lets you edit the field displayed in the current record. Press ▶ and ◀ to move from field to field. (Press ENTER to save the changes and continue using /Data Query Find; press ESC to cancel the changes and continue using /Data Query Find.)
END	Moves the cell pointer to the last record in the input range.
ESC or ENTER	Ends /Data Query Find and returns you to the /Data Query menu.
HOME	Moves the cell pointer to the first record in the input range.
QUERY (F7)	Ends /Data Query Find, leaves the cell pointer in the current cell, 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

Use /Data Query Input to specify the range that contains the records you want 1-2-3 to search. You must use /Data Query Input before you can complete any data query operation.

1. Select /Data Query Input.

2. Specify an input range containing all data you want to query and press (ENTER). (Be sure to include the field names in the first row.)

/Data Query Output

Use /Data Query Output to specify the range in which you want 1-2-3 to place the results of /Data Query Extract or /Data Query Unique. You must use /Data Query Output before you can use either of these commands.

1. Select /Data Query Output.
2. Specify the output range as either a single row or multiple row range and press (ENTER). (Remember to include the field names as the first row.)
3. Specify a **single row output range** containing just the field names if you have a lot of empty space below the field names and are not concerned about any existing entries being written over. 1-2-3 will use as many rows below the field names as it needs.
4. Specify a **multiple row output range** with the field names as the first row if you want to be certain that 1-2-3 does not write over existing entries. 1-2-3 will write only to the multiple row range you specify. If the range is not large enough to accommodate all the records that match your selection criteria, 1-2-3 will fill in as many as will fit and then display an error message.

/Data Query Quit

Use /Data Query Quit to return 1-2-3 to READY mode.

/Data Query Reset

Use /Data Query Reset to clear the range address settings for the input, criteria, and output ranges you specified.

/Data Query Unique

Use /Data Query Unique to perform the same operation as /Data Query Extract except you can eliminate any duplicate records in the output range.

1. Before you use /Data Query Unique, you must specify an input range, a criteria range, and an output range.
2. Select /Data Query Unique.

1-2-3 copies to the output range the records in the input range that match your criteria, eliminating any duplicate records in 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 you have a lot of empty space below the output range, specify just the row that contains the field names as the output range.

/Data Regression

Use /Data Regression to perform a regression analysis on existing data. A regression analysis is a statistical application used for predicting future data based on current data. Use the following commands to perform a data regression:

Command	Task
Go	Calculates a data regression for the selected X range, Y range, and output range.
Intercept	Determines whether 1-2-3 calculates the y-axis intercept automatically (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; resets the intercept to Compute.
X-Range	Specifies the independent variables.
Y-Range	Specifies the dependent variable.

Use /Data Regression to predict a value for a dependent variable based on the values for one or more independent variables. /Data Regression also indicates the statistical accuracy of these values.

You can also use /Data Regression when you have several sets of values and you want to see how and whether one set is dependent on the others, and also to determine the slope and the y-axis intercept of the best-fitting line for a set of data points.

Terms to Know

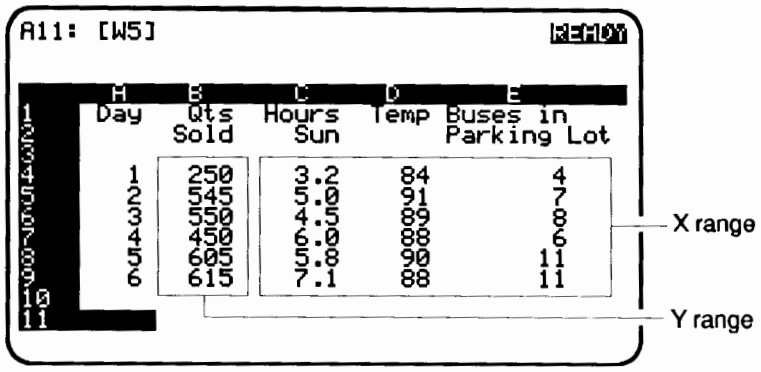
- An **independent variable** is a value used to determine a prediction.
- A **dependent variable** is the data for which you have current information, but which you want to predict.
- The **intercept** is the point at which the Y-axis is crossed by the predicted line.

/Data Regression Settings Sheet

When you select /Data Regression, 1-2-3 displays a settings sheet listing by cell address the location of the X range, Y range, output range, and y-axis intercept. These are the settings 1-2-3 will use when you are ready to perform the regression with /Data Regression Go.

Example: **Performing Regression Analysis.** You are the proprietor of an ice cream stand at a tourist location, and you want to predict 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.

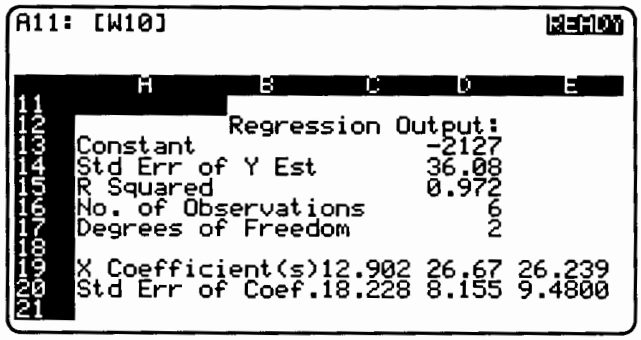
You created a database that contains the available information for a six day period. (In practice, you would probably collect data for a much longer period to get greater accuracy.)



Before you can predict sales, you need to perform a regression analysis on the existing data, as described in the steps below.

1. Select /Data Regression X-Range. The X range contains the independent variables in the database (the variables you can estimate with some degree of accuracy already). For the ice cream stand, the independent variables are the number of hours of sunshine, the midday temperature, and the number of buses in the parking lot (the range C4..E9).
2. Select /Data Regression Y-Range. The Y range contains the dependent variable in the database (the variable you want to predict). For the ice cream stand, the dependent variable is the amount of ice cream sold (the range B4..B9).
3. Select /Data Regression Output-Range to indicate the area of the worksheet 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 (the cell A12).

4. Select /Data Regression Go. 1-2-3 automatically enters the following calculated results (including labels) in the output range, as illustrated in the figure below:



Now you can use the regression data you have generated for a prediction. Suppose the weather forecast tells you that tomorrow will be cloudy, with only two hours of sunshine and a midday temperature of 84°F. You guess that no more than five buses will visit. These are the predicted X values.

To predict the ice cream sales (Y value) for tomorrow, complete the following steps:

1. Enter the predicted values (2, 84, 5) in the database. (If you want to continue our example, enter the predictions in C10..E10.)
2. Enter the following formula in the cell where you want to see the prediction. (Enter the formula in cell F10 so that the prediction is in sequence with actual sales, but in a different column so that it is not confused with actual sales.)

   +(C10*$C$19)+(D10*$D$19)+(E10*$E$19)+$D$13

   This formula may look complicated, but it is really only the sum of the following four items:
   - The first predicted x value multiplied by the first x coefficient.
   - The second predicted x value multiplied by the second x coefficient.
   - The third predicted x value multiplied by the third x coefficient.
   - The constant.

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.

The prediction indicates that you should expect to sell approximately 270 quarts of ice cream tomorrow.

5

Using /Data Regression

1. Select /Data Regression.
2. Select X-Range to specify the independent variables. (Select Reset at any time to clear the regression settings.) You can specify up to 16 independent variables.
3. Specify the X range and press ENTER.
4. Select Y-Range to specify the dependent variable.
5. Specify the Y range and press ENTER. (The X range and Y range must have the same number of rows.)
6. If you select Intercept, select one of the following options:

Compute	Calculates the y-axis intercept automatically.
Zero	Uses zero as the y-axis intercept. (Do not select Zero unless when all of your independent variables equal zero, the dependent variable must equal zero also.)

7. Select Output-Range.
8. Specify the output range in a blank area of the worksheet and press ENTER. If you select a 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.)
No. of observations	The number of rows of data in the X and Y ranges.
R squared	The reliability of the regression (a value from 0 to 1, inclusive). 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.
Std Err of Coef.	The standard error of each of the x coefficients.
Std Err of Y Est.	The standard error of the estimated y values.
X coefficients	The slope for each independent variable.

/Data Regression Go

Use /Data Regression Go to calculate a data regression for the selected X range, Y range, and output range.

1. Before you use /Data Regression Go, you must specify the X range, Y range, and output range.
2. Select /Data Regression Go.

/Data Regression Intercept

Use /Data Regression Intercept to determine whether 1-2-3 calculates the y-axis intercept automatically or uses zero as the intercept. The y-axis intercept appears as the constant in the results.

1. Select /Data Regression Intercept.
2. Select one of the following options:

Compute	Calculates the y-axis intercept automatically.
Zero	Uses zero as the y-axis intercept. (Do not select Zero unless when all of your independent variables equal zero, the dependent variable must equal zero also.)

/Data Regression Output-Range

Use /Data Regression Output-Range to specify the range in which 1-2-3 places the results of the regression analysis.

1. Select /Data Regression Output-Range.
2. Specify an output range in a blank area of the worksheet and press (ENTER).
   - If you specify just one cell 1-2-3 will use that cell as the upper left cell of the output range, and determine how big a range it needs.
   - If you specify a larger range but one which is not big enough to contain the regression calculations, 1-2-3 will display an error message when you select Go.

/Data Regression Reset

Use /Data Regression Reset to clear range address settings for the X range, the Y range, and the output range, and to reset the intercept to Compute.

/Data Regression X-Range

Use /Data Regression X-Range to specify the independent variables.

1. Select /Data Regression X-Range.
2. Specify the independent variables and press (ENTER). You can specify up to 16 independent variables.

/Data Regression Y-Range

Use /Data Regression Y-Range to specify the dependent variable.

1. Select /Data Regression Y-Range.
2. Specify the dependent variable and press (ENTER). (The X range and the Y range must have the same number of rows.)

/Data Sort

Use /Data Sort to arrange the data in a range in the order you specify. The range can be records in a database or rows in the worksheet.

Before you use /Data Sort, make sure that the data you want to sort is in a range, and that you have similar data in the columns of the range. For example,if you want to sort numbers in column A in descending order, it may not be useful if column A contains labels. (If the data is in a database, it will already be organized properly.)

The /Data Sort Settings Sheet

When you select /Data Sort, 1-2-3 displays a settings sheet. The settings sheet lists by cell address the location of the data range, primary sort key, and secondary sort key. These are the settings 1-2-3 will use when you are ready to perform a sort.

Sort Order

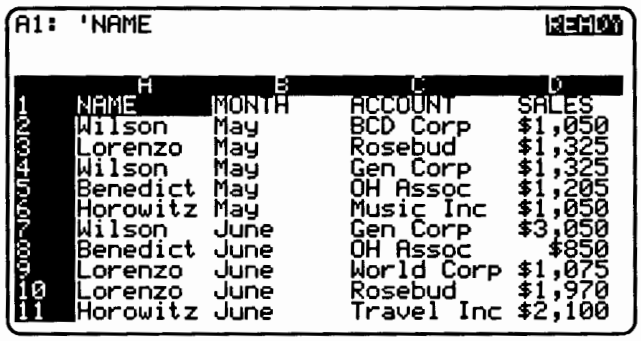
Ascending sort order arranges data by listing numbers first, unless you change the initial setting for the sort order (also called the collating sequence) using the Setup utility. The following table shows the available collating sequences. (Descending sort order reverses the order.)

Collating Sequence	Sort Order
Numbers first	1. Blank cells 2. Labels beginning with numbers in numerical order 3. Labels beginning with letters in alphabetical order 4. Labels beginning with other characters 5. Values 1-2-3 ignores capitalization.
Numbers last	1. Blank cells 2. Labels beginning with letters in alphabetical order 3. Labels beginning with numbers in numerical order 4. Labels beginning with other characters 5. Values 1-2-3 ignores capitalization.
ASCII	1. Blank cells 2. All labels, using their ASCII values 3. Values Uppercase letters precede lowercase letters.

How to Use /Data Sort

1. Select /Data Sort Data-Range.
2. Specify the range you want to sort and press (ENTER).

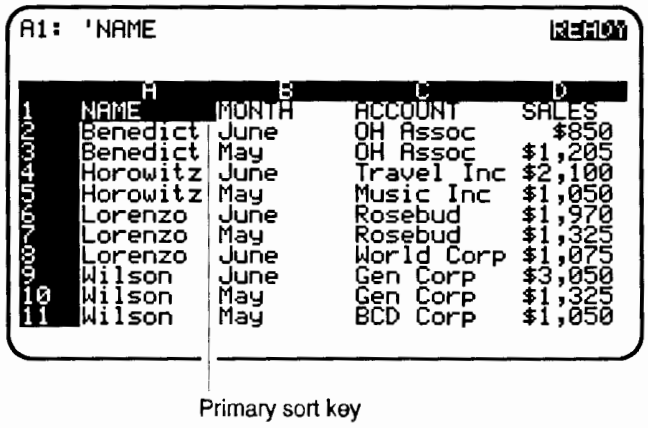
   The data range must contain all the records or rows you want to sort. If you are sorting a database, do not include the field names (the first row of the database).
3. Select Primary-Key.
4. Specify the primary sort key by entering the cell address of any cell in the field you want 1-2-3 to use to determine the new order for your records.
5. Enter the primary sort order (A for ascending or D for descending).
6. If some records have the same entries in the primary sort key field and you want these records arranged in a specific order, then select Secondary-Key.
7. Specify the secondary sort key by entering the address of the cell you want 1-2-3 to use to break ties in the primary sort key field and press (ENTER).
8. Enter the secondary sort order (A for ascending or D for descending).
9. Select Go to sort the database or range.



A1: 'NAME READY

	A	B	C	D
1	NAME	MONTH	ACCOUNT	SALES
2	Wilson	May	BCD Corp	$1,050
3	Lorenzo	May	Rosebud	$1,325
4	Wilson	May	Gen Corp	$1,325
5	Benedict	May	OH Assoc	$1,205
6	Horowitz	May	Music Inc	$1,050
7	Wilson	June	Gen Corp	$3,050
8	Benedict	June	OH Assoc	$850
9	Lorenzo	June	World Corp	$1,075
10	Lorenzo	June	Rosebud	$1,970
11	Horowitz	June	Travel Inc	$2,100

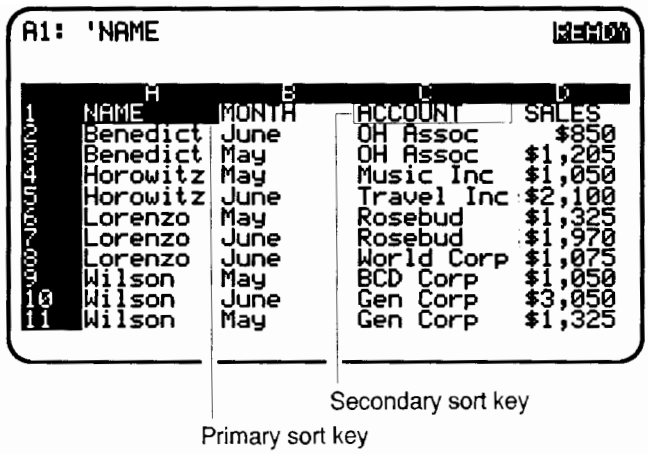
The illustration above shows a database with four fields (NAME, MONTH, ACCOUNT, and SALES) and 10 records (rows 2 through 11). Once you select the database (not including the field names) as the data range, you can sort the records in many different ways, depending on the information you need to gather.



A1: 'NAME READY

	A	B	C	D
1	NAME	MONTH	ACCOUNT	SALES
2	Benedict	June	OH Assoc	$850
3	Benedict	May	OH Assoc	$1,205
4	Horowitz	June	Travel Inc	$2,100
5	Horowitz	May	Music Inc	$1,050
6	Lorenzo	June	Rosebud	$1,970
7	Lorenzo	May	Rosebud	$1,325
8	Lorenzo	June	World Corp	$1,075
9	Wilson	June	Gen Corp	$3,050
10	Wilson	May	Gen Corp	$1,325
11	Wilson	May	BCD Corp	$1,050

For example, if you want to review each person's sales, you would sort the database using the NAME field as the primary sort key (cell A1). The illustration above shows the database sorted by NAME in ascending order.



You can also sort by two sort keys at once. For example, you can sort the database by NAME and ACCOUNT. The illustration above shows the database sorted by two keys. The primary sort key is NAME (cell A1) in ascending order; the secondary sort key is ACCOUNT (cell C1) in ascending order.

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 cell addresses in the formulas to reflect the new position of the cell. This can cause problems if the formula refers to information outside the database.

Use /Data Fill to enter a field of record numbers in a database 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 re-sort the records back to their original order.

/Data Sort Data-Range

Use /Data Sort Data-Range to specify the range you want to sort—either records in a database or rows in the worksheet.

1. Select /Data Sort Data-Range.
2. Specify the range of data you want to sort and press (ENTER).

   Include all the rows and columns you want to sort, but not the field names.

/Data Sort Go

Use Data Sort Go to sort the data in the data range according to the primary and secondary key settings.

1. Before you use /Data Sort Go, you must specify a data range and a primary sort key. The secondary sort key is optional.
2. Select /Data Sort Go.

/Data Sort Primary-Key

Use /Data Sort Primary-Key to determine the primary field 1-2-3 will use to sort the data in the data range. You must specify a primary key and sort order before you can perform a sort.

1. Select /Data Sort Primary-Key.
2. Specify the cell in the field or column you want 1-2-3 to use to sort the data and press (ENTER).
3. Specify a sort order:

A	Sorts numbers and letters in ascending order.
D	Sorts numbers and letters in descending order.

/Data Sort Quit

Use /Data Sort Quit to return 1-2-3 to READY mode without sorting the records or rows.

/Data Sort Reset

Use /Data Sort Reset to clear the data range and primary and secondary sort key settings.

/Data Sort Secondary-Key

Use /Data Sort Secondary-Key as an optional setting to determine the secondary field 1-2-3 will use to sort data. This is used as a tie-breaker for records in a database or rows in the worksheet that have identical primary sort key entries. After sorting the data according to the primary field, 1-2-3 will sort the data according to the secondary field. 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.

Follow these steps when using /Data Sort Secondary-Key:

1. Select /Data Sort Secondary-Key.
2. Specify any cell in the field or column you want 1-2-3 to use as a tie-breaker and press ENTER.
3. Specify a sort order:

A	Sorts numbers and letters in ascending order.
D	Sorts numbers and letters in descending order.

/Data Table

The Data Table commands let you calculate a table of results when you provide different numbers for the same formulas. You can use the Data Table commands to perform "what-if" or "sensitivity" analyses, and cross-tabulate the information in a 1-2-3 database.

Terms to Know

A **data table** is an area of a worksheet that contains the input values, formulas, and results of the calculations.

A **variable** is the part of a formula for which input values can be substituted. For example, the formula +40*B2 contains one variable, B2.

An **input cell** is an unprotected cell in which 1-2-3 places values when it performs calculations. Each variable in a formula has a separate input cell.

An **input value** is a value 1-2-3 substitutes for a variable when it performs calculations. You must include input values in the data table.

The **results area** is an unprotected area of a data table in which 1-2-3 enters the results of the calculations.

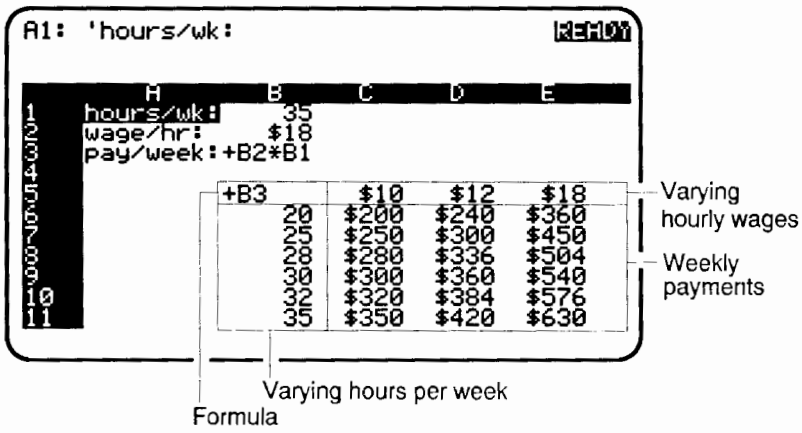
Before You Use /Data Table

Before using /Data Table you must have a formula containing a variable, plus the input values you want 1-2-3 to substitute for the variable. For example, you have a formula that multiplies an hourly wage by a number of hours to calculate the payment due. The variable is the number of hours; the input values are the range of hours you specify. 1-2-3 will then calculate the range of payments due.

1-2-3 can create two types of data tables: data table 1 and data table 2. The type of data table you create depends on the number of variables you want to use in your formulas. Use /Data Table 1 if you have one or more formulas with one variable for which you want to substitute a range of numbers; use /Data Table 2 if you have one formula with two variables for which you want to substitute a range of numbers.

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.

You can use TABLE (F8) 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.



Example: Performing a What-If Analysis. The illustration shows how you can use /Data Table 2 to calculate a variety of weekly payments depending on the number of hours per week and the hourly wage. The values in B6..B11 represent a range of hours per week, and the values in C5..E5 represent a range of hourly wages. The dollar amounts in C6..E11 represent the results of substituting the two sets of variables into the formula in B3. (Cells B3 and B5 are formatted with /Range

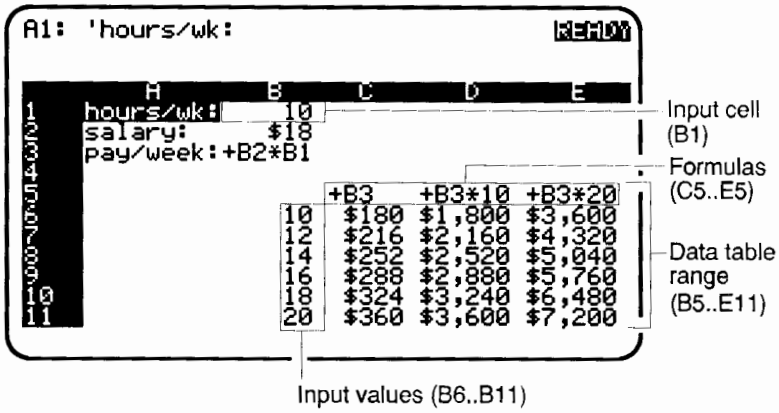
Format Text so you can see the formula in the cell; cells C5..E11 are formatted with /Range Format Currency.)

If you have a database 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 to show the total sales for each person for each month.

5

/Data Table 1

/Data Table 1 produces a table that shows the effect of changing one variable in one or more formulas.



1-2-3 places the results of each formula in the column below the formula. For example, the data table illustrated shows the salaries resulting from a range of hours in 1 week (column C), 10 weeks (column D) and 20 weeks (column E). The formula is written in cell B3 with the variable in B1. This makes it easy to identify the input cell. C5, the first formula in the data range, uses the formula in B3. (Cells C5..E5 and B3 are formatted with /Range Format Text so you can see the formulas in the cells.)

Before you use /Data Table 1, you must set up the data table range. The following procedure uses the data table in the previous illustration as an example for setting up a data table range.

1. Decide on a location for the data table range. You must use the following structure when setting up a data table range:

Computer Museum

- The left column contains the variables.
- The upper left cell is empty.
- The formula is located in the top cell of the second column.
- Additional formulas are located in adjacent cells to the right of the first formula.

In our example, the data table range is B5..E11: the input values (hours per week) are in B6..B11, the formulas (salary for one, 10, and 20 weeks, based on hours per week) in C5..E5, and the results area in C6..E11.

2. Decide on the location for the input cell.

   The initial formula (salary times hours per week) is in B3; the variable (hours per week) is in B1, which is also the input cell. You can document the location of the input cell by entering a label such as "=Input 1" next to the input cell.

   The input cell can be empty. However, you can write the formula so the input cell contains a variable used in the formula. This helps to clarify where 1-2-3 places the input values to calculate the results.

3. Enter the formula in the first row at the top of the second column of the data table range. Make sure the formula refers to the input cell, directly or indirectly. The previous illustration is an example of an indirect reference. The formula in the next illustration uses a direct reference.

   Only one formula is required.

   In our example, the initial formula is in B3. C5 uses the formula in B3. The other formulas in D5 (10 weeks) and E5 (20 weeks) both use the formula in B3, which contains a reference to B1, the input cell.

Note



Unless the input cell contains data, the formulas will evaluate to 0 or ERR. This will not, however, affect the results of the /Data Table command.

4. In the first column of the data table range, starting with the second cell, enter the input values you want to use in each of the formulas.

Note



If you are using string formulas in the data table, enter labels instead of values in the first column of the data table range.

In the previous illustration, the input values (the hours per week) are in B6..B11.

5. Select /Data Table 1.
6. Specify the data table range and press (ENTER).

   In the previous example, this is B5..E11.
7. Specify the input cell and press (ENTER).

   In our example, this is B1. 1-2-3 calculates each of the formulas in B5..E5, using each of the input values in B6..B11. The result of each calculation appears in the cell at the intersection of the row and column containing the input value and formula, respectively. In our example, the results area is C6..E11.

Using /Data Table 1 with a Database

/Data Table 1 lets you analyze or cross-tabulate the data in a 1-2-3 database. You can use database @functions in the formulas in the data table. This allows you to perform calculations using data from selected records in the database.

Before you use /Data Table 1 with a database, you need to be familiar with the following:

- The structure of databases. See "1-2-3 Databases" at the beginning of this chapter.
- Database @functions. For detailed information on the database @functions, see "@Function Descriptions" in Chapter 14.

Before using /Data Table 1, you must set up the data table range.

1. Decide on a location for the data table range and 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, you can use it to specify the input cell, or you can create a separate criteria range specifically for the data table.
2. Enter the formulas. Be sure to include a reference to the input cell.

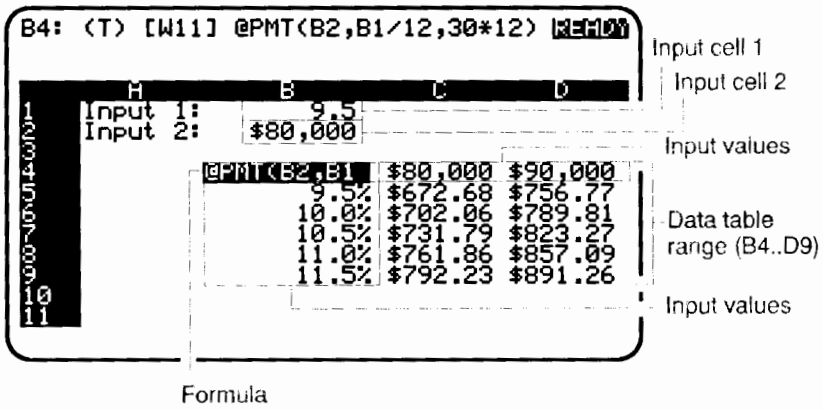
3. Enter the input values. You must enter these values or labels exactly as they appear in the database.
4. Position the cell pointer in the blank cell in the upper left corner of the data table.
5. Select /Data Table 1.
6. Specify the data table range and press (ENTER).
7. Specify the input cell and press (ENTER).

1-2-3 calculates each of the formulas, using each of the input values. The result of each calculation appears in the cell at the intersection of the row and column containing the input value and formula, respectively.

You can use an XY graph to graph information from a data table 1. The X range is the range of values in the first column, and the other ranges are selected columns in the results area of the table.

/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 the figure below shows the effect of varying the interest rate and the principal in an @PMT formula.



Before using /Data Table 2, you must set up the data table range. (The following procedure uses the data table in the illustration as an example.)

1. Decide on a location for the data table and input cells 1 and 2.

Input cell 1 always refers to the values in the first column of the data table. Input cell 2 always refers to the values in the first row of the data table.

In our example, the data table range is B4..D9: the first set of input values (interest rate) is in B5..B9, the second set (principal) in C4..D4, the formula in B4, and the results area in C5..D9. The two input cells are in B1 and B2. Because the input values for the interest rate are in the first column, cell B1 (which represents the interest rate in the @PMT formula) must be input cell 1. Because the input values for the principal are in the first row, cell B2 (which represents the principal in the @PMT formula) must be input cell 2. You can document the location of each input cell by entering a label such as "Input 1" or "Input 2" next to each input cell.

2. Enter the formula in the upper left cell of the data table range. Make sure the formula refers to both input cells.

   In our example, the @PMT formula is in B4 (the entire formula is visible in the control panel). The formula contains references to B1, the first input cell, and B2, the second input cell.

Note



Unless the input cells contain data, the formulas will evaluate to 0 or ERR. This will not, however, affect the results of the Data Table command.

3. Enter the input values for the variable associated with input cell 1.

   In the example, the input values for the interest rate are in the first column of the data table (B5..B9) because the variable that represents the interest rate (B1) is associated with input cell 1. (The input values are formatted with /Range Format Percent.)

Note



If you are using string formulas in the data table, enter labels instead of values in the first column of the data table range.

4. Enter the input values for the variable associated with input cell 2. In the example, the input values for the principal are in the first row of the data table (C4..D4) because the variable that represents the principal (B2) is associated with input cell 2.
5. Select /Data Table 2.

6. Specify the data table range and press (ENTER).
7. Specify input cell 1 and press (ENTER).
8. Specify input cell 2 and press (ENTER).

   1-2-3 pairs each input value in the top row of the data table range with each input value in the first column of the data table range and calculates the formula using each pair of values. The result of each calculation appears in the cell at the intersection of the row and column containing the two input values. In our example, the results area is C5..D9.

Using /Data Table 2 with a Database

/Data Table 2 lets you analyze or cross-tabulate the data in a 1-2-3 database. You can use a database @function in the formula in the first cell of the data table range, letting you perform calculations using data from selected records in the database.

Before you use /Data Table 2 with a database, you need to be familiar with the following:

- The structure of databases. See "1-2-3 Database" at the beginning of this chapter.
- Database @functions. For detailed information on the database @functions, see "@Function Descriptions" in chapter 14.

Before using/Data Table 2, you must set up the data table range.

1. Decide on a location for the data table range, input cell 1, and input cell 2.
2. Enter the formula, making sure it refers to both input cells.
3. Enter the input values for input cell 1. You must enter these values or labels exactly as they appear in the database.
4. Enter the input values for input cell 2. You must enter these values or labels exactly as they appear in the database.
5. Select /Data Table 2.
6. Specify the data table range and press (ENTER).
7. Specify input cell 1 and press (ENTER).
8. Specify input cell 2 and press (ENTER).

   1-2-3 pairs each input value in the top row of the data table range with each input value in the first column of the data table range and calculates the formula using each pair of values. The result of each calculation appears in the cell at the intersection of the row and column containing the two input values.

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 in the results area of the table as data ranges A - F. Do not include the formula in the top left cell of the table range in any of the graph ranges.

/Data Table Reset

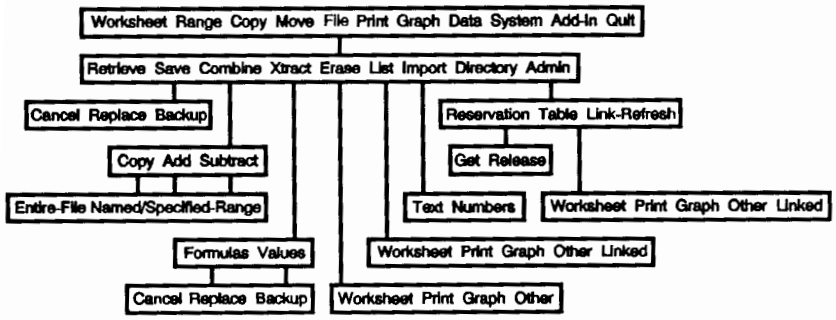
/Data Table Reset clears all the table range and input cell settings you specified in the worksheet.

1. Make sure the cell pointer is in the file containing the table ranges and input cell settings you want to clear.
2. Select /Data Table Reset.

   1-2-3 clears all the table range and input cell settings.

6

File Commands



The File commands organize and maintain the information you store in files. File commands also manipulate data between files. Use File commands to do any of the following:

- Name, save, retrieve or erase a file.
- Import, extract, or combine files.
- Change the file directory for the current session.
- Obtain a list of files by file type.

File Names

When you save a file on disk, 1-2-3 prompts you for a file name. Use the following general guidelines for assigning a file name:

- File names can contain up to eight characters. Letters, numbers, underscores (_) and hyphens (-) are acceptable. Spaces are not allowed.
- Upper and lowercase letters are equivalent in file names.
- Some of the file names to avoid are AUX, CON, COM1, COM2, LPT1, NUL, and PRN (see appendix B for a complete list of MS-DOS reserved names).

File Extensions

A file extension is an optional extension that you can add to a file name. It consists of a period followed by one to three characters. File extensions allow you to group files into categories. If you do not provide an extension, 1-2-3 will automatically add an extension, depending on the file type:

File Type	Extension	File Type	Extension
Backup worksheet file	.BAK	Graph file	.PIC
Print or text file	.PRN	Worksheet file	.WK1

File Command Descriptions

The following section describes the File commands.

Remember that you can press HELP (F1) *to get information about the command you are using.*

/File Admin

Use /File Admin to recalculate formulas, get and release a file reservation, or create a table of information about disk files.

/File Admin Link-Refresh

Use /File Admin Link-Refresh to recalculate formulas in the current worksheet that refer to worksheet files on disk.

/File Admin Reservation

This command is not available on Lotus 1-2-3 on the HP 95LX.

/File Admin Table

Use /File Admin Table to create a table of information about files and directories on disk.

1. Decide where on your worksheet you want to place the file table. Because 1-2-3 writes over existing data when it creates the table, make sure that the worksheet location you choose is either blank or contains unimportant information.
2. Select /File Admin Table.
3. Select one of the following options:

Worksheet	Creates a table of worksheet files (*.WKS, *.WK1, and *.WK3).
Print	Creates a table of print files (*.PRN).
Graph	Creates a table of graph files (*.PIC).
Other	Creates a table of all files (*.*).
Linked	Creates a table of all files linked to the current worksheet by formula references.

4. To list files in the displayed directory, press (ENTER); to list files in a different drive and/or directory, edit the displayed drive/directory and press (ENTER).
5. Specify the range determined in step 1 and press (ENTER).

/File Combine

Use /File Combine to add to, copy to, or subtract incoming data from your current worksheet. 1-2-3 changes cell formats in the current worksheet to reflect those of the incoming data, but it doesn't change range names or other settings, such as column widths. (You cannot combine 1-2-3 Release 3 files, saved in the .WK3 worksheet file format, with the current worksheet.)

/File Combine Add

Use /File Combine Add to add numbers and the results of numeric formulas in a worksheet file on disk to numbers and blank cells in the current worksheet. The incoming data has no effect on labels or formulas in the current worksheet.

Because /File Combine Add changes numbers in the current worksheet beginning at the cell pointer position, verify that the pointer is in the correct position. To avoid possible data loss from incorrectly importing files, save your current worksheet before using /File Combine Add. If you have combined files incorrectly and the UNDO feature is on, press UNDO ([ALT]-[F4]) immediately to restore the original worksheet.

Follow these steps to add files:

1. Move the cell pointer to where you want 1-2-3 to start adding the data.
2. Select /File Combine Add.
3. Select one of the following options:

Entire-File	Adds all numeric data in a file to the current worksheet.
Named-Range or Specified-Range	Adds numeric data in a file range to the current worksheet. Specify the range and press [ENTER]. (You cannot specify a range in a file saved in the .WK3 worksheet file format.)

4. Specify the file you want to add to the current worksheet and press [ENTER]. (If the file is password-protected, type the password exactly as it was created and press [ENTER].)

(Don't use this feature to add date or time numbers because the results will not be meaningful.)

/File Combine Copy

Use /File Combine Copy to copy all data (labels and values) from a worksheet file to the current worksheet, beginning at the cell pointer location.

Because /File Combine Copy enters data in the current worksheet beginning at the cell pointer position, verify that the pointer is in the correct position. To avoid possible data loss from incorrectly importing files, save your current worksheet before using /File Combine Copy. If you have combined files incorrectly and the UNDO feature is on, press UNDO ([ALT]-[F4]) immediately to restore the original worksheet.

Follow these steps to combine files:

1. Move the cell pointer to where you want 1-2-3 to start copying the data.
2. Select /File Combine Copy.
3. Select one of the following options:

Entire-File	Copies all data in a file to the current worksheet.
Named-Range or Specified-Range	Copies data in a file range to the current worksheet. Specify the range and press [ENTER]. (You cannot specify a range in a file saved in the .WK3 worksheet file format.)

4. Specify the file you want to copy to the current worksheet and press [ENTER]. (If the file is password-protected, type the password exactly as it was created and press [ENTER].)

/File Combine Subtract

Use /File Combine Subtract to subtract numeric data (and the results of numeric formulas) in a file from the current worksheet. It works the same way as the Add feature, except that it subtracts instead of adding. And, as with Add, the incoming data has no effect on labels or formulas in the current worksheet.

Because /File Combine Subtract changes numbers in the current worksheet beginning at the cell pointer position, verify that the pointer is in the correct position. To avoid possible data loss from incorrectly importing files, save your current worksheet before using /File Combine Subtract. If you have combined files incorrectly and the UNDO feature is on, press UNDO ([ALT]-[F4]) immediately to restore the original worksheet.

Follow these steps to subtract files:

1. Move the cell pointer to where you want 1-2-3 to begin subtracting the data.
2. Select /File Combine Subtract.
3. Select one of the following options:

Entire-File	Subtracts all numeric data in a file from the current worksheet.
Named-Range or Specified-Range	Subtracts numeric data in a file range from the current worksheet. Specify the range and press ENTER. (You cannot specify a range in a file saved in the .WK3 worksheet file format.)

4. Specify the file you want to subtract from the current worksheet and press ENTER. (If the file is password-protected, type the password exactly as it was created and press ENTER.)

Don't use this feature to subtract date or time numbers because the results will not be meaningful.

/File Directory

Use /File Directory to override the default directory for the current 1-2-3 session. (The directory consists of a drive name (such as A: or C:) followed by a \ (backslash), and possibly a subdirectory.)

For example, suppose your default directory is C:\123, but the files you want to use during the current session are in C:\EXPENSES. You can use /File Directory to make C:\EXPENSES the current directory (1-2-3 automatically uses that directory during the current session). Or, if you are using data files on a RAM disk in drive A, you can use /File Directory to make A:\ the current directory. 1-2-3 will use the specified directory until you use /File Directory again, use /Worksheet Global Default Directory, or end the 1-2-3 session.

Follow these steps to change the current directory:

1. Select /File Directory.
2. Choose one of the following:
   - Press ENTER to accept the displayed directory.
   - Type the name of the new directory and press ENTER.

If the current worksheet contains linking formulas that do not include paths as part of their references, and you use /File Directory to change the default directory, 1-2-3 will no longer be able to locate

the source files to which the formulas refer. The linking formulas will evaluate to ERR.

/File Erase

Use /File Erase to erase a file on disk. Once you erase the file, you cannot retrieve the data or use UNDO to recover the file; so before using this feature, make sure that you no longer need the data you are erasing. You cannot erase the current file if anyone has the reservation for it.

Note these differences between /File Erase and /Worksheet Erase:

- /File Erase erases a file on disk.
- /Worksheet Erase removes the current worksheet from memory (leaving a blank worksheet), but it does not erase the corresponding file on disk.

Follow these steps to erase a file:

1. Select /File Erase.
2. Select one of the following options:

Worksheet	Displays worksheet files in the current directory (*.WKS, *.WK1, and *.WK3.)
Print	Displays print files in the current directory (*.PRN).
Graph	Displays graph files in the current directory (*.PIC).
Other	Displays all files in the current directory (*.*).

3. If 1-2-3 cannot find specified files, it enters EDIT mode:
   - To display files with a different extension, type *. followed by the extension and press ENTER.
   - To display all files in the current directory, type *.* and press ENTER.
4. If you want to list different files, press ESC to clear the file names, type the new file name, and press ENTER.
5. Specify the name of the file to erase and press ENTER.
6. Select either of the following options:

No	Cancels the command without erasing the file.
Yes	Erases the file on disk.

/File Import

Use /File Import to copy data from a print or text file into the current worksheet beginning at the cell pointer position. There are two types of text files:

- **A delimited text file** contains characters (delimiters) that separate data. 1-2-3 imports both labels and numbers, entering them in different cells. To import this file type correctly, labels must be enclosed in quotation marks, and all labels and numbers must be separated by commas, spaces, colons, or semicolons. (Don't format numbers with commas because the commas will act as delimiters.) Use /File Import Numbers to import data from a delimited text file.
- **A nondelimited text file** does not separate data. To import this file type correctly, each line in the file must end with a carriage return or a line feed and must not exceed 240 characters. Use /File Import Numbers to import numbers only from a nondelimited text file; use /File Import Text to import both labels and numbers. 1-2-3 treats each line of data in the text file as a long label, entering it in a separate cell. (To create a nondelimited text file with 1-2-3, use /Print File.)

To avoid possible data loss from incorrectly importing files, save your current worksheet before using /File Import. If you make a mistake and the UNDO feature is on, press UNDO ([ALT]-[F4]) immediately to restore the worksheet to its original state.

Follow these steps to import data:

1. Move the cell pointer to an area of the worksheet large enough to accommodate the imported data.
2. Select /File Import.
3. Select one of the following options:

Text	Imports labels and numbers from a nondelimited text file beginning at the cell pointer position in the current worksheet. (You can view or print data imported with /File Import Text, but you cannot use the numbers in calculations unless you use /Data Parse to place the labels and numbers in separate cells in the worksheet.)
Numbers	Imports only numbers from a nondelimited text file; imports numbers and labels from a delimited text. 1-2-3 places each entry in a separate cell

beginning at the cell pointer location in the current worksheet.

4. To display files in a different drive or directory, press ESC to clear the displayed file name, enter the drive and/or directory, and press ENTER.
5. Specify the name of the text file to import and press ENTER.

/File List

Use /File List to display a temporary list of files that overlays the current worksheet. When you highlight a file name, 1-2-3 displays specific information about that file.

1. Select /File List.
2. Select one option:

Worksheet	Lists worksheet files (*.WKS, *.WK1, and *.WK3) in the current directory.
Print	Lists print files (*.PRN) in the current directory.
Graph	Lists graph files (*.PIC) in the current directory.
Other	Lists all files (*.*) in the current directory.
Linked	Lists all files linked to the current worksheet by formula references.

3. If 1-2-3 can't find the specified files, it enters EDIT mode:
   - To list files with a different extension, type *. followed by the new extension and press ENTER.
   - To list all files in the current directory, type *.* and press ENTER.
4. To display files in a different drive or directory, press ESC to clear the displayed file name, enter the drive and/or directory, and press ENTER.
5. Use the pointer-movement keys to highlight a file name and display information:
   - If you select Worksheet, Print, Graph, or Other, 1-2-3 displays the name, the date and time the file was last saved, and the size of the file in bytes.
   - If you select Linked, 1-2-3 displays the names of all files on disk that are linked to the current worksheet.
6. Press ENTER to return to the current 1-2-3 worksheet.

/File Retrieve

Use /File Retrieve to read a file from disk. The retrieved worksheet file will replace the current worksheet. (Use /File Save to save the current worksheet before you select /File Retrieve. If the UNDO feature is on, you can press UNDO ([ALT]-[F4]) immediately to restore the worksheet that was in memory when you selected /File Retrieve.)

Follow these steps to retrieve a file:

1. Select /File Retrieve. (You cannot retrieve files saved in .WK3 format.)
2. If you want to display other files, press [ESC] to clear the file names, then enter the desired drive and/or directory, and press [ENTER].
3. Specify the name of the file you want to retrieve and press [ENTER].
4. If you are trying to retrieve a file shared on a network that is reserved by someone else, select one of these options:

Yes	Retrieves the file without the reservation; changes cannot be saved to the same file name.
No	Cancels the command without retrieving the file.

5. If the file is password protected, type the password and press [ENTER].

Normally, when you start 1-2-3, the program displays a blank worksheet. You can, however, have 1-2-3 display a particular worksheet automatically every time you start the program. Use /File Save to save the desired worksheet in a file named AUTO123.WK1 in the default directory. 1-2-3 will then retrieve that file whenever you start 1-2-3.

/File Save

Use /File Save to create a permanent copy of your worksheet on disk. You can create new files, update existing files, or change the name or extension when you save a file. (1-2-3 assigns a .WK1 extension to files you create with /File Save unless you enter a different extension when you name the file.)

Saving a File without a Password.

1. Select /File Save.

2. 1-2-3 displays the current directory and the default file extension; if the file has been saved before, 1-2-3 also displays the file name. Do one of the following:
   - If the current worksheet is unnamed, type a file name and press (ENTER). To save the file in a different drive or directory, press (ESC) twice, edit the drive/directory, type a file name, and press (ENTER).
   - If the worksheet has been saved before, and you want to use the same file name, press (ENTER). To save the file with a different name in the same directory, type a new file name and press (ENTER).
   - If the current worksheet has been saved previously and you want to save the file in a different drive or directory, press (ESC) twice, edit the drive/directory, specify a file name, and press (ENTER).
   - If the file is shared on a network, you need the reservation to save it to the same file name. Use /File Admin Reservation Get to see if the reservation is available. If it isn't and you want to save your changes, you must save the file under a different file name.
3. If saving to an existing file, select one of the following options:

Cancel	Returns 1-2-3 to ready mode without saving the worksheet.
Replace	Writes over the saved worksheet file with a copy of the current worksheet.
Backup	Copies the worksheet file (on disk) to a backup file with the same name, but with extension .BAK; saves the current worksheet with the existing file name and with the extension .WK1.

Saving a File with a Password.

(Remember, when you save a file with a password, you must enter the password exactly as it was saved before you can read the file.)

1. Select /File Save.
2. 1-2-3 displays the current directory and the default file extension; if the file has been saved before, 1-2-3 also displays the file name. Do one of the following:
   - If you are updating the file, 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. Do *not* press (ENTER).
   - If the file is new, enter the file name and press the space bar once. Do *not* press (ENTER).

3. Type P and then press ENTER.
4. Type a password and press ENTER. (1-2-3 displays blanks as you enter the password.) Passwords can contain any combination of up to 15 characters. You must remember the exact combination of uppercase and lowercase letters.
5. Type the same password again at the Verify password prompt and press ENTER.
6. If you are updating the file, select Replace to save the file with the password.

Changing a Password

Follow these steps to change your password:

1. Select /File Save.
2. Press ⊙ once to clear the PASSWORD PROTECTED prompt.
3. Press the space bar once.
4. Follow steps 2 through 5 in the preceding procedure.

Deleting a Password

Follow these steps to delete your password:

1. Select /File Save.
2. Press ⊙ once to clear the PASSWORD PROTECTED prompt and press ENTER.
3. Select Replace to update the file without a password.

/File Xtract

Use /File Xtract to save a range of data from the current worksheet to a new worksheet file on disk. /File Xtract also saves all settings associated with the worksheet in the extracted file. (This command does not change the current worksheet.)

Before you use /File Extract, note the following:

- If you extract a formula, make sure that you extract all data referred to by the formula, or the formula may not produce the expected results.
- If you extract data in a named range, make sure you extract the entire named range, or the range name in the extracted file may not refer to the correct range of data.

- If the Calc indicator appears at the bottom of the screen, press CALC (F9) to update formulas before you use /File Xtract Values.
- 1-2-3 assigns a .WK1 extension to files you create with /File Xtract unless you enter a different extension when you name the file.
- Do not use /File Xtract if you are working with shared files on a network.

Follow these steps to extract a file:

1. Select /File Xtract.
2. Select one of the following options:

Formulas	Copies a range of data in the current worksheet to a file on disk, including labels, numbers, formulas, and worksheet settings.
Values	Copies a range of data in the current worksheet to a file on disk, including labels, numbers, values of formulas, and worksheet settings.

3. If you want to save the extracted data in a different drive or directory, press (ESC) to clear the file names, edit the drive/directory, and then press (ENTER).
4. Specify a file name for the extracted data and press (ENTER).
5. Specify the range of data you want to extract and press (ENTER). (1-2-3 enters the extracted range in the new file beginning in cell A1. If you extracted formulas, 1-2-3 adjusts the cell references to reflect their new locations.)
6. If you specified a file name that already exists, select one of the following options:

Cancel	Returns 1-2-3 to READY mode without extracting the range.
Replace	Writes over the file on disk with the extracted range.
Backup	Renames the previously extracted file on disk with the extension .BAK and saves the extracted range with the existing file name and the extension .WK1.

Extracting a File with a Password. You can limit access to a worksheet by extracting it with a password. No one can read that file without knowing and specifying the password.

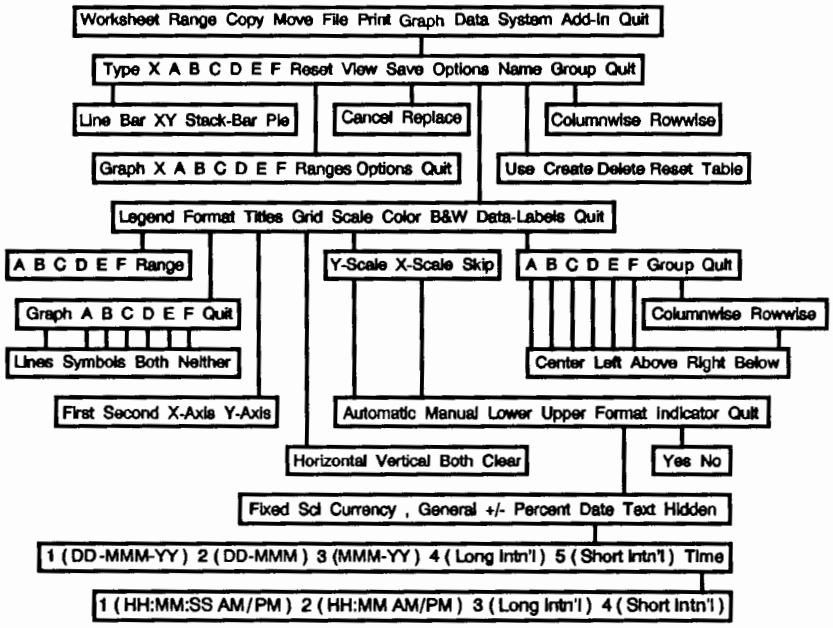
Follow these steps to extract a file with a password:

1. Follow steps 1 through 3 in the preceding procedure.
2. Specify a file name for the extracted data, press the space bar, type `P`, and then press (ENTER).
3. Type a password and press (ENTER).
4. Type the same password again at the `Verify password` prompt and press (ENTER).
5. Specify the range of data you want to extract and press (ENTER). (1-2-3 enters the extracted range in the new file beginning in cell A1. If you extracted formulas, 1-2-3 adjusts the cell references to reflect their new locations.)
6. If you specified a file name that does not already exist, 1-2-3 saves the extracted file in a password-protected file. If you specified a file name that already exists, select one of the following:

Cancel	Returns 1-2-3 to READY mode without extracting the range.
Replace	Writes over the file on disk with the extracted range.
Backup	Renames the previously extracted file on disk with the extension .BAK and saves the extracted range with the existing file name and the extension .WK1.

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The 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. Use the Graph commands to perform these tasks:

Command	Task
/Graph A - F	Specifies the ranges that contain the numeric data you want to graph.
/Graph Group	Specifies multiple graph data ranges at once when the ranges are located in consecutive columns or rows.
/Graph Name	Creates, modifies, and deletes named graphs in the current worksheet and creates tables of named graphs.
/Graph Options	Adds enhancements such as titles, legends, colors, and grid lines to a graph and determines the scaling method 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 (.PIC) file.
/Graph Type	Specifies the kind of graph to create: line graph, bar graph, XY graph, stacked bar graph, or pie chart.
/Graph View	Displays the current graph on your screen.
/Graph X	Specifies the range that contains the x-axis labels, the x-axis values for an XY graph, or the pie slice labels.

When you're viewing a graph, you can use the Zoom and Pan capabilities. If you wish to view an area more closely, each press of + increases the magnification by 0.5 (up to 4 times the original scale). Then, the ◄, ►, ▲, ▼, CTRL-◄, and CTRL-► keys allow you to move around the graph. (Pressing − ultimately returns the graph to its original size.)

Remember that you can press HELP (F1) *to get information about the command you are using.*

The /Graph Settings Sheet

When you select /Graph or any of the graph subcommands, 1-2-3 displays special screens called /Graph settings sheets. On these screens, 1-2-3 lists the names of graph settings and the settings for the current graph (if any). 1-2-3 will use these settings the next time you display a graph with /Graph View or GRAPH (F10).

The /Graph settings sheets allow you to see the settings for the current graph at a glance. You can change any of the settings with the Graph commands displayed in the menu above the settings sheets.

1-2-3 Graph Types

With 1-2-3, you can create five basic graph types:

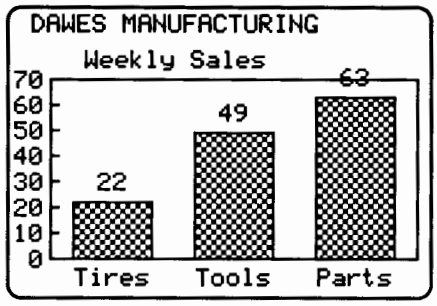


- Bar
- Line
- Pie
- Stacked bar
- XY (scatter)

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. In our example, the bar graph shows three categories of products sold by Dawes Manufacturing and compares the sales for one week.

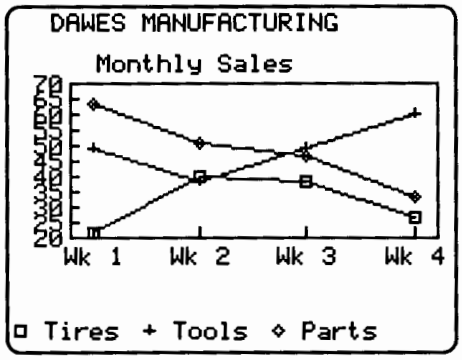


Use the following guidelines to determine the appropriate graph data ranges for a bar graph:

- For a single range bar graph, use /Graph A to indicate the range of values you want each bar to represent.
- For a multiple range bar graph, use /Graph A - F to indicate the ranges of values you want to represent simultaneously.
- Use /Graph X to indicate labels for the x-axis.

Line Graphs

Line graphs are generally used to plot changes in one or more data values 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 our example compares the weekly sales of the three products from Dawes Manufacturing for one month. Because line graphs stress continuity of data over time, they are particularly useful for identifying trends and making projections.

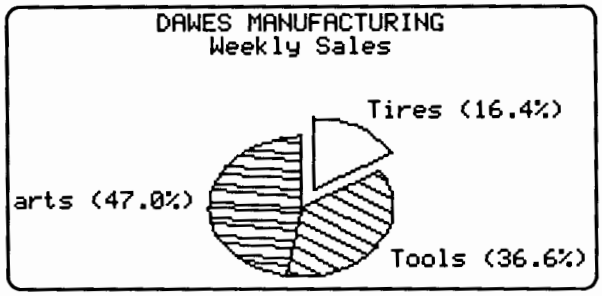


Use the following guidelines to determine the appropriate graph data ranges for a line graph:

- Use /Graph A to indicate the set of values you want to represent with your first line, or with one single line.
- Use /Graph B - F to indicate the sets of values you want to represent with each additional line.
- Use /Graph X to indicate labels for the x-axis.

Pie Charts

Pie charts (graphs) are used to relate two or more values to one another by representing the values as slices of a pie. They are useful for comparing parts to the whole. You can emphasize one or more values in a pie chart by **exploding** (separating slightly) the slices that represent those values. The pie chart in our example shows the weekly sales of the three Dawes Manufacturing products, with tire sales exploded.

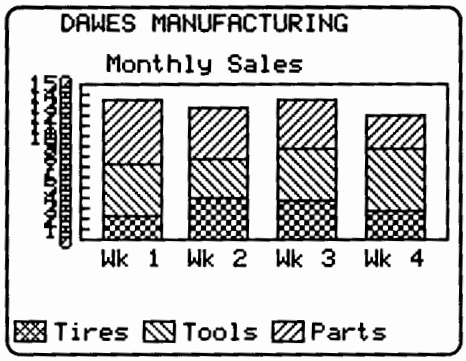


Use the following guidelines to determine the appropriate graph data ranges for a pie chart:

- Use /Graph A to indicate the set of values you want to represent as slices of pie.
- Use /Graph B to indicate the range where you entered values for controlling the hatch patterns or colors for slices of pie, or for exploding slices of pie. (For instructions, see /Graph A - F later in this chapter.)
- Use /Graph X to indicate labels for the slices of pie.

Stacked Bar Graphs

Stacked bar graphs compare values by stacking them one on top of the next in a single bar and using different colors or hatch patterns to differentiate the parts of the bar. The stacked bar graph in our example compares product sales in yet another way.



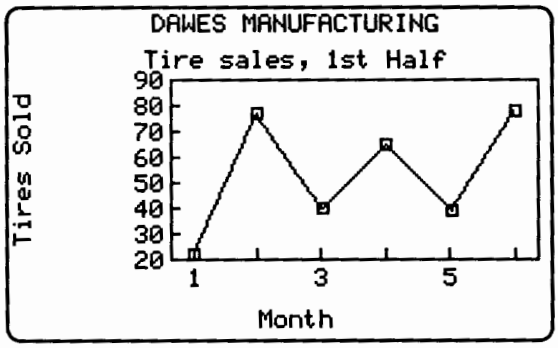
Use the following guidelines to determine the appropriate graph data ranges for a stacked bar graph:

- Use /Graph A - F to indicate each set of values you want to represent as portions of bars. Positive values are stacked by range in ascending alphabetical order: 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. Negative values are stacked by range in descending alphabetical order. Mixed values appear above and below zero, still in alphabetical order.
- Use /Graph X to indicate labels for the x-axis.

XY Graphs

XY graphs (also called scatter charts) are used to show correlations between two types of numeric data. XY graphs resemble line graphs in the sense that values are plotted as points in the graph. Unlike line graphs, however, XY graphs use a numeric scale along the x-axis.

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Use the following guidelines to determine the appropriate graph data ranges for an XY graph:

- Use /Graph X to indicate the set of values you want to plot on the x-axis.
- Use /Graph A to indicate the set of values you want to plot on the y-axis in your first line, or in one single line.
- Use /Graph B - F to indicate the sets of values you want to plot in each additional line.

Creating a Graph with the /Graph Menu

1. Select /Graph Type.
2. Select one of the following options: line, bar, XY, stack-bar, or pie.
3. Use /Graph X to specify the graph's X data range.
4. Use /Graph A - F to specify the graph's numeric data ranges (the worksheet ranges that contain the numbers to be graphed).

   1-2-3 uses the data in the B range differently in a pie chart—see /Graph A - F.

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).

5. To view the graph, do one of the following:
   - Select View from the /Graph menu.
   - Press GRAPH (F10) when 1-2-3 is in READY mode.

   The screen goes blank if 1-2-3 cannot display the graph for any reason (for example, you have not specified enough data for 1-2-3 to draw the graph).
6. To redisplay the worksheet, press GRAPH (F10), ENTER, or Spacebar .
7. If you want to add explanatory text, colors, grid lines, and other enhancements to the basic graph, use /Graph Options.
8. If you want to save the graph so you can view it at another time, you must name the graph with /Graph Name Create (see "Saving the Graphs You Create" in the next section).
9. If you want to print the graph using a graph print utility, you must save the graph in a graph or picture (.PIC) file with /Graph Save (see "Saving the Graphs You Create" in the next section).
10. When you have completed the graph and want to return 1-2-3 to READY mode, select /Graph Quit.

Saving the Graphs You Create

Whenever you select /Graph View or press GRAPH (F10), 1-2-3 displays 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. The current graph can be preserved in its present form for worksheet use, printing, or both.

Saving a Graph for Worksheet Use

- Use /Graph Name Create to store the current graph so you can display it at another time. You can continue to change the graph settings and create and store new graphs, and will be able to display and work with each of them. /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 worksheet.

- Use /File Save to save the worksheet that contains the named graphs. This saves all the named graphs you created for use in future 1-2-3 sessions.
- If you want to display and work with a named graph, select /Graph Name Use, which retrieves a named graph in a worksheet to make it once again the current graph.

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Saving a Graph for Printing

Use /Graph Save to save the current graph so you can print it using a graph print utility. /Graph Save creates a graph (.PIC) file, which cannot be printed or modified in 1-2-3.

Printing the Graphs You Create

You can also print graphs you create in 1-2-3 with any program that prints graph (.PIC) files. Use /Graph Save to save the graph in a picture file, then import the file into the program you are using.

/Graph A - F

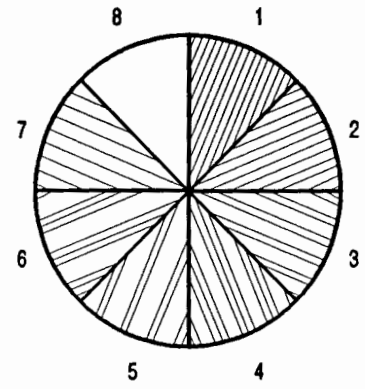
/Graph A - F specifies the A - F data ranges, the ranges that contain the numeric data you want to graph.

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 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 pie chart, 1-2-3 uses 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 from the rest of the pie, and the X data range as labels for each pie slice.

  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 8 in each cell in the B data range. When graph display is set to color, the B data range values determine the colors

of the pie slices; the color each value represents depends on your monitor. When graph display is set to black and white, the B data range values determine the hatch patterns, which are the same for all monitors.



To explode one or more slices in a pie chart, add 100 to the B data range values that correspond to the slices you want to explode. For example, to explode the slice with color or hatch pattern 6, enter 106 in the corresponding B data range cell.

- In a stacked bar graph, 1-2-3 uses the A - F data ranges as portions of the bars. Positive values are stacked by range in ascending alphabetical order; negative values are stacked by range in descending alphabetical order. Mixed values appear above and below zero, still in alphabetical order.
- In an XY graph, 1-2-3 uses the A - F data ranges as points plotted against the X data range. 1-2-3 creates one set of points for each data range you set.

Follow these steps when using /Graph A - F:

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 and press (ENTER).

   The range should include only numeric data (numbers and/or numeric formulas). Cells containing labels will be interpreted by 1-2-3 as zero. The range must include at least two cells, and can include any number of columns and rows.

/Graph Group

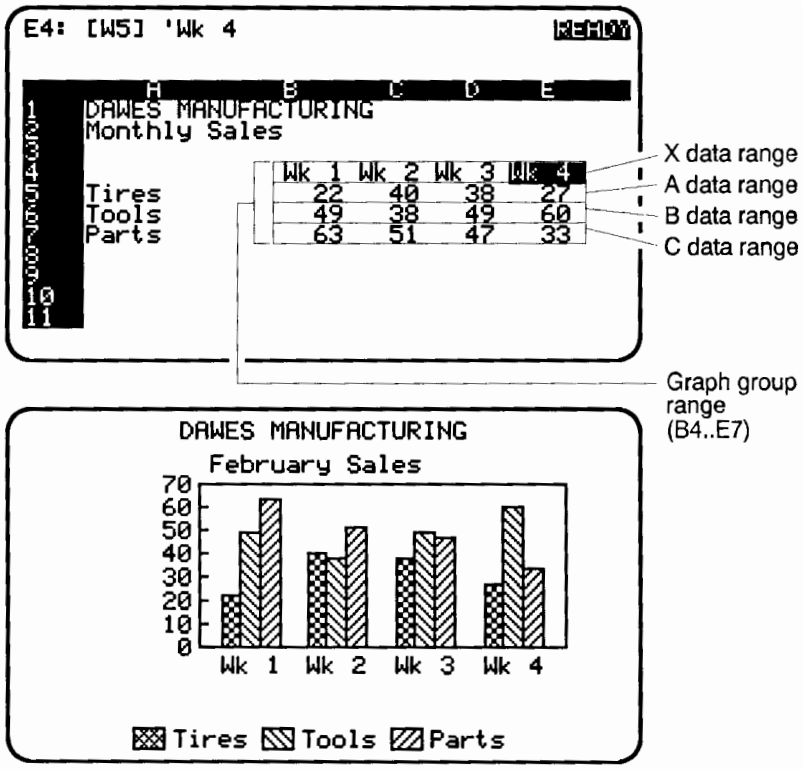
Use /Graph Group to specify all graph data ranges (X and A - F) at once, when the X and A - F data ranges are in consecutive columns or rows of a range.

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1. Select /Graph Group.
2. Specify the group range you want to divide into graph data ranges and press ENTER.
3. Select one of the following options:

Columnwise	Divides the group range into data ranges by columns.
Rowwise	Divides the group range into data ranges 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 seven columns or rows, 1-2-3 stops assigning data ranges after the seventh column or row.



Example. The bar graph in our illustration shows /Graph Group being used to specify the X, A, B, and C data ranges, which are in consecutive rows of the range B5..E7. The group range is specified as B5..E7, Rowwise.

/Graph Name

/Graph Name lets you create, delete, and retrieve named graphs, and create a table of named graphs in the worksheet.

/Graph Name Create

Use /Graph Name Create to create or redefine a named graph by storing the current graph settings with the name you specify.

1. Display the current graph using /Graph View or GRAPH (F10) to verify that the graph looks the way you want it to look.
2. Select /Graph Name Create.
3. Specify an existing graph name or a new graph name of up to 15 characters and press ENTER. (1-2-3 does not distinguish between uppercase and lowercase letters in graph names.)

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Follow these guidelines when you create graph names:

- Do not include spaces, commas, semicolons, or the characters + * - / & > < { @ and # in graph names because they may appear to be formulas to 1-2-3.
- Do not use a name that already exists; if you do, you will write over the graph that was previously stored with that name.
- Do not use names that look like cell addresses, such as P12 or EX100.
- Do not use @function names, advanced macro command keywords, or 1-2-3 key names as graph names.

/Graph Name Delete

Use /Graph Name Delete to delete a named graph.

1. Select /Graph Name Delete.
2. Specify the named graph you want to delete and press ENTER.

If you did not mean to select Delete and the undo feature is on, select Quit to return to the worksheet, then press UNDO (ALT-F4) immediately to restore the named graph.

/Graph Name Reset

Use /Graph Name Reset to delete all named graphs in the worksheet.

/Graph Name Table

Use /Graph Name Table to create a three column table that alphabetically lists all named graphs in the worksheet, as well as graph types and titles.

1. Decide on a location for the graph name table. The table can be placed in any unprotected area of the worksheet.
2. Select /Graph Name Table.
3. Specify the location you decided on in step 1 and press ENTER. (You need to specify only the first cell of the table's location.)

Note



/Graph Name Table will create a table that occupies three columns and as many rows as there are named graphs plus one blank row. To avoid possible data loss from writing over existing data, save the worksheet before using /Graph Name Table. After you use /Graph Name Table, select Quit to return to the worksheet and check the location of the table. If you made a mistake when placing the table and the undo feature is on, press UNDO ([ALT]-[F4]) immediately to restore the worksheet to its original state.

/Graph Name Use

Use /Graph Name Use to retrieve a named graph (making it the current graph).

Note



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.

Follow these steps when using /Graph Name Use:

1. Select /Graph Name Use.
2. Specify a named graph and press [ENTER].

/Graph Options

/Graph Options lets you select format options for your graph.

/Graph Options B&W

/Graph Options B&W (the default setting) sets the graph display to black and white. 1-2-3 displays bars and pie slices (if you specified a B data range for the pie chart) in contrasting hatch patterns.

1. Select /Graph Options B&W.
2. Select Quit to return to the /Graph Options menu.

/Graph Options Color

Because the HP 95LX does not display colors, if you select /Graph Options Color, 1-2-3 displays clear (no hatch pattern) bars and pie slices; and graph lines and symbols that are identical to those with B&W setting.

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1. Select /Graph Options Color.
2. Select Quit to return to the /Graph Options menu.

If you have a color printer or plotter, you can use /Graph Options Color with /Graph Save even if your monitor does not display colors.

If you have a black and white printer, do not use /Graph Options Color with /Graph Save, because your printer will print all the ranges in solid blocks of black.

/Graph Options Data-Labels

Use /Graph Options Data-Labels to label the contents of a range as labels for the points or bars in a graph. The labels come from the ranges you specify as the A - F data label ranges.

1. Select /Graph Options Data-Labels.
2. Select one of the following options:

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.
Quit	Returns you to the /Graph Options menu.

3. To specify the data label range, do one of the following:
   - If you selected A, B, C, D, E, or F, specify a data label range of the same size as the selected data range and press (ENTER).
   - If you selected Group, specify a data label range of the same size as all the data ranges combined and press (ENTER).
4. If you selected Group and then specified a range, select one of the following options:
   - Columnwise, to divide the data label range into individual ranges by columns.
   - Rowwise, to divide the data label range into individual ranges by rows.

5. Select one of the following options:

Center	Places data labels on top of the points in a line.
Left	Places data labels to the left of the points in a line.
Above	Places data labels above the points in a line.
Right	Places data labels to the right of the points in a line.
Below	Places data labels below the points in a line.

   If you are creating data labels for a bar or stacked bar graph, 1-2-3 places data labels above the corresponding bars if the values are positive and below if the values are negative regardless of the placement you specify.
6. Select Quit to return to the /Graph Options menu.

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 don't want to label.

To include descriptive text in a line or XY 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 Symbols or Neither to hide the line that positions the text.

If the format of the cells containing the data label entries is Hidden, 1-2-3 will not display them. 1-2-3 will, however, display data label entries stored in hidden columns.

/Graph Options Format

Use /Graph Options Format to set the way 1-2-3 displays each line in a line or XY graph. 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.

1. Select /Graph Options Format.
2. Select one of the following options:
   - Graph, to format all lines in the graph at once.
   - A - F, to format the line defined by the specified data range.
   - Quit, to return to the /Graph Options menu.

3. Select one of the following options:
   - Lines, to connect the points along the line.
   - Symbols, to display a symbol at each data point.
   - Both, to display a symbol at each point and connect the points with lines. (This is the default display.)
   - Neither, to display neither symbols nor connecting lines.
4. Select Quit to return to the /Graph Options menu.

/Graph Options Grid

Use /Graph Options Grid to add or remove grid lines in a graph. (Pie charts do not include grid lines.)

1. Select /Graph Options Grid.
2. Select one of the following options:

Horizontal	Draws grid lines across the graph, originating from the left border.
Vertical	Draws grid lines up the graph, originating from the bottom border.
Both	Draws horizontal and vertical grid lines.
Clear	Clears all grid lines from the graph, returning the graph to the 1-2-3 default display.

/Graph Options Legend

Use /Graph Options Legend to create legends for the graph's data ranges.

1. Select /Graph Options Legend.
2. Select one of the following options:
   - A - F, to assign a legend to an individual data range.
   - Range, to assign legends to all data ranges at once.
3. If you selected Range, specify the legend range and press (ENTER). The **legend range** is the range that contains the legend for each graph data range.
4. If you selected A, B, C, D, E, or F, specify the legend for the data range by doing one of the following:
   - Type the actual legend (up to 19 characters) and press (ENTER).
   - Press backslash (\), specify the cell that contains the legend, and then press (ENTER).

   If the format of the cells containing the legend entries is Hidden, 1-2-3 will not display them. 1-2-3 will, however, display legend entries stored in hidden columns when the graph is viewed.

To ensure that your legends will be displayed fully and print out completely, keep them each under 19 characters. (Legends over 19 characters will overlap and run off the 40 character screen.)

To assign legends to the slices of a pie chart, use the X data range.

/Graph Options Quit

/Graph Options Quit returns you to the /Graph menu.

/Graph Options Scale

/Graph Options Scale determines the scaling method for the 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 entries in the X data range appear along the x-axis in line, bar, and stacked bar graphs.

1. Select /Graph Options Scale.
2. Select one of the following options:
   - Y-Scale, to set the scaling for the y-axis.
   - X-Scale, to set the scaling for the x-axis.
   - 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 and press (ENTER).

4. If you selected Y-Scale or X-Scale, select one of the following options:

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.
Manual	Sets the scaling method for the selected axis to manual, so 1-2-3 creates a scale using the upper and lower 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 those limits. Depending on the upper and lower limits you specify, some of the contents of the A - F data ranges (and, for XY graphs, the X data range) may not appear in the graph.
Lower	Used only when you select /Graph Options Y-Scale or X-Scale Manual. Sets the lower scale limit (the default is 0) for the selected axis. In some instances, 1-2-3 rounds down the limit you specify. The lower limit with bar graphs is always 0.
Upper	Used only when you select /Graph Options Y-Scale or X-Scale Manual. Sets the upper scale limit (the default is 0) for the selected axis. In some instances, 1-2-3 rounds up the limit you specify.
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, +/−, Sci (Scientific), Text, or Time format.
Indicator	Determines whether or not the scale indicator is displayed. 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 10E15), 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/No menu. Select Yes (the default) to display the scale indicator. Select No to suppress display of the scale indicator entirely.
Quit	Returns you to the /Graph Options menu.

/Graph Options Titles

/Graph Options Titles adds graph titles and axis titles to a graph.

1. Select /Graph Options Titles.
2. Select one of the following options:
   - First, to set the first line of the graph title.
   - Second, to set the second line of the graph title.
   - X-Axis, to set the title for the x-axis.
   - Y-Axis, to set the title for the y-axis.
3. Specify a title by doing one of the following:
   - Type the title (up to 39 characters) and press (ENTER).
   - Press backlash (\), specify the cell that contains the title, and then press (ENTER).

     If the format of the cells containing the title entries is Hidden, 1-2-3 will not display them. 1-2-3 will, however, display title entries stored in hidden columns when the graph is viewed.
4. Repeat steps 2 and 3 to specify another title.
5. Select Quit to return to the /Graph Options menu.

/Graph Quit

Use /Graph Quit to remove the /Graph menu and return 1-2-3 to READY mode.

/Graph Reset

Use /Graph Reset to reset some or all of the current graph settings to the default settings.

1. Select /Graph Reset.
2. Select one of the following options:

Graph	Resets all graph settings; returns you to the /Graph menu.
X	Resets the X data range setting.
A - F	Resets the A - F data range settings and the corresponding data label settings, if any.
Ranges	Resets all data range settings (X and A - F data ranges) and data label settings.
Options	Resets all current /Graph Options settings.
Quit	Returns you to the /Graph menu.

3. Select Quit to return to the /Graph menu.

/Graph Save

Use /Graph Save to save the current graph in a .PIC file. /Graph Save saves the graph only for use outside 1-2-3. You cannot retrieve a .PIC file with 1-2-3. (To save the current graph for future worksheet use within 1-2-3, use /Graph Name Create and /File Save.)

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1. Select /Graph Save.
2. 1-2-3 displays the default directory and extension. Do one of the following:
   - Specify a graph file name and press (ENTER).
   - To save the graph file in another directory, press (ESC), edit the directory, type a file name, and press (ENTER).
3. If you enter an existing graph file name, select one of the following options:
   - Cancel, to end the /Graph Save command without saving the current graph.
   - Replace, to complete the /Graph Save command, replacing the stored graph file with the current graph.

/Graph Type

Use /Graph Type to set the basic type of graph you are creating: bar, line, pie, stacked bar, or XY.

1. Select /Graph Type.
2. To set a basic graph type, select one of the following options:

Command	Task
Line	Graphs one or more data ranges (A - F). 1-2-3 displays line graphs in one of four ways set with /Graph Options Format: Lines, Symbols, Both, or Neither.
Bar	Graphs one or more data ranges (A - F) as bars. The different ranges are distinguished by either hatch patterns or colors.
XY	Graphs the X data range and one or more other data ranges (A - F). You must specify the X data range and at least one other data range. The X data range determines the numeric scale of the X-axis. 1-2-3 pairs the other data ranges with the X data range values, and plots them as coordinates along the X and Y axes. They are displayed in one of four ways set with /Graph Options Format: Lines, Symbols, Both, or Neither.
Stack-Bar	Graphs one or more data ranges (A - F) as stacked bars. The ranges are distinguished by either hatch patterns or colors.
Pie	Graphs the A data range as slices of a pie. 1-2-3 labels each slice of the pie with the percentage it represents of the whole pie. (These numbers are rounded off, so they may not exactly total 100%.) Entries in the X data range appear as labels next to each slice. Values in the B data range specify exploded or unexploded slices, as well as the type of hatch patterns or colors.

/Graph View

Use /Graph View to temporarily display the current graph.

1. Select /Graph View.
2. When you finish viewing the graph, press GRAPH (F10), ENTER, ESC or Spacebar to redisplay the worksheet.

When you're viewing a graph, you can use the Zoom and Pan capabilities. If you wish to view an area more closely, each press of + increases the magnification by 0.5 (up to 4 times the original scale). Then, the ◄, ►, ▲, ▼, CTRL-◄, and CTRL-► keys allow you to move around the graph. (Pressing − ultimately returns the graph to its original size.)

/Graph X

Use /Graph X to specify 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 or stacked bar graphs, 1-2-3 uses the contents of the X data range as the x-axis labels. The X data range can contain either 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 either 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.

Follow these steps when using /Graph X:

1. Select /Graph X.
2. Specify the range that contains the entries you want to use as the graph's X data range and press (ENTER).

8

The Move Command

Worksheet Range Copy Move File Print Graph Data System Add-in Quit

Use /Move to reorganize data. /Move lets you transfer a range of data, range names, and cell formats to another range in the worksheet.

Remember that you can press HELP (F1) *to get information about the command you are using.*

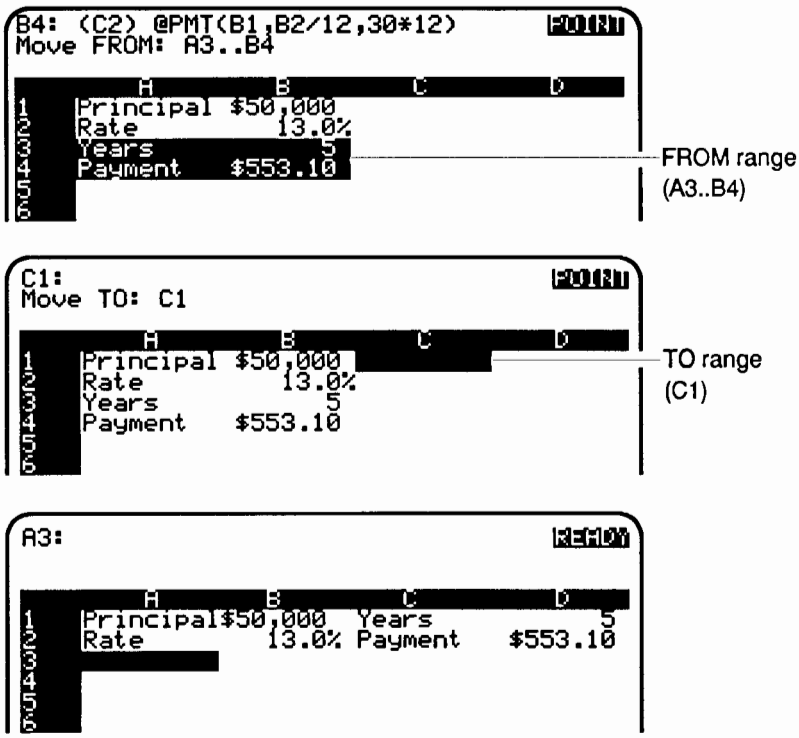
Before You Use /Move

- If you move data that a formula refers to, the cell references in the formula change to reflect the new location of that data. For example, the formula @SUM(A1..A3) adds the numbers entered in the range A1..A3. If you move the data from A1..A3 to C1..C3, the formula will change to @SUM(C1..C3).
- If you move data into the cells that define a range in a formula, the range changes to ERR and formulas that refer to that range evaluate to ERR.
- If you move data out of the cells that define a range in a formula, 1-2-3 changes the range definition. For example, if you refer to the range A3..D8 in the formula @SUM(A3..D8), and then move the contents of cell D8 to F6, 1-2-3 changes the formula to @SUM(A3..F6) and includes any data in the expanded range.

/Move

1. Select /Move.
2. Specify the range you want to move FROM and press ENTER.
3. Specify the range you want to move TO and press ENTER. You need to specify only the upper left cell in the TO range.

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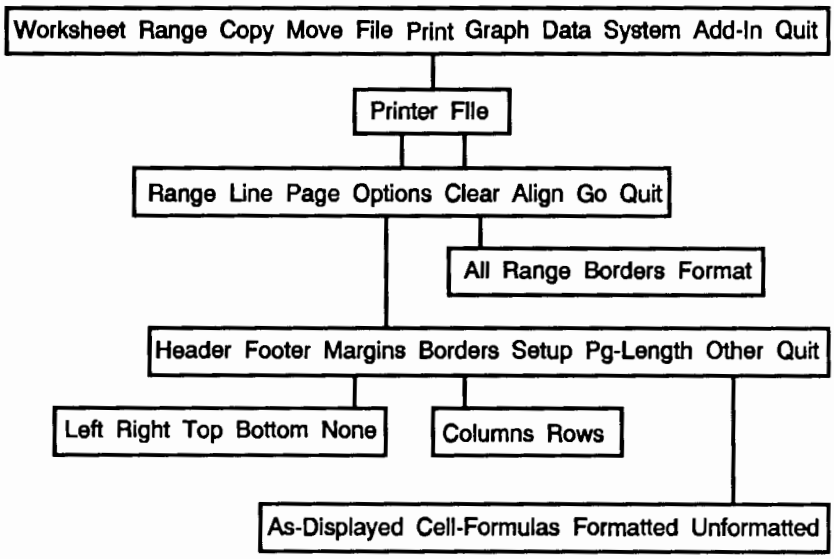


Note

The TO range can be any unprotected area of the worksheet. To avoid possible data loss from writing over existing data, save the worksheet before using /Move. If you make a mistake when moving data and the undo feature is on, press UNDO (ALT-F4) immediately to restore the worksheet to its original state.

9

The Print Commands



The Print commands create printed copies of your work and let you control basic printing operations such as specifying a range to print or advancing the paper in the printer by a line or a page. They also let you enhance printed worksheets by adding headers, footers, and borders, for example.

Before you can use the Print commands, however, you must select the destination for your worksheet print output. 1-2-3 offers you two choices.

You can select Printer to print your worksheet data directly on a printer. (Refer to appendix C for information on connecting a printer to HP 95LX.) You can select File to print your worksheet data to a standard ASCII text file (a file with a .PRN extension). You can print

the text file later with an operating system command or a print utility program, or use the text file in another program (for example, a word processing program). When you select File, 1-2-3 will prompt you to enter a name for the text file.

Once you select Printer or select File and specify a file name, 1-2-3 displays the same menu. You can use all of the Print commands whether you select [Printer or File] as the print destination.

Terms to Know

A **print** job consists of one or more printed items. A printed item can be a file, a range of data, or blank lines. The print job begins when you start sending data to a printer or a file. You can select Go, Line, or Page from the /Print [Printer or File] menu to begin the print job. The print job ends when the WAIT mode indicator at the top right of the screen stops flashing, or when you press CTRL-BREAK.

Print settings are the options you specify for your print job. Margins, page headers, and page footers are a few examples of print settings.

A **print** destination is where 1-2-3 prints your data. In 1-2-3, the print destination can be a text file on disk or a printer.

A **text** or **print** file is a standard ASCII file that contains data, including text, borders, headers, footers, margins, and page breaks; but no graphs or special printer codes. When you use /Print File to create a text file from a worksheet range, 1-2-3 assigns the file the default extension .PRN.

The **default** printer is the printer listed in the /Worksheet Global Default settings sheet and configured in the Setup utility (see appendix C for additional information).

A **settings sheet** is a special status screen that displays all the settings associated with a particular task. When you select /Print Printer or /Print File, 1-2-3 displays the /Print settings sheet, which allows you to see the settings that will affect the current print job.

The /Print Settings Sheet

When you select /Print Printer or select /Print File and specify a file name, 1-2-3 displays a special screen called the /Print settings sheet. On this screen, 1-2-3 lists the names of all the print settings and the settings for the current print job (if any). 1-2-3 will use these settings the next time you print your work.

You can change any of the settings with the Print [Printer or File] commands displayed in the menu above the settings sheet.

Basic Steps for Printing in 1-2-3

This section describes the steps for printing a worksheet range on a printer (/Print Printer) or to a print file (/Print File).

Printing a Range on a Printer (/Print Printer)

(1-2-3 uses the printer configured in the Setup utility. For additional information, see appendix C.)

1. Select /Print Printer.

   1-2-3 displays the Print commands and the /Print settings sheet to control the appearance and format of the print output.
2. Select Range. You must always specify a print range (see /Print [Printer or File] Range later in this chapter).
3. Specify the range you want to print and press (ENTER).
4. If you want to change any of the current print settings, select Options.

   For a description of available print options, see /Print [Printer or File] Options later in this chapter. If you do not change the margins or page length, 1-2-3 uses the following default settings when it prints the range:

Left margin	4 characters from left edge of the paper
Right margin	76 characters from left edge of the paper
Top margin	2 lines from the top of the paper
Bottom margin	2 lines from the bottom of the paper
Page length	66 lines

5. When you have specified the print options, select Quit as many times as necessary to return 1-2-3 to the /Print [Printer or File] menu.
6. Select Align to tell 1-2-3 the paper in the printer is correctly positioned at the top of a page and ready for printing.
7. Select Go to print the range on the printer.
8. Select Page to advance the paper to the top of the next page and include the footer (if you have specified one) on the last line of the page.
9. Select Quit to complete the print job and return 1-2-3 to READY mode.

Printing a Range to a Text File (/Print File)

This section describes the steps for printing a worksheet range to a text (.PRN) file on either the internal disk or an installed ram card.

1. Select /Print File. 1-2-3 displays files with a .PRN extension in the current directory.
2. If you want to display files in a different drive and/or directory or with a different extension, do one of the following:
   - To display files with a different extension, type *. followed by another extension and press (ENTER) (for example, *.txt).
   - To display all files in the current directory, type *.* and press (ENTER).
   - To display files in a different drive and/or directory, press (ESC) to clear the file names, edit the drive and/or directory, and then press (ENTER).
3. Specify the name of the text file you want 1-2-3 to create and press (ENTER). 1-2-3 automatically uses the extension .PRN for text files, unless you specify a different extension.
4. If you specify the name of a text file that already exists, select one of the following options:

Cancel	Returns 1-2-3 to READY mode without specifying a text file as the print destination.
Replace	Writes over the existing text file on disk when you select /Print File Go.

   1-2-3 displays the Print commands and the /Print settings sheet after you specify the file name. These commands offer you a number of options that control the appearance and format of the

print output. The only option that must be specified is the range to be printed.

5. Select Range.
6. Specify the range you want to print and press (ENTER).
7. If you want to change any of the current print settings, select Options. If you are creating a text file on disk so you can use 1-2-3 data with another program, you may want to change the following print options:
   - To eliminate headers, footers, and page breaks from the text file 1-2-3 will create, select Options Other Unformatted.
   - To set the left margin to 0, select Options Margins Left and enter 0.
   - To set the right margin, select Options Margins Right and enter a number for the right margin that is appropriate for the program in which you are going to use the text file.
8. When you have specified the print options, select Quit as many times as necessary to return 1-2-3 to the /Print [Printer or File] menu.
9. Select Align to set the internal line count 1-2-3 maintains to zero, which represents the top of a page.
10. Select Go to print the range to a text file.
11. If you want to include other worksheet ranges in the same text file, repeat steps 6, 7, and 10. (1-2-3 appends the new range to the end of the previous range in the text file.)
12. If you specified a footer and you want it to appear on the last line of the page, select Page.
13. Select Quit to complete the print job and return 1-2-3 to READY mode.

Command Definitions

The following section describes the Print commands available in 1-2-3 and lists them in alphabetical order.

Remember that you can press HELP ((F1)) *to get information about the command you are using.*

/Print [Printer or File] Align

Use /Print [Printer or File] Align to tell 1-2-3 that the paper in the printer is correctly positioned at the top of a page and to reset the page number to 1. This ensures that headers, footers, and page breaks will be in the correct spot when you print.

/Print [Printer or File] Align also lets you tell 1-2-3 to reset the program's internal line count to 0 (top of a page). 1-2-3 maintains an internal line count to determine how many lines of text it can fit on a page in the print output and when to begin a new page. (You should use /Print [Printer or File] Align even when the print destination is a text file on disk. And, if you select /Print Printer Options Other Unformatted, which eliminates headers, footers, and page breaks from the print output, /Print [Printer or File] Align has no effect.

Follow these steps to use /Print [Printer or File] Align:

1. If you are printing on a printer, position the paper in the printer at the top of a page, with the perforation just above the print head.

   Each time you reposition the paper in the printer at the top of a new page, you should select /Print [Printer or File] Align. If you do not, the new page will not be filled correctly because 1-2-3 will continue to use its existing line count instead of starting at 0 again.
2. Select /Print [Printer or File] Align.

Use 1-2-3 commands to advance paper in the printer by line or page instead of the printer controls.

/Print [Printer or File] Clear

Use /Print [Printer or File] Clear to reset some or all of your current print settings to the default settings.

1. Select /Print [Printer or File] Clear.
2. Select one of the following options:

All	Clears the current print range; clears all borders, headers, and footers; resets all formats and options to their default settings.
Range	Clears the current print range.
Borders	Clears all borders (column and row ranges).
Format	Resets margins, page length, and setup strings to their default settings.

3. Do one of the following:
   - Select other settings from the /Print menu.
   - Select Quit to return 1-2-3 to READY mode.

/Print [Printer or File] Go

Use /Print [Printer or File] Go to start the print job, sending your worksheet data to a printer or to a file on disk.

1. Make sure you specified a print range using /Print [Printer or File] Range.
2. If you are printing on a printer, make sure the printer you want to use is turned on, properly connected, and ready to print (on-line), and that the paper in the printer is aligned at the top of a new page.
3. Select /Print [Printer or File] Align.
4. Select Go.
5. If you want to print additional ranges with different options as part of the same print job, change your options, select the new ranges, and select Go again.
6. Select Quit.

   Quit closes the print job and returns 1-2-3 to READY mode. If you do not select Quit, you may notice the following effects:
   - If you are printing to a text file on disk, 1-2-3 does not complete saving the file on disk until you select Quit.
   - If you are using a print spooler, the spooler may not send data to the printer until you select Quit.
   - If your printer is attached to a network, the printer will not print your data until you select Quit.

   1-2-3 also closes your print job when you press CTRL-BREAK or press ESC enough times to return 1-2-3 to the /Print menu.

/Print [Printer or File] Line

Use /Print [Printer or File] Line to force a line feed on a printer or in a file. It also adds one line to the internal line count 1-2-3 maintains. This ensures that headers, footers, and page breaks will be in the correct spot when you print.

Use /Print [Printer or File] Line to insert blank lines between print ranges if you are printing several different ranges in the same print job.

Each time you select Line, 1-2-3 advances the paper in the printer one line or inserts a new line in the text file.

9 If you use your printer's line feed control to advance the paper in the printer up by one line, 1-2-3 does not adjust its internal line count. This causes the positioning of headers, footers, and page breaks on subsequent pages to be incorrect. Use /Print [Printer or File] Line to keep the line count synchronized with the paper.

/Print [Printer or File] Options

Use /Print [Printer or File] Options to control the appearance of your print output.

/Print [Printer or File] Options Borders

/Print [Printer or File] Options Borders lets you print descriptive information from specified columns and rows in your worksheet to the left and top edges of every page of print output. (This is useful when you are printing a large range that will be split up on several pages and you want to keep track of related data more easily.)

1. Select /Print [Printer or File] Options Borders.
2. Select one of the following options:

Columns	Creates vertical headings that are repeated on the left side of each page of print output. Use this option when the print range contains more columns of data than will fit across one page and you have labels or other information in a column or columns that will help identify data printed on subsequent pages.
Rows	Creates horizontal headings that are repeated on the top of each page of print output. Use this option when the print range contains more rows of data than will fit down one page and you have labels or other information in a row or rows that will help identify data printed on subsequent pages.

If you have previously specified borders, 1-2-3 highlights this range.

3. Specify the range you want to print as borders and press (ENTER).

/Print [Printer or File] Options Footer

Use /Print [Printer or File] Options Footer to create a page **footer**, which is a line of text printed just above the bottom margin of every page of print output.

Use the following guidelines when creating footers:

- A footer can contain up to 240 characters (including spaces), which is the widest page you can print in 1-2-3.
- Although a footer is limited to a single line, 1-2-3 allows you to divide the footer into separate segments for the right, left, and center portions of each line. This means you can include more than one piece of information in a footer. Use the split vertical bar (|) to separate the information you are entering into each section of the footer. 1-2-3 left-aligns text you type before a split vertical bar, centers text you type after a split vertical bar, and right-aligns text you type after a second split vertical bar. If you do not use any split vertical bars, 1-2-3 left-aligns the entire footer.
- A footer can include any text as well as the special character @ and the # symbol.

  Use the # symbol anywhere in a footer to include a page number on every page of print output. It can be combined with text for additional description, such as Page #.

  Use @ anywhere in a footer to include the current date on every page of print output. 1-2-3 uses the date supplied by your computer's internal clock. Like the # symbol, the @ can be combined with text for additional description, such as Today's Date: @. (1-2-3 uses the date format set with /Worksheet Global Default Other Clock.)
- Use backslash (\) followed by a cell address or range name to use the contents of a single cell as the footer. For example, entering \B1 uses the contents of cell B1 as the footer. If a split vertical bar is the first character in a cell, you must precede it with another split vertical bar as a label prefix for the footer to work.

The following table shows some examples of footers.



Enter:	Resulting footer:		
Goodwin	Goodwin		
|Goodwin		Goodwin	
Goodwin||Page #	Goodwin		Page 15
@|Goodwin|Page #	4/1/89	Goodwin	Page 15

Follow these steps to create a footer:

1. Select /Print [Printer or File] Options Footer. (1-2-3 displays the current footer, if any.)
2. If 1-2-3 displays a footer, edit the displayed text and press ENTER when you finish. Otherwise, specify the footer by doing one of the following:
   - Type the text for the footer and press ENTER.
   - Type a backslash (\) followed by the address or range name of the cell that contains the text for the footer, and then press ENTER.

   The program prints the footer on the line above the bottom margin, and leaves two blank lines between printed data and the footer.

1-2-3 will not print the footer on the last page of the print job unless you select /Print [Printer or File] Page after printing the print job.

/Print [Printer or File] Options Header

Use /Print [Printer or File] Options Header to create a page **header**—a line of text printed just below the top margin of every page of print output. When creating headers, you may want to refer to the guidelines described in the previous section, /Print [Printer or File] Options Footer.

Follow these steps to create a header:

1. Select /Print [Printer or File] Options Header. (1-2-3 displays the current header, if any.)
2. If 1-2-3 displays a header, edit the displayed text and press ENTER when you finish. Otherwise, specify the header by doing one of the following:

- Type the text for the header and press (ENTER).
- Type a backslash followed by the address or range name of the cell that contains the text for the header, and then press (ENTER).

The program prints the header on the line below the top margin, and leaves two blank lines between printed data and the header.

/Print [Printer or File] Options Margins

Use /Print [Printer or File] Options Margins commands to override the default print margins (see chapter 13, /Worksheet Global Default Printer).

/Print [Printer or File] Options Margins Bottom. Use /Print [Printer or File] Options Margins Bottom to set the bottom margin for printed pages, in number of lines (from 0 to 32) from the bottom edge of the paper.

1. Select /Print [Printer or File] Options Margins Bottom. (1-2-3 displays the current bottom margin setting.)
2. Do one of the following:
   - Press (ENTER) to accept the current bottom margin setting.
   - Change the setting by typing the number of lines (0 to 32) for the bottom margin and pressing (ENTER).

/Print [Printer or File] Options Margins Left. Use /Print [Printer or File] Options Margins Left to set the left margin for printed pages in number of characters from the left edge of the paper. You can specify any number from 0 to 240, but the number should be smaller than the right margin setting.

1. Select /Print [Printer or File] Options Margins Left. (1-2-3 displays the current left margin setting.)
2. Do one of the following:
   - Press (ENTER) to accept the current left margin setting.
   - Change the setting by typing the number of characters (0 to 240) for the left margin and pressing (ENTER).

/Print [Printer or File] Options Margins None. Use /Print [Printer or File] Options Margins None to clear the current margins and reset the top, left, and bottom margins to 0 and the right margin to 240.

/Print [Printer or File] Options Margins Right. Use /Print [Printer or File] Options Margins Right to set the right margin for printed pages in number of characters from the left edge of the paper. You can specify any number from 0 to 240, but the number should be greater than the left margin setting.

1. Select /Print [Printer or File] Options Margins Right. (1-2-3 displays the current right margin setting.)
2. Do one of the following:
   - Press (ENTER) to accept the current right margin setting.
   - Change the setting by typing the number of characters (0 to 240) for the right margin and pressing (ENTER).

/Print [Printer or File] Options Margins Top. Use /Print [Printer or File] Options Margins Top to set the top margin for printed pages in number of lines (from 0 to 32) from the top edge of the paper.

1. Select /Print [Printer or File] Options Margins Top. (1-2-3 displays the current top margin setting.)
2. Do one of the following:
   - Press (ENTER) to accept the current top margin setting.
   - Change the setting by typing the number of lines (0 to 32) for the top margin and pressing (ENTER).

/Print [Printer or File] Options Other

Use /Print [Printer or File] Options Other to specify whether 1-2-3 prints the data in the worksheet or the formulas underlying the data, and whether 1-2-3 prints headers and footers and inserts page breaks.

1. Select /Print [Printer or File] Options Other.
2. Select one of the following options:

As-Displayed	Prints the data as it appears on your screen (the default setting). Results of formulas are printed as they are displayed on the screen, using current cell formats and column widths.
Cell-Formulas	Prints the contents of each nonblank cell in the print range, one cell per line. Each line contains exactly what appears in the first line of the control panel when the cell pointer is on the cell: the cell address, the cell format, the protection status (PR or U), and the cell contents (number, formula, or label). 1-2-3 does not print borders, even if you specify them.

Formatted	Prints with all specified formatting options (the default setting), including page breaks, headers, and footers.
Unformatted	Prints without using /Print Options settings, including page breaks, headers, footers, and top and bottom margins. (Use this option if you are printing to a text file.)

3. If you want to select a combination of options, such as Cell-Formulas and Unformatted, select Other again and then select another option.

/Print [Printer or File] Options Pg-Length

Use /Print [Printer or File] Options Pg-Length to override the default page length set with /Worksheet Global Default Printer Pg-Length (see chapter 13).

Page length is measured in lines. The default page length is 66 lines. When you print with the default page length, 1-2-3 uses the 66 lines as follows:

Lines	Use
1 and 2	Default top margin.
3	Header or blank line.
4 and 5	Blank lines.
6 through 61	Worksheet data (total of 56 lines).
62 and 63	Blank lines
64	Footer or blank line.
65 and 66	Default bottom margin.

Follow these steps to set the page length:

1. Select /Print [Printer or File] Options Pg-Length. (1-2-3 displays the current page length setting.)
2. Do one of the following:
   - Press (ENTER) to accept the current setting.
   - Type the number of desired lines (1 to 100) and pressing (ENTER). (Laser printers often have special rules for determining the length of a page. See appendix C or your printer manual for assistance.)

/Print [Printer or File] Options Quit

Use /Print [Printer or File] Options Quit to return to the /Print menu.

/Print [Printer or File] Options Setup

9

Use /Print [Printer or File] Options Setup to override the default setup string specified with /Worksheet Global Default Printer Setup (see chapter 13).

A **setup string** is a series of characters preceded by a backslash (\) that 1-2-3 uses to tell your printer to print a certain way. For example, you can send a setup string that causes the printer to compress or underline type. You create setup strings by translating the printer control codes for your printer into setup string format. 1-2-3 sends the setup string to your printer before printing begins. For complete information on entering printer control codes as setup strings, see appendix C. (1-2-3 ignores setup strings when you are printing to a text file on disk.)

Note



To avoid complications when printing, do not use setup strings to control print settings that you can control through 1-2-3 commands. For example, do not use setup strings to control page length and margins.

Follow these steps to create or change the setup string:

1. Select /Print [Printer or File] Options Setup. (1-2-3 displays the current setup string, if any.)
2. Do one of the following:
   - Type a setup string (up to 39 characters) and press ENTER.
   - Press ENTER to accept the previously specified setup string (if any).
   - Press ← or ESC to edit the previously specified setup string (if any), and then press ENTER.

/Print [Printer or File] Page

Use /Print [Printer or File] Page to advance the paper in the printer to the top of the next page or insert blank lines in a text file on disk.

/Print [Printer or File] Quit

Use /Print [Printer or File] Quit to close the current print job and return 1-2-3 to READY mode.

/Print [Printer or File] Range

Use /Print [Printer or File] Range to specify the **print range**—the data 1-2-3 prints when you select /Print [Printer or File] Go. Whether you are printing on a printer or to a file on disk, you must specify the cells you want 1-2-3 to print.

Consider the following information when specifying the print range:

- If the data in the print range is wider than the paper you are printing on, 1-2-3 automatically prints the data that extends beyond the right margin on a separate page.
- When you print long labels on a printer using proportionally spaced fonts, the number of characters your printer prints may differ from the number of characters you specified in your 1-2-3 print range.
- When a print range includes hidden columns, 1-2-3 does not print the hidden columns. Likewise, when a cell's format is Hidden, 1-2-3 does not print the contents of that cell.
- 1-2-3 remembers the last print range you specified. To print the same range again, select /Print[Printer or File]Go without respecifying a range.

Follow these two steps to specify a print range:

1. Select /Print [Printer or File] Range.
2. Specify the range you want to print and press (ENTER).

Note



If the print range includes long labels, the print range must include 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 cells A1, B1, and C1 are included in the print range.

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The Quit Command

Worksheet Range Copy Move File Print Graph Data System Add-in Quit

Use /Quit to end the 1-2-3 session.

1. Select /Quit.
2. Select one of the following options:

No	Returns 1-2-3 to READY mode.
Yes	Ends 1-2-3 session.

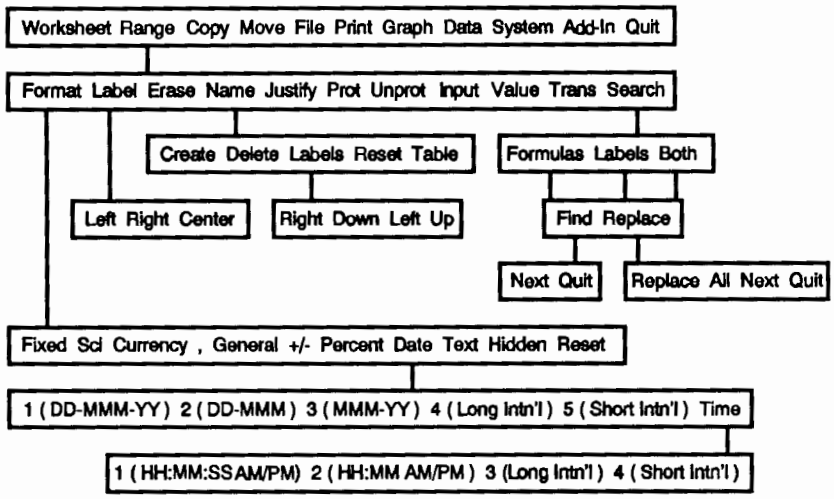
3. If you selected Yes and have changed data in the worksheet but not saved it, 1-2-3 displays another No/Yes menu. Select one of the following:

No	Returns to READY mode so you can use /File Save to save the worksheet.
Yes	Ends 1-2-3 session without saving changes to the worksheet (all changes to the current worksheet will be lost).

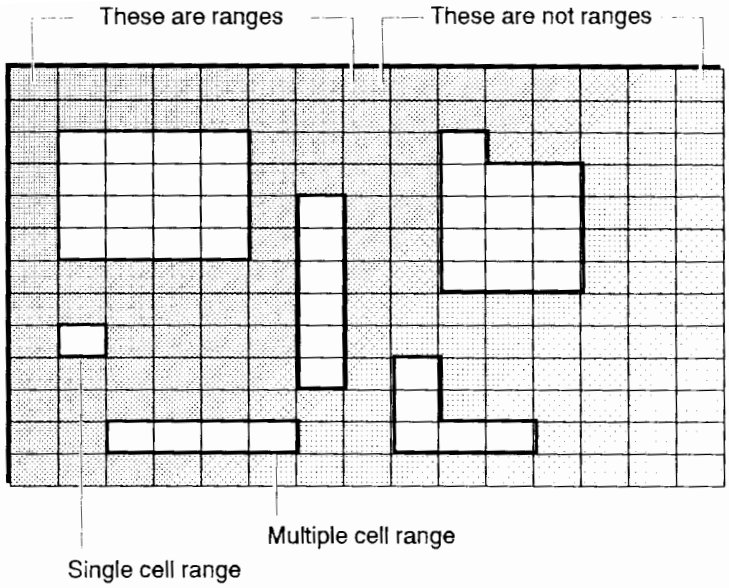
Remember to press HELP (F1) to get information about the command you are using.

11

The Range Commands



The /Range commands let you 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 next illustration shows several examples of ranges.



Command Descriptions

The Range commands are described in the following sections.

Remember to press HELP (F1) to get information about the command you are using.

/Range Erase

Use /Range Erase to erase the data in a range (does not change the format or protection status of cells in the range).

1. Select /Range Erase.
2. Specify the range you want to erase and press ENTER.

Note



You cannot erase data in protected cells unless you turn off worksheet protection using /Worksheet Global Protection Disable (see chapter 13) or unprotect the cells whose contents you want to erase with /Range Unprot.

/Range Format

Use /Range Format to specify the cell format (the way 1-2-3 displays data) for each cell in a range, overriding the global cell format (set with /Worksheet Global Format).

Before using /Range Format, note the following:

- Most cell formats only affect the way 1-2-3 displays numeric data. Hidden and Text formats, however, also affect the display of labels and formulas.
- Changing a cell's format changes the way 1-2-3 displays data in the cell but not the data itself. You can choose a cell format that displays 45.123 as $45, but 1-2-3 still stores the value as 45.123 and uses that value when calculating.
- 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, (P2) means Percent format with 2 decimal places.

Follow these steps to specify the range format:

1. Select /Range Format.
2. Select 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 and press ENTER.

   If 1-2-3 displays a cell filled with asterisks, it usually means the column is not wide enough to display the entire number. The column must be one character wider than the width of the number. To widen the column, use either /Worksheet Column Set-Width or /Worksheet Global Column-Width.

The following table describes the /Range Format menu and includes examples of data in each cell format. The third column of the table shows the data as you would enter it and the fourth column shows the way 1-2-3 displays the data (preceded by the control panel notation for that format).

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Format	Result	Data entered	Data displayed
, (Comma)	Displays numbers with thousands separators and a leading zero for decimal values. Negative numbers are displayed with either parentheses or a minus sign, depending on the /Worksheet Global Default Other International Negative setting. 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, and a leading zero for decimal values.Negative numbers are displayed with either parentheses or a minus sign, depending on the /Worksheet Global Default Other International Negative setting. 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

Format	Result	Data entered	Data 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 (D1 - D5) you select. 1-2-3 uses only the integer part of a number to determine the date the number represents.	32734.11 32734.99 @DATE(89,8,14) @NOW @NOW	(D1) 14-Mar-91 (D2) 14-Mar (D3) Mar-89 (D4) 03/14/91 *(or today's date)* (D5) 03/14 *(if today is 3/14)*
	For numbers less than 1 or more than 73050, displays asterisks.	-2 73052	(D1) ********* (D4) *********
(Date) Time	Displays numbers as times, in the Time format (D6 - D9) 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 0.	.5855 -.5855 @TIME(14,3,7) @NOW	(D6) 02:03:07 PM (D7) ********* (D8) 14:3:07 (D9) 14:03 *(if it is 2:03 PM)*
Fixed	Displays numbers 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, 1-2-3 displays as many digits as it can.	130000000000 123.876876	(G) 1.3000E+11 (if column width is 12) (G) 123.8768 (if column width is 9)

Format	Result	Data entered	Data displayed
Hidden	Makes data in the range invisible, though the data still exists. The data appears in the control panel unless the cells are protected and global protection is on.	+C22/4.2*B2 12.42738	(H) (H)
Percent	Displays numbers as percentages, 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 whole-number value of the entry (rounded to the nearest integer). Plus signs indicate a positive value, minus signs indicate a negative value, and a period indicates a number between -1 and 1. If the whole-number value of the entry is wider than the column width, 1-2-3 displays asterisks.	5.3 -3 -.024	(+) +++++ (+) --- (+).
Reset	Resets the range to the global cell format (specified with /Worksheet Global Format).		
Sci	Displays numbers in scientific 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 computed values; displays numbers in General format.	+C22/4.2*B2 +FIRST&LAST 165.00 165.03	(T) +C22/4.2*B2 (T) +FIRST&LAST (T) 165 (T) 165.03

Using /Range Format requires additional memory. If you are concerned about the amount of memory a worksheet is using, format only ranges that require it or use /Worksheet Global Format, which does not require additional memory.

Computer Museum

/Range Input

Use /Range Input to limit cell pointer movement and data entry to unprotected cells in a range so you can enter or edit data in those cells but not in others. This command works with /Range Unprot.

Use /Range Input for data entry in a fill-in-the-blanks entry form, with the unprotected cells acting as the blanks in the form.

1. If you want a fill-in-the-blanks entry form, set up the form.

   The entry form should include prompts for the information you want entered in the blanks and any pertinent instructions.
2. Select /Range Unprot.

   Specify the cell or cells in which you want to enter or edit data and press (ENTER).
3. Select /Range Input.
4. Specify the data input range and press (ENTER).

   The data input range is any range that includes the cells you unprotected in step 2. If you set up an entry form, 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.
5. Enter or edit data in the unprotected cells. You can move the cell pointer only to the unprotected cells in the data input range.
6. To end /Range Input, press either (ENTER) or (ESC) when 1-2-3 is in READY mode. (1-2-3 returns the cell pointer to the cell it was in before you selected /Range Input and restores unrestricted cell pointer movement.)

/Range Input is also commonly used in interactive macros. 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.

/Range Justify

/Range Justify lets you treat a column of labels as a paragraph and rearranges (justifies) the labels to fit within your specified width. Use /Range Justify to make labels equal lengths in a range, fit text into a specific width for viewing or printing, create a paragraph in a worksheet, or rejustify an edited paragraph. To use this command, global worksheet protection must be off.

11

Note



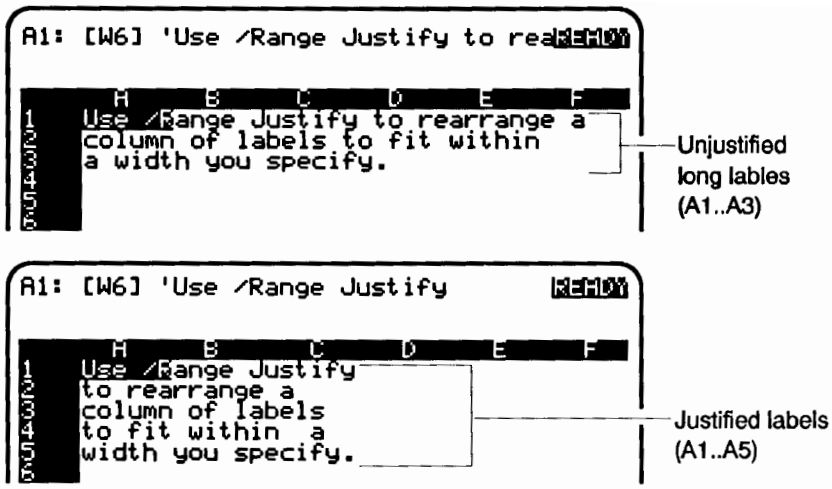
Do not use /Range Justify on a column whose contents are used in macros or string formulas; otherwise, each cell that gets moved up to the previous line will have a space inserted in front of it, thus changing the formula.

Follow these steps when using /Range Justify:

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 and press (ENTER).

   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 using as many rows as necessary. If the justified labels occupy more rows than the original labels, 1-2-3 moves down any subsequent data in the column (data below the justified labels). If the justified labels occupy fewer rows than the original labels, 1-2-3 moves up any subsequent data. 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.

   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. 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.



11

/Range Label

Use /Range Label to change the alignment of labels in a range by changing their label prefix: ' (left-aligned), " (right-aligned), or ^ (centered). Labels that exceed the width of a column appear left-aligned no matter what label prefix they have. (Right-aligned labels leave a blank space to the right if there is enough room.)

1. Select /Range Label.
2. Select one of the following options:

Left	Aligns labels with left edge of cells.
Right	Aligns labels with right edge of cells.
Center	Centers labels in cells.

3. Specify the range of labels whose alignment you want to change and press (ENTER).

/Range Name

Range names are names of up to 15 characters that you use in commands and formulas instead of cell or range addresses. For example, if you assign the name SALES to A5..D9, you can move the cell pointer to A5 by pressing GOTO (F5), typing sales, and pressing ENTER; 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 selected more quickly than the range addresses to which they correspond.

/Range Name Create

Use /Range Name Create to assign a name to a range or redefine which cells an existing range name refers to. Use /Range Name Create to edit a range name by selecting an existing name, pressing EDIT (F2) and editing it.

To prevent confusion when using range names in formulas and advanced macro commands, follow these guidelines:

- Do not include spaces, commas, semicolons, or the characters + * – / & > < { @ and # in range names because they may appear to be formulas to 1-2-3.
- Do not create names that look like cell addresses, such as Q2 or EX100.
- Do not use @function names, advanced macro command keywords, or 1-2-3 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.

Caution



If you enter a range name identical to an existing range name, 1-2-3 reassigns the range name to the new range.

Follow these steps to create or edit a range name:

1. Select /Range Name Create.
2. Specify a range name of up to 15 characters and press ENTER. (1-2-3 does not distinguish between uppercase and lowercase letters in range names.)
3. Specify the range to name and press ENTER.

If, when using /Move, you move data into the upper left or lower right cell of a named range, the range name becomes undefined. Formulas that used that range evaluate to ERR.

Use NAME (F3) to specify a named range when completing a command or writing a formula.

/Range Name Delete

Use /Range Name Delete to delete a range name but leave the data in the range unchanged.

1. Select /Range Name Delete.
2. Specify the range name you want to delete and press (ENTER).

/Range Name Labels

Use /Range Name Labels to assign range names to single cell ranges, using existing adjacent labels as the range names.

To prevent confusion when using range names in formulas and advanced macro commands, make sure that the labels you are going to use to create range names meet these guidelines:

- Do not include spaces, commas, semicolons, or the characters + * − / & > < { @ and # because they may appear to be formulas to 1-2-3.
- Do not look like cell addresses, such as Q2 or EX100.
- Do not use @function names, advanced macro command keywords, or 1-2-3 key names.
- Do not begin with a number, such as 20DEC, or consist entirely of numbers, such as 1989.

Note



If a label you use as a range name (or the first 15 characters of the label) duplicates an existing range name, 1-2-3 reassigns the range name to the new range. Formulas that refer to the named range as it was previously defined now refer to the new range.

Follow these steps to assign a range name:

1. Select /Range Name Labels.
2. Select one of the following options:

Right	Cell to name is to the right of the label.
Down	Cell to name is below the label.
Left	Cell to name is to the left of the label.
Up	Cell to name is above the label.

3. Specify the range that contains the labels you want to use as range names and press (ENTER).

   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.

/Range Name Reset

Use /Range Name Reset to delete all range names in the current worksheet but leave the data in the ranges unchanged. (Named macros are disabled with /Range Name Reset.)

/Range Name Table

Use /Range Name Table to create a two column table that alphabetically lists range names in the worksheet and their corresponding addresses.

1. Decide on a location for the range name table.

Note



The table can be placed in any unprotected area of the worksheet. Make sure, however, that the worksheet location is blank or contains unimportant data because 1-2-3 writes over the existing data when it creates the table. The table will occupy two columns and as many rows as there are range names plus one blank row. If you make a mistake when creating a range name table and the undo feature is on, press UNDO ((ALT)-(F4)) immediately to restore the worksheet to its original state.

---

2. Select /Range Name Table.
3. Specify the location you decided on in step 1 and press (ENTER). (You need to specify only the first cell of the table's location.)

   If you use /Range Name Table frequently, assign a range name to a worksheet area you designate as the table location. Whenever you select /Range Name Table, type the range name. This technique saves time and helps avoid the possibility of writing over data when you create a range name table.

/Range Prot

Use /Range Prot to reprotect cells in a range (that have been unprotected with /Range Unprot) when global worksheet protection is on. (See /Worksheet Global Protection in chapter 13.)

1. Select /Range Prot.
2. Specify the range containing the unprotected cells you want to protect again and press (ENTER).

/Range Search

Use /Range Search to locate character strings consisting of letters or numbers in labels and/or formulas within a specified range. /Range Search does not locate numbers that are not in formulas.

Use Find to locate the string you specify by highlighting it with the cell pointer, or Replace to locate the specified string and replace it with another string. The search string is not case sensitive, however the replacement string is.

Searching for a String

1. Select /Range Search.
2. Specify the range you want 1-2-3 to search and press (ENTER).
3. Do one of the following:
   - Type the string you want 1-2-3 to search for and press (ENTER).
   - Press (ENTER) to accept the previously specified string (if any).
   - Press (←) or (ESC) to edit the previously specified string (if any), and then press (ENTER).
4. Select one of the following options:

Formulas	Looks only in formulas for the search string.
Labels	Looks only in labels for the search string.
Both	Looks in both formulas and labels for the search string.

5. Select Find to highlight the first occurrence of the search string.
6. Select one of the following options:

Next	Highlights the next occurrence of the search string.
Quit	Stops the search and returns 1-2-3 to READY mode.

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.

   (/Range Search does not search hidden columns. It does, however, search cells formatted with /Range Format Hidden.)

11

Replacing a String

1-2-3 does a search and replace with the strings you specify. 1-2-3 will replace numeric strings in formulas, but will not replace numbers entered directly in cells.

Note



1-2-3 searches and replaces left to right by column, starting with column A, then B, and so on. When you replace range names in formulas, you may get unexpected results depending on the location of the range name references.

Follow these steps to replace a string:

1. Select /Range Search.
2. Specify the range you want 1-2-3 to search and press (ENTER).
3. Do one of the following:
   - Type the string you want 1-2-3 to search for and press (ENTER).
   - Press (ENTER) to accept the previously specified string (if any).
   - Press (•) or (ESC) to edit the previously specified string (if any), and then press (ENTER).
4. Select one of the following options:

Formulas	Looks only in formulas for the search string.
Labels	Looks only in labels for the search string.
Both	Looks in both formulas and labels for the search string.

5. Select Replace to replace occurrences of the search string with a different (replacement) string.
6. Do one of the following:
   - Type the replacement string and press (ENTER).
   - Press (ENTER) to accept the previously specified string (if any).
   - Press (•) or (ESC) to edit the previously specified string (if any), and then press (ENTER).

7. 1-2-3 highlights the cell containing the first occurrence of the search string. Select one of the following options:

Replace	Replaces the current string with the replacement string and highlights the next cell containing the search string.
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.

8. If you selected Replace or Next, 1-2-3 displays an error message when it cannot find any more occurrences of the search string in the search range. Press (ESC) or (ENTER) to return 1-2-3 to READY mode.

Although /Range Search does not search hidden columns, it does search cells formatted with /Range Format Hidden.

/Range Search ends with an error message if you attempt a replacement that would cause a formula to become invalid.

/Range Trans

Use /Range Trans to copy a range of data, transposing the copied data and replacing any copied formulas with their current values. 1-2-3 transposes the data from a horizontal arrangement to a vertical arrangement, or vice versa.

Note



If the `Calc` indicator appears at the bottom of the screen, press CALC ((F9)) to update formulas before you use /Range Trans. If any of the formulas whose values you will be transposing refer to cells in files on disk, you also need to use /File Admin Link-Refresh to make sure those formulas' values are up to date.

Follow these steps when using /Range Trans:

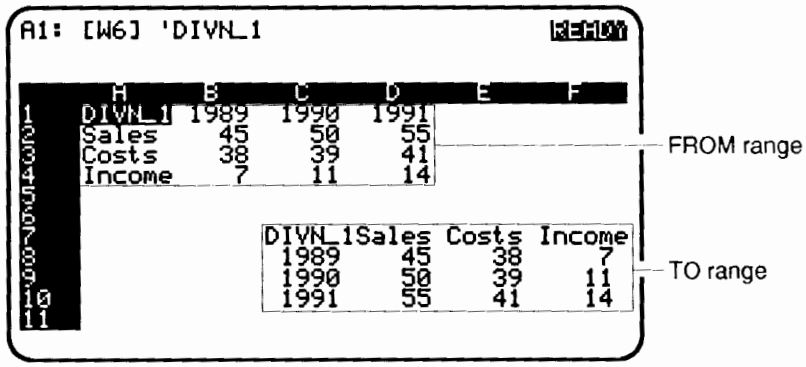
1. Select /Range Trans.
2. Specify the FROM range (the range whose data you want to transpose) and press (ENTER).

3. Specify the TO range (the location for the transposed data) and press (ENTER). You need to specify only the first cell of the TO range.

Caution



If the FROM and TO ranges overlap, you may get unexpected results. To avoid possible data loss from writing over existing data, save the worksheet before using /Range Trans. If you do not get the results you want and the undo feature is on, press UNDO ((ALT)-(F4)) immediately to restore the worksheet to its original state.



/Range Unprot

Use /Range Unprot to unprotect cells. This allows changes to cells in a range when global worksheet protection is on. (See /Worksheet Global Protection in chapter 13.) When the cell pointer is on an unprotected cell, 1-2-3 displays a U in the control panel.

1. Select /Range Unprot.
2. Specify the range you want to unprotect and allow changes to and press (ENTER).

/Range Value

Use /Range Value to copy 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.

Note



If the `Calc` indicator appears at the bottom of the screen, press CALC (F9) to update formulas before you use /Range Value. If any of the formulas whose values you will be copying refer to cells in files on disk, use /File Admin Link-Refresh to make sure those formulas' values are up to date.

Follow these steps when using /Range Value:

1. Select /Range Value.
2. Specify the FROM range (the range whose current values you want to copy) and press ENTER.
3. Specify the TO range (the location for the copied values) and press ENTER. (You need to specify only the first cell of the TO range.)

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. To avoid possible data loss from writing over existing data, save the worksheet before using /Range Value. If you make a mistake when using /Range Value and the undo feature is on, press UNDO (ALT-F4) immediately to restore the worksheet to its original state.

To convert a formula to its current value without using /Range Value, move the cell pointer to the cell containing the formula, press EDIT (F2), press CALC (F9), then press ENTER.

12

The System Command

Worksheet Range Copy Move File Print Graph Data System Add-In Quit

The /System command is not available in Lotus 1-2-3 on the HP 95LX. To exit to the operating system, use the system command in the Filer.

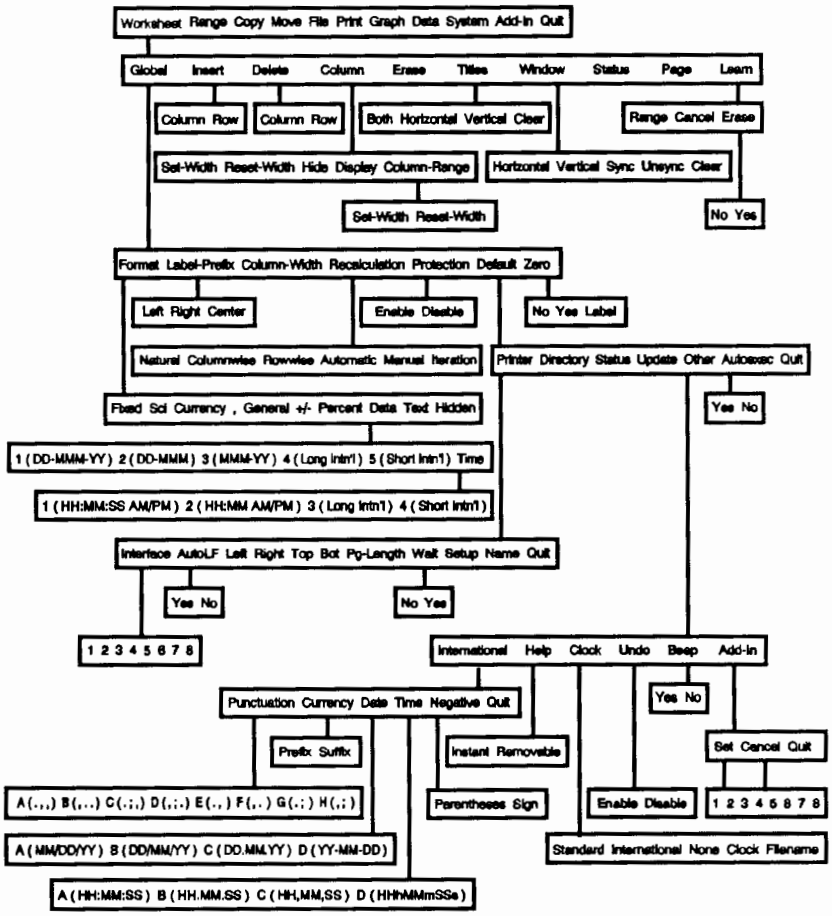
Note



If your macros include either /s or {SYSTEM} macro commands, the macros will not work.

13

The Worksheet Commands



The Worksheet commands let you control the display and organization of your work. They also let you control **global settings**, which are 1-2-3 settings that affect the entire worksheet and 1-2-3 as a whole.

A **default setting** is one that 1-2-3 uses unless you specify a different setting.

13 A **configuration setting** is one that 1-2-3 uses each time you begin a session, such as autoexecute macros, Help access method, printer instructions, and many others. Configuration settings are stored in a file named 123.CNF, and displayed in a settings sheet when you select /Worksheet Global Default.

The /Worksheet commands are defined in the following sections.

Remember to press HELP (F1) to get information about the command you are using.

/Worksheet Column

Use /Worksheet Column to change the width of one or more columns, reset columns to the global column width, and hide and redisplay columns.

If you split the screen into two windows with /Worksheet Window Horizontal or Vertical, the /Worksheet Column affects 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 Column Column-Range

Use /Worksheet Column Column-Range to change the width of a range of adjacent columns.

After you set the width of column with /Worksheet Column Column-Range Set-Width, the column's width appears in brackets in the control panel when the cell pointer is anywhere in that column.

Computer Museum

Follow these steps to adjust a column width:

1. Select /Worksheet Column Column-Range.
2. Select one of the following options:

Set-Width	Changes the width of a range of columns.
Reset-Width	Resets a range of columns to the global default column width (the default is 9 characters).

3. Specify the range of columns whose widths you want to set or reset and press (ENTER).
4. If you selected Set-Width, in step 2, specify the new width by doing one of the following:
   - Type a number from 1 to 240 and press (ENTER).
   - Press (◀) or (▶) to decrease or increase the width and press (ENTER).

/Worksheet Column Display

Use /Worksheet Column Display to redisplay hidden columns.

1. Select /Worksheet Column Display.

   1-2-3 temporarily redisplays all hidden columns with asterisks next to their column letters.
2. Specify the range of columns you want to redisplay and press (ENTER).

/Worksheet Column Hide

Use /Worksheet Column Hide to hide one or more columns without permanently erasing the data in those columns. Formulas in hidden columns and formulas that refer to cells in hidden columns continue to work correctly.

1-2-3 temporarily redisplays hidden columns whenever it changes to POINT mode, using asterisks next to the column letters to identify them as hidden columns. Follow these steps to hide columns:

1. Select /Worksheet Column Hide.
2. Specify the range of columns you want to hide and press (ENTER).

/Worksheet Column Reset-Width

Use /Worksheet Column Reset-Width to restore the global default column width (9 characters) for the column that contains the cell pointer.

13

/Worksheet Column Set-Width

Use /Worksheet Column Set-Width to change the width of the column that contains the cell pointer.

After you set the width of a column with /Worksheet Column Set-Width, the column's width appears in brackets in the control panel when the cell pointer is in that column.

Follow these steps to change the width of a cell:

1. Select /Worksheet Column Set-Width.
2. Specify a width for the current column by doing one of the following:
   - Type a number from 1 to 240.
   - Press ◀ or ▶ to decrease or increase the width and press ENTER.

/Worksheet Delete

Use /Worksheet Delete to remove columns or rows from the worksheet. 1-2-3 closes up the space left by the deletion. (You cannot delete columns or rows if /Worksheet Global Protection is enabled.)

1. Select /Worksheet Delete.
2. Select one of the following options:

Column	Deletes one or more columns.
Row	Deletes one or more rows.

3. Specify the range of columns or rows you want to delete and press ENTER.

Note



To avoid possible data loss from deleting columns or rows, save your worksheet before using /Worksheet Delete. If you make a mistake when deleting columns or rows and the undo feature is on, press UNDO ([ALT]-[F4]) immediately to restore the worksheet to its original state.

When a column or row 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 or row deletion moves the upper left or lower right 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).

If you delete the upper left or lower right cell of a named range, the range loses its definition and formulas that refer to that range evaluate to ERR. For example, suppose you assign the range name TOTALS to B2..M15. If you then delete row 2 or column B, the range name loses its definition.

/Worksheet Erase

Use /Worksheet Erase to remove the worksheet from memory and replace it with a blank worksheet. /Worksheet Erase restores the default Global settings.

1. Select /Worksheet Erase.
2. Select one of the following options:

No	Returns 1-2-3 to READY mode without erasing the worksheet.
Yes	Erases the worksheet.

Note



/Worksheet Erase removes the current worksheet from memory, but it does not affect the worksheet file stored on disk. To avoid data loss, use /File Save to save the worksheet before using /Worksheet Erase. If you make a mistake when erasing a worksheet and the undo feature is on, press UNDO (ALT-F4) immediately to restore the worksheet to its original state.

/Worksheet Global

The /Worksheet Global commands let you change settings that affect the current worksheet as well as configuration settings that 1-2-3 uses every time you start a 1-2-3 session.

Global and Default Settings Sheets

When you select /Worksheet Global or /Worksheet Global Default, 1-2-3 displays special status screens called **settings sheets**. The /Worksheet Global settings sheet displays the current global settings, such as the recalculation method and column width. When you change settings by making selections from the /Worksheet Global menu, the settings sheet reflects the changes. Conventional memory, Expanded memory and Math coprocessor are indicators and are not affected by menu selections.

The /Worksheet Global Default settings sheets display the current default settings, such as the default directory and printer. When you change these settings by making selections from the /Worksheet Global Default menu, the settings sheets reflect the changes.

Saving Global and Default Settings

You may want to vary the settings you use with different worksheets. For example, you might want to set the recalculation method to Manual, and save the worksheet. The next time you retrieve it, recalculation will still be set to Manual, even if you started the 1-2-3 session with recalculation set to Automatic. Or you may set some settings, and then decide that you want to reset the Global settings for a new worksheet with /Worksheet Erase.

Default settings are saved in the 1-2-3 configuration file. Those settings are in effect for every 1-2-3 session until you change them, but they are not saved with the worksheet.

/Worksheet Global Column-Width

Use /Worksheet Global Column-Width to change the width of all columns in the worksheet except those columns whose widths you set individually with /Worksheet Column Set-Width or /Worksheet Column Column-Range Set-Width. The minimum column width is 1; the maximum is 240. The default global column width setting is 9 characters.

1. Select /Worksheet Global Column-Width.
2. Specify a column width by doing one of the following:
   - Type a number from 1 to 240.
   - Press ◀ or ▶ to decrease or increase the width; press ENTER.

/Worksheet Global Default

The Worksheet Global Default commands let you control default settings for the 1-2-3 session. With these commands you can specify many global worksheet settings, such as printer instructions, the current directory, international and clock display formats, autoexecute macros, and auto-attach add-ins.

Although the settings you establish with /Worksheet Global Default apply globally during the current 1-2-3 session, you can override some of them with other commands. (For example, you can override print margins set with /Worksheet Global Default Printer by using /Print Printer Option Margins.)

The settings you specify with /Worksheet Global Default are stored in a file called 123.CNF. This file is read by 1-2-3 each time you start a session, and the settings take effect automatically. If you have changed some settings and want to save them for future sessions, you must select /Worksheet Global Default Update, which will save the changes in the 123.CNF file. To view your current settings, select /Worksheet Global Default Status and check the status screen; or select /Worksheet Global Default and check the settings sheet.

/Worksheet Global Default Autoexec

Use /Worksheet Global Default Autoexec to tell 1-2-3 whether to run autoexecute macros, macros named \0 (zero), when it retrieves a file that contains one. For more information on macros, see chapter 15.

1. Select /Worksheet Global Default Autoexec.
2. Select one of the following options:

Yes	Automatically executes macros named \0 (zero).
No	Does not automatically execute macros named \0 (zero).

3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new Autoexec setting in future sessions, select Update from the /Worksheet Global Default menu.

/Worksheet Global Default Directory

Use /Worksheet Global Default Directory to set the path (drive and directory names) that 1-2-3 automatically searches when you save, read, or list files. Initially, the default directory is the directory that contains the 1-2-3 program files. If the files you most frequently work with are in another directory, you will probably want to use this command to change the directory.

1. Select /Worksheet Global Default Directory.
2. Specify the new directory and press (ENTER).
3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new Directory setting in future sessions, select Update from the /Worksheet Global Default menu.

To override the default directory and change the current directory for the current session only, use /File Directory rather than /Worksheet Global Default Directory.

/Worksheet Global Default Other

The /Worksheet Global Default Other commands let you specify the international and clock display formats, the Help access method, the computer's beep, and auto-attach add-ins. This command also turns the undo feature on and off.

/Worksheet Global Default Other Add-In. Use /Worksheet Global Default Other Add-In to configure 1-2-3 so it automatically attaches an add-in program whenever you start 1-2-3. You can specify up to

eight auto-attach add-ins. You can also specify whether you want 1-2-3 to automatically invoke one of the auto-attach add-ins as well.

1. Select /Worksheet Global Default Other Add-In.
2. Select one of the following options:

Set	Sets an auto-attach add-in, and attaches the add-in.
Cancel	Cancels an auto-attach add-in, and detaches the add-in.
Quit	Returns you to the /Worksheet Global Default menu.

3. Select the number (1 through 8) of the auto-attach add-in to set or cancel.

   If you selected Set, 1-2-3 displays a menu of files with an .ADN extension in the directory from which you started 1-2-3.
4. Specify the file name of the add-in you want to attach automatically and press (ENTER).

   You can specify a different directory from the start up directory, if necessary, by pressing (ESC) to erase the path and then entering a new drive and/or directory.

   Steps 5 and 6 do not apply to add-in @functions.
5. Select the key you want to use to invoke the add-in:

7	Assigns the add-in to APP1 ((ALT)-(F7)).
8	Assigns the add-in to APP2 ((ALT)-(F8)).
9	Assigns the add-in to APP3 ((ALT)-(F9)).
10	Assigns the add-in to APP4 ((ALT)-(F10)).
no key	Does not assign the add-in to a key.

   Once you assign an add-in to a key, that key will no longer appear in the menu during the current session unless you cancel the auto-attach add-in setting.
6. 1-2-3 asks if you want the add-in to be invoked automatically at the start of each session. Select one of the following options:

Yes	Invokes the auto-attach add-in whenever you start 1-2-3.
No	Attaches the add-in but does not automatically invoke it.

Note Only one add-in can be auto-invoked.



7. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new Add-In settings in future sessions, select Update from the /Worksheet Global Default menu.

13

/Worksheet Global Default Other Beep. Lets you control whether 1-2-3 sounds the computer bell when errors occur and when executing {BEEP} commands in a macro.

1. Select /Worksheet Global Default Other Beep.
2. Select one of the following options:

Yes	1-2-3 will sound the bell.
No	1-2-3 will not sound the bell.

3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new Beep setting in future sessions, select Update from the /Worksheet Global Default menu.

/Worksheet Global Default Other Help. Use /Worksheet Global Default Other Help to specify the method 1-2-3 uses to access the Help system. The Help file (123.HLP) either remains open during the 1-2-3 session (Instant), or closes each time you return to the worksheet (Removable).

1. Select /Worksheet Global Default Other Help.
2. Select one of the following options:

Instant	1-2-3 opens the Help file the first time you press HELP (F1) in a 1-2-3 session and keeps the file open for the rest of the session.
Removable	1-2-3 opens the Help file each time you press HELP (F1) and closes the file again when you press ESC to leave Help.

3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new Help setting in future sessions, select Update from the /Worksheet Global Default menu.

Note



1-2-3 looks to the internal ROM (C:) for Instant Help and looks to a plug-in card (A:) for Removable Help. If 1-2-3 attemps to access Removable Help when the card is not inserted, 1-2-3 beeps and displays the error message `No Help available. Press ESC to exit.`

/Worksheet Global Default Other International. Use /Worksheet Global Default Other International to set a variety of display formats, including the punctuation for numbers, the argument separators for @functions and advanced macro commands, the currency symbol, the international date and time formats, and the negative number display in Comma and Currency formats.

1. Select /Worksheet Global Default Other International.
2. Select one of the following options:

Punctuation	Sets the characters 1-2-3 uses as the decimal point, argument separator for @functions and advanced macro commands, and thousands separator for numbers. You can choose from eight combinations of three, listed in order of decimal point, argument separator, and thousands separator: A (.,,), B (,..), C (.;,), D (,;.), E (.,), F (,.), G (.;), and H (,;). 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. You can always use a semicolon as an argument separator.
Currency	Sets the currency symbol 1-2-3 uses in cells formatted as Currency and whether the currency symbol precedes or follows numbers. (The default is $ Prefix.)
Date	Sets the international Date format 1-2-3 uses for cells formatted as D4 (MM/DD/YY, Long Intn'l) or D5 (MM/DD, Short Intn'l). The options are A (MM/DD/YY), B (DD/MM/YY), C (DD.MM.YY), and D (YY-MM-DD).

	Time	Sets the international Time format 1-2-3 uses for cells formatted as D8 (HH/MM/SS, 24 hour, Long Intn'l) or D9 (HH/MM, 24 hour, Short Intn'l). The four options are A (HH:MM:SS), B (HH.MM.SS), C (HH,MM,SS), and D (HHhMMmSSs).
13	Negative	Sets whether 1-2-3 uses parentheses (the default setting) or a minus sign for negative values in cells formatted as Comma or Currency.
	Quit	Returns you to the /Worksheet Global Default menu.

3. Do one of the following, depending on the option you selected in step 2:
   - If you selected Punctuation, select A, B, C, D, E, F, G, or H.
   - If you selected Currency, enter the currency symbol and then select Prefix or Suffix. The currency symbol can consist of up to 15 characters and can include any of the characters in the Lotus International Character Set (LICS).
   - If you selected Date or Time, select A, B, C, or D.
   - If you selected Negative, select Parentheses or Sign.
4. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new International settings in future sessions, select Update from the /Worksheet Global Default menu.

To use a character that is not on the keyboard as part of the default currency symbol, use COMPOSE (ALT-F1). For example, to specify the £ (British pound) as the default currency symbol, press COMPOSE (ALT-F1), type L= and press ENTER. For a list of LICS characters and compose sequences, see appendix F.

/Worksheet Global Default Other Undo. Use /Worksheet Global Default Other Undo to turn the undo feature on and off. When the undo feature is on, you can press UNDO (ALT-F4) to cancel any changes made to the worksheet since 1-2-3 was last in READY mode.

1. Select /Worksheet Global Default Other Undo.
2. Select one of the following options:

Enable	Turns on the undo feature.
Disable	Turns off the undo feature.

3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new Undo setting in future sessions, select Update from the /Worksheet Global Default menu.

When undo is on, 1-2-3 reserves a portion of memory for the undo buffer, which is used to make a backup copy of the worksheet. 1-2-3 uses expanded memory for the undo buffer if possible, but uses conventional memory if there is not enough (or any) expanded memory available. Using conventional memory for the undo buffer significantly reduces the amount of memory for worksheet data and add-ins. If necessary, use /Worksheet Global Default Other Undo Disable to turn off the undo feature and increase your available memory. For other ways to increase available memory, see chapter 1.

For further information on Undo, see "Using the Undo Feature" in chapter 2.

/Worksheet Global Default Printer

The /Worksheet Global Default Printer commands provide 1-2-3 with information about your printer at the start of each 1-2-3 session, including the type of printer you are using, its interface with your computer, and the settings for printed pages.

(Use /Print Printer Options rather than /Worksheet Global Default Printer to specify settings for individual print jobs.)

/Worksheet Global Default Printer AutoLF. Use /Worksheet Global Default Printer AutoLF to control the signal 1-2-3 sends to your printer at the end of each line of output.

To determine the correct AutoLF setting for your printer, print a range of two or more rows. Then use the following guidelines:

- If the printing is double-spaced, set AutoLF to Yes.
- If the paper in the printer does not advance, set AutoLF to No (the default setting).

Follow these steps when using /Worksheet Global Default Printer AutoLF:

1. Select /Worksheet Global Default Printer AutoLF.
2. Select one of the following options:

Yes	Does not send line feeds to your printer because your printer automatically advances at the end of each line of output.
No	Sends line feeds to your printer at the end of each line of output because your printer does not automatically advance.

3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new setting in future sessions, select Update from the /Worksheet Global Default menu.

/Worksheet Global Default Printer Bot. Use /Worksheet Global Default Printer Bot to set the default bottom margin for printed pages in number of standard lines. You can specify any number from 0 to 32 (the default setting is 2).

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1. Select /Worksheet Global Default Printer Bot.
2. Specify the number of standard lines (0 to 32) for the default bottom margin and press (ENTER).
3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new setting in future sessions, select Update from the /Worksheet Global Default menu.

/Worksheet Global Default Printer Interface. Use /Worksheet Global Default Printer Interface to specify the interface for your printer. The **interface**, or port, refers to the way your printer is connected to the computer. The default is 2 (Serial 1). *This is the only appropriate interface for the HP 95LX at this time.*

For the serial interface, you will need to indicate the baud for which your printer is set (the default is 9600). The baud is the rate at which 1-2-3 sends data to the printer. The baud setting must match your printer's baud rate. The 1-2-3 printer interface and baud rate default to the printer interface and baud specified in the Setup utility.

Follow these steps when using /Worksheet Global Default Printer Interface:

1. Select /Worksheet Global Default Printer Interface.
2. Select 2 (Serial 1).
3. Select one of the following options to specify the baud:

1	110 baud	6	2400 baud
2	150 baud	7	4800 baud
3	300 baud	8	9600 baud
4	600 baud	9	19200 baud
5	1200 baud		

4. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new setting in future sessions, select Update from the /Worksheet Global Default menu.

Change the following settings on your serial printer. These are not settings you can change in 1-2-3—refer to your printer manual for instructions.

Data bits: 8
Stop bits: 2 if 110 baud; otherwise 1
Parity: None
Handshaking (XON/XOFF): Enabled

/Worksheet Global Default Printer Left. Use /Worksheet Global Default Printer Left to set the default left margin for printed pages (in number of characters from the left edge of the paper). You can specify any number from 0 to 240, but the number should be smaller than the number you specify as the right margin setting. The default left margin setting is 4.

1. Select /Worksheet Global Default Printer Left.
2. Specify the number of standard characters (0 to 240) for the default left margin and press (ENTER).
3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new setting in future sessions, select Update from the /Worksheet Global Default menu.

/Worksheet Global Default Printer Name. /Worksheet Global Default Printer Name specifies which printer you want to use. The HP 95LX uses the system printer as specified in the Setup utility.

/Worksheet Global Default Printer Pg-Length. Use /Worksheet Global Default Printer Pg-Length to set the length of each printed page. Page length is measured in standard lines.

The Pg-Length setting determines the number of printed lines per page and where 1-2-3 creates page breaks when printing. You can specify any number from 1 to 100; the default setting is 66.

1. Select /Worksheet Global Default Printer Pg-Length.
2. Specify the number of standard lines (1 to 100) for the page length and press (ENTER).
3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new setting in future sessions, select Update from the /Worksheet Global Default menu.

/Worksheet Global Default Printer Quit. Use /Worksheet Global Default Printer Quit to return to the /Worksheet Global Default menu.

/Worksheet Global Default Printer Right. Use /Worksheet Global Default Printer Right to set the default right margin for printed pages, in number of characters from the left edge of the paper. You can specify any number from 0 to 240, but the number should be greater than the number you specify as the left margin setting. The default right margin setting is 76.

1. Select /Worksheet Global Default Printer Right.
2. Specify the number of standard characters (0 to 240) for the default right margin and press (ENTER).
3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new setting in future sessions, select Update from the /Worksheet Global Default menu.

/Worksheet Global Default Printer Setup. Use /Worksheet Global Default Printer Setup to enter a default **setup string**, which is a series of characters preceded by a backslash (\) that 1-2-3 sends to your printer to tell it to print a certain way. For example, you can send a setup string that causes the printer to compress type or underline text.

You create setup strings by translating the printer control codes for your printer into the appropriate format. For more information on entering printer control codes as setup strings, see appendix C. (To avoid problems when printing, do not use setup strings to control print settings that you can control through 1-2-3 commands.)

1. Select /Worksheet Global Default Printer Setup.
2. Specify the default setup string and press (ENTER).
3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new setting in future sessions, select Update from the /Worksheet Global Default menu.

/Worksheet Global Default Printer Top. Use /Worksheet Global Default Printer Top to set the default top margin for printed pages (in number of standard lines). You can specify any number from 0 to 32; the default setting is 2.

1. Select /Worksheet Global Default Printer Top.
2. Specify the number of standard lines (0 to 32) for the default top margin and press (ENTER).
3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new setting in future sessions, select Update from the /Worksheet Global Default menu.

/Worksheet Global Default Printer Wait. Use /Worksheet Global Default Printer Wait to tell 1-2-3 to pause after it prints each page so you can insert a new piece of paper. Use this command when you are printing on single sheets of paper rather than continuous-form paper. (The default setting is No.)

1. Select /Worksheet Global Default Printer Wait.
2. Select one of the following options:

Yes	Pauses after printing each page so you can insert a new sheet of paper. (Do not select Yes if you are using a print spooler because the spooler controls single sheet paper feeding.))
No	Does not pause after printing a page.

3. To update the 1-2-3 configuration file (123.CNF) so 1-2-3 uses the new setting in future sessions, select Update from the /Worksheet Global Default menu.

/Worksheet Global Default Quit

Use /Worksheet Global Default Quit to return 1-2-3 to READY mode.

/Worksheet Global Default Status

Use /Worksheet Global Default Status to display current worksheet settings, such as the default directory. The status screen overlays the worksheet. You can press any key to redisplay the worksheet.

1. Select /Worksheet Global Default Status.
2. When you finish viewing the status screen, press any key to remove it and redisplay the worksheet.

To see information about available memory, recalculation settings, circular references, the math coprocessor you are using, the global cell format, label prefix, column width and zero display settings, and the protection status of the current worksheet, select either /Worksheet Status or /Worksheet Global to display the settings sheet.

/Worksheet Global Default Status is useful if you have cleared the display of the settings sheet by pressing WINDOW (F6) and then want to redisplay the settings sheet.

/Worksheet Global Default Update

Use /Worksheet Global Default Update to save the current /Worksheet Global Default settings in the 1-2-3 configuration file (123.CNF). 1-2-3 reads the new /Worksheet Global Default settings each time you start the program until you change the settings and again select /Worksheet Global Default Update.

/Worksheet Global Format

Use /Worksheet Global Format to set the global cell format for the worksheet. The cell format setting determines the way 1-2-3 displays data in the worksheet.

When using /Worksheet Global Format, note the following:

- Cells formatted with /Range Format override the global format set with /Worksheet Global Format.
- 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.
- 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 Column-Width. Or try a cell format which uses fewer characters.

- Cell formats set with /Worksheet Global Format are not displayed in the control panel, as they are with /Range Format.

Follow these steps when using /Worksheet Global Format:

1. Select /Worksheet Global Format.
2. Select the cell format you want from the series of menus and prompts 1-2-3 displays.

The following table describes the /Worksheet Global Format menu and includes examples of data in each cell format. The third column of the table shows the data as you would enter it and the fourth column shows the way 1-2-3 displays the data in the worksheet when you select the format type indicated in parentheses.

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

Format	Result	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) ********* (D4) *********

Format	Result	Data as entered	Data as displayed
(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 0. 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).	.5855 .5855 @TIME(14,3,7) @NOW	(T1) 02:03:07 PM (T2) 02:03 PM (T3) 14:03:07 (T4) 14:03 (if it is 2:03 PM)
Fixed	Displays numbers 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, 1-2-3 displays as many digits as it can.	130000000000 123.876876	(G) 1.3000E+11 (when column width is 12) (G) 123.8768 (when column width is 9)

Format	Result	Data as entered	Data as displayed
Hidden	Makes data in the range invisible, though the data still exists. The data appears in the control panel unless the cells are protected and global protection is enabled.	+C22/4.2*B2 12.42738	(H) (H)
Percent	Displays numbers as percentages (that is, multiplied 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 whole-number value of the entry (rounded to the nearest integer). Plus signs indicate a positive value, minus signs indicate a negative value, and a period indicates a number between −1 and 1. If the whole number value of the entry is wider than the width of the column the entry is in, 1-2-3 displays asterisks instead of a bar.	5.3 −3 −.024	(+) +++++ (+) −−− (+) .
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 computed values; displays numbers in General format.	+C22/4.2*B2 +FIRST&LAST 165.00 165.03	(T) +C22/4.2*B2 (T) +FIRST&LAST (T) 165 (T) 165.03

Computer Museum

/Worksheet Global Label-Prefix

Use /Worksheet Global Label-Prefix to set the global label alignment for the worksheet. The command affects future entries only; it does not change the alignment of labels already entered in the worksheet.

1. Select /Worksheet Global Label-Prefix.
2. Select one of the following options:

Left	Aligns labels at the left edge of cells.
Right	Aligns labels at the right edge of cells.
Center	Centers labels in cells.

Labels that exceed the width of a column always appear left-aligned regardless of the global label alignment setting.

You can override the global label alignment setting by using /Range Label after you enter a label, or by typing a label prefix as the first character in a label you are entering:

Label prefix	Alignment
'	Aligns labels at the left edge of cells.
"	Aligns labels at the right edge of cells.
^	Centers labels in cells.

/Worksheet Global Protection

Use /Worksheet Global Protection to turn global protection on or off for the worksheet. It works in conjunction with /Range Prot and /Range Unprot to prevent changes being made to particular cells.

When global protection is on (1-2-3 displays PR in the control panel for protected cells), you can make changes only to cells that you explicitly unprotect with /Range Unprot.

1. Select /Worksheet Global Protection.
2. Select one of the following options:

Enable	Turns on worksheet protection, preventing you from entering or editing data in the worksheet except in cells you explicitly unprotect with /Range Unprot.
Disable	Turns off worksheet protection, letting you enter or edit data in any cell in the worksheet.

/Worksheet Global Recalculation

Use /Worksheet Global Recalculation to control 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.

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The recalculation settings you specify with /Worksheet Global Recalculation remain in effect until you end the 1-2-3 session or read into memory another worksheet file with different recalculation settings. Whenever you read a file into memory with /File Retrieve, that file's recalculation settings override the current recalculation settings for the 1-2-3 session. The default setting is Automatic (recalculation method) Natural (recalculation order).

1. Select /Worksheet Global Recalculation.
2. Select from the following options to specify a new recalculation order and/or recalculation method, or change the number of recalculation passes (you can select one option from each of the following categories):

Recalculation order:	
Natural	(Default) Before recalculating a particular formula, 1-2-3 recalculates any other formulas on which that formula depends. 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.
Columnwise	Starting in A1, 1-2-3 moves column by column through the worksheet, recalculating all formulas.
Rowwise	Starting in A1, 1-2-3 moves row by row through the worksheet, recalculating all formulas.
Recalculation method:	
Automatic	(Default) Each time you change the contents of a cell, 1-2-3 recalculates any formulas that are affected by the change, using Natural, Columnwise, or Rowwise order.
Manual	Recalculates formulas only when you press CALC (F9). The CALC indicator appears at the bottom of the screen whenever any entries have changed since the last recalculation. 1-2-3 uses Natural, Columnwise, or Rowwise order.
Recalculation passes:	
Iteration	Sets the number of recalculation passes (from 1 to 50) 1-2-3 makes for a complete recalculation. The default setting is 1. 1-2-3 uses the Iteration setting only when the recalculation order is Columnwise or Rowwise, or when the recalculation order is Natural and a circular reference exists.

3. If you selected Iteration, specify the number of recalculation passes (1 to 50) and press ENTER.

Recalculation. Whenever the recalculation order specified with /Worksheet Global Recalculation is Natural, 1-2-3 recalculates only those cells that have changed since the worksheet was last recalculated, and the cells that depend on them. Known as **minimal recalculation**, this feature optimizes the recalculation of cells in a worksheet and decreases recalculation time. There is no way to turn minimal recalculation on or off. If, however, you change the recalculation order to a setting other than Natural, 1-2-3 does not use minimal recalculation and will recalculate all the formulas in the worksheet when you make a change.

There are several @functions that 1-2-3 updates each time it recalculates the worksheet—even when minimal recalculation is in effect—because their values may change even if you do not modify the worksheet:

@@	@ISAAF	@STRING
@CELL	@ISAPP	@TIMEVALUE
@CELLPOINTER	@NOW	@VALUE
@DATEVALUE	@RAND	Add-in @functions

1-2-3 also recalculates cells that depend on the cells containing these @functions.

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.

/Worksheet Global Zero

Use /Worksheet Global Zero to specify whether 1-2-3 displays a zero, a label, or nothing in cells that contain either the number zero or a formula that evaluates to zero.

1. Select /Worksheet Global Zero.
2. Select one of the following options:

No	(Default) Displays zero in cells whose value is zero.
Yes	Causes cells whose value is zero to appear blank. 1-2-3 continues to display the contents of these cells in the control panel.
Label	Displays a label in cells whose value is zero. 1-2-3 continues to display the contents of these cells in the control panel.

3. If you selected Label, type the label to display in cells whose value is zero and then press ENTER. Pressing ENTER without typing a label will cause 1-2-3 to display zeros as blanks.

   The label can be any combination of up to 240 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 inserts the " label prefix, and right-aligns the label in cells.

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.)

If you select /Worksheet Global Zero Yes, you may want to turn on worksheet protection with /Worksheet Global Protection Enable so you do not inadvertently write over data in cells that appear empty.

/Worksheet Insert

Use /Worksheet Insert to insert one or more blank columns or rows in the worksheet.

1. Select /Worksheet Insert.
2. Select one of the following options:

Column	Inserts one or more blank columns to the left of the first column of the insert range.
Row	Inserts one or more blank rows above the first row of the insert range.

3. Specify a range that includes at least one cell in each of the columns or rows you are inserting, and press (ENTER).

/Worksheet Learn

/Worksheet Learn provides an alternative method of entering macro instructions. Instead of typing the macro instructions, you simply perform the task that you want to automate.

Once you specify a learn range and turn on the learn feature with LEARN ((ALT)-(F5)), 1-2-3 translates your keystrokes into macro instructions and records them in the learn range. 1-2-3 continues recording your keystrokes until you turn off the learn feature by pressing LEARN ((ALT)-(F5)) again or until you fill the learn range. You then name the macro and when you run it, 1-2-3 automatically executes the instructions recorded in the learn range.

For more information on how to use the learn feature to write macros, read "Using the Learn Feature to Create Macros" in chapter 15.

/Worksheet Learn Cancel

Use /Worksheet Learn Cancel to cancel the currently specified learn range. If you want 1-2-3 to record keystrokes when you turn on the learn feature, you must specify another learn range.

/Worksheet Learn Erase

Use /Worksheet Learn Erase to clear the contents of the learn range. The range is still defined and if you turn on the learn feature by pressing LEARN ([ALT]-[F5]), 1-2-3 will record new keystrokes in the range.

1. Select /Worksheet Learn Erase.
2. Select one of the following options:

Yes	Clears the contents of the learn range.
No	Returns 1-2-3 to READY mode.

/Worksheet Learn Range

Use /Worksheet Learn Range to specify the range where 1-2-3 will record keystrokes as labels. 1-2-3 begins recording keystrokes in the learn range when you turn on the learn feature by pressing LEARN ([ALT]-[F5]). 1-2-3 continues recording keystrokes until you press [LEARN] again (to turn off the learn feature).

1. Select /Worksheet Learn Range.
2. Specify a long, single column range in an empty part of the worksheet and press [ENTER].

Here are some tips to remember when using /Worksheet Learn Range:

- It is necessary to specify only a single column as the learn range. 1-2-3 stores your keystrokes as long labels in the leftmost column of the learn range, even if you specify a multiple column range.
- If there are any nonblank cells in the learn range when you press [LEARN], 1-2-3 begins recording keystrokes in the first cell of contiguous blank cells that extend all the way to the bottom of the learn range. This can significantly reduce the number of keystrokes that can be recorded in the learn range. For example, if the bottom cell of the learn range is nonblank and you turn on the learn feature, the learn range will be immediately filled—even if

all the other cells in the learn range are blank. If 1-2-3 displays a `Learn range is full` error message, you can increase the size of the learn range and then continue saving keystrokes in the learn range. Press (ESC) to clear the error message, select /Worksheet Learn Range, specify a new learn range that is large enough to accommodate your macro, and then press (ENTER). You may have to reenter the keystroke that caused the error message, and check the macro to be sure it is complete.

- Be careful not to delete the column that contains the learn range while the learn feature is on. If you do, 1-2-3 turns off the learn feature and cancels the learn range.
- If you make a mistake when the learn feature is on, you can erase the entire learn range with /Worksheet Learn Erase and start again, or you can continue to record keystrokes and edit the macro later in the same way that you edit all 1-2-3 data (for more information, see "Editing an Entry" in chapter 2). To successfully edit macros, you must be familiar with the guidelines for entering macro instructions. See "Entering a Macro" in chapter 15.

/Worksheet Page

Use /Worksheet Page to insert a row in the worksheet that contains two colons (::). When you print the worksheet range, this symbol forces a page advance and resets the line counter in 1-2-3.

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.
2. Select /Worksheet Page.

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.

You can also enter a page break symbol manually. Move the cell pointer to the leftmost column in the range you are printing, and enter a split vertical bar followed by two colons (|::) in the row where you want the new page to start.

/Worksheet Status

Use /Worksheet Status to display information about available memory, recalculation, cell display format, circular references, and global protections in a status screen that overlays the worksheet.

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1. Select /Worksheet Status.
2. When you finish viewing the status screen, press any key to remove it and redisplay the worksheet.

The status screen displays only one circular reference at a time. If you eliminate the displayed circular reference, select /Worksheet Status again to see whether another circular reference exists.

/Worksheet Titles

Use /Worksheet Titles to freeze rows and/or columns along the top and left edges of the worksheet so they remain in view as you scroll through the worksheet.

1. Before freezing 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 one of the following options:

Both	Freezes rows above the cell pointer and columns to the left of the cell pointer.
Horizontal	Freezes rows above the cell pointer.
Vertical	Freezes columns to the left of the cell pointer.
Clear	Unfreezes all title rows and columns.

To move the cell pointer to a frozen row or column, press GOTO (F5) and then specify the address or range name of 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 PG DN and then PG UP (for rows) or BIG RIGHT (CTRL-▶) and then BIG LEFT (CTRL-◀) (for columns).

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 retrieve a file in which rows 1 through 25 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.

/Worksheet Window

Use /Worksheet Window lets you view your work in several ways: It lets you split the screen horizontally or vertically into two windows, and synchronize scrolling in two windows or scroll them independently.

1. Before creating split windows, do one of the following:
   - To split the screen horizontally, move the cell pointer to the row you want to use as the top edge of the second window.
   - To split the screen vertically, 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 one of the following options:

Horizontal	Creates two windows with the screen split horizontally immediately above the row the cell pointer is in. Use WINDOW (F6) to move the cell pointer from one window to the other.
Vertical	Creates two windows with the screen split vertically immediately to the left of the column the cell pointer is in. Use WINDOW (F6) to move the cell pointer from one window to the other.
Sync	Synchronizes window scrolling (the default 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.
Unsync	Unsynchronizes window scrolling, allowing windows to scroll independently in all directions.

Clear	Restores a single window that occupies the whole screen, using the contents and settings of the window that was on the left or on the top.

With horizontal or vertical windows, all commands that change the worksheet display affect both windows, except for /Worksheet Column, /Worksheet Global Column-Width, and /Worksheet Titles, which affect only the current window.

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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.

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1-2-3 @Functions

The 1-2-3 **@functions** are built-in formulas that perform a variety of calculations. You can use @functions for financial, mathematical, statistical, 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.

This chapter is divided into three sections:

- "Syntax of @Functions" explains the rules for writing formulas that contain @functions.
- "Types of @Functions" lists the 1-2-3 @functions by category, and provides some specific rules and tips.
- "@Function Descriptions" contains descriptions and examples of each @function, arranged alphabetically.

Syntax of @Functions

Each @function has a specific structure, or **syntax**. Unless you follow this syntax exactly, 1-2-3 cannot interpret the @function. The syntax for an @function is in one of two forms:

- An @ symbol followed by the function name, as in @PI and @NOW.
- An @ symbol and the function name followed by a set of parentheses enclosing arguments separated by **argument separators** (normally commas or semicolons). Examples of this syntax are @DDB(1000,200,8,5) and @TIME(12,32,0).

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.

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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 240.

@Functions use four types of information as arguments: values, strings, locations (cells or ranges), and conditions (usually logical formulas).

- 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 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, 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 @ (at sign).
- 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; @AVG (B6..B12) is not.
- Always enclose an @function's arguments in parentheses.
- When you use an @function as an argument, enclose the arguments for each @function 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. By default, 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. (To learn how to write 1-2-3 macros, see "Creating a Macro" in chapter 15.) In any case, the total number of characters in the cell that contains the formula or macro instructions must not exceed 240.
- 1-2-3 assigns the value 0 to blank cells whose addresses are used as arguments in financial, logical, and mathematical @functions.

Types of @Functions

1-2-3 @functions can be grouped into nine categories.

- Add-in @functions that perform a variety of tasks are available from many third-party software developers.
- Database @functions perform statistical calculations and queries in 1-2-3 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. For information about logical formulas, read "Working with Formulas" in chapter 2.
- Mathematical @functions perform a variety of calculations with values.
- Special @functions perform a variety of 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).

Add-In @Functions

If an add-in program provides @functions, they can be attached and will remain in memory until you end the 1-2-3 session. If you want to retrieve a worksheet that contains add-in @functions, you should attach the appropriate add-in @functions before retrieving the file.

Note



If you retrieve a worksheet that contains add-in @functions without first attaching the appropriate add-in, each add-in @function is displayed as @? in the control panel and returns the value NA in the worksheet. To correct this, attach the add-in and then retrieve the worksheet again.

Database @Functions

For a complete description of an @function listed here, see the alphabetical listing later in this chapter.

@DAVG	Averages the values in a field of a database based on certain criteria.
@DCOUNT	Counts the nonblank cells in a field of a database based on certain criteria.
@DMAX	Finds the largest value in a field of a database based on certain criteria.
@DMIN	Finds the smallest value in a field of a database based on certain criteria.
@DSTD	Calculates the population standard deviation of the values in a field of a database based on certain criteria.
@DSUM	Sums the values in a field of a database based on certain criteria.
@DVAR	Calculates the population variance of the values in a field of a database based on certain criteria.

Guidelines for Using Database @Functions

Database @functions scan a database, 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.

All database @functions have three arguments: *input*, *field*, and *criteria*.

- *Input* is the range that contains the database. *Input* can be the address or name of a range that contains a database.
- *Field* is the field's offset number. 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 field's offset number is a value larger than the number of columns 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.
- *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

For a complete description of an @function listed here, see the alphabetical listing later in this chapter.

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.
@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 a two- or three-digit value for 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 PM.
@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 PM.
@SECOND	Calculates the seconds in a time number. For example, @SECOND(0.604745) returns the value 50 because 0.604745 is the time number for 2:30:50 PM.
@TIME	Calculates the time number for a set of hour, minutes, and seconds values. For example, @TIME(14,30,50) returns 0.604745, the time number for 2:30:50 PM.
@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.

Date calculations:	
Current date and time calculations:	
@NOW	Calculates the value that corresponds to the current date and time on the computer's clock. For example, @NOW returns the value 32515.604745 at 2:30:50 PM (the time number 0.604745) on January 7, 1989 (the date number 32515).

Guidelines for Using Date and Time @Functions

- Date @functions use 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 use time numbers, consecutive decimal values that correspond to times from midnight (the time number 0.000000) through 11:59:59 PM (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 number that contains decimal places as a date number in an argument, 1-2-3 uses only the integer part of the number. For example, 1-2-3 calculates both @YEAR(31790.6) and @YEAR(31790) as 87.

Financial @Functions

For a complete description of an @function listed here, see the alphabetical listing later in this chapter.

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 for one period.
@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 for one period.
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.

Guidelines for Using Financial @Functions

- Within an @function, express the term and the interest rate in the same unit of time. For example, in @PMT(1000,0.05/12,36) 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 0.155 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

For a complete description of an @function listed here, see the alphabetical listing later in this chapter.

@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,SALES-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.
@ISAAF	Returns 1 (true) for a defined add-in @function; 0 (false) for any other entry.
@ISAPP	Returns 1 (true) for a currently attached add-in; 0 (false) for any other entry.
@ISERR	Returns 1 (true) for the value ERR; 0 (false) for any other value.
@ISNA	Returns 1 (true) for the value NA; 0 (false) for any other value.
@ISNUMBER	Returns 1 (true) for a numeric value, NA, ERR, or a blank cell; 0 (false) for a string.
@ISSTRING	Returns 1 (true) for a string; 0 (false) for a numeric value, NA, ERR, or a blank cell.
@TRUE	Returns the logical value 1 (true).

Guidelines for Using Logical @Functions

- You 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. 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 @AVG(A12..K12) if G12 contains a value. If G12 contains a label, the @IF formula returns the word Label.

Mathematical @Functions

For a complete description of an @function listed here, see the alphabetical listing later in this chapter.

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.
@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 π (calculated at 3.1415926536).
@SIN	Calculates the sine of an angle.
@TAN	Calculates the tangent of an angle.

Guidelines for Using Mathematical @Functions

- You must express angles you enter as arguments for @COS, @SIN, and @TAN in radians. To convert degrees to radians, multiply the number of degrees by @PI/180.
- @ACOS, @ASIN, @ATAN, and @ATAN2 produce range values in radians. To convert radians to degrees, multiply the number of radians by 180/@PI.

Special @Functions

For a complete description of an @function listed here, see the alphabetical listing later in this chapter.

Cell and range information:	
@@	Returns the contents of the cell whose cell address another cell contains.
@CELL	Returns information about a cell. 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. 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.
@ROWS	Counts the rows in a range.
Error trapping:	
@ERR	Returns the value ERR (error).
@NA	Returns the value NA (not available).
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 range.
@INDEX	Finds the value of the cell in a specified row and column in a range.
@VLOOKUP	Finds the contents of the cell in a specified column in a range.

Guidelines for Using 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.

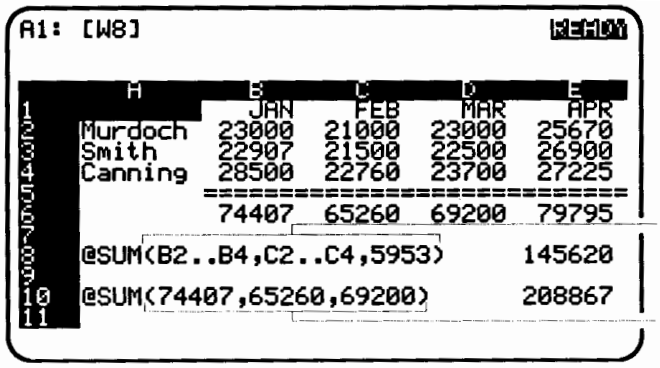
Statistical @Functions

For a complete description of an @function listed here, see the alphabetical listing later in this chapter.

@AVG	Averages a list of values.
@COUNT	Counts the nonblank cells in a list of values.
@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.
@SUM	Sums a list of values.
@VAR	Calculates the population variance of a list of values.

Guidelines for Using 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.



1-2-3 assigns the value 0 to any strings used as arguments in statistical @functions. Therefore, labels within ranges in list will not cause statistical @functions to evaluate to ERR. 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.

Note



You should always check for labels in the ranges you use in a 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.

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 that meet certain criteria.

String @Functions

For a complete description of an @function listed here, see the alphabetical listing later in this chapter.

@CHAR	Returns the character that a Lotus International Character Set (LICS) code produces.
@CLEAN	Removes control characters from a string.
@CODE	Returns the LICS 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.
@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 a blank cell if the cell contains a value.
@STRING	Converts a value into a label with a specified number of decimal places. For example, @STRING(34.567,1) returns the label (not the value) 34.5.
@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. For example, @VALUE("34.5") returns the value 34.5.

Guidelines for Using String @Functions

- Always enclose literal strings used as arguments in quotation marks. 1-2-3 treats strings not enclosed in quotation marks as range names. For example, @LENGTH("EXPENSES") returns the number of characters in the string "EXPENSES" while @LENGTH(EXPENSES) returns the number of characters in the label located in the single cell range named EXPENSES.
- Some string @functions use 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 LICS codes. For example, @CODE("A") returns the code 65, but @CODE("a") returns the code 97. For information on LICS, see appendix F.
- 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 " ' ^ or | 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

This section contains descriptions of the 1-2-3 @functions. As you use it, keep in mind the following conventions:

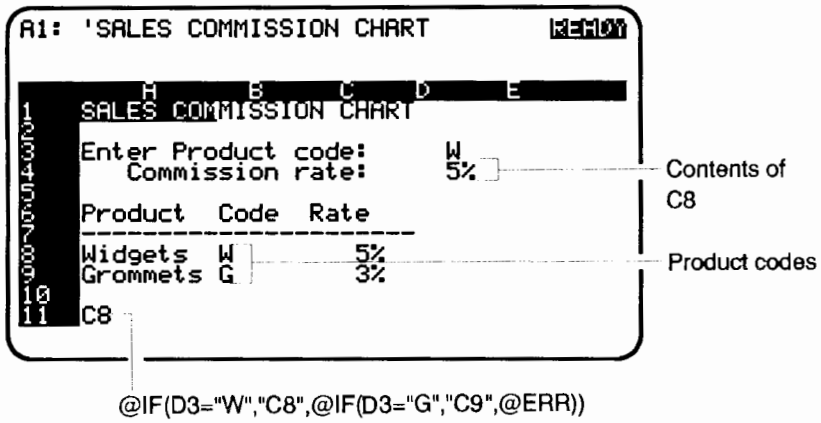
- Each @function is listed alphabetically.
- @Functions, advanced macro command keywords, cell addresses, and range names appear in uppercase letters, but they can be entered in uppercase and/or lowercase letters.
- Argument names appear in italics but actual arguments used in examples are not italicized.

@@

@@(*location*) returns the contents of the cell whose name or address is specified in *location*. *Location* must be the name or address of a single cell range that contains a valid cell reference. If you specify a multiple cell range for *location*, @@ evaluates to ERR.

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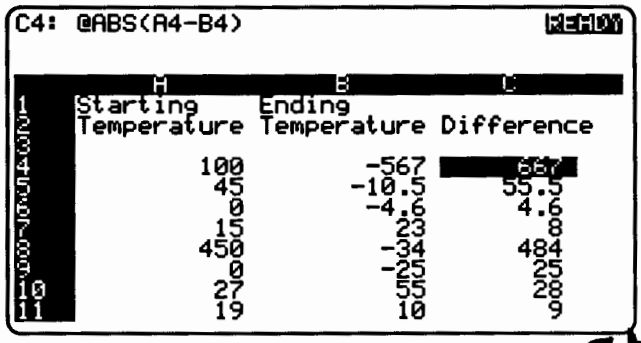
Example. The following figure shows a simple sales commission chart. The @@(A11) formula entered in D4 returns the contents of C8, which is the cell specified in A11. Cell A11 contains an @IF formula that enters one of two cell addresses, depending on which product code you enter in D3. If you enter anything in D3 other than one of the two product codes, both the @IF and @@ functions will evaluate to ERR.



@ABS

@ABS(x) calculates the absolute (positive) value of x.

Example. In the following example, the formula @ABS(A4–B4) copied down column C calculates the differences between the starting and ending temperatures. (@ABS calculates each difference as a positive value.)



Computer Museum

@ACOS

@ACOS(x) calculates the arc cosine in radians of a value. (Multiplying the result by 180/@PI converts the radians to degrees.)

Example. @ACOS(.5)*180/@PI = 60 (degrees).

@ASIN

@ASIN(x) calculates the arc sine in radians of a value. (Multiplying the result by 180/@PI converts the radians to degrees.)

Example. @ASIN(1)*180/@PI = 90 (degrees).

@ATAN

@ATAN(x) calculates the arc tangent in radians of a value. (Multiplying the result by 180/@PI converts the radians to degrees.)

Example. @ATAN(1) = 0.785398 (radians).

@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. The result of @ATAN2 is a value from $-\pi$ to π. (Multiplying the result by 180/@PI converts radians to degrees.)

Example. @ATAN2(1.5,2) = 0.927295 (radians).

@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.

Example. @AVG(C1..C3,D1..D3) returns the average of the values in cells C1, C2, C3, D1, D2, and D3.

@CELL

@CELL(*attribute,range*) returns information about an attribute for the first cell in range.

Note



@CELL evaluates the first cell in range at the point when that cell was last recalculated, so be sure to recalculate your work before using @CELL.

Attribute can be any of the 10 strings in the following list. *Attribute* can be entered as a literal string, a string formula, or a reference to a cell that contains a label. *Range* can be any range name or address.

Attribute	Result
address	The absolute cell address (for example, $A$1).
col	The column letter, as a value from 1 to 256 (1 for column A, 5 for column E, and so on).
contents	The contents of the cell.
filename	The name of the current file including the path.

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.
D1 if DD-MMM-YY.
D2 if DD-MMM.
D3 if MMM-YY.
D4 if MM/DD/YY, DD/MM/YY, DD.MM.YY, or YY-MM-DD.
D5 if MM/DD, DD/MM, 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), HH.MM.SS (24 hour), HH,MM,SS (24 hour), or HHhMMmSSs.
D9 if HH:MM (24 hour), HH.MM (24 hour), HH,MM, or HHhMMm.
T if Text format.
H if Hidden format.

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 symbol) if the cell is empty 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.
type	The type of data in the cell: b if the cell is blank (that is, has no entry). v if the cell contains a numeric value or a formula. l if the cell contains a label.
width	The column width.

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 whether a particular cell contains data, with the result directing a macro subroutine. For example, in the macro instructions

{IF @CELL("type",C5)="b"}{BEEP}{INDICATE "Do Not Leave Blank!"}

if C5 is blank, @CELL("type",C5) returns B; 1-2-3 then beeps and the mode indicator changes to Do Not Leave Blank!

@CELLPOINTER

@CELLPOINTER(*attribute*) returns information about an attribute for the current cell. *Attribute* can be any of the 10 valid *attribute* arguments for @CELL.

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. In the macro instructions

{IF @CELLPOINTER("type")="b"}{BEEP 2}{QUIT}

@CELLPOINTER is used 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 Lotus International Character Set (LICS) code x produces. (For information on LICS, see appendix F.) X can be any integer from 1 to 255. Values outside this range yield ERR.

@CHAR is useful for entering foreign language characters and mathematical symbols. Whether a character prints depends on the capabilities of your printer.

Example. The formula

+"Champs-"&@CHAR(201)&"lys"&@CHAR(233)&"es"

returns Champs-Élysées.

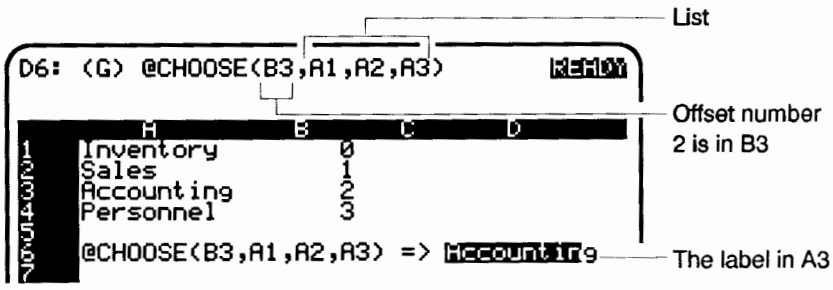
@CHOOSE

@CHOOSE(*offset,list*) finds the value or string in *list* that is specified by *offset*. Use @CHOOSE to enter a list of lookup values without setting up a lookup table.

Offset represents an offset number. The first item has an offset of 0; the second, 1; the third, 2; and so on.

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.

Example. The worksheet in the following figure contains a list of labels (A1..A4) and their offset numbers (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*.



@CLEAN

@CLEAN(*string*) removes the following control characters from *string*:

- Control characters with ASCII codes below 32.
- The begin and end attribute characters, as well as the attribute character itself.
- The merge character (LICS code 155) and the character following.

Example. If cell A45 was imported to 1-2-3 from a word processing program and contains

→Second, we must act soon.←

@CLEAN(A45) = Second, we must act soon.

@CODE

@CODE(*string*) returns the Lotus International Character Set (LICS) code that corresponds to the first character in *string*. (For information on LICS, see appendix F.) *String* can be a literal string, the range name or address of 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.

Example. @CODE(C5) = 77 if C5 contains the label Mrs. Jones, because 77 is the LICS code for M.

@COLS

@COLS(*range*) counts the number of columns in *range*.

Example. @COLS(EMPLOYEES) = 20 if EMPLOYEES is the range name for B3..U75.

@COS

@COS(x) calculates the cosine of angle x measured in radians. (Multiplying the result by 180/@PI converts radians to degrees.)

Example. @COS(45*@PI/180) = 0.707106.

@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.
- If you enter a single cell address in *list* it will increase the count by one, even if the cell is blank. For example, if A2 is blank, @COUNT(A2) = 1.
- @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 does not ignore cells that evaluate to ERR or NA.

Examples. @COUNT(C5..C10,D5,E5..E10) = 1 if all the cells are blank because D5 is not entered as a range.

Use @COUNT to stop a macro when the cell pointer reaches a blank row. For example, {IF @COUNT(WORK)=0}{QUIT} stops the macro because 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. *Future-value* and *present-value* can be any values, but must be the same sign, that is both must be positive or negative.

Example. You just deposited $10,000 in an account that pays an annual interest rate of 10% (0.10), compounded monthly. You want to determine how many years it will take to double your investment.

@CTERM(.10/12,20000,10000)/12 = 6.960312; 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 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 0.10/12 (interest divided by the number of compounding periods per year).

@DATE

@DATE(*year,month,day*) calculates the date number for the specified *year*, *month*, and *day*. (For an explanation of date numbers, see "Date and Time @Functions" earlier in this chapter.) *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.

Use @DATE to sort by date or to set up search criteria using dates.

Note



Even though February 29, 1900 did not exist (1900 was not a leap year), 1-2-3 assigns a date number to this "day." This does not affect 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. @DATE(91,1,7) returns 33245, the date number for January 7, 1991. /Range Format Date commands can be used to format the date numbers to more traditional formats.

@DATEVALUE

@DATEVALUE(*string*) calculates the date number for a *string* that looks like a date. (For an explanation of date numbers, see "Date and Time @Functions" earlier in this chapter.) *String* can be a literal string, the range name or address of a cell that contains a label, or a formula or @function that evaluates to a string. *String* must be in one of the 1-2-3 Date formats (see /Range Format in chapter 11).

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. @DATEVALUE("7-Jan-91") returns the date number 33245.

@DAVG

@DAVG(*input,field,criteria*) averages values in a *field* of the *input* range that meet criteria in the *criteria* range. (For an explanation of the way database @functions work, see "Database @Functions" earlier in this chapter.)

Example. @DAVG(EXPENSES,2,CRIT_RANGE) searches a database *input* range EXPENSES for records that match the criteria in the *criteria* range CRIT_RANGE, and then averages the selected values in the *field* whose offset number is 2.

@DAY

@DAY(*date-number*) calculates the day of the month (an integer from 1 to 31) in *date-number*. (For an explanation of date numbers, see "Date and Time @Functions" earlier in this chapter.) *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(@NOW) = 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. (For an explanation of the way database @functions work, see "Database @Functions" earlier in this chapter.)

Example. @DCOUNT(EXPENSES,2,CRIT_RANGE) searches the database *input* range EXPENSES for records that match the criteria in the *criteria* range CRIT_RANGE, and then counts the selected values in the *field* whose offset number is 2.

@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.

Example. @DDB(10000,1200,8,5) returns $791.02, which is the depreciation expense in the fifth year for a $10,000 machine with a useful life of 8 years and a salvage value of $1200.

@DMAX

@DMAX(*input,field,criteria*) finds the largest value in a *field* of the *input* range that meets the criteria in the *criteria* range. (For an explanation of the way database @functions work, see "Database @Functions" earlier in this chapter.)

Example. @DMAX(EXPENSES,1,CRIT_RANGE) searches the database *input* range EXPENSES for records that match the criteria

in the *criteria* range CRIT_RANGE, and then selects the largest value in the *field* whose offset number is 1.

@DMIN

@DMIN(*input,field,criteria*) finds the smallest value in a *field* of the *input* range that meets the criteria in the *criteria* range. (For an explanation of the way database @functions work, see "Database @Functions" earlier in this chapter.)

Example. @DMIN(EXPENSES,1,CRIT_RANGE) searches the database *input* range EXPENSES for records that match the criteria in the *criteria* range CRIT_RANGE, and then selects the smallest value in the *field* whose offset number is 1.

@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. (For an explanation of the way database @functions work, see "Database @Functions" earlier in this chapter.)

@DSTD produces most accurate results when the number of observations is large.

Example. @DSTD(REGION,2,CRIT_RANGE) searches the *input* range region 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* whose offset is 2.

@DSUM

@DSUM(*input,field,criteria*) sums the values in a *field* of an *input* range that meet the criteria in the *criteria* range. (For an explanation of the way database @functions work, see "Database @Functions" earlier in this chapter.)

Example. @DSUM(EXPENSES,3,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* whose offset number is 3.

@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. (For an explanation of the way database @functions work, see "Database @Functions" earlier in this chapter.)

@DVAR produces most accurate results when the number of observations is large.

Example. @DVAR(REGION,"2",CRIT_RANGE) searches the *input* range REGION 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* whose offset number is 2.

@ERR

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) = ERR when the value in B14 is greater than 3.

@EXACT

@EXACT(*string1,string2*) tests whether *string1* and *string2* match exactly. If the two strings are identical, @EXACT returns 1 (true); if the two strings are not the same, @EXACT returns 0 (false).

String1 and *string2* can be literal strings, range names or addresses of cells that contain labels, or formulas or @functions that evaluate to strings.

You can use @EXACT in a macro to check user input against a required entry before the macro continues processing.

Example. @IF(@EXACT(A6,"Posted"),A25,@NA) = the value in A25 if A6 contains the label Posted. If A6 contains any other label, the formula returns the value NA.

@EXP

@EXP(x) calculates the value of e (approximately 2.718282) raised to the power x. The constant e is used as the base in natural logarithms.

x can be any value less than or equal to 709. If x is greater than 230 or smaller than -227, 1-2-3 can calculate and store the result of @EXP but cannot display it. If x is greater than 709, the calculation is too large for 1-2-3 to store, and @EXP returns the value ERR. If x is less than -709, @EXP returns the value 0.

Example. @EXP(1.25) = 3.490342.

@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) = 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, range names or addresses of cells that contain labels, or formulas or @functions that evaluate to strings. *Start-number* represents an offset number of a character in *string*. The first character has an offset number of 0; and the second, 1; and so on.

@FIND is case sensitive; for example, @FIND will not find *search-string* pay in *string* PAYMENT.

Example. @FIND("P","Accounts Payable",0) = 9 because search-string P is at position 9 in string Accounts Payable.

@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.

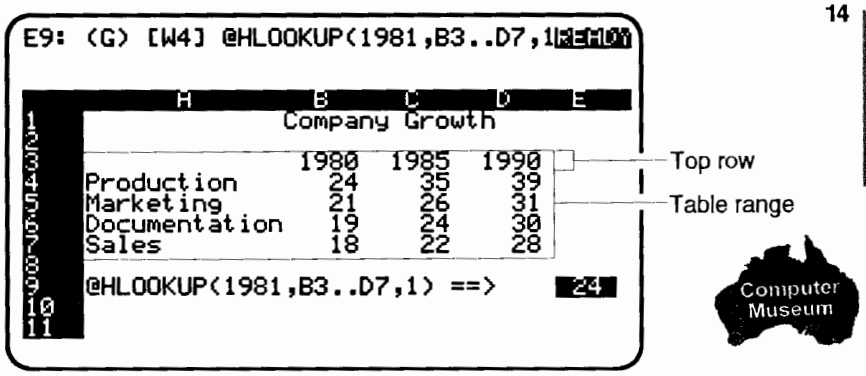
1-2-3 assumes that calculations made with @FV use an investment that is an ordinary annuity (payments at the end of each period).

Examples. 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. @FV(2000,0.075,20) returns $86,609, the value of your account at the end of 20 years.

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 formula @FV(*payments,interest,term*)*(1+*interest*). For example, @FV(2000,0.075,20)*(1+0.075) = $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.



@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 the 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.

Row-offset represents an offset number.

Use @HLOOKUP to locate entries in a table, such as a tax table or a sales commissions table.

Example. The table in the previous figure contains the number of employees in various departments of a company during a 10-year period. @HLOOKUP(1986,B3..F7,1) entered in D9 returns 35. 1986 does not appear in the top row of the table, so @HLOOKUP stops at column C, because 1985 is the value closest to, but not larger than, 1986.

@HOUR

@HOUR(*time-number*) calculates the hour, an integer from 0 (midnight) to 23 (11:00 PM), in a *time-number*. (For an explanation of time numbers, see "Date and Time @Functions" earlier in this chapter.) *Time-number* is a decimal value from .000000 (midnight) to .999988 (11:59:59 PM). Usually, another time @function supplies *time-number*.

Example. @HOUR(@TIME(13,45,18)) = 13 (1:00 PM), because 13 is the hour argument for @TIME(13,45,18).

@IF

@IF(*condition,x,y*) evaluates *condition* 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 and strings equal zero when used as *condition*.

x and *y* can be values or strings.

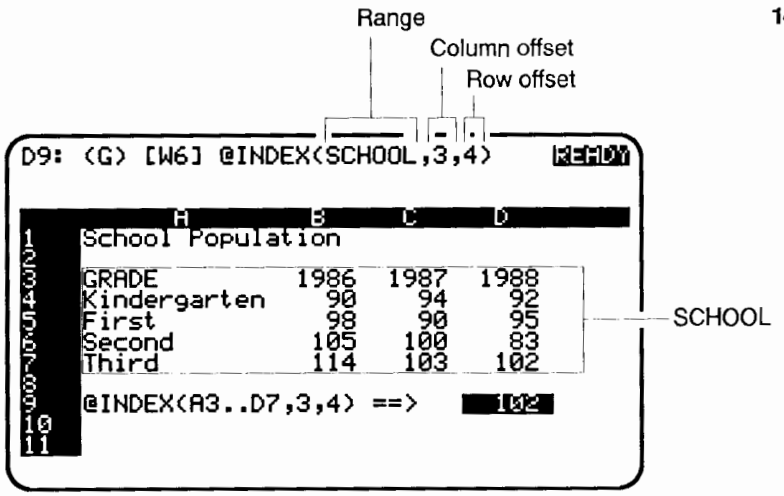
Example. @IF(BID>=2500,BID,"Too Low") returns the contents of the cell BID if it contains a value greater than or equal to 2,500. If BID contains a value less than 2,500 or a label, the formula returns the string "Too Low".

@INDEX

@INDEX(*range,column-offset,row-offset*) finds the value in the cell located at a specified *column-offset* and *row-offset* of *range*. *Range* can be any range name or address. *Column-offset* and *row-offset* represent offset numbers.

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 the following figure shows the number of children enrolled in kindergarten through third grade at an elementary school. @INDEX(SCHOOL,3,4) entered in D9 returns 102, the number of students in the third grade (row-offset number 4) in 1988 (column-offset number 3).



@INT

@INT(x) returns the integer portion of x, without rounding the value. x can be any value.

Example. @INT(-35.67) = -35.

@IRR

@IRR(*guess,range*) calculates the internal rate of return expected from a series of cash flows generated by an 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.

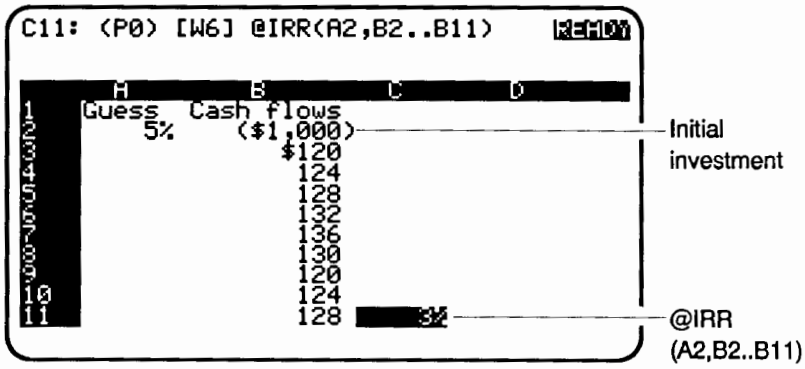
If @IRR cannot approximate the result to within 0.0000001 after 30 calculation iterations, the formula evaluates to ERR. If your guesses continue to return ERR, use @NPV to determine a better guess. If @NPV returns a positive value, your guess is too low. If @NPV returns a negative value, your guess 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 the following figure, @IRR(A2,B2..B11) entered in C11 returns 3%; the initial investment is $1000 (in B2) and the cash flows are shown in B3..B11.



@ISAAF

@ISAAF(*name*) tests *name* for a defined add-in @function. If *name* is a defined add-in @function, @ISAAF returns 1 (true); if *name* is not a defined add-in @function, @ISAAF returns 0 (false). Do not include the initial @ (at sign) in *name*.

Example. @ISAAF("dsum") = 0 because @DSUM is a built-in 1-2-3 @function, not an add-in @function.

@ISAPP

@ISAPP(*name*) tests *name* for an attached add-in. If *name* is an attached add-in, @ISAPP returns 1 (true); if *name* is not an attached add-in, @ISAPP returns 0 (false). Do not include the initial .ADN extension in *name*.

Note



@ISAPP returns 1 (true) only for any add-ins you invoke using /Add-In Invoke.

Example. @ISAPP("finance") = 1 if an add-in called FINANCE is currently attached.

@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. (For an explanation of the ripple-through effect, see "Logical @Functions" earlier in this chapter.)

Example. @ISERR is frequently used 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. (For an explanation of the ripple-through effect, see "Logical @Functions" earlier in this chapter.)

Example. @ISNA(B1) = 1 if B1 contains the value NA; @ISNA(B1) = 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. Use @ISNUMBER to prevent errors that would occur if a cell used in a formula contained the wrong type of data.

Example. @ISNUMBER is often used in macros to make sure a user enters the correct type of information (values or labels). The macro instructions {IF @ISNUMBER(C6)=0}{BEEP}{QUIT} returns 0 if C6 contains a label; 1-2-3 then beeps and ends the macro.

@ISSTRING

@ISSTRING(x) tests x for a string. If x is a literal string or cell that contains a label or string formula, @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. Use @ISSTRING to prevent errors that would occur if a cell used in a formula contained the wrong type of data.

@ISSTRING returns 1 even if a cell contains only a label prefix or space.

Example. @ISSTRING is often used in macros to make sure a user enters the correct type of information (values or labels). The macro instructions {IF @ISSTRING(C6)=0}{BEEP}{QUIT} 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, the range name or address of a cell that contains a label, or a formula or @function 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 greater than or equal to the length of *string*, @LEFT returns the entire string.

1-2-3 counts punctuation and spaces as characters in @LEFT.

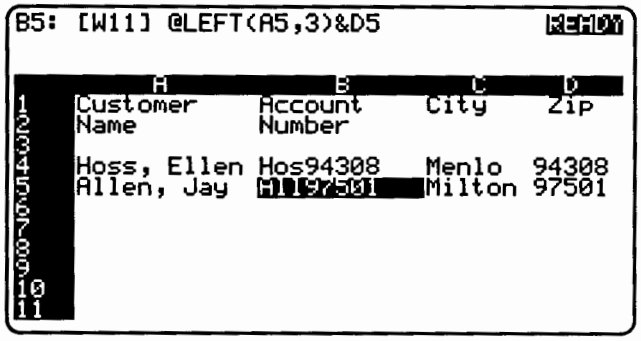
@LEFT is useful for copying only part of a label into another cell.

Example. In the following figure, 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 (in D4).

Note



The zip codes in D4 and D5 must be entered as labels, not values.



@LENGTH

@LENGTH(*string*) counts the number of characters in *string*. *String* can be a literal string, the range name or address of a cell that contains a label, or a formula or @function that evaluates to a string.

1-2-3 counts punctuation and spaces as characters in @LENGTH.

Example. @LENGTH(B1) = 16 when B1 contains the label Accounts Payable.

@LN

@LN(*x*) calculates the natural logarithm (base e) of *x*.

Example. @LN(2) = 0.693147.

@LOG

@LOG(*x*) calculates the common logarithm (base 10) of *x*.

Example. @LOG(4) = 0.602059.

@LOWER

@LOWER(*string*) converts all uppercase letters in *string* to lowercase. *String* can be a literal string, the range name or address of a cell that contains a label, or a formula or @function that evaluates to a string.

Example. @LOWER("EXPENSES") = expenses.

@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.

Example. @MAX(A1..C10) returns the largest value in A1..C10.

@MID

@MID(*string,start-number,n*) returns *n* characters from *string*, beginning with the character at *start-number*. *String* can be a literal string, the range name or address of a cell that contains a label, or a formula or @function that evaluates to a string. *Start-number* represents the offset number of a character in *string*. If *start-number* is greater than the length of string minus 1, 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. The first character has an offset of 0; the second, 1; and so on.

Use a large number for n if you don't know the length of string; 1-2-3 will return the remainder of string.

1-2-3 counts punctuation and spaces as characters in @MID.

Use @MID when you need to extract a 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 don't know its start-number, use @MID with @FIND.

Example. @MID("Daily Account Balance",6,7) = Account.

@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.

Example. @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*. (For an explanation of time numbers, see "Date and Time @Functions" earlier in this chapter.) *Time-number* can be any decimal value from .000000 (midnight) to .999988 (11:59:59 PM). Usually, another time @function supplies time-number.

Example. @MINUTE(@TIME(11,15,45)) = 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.

Example. @MOD(9,4) = 1.

@MONTH

@MONTH(*date-number*) calculates the month, an integer from 1 (January) to 12 (December) in *date-number*. (For an explanation of date numbers, see "Date and Time @Functions" earlier in this chapter.) *Date-number* can be any integer from 1 (January 1, 1900) to 73050 (December 31, 2099). Usually, another date @function supplies *date-number*.

Example. @MONTH(20181) = 4 because 20181 is the date number for April 2, 1955.

@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.

Example. Use @N in error-trapping routine in macros to prevent errors that would result if a cell used in formulas contained the wrong type of data. The macro instructions {IF @N(B6)=0}{BEEP}{INDICATE "ENTRY MUST BE NUMERIC"} return 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((@CELL("type",B14)="b"),@NA,B14) returns the value NA when B14 is blank.

@NOW

@NOW calculates the value that corresponds to the current date and time on the computer's clock. This includes both a date number (integer portion) and a time number (decimal portion). (For an explanation of date numbers and time numbers, see "Date and Time @Functions" earlier in this chapter.)

You can format the value of @NOW in any of the 1-2-3 Date or Time formats. 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.

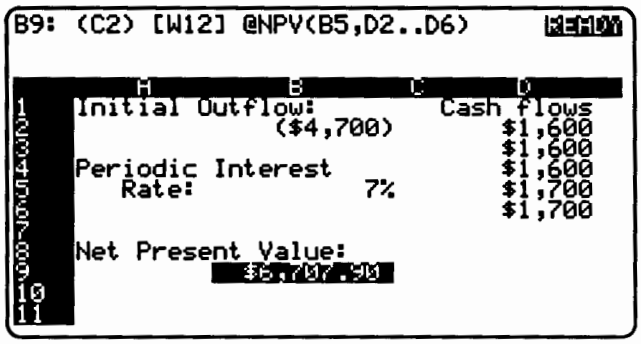
Example. If column D in a spreadsheet contains dates of employees' last reviews as date numbers, the formula @IF((@NOW-D6)>=180,"Yes","No") in column E subtracts the date of an employee's last review from the current date and tells you whether or not the employee is due for a review.

@NPV

@NPV(*interest,range*) calculates the net present value of a series of future cash flows discounted at a fixed, periodic *interest* rate. (@NPV is similar to @PV, except that with @PV all cash flows are equal amounts.) *Interest* can be any value greater than -1. *Range* can be the name or address of the range that contains the cash flows.

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.

Example. In the following figure, @NPV(B5,D2..D6) entered in B9 returns $6,707.90, the net present value of the cash flows in D2..D6.



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) = $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 3.1415926536), the ratio of the circumference of a circle to its diameter.

Example. @PI*4^2 = 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 and can be any value. *Interest* represents the periodic interest rate and can be any value greater than -1. *Term* represents the number of payment periods and 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.

Example. You are considering taking out an $8,000 loan for 3 years at an annual interest rate of 14%, compounded monthly. You want to determine your monthly payment. @PMT(8000,0.14/12,36) returns $273.42, the monthly payment.

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*).



@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, the range name or address of a cell that contains a label, or a formula or @function that evaluates to a string.

Use @PROPER when you combine data from several sources and want labels to be consistent throughout your worksheet.

Example. @PROPER("354-a babcock") = 354-A Babcock.

@PV

@PV(*payments,interest,term*) determines 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.

Example. You won $1,000,000. You can receive either 20 annual payments of $50,000 at the end of each year or a single 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.

@PV(50000,0.08,20) returns $490,907, which tells you that the $1,000,000 paid over 20 years is worth $490,907 in today's dollars.

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*). For example, @PV(50000,0.08,20)*(1 + 0.08) = $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.

Examples. @RAND*10 = 6.933674 or any value between 0 and 10. @INT(@RAND*50)+1 = 49 or any integer from 1 to 50.

@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.

Example. You invested $10,000 in a bond. The bond matures in 5 years and has a maturity value of $18,000. Interest is compounded monthly. You want to determine the periodic interest rate for this investment.

@RATE(18000,10000,60) returns 0.984%, the periodic (monthly) interest rate. To determine the annual rate, multiply the above formula by 12. This yields a result of 11.8% annually.

@REPEAT

@REPEAT(*string,n*) duplicates string *n* times. *String* can be a literal string, the range name or address of a cell that contains a label, or a formula or @function 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.

Example. @REPEAT("+",10) returns ++++++++++.

@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, the range name or address of cells that contain labels, or formulas or @functions that evaluate to strings. *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.

Example. @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, the range name or address of a cell that contains a label, or a formula or @function that evaluates to a string. *n* can be any positive integer or 0.

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If *n* is 0, the result of @RIGHT is an empty string. If *n* is greater than or equal to 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.

Example. @RIGHT("Average Daily Balance",7) = Balance.

@ROUND

@ROUND(*x,n*) rounds the value *x* to *n* places. *x* can be any value. *n* can be any integer from -15 to 15.

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 nth 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.

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, use /Range Format Fixed or /Worksheet Global Format Fixed. Do not use @ROUND.

Example. @ROUND(134.578,2) = 134.58.

@ROWS

@ROWS(*range*) counts the number of rows in *range*. *Range* can be any range name or address.

You can use @ROWS to find the length of a range you want to print.

Example. @ROWS(SCORES) = 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.

Example. 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. The macro instructions {IF @S(B6)=""}{BEEP}{INDICATE "ENTRY MUST BE A LABEL"} 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 to 59, in *time-number*. (For an explanation of time numbers, see "Date and Time @Functions" earlier in this chapter.) *Time-number* can be any decimal value from 0.000000 (midnight) to 0.999988 (11:59:59 PM). Usually, another time @function supplies time-number.

Example. @SECOND(@TIME(11,15,45)) = 45 because 45 is the seconds argument for @TIME(11,15,45).

@SIN

@SIN(x) calculates the sine of angle x measured in radians. (To convert degrees to radians, multiply by @PI/180.) x can be any value.

Example. @SIN(.883) = 0.772646.

@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 and can be any value. *Salvage* represents the estimated value of the asset at the end of its life and can be any value. *Life* presents the number of periods it will take to depreciate the asset to its salvage value and can be any value except 0.

Example. You have an office machine worth $10,000, with a useful life of 10 years, and a salvage value of $1200. You have a worksheet with the $10,000 cost in cell D2, the $1200 salvage value in D3, and the 10-year life in D4. @SLN(D2,D3,D4) returns $880, the yearly, straight-line depreciation allowance.

@SQRT

@SQRT(x) calculates the positive square root of x. x can be any positive value or 0.

Example. @SQRT(@INT(25.768)) = 5 because @INT(25.768) = 25.

@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.

Population standard deviation is most accurate when the number of observations is large.

Example. @STD(C3..C43) returns the population standard deviation of a list of test scores in C3..C43.

@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.

Example. @STRING(100.357,2) = the string 100.35.

@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. @SUM(B5..B9) returns the sum of the values in B5..B9.

@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 and can be any value.

Salvage represents the value of the asset at the end of its life and 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.

Example. You have an office machine worth $10,000, with a useful life of 10 years, and a salvage value of $1200. You have a worksheet with the $10,000 cost in cell D2, the $1200 salvage value in D3, and the 10-year life in D4. @SYD(D2,D3,D4,5) returns $960, the sum-of-the-years'-digits depreciation allowance for the fifth year.

@TAN

@TAN(x) calculates the tangent of angle x measured in radians. (To convert degrees to radians, multiply by @PI/180.) x can be any value.

Example. @TAN(35*@PI/180) = 0.700207.

@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 (payments at the end of each period).

Examples. You deposit $2,000 at the end of each year into a bank account that earns 7.5% a year, compounded annually. You want to determine how long it will take to accumulate $100,000. @TERM(2000,0.075,100000) returns 21.5, the number of years it will take to accumulate $100,000 in your account.

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)) = 20.8, the number of years it would take to accumulate $100,000 if you made deposits at the beginning of each year.

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)) = 20 years to pay back the loan.

@TIME

@TIME(*hour,minutes,seconds*) calculates the time number for the specified *hour*, *minutes*, and *seconds*. (For an explanation of time numbers, see "Date and Time @Functions" earlier in this chapter.) *Hour* can be any integer from 0 (midnight) to 23 (11:00 PM). *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. (To format time numbers, use /Range Format Date Time.)

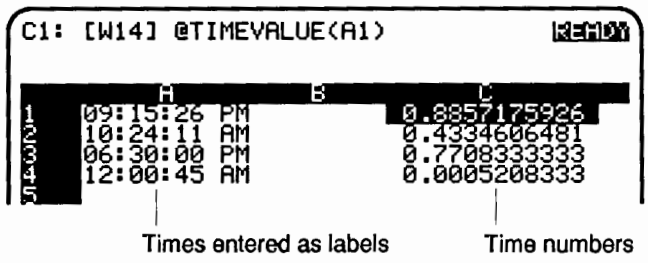
Example. You want to determine a consultant's payment. The formula (@TIME(13,0,0)-@TIME(9,15,0))*95*24 calculates the amount due on a given day by subtracting the start time (9:15 AM) from the stop time (1:00 PM) and multiplying the result by an hourly rate of $95.00. The result is $356.25.

@TIMEVALUE

@TIMEVALUE(*string*) calculates the time number for a *string* that looks like a time. (For an explanation of time numbers, see "Date and Time @Functions" earlier in this chapter.) *String* can be a literal string, the range name or address of a cell that contains a label, or a formula or @function that evaluates to a string. *String* must be in one of the 1-2-3 Time formats (see /Range Format in chapter 11).

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.

Example. In the following figure, 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.



@TRIM

@TRIM(*string*) removes leading, trailing, and consecutive spaces from *string*. *String* can be a literal string, the range name or address of a cell that contains a label, or a formula or @function that evaluates to a string.

Use @TRIM to control spacing during data entry or to combine strings that have unknown spacing.

Example. In this example, each • (bullet) represents one space: @TRIM("45••3/8") = 45 3/8.

@TRUE

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@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 any nonzero value in formulas that evaluate logical conditions, but @TRUE makes the formula easier to read.

Example. @IF(A6>500,@TRUE,@FALSE) = 1 when A6 contains a value greater than 500.

@UPPER

@UPPER(*string*) converts all lowercase letters in *string* to uppercase. *String* can be a literal string, the range name or address of a cell that contains a label, or a formula or @function that evaluates to a string.

Example. @UPPER("Warning") = WARNING.

@VALUE

@VALUE(*string*) converts a number entered as a string to its corresponding value. *String* can be a literal string, the range name or address of a cell that contains a label, or a formula o @function that evaluates to a string. *String* must contain only numbers or numeric symbols; it 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 \P 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 example below.)

Use @VALUE when you want to convert a string that contains numbers into values that can be used in mathematical calculations.

Example. @VALUE("22"+"20") = 0, but
@VALUE("22")+@VALUE("20") = 42.

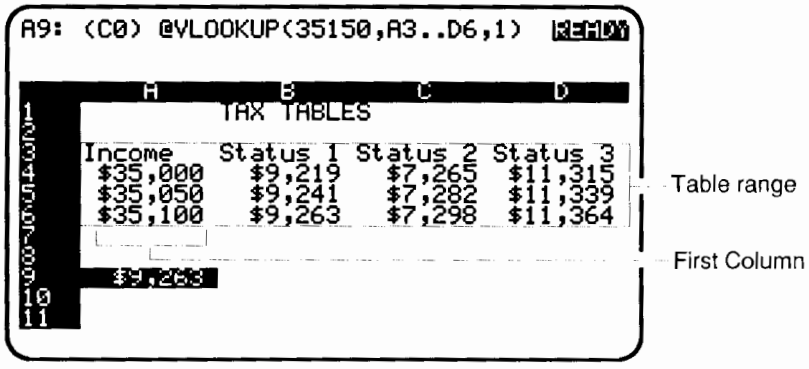
@VAR

@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.

Example. @VAR(B3..B43) returns the population variance of a list of test scores in B3..B43.

@VLOOKUP

@VLOOKUP(*x,range,column-offset*) finds the contents of a cell in the specified column of a vertical lookup table. **A vertical lookup table** is a range with value information in ascending order in the first column.



@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 the 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.

Range represents the location of the vertical lookup table. *Range* can be any range name or address.

Column-offset represents an offset number. The first column has an offset number of 0, the second, 1, and so on.

Use @VLOOKUP to locate entries in a table, such as a tax table or a sales commissions table.

Example. The previous figure contains a tax table. @VLOOKUP(35150,A3..D6,1) entered in A9 returns the amount of tax you would pay if your income was $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.

@YEAR

@YEAR(*date-number*) calculates the year, an integer from 0 (1900) to 199 (2099), in *date-number*. (For an explanation of date numbers, see "Date and Time @Functions" earlier in this chapter.) *Date-number* can be any integer from 1 (January 1, 1900) to 73050 (December 31, 2099).

Examples. @YEAR(20181) = 55 because 20181 is the date number for April 2, 1955.

@YEAR(@NOW) = the current year.

Add 1900 to the result of an @YEAR calculation to convert it into a four-digit year. For example, @YEAR(20181)+1900 returns 1955.

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1-2-3 Macros

A **macro** is a set of commands and keystroke instructions that you create to perform a 1-2-3 task. You enter the macro in a worksheet as one or more labels in a column and assign it a range name. Then, whenever you run the macro, 1-2-3 reads and executes the commands and keystroke instructions automatically.

Macros expedite your work. They save time that would otherwise be spent performing simple but repetitive tasks, and they streamline complex procedures. You can use a macro to enter data or to perform a series of commands that format worksheets, calculate complex formulas with variable data, extract database records for use in a report, and so on.

Note



Some macros that were written assuming an 80 x 25 display may exhibit unexpected behavior on the HP 95LX. (For example, {PGUP}, {PGDN}, {BIGLEFT}, and {BIGRIGHT} commands assume an 80 column display and may not function properly in a macro on the HP 95LX.)

Creating a Macro

Creating a macro involves seven 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 worksheet.

Planning a Macro

The first step in creating a macro involves identifying the tasks you want to automate. For example, suppose you want to create a macro that sets the width of a column to 15. To create the macro, you must know that the task involves selecting /Worksheet Column Set-Width, typing 15 as the column width, and pressing (ENTER).

In some cases, identifying the steps means performing the task once manually and 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

To enter a macro you need to know two things:

- The worksheet location where you will enter the macro.
- How to write the macro instructions.

Choosing a Macro Location

When you enter macros in a worksheet with data, enter the macros below and to the right of 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. For example, if the data occupies the range A1..Z240, put the macro below row 240 and to the right of column Z.

Writing Macro Instructions

Macro instructions are like programming code—they tell 1-2-3 what actions to perform. For example, /wcs15~ is a set of macro instructions that tells 1-2-3 to widen the current column to 15 characters.

Macro instructions can be either **keystroke instructions** (as in the example above) or **advanced macro commands**. (For information on advanced macro commands, see "Using the Advanced Macro Commands" later in this chapter.)

Keystroke instructions can be divided into two groups:

- Instructions that consist of a single character, such as / (slash), w, and ~ (tilde).
- Instructions that consist of a key name within { } (braces), such as {RIGHT}.

The single-character keystroke instructions represent the typewriter keys on your keyboard. Most of these instructions duplicate the character on the key they represent. For example, the keystroke instruction that displays the 1-2-3 main menu is / (slash); the keystroke instruction that selects Worksheet from the main menu is w, and so on.

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 /wcs15~, the tilde enters the specified column width to complete the /Worksheet Column Set-Width command.

Note



Screen scrolling macro commands from macros created on PCs that depend on the 80 x 25 screen size will not be compatible with the HP 95LX. These commands include {BIGRIGHT}, {BIGLEFT}, {PGUP}, and {PGDN}.

The keystroke instructions that consist of a key name within { } (braces) represent the pointer-movement keys, function keys, and a few other keys as shown in the following table:

1-2-3 Key	Macro Keystroke Instruction
▼	{DOWN} or {D}
▲	{UP} or {U}
◀	{LEFT} or {L}
▶	{RIGHT} or {R}
ABS (F4)	{ABS}
APP1 (ALT-F7)	{APP1}
APP2 (ALT-F8)	{APP2}
APP3 (ALT-F9)	{APP3}
APP4 (ALT-F10)	{APP4}
◆	{BACKSPACE} or {BS}
CTRL-◀ or na-TAB	{BIGLEFT}
CTRL-▶ or TAB	{BIGRIGHT}
CALC (F9)	{CALC}
DEL	{DELETE} or {DEL}
EDIT (F2)	{EDIT}
END	{END}
ESC	{ESCAPE} or {ESC}
GOTO (F5)	{GOTO}
GRAPH (F10)	{GRAPH}
HELP (F1)	{HELP}
HOME	{HOME}
INS	{INSERT} or {INS}
NAME (F3)	{NAME}
PGDN	{PGDN}
PGUP	{PGUP}
QUERY (F7)	{QUERY}
TABLE (F8)	{TABLE}
WINDOW (F6)	{WINDOW}
MENU or <	/, <, or {MENU}
~ (tilde)	{~}
{ (open brace)	{ { }
} (close brace)	{ } }

Note



1-2-3 does not have macro key names for the following keys: CAPS LOCK, COMPOSE (ALT-F1), LEARN (ALT-F5), NUM LOCK, PRINT SCREEN, RUN (ALT-F3), SCROLL LOCK, SHIFT (⇧), STEP (ALT-F2), and UNDO (ALT-F4). Therefore, you cannot use these keystrokes in a macro.

Guidelines for Entering a Macro

When you enter a macro, observe the following guidelines:

- Macro instructions must be entered as labels. You can either include the entire set of macro instructions (up to 240 characters) in one label or divide the instructions among a series of labels in consecutive cells in a column. Unless a 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 instruction begins with a number, / (slash), \ (backslash), < (less-than symbol), or one of the numeric symbols . + - @ (# or $, type a label prefix (' " ^ or |) before typing the label.
- Begin and end any instruction in { } (braces), such as {DOWN}, in the same cell. Splitting the instruction between two or more cells results in an error.
- You can type any instruction in braces in uppercase or lowercase letters, or a combination of both.

Note



This section has presented guidelines for entering a macro directly in the worksheet. You can also use the learn feature to enter a macro. See "Using the Learn Feature to Create Macros" later in this chapter.

Naming a Macro

After you enter a macro, assign it a range name. You use the range name to run the macro.

Use /Range Name Create to assign a range name to the macro:

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1. Select /Range Name Create.
2. Specify the macro's name as the range name.
3. Specify the first cell of the macro as the range to name.

Note



If you expect to move the macro around the worksheet, specify the entire macro as the range, not just the first cell. You can then use the range name when moving the macro.

When deciding on a name for your macro, be aware of the following:

- Macro range names can consist of any combination of up to 15 characters. Like any range name, they should not duplicate cell addresses; they should not include spaces, commas, semicolons, or periods; and they should not duplicate @function names, advanced macro command keywords, or 1-2-3 key names.
- If you use a macro range name that consists of a backslash and a single letter, such as \N, you can use the (ALT) key as well as RUN to run the macro. For example, to run the macro named \N, you would hold down (ALT) and press (N). Using (ALT) is the simplest way to run a macro.
- If you use a macro range name that consists of any other combination of characters, such as NEW_ROW, you must either use RUN ((ALT)-(F3)) to execute the macro or call it or branch to it from another macro.

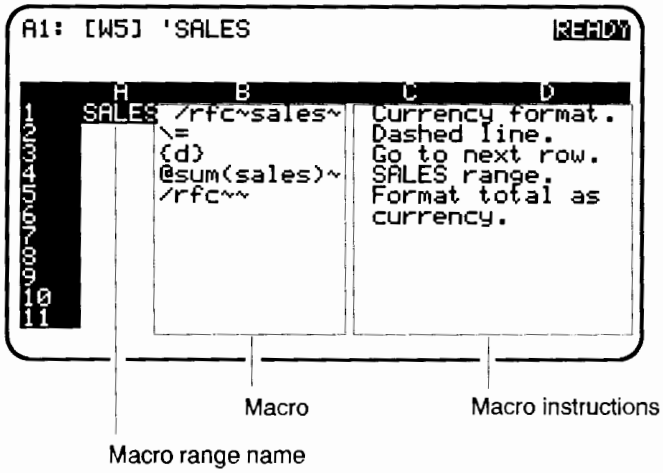
Documenting a Macro

After entering and naming a macro, consider documenting 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 worksheet that contains many named ranges); it clarifies the macro's purpose; and it 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 if you haven't used it for a while.

- Document the macro's range name by entering the name as a label to the left of the first cell of macro instructions.
- 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.

The following figure shows a documented macro. 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.



Running a Macro

After you have entered, named, and documented the macro, try running it to see if it works as planned. If it performs as expected, you can go ahead and use the macro at any time during the current 1-2-3 work session. To use the macro in future sessions, save the worksheet.

You run a macro in one of two ways: with (ALT) or with RUN ((ALT)-(F3)). The method you use depends on the macro's name.

Caution



Before you run the macro, use /File Save to save your work. That way, if the macro produces unexpected results, you can easily retrieve the original version of the worksheet. If the undo feature is on, you can press UNDO ([ALT]-[F4]) immediately after the macro is done executing to restore the worksheet to the way it was before you ran the macro.

Running a Macro with ALT

If the macro's name consists of a backslash and a single letter (for example, \N), you can run the macro by holding down [ALT] and pressing the letter in the macro range name. For example, to run a macro named \N, you would press [ALT]-[N].

Running a Macro with RUN

If the macro's name consists of any other combination of characters (for example, NEW_ROW), you must use RUN ([ALT]-[F3]) to run the macro.

1. Press RUN ([ALT]-[F3]). 1-2-3 displays a menu of range names in the worksheet.
2. To specify the macro to run, do one of the following:
   - Type the macro range name or address and press [ENTER].
   - Highlight the macro range name in the list of range names and press [ENTER].
   - Press [ESC] to switch 1-2-3 to POINT mode, move the cell pointer to the first cell of the macro, and press [ENTER].

Debugging a Macro

If a macro 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—that is, find out which macro instructions are causing the problem and edit them.

Troubleshooting Checklist

If 1-2-3 displays an error message when you run a macro, press HELP ([F1]) while the error message is on the screen to get an explanation of

the message. When you are done using the Help system, press ESC or ENTER to clear the error message. Then 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 {WINDOWOFF} instead of {WINDOWSOFF}.
- Spaces where there shouldn't be any, for example, between arguments in an @function or advanced macro command.
- Missing tildes in a command sequence, for example, /rfp0~ instead of /rfp0~~.
- Missing steps in a command sequence, for example, /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 a nonexistent range name.
- Range names that duplicate macro key names or advanced macro command keywords, for example NAME, END, HELP, or QUIT.
- Missing arguments, arguments of the wrong type, or misplaced or missing argument separators in macros that include advanced macro commands.

Macro error messages 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, check to see if 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 (F2), 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.

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1. With 1-2-3 in READY mode, press STEP (ALT-F2) to turn on STEP mode. The STEP indicator (Stp) appears at the bottom of the screen.
2. Start the macro using one of the methods described in "Running a Macro" earlier in this chapter.
3. Press the space bar (or any key) to execute the first macro instruction.
4. Repeat step 3 as many times as necessary to find the part of the macro that contains the error.

   Each time you press a key, 1-2-3 executes another instruction in the macro and replaces the status line with two pieces of information: the cell address of the cell that contains the macro instructions being executed and the contents of that cell. The current macro instruction (the one to be executed next) is highlighted.

   If the instruction includes an @function or label, each time you press a key, 1-2-3 steps through one character of the @function or label.

   If the macro is getting input because of an advanced macro command such as {GETLABEL} or {?}, key indicators such as Cap may appear in the status line to show you what kind of input the macro is expecting. (Single-step mode indicates that the macro is waiting for user input.)
5. Once you find the error, end the macro by pressing CTRL-BREAK followed by ESC or ENTER.

   When you end the macro to edit it, the Stp indicator reappears to remind you that STEP mode is still on. You do not need to turn off STEP mode to edit the macro.
6. Edit the macro to correct the problem.
7. Run the macro in STEP mode again if you need to locate any other problems.
8. To turn off STEP mode in order to run the macro normally, press STEP (ALT-F2) again and then press any key.

Note



You can turn STEP mode on or off during a macro. To do so, press STEP ((ALT)-(F2)) when 1-2-3 is waiting for input during an interactive command.

Saving a Macro

When the macro is running correctly, save it for future use by saving the worksheet with /File Save. Then you can run the macro any time you retrieve the worksheet.



Using the Learn Feature to Create Macros

In addition to typing macros directly into the worksheet, you can use the 1-2-3 learn feature to create a macro. When you use this feature, 1-2-3 records all your keystrokes in a **learn range**, a single column range that you define.

The learn feature has the advantage of letting you record a macro and test it at the same time. Because you are performing the procedure that will be automated in the macro, you can see on the screen exactly what will happen when the macro runs. The learn feature also minimizes the possibility of syntax errors because it records the keystrokes in the learn range in the correct format. You simply press keys and respond to the menus and prompt lines as they appear.

To create a macro with the learn feature, you go through four basic steps:

1. Specify a learn range for the macro and turn on the learn feature.
2. Record keystrokes in the learn range by performing the task you want to automate.
3. Name the macro by assigning a range name to the first cell of the learn range.
4. Run the macro to see if it works and, if necessary, edit it so it works the way you planned.

Specifying a Learn Range

To use the learn feature, you must first specify a learn range in an empty part of the worksheet where the macro cannot interfere with data. You need to specify a single column range.

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1. Select /Worksheet Learn Range.
2. Specify a single column range when prompted.

You are now ready to turn on the learn feature and start recording keystrokes.

Recording Keystrokes in the Learn Range

The 1-2-3 learn feature records keystrokes in macro instruction format. For example, when you press GOTO ([F5]), type a5, and press [ENTER], 1-2-3 records {GOTO}a5~. Also, the program uses abbreviated instructions (like {D} for ▼ instead of {DOWN}) whenever it can.

1-2-3 does not record any /Worksheet Learn commands while you're using the learn feature. It also doesn't record the following keys in the learn range: [COMPOSE], [LEARN], [RUN], [UNDO], [⇧], [CAPS], [STEP], or [SCRL]. In addition, learn will not record [HELP] or any keystrokes you enter while using Help.

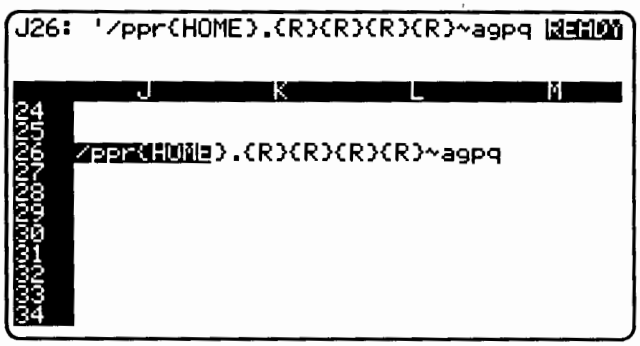
1. Move the cell pointer to the cell where you want to start the task.
2. Press LEARN ([ALT]-[F5]). The Learn indicator (Learn) appears at the bottom of the screen. As long as the Learn remains on, 1-2-3 records each of your keystrokes in the learn range.
3. Perform the task or series of tasks you want to record. If you want to include another macro in the one you're recording, enter its range name in braces, for example, {TOTAL}. When you execute the macro, 1-2-3 will execute the macro you have included and then return control to the original macro.

   You can also include advanced macro commands into a macro created with the learn feature by typing the commands directly into the learn range.
4. After you finish, press LEARN ([ALT]-[F5]) again to stop 1-2-3 from recording any more keystrokes.

5. Move the cell pointer to the learn range and examine the recorded keystrokes. If you made mistakes while performing the task, 1-2-3 recorded them, so edit them before going any further. (Be sure not to leave any empty cells in the middle of the macro or 1-2-3 will interpret the blank cell as the end of the macro.)

   If you made many mistakes and want to start over, erase the learn range with /Worksheet Learn Erase and start again at step 1.
6. If the macro looks correct, name it and run it just as you would a macro you had entered yourself.

The following figure shows a learn range with the recorded keystrokes for performing a print operation.



Using the Advanced Macro Commands

An **advanced macro command** is a macro instruction that tells 1-2-3 to perform a built-in programming function. For examples, the advanced macro command {LET} tells 1-2-3 to enter a label or number in a cell, and {BEEP} tells 1-2-3 to sound your computer's bell.

Types of Advanced Macro Commands

The 50 advanced macro commands in 1-2-3 can be grouped in five command categories:

- **Data manipulation commands** enter data, edit existing entries, erase entries, and clear control panel prompts.
- **File manipulation commands** work with text files. Text files, also called print files, are files on disk in ASCII format. 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 for loops, branches, subroutine calls, and conditional processing.
- **Interactive commands** suspend macro execution for keyboard input, control the timing of macro execution, and prevent undesired changes to a worksheet while a macro is running.
- **Screen control commands** control different parts of the screen display, change the contents of the mode indicator, and sound your computer's bell.

The following tables list the 50 advanced macro commands by category and briefly describes each command. For a more complete description of the commands and examples of how they work, see "Advanced Macro Command Descriptions."

Data Manipulation

{BLANK}	Erases a cell or range.
{CONTENTS}	Copies the formatted value of one cell to another cell as a label.
{LET}	Enters a label or number in a cell.
{PUT}	Enters a label or number in a range.
{RECALC}	Recalculates formulas in a range row by row.
{RECALCCOL}	Recalculates formulas in a range column by column.

File Manipulation

{CLOSE}	Closes the open text file (the file you are currently working with).
{FILESIZE}	Records in a cell the number of bytes in the open text file.
{GETPOS}	Determines the position of the byte pointer in the open text file and records that position in a cell.
{OPEN}	Opens a text file so you can work with that 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}	Repositions the byte pointer in the open text file.
{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.

{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.
{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 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 terminating at the error.
{QUIT}	Ends a macro, returning keyboard control to the user.
{RESTART}	Clears the subroutine stack. 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}	The {SYSTEM} macro command is not available on the HP 95LX.

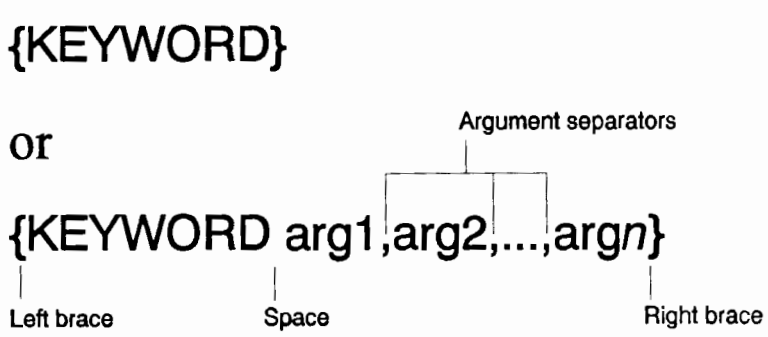
{?}	Suspends macro execution to let you move the cell pointer or enter data.
{BREAK}	Has the effect of pressing CTRL-BREAK (equivalent to pressing ESC one or more times), so you can return 1-2-3 to READY mode.
{BREAKOFF}	Disables CTRL-BREAK while a macro is running, protecting the macro from interruption.
{BREAKON}	Restores use of CTRL-BREAK, undoing {BREAKOFF}.
{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 numeric response to the prompt, and enters the response as a number in a cell.
{LOOK}	Checks the computer's keyboard buffer (the buffer in which 1-2-3 stores keystrokes during noninteractive parts of a macro) and records the first keystroke in the buffer 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 for a specified duration.

Screen Control

{BEEP}	Sounds your computer's bell.
{BORDERSOFF}	Turns off display of the worksheet frame (column letters and row numbers). (Works the same as {FRAMEOFF}.)
{BORDERSON}	Restores display of the worksheet frame, reversing {BORDERSOFF}. (Works the same as {FRAMEON}.)
{FRAMEOFF}	Turns off display of the worksheet frame (column letters and row numbers). (Works the same as {BORDERSOFF}.)
{FRAMEON}	Restores display of the worksheet frame, reversing {FRAMEOFF}. (Works the same as {BORDERSON}.)
{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, undoing {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. The following figure shows the syntax of advanced macro commands:



The first word in an advanced macro command is the keyword. The keyword is often the verb in the command—it tells 1-2-3 what action to perform.

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 the cell named TOTAL) and the second argument, @SUM(EXPENSES), tells 1-2-3 what data to enter (the value of @SUM(EXPENSES)).

Arguments

Advanced macro commands use four types of information as arguments: numbers, strings, locations (cells or ranges), and conditions (usually logical formulas).

- For number 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, or colons within the literal string as argument-type specifiers (see "Declaring Argument Types" in the {DEFINE} section later in this chapter).

- For location arguments, you can use a range name, address, or any formula that evaluates to a range name or address. You can precede the location with a + (plus) if you want to indicate that it contains a reference to another cell or range.
- 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, you can also use any numeric or string formula, number, literal string, or cell reference as a condition argument.

Also, you can use a link to data in another file as an argument to a macro, for example, {let revenues,+<<chicago>>sales}. For more information on links, refer to "Linking Files" in chapter 2.

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. By default, semicolons and commas are valid argument separators for advanced macro commands, and the examples in this chapter always use commas. You can, however, use /Worksheet Global Default Other International Punctuation to set a different argument separator. See chapter 13 for information on this command.
- 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 240.

Worksheet Recalculation and Advanced Macro Commands

When you run a macro with the worksheet recalculation method set to Automatic (see /Worksheet Global Recalculation Automatic in chapter 13), 1-2-3 does not recalculate all data continuously. Automatic recalculation of advanced macro commands occurs if the user enters data in the worksheet in response to a {?} command or if you have followed a command such as {LET} or {GET} with a ~ (tilde) to represent the ENTER key (which 1-2-3 interprets as user input). Suppose you have a series of {LET} commands, but no user data entry in response to a {?} command. If any other commands in the macro depend on the results of the {LET} command, you'll need to recalculate the worksheet, either by following the last {LET} command with a ~ (tilde) or by including a {RECALC} or {RECALCOL} command.

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.

15 **Note**



In addition to the advanced macro commands, 1-2-3 Release 2.2 also supports the /X macro commands originally included in 1-2-3 Release 1A. The have been retained in Release 2.2 for compatibility, although each one has a corresponding advanced macro command.

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 you can enter them in uppercase or lowercase letters.
- [ ] (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 a 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}.

{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 the current macro instructions.

When 1-2-3 encounters a {subroutine} command, it does the following:

1. Shifts macro control from the current macro cell to the specified subroutine. (***subroutine*** is the range name 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.

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. These examples illustrate {subroutine} commands without arguments. See {DEFINE} for {subroutine} commands that include arguments.

The following macro 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.

```
{GOTO}ONE~{SUBR1}
{GOTO}TWO~{SUBR1}
{GOTO}THREE~{SUBR1}
{GOTO}MESSAGE_CELL~
All done!~
```

In this excerpt from a macro, 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.

```
{IF AGE<21}{MINOR}{QUIT}
{MAJOR}
```

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 rest of the instructions in the first subroutine. Putting subroutine calls within other subroutines is called **nesting** subroutines, or creating a **subroutine stack**. The number of subroutines you can include in a stack is limited to 32. To clear a subroutine stack, use {RESTART}.

In general, avoid using a {BRANCH} command to leave a subroutine. Using it can cause stack nesting problems and result in an error.

{?}

{?} suspends macro execution to let you move the cell 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. The following macro 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.

```
'/rfc2~{?}~
```

The following macro 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.

```
{GOTO}ERR_MSG~
{?}
```

{BEEP}

{BEEP [*tone-number*]} sounds your computer's bell. Use {BEEP} to signal the end of a macro or 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}.

Example. The following macro sounds your computer's bell twice, using two different tones, to draw your attention to the subsequent interactive command.

```
{BEEP}{BEEP 4}
{?}
```

{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.

Example. This macro erases the current cell and then resets the cell to the worksheet's global cell format:

```
{BLANK @CELLPOINTER("address")}
/rfr~
```

{BORDERSOFF} and {BORDERSON}

{BORDERSOFF} suppresses display of the worksheet frame (column letters and row numbers). The worksheet frame remains hidden until 1-2-3 reaches a {BORDERSON} command or the macro ends. When the macro ends, the borders return to their default state of being displayed. {BORDERSOFF} and {BORDERSON} are identical in functionality to {FRAMEOFF} and {FRAMEON}.

Note



If a {WINDOWSOFF} command was executed earlier in the macro, be sure to precede {BORDERSOFF} or {BORDERSON} with a {WINDOWSON} command. The effects of {BORDERSOFF} or {BORDERSON} will not be visible until you turn screen redrawing back on.

15

Example. The following macro turns off display of the worksheet frame during a {?} command so the column letters and row numbers do not distract the user, and then redisplays the worksheet frame.

```
{BORDERSOFF}
{?}
{BORDERSON}
```

{BRANCH}

{BRANCH *location*} transfers macro control from the current macro cell 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 CTRL-BREAK can interrupt).

{BRANCH} produces different results from {*subroutine*}. {*subroutine*} executes the specified subroutine and then returns control to the original macro instructions. {BRANCH}, on the other hand, transfers macro control to the new location permanently. Control does not return to the original macro instructions when 1-2-3 completes the instructions in the branch location.

Examples. This macro transfers macro control to location TALL or SHORT, depending on whether the value in cell HEIGHT is greater than 100:

```
{IF HEIGHT>100}{BRANCH TALL}
{BRANCH SHORT}
```

The following macro (named \A) creates an infinite loop for data entry. It enters the data you supply during the {?} command in subsequent cells down a column until you press CTRL-BREAK to end the macro.

{?}{DOWN}
{BRANCH \A}

{BREAK}

{BREAK} produces the effect of pressing CTRL-BREAK so you can return 1-2-3 to READY mode. {BREAK} simulates pressing ESC one or more times; it will not interrupt a macro.

{BREAKOFF} and {BREAKON}

{BREAKOFF} disables CTRL-BREAK while a macro is running. Normally, you can stop a macro at any time by pressing CTRL-BREAK. While {BREAKOFF} is in effect, however, you cannot use CTRL-BREAK to stop the macro.

{BREAKON} restores use of CTRL-BREAK while a macro is running, 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 restart your HP 95LX (press CTRL-ALT-DEL).

Example. In the following excerpt from a macro, assume subroutine PAYROLL_INPUT extracts payroll information to a master file. The macro disables CTRL-BREAK before starting the PAYROLL_INPUT subroutine to make sure information is copied without any interruption. When the PAYROLL_INPUT subroutine ends, it restores use of CTRL-BREAK.

{BREAKOFF}
{PAYROLL_INPUT}
{BREAKON}

{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, so you should keep {CLOSE} on a separate line.

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 don't need a {CLOSE} command before the {OPEN} command. 1-2-3 does not, however, 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.

Example. The following macro opens a text file named SCHEDULE.PRN with append access, adds a line to the file reporting the supervisor for a particular shift, and closes the file. (Without the {CLOSE} command, SCHEDULE.PRN would remain open at the end of the macro, so in a subsequent macro you could continue processing SCHEDULE.PRN without using an {OPEN} command.)

```
{OPEN SCHEDULE.PRN,A}
{WRITELN+"Shift:"&SHIFT&"Supervisor:"&SUPERVISOR}
{CLOSE}
{QUIT}
```

{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 whose contents look like a numeric cell in the specified format. The *target-location* does not have its format changed.

Width can be a number, numeric formula, or reference to a cell that contains a number or numeric formula whose value is from 1 to 240.

Cell-format must be one of the code numbers from the following list, 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 11 or /Worksheet Global Format in chapter 13.

Code Number	Corresponding 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)
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 must include a *width* argument to use the *cell format* argument. If you do not include the *width* and *cell-format* arguments, the label 1-2-3 creates in *target-location* has the same width and format as that in *source-location*.

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. In the explanations of the examples, each • (bullet) represents one space.

The following macro enters the nine-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}
+"Today we earned"&REPORT~
```

15 The following macro enters the label +GROSS-EXP• in REPORT (because 117 formats the cell as Text), then creates the sentence `The formula for earnings is: +GROSS-EXP` and enters it in the current cell.

```
{CONTENTS REPORT,INCOME,11,117}
+"The formula for earnings is:•"&REPORT~
```

{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.

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.

When you use suffixes with {DEFINE}, 1-2-3 treats the suffix as an additional argument. This means that you can have a maximum of 15 arguments (rather than the usual 31) passed by a subroutine.

Examples. (In these examples, each • (bullet) represents one space.)

In the following excerpt from a macro, 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 and enters in that 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. The result of this macro might therefore be: 09-Mar Closing Price: $123.35.

```
\A          {SUBR1 @NOW,+"Closing"&"•Price:",CLOSING}
              ⋮

SUBR1       {DEFINE ONE:V,TWO:V,THREE:V}
            /rfd2~{LET @CELLPOINTER("address"),ONE}{R}
            {LET @CELLPOINTER("address"),TWO}{R}
            /rfc2~~{LET @CELLPOINTER("address"),THREE}
```

In the next example, the {*subroutine*} command in macro \A passes three arguments to SUBR1. The {DEFINE} command at the beginning of SUBR1 stores the label @NOW 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. The result of this macro is therefore: @NOW +"Closing"&"Price:" CLOSING.

```
\A          {SUBR1 @NOW,+"Closing"&"•Price:",CLOSING}
              :

SUBR1       {DEFINE ONE,TWO,THREE}
            {LET @CELLPOINTER("address"),ONE}{R}
            {LET @CELLPOINTER("address"),TWO}{R}
            {LET @CELLPOINTER("address"),THREE}
```

15

{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. Location must be a single cell.

Example. The following 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.

```
{LET SWITCH,"NEITHER_OWES"}
{IF YOURS>MINE}{LET SWITCH,"YOU_OWE"}
{IF YOURS<MINE}{LET SWITCH,"I_OWE"}
{DISPATCH SWITCH}
```

{FILESIZE}

{FILESIZE *location*} enters a number in *location*. This number reports the number of bytes in the open text file. You must open a text file with {OPEN} before using {FILESIZE}.

If 1-2-3 succeeds in executing a {FILESIZE} command, it goes directly to the next cell in the macro, skipping any further instructions in the same cell as the {FILESIZE} command. If 1-2-3 cannot report on the number of bytes because a file is not open, it continues to the next macro instruction in the same cell as {FILESIZE}.

Example. In the following macro, 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. (Note that {SETPOS 0} resets the file position to the first byte in the file.)

```
{FILESIZE BYTES}{BRANCH NO_OPEN_FILE}
{SETPOS 0}
{READ BYTES,FILECONTENTS}
```


{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. You can precede both *counter* and *subroutine* with a + (plus) to indicate they contain an address of another cell.

When 1-2-3 encounters a {FOR} command, it does the following:

1. Enters *start-number* in *counter* (*counter* is a cell in the worksheet).
2. Compares the number in *counter* with *stop-number*. If the number in *counter* is less than or equal to *stop-number*, 1-2-3 performs a subroutine call to *subroutine* and goes to step 3. If the number in *counter* is greater than *stop-number*, 1-2-3 does not perform a subroutine call to *subroutine*. Instead, 1-2-3 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.

Examples. This macro repeats subroutine FORMAT 10 times, keeping track of the repetitions in a cell named REP_NUM:

```
{FOR REP_NUM,1,10,1,FORMAT}
```

This macro repeats subroutine FORMAT four times:

```
{FOR REP_NUM,2,9,2,FORMAT}
```

{FORBREAK}

{FORBREAK} ends a for loop created by a {FOR} command. Macro execution continues at the instruction immediately following the {FOR} command. Use {FORBREAK} only within a for loop or the macro will terminate with an error.

15

Example. In the following example, 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. (In the example, each • (bullet) represents one space.)

```
\A        {BLANK ROSTER}
          {GOTO}ROSTER~
          {FOR I,1,10,1,ENTRY}
            :

ENTRY     {GETLABEL"Enter name:•",@CELLPOINTER("address")}
          {IF @CELLPOINTER("contents")=""}{FORBREAK}
          {DOWN}
```

{FRAMEOFF} and {FRAMEON}

{FRAMEOFF} and {FRAMEON} are identical to {BORDERSOFF} and {BORDERSON}. Refer to those descriptions for information.

{GET}

{GET *location*} suspends macro execution until you press a key, then records your keystroke as a left-aligned label in *location*. You can press any typewriter key or any of the keys listed in the table in "Entering a Macro" earlier in this chapter, except for CTRL-BREAK.

Example. The following macro checks to see if it's after 6:00 PM when you press CALC (F9) because you don't want to miss dinner for a long recalculation of the worksheet.

```
                {GET testkey}
                {IF testkey="{CALC}"}{BRANCH CHECK_TIME}
                {BRANCH TESTKEY}
                {CALC}
CHECK_TIME      {IF (@NOW - @INT(@NOW))>@TIME(18,0,0)}{QUIT}
```

{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.

You can use any literal string, with as many characters as fit within the control panel edit line, as *prompt*. *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.

The response to the prompt can include up to 240 characters. If you press ENTER without typing anything, 1-2-3 enters an ' (apostrophe) label prefix in *location*. If you enter a numeric value, it's converted to a label in *location*.

Example. The following macro prompts you for your first name, enters it in cell FIRST, then prompts you for your last name and enters it in cell LAST. (In the example, each • (bullet) represents one space.)

```
{GETLABEL "Type your first name:•",FIRST}~
{GETLABEL "Now type your last name:•",LAST}~
```

{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.

You can use any literal string, with as many characters as fit on the control panel edit line, as *prompt*. *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.

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 240 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.

Example. This macro prompts you for your age, then enters your response in the current cell. (In the example, each • (bullet) represents one space.)

15

```
{GETNUMBER "Age:•",@CELLPOINTER("address")}~
```

{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. You must open a text file with {OPEN} before using {GETPOS}.

If 1-2-3 succeeds in executing the {GETPOS} command, it continues to the next cell in the macro. If no file is open, 1-2-3 ignores a {GETPOS} command and continues to the next macro instruction in the same cell as {GETPOS}.

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.

Example. The following excerpt from a macro records the current position of the byte pointer in cell POINTER, if a text file is open, and goes immediately to the next cell for further instructions. If a text file is not open, the macro branches to location NO_GO.

```
{GETPOS POINTER}{BRANCH NO_GO}
```

Computer Museum

{GRAPHOFF} and {GRAPHON}

{GRAPHON [*named-graph*],[nodisplay]} 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 a {GRAPHOFF} command, another {GRAPHON} command, an {INDICATE} or {?} command, a command that displays a prompt or menu in the control panel ({GETLABEL}, {GETNUMBER}, {MENUCALL}, {MENUBRANCH}), or the end of the macro, 1-2-3 removes the graph from the screen.
- {GRAPHON *named-graph*} makes the *named-graph* settings the current graph settings and displays a full-screen view of *named-graph* while the macro continues to run. When 1-2-3 reaches any of the conditions listed above, the *named-graph* is removed from the screen.
- {GRAPHON *named-graph*,nodisplay} makes the *named-graph* settings the current graph settings without displaying the graph.

{GRAPHOFF} removes a graph displayed by a {GRAPHON} command and redisplays the worksheet.

Examples. The following excerpt from a macro erases cell KEY in preparation for the {LOOK} {IF} sequence, then displays the current graph. 1-2-3 waits one second and then performs the {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, 1-2-3 waits another second and then repeats the {LOOK} {IF} sequence. If the user pressed a key, 1-2-3 removes the graph and continues the macro. (The {GET KEY} statement removes the key from the keyboard buffer.)

```
\A      {BLANK KEY}
        {GRAPHON}
LOOP    {WAIT @NOW+@TIME(0,0,1)}
        {LOOK KEY}
        {IF KEY=""}{BRANCH LOOP}
        {GET KEY}
        {GRAPHOFF}
         :
```

This macro displays three consecutive graphs (LINE, BAR, and PIE) at 2-second intervals and then redisplays the worksheet:

```
{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}
```


{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.

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).

Example. In the following macro, if cell TESTVAL evaluates to true (not zero), the macro executes subroutine {RTN1} and subroutine {RTN2}. Otherwise, the macro executes only subroutine {RTN2}.

```
{IF TESTVAL=1}{RTN1}
{RTN2}
```

{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 in the control panel. The indicator displays READY, EDIT, WAIT, LABEL, VALUE, and so on, depending on the current operation.

Examples. This macro displays 1 in the mode indicator, whose width shrinks to one character:

```
{INDICATE "1"}
```

This macro displays the contents of cell MSG in the mode indicator:

```
{INDICATE MSG }
```

{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. You can also precede *location* with a + (plus) to indicate it contains the address of a cell where you want to store the entry. *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.

Examples. In the following examples, each • (bullet) represents one space.

This macro, if cell QTR_1 exists, enters the result of 1.5 times the value of cell QTR_1 in cell QTR_2. Otherwise it enters 1.5*QTR_1 as a label in cell QTR_2.

{LET QTR_2,1.5*QTR_1}~

The following macro, if cell NAME exists, enters the result of the string formula +"Mr.•"&NAME in cell CUSTOMER. If cell NAME does not exist, it enters +"Mr.•"&NAME as a label in cell CUSTOMER.

{LET CUSTOMER,+"Mr.•"&NAME}~

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 evaluate the argument before entering it.

The following macro, if cell NAME exists, enters the result of the string formula +"Mrs.•"&NAME in cell CUSTOMER. If cell NAME does not exist, the macro terminates with an error message.

{LET CUSTOMER,+"Mrs.•"&NAME:v}~

{LOOK}

{LOOK *location*} checks the keyboard 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 keyboard 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 keyboard buffer in the next {?}, {GET}, {GETLABEL}, or {GETNUMBER} command.

Example. The following macro erases the current contents of cell IN_CHAR in preparation for the {LOOK} command. It then displays an instruction in the control panel for 2 seconds and gives you 5 seconds to start typing after it clears the instruction. During those 5 seconds, 1-2-3 constantly checks the keyboard 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 5 seconds, 1-2-3 beeps, scolds you for your sluggishness, and ends the macro.

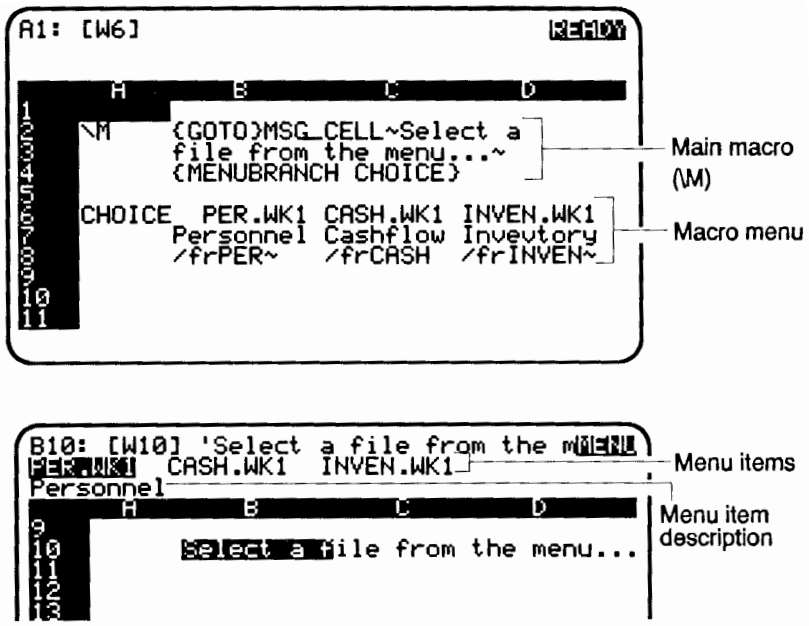
```
\A          {BLANK IN_CHAR}
            Enter your name when this message clears
            {WAIT @NOW+@TIME(0,0,2)}{ESC}
            {LET ENDTIME,@NOW+@TIME(0,0,5)}
LOOP        {LOOK IN_CHAR}
            {IF IN_CHAR<>""}{BRANCH NEXT_STEP}
            {IF @NOW<ENDTIME}{BRANCH LOOP}
            {BEEP}You're too slow!{GET IN_CHAR}{ESC}{QUIT}
```


{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.

{MENUCALL *location*} displays in the control panel the macro menu found at location. After you select an item from the menu, 1-2-3 performs the associated macro instructions as a subroutine. When 1-2-3 completes the instructions, macro control returns to the statement in the original macro that follows {MENUCALL}.

A *macro menu* is a menu you set up for use during a macro. 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. The following figures show a macro menu in a range named FILE_CHOICE (the macro menu is part of macro \M) and the control panel when the menu is activated with the command {MENUBRANCH FILE_CHOICE} (in macro \M).



Note

If macro menus are greater than the screen width (including the spaces between each menu), they will wrap to the third line of the control panel, and no long prompts will display.

Creating a Macro Menu

1. Decide on a location for the macro menu.
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. Follow these guidelines when entering menu items:
   - You can enter labels or string formulas as the menu items. If you enter a formula, 1-2-3 displays the resulting label as the menu item.
   - You can have up to eight menu items.
   - 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.

- 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.
- The combined menu items and delimiting spaces are restricted to the screen width. If you exceed the width of the screen, an error will occur.

3. Enter the description for each menu item in the cell directly below the menu item. You can enter labels or string formulas as menu item descriptions. The description of each menu item cannot exceed the width of the screen, or an error will occur.
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 menu item in your 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; when 1-2-3 completes the instructions, macro control returns to the statement in the original macro that follows {MENUCALL}.

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 {MENUBRANCH} or {MENUCALL} command was issued, and the macro continues at the instruction that follows the {MENUBRANCH} or {MENUCALL} command. Once you choose a menu item, you must either complete the macro or press (CTRL)-(BREAK) to exit the macro.

Examples. The following macro 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.

```
{MENUBRANCH MACROMENU}
{BEEP}
```

The following macro 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.

```
{MENUCALL MACROMENU}
/fs~r
```

{ONERROR}

{ONERROR *branch-location*,[*message-location*]} traps and handles errors that occur while a macro is running.

Note



{ONERROR} does not trap macro syntax errors (typing errors in macro instructions that prevent 1-2-3 from interpreting the instructions). When 1-2-3 encounters a syntax error, it ends the macro and displays an error message that describes the error.

Normally, if an error occurs while a macro is running, 1-2-3 displays an error message, 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 instead of ending the macro. If you include the optional ***message-location*** argument, 1-2-3 records the error message (in most cases, excluding the - press HELP (F1) portion of the message) in ***message-location***.

An {ONERROR} command remains in effect until (1) an error occurs (each {ONERROR} command can handle only one error), (2) it is superseded by a subsequent {ONERROR} command, or (3) the macro ends. Use {ONERROR} at any point in which there is a possibility of an error.

In addition, {ONERROR} clears the subroutine stack. 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 at the {ONERROR} ***branch-location***.

Note



Pressing CTRL-BREAK causes a 1-2-3 error. Therefore, if you press CTRL-BREAK while an {ONERROR} command is in effect, the command will trap that error rather than the one you want it to trap. You may want to disable CTRL-BREAK with {BREAKOFF} if you are using {ONERROR} to trap a specific error.

Example. In the following example, 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 to retrieve another file. (In this example, the • (bullet) represents one space.)

```
\A          {ONERROR FILEERR,ERRMSG}
            {GETLABEL "Enter file name:•",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}
```


{OPEN}

{OPEN *file-name,access-type*} opens a text file for read-only processing, write-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.

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 as {OPEN}.

File-name is the full name (including the extension) of a text file. *File-name* can also be the range name or cell address containing the full 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. All of the following are examples of valid *file-name* specifications:

```
PASTDUE.PRN
"A:PASTDUE.PRN"
"\ACCOUNTS\PASTDUE.PRN"
"C:\BUSINESS\ACCOUNTS\PASTDUE.PRN"
```

Access-type is one of the four characters r, w, m, or a (in uppercase or lowercase letters), or a range name or cell address 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}, {READLN}, {GETPOS}, and {SETPOS} but not {WRITE} and {WRITELN} with a file opened with read access.
- w (write access) opens a new file for reading and writing. You can use {READ}, {READLN}, {GETPOS}, {SETPOS}, {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}, {GETPOS}, {SETPOS}, {WRITE}, and {WRITELN} with a file opened with modify access.
- 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}, {GETPOS}, {SETPOS}, {WRITE}, and {WRITELN} with a file opened with append access.

When opening a new file (a file that does not yet exist in the specified directory), you can use write access only. If you try to open a new file with read, modify, or append access, the {OPEN} command will fail.

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. In the following macro, if a file named PASTDUE.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, and closes the file. If a file named PASTDUE.PRN does not exist in the current directory, 1-2-3 branches to PLANB for further instructions.

```
{OPEN PASTDUE.PRN,r}{BRANCH PLANB}
{READLN FULLNAME}
{CLOSE}
```

In the following macro, if a file named PASTDUE.PRN exists in the current directory, 1-2-3 opens the file, writes over the first five bytes in the file with the string Hello, and closes the file. If a file named PASTDUE.PRN does not exist in the current directory, 1-2-3 branches to PLANB for further instructions.

```
{OPEN PASTDUE.PRN,m}{BRANCH PLANB}
{WRITE "Hello"}
{CLOSE}
```

{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 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 that cause changes in the control panel—{MENUBRANCH}, {MENUCALL}, {GETLABEL}, {GETNUMBER}, {WAIT}, and {INDICATE}—override a {PANELOFF} condition.

Example. The following macro freezes the control panel so you don't see the prompts and menus that normally appear during the /Range Erase command:

```
{PANELOFF}
/reDATA_RANGE~
{PANELON}
```


{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 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).

Examples. The following examples assume range COSTS occupies the range A1..D5 and that each • (bullet) represents one space.

This macro copies the contents of cell MONTH to cell C1. If cell MONTH contains a formula, 1-2-3 copies the current value of the formula to cell C1.

```
{PUT COSTS,2,0,MONTH}~
```

The following macro takes the contents of cell MONTH (a label for a month), adds the year 1991 to it, and copies it to cell C1.

```
{PUT COSTS,2,0,+MONTH&"•1991"}
```

{QUIT}

{QUIT} ends a macro immediately, returning keyboard control to the user. Any instructions that follow a {QUIT} command in a macro are never completed. Even if you use {QUIT} in a subroutine, the command ends the entire macro, not just the subroutine.

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Example. In the following excerpt from a macro, 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}{QUIT}
   :
```

{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.

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 240. 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 240 as *byte-count* is equivalent to using 240.

{READ} copies the carriage return and line feed at the end of text lines. If you don't want to copy the carriage return and line feed, use {READLN}.

You must open a text file with {OPEN} before you use {READ}.

If 1-2-3 succeeds in reading the specified file, it goes directly to the next cell in the macro, skipping any further instructions in the same cell as the {READ} command. If the text file is not open, 1-2-3 ignores the {READ} command and continues to the next instruction in the same cell as the {READ} command.

Examples. The following examples assume the open text file contains these two lines:

```
Total Sales
for the Year Ending 1990
```

and that the byte pointer is on the T in Total (position 0).

The following macro enters the left-aligned label Total Sa (the first eight bytes in the file) in cell CHARS and advances the byte pointer to the position eight (the l in Sales).

{READ 8,CHARS}

The following macro enters in cell CHARS a 15-character, left-aligned label that starts with the T in Total and ends with the o in for, and advances the byte pointer to the r in for. The twelfth and thirteenth characters in the label represent the carriage return and line feed at the end of the first line.

{READ 15,CHARS}

{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.

With {READLN}, 1-2-3 does not copy the end-of-line sequence (carriage return and line feed) to the worksheet. To copy these to the worksheet, use {READ}.

You must open a text file with {OPEN} before you use {READLN}.

If 1-2-3 succeeds in reading the specified file, it goes directly to the next cell in the macro, skipping any further instructions in the same cell as the {READLN} command. If the text file is not open, 1-2-3 ignores the {READLN} command and continues to the next instruction in the same cell as the {READLN} command.

Examples. The following examples assume the open text file contains these two lines:

Total Sales
for the Year Ending 1990

and that the byte pointer is on the S in Sales (position 6).

The following macro enters the left-aligned label Sales in cell FIRST and the left-aligned label for the Year Ending 1990 in cell SECOND.

{READLN FIRST}
{READLN SECOND}

The following macro enters the left-aligned label Sales in cell LINE, immediately writes over it with the left-aligned label for the Year Ending 1990, 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.


```
{READLN LINE}
{READLN LINE}{BEEP}
{GETPOS POS}
```

{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.

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. You need to include both optional arguments together—1-2-3 repeats the recalculation until *condition* is true or until it has performed the specified number of recalculation passes, whichever happens first.

Condition is typically a logical formula or reference to a cell containing a logical formula, but it can be any formula, number, literal string, or cell reference. 1-2-3 evaluates any *condition* that does not equal zero as true and any *condition* that equals zero as false. Blank cells, strings, and ERR and NA values all equal zero when used as condition. *Iterations* can be a number, numeric formula, or reference to a cell that contains a number or numeric formula. You cannot use the *iterations* argument without the *condition* argument.

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*.

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}, include a {CALC} instruction in the macro, change worksheet recalculation to Automatic, or press CALC ((F9)) when the macro ends.

Examples. Assume the following 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. (Because recalculation proceeds row by row, 1-2-3 recalculates cell D4 before cell A8, and the result is accurate.)

{RECALC RANGE_1}

The following macro continuously recalculates range PAYMENT, column by column, until the value in cell VAL falls below 100 or the number of recalculation passes equals 50.

{RECALCCOL PAYMENT,VAL<100,50}

{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.

Example. In this example, the *subroutine* command {CKS} called the subroutine. In this excerpt from a macro, if cell CKST contains the label not ok or a string formula that evaluates to not ok, the macro ends after 1-2-3 completes the remainder of subroutine CKS. If cell CKST contains any other label, macro control returns to the location from which the subroutine call CKS was issued after 1-2-3 completes the remainder of the subroutine.

```
CKS     :
        {IF CKST="not ok"}{RESTART}
        :
        {RETURN}
```

15 {RETURN}

{RETURN} affects flow of control in subroutines. In a subroutine called by {subroutine} or {MENUCALL}, {RETURN} immediately returns macro control from the subroutine to the location from which the {subroutine} 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.

When used in the main body of macro instructions rather than in a subroutine, {RETURN} is equivalent to {QUIT}; it ends the macro immediately.

Note



{RETURN} is optional in a subroutine. If a macro encounters a blank cell at the end of a subroutine, it interprets this as a {RETURN}.

Example. In this example, the subroutine SAVE is called with the {subroutine} command. 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.

```
SAVE    {GETLABEL "Do you want to save (Y/N):",INPUT}
        {IF INPUT="n"}{RETURN}
        {IF INPUT="y"}/fs~r{RETURN}
        {BRANCH SAVE}
```

Computer Museum

{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.

You must open a text file with {OPEN} before you use {SETPOS}.

If 1-2-3 succeeds with the {SETPOS} command, it goes to the instructions in the next cell, skipping any further instructions in the same cell as {SETPOS}. If no text file is open, however, 1-2-3 ignores the {SETPOS} command and continues to the next macro instruction in the same cell as {SETPOS}.

Examples. For all of these 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.

This macro moves the byte pointer to the first r in the word report:

```
{SETPOS 10}
```

This macro moves the byte pointer to the T in This:

```
{SETPOS 0}
```

This macro enters the value 40 in cell COUNT, then sets the byte pointer immediately after the period at the end of the sentence:

```
{FILESIZE COUNT}
{SETPOS COUNT}
```

The following macro enters the nine-character string "the state" in cell RECORD. If no text file was open, the macro would branch to location CLOSED.

```
{SETPOS 20}{BRANCH CLOSED}
{READ 9,RECORD}
```

{SYSTEM}

{SYSTEM *command*} is not available in the HP 95LX version of Lotus 1-2-3. Macros that use the {SYSTEM} command will be incompatible.

15

{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 nonexistent time or 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 examples below.

During a {WAIT} command, the only keystroke 1-2-3 responds to is (CTRL)-(BREAK). If you press (CTRL)-(BREAK) during a {WAIT} command, 1-2-3 immediately stops running the macro (unless you used {BREAKOFF} earlier in the macro to disable use of (CTRL)-(BREAK)).

{WAIT} overrides a {PANELOFF} command, but not an {INDICATE} command.

Note



1-2-3 uses the system date and time settings to keep track of time. Be sure these settings are correct before you use {WAIT}.

Examples. The following macro suspends macro execution for 10 seconds.

```
{WAIT @NOW+@TIME(0,0,10)}
```

The following macro suspends macro execution for the amount of time specified by the @TIMEVALUE formula.

```
{WAIT @NOW+@TIMEVALUE(INTERVAL)}
```

{WINDOWSOFF} and {WINDOWSON}

{WINDOWSOFF} freezes the worksheet area of the screen, including worksheet borders, during macro execution. It also suppresses the display of settings sheets if you previously used a {WINDOWSON} command to turn on settings sheets during macro execution. The area remains frozen 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 significantly.

{WINDOWSON} restores normal updating of the worksheet area, undoing a {WINDOWSOFF} command.

By default, settings sheets do not appear while a macro is running. To display settings sheets in a macro, use {WINDOWSON}. If you've used {WINDOWSOFF} to turn off the display of the worksheet area, use {WINDOWSON} twice: once to redisplay the worksheet and the second time to redisplay settings sheets.

Unless you've used {WINDOWSOFF} to turn off the display of the worksheet area, you can also use {WINDOW} (which simulates WINDOW (F6)) to turn settings sheets on or off, but only while in MENU mode. If you have used {WINDOWSOFF}, you must use {WINDOWSON} to redisplay the worksheet area before you can redisplay settings sheets.

{WINDOWSOFF} and {WINDOWSON} are often used in conjunction with {PANELOFF} and {PANELON}. {PANELOFF} freezes the control panel and status line, and {PANELON} unfreezes the control panel and status line.

Example. The following excerpt from a macro freezes the worksheet area of the screen during a noninteractive part of a macro and suppresses the display of any settings sheets. The 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, the macro refreezes the worksheet area and continues.

```
{WINDOWSOFF}
  :
{WINDOWSON}
{?}~
{WINDOWSOFF}
  :
```

15

{WRITE}

{WRITE *string*} copies string to the open text file, starting at the current byte pointer position. {WRITE} works only if a text file was opened with write, append, or modify access (see {OPEN}).

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 LICS codes (the codes 1-2-3 Release 2.2 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



To use {WRITE} to write values or formulas that evaluate to values, use @STRING to convert the value to a string, for example, {WRITE @STRING(NUMBER,0)}.

If 1-2-3 succeeds in writing to a file, it goes to the instructions in the next cell, skipping any further instructions in the same cell as {WRITE}. If, however, no text file is open, or if the open file was opened with read access, 1-2-3 ignores the {WRITE} command and goes to the next macro instruction in the same cell as {WRITE}.

Examples. The following macro writes the character string OneTwoThree to the open text file. If no text file is open, or if the file was opened with read access, the macro branches to location FAILED for further instructions.

```
{WRITE "One"}{BRANCH FAILED}
{WRITE "Two"}
{WRITE "Three"}
```


The following macro writes the character string One Two Three to the open text file (assuming the file was opened with write, append, or modify access). In the macro, each • represents one space.

```
{WRITE +"One"&"•"&"Two"&"•"&"Three"}
```

{WRITELN}

{WRITELN *string*} works the same way {WRITE} does, except that it adds an end-of-line sequence (a carriage return and line feed) to the string it writes to the file.

Note that {WRITELN} works only if a text file was opened with write, append, or modify access (see {OPEN}).

Note



To use {WRITELN} to write values or formulas that evaluate to values, use @STRING to convert the value to a string, for example, {WRITELN @STRING(NUMBER,0)}.

If 1-2-3 succeeds in writing to a file, it goes to the instructions in the next cell, skipping any further instructions in the same cell as {WRITELN}. If, however, no text file is open, or if the open 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 {WRITELN}.

Example. The following macro writes three separate lines to the open text file. If no text file is open, or if the text file was opened with read access, the macro branches to location FAILED.

```
{WRITELN "One"}{BRANCH FAILED}
{WRITELN "Two"}
{WRITELN "Three"}
```

16

1-2-3 Templates

The cash-flow and statistics templates are designed to provide the capability found in many advanced financial calculators, but in a convenient worksheet format. This chapter is for users who are already familiar with 1-2-3 features and terminology.

Each **template** is a 1-2-3 worksheet that is ready to accept specific data because formulas, macros, labels, and cell formats have been set up for you. You can experiment with each template by entering data and seeing the results.

It's easy to use these templates:

1. Start 1-2-3.
2. Retrieve the template.
3. Enter the appropriate data.
4. Invoke the macros.
5. Save your worksheet, if desired.

The _CFLOW and _STAT templates are read-only files. To save a modified template, specify a different file name.

Note



These templates contain formulas and range names that, if altered, will cause the template to give incorrect results. Please use the provided macros (rather than the 1-2-3 commands) to edit data and calculate results.

Tips.

- The top of the worksheet shows which macros are available for that template. To run a macro, hold down (ALT) and the first letter of the macro name. (For example, to invoke the Cash Flows macro, press (ALT)-(C).)
- To save your new worksheet:
  1. Select /File Save
  2. Type the name of your new worksheet.
  3. Press (ENTER).
- To print a copy of your worksheet, use 1-2-3: select /Print Printer.
- You can end 1-2-3 by pressing (MENU) and selecting Quit. When 1-2-3 asks you to confirm your selection, select Yes.

Cash Flow Analysis

Cash flows are used to analyze "flows" of money received or money paid out at regular intervals. Once you've entered the cash flows, you can calculate the following:

- Calculate the total and internal rate of return of the cash flows.
- Calculate the net present value, net uniform series, and net future value for a specified periodic interest rate.
- Plot a graph of NPV versus I%.

To use the cash-flow template:

1. Retrieve the _CFLOW template: Press (1²3), select /File Retrieve, type C:_CFLOW and press (ENTER). (Press (ALT)-(E), then Y to erase the Help message.)
2. Enter your data into the cash-flow list in Column B beginning at cell B44. Remember, money received is entered as positive; money paid out is entered as negative.
3. Press (ALT) and the first letter of the macro you wish to invoke (see the following table).
4. After you input data in response to a prompt, press (ENTER).

The top of the display shows the names of available macros you can invoke (step 3 above):

Macro	Keys	Description
Cash_Flows	(ALT)-(C)	Displays cash-flow data.
Size	(ALT)-(S)	Prompts for the last item number in your range (< 8149) and numbers the cash flows accordingly, beginning at cell B44. If you do not specify a number (or type something other than a number) and press (ENTER), this macro numbers the cash flows (beginning with B44) until the first blank cell is encountered.
Erase	(ALT)-(E)	Erases all cash flows in column B if you type Y or YES at the prompt.
Delete	(ALT)-(D)	Deletes the specified number of cash flows, starting at the cell pointer and going downward. If you do not specify a number (or type something other than a number) and press (ENTER), this macro deletes one cash flow.
Insert	(ALT)-(I)	Allows you to insert a specified number of 0 cash flows, starting at the cell pointer and going downward. If you do not specify a number (or type something other than a number) and press (ENTER), this macro inserts one 0 cash flow.
Group	(ALT)-(G)	Allows you to enter a group of consecutive, equal cash-flow amounts, starting at the cell pointer position and going downward. (The macro will not insert the group, it writes over any previous flows in the range.)
NPV/IRR	(ALT)-(N)	Computes NPV, NUS, NFV, Total, and IRR.

Macro	Keys	Description
Bar	(ALT)-(B)	Displays a bar graph of the cash flows. Press (ESC) to clear the graph and return to the cash-flow screen.
Plot	(ALT)-(P)	Plots on the screen NPV versus 26 values of I%. The macro prompts for starting I% and the increment between values. Press (ESC) to clear the graph and return to the NPV screen.

All the calculations and graphs operate on the range of cash flows beginning with cell B44 and extending downward until the first blank cell is encountered. (So, if a cash flow amount is 0, remember to enter the number 0 rather than leaving it blank.) Labels that are included in the range are treated as a 0 cash-flow amount.

The cash flow data is numbered in column A. Initially, the list is numbered from 0 to 60 (if AutoExecute Macros is set to Yes). The macro Size allows you to extend the numbering to end at any specified number up to 8148. Numbering the cash flows is optional; the calculations do not require it.

The NPV/IRR macro

The NPV/IRR macro performs these calculations:

Calculation	Description
NPV	Calculates **net present value**: the present value of a series of cash flows plus the initial cost of the investment, computed for a specified periodic interest rate.
NUS	Calculates the **net uniform series**: the dollar amount of regular, equal cash flows having a present value equivalent to the net-present value.
NFV	Calculates **net future value** of a series of cash flows by finding the future value of the net present value.
Total	Calculates the sum of the cash flows.
IRR	Calculates the **internal rate of return**: the interest rate at which the net present value of the cash flows equals 0. (HP 95LX calculates the *periodic* rate of return. To calculate the annual return, multiply the periodic rate by the number of periods per year.)

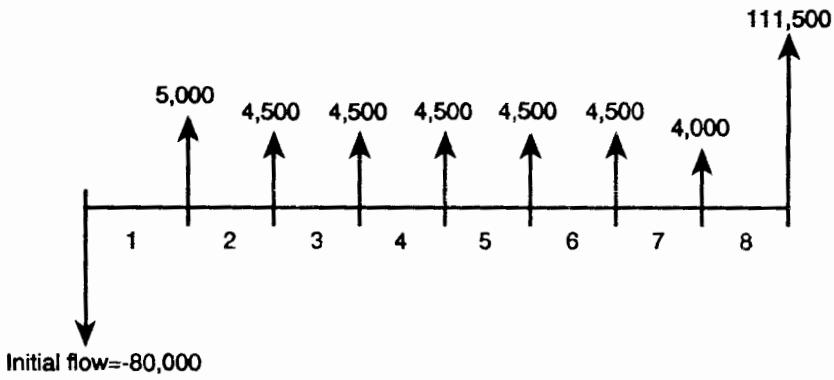
N is the number of the cash flows in the range being computed. For example, if your cash flow range starts at 0 and ends at 60, then N = 61.

I% is the periodic interest rate, expressed as a percentage.

NPV, NUS, and NFV depend on the periodic interest rate I%. The default rate is 10%. After executing the macro, the cell pointer is on I%; to change the rate, simply type the new I% rate, and press (ENTER).

This macro also computes IRR, which may depend on Guess. The default Guess is 10; to change the guess, move the cell pointer to Guess, type in your new guess, and press (ENTER).

Example: Calculating IRR%, NPV, NUS, and NFV of an investment.
Part 1. An investor makes an initial investment of $80,000 and expects returns over the next eight years as illustrated below:



Calculate the total of the cash flows and the internal rate of return of the investment. Also calculate NPV, NUS, and NFV—assuming an annual interest rate of 8.5%.

Keys:	Description:
(123) /File Retrieve .CFLOW (ENTER)	Displays the .CFLOW data screen.
(ALT)-(E) Y (ENTER)	Clears the list.
−80000 (▼)	Enters the initial cash flow—cash flow (0).
5000 (▼)	Enters cash flow (1).
(ALT)-(G) 4500 (ENTER)	Enters cash flow (2).
5 (ENTER)	Enters the number of consecutive times it occurs.
4000 (▼)	Enters cash flow (7).
111500 (▼)	Enters the final cash flow.

ALT-B	Displays the cash-flow bar diagram.
ESC	Clears graph; returns to cash-flow screen.
ALT-N	Displays NPV tableau.
8.5 ENTER	Stores the periodic rate and displays results.

```
NPV   =      1266.3205796
NUS   =      224.55745571
NFV   =      2432.1007985
TOTAL=             63000
N     =                 9
IRR%  =      8.7534098432

I%    =               8.5
Guess=                10
```


Part 2. Assuming the same interest rate, recalculate your answers if cash flow #7 is reduced from $4,000 to $1,000.

Keys:	**Description:**
ALT-C	Displays cash flow data.
▼▼▼▼▼▼▼	Moves the pointer to cash flow 7.
1000 ENTER	Changes cash flow 7 to $1,000.
ALT-N	Displays NPV tableau with the new answers.

```
NPV   =     -428.45847275
NUS   =       -75.9788209
NFV   =     -822.89920146
TOTAL=             60000
N     =                 9
IRR%  =      8.4135170202

I%    =               8.5
Guess=                10
```

Statistics

The HP 95LX statistics template makes one or two-variable statistical calculations as easy as 1,2,3. As you enter data, the column totals are updated in the display, so this template is useful for simply adding columns of numbers—like balancing your checkbook.

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To use the statistics template:

1. Retrieve the _STAT template: Press (123), select /File Retrieve, type C:_STAT and press (ENTER).
2. Enter your data beginning in row 44: use either Column B or C for one-variable statistics, use both columns for two-variable statistics.
3. To run a macro, press (ALT) and the first letter of the macro you wish to invoke. The top of the display shows the names of available macros:

Macro	Keys	Description
XY-DATA	(ALT)-(X)	Displays statistics data.
Size	(ALT)-(S)	Prompts for the last item number in your data range (< 8149) and numbers the data accordingly, beginning at cell B44. If you do not specify a number (or type something other than a number) and press (ENTER), the macro numbers the data pairs (beginning at cell B44) until a blank cell is encountered.
Erase	(ALT)-(E)	Erases all statistics data if you type Y or YES and press (ENTER) at the prompt.

Macro	Keys	Description
Delete	ALT-D	Deletes the specified number of data pairs, starting at the cell pointer and going downward. If you do not specify a number (or type something other than a number) and press ENTER, one data pair is deleted. If you have entered data pairs, you cannot delete items in one column without affecting the other column.
Insert	ALT-I	Allows you to insert a specified number of blank rows, starting at the cell pointer and going downward. If you do not specify a number (or type something other than a number) and press ENTER, the macro will insert one blank row.
Group	ALT-G	Allows you to enter a group of consecutive, equal data pairs, starting at the cell pointer position and going downward. In one-variable statistics, you may use either column B or C. (The macro will not insert the group, it writes over any data in the range.)
AVG, ...	ALT-A	Displays N, the number of items; calculates and displays Totals, Average, Population Standard Deviation and Sample Standard Deviation; displays the Minimum and Maximum; calculates and displays Range of the data in columns B and C. (If the number of items is not what you expected, you may have some labels in the data range.)

Macro	Keys	Description
Regression	(ALT)-(R)	Calculates the Y-intercept, Standard Error of Y Estimate, R Squared (the square of the correlation coefficient), Number of Observations, Slope, and Standard Error of the Coefficient. Also calculates Y Predicted Value (the predicted value of Y given a value of X). To change the value of X, type the new value in the X Value cell and press (ENTER).
Plot	(ALT)-(P)	Plots on the screen a scatter diagram of the XY data, and draws the linear regression line. Press (ESC) to clear the table and return to the XY-Data screen.

All calculations except linear regression and plotting operate on a single range of data starting in row 44 and extending downward to row 8192. Blank cells are not included in the calculations; however, cells containing labels are treated as zero data and *are* included in the calculations. So, avoid storing labels in the range.

Linear regression and plotting operate on two ranges. The X range starts with cell B44 and extends downward until the first blank cell is encountered. The Y range starts with cell C44 and also extends downward until the first blank cell is encountered. If the two ranges are not the same length, linear regression and plotting will error.

Example. Compute the average sales, standard deviation, and so on, for the following staff of salespersons:

Salesperson	Hours/Week	Sales/Month
1	32	$17,000
2	40	$25,000
3	45	$26,000
4	40	$20,000
5	38	$21,000
6	50	$28,000
7	35	$15,000

Keys:	Description:
123 /File Retrieve _STAT ENTER	Displays the _STAT data screen.
ALT-E Y ENTER	Clears data screen.
32 ▼	Enters hours worked for the first salesperson.
40 ▼ 45 ▼ 40 ▼	Enters hours worked for the next three employees.
38 ▼ 50 ▼ 35 ▼	Enters hours worked for the last employees.
HOME ►	Moves cursor to top of second data-entry column .
17000 ▼ 25000 ▼ 26000 ▼	Enters sales for first three employees.
20000 ▼ 21000 ▼ 28000 ▼ 15000 ▼	Enters remaining sales.

(ALT)-(A) Displays AVG, ... screen and all calculated results.

	X	Y
N	7	7
Totals	280	152000
AVG	40	21714.285714
P. STD	5.580578567	4462.9998148
S. STD	6.0277137733	4820.5907561
MIN	32	15000
MAX	50	28000
RANGE	18	13000



Keys:	Description:
(ALT)-(R)	Displays the Regression screen.
48 (ENTER)	Enters X value

Intercept	-7093.0537353
Std Err of Y Est	2296.0733477
R Squared	0.8109443149
No. of Observations	7
Slope	720.18348624
Std Err of Coef.	155.50970969
Y Predicted Value	27475.753604
X Value	48

Example: Weighted Mean. You can calculate weighted mean using the Group macro. For example, let's say that on your last vacation you bought gas at four stations as follows: 15 gallons at $1.26 per gallon, 7 gallons at $1.34 per gallon, 10 gallons at $1.30 per gallon, and 17 gallons at $1.48 per gallon. What is the weighted mean? (Remember to press ENTER twice after entering the X values.)

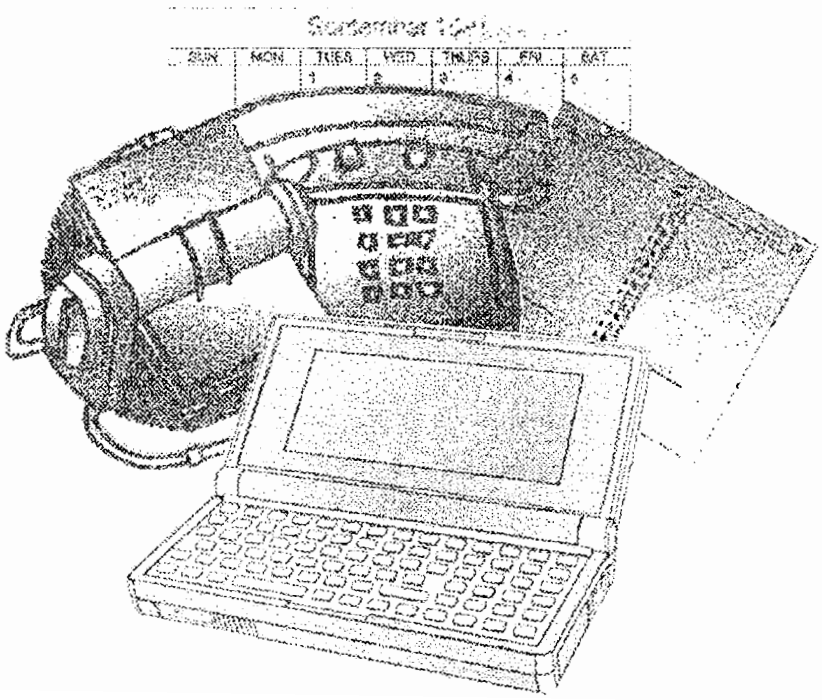
Keys:	Description:
ALT-X	Displays STAT1 data screen.
ALT-E Y ENTER	Erases data.
ALT-G 1.26 ENTER ENTER 15 ENTER	Enters first gasoline data.
ALT-G 1.34 ENTER ENTER 7 ENTER	Enters second gasoline data.
ALT-G 1.30 ENTER ENTER 10 ENTER ALT-G 1.48 ENTER ENTER 17 ENTER	Enters the third and forth gasoline data.
ALT-A	Displays AVG, ... screen and all calculated results. The AVG calculation now reflects the weighted mean. The P.STD and S.STD reflect the weighted standard deviations.

	X	Y
N	49	0
Totals	66.44	0
AVG	1.3559183673	ERR
P. STD	0.0939804228	ERR
S. STD	0.0949543892	ERR
MIN	1.26	ERR
MAX	1.48	ERR
RANGE	0.22	ERR

(The error message appears because no Y values were entered.)

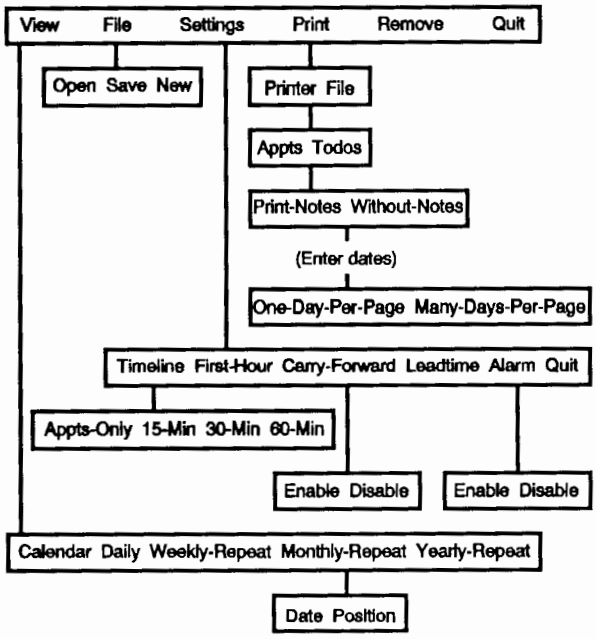
Part 3

The Personal Information Manager



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The Appointment Book



The Appointment Book helps you organize your time by enabling you to:

- Enter appointments with optional alarms.
- Enter repeating appointments: weekly, monthly, or yearly.
- Create to-do lists.
- Attach a note to any appointment or to-do item.
- Display current time in many world cities.
- Time different events with the stopwatch and countdown timer.

Press (clock) to open the Appointment Book. If you have not yet set the current date and time, do so using the Date Current and Time Current commands in the Setup utility.

To close the Appointment Book, select (MENU) Quit or open another application. For help, press (F1) anytime. To cancel an action, screen, or menu, press (ESC) one or more times. If pressing (MENU) causes a beep, press (ESC) and try again.

Note



Before you leave the Appointment Book, save your appointment book (see "Saving an Appointment Book" later in this chapter). Otherwise, the Appointment Book copy and the disk copy (if any) may not match. Later operations on that disk file from the Filer (printing, viewing, transferring to a PC, etc.) would be performed on an out-of-date copy.

Entering Appointments

The Appointment Book display and alarms are based on the system time and date. Before you enter an appointment, make sure the **system time** and **system date** are set correctly. For information about setting time and date and their formats, see "Setting the Date and Time" in chapter 21.

Example: **Entering Your First Appointment.** You want to enter an appointment with an alarm for a one-hour project status meeting at 9:00 AM, Friday, June 5, 1992.

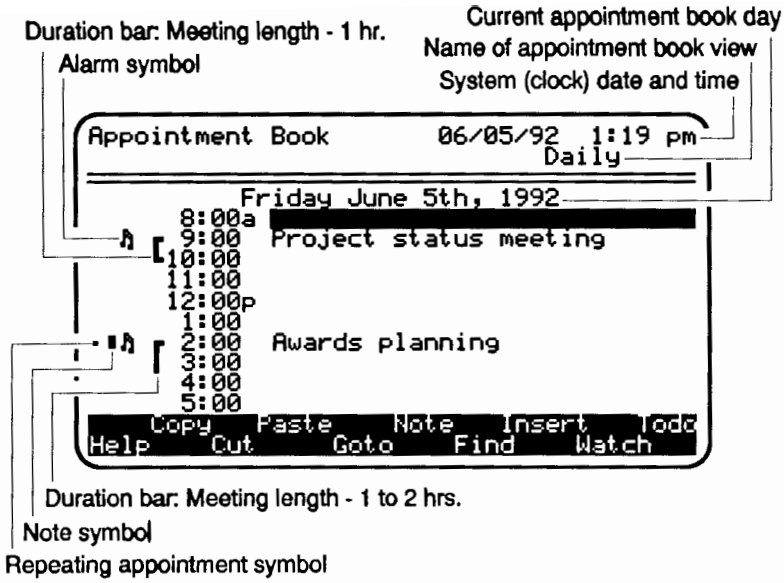
1. Press (clock) to open the Appointment Book.
2. Select (MENU) View Daily.
3. Press Goto ((F5)). The prompt (left, above the double line) shows today's date.
4. Type 6/5/92 in place of the displayed date and press (ENTER). A new daily view is displayed for Friday, June 5, 1992.
5. Move the highlight to the 9:00 AM position using the arrow keys.

6. Type Project status meeting and press (ENTER). A heavy bracket, the **duration bar** (see the figure below), appears to the left of the appointment time showing that this appointment lasts for one hour.
7. Press (ENTER) to display the **edit daily** screen for your appointment.
8. Move the highlight to the alarm field using (▼) and press (Spacebar) to display enable. The alarm will sound 5 minutes before your appointment.
9. Press Done ((F10)) to save your appointment and return to the daily view shown in the following figure. A musical-note alarm symbol appears to the left of the appointment showing that the repeating appointment alarm is set.

This figure also shows a 2:00 PM appointment. The symbols indicate the meeting:

- Has an alarm (musical notes).
- Is a repeating appointment (black dot).
- Has a note attached (black note pad symbol).
- Is scheduled to last between 1 and 2 hours (the duration bar does not point to an end time).

The **current appointment day** (also called **current day**) is unique to the Appointment Book. The current appointment day is defined by the date of the most recently displayed daily view. After completing the example above, the current day would be June 5, 1992 as shown in the figure below.



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Entering Concurrent Appointments

The Appointment Book allows you to enter more than one appointment for a single time period. This permits you to enter two concurrent meetings. You could then decide on the day of the meetings which had priority.

Entering Dates and Times

The years covered by the Appointment Book are 1900 through 2099. All years may be specified with four digits, but 1980 through 1999 may also be specified by 80 through 99, and 2000 through 2079 may be specified by 00 through 79. To specify a year less than 1980 or greater than 2079, you must use four digits.

Dates and times *must* be entered using the same general form (for instance, month, day, year; 12- or 24-hour clock) shown in the upper right corner of any Appointment Book screen. But you have a wide choice of characters to separate day, month, and year and hours and minutes.

The format used to display date and time is set in the Setup Utility. See "Setting the Date and Time" in chapter 21. Regardless of the format chosen in the Setup Utility, you can use the following characters in the Appointment Book to separate month, day, and year: - (hyphen), / (slash), (space), : (colon), . (period), and , (comma). Also, you need not type a leading zero (4/3/93 works just as well as 04/03/93).

All the characters listed above to separate month, day, and year also can be used to separate hours, minutes, and seconds. Additional time separators are h, m, and s. To type an even hour (like 3:00 PM), you can leave off the zeros. And you need only type a or p rather than am or pm. So 3:00 PM can be typed as 3p.

Entering a One-Time-Only Appointment

Choose one of the two procedures that follow based on the appointment you want to enter. Here is how to make your choice:

- Use the simpler procedure "To enter an appointment into the daily view" if your appointment starts at a time displayed in the daily appointments view. Your new HP 95LX shows intervals—**timeline intervals**— of one hour. You can change this interval to 30 or 15 minutes using (MENU) Settings Timeline (see "To specify the timeline interval shown on the daily view" later in this chapter). The duration bar (see the previous figure) will be automatically set to indicate an appointment duration of one timeline interval.

  You can also set an alarm for your appointment using this simpler procedure.

- Use the more versatile procedure "To enter an appointment into the insert daily screen" if your appointment fits one of these descriptions:

  - It starts at a time not displayed on the daily view, or
  - It's concurrent with an existing appointment, or
  - You want to specify an appointment duration other than that given by the timeline interval.

The table below lists the editing keys available in the appointment, insert, todo, and note screens. Use those keys as you follow the procedures. For more typing aids see "Typing Tools" at the end of this chapter.

Keys Active in Appointments, Insert, Note, and To-Do Screens

Key	Description
◀	Moves one character to the left.
▶	Moves one character to the right.
▲	Moves up to the previous line or entry.
▼	Moves down to the next line or entry.
⌫	Backspace—moves left one space, erasing previous character.
⇥	Moves the cursor 5 spaces in a note.
CTRL-◀	Moves left to the beginning of the previous word.
CTRL-▶	Moves right to the beginning of the next word.
HOME	Moves to the first character of the current line, or (appointment and to-do screens only) to the first field in the display.
END	Moves to last character in the line or, in edit mode, to last field in the display.
CTRL-HOME	(Press CTRL, ⇧, and ◀ simultaneously.) Moves to the top of the display or to the beginning of the note.
CTRL-END	(Press CTRL, ⇧, and ▶ simultaneously.) Moves to the bottom of the display or to the end of the note.
CTRL-ENTER	Deletes note text to the end of the line.
DEL	Deletes current character.
ENTER	Moves to the next line or field (except in appointment screens).
ESC	Ends editing the current field and restores its previous contents, or exits the screen.
PG DN	Moves to the next day, week, or month (appointment views and to-do screens) or to the last line of the note.
PG UP	Moves to the previous day, week, or month (appointment views and to-do screens) or to the first line of the note.

To enter an appointment into the daily view:

1. Press Day ((F10)), if necessary, to display the daily appointments view.
2. Press Goto ((F5)). The date displayed is today's date.
3. Type the date of your appointment if different from today's date (see the earlier "Entering Dates and Times").
4. Press (ENTER) to display a daily view for the date of your appointment.
5. Move the highlight to the starting time of your appointment. The daily view displays all hours from 12:00 AM (midnight) to 11:00 PM. Use (▲), (▼), (HOME) and (END) to move the highlight and scroll the display. (By using (MENU) Settings Timeline, you can chose a timeline interval of 60, 30 or 15 minutes.)
6. Type your appointment's name (up to 27 characters) and press (ENTER).

   To edit your entry either before or after pressing (ENTER), use the editing keys in the previous table. If you've already pressed (ENTER), first highlight your entry, then your first editing keystroke (an arrow key, letter key, etc.) will automatically open edit mode. Press (ENTER) after editing.

   If you do not want to set an alarm for this appointment, your entry is complete.
7. To set an alarm:
   a. Highlight your appointment (if not already highlighted). Then press (ENTER) to display the edit daily screen for this appointment.
   b. Press (▲) twice (fewer keystrokes than pressing (▼)) to move the highlight to the alarm field.
   c. Press (Spacebar), if necessary, to select enable, then press (ENTER) to move the highlight to the leadtime field.
   d. Accept the offered time interval or type any number between 0 and 30 to specify the number of minutes between alarm and appointment.
   e. Press (ENTER) to set the leadtime.
   f. Press Done ((F10)) to save your alarm and return to the daily appointments view, or press (ESC) to reject the changes and return to the daily view.

To enter an appointment into the insert daily screen:

See the earlier "Entering Dates and Times" to help you complete this procedure.

1. Press Day (F10), if necessary, to display the daily appointments view.
2. Press Insert (F8) to display the insert daily screen.
3. Type your appointment's name (up to 27 characters) and press ENTER.

   To edit your entry either before or after pressing ENTER, use the editing keys in the previous table. If you've already pressed ENTER, first highlight your entry, then your first editing keystroke (an arrow key, letter key, etc.) will automatically open edit mode. Press ENTER after editing.
4. Accept the offered date or type a new date for your appointment (see the earlier "Entering Dates and Times"), then press ENTER to highlight the start time field.
5. Type your appointment's start time. Press ENTER to highlight the end time field.
6. Type your appointment's end time if it's different from that shown. In any case, press ENTER to enter that time and to highlight the alarm field. (The paragraph directly below this procedure describes how you can bypass this end time step in many cases.)
7. Press Spacebar, if necessary, to select disable or enable, then press ENTER to move the highlight to the leadtime field.
8. Accept the offered time interval or type any number between 0 and 30 to specify the number of minutes between alarm and appointment.
9. Press ENTER to set the leadtime.
10. Do one of the following:
    - Press Done (F10) to save your appointment and to return to the daily appointments view.
    - Press Insert (F8) to save your appointment and to display a new, blank insert daily screen.
    - Press ESC to reject the changes and return to the daily appointments view.

Here's how you can make entering many appointments in the insert screen easier: Say the times displayed on your daily view include 2:00 PM and 3:00 PM, reflecting the default timeline interval of one hour.

You're scheduling a meeting that starts at 2:30 PM and ends at 3:30 PM. In the insert screen, you enter 2:30 PM as the start time and see 9:00 AM, for instance, as the displayed end time. Since the length of you meeting is the timeline interval (one hour), you need not enter the end time. When the end time is highlighted, press (▼), not (ENTER) (or, if you don't want to enter an alarm, press Done ((F10))). The Appointment Book will enter 3:30 PM for you. While the end time on the insert screen will not change immediately, the duration bar in the daily view will show an appointment that extends beyond 3:00 PM. Also, if you press (ENTER) from the daily view (with your 2:30 appointment highlighted), you'll see an end time of 3:30 PM on the edit daily screen.

Entering Repeating Appointments

You can enter a repeating appointment as one that repeats weekly, monthly by position (first Monday, third Thursday, etc.), monthly by date, or yearly. The appointment you enter not only appears in the repeating view you choose, but also in the daily views specified by the data you enter in the repeating appointment view.

Also, every daily view entry of your repeating appointment is identified by a small dot, the same size as the dots that make a colon (:). (A larger solid rectangle—a note pad symbol—indicates that the appointment has a note).

For example, say you want to enter the meeting days for your monthly meeting of the Carole Balzer Gourmet Cooking and Star Trek Tape Watching Society (Balzer Cook-Trek). The group meets every second Tuesday at 11:30 AM and adjourns at 2:30 PM. You plan to enter this appointment for the next 12 months. You'd enter the meeting in the insert monthly position screen using the procedure "To enter a monthly repeating appointment by position" later in this chapter. When this appointment was entered, it would appear not only in the monthly position view, but also in the daily view for every second Tuesday for each of the next 12 months.

To enter a weekly repeating appointment:

See the earlier "Entering Dates and Times" to help you complete this procedure.

1. Select (MENU) View Weekly-Repeat to display the weekly appointments screen.
2. Press Insert ((F8)) to display the insert week screen.
3. Type the name of your appointment in the appt field.
4. Press (ENTER) to enter your appointment name and move the highlight to the weekday field.
5. Press (Spacebar), (+), or (-), if necessary, to move forward or back through the weekdays to display the day of your appointment.
6. Press (ENTER) to set the day and move the highlight to the start time field.
7. Type the start time and press (ENTER). Your highlight moves to the end time field.
8. If a one-hour duration (or the interval specified by (MENU) Settings Timeline) is acceptable, press (▼) to move to the start date field. Otherwise, type an end time and press (ENTER).
9. Accept the offered choice for start date or type another choice, then press (ENTER). Your highlight is now in the end date field. If the *date* you enter in the start date field does not match the *day* you entered in the weekday field (step 6 above), the first appointment will be scheduled for the specified weekday following the specified start date.
10. Accept the offered choice for end date or type another choice. Your highlight is now in the alarm field.
11. Press (Spacebar), if necessary, to select disable or enable, then press (ENTER) to move the highlight to the leadtime field.
12. Accept the offered time interval or type any number between 0 and 30 to specify the number of minutes between alarm and appointment.
13. Press (ENTER) to set the leadtime.
14. Do one of the following:
    - Press Done ((F10)) to save your appointment and to return to the previous screen.
    - Press Insert ((F8)) to save your appointment and to display a new, blank insert weekly screen.
    - Press (ESC) to reject the changes and return to the previous screen.

To enter a monthly repeating appointment by position:

Besides entering a monthly repeating appointment by position (first Monday, third Wednesday, etc.), you can also enter a monthly appointment by date as described later.

See the earlier "Entering Dates and Times" to help you complete this procedure.

1. Select (MENU) View Monthly-Repeat Position to display the monthly position view.
2. Press Insert ((F8)) to display the insert monthly position screen.
3. Type the name of your appointment in the appt field.
4. Press (ENTER) to enter your appointment name and move the highlight to the week field.
5. Press (Spacebar), (+), or (-), if necessary, one or more times to reach the week (1st, 2nd, etc.) of your appointment.
6. Press (ENTER) to set the week and move the highlight to the weekday field.
7. Press (Spacebar), (+), or (-), if necessary, one or more times to display the day of your appointment.
8. Press (ENTER) to set the day and move to the start time field.
9. Type the start time and press (ENTER). Your highlight moves to the end time field.
10. If a one-hour duration (or the interval specified by (MENU) Settings Timeline) is acceptable, press (▼) to move to the start date field. Otherwise, type an end time and press (ENTER).
11. Accept the offered choice for start date or type another choice, then press (ENTER). Your highlight is now in the end date field. If the *date* you enter in the start date field does not match the *day* you entered in the weekday field (step 8 above), the first appointment will be scheduled for the specified weekday following the specified start date.
12. Accept the offered choice for end date or type another choice. Your highlight is now in the alarm field.
13. Press (Spacebar), if necessary, to select `disable` or `enable`.
14. Press (ENTER) to move the highlight to the leadtime field. Accept the offered time interval or type any number between 0 and 30 to specify that number of minutes between alarm and appointment.
15. Press (ENTER) to set the leadtime.
16. Do one of the following:
    - Press Done ((F10)) to save your appointment and to return to the previous screen.
    - Press Insert ((F8)) to save your appointment and to display a new, blank insert monthly position screen.
    - Press (ESC) to reject the changes and return to the previous screen.

To enter a monthly repeating appointment by date:

See the earlier "Entering Dates and Times" to help you complete this procedure.

1. Select (MENU) View Monthly-Repeat Date to display the monthly date appointments view.
2. Press Insert ((F8)) to display the insert monthly date screen.
3. Type the name of your appointment in the appt field.
4. Press (ENTER) to enter your appointment name and move the highlight to the day field.
5. Type a number from 1 to 31 and press (ENTER) to move the highlight to the start time field.
6. Type the start time and press (ENTER). Your highlight moves to the end time field.
7. If a one-hour duration (or the interval specified by (MENU) Settings Timeline) is acceptable, press (▼) to move to the start date field. Otherwise, type an end time and press (ENTER).
8. For each of the start date and end date fields, accept the offered choice or type another choice, then press (ENTER). Your highlight is now in the alarm field.
9. Press (Spacebar), if necessary, to select disable or enable.
10. Press (ENTER) to move the highlight to the leadtime field. Accept the offered time interval or type any number between 0 and 30 to specify that number of minutes between alarm and appointment.
11. Press (ENTER) to set the leadtime.
12. Do one of the following:
    - Press Done ((F10)) to save your appointment and to return to the previous screen.
    - Press Insert ((F8)) to save your appointment and to display a new, blank insert monthly date screen.
    - Press (ESC) to reject the changes and return to the previous screen.

To enter a yearly repeating appointment:

See the earlier "Entering Dates and Times" to help you complete this procedure.

1. Select (MENU) View Yearly-Repeat to display the yearly view.
2. Press Insert ((F8)) to display the insert yearly screen.
3. Type the name of your appointment in the appt field.

4. Press (ENTER) to enter your appointment name and move the highlight to the month field.
5. Press (Spacebar), (+), or (−), if necessary, one or more times to display the month of your appointment.
6. Press (ENTER) to set the month and move the highlight to the day field.
7. Type a number from 1 to 31 and press (ENTER) to move the highlight to the start time field.
8. Type the start time and press (ENTER). Your highlight moves to the end time field.
9. If a one-hour duration (or the interval specified by (MENU) Settings Timeline) is acceptable, press (▼) to move to the start date field. Otherwise, type an end time and press (ENTER).
10. For each of the start date and end date fields, accept the offered choice or type another choice, then press (ENTER). Your highlight is now in the alarm field.
11. Press (Spacebar), if necessary, to select `disable` or `enable`.
12. Press (ENTER) to move the highlight to the leadtime field. Accept the offered time interval or type any number between 0 and 30 to specify that number of minutes between alarm and appointment.
13. Press (ENTER) to set the leadtime.
14. Do one of the following:
    - Press `Done` ((F10)) to save your appointment and to return to the previous screen.
    - Press `Insert` ((F8)) to save your appointment and to display a new, blank insert monthly date screen.
    - Press (ESC) to reject the changes and return to the previous screen.

To enter an appointment that repeats irregularly:

This procedure is explained as an example. It leads you step by step through the use of the copy and paste functions of the Clipboard. All the Clipboard functions are described later in "Using the Clipboard with Appointments and Notes."

You've just learned that your employer, Beaton's Deep Fried Pizza, has scheduled a series of four meetings over the next several weeks to discuss next year's budget. The dates and times are:

- October 8, 9:00 AM, 1992
- October 13, 10:00 AM, 1992
- October 16, 9:00 AM, 1992

- October 21, 1:00 PM, 1992.

1. From the daily view, press Goto (F5).
2. Type 10/8/92 and press ENTER.
3. Highlight the 9:00 AM appointment field and type FY 93 budget. Press ENTER.
4. Press ENTER to display the edit screen for this appointment.
5. Press ▼ 4 times to highlight the alarm field.
6. Press Spacebar to display enable. You accept the displayed 5 minute leadtime.
7. Press Done (F10) to complete the entry of this appointment and return to the daily view.
8. Press Copy (F2) to copy to the Clipboard this highlighted appointment name with its alarm.
9. Press PG DN 5 times to display the daily view for Tuesday, October 13.
10. Highlight the 10:00 AM appointment field and press Paste (F4) to enter the copied appointment name with its alarm. A copy of the appointment (name and alarm) is still on the Clipboard. (If you entered the appointment at the wrong time or date, highlight the appointment, press Cut (F3), and try again. The appointment is still in the Clipboard.)
11. Follow the same routine to paste the appointment name into the proper appointment fields for October 16 and 21.

Using Appointment Notes

You can add a note (one screen long) to any one-time-only or repeating appointment. You cannot enter a note for a time period for which no appointment is scheduled. When a note is added to an appointment, a solid rectangle mark like a note pad (▪) is placed to the left of the appointment starting time.

To add a note:

1. Select MENU View, then select the appointment view containing the appointment you want to augment with a note. If it's a repeating appointment, select the view (Weekly, Monthly Position, Monthly Date, or Yearly) in which you entered the appointment.
2. Highlight the appointment to which you will add a note.

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3. Press Note (F6) to display the 40 character by 11 line note screen. The related appointment name is displayed on the second line of the screen.
4. Type your note using the editing keys described in the earlier table.
5. Do one of the following:
   - Press Done (F10) to save your note and return to the previous screen. A ■ mark to the left of the appointment time will show that the appointment has a note.
   - Press ESC to reject the note and return to the previous screen.

To view a note:

1. Highlight the appointment associated with a note in any view in which the appointment appears.
2. Press Note (F6) to display the note screen with its note.
3. Press ESC to return to the related appointment view.

To edit a note:

1. View the note you want to edit by following the above procedure.
2. Edit the note using the editing keys described in the earlier table "Keys Active in Appointments, Insert, Note, and To-Do Screens."
3. Press Done (F10) to save your edited note and return to the previous view. To discard your edits, preserve the original note, and return to the previous view, press ESC.

Using the Clipboard with Appointments and Notes

Note



The Clipboard is available in all appointment views except calendar. It's also available in notes and in to-do lists. The Clipboard is not available in insert or edit screens, in world-time, in the stopwatch, or in the timer. The use of the Clipboard in to-do lists (and associated notes) is discussed later in this chapter.

Copy, cut, and paste functions access a storage area called the Clipboard. The use of these functions in view screens is summarized in the following table. To *move* text, first cut it, then paste it in the new location. After a paste, a copy of the appointment or selected note text remains in the Clipboard (until another cut or copy

operation replaces it), allowing multiple placements. For instance, this allows placing the same appointment into different time fields and in different views, as shown in the previous example.

When a highlighted appointment in any view is copied or cut to the Clipboard, any associated alarm or note is also copied. All this information can be pasted into any available time period in a *daily view only*.

Note



Although repeating appointments can be copied or cut, you cannot paste data into a repeating view.

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You can paste an appointment into a note screen, into another appointment or note location, or into another application, such as the Memo Editor. The appointment time, name, and related note, if any, are pasted to the new location. However, any alarm information in the Clipboard can be pasted only to an appointment location. Selected note text that is copied or cut can also be pasted into another application. See "To select text in a note field" below.

If Clipboard text that is not an appointment is inadvertently pasted over an appointment, the text will overwrite the appointment. (The pasted text would be limited to that which would fit in the field—27 characters.)

If an appointment (or to-do item) is pasted into a to-do view, it will be entered as a new to-do item. (If the pasted item was not an appointment or to-do-item, it would overwrite any highlighted to-do item.)

To select text in a note field:

1. Position the cursor at the beginning of the text you want to select.
2. Press Mark (F9).
3. Move the cursor to highlight and define the selected text.

This text can now be copied or cut into the Clipboard.

The table below describes Clipboard operations with appointments and their notes. A later table "Interaction Between Clipboard Function Keys and To-Do Items and Notes" further describes Clipboard operations.

Interaction Between Clipboard Function Keys and Appointments and Notes

Function Key	Description
Copy (F2)	Copies from any view a highlighted appointment plus any note and alarm and puts it into the Clipboard. Also copies marked note text into the Clipboard.
Cut (F3)	Removes from any view a highlighted appointment plus any note and alarm and puts it into the Clipboard. Also cuts marked note text and puts it into the Clipboard.
Paste (F4)	Copies appointment plus any note and alarm from the Clipboard and pastes it into the highlighted appointment field in any daily view. If the field already has an appointment, the pasted appointment is placed in a concurrent appointment field. Nothing is lost. Also copies selected note text from the Clipboard into any note screen at the cursor's position.
Mark (F9)	Locates the beginning of marked text in a note at the cursor position. Moving the cursor then selects (highlights) text (marked text) for copying or cutting.

Formatting the Daily View

You can specify the timeline interval and the first hour displayed on the daily view through the settings menu. This first hour is the hour displayed before you scroll the display using ▲, ▼, HOME, and END. The timeline choices are shown below:

Time Choices for Daily View

Choice	Description
Appts-Only	Displays only scheduled appointments with their start times.
15-Min	Displays 15-minute increments.
30-Min	Displays 30-minute increments.
60-Min	Displays 60-minute increments.

To specify the first hour displayed on the daily view:

This first hour is the hour displayed before you scroll the display using ▲ and ▼. This first hour is also displayed when you press PG UP or PG DN from a daily view.

1. Select MENU Settings to display the Appointment Book Settings screen.
2. Select First-Hour.
3. Type the time and press ENTER. When you display the daily view, this hour will the earliest hour displayed. Use ▲, ▼, HOME, and END to display any time from midnight to 11:00 PM.

To specify the timeline interval shown on the daily view:

1. Select MENU Settings to display the Appointment Book Settings screen.
2. Select Timeline.
3. Select Appts-Only, 15-Min, 30-Min, or 60-Min to display corresponding times.

When Appts-Only is specified, you must use an insert screen to enter an appointment. If you do not specify an end time, an appointment duration of 1 hour is set.

When 15-Min, 30-Min, or 60-Min is specified, you may enter an appointment in the daily view screen or in an insert screen. If you

use an insert screen and do not specify an end time, the appointment duration is set to equal the daily view time interval (15-Min, 30-Min, or 60-Min).

Using Alarms

You can set an alarm, consisting of a sound and a message, for any one-time-only or repeating appointment. To see how to set an alarm while entering an appointment, see the section "Entering Appointments" near the beginning of this chapter. Unless you change it, an alarm is set to go off 5 minutes before the appointment time. When the alarm turns on, the alarm sounds periodically for 10 seconds or until (ESC) is pressed, and the message remains until (ESC) is pressed. If no key is pressed in the next five minutes, the HP 95LX turns itself off to conserve power, but an uncanceled message will reappear when the computer is turned back on.

To change an individual alarm:

1. Highlight the appointment whose alarm you want to change. Be sure to highlight the appointment in the view where the appointment was entered. Select (MENU) View, then select Daily, Weekly-Repeat, Monthly-Repeat Date, Monthly-Repeat Position, or Yearly-Repeat. In the daily view, use Goto ((F5)) to specify the correct date.
2. Press (ENTER) to display the edit day screen.
3. Highlight the alarm field and press (Spacebar), if necessary, to select enable or disable.
4. Highlight the leadtime field. Either accept the displayed default time interval or type any number between 0 and 30 to specify a 0 to 30 minute interval.
5. Press Done ((F10)) to replace your original appointment with this edited version.

To change the default time interval (leadtime) between alarm and appointment:

The default leadtime will apply to all new appointments that you enter. For example, once you change the leadtime, the insert appointment screens will display the newly specified leadtime.

Note



This procedure does not affect the leadtime values for existing appointment alarms.

1. Select (MENU) Settings to display the Appointment Book Settings screen. This screen shows the present default value for `Leadtime`
2. Select Leadtime.
3. Type a new default leadtime from 0 to 30 minutes.

To enable and disable the alarm sound:

17 The sound of *all* alarms in both the appointment book *and in the watch feature* can be enabled or disabled in the settings alarm screen. This affects only the sound, not the message. The message will still display at the specified time interval (leadtime) before the appointment time.

You might want to disable all alarms if you're in a meeting, for instance.

To control the alarm sound for all alarms:

1. Select (MENU) Settings Alarm.
2. Do one of the following:
   - Select Enable to allow all alarms to sound.
   - Select Disable to turn off the sound of all alarms.

To turn off an alarm after it turns on:

1. Read the message first because turning off the alarm removes the message.
2. Press (ESC) to turn off the sound (and to remove the message). Otherwise, the alarm will turn off in 10 seconds and the message will remain until you press (ESC).

Using the Calendar

The calendar, one of whose screens is shown below, contains a calendar for every month from January 1900 through December 2099. To display the calendar, press (ESC) from any appointment view or select (MENU) View Calendar. Once the calendar is displayed, you can easily change the display to any other month in two ways:

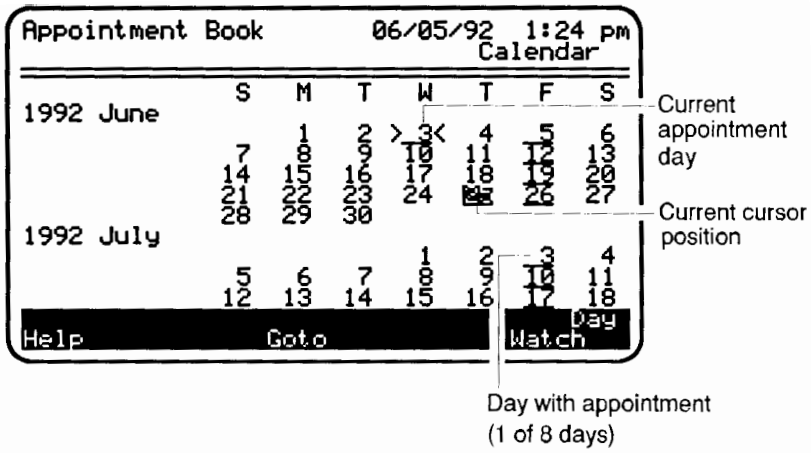
- To display nearby months, press (PG UP) and (PG DN) one or more times.
- To display more distant months, it might be faster to use Goto ((F5)) as described in the procedure below "To display any month in the calendar."

To display any month in the calendar:

1. Press (ESC) from any appointment view or select (MENU) View Calendar to display the calendar.
2. Press Goto ((F5))
3. Type the date you choose in place of the offered date. You must use the same order, but you can use different separators (see "Entering Dates and Times" near the beginning of this chapter).
4. Press (ENTER) to display the month you've selected. The day you specified will be highlighted.

The calendar view provides this special information (see the figure below):

- A day with appointments: identified by an underline.
- The current appointment day: identified by > <.
- Cursor position: identified by a block cursor.



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Keys Active in Calendar View

Key	Description
◀	Moves to the previous day and scrolls the calendar as necessary.
▶	Moves to the next day and scrolls the calendar as necessary.
▲	Moves up to the previous week and scrolls the calendar as necessary.
▼	Moves down to the next week and scrolls the calendar as necessary.
ENTER	Displays the daily view for the highlighted date.
END	Moves to the last displayed date.
HOME	Moves to the first displayed date.
PG DN	Scrolls forward 4 weeks.
PG UP	Scrolls backward 4 weeks.

Viewing Appointments

You can display a daily view showing the *current day's* appointments by pressing Day (F10) from any other view. (The current day is the day last displayed in the daily view and is identified in the calendar by > <). When viewing a daily view, you can view (or enter) an appointment for any hour from midnight (12:00a) to 11:00 PM by scrolling the screen with ▲, ▼, HOME, and END.

You can choose the daily view's date by using the calendar or by typing the date you want. Procedures for each method follow:

Choosing a Current Appointment Day by Using the Calendar

1. Press ESC from any view or select MENU View Calendar to display the calendar.
2. Move the cursor to the date you seek. You can scroll the calendar using the keys described in the table above, or use Goto (F5), as described earlier in "To display any month in the calendar."
3. Press ENTER to display that date in the daily view. This defines a new current day.

Choosing a Current Appointment Day by Typing the Date

1. If you're in a repeating view (weekly, monthly, yearly) or in the calendar, press Day (F10) to display the daily view for the current day.
2. Press Goto (F5) from the daily view.
3. Type the date you choose in place of the offered date. You must use the same order (like month, day, year) but you can use different separators (see "Entering Dates and Times" near the beginning of this chapter).
4. Press ENTER to display that date in the daily view. This defines a new current day.

Finding Appointment Book Text

The Find command (Find (F7)) can be executed from a daily appointments or daily todo screen (see the later section "Using To-Do Lists"). It searches all daily appointments and daily note screens for specified text within plus or minus two years from the current day. If the text is found, you'll see displayed the daily appointments screen that contains the text, or whose note screen contains the text (in that case, press Note (F6) to see the text). The search initiated by Find is case insensitive (entering "text" will find both "Text" and "text"). You can search forward (toward later dates) and backward (toward earlier dates). Once a match is found, you can continue the search in the same direction, or you can change the direction of search at any time.

To search all dates, conduct a forward (next) search repeatedly until a message reports that no match is found. Then conduct a backward (previous) search until no match is found.

1. Press Day (F10) from any repeating appointment view to display the current daily view.
2. Press Find (F7) to display the Find prompt.
3. Type the text you want to find, 39 characters maximum.
4. Press Next (F7) to search for the next occurrence of this text. If the text is found, the daily view or to-do screen containing that text will be displayed.
5. Press Prev (F5) to complete the search. (You can press Prev (F5) first, followed by Next (F7).)
6. To search for other occurrences of the text, repeat steps 4, 5, and 6.

Rescheduling, Changing, and Canceling Appointments and Notes

Example: Changing the Date of an Appointment Using the Edit Screen. You have a one-time-only appointment with note and alarm presently scheduled for 9:00 AM, October 15, 1991. You want to change it to November 5, 1991. Today's date is September 19, 1991. Here are the steps you can perform to do this. (This is a read-only example—no need to press keys.)

1. Press (ESC) to display the calendar.
2. Press (PG DN), then use the arrow keys to highlight October 15.
3. Press (ENTER) to display the daily view for October 15.
4. Highlight your 9:00 AM appointment.
5. Press (ENTER) to display the edit screen for this appointment.
6. Highlight the date field and type `11/05/91`, then press Done ((F10)). Your appointment, together with its note and alarm, is rescheduled.

The six procedures that follow apply to daily, weekly, monthly, and yearly appointments. When making changes, use the keys described in the table "Keys Active in Appointments, Insert, Note, and To-Do Screens" earlier in this chapter. For other typing aids, see "Typing Tools" at the end of this chapter.

To change only an appointment name:

1. Display the view in which the appointment was entered (daily, weekly, monthly date, monthly position, yearly).
2. Highlight the appointment you want to change.
3. Do one of the following:
   - Type a new name. As you begin, the old name is deleted and a single-character cursor appears.
   - Press (▶) to enter edit mode. The old name remains and a single-character cursor appears. Make your changes.
4. Press (ENTER) to save your new or edited name.

To make other changes to an appointment:

1. Display the view in which the appointment was entered (daily, weekly, monthly date, monthly position, yearly).
2. Highlight the appointment you want to change.
3. Press (ENTER) to display the edit screen.

4. Move the cursor to the field you want to change.
5. Either type your change or, if the field is surrounded by a box, press (Spacebar), (+), or (−) to display other choices.
6. Press (ENTER) to enter the change and move the highlight to the next field.
7. Repeat steps 4, 5, and 6 until you've made all your changes.
8. Press Done ((F10)) to save the new version of your appointment, including any note or alarm.

To reschedule a one-time-only appointment:

1. Highlight the appointment in the daily view.
2. Press Cut ((F3)) to move the appointment into the Clipboard.
3. Highlight the new location of the appointment.
4. Press Paste ((F4)) to reschedule the appointment.

To cancel a one-time-only appointment:

1. Highlight the appointment in the daily view.
2. Press Cut ((F3)) to cancel the appointment.

To reschedule or cancel one day of a repeating appointment:

1. Highlight the appointment in the daily view.
2. Press (ENTER) to display the edit day screen.
3. Enter a concurrent "appointment" whose name is a message informing you that the appointment is canceled or rescheduled.
4. To reschedule, enter a one-time-only appointment for the rescheduled day and time.

The original repeating appointment will still display. If you want to disable any alarm, you must do so in the edit screen of the repeating view in which the appointment was entered.

To cancel all days of a repeating appointment:

1. Display the view in which the appointment was made (Weekly, Month Date, Month Position, Yearly).
2. Highlight the appointment.
3. Press Cut ((F3)). All occurrences of the appointment are deleted.

To change or delete a note:

You can change an appointment note in any view. If it's a note for a repeating appointment, the change will appear in all occurrences of the repeating appointment.

To change a note:

1. Highlight the appointment whose note you want to change.
2. Press Note (F6).
3. Type your changes.
4. Press Done (F10) to save your changes.

To delete a note:

1. Highlight the appointment whose note you want to delete.
2. Press Note (F6). The cursor is on the first character in your note.
3. Press Mark (F9)
4. Press CTRL END (press ⇧, then press CTRL and ▶ together) to move the cursor to the last character in your note. The entire note is highlighted.
5. Press Cut (F3)
6. Press Done (F10) to delete the note.

To remove all appointments and to-do items before a chosen date:

The Remove command erases all appointments and to-do items before a date you specify. (To-do items are described below.) You might want to do this to release disk space for other uses if your appointment book is large.

Note



Once Remove is executed, the appointments are gone and cannot be recovered, so make sure the date you specify is the date you want.

---

1. Select MENU Remove.
2. Either accept the offered date, or type a new date and press ENTER.
3. Do one of the following:
   - Type y to remove all appointments before the specified date.
   - Type n to cancel the operation.

Using To-Do Lists

You can create a prioritized to-do list and check off an item as it's completed. You can specify that an item not completed on the day it's due be automatically deleted from future lists. Or you can specify that such an item continue to be listed day after day until it is completed (checked off) or deleted. To-do items can be entered on a daily basis only. For instance, you cannot have weekly to-do items.

A to-do screen is similar to a daily view, except no times are involved. Instead, to-do items are prioritized.

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Use Todo / Day (F10) to switch between a daily view and the to-do screen of the same date.

Entering a To-Do Item

1. From a daily view, press Todo (F10) to display the to-do list.
2. Move, if necessary, to the date of your to-do item by using Goto (F5) or the PG UP, PG DN keys.
3. Press Insert (F8) to display the insert to-do screen. The highlight is in the item field.
4. Type your to-do item (27 characters maximum) using the editing keys described in the earlier table "Keys Active in Appointments, Insert, Note, and To-Do Screens." For more typing aids, see "Typing Tools" at the end of this chapter.
5. Press ENTER to move to the priority field.
6. Press Spacebar, +, or - to cycle forward through the available priorities, 1-9. Select the priority of your item.
7. Press ENTER to move to the carry forward option field. If carry forward is enabled, this to-do item will appear on to-do lists for future days until it is checked off or deleted as explained later. If carry forward is disabled, this to-do item will appear only on this screen; that is, only on the date it is scheduled to be done.
8. Press Spacebar to cycle between Yes and No. Select your choice.
9. Press ENTER to move to the last field, date. Accept the displayed date or type a new date, then press ENTER.
10. Do one of the following:
    - Press Done (F10) to save the item and return to the to-do list.
    - Press Insert (F8) to save the item and display a new, blank insert to-do screen.

- Press (ESC) to cancel the item and return to the to-do list.

Editing a To-Do Item

1. Highlight the to-do item to edit.
2. Do one of the following:
   - If only the name needs changing, type the changes and press (ENTER) to save the changes. You've completed this procedure.
   - Otherwise, press (ENTER) to display the edit to-do screen, then continue with the following steps.
3. Move the highlight to the field or fields to change.
4. Make the desired changes.
5. Do one of the following:
   - Press Done ((F10)) to save the item and return to the to-do list.
   - Press (ESC) to cancel the changes and return to the previous screen.

Adding or Changing a Note to a To-Do Item

You can add or change notes to to-do items just as you can to appointments.

1. Highlight the to-do item whose note you want to create or change.
2. Press Note ((F6)) to display the note screen.
3. Type your note or make your changes to the existing note.
4. Do one of the following:
   - Press Done ((F10)) to save the note and return to the previous screen.
   - Press (ESC) to cancel the changes and return to the previous screen.

Checking Off or Deleting a Completed To-Do Item

When you complete a to-do item, you can put a check mark in front of the item or delete it. Once an item is checked, it will not appear on previous or future todo screens.

1. Display the to-do screen containing the item to be checked off or deleted.
2. Do one of the following:

- To check the item, highlight the item and press (Spacebar) to put a check (#) in front of the item. To toggle # on and off, press (Spacebar).
- To delete the item, highlight the item and press Cut ((F3)).

Displaying Past-Due To-Do Items

You can control whether or not past-due items continue to appear on later to-do lists. This control is exercised by choosing whether the carry-forward command is enabled (items carry over to later lists) or disabled. There are two ways to exercise this control:

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- Select yes or no in the carry forward field of each to-do item's insert or edit screen as explained earlier in "Entering a To-Do Item." In this way, the carry-forward state of each item can be controlled individually.
- Select Enable or Disable after selecting Settings Carry-Forward. In this way, the default carry-forward state of all future to-do items are set.

To change the default carry-forward state of future to-do items:

This procedure does not affect the carry-forward states of existing to-do items.

1. Select (MENU) Settings to display the Appointment Book Settings screen. This screen shows the present default Carry Forward state, either Enabled or Disabled.
2. Select Carry-Forward.
3. Do one of the following:
   - Select Enable. The default value of Carry forward in the insert to-do screens is set to yes.
   - Select Disable. The default value of Carry forward in the insert to-do screens is set to no.

Using the Clipboard with To-Do Screens and Notes

The use of these functions in to-do screens is summarized in the following table. To *move* a to-do item, first cut it, then paste it in the new location. After a paste, a copy of the to-do item and any note remains in the Clipboard, allowing multiple placements.

Paste is available in the daily view and todo screens only. If you paste a to-do item into either screen, the Clipboard contents are entered as a new item. The amount of Clipboard text that is pasted depends on the capacity of the field into which it's pasted. Existing text is not overwritten.

You can paste a to-do item and any note (but not its priority) into a note screen, or into another application, such as the Memo Editor. The to-do item and related note, if any, are pasted into the new location. Selected note text that is copied or cut can also be pasted into another application.

Interaction Between Clipboard Function Keys and To-Do Items and Notes

Function Key	Description
Copy (F2)	Copies from to-do screen a highlighted to-do item with any note and puts it into the Clipboard. Also copies selected note text (press Mark (F9), move cursor) into the Clipboard.
Cut (F3)	Removes from any to-do screen a highlighted to-do item and any note and puts it into the Clipboard. Also cuts selected note text and puts it into the Clipboard.
Paste (F4)	Copies to-do item and any note from the Clipboard and pastes it into a highlighted to-do field in any to-do screen. If the field already contains a to-do item, the pasted item is inserted immediately below the existing item and adopts its priority. Nothing is lost. Also copies selected note text from the Clipboard into any note screen at the cursor's position.
Mark (F9)	Locates the beginning of marked text at the cursor position. Moving the cursor then selects (highlights) text (marked text) for copying or cutting.

Saving an Appointment Book

To avoid losing any unsaved appointments, you must save your appointment book in a file before executing a command, such as (MENU) Quit or (MENU) File Open, that can cause your appointments to be lost. Reasons to execute (MENU) Quit include releasing memory occupied by an open Appointment Book application and executing MS-DOS commands (see "Executing MS-DOS Commands" in chapter 20).

Before you execute a command that could cause loss of appointment book information, the Appointment Book gives you an opportunity to save before executing the command. You may select (MENU) File Save to save your appointment book at any time.

Follow these procedures to save your appointment book for later use in the Appointment Book application. (To save appointments and to-do items for use in an another HP 95LX application or in an application outside of the HP 95LX, see "Writing Selected Appointments to an ASCII File" later in this chapter.)

To save an appointment book in a new file:

1. Select (MENU) File Save. You'll see displayed C:_DAT*.ABK with perhaps some file names also displayed.
2. Type a file name (8 characters maximum). File names are case insensitive (A = a). Your first character will replace *. If you type no extension, .ABK will be supplied to identify your file as an appointment book.
3. Press (ENTER) to save your appointment book.

To save an appointment book in an existing file:

This procedure assumes you earlier selected (MENU) File Open to open an existing appointment book. After changing it, you follow this procedure to save it in the same file.

- Select (MENU) File Save. You'll see displayed C:_DAT\ *filename* .ABK where *filename* is the existing name of your appointment book file.
- Press (ENTER) to save your file under its existing name.

Opening an Appointment Book

When you open the Appointment Book application, the last appointment book (if any) you saved will be opened automatically. To open another appointment book, use one of the procedures below:

To open an existing appointment book file:

1. Save your current appointment book (if you want to) by following one of the procedures in the earlier section "Saving an Appointment Book."
2. Select (MENU) File Open. If `Replace file without saving? (Y/N)` is displayed, press Y to lose your appointment book or your recent changes.
3. Highlight the displayed name of the file you want to open and press (ENTER). If the file you want to open is not displayed, see the procedure below, "To display all file names."

To display all file names:

After executing (MENU) File Save, (MENU) File Open, or any other file related command, follow this procedure to display all file names in the HP 95LX's C: and A: directories. If necessary, press (ESC) to display the `C:\_DAT\*.ABK` prompt.

- To display files in the _DAT directory, type `*.*` and press (ENTER).
- To display all subdirectories and files in the `C:\` directory with the `.ABK` extension, highlight `..\` and press (ENTER).
- To display all files and subdirectories in the root directory of the RAM disk, press (←) (backspace) repeatedly to erase all but `C:\`, type `*.*`, then press (ENTER).
- To display all files and subdirectories in the root directory of a plug-in card, press (←) (backspace) to erase the entire line, type `a:\*.*`, then press (ENTER).
- To display all files in any subdirectory, highlight the subdirectory name (for instance, `APPTS\`), then press (ENTER).

To start another separate appointment book:

1. Save your current appointment book (if you want to) by following one of the procedures in the earlier section "Saving an Appointment Book."

2. Select (MENU) File New. If you decided, at step 1 above, not to save your appointment book, you'll see `Save changes? (Y/N)`. Press N to lose your appointment book. An empty daily view is displayed.

Printing Appointments and To-Do Items

To configure your printer, see "The Printer Configuration Settings" in chapter 21.

The Print Printer command initiates a series of automatically displayed prompts. The responses to those prompts are explained below:

1. Turn on your printer.
2. Select (MENU) Print Printer.
3. Either select Appts to print a set of appointments, or select Todos to print a set of to-do lists.
4. Do one of the following:
   - Select Print-Notes to print all associated notes with the appointments or to-do items.
   - Select Without-Notes to print only appointments or to-do items and omit notes.
5. Type the date where you want your printout to begin, then press (ENTER).
6. Type the date where you want your printout to end, then press (ENTER).
7. Either select One-Day-Per-Page to print one screen on each page, or select Many-Days-Per-Page to print continuously on each page. Your printout begins.

Writing Selected Appointments to an ASCII File

Use the Print File procedure below to save appointment book information in an ASCII file when you intend to use that information in another application, either inside or outside the HP 95LX. Use File Save (see "Saving an Appointment Book" earlier in this chapter) when you intend to use this information within the Appointment Book application.

Print File initiates a series of prompts. The responses to those prompts are explained below:

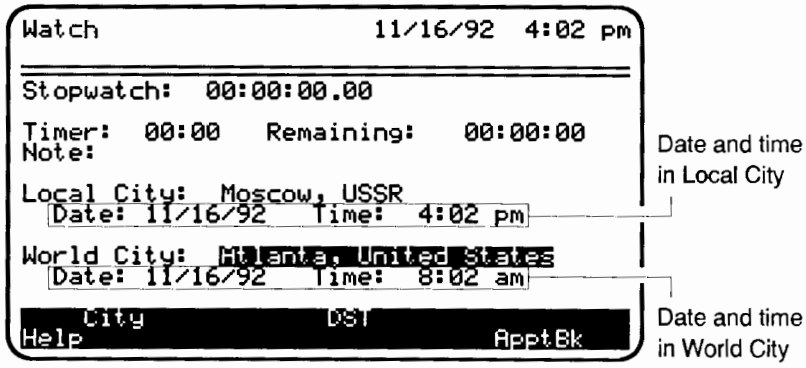
1. Select (MENU) Print File.
2. Either select Appts to save in a file a set of appointments, or select Todos to save in a file a set of to-do lists.
3. Do one of the following:
   - Select Print-Notes to save all associated notes with the appointments or to-do items.
   - Select Without-Notes to save only appointments or to-do items and omit notes.
4. Type the date of the first appointment or to-do item you want saved, then press (ENTER).
5. Type the date of the last appointment or to-do item you want saved, then press (ENTER).
6. Do one of the following:
   - Select One-Day-Per-Page to include instructions in the file that will cause a future printing to print one screen on each page.
   - Select Many-Days-Per-Page to include instructions in the file that will cause a future printing to print continuously on each page.
7. Do one of the following:
   - Type your choice of file name, plus path and/or extension if you choose, then press (ENTER). If you omit an extension, the .TXT extension will be added automatically. Your appointments or to-do-items are saved.
   - Highlight a file. To replace the existing file contents, press (ENTER). Your appointments or to-do-items are saved.

Displaying Current Time in World Cities

The Appointment Book world-time feature allows you to view on one screen the current time and date in any world city and in your local city. You initially choose your local city from a large supplied list of cities and then any world city from the same list. Also, you can add up to eight cities to this list.

Press Watch ([F9]) from any Appointment Book view or to-do screen to display the watch screen, your window to the world-time feature. This screen is shown below. Press ApptBk ([F9]) or [ESC] to return to the previous Appointment Book screen. Press [ESC] one or more times to stop any action and return to the previous state. Press Help ([F1]) for assistance.

A brief introductory example is followed by procedures describing in general terms how to select your Local and World Cities. Then a keystroke example leads you step by step through the process.



Example: Using the World-Time Feature. You've just arrived in Moscow for a business trip. Since you'll be in Moscow for a week, you've made Moscow time your system (clock) time. This means the Moscow appointments you enter into the Appointment Book will be based on Moscow time. You've also made Moscow your Local City so the times in other world cities will be relative to Moscow (Local City) time. Since you'll be communicating with your home office in Atlanta frequently, you've made Atlanta your World City.

Computer Museum

It's now 4:15 PM. You need to call your home office in Atlanta, but want to make sure the home office is open. Before you turned your HP 95LX off, you were viewing your watch screen. Here is the one keystroke you perform to check on Atlanta time:

(ON)

You see that Atlanta time is 8:15 AM. You place your call and complete your business successfully.

Since the watch screen was the last screen displayed when you turned your HP 95LX off, it's the first one you see when you turn it on.

Starting to Use the World-Time Feature

Before you can find the time in other cities, you must define a reference time the world-time feature can use. That reference time is the time in your **Local City**, the city whose name is displayed on the watch screen. To choose your Local City, follow these steps:

Choosing a Local City from the City List

1. Press Watch ((F9)) to display the watch screen if it's not already displayed. The figure above shows the watch screen.
2. Move the cursor to highlight the Local City field. Use (▲) and (▼).
3. Press City ((F2)) to display the alphabetical city list. The name of the current (highlighted) city displays at the top of the screen with its current date and time.
4. Search for a city in your time zone to use as your Local City:
   a. Type the first letter of your city. The first city starting with that letter is highlighted. This letter search is case-insensitive—typing T or t will find the first city starting with T.
   b. Type the second letter of your city. The first city starting with those two letters is highlighted.
   c. Continue spelling your city's name on the keyboard until your city is highlighted. (You can search for your city in other ways. See "Searching for a City" below).
5. Press (ENTER) to end the search for your city.
6. If daylight savings time is in effect, press DST ((F6)). Three things happen:
   - One hour is added to your city's time displayed on the first line.
   - One hour is added to the difference between the time in Greenwich (London), England (Greenwich Mean Time—GMT)

and your local time. This time difference is displayed at the right end of the highlight in the GMT Offset column.

- DST (daylight savings time) is displayed at the far right of the highlighted city's entry.

7. Press (ENTER) to display the watch screen. This places the selected city, today's date, and the current time in the appropriate Local City fields. If Local City time is different from system time, a prompt is displayed asking if you want to change the HP 95LX's system time covering all applications to equal Local City time. (System time; that is, clock time, is displayed at the upper-right of most HP 95LX screens.) In most cases you'll want to answer yes (press y) to that prompt.

8. Respond with either y if you want the HP 95LX's clock changed, or n if you do not want to change the HP 95LX's clock setting.

Searching for a City

There are several reasons to search for a city:

- To display the local date and time in that city.
- To choose a city as your Local City.
- To choose a city as your World City.
- To change the daylight savings-time status of a city. (Note that you can change the daylight savings-time status of your Local and World Cities from the watch screen.)
- To view rapidly all the cities in a certain country.

Here are three ways to search the city list for a city.

To search for a city by scrolling:

Use the keys described in this table to search for a city.

Highlight Moving Keys Active in the City Screen

Key	Description
▲	Moves up one line.
▼	Moves down one line.
HOME	Moves to the first entry in the displayed screen.
END	Moves to the last entry in the displayed screen.
PG UP	Moves up to the next screen.
PG DN	Moves down to the next screen.
CTRL-HOME	Moves to the first entry in the list.
CTRL-END	Moves to the last entry in the list.

To search for a city by typing its first letter:

1. Press City (F2).
2. Type the first letter (upper- or lowercase) of the city you seek. To type letters not on the keyboard, see "Typing Characters Not on the Keyboard" at the end of this chapter. The highlight moves to the first city in the list that starts with that letter.
3. Type the second letter of the city you seek. The highlight moves to the first city in the list that starts with those two letters.
4. Continue typing letters until the city you seek is highlighted.
5. Press ENTER to complete the search.

To search for a city by searching for text:

This method of searching the city list is primarily useful if you want to view rapidly only cities in a certain country.

Note



The watch feature will search for text only within fields, not across fields. For instance, it will find "Acapulco" or "Mexico," but not "Acapulco Mexico." Also, it will not search for time intervals in the column labelled GMT Offset.

---

1. Press City (F2).
2. Press Find (F7).
3. Type the text you wish to find. The search is case-insensitive (detroit and Detroit will find Detroit.) To type letters not on the keyboard, see "Typing Characters Not on the Keyboard" later in this chapter.

4. Do one of the following:
   - Press (ENTER) to search the entire list from the beginning.
   - Press Prev ((F5)) to search only the preceding entries in the list.
   - Press Next ((F7)) to search only the following entries in the list.
5. To search for the next occurrence of the text, press Find ((F7)), then press either Prev ((F5)) or Next ((F7)).

If the text is found, the line containing that text is highlighted.

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Choosing a World City from the City List

This procedure selects the World City to be displayed on the watch screen. This city can be your initial World City for your new HP 95LX or a replacement.

1. Highlight the World City field in the watch screen.
2. Press City ((F2)) to display the city list.
3. Highlight the city you want as your World City. See "Searching for a City" earlier in this chapter.
4. Press (ENTER) to enter your chosen city into the World City field of the watch screen. The watch screen is displayed and your new world city is highlighted.

Example: Starting the World-Time Feature. In her work, Betsey Harrington often telephones Tokyo from Cambridge, Massachusetts. She's tired of trying to figure Tokyo time in her head.

To remove the confusion about Tokyo time, she decides to use her world-time feature for the first time to make Tokyo her World City. But she knows she must first set her HP 95LX's system clock and define her Local City. After using "Setting the Date and Time" in chapter 21 to set the HP 95LX's clock to Boston's Eastern Standard Time, she performs the following steps to define her Local and World Cities.

This example assumes Betsey has never used the watch feature before. You can follow these steps to enter choices for your initial Local and World Cities.

Keys:	Description:
⏲	Starts the Appointment Book.
Watch	Starts the watch accessory and displays the watch screen.
▼ ▼ ▼	Highlights the Local City field.
City	Displays the city list. Betsey is ready to select her local city. She wants to select Boston, Massachusetts since both Cambridge and Boston are in the same time zone and follow the same daylight savings time schedule.
	Now Betsey will search the city list for Boston by starting to spell "boston" on the keyboard. (She could use either lower- or uppercase letters.)
b	Types b. The first city starting with b, Baghdad, is highlighted.
o	Types o. The first city starting with bo, Bogota, is highlighted.
s	Types s. The first city starting with bos, Boston, is highlighted.
ENTER	Ends the search.
ENTER	Selects Boston as her Local City and displays the watch screen.

Her watch screen now looks like this:

```
Watch                          03/31/92 11:17 am

Stopwatch:  00:00:00.00

Timer:  00:00    Remaining:    00:00:00
Note:

Local City:  Boston, United States
  Date: 03/31/92    Time: 11:17 am

World City:
  Date:                Time:

   City                DST
Help                              ApptBk
```

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Keys:	Description:
▼	Highlights "World City" in the watch screen.
City	Displays the city list.
to ENTER	Types t and o to highlight Tokyo, then ends the search.
ENTER	Selects Tokyo as her World City and displays the watch screen, which now looks like this:

```
Watch                          03/31/92 11:18 am

Stopwatch:  00:00:00.00

Timer:  00:00    Remaining:    00:00:00
Note:

Local City:  Boston, United States
  Date: 03/31/92    Time: 11:18 am

World City:  Tokyo, Japan
  Date: 04/01/92    Time:  1:18 am

   City                DST
Help                              ApptBk
```

Now that Betsey has selected Boston and Tokyo as her local and world cities, she can see by glancing at the watch screen the current time in both cities. She can also easily display the current time in any of the cities in the city list. All she needs to do is highlight that city in the list and see the time on the first line of the screen.

Adding a City to the City List

By using this procedure repeatedly, you may add up to eight cities to the list. Since you can add duplicate cities, check the city list first to avoid an unwanted duplication.

1. Press City (F2) from the watch screen (either Local City or World City must be highlighted for the City function key to appear).
2. Press Insert (F8) to display the insert city screen.
3. Type the city name, then press ENTER. To type letters not on the keyboard, see "Typing Characters Not on the Keyboard" later in this chapter.
4. Type the country name, then press ENTER.
5. Press ▼ to highlight the system time field. (You could, instead, enter a GMT offset, but it's generally easier to determine a system time offset to enter than a Greenwich Mean Time offset.)
6. Type the time difference: local time minus system time (system time is that displayed in the upper-right corner of your screen).
7. Press ENTER. The GMT is automatically entered based on the city's system time.
8. Press Done (F10). The city list is displayed with the name of your added city highlighted. An asterisk (*) to the left of the city name identifies it as user-defined.

Example: Adding a City to the City List as a New Local City. Pressing keys in this example will give the results shown if you've just finished the previous example, or if the following are both true:

- The current Local City in your HP 95LX is now Boston or another Eastern Standard Time zone city.
- Your system time—the time displayed in the upper-right corner of your screen—is the same as your current Local City time.

Helen Ansted has just moved from Boston to Pullman, Washington. She wants to change her Local City to her new home town, but finds that Pullman is not in the city list. She could use Seattle as her Local

City (it's in the same time zone as Pullman), but wants Pullman to display on her watch screen. The following steps show how she adds Pullman to the city list, then makes Pullman her new Local City. She starts from an Appointment Book screen.

Keys:	Description:
Watch	Displays the watch screen.
▼▼▼	Highlights the Local City.
City	Displays the city list.
Insert	Displays the insert city screen.
17 Pullman ENTER	Types and enters her new local city's name. The country field is highlighted.
United States ENTER	Types and enters the country's name. The Offset, GMT field is highlighted.
▼	Moves the highlight to the offset, system time field.
-3 ENTER	Enters the offset between Pacific Standard Time and Eastern Standard Time (Pacific Time minus Eastern Time).
Done (F10)	Adds Pullman to the city list. The city list is displayed and Pullman is highlighted.



Keys:	Description:
(ENTER)	Enters Pullman in the watch screen as the new Local City. A prompt asks if she wants to change the HP 95LX's system clock to the offered time. This time was calculated by the HP 95LX from the offset Helen entered two steps above.
y	She sets her system clock to Pullman time. Now she doesn't have to use the Setup Application to change her system time.

Changing Daylight Savings Time for Your Local City

You need to tell the world-time feature when daylight savings time starts or stops in your Local City.

To make a one-hour daylight savings time change:

1. Highlight the Local City on the watch screen.
2. Press DST ((F6)). A prompt asks if you want to change the HP 95LX's clock to the displayed new time.
3. Type y to make the change. Two displayed times (and dates if necessary) on the watch screen change. These are system time in the upper right corner and Local City time.

Example: Changing the HP 95LX's Clock to Daylight Savings Time. Daylight savings time has come to Pullman, Washington. To change HP 95LX's clock to reflect this time change, Helen Ansted performs the following steps, starting from an Appointment Book screen:

Keys:	Description:
Watch	Displays the watch screen.
(▼)(▼)(▼)	Highlights Helen's local city, Pullman.
DST	A prompt offers to change the HP 95LX's clock.
y	The HP 95LX's system clock and Local City time is now set for daylight savings time.

Viewing a City's Current Date and Time

The watch screen shows the current time for your Local City and your World City. To view the current time in any city in the city list:

1. Highlight the Local City or World City field to display the `City` label.
2. Press `City` (F2) to display the city list.
3. Search the list for the city you seek. See the earlier section "Searching for a City."
4. Highlight the city you seek. That city's current date and time will be displayed on the first line of your screen.

Changing Your Local City

1. Highlight the Local City field in the watch screen.
2. Press `City` (F2) to display the city list.
3. Search for a city in the proper time zone to use as your new Local City. See "Searching for a City" earlier in this chapter.
4. Press ENTER to change your Local City.
5. If the new city time is different from the old, you're asked if you want to change the system date and time for all applications throughout the HP 95LX. Either press y to change the system date and time or press n to leave system date and time unchanged.

Deleting a City You've Entered

Only cities you've entered into the city list (marked with *) can be deleted.

1. Highlight the Local City or World City field to display the `City` label.
2. Press `City` (F2) to display the city list.
3. Highlight the city you want to delete.
4. Press `Delete` (F3).
5. Either press y to delete the city or press n to cancel the delete operation.

Editing a City's Listing

Only cities you've entered into the city list can be changed. Since you cannot type in the city list, to change a listing:

1. Delete the listing following the procedure directly above.
2. Re-enter the listing with the changes you want. See the earlier section "Adding a City to the City List."

Using the Stopwatch and Countdown Timer

Using the Stopwatch

- To start the stopwatch, display the watch screen, highlight `Stopwatch:`, then press `Start` (F6). It continues to run after you leave the Appointment Book and while the HP 95LX is turned off. When it reaches 24 hours, it resets to zero and continues to run.
- To stop it, press `Stop` (F6).
- To reset and stop it, or to reset it after pressing `Stop` (F6), press `Reset` (F4).

Using the Countdown Timer

You can use the countdown timer to sound an alarm at a specified time interval within the next 24 hours and to display a note. If you don't specify a note, the HP 95LX will display `The timer has expired.`

To start the Timer and write an optional note:

1. Press `Watch` (F9) from any Appointment Book view or to-do screen.
2. Press ▼ to move the highlight to the Timer field.
3. Type the time interval between now and the time you want the alarm to sound. For example, enter 5 hours as `5` and 5 minutes as `0:05`, `0/05`, etc. The minimum time interval is 1 minute, the maximum 24 hours.
4. Do one of the following:

- Move the highlight to the note field, type a note, and press Start (F6) to begin the countdown.
- Press Start (F6) to begin the countdown without typing a note.

The Timer continues to run after you leave the Appointment Book and while the HP 95LX is turned off.

To turn off the alarm before it turns on:

Press Stop (F6).

To turn off the alarm after it turns on:

Press ESC to stop the alarm and clear the note.

To respond to an expired alarm:

The alarm sounds for 10 seconds, and the note displays for 5 minutes. At that time, the HP 95LX's display turns off.

1. Press ON to turn the HP 95LX on if you found it turned off.
2. Press ESC to clear the note, turn off the alarm, and display the Timer screen.

To see the time interval since the alarm went off:

The Remaining field shows the time interval (maximum −24 hours) since the alarm sounded.

To control the alarm sound:

Note



Settings Alarm affects the alarm in both the watch and appointment book.

1. Press ESC or ApptBk (F9) to display an appointment book screen.
2. Select MENU Settings Alarm.
3. Select either Enable (alarm will sound) or Disable (alarm will not sound).

Typing Tools

Using User Keys

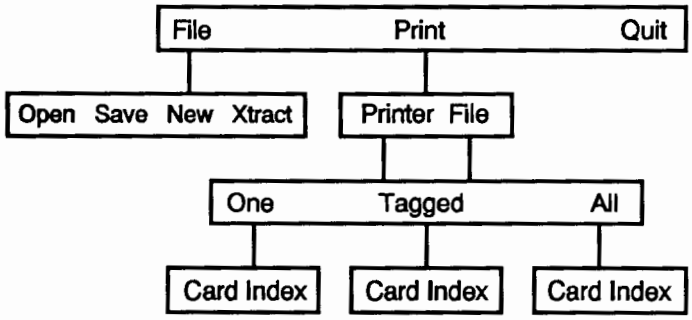
Any of the ten function keys (F1 through F10) can be assigned a sequential group of keystrokes which can then be executed ("pressed") by pressing CHAR simultaneously with that function key. This is one way a segment of text or a commonly executed command can be stored and used as needed. For more information, see "Creating and Using User Keys" in chapter 21.

Typing Characters Not on the Keyboard

The compose function is used to create international characters and other characters you cannot enter directly from the keyboard. A particular special character is created by pressing Comp (ALT-F1) followed by one or two specific alphanumeric keys. For information on compose sequences, see appendix F, "Lotus International Character Set."

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The Phone Book

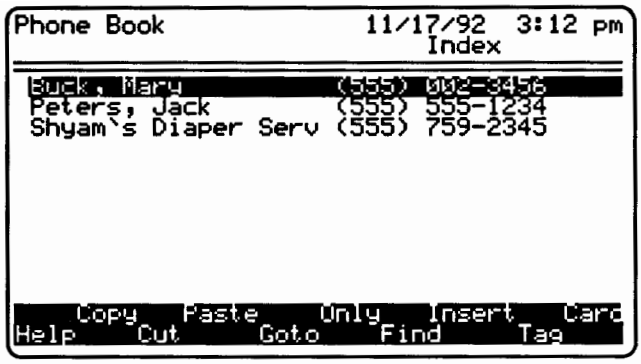


The Phone Book enables you to enter names, phone numbers, and other information (such as addresses), which are alphabetized by name automatically.

- You can search for phone numbers and other information in several ways.
- You can create and use multiple phone books.
- You can save and print selected records or entire phone books.

To open the Phone Book, press [📞]. To leave the Phone Book, select [MENU] Quit. To display a help screen, press Help ([F1]). If pressing [MENU] produces no menu, press [ESC] and try again.

Names and phone numbers are displayed as single-line entries in an **index** screen (see the figure below). Additional information like an address (plus the name and phone number) are displayed in a **card** screen (see the second figure). Each index entry has a separate card screen associated with it, and together they make up one **record**. To move between index and card screens, press Card ([F10]) or [ENTER] from an index screen and Index ([F10]) or [ESC] from a card screen.



Starting a New Phone Book

1. Press [ON] to start the Phone Book and display an index screen.
   - If this index screen contains no entries, your new phone book has started.
   - If the index screen contains phone book entries, save your current phone book, if you want to, by performing one of the procedures in the later section "Saving A Phone Book."
   - If you do *not* want to save your current phone book, select [MENU] File New and press N when you see the message `Save changes? (Y/N)`. Your new phone book has started.

Note

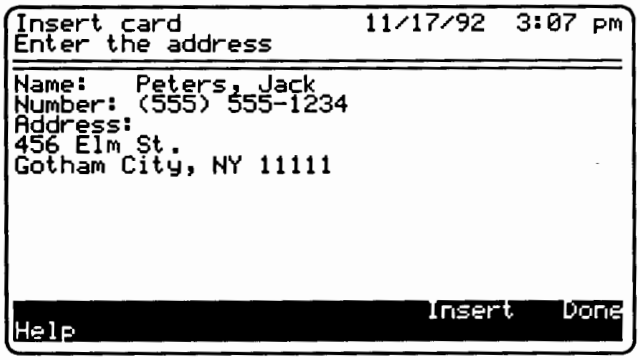


Before you leave the Phone Book, save your file (see "Saving Phone Book Records" later in this chapter). Otherwise, the Phone Book copy and the disk copy (if any) may not match. Later operations on that disk file from the Filer (printing, viewing, transferring to a PC, etc.) would be performed on an out-of-date copy.

Example: Opening, Using, and Leaving the Phone Book. In this example, you'll add three name and phone number records to your new phone book, add an address to one record, and delete one record. Then you'll leave the Phone Book application.

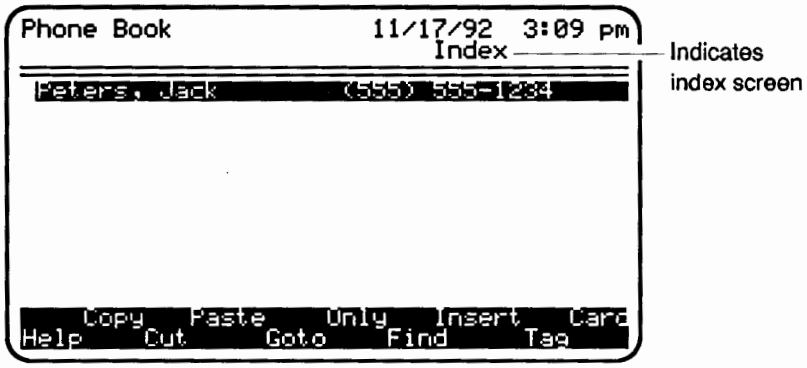
Keys:	Description:
[Phone]	Starts the Phone Book application and displays an empty index screen.
Insert	Displays the insert card screen.
Peters, Jack [ENTER]	Enters the name. Erase any errors with the backspace key ([◆]). The highlight moves to the number field.
(555) 555-1234	
[ENTER]	Enters Jack's phone number. The highlight moves down to the address field.
456 Elm St. [ENTER]	
Gotham City,	
NY 11111 [ENTER]	Enters Jack's address. Use [◀], [▶], [▲], [▼], [DEL], and [◆] to make any corrections.

Your screen should look like this:



Keys:	Description:
Done	Displays the index screen showing the Peters record.

Your screen should now look like this:



Keys:	Description:
Insert	Displays the insert card screen. You're now ready to add the second name to your phone book.
Shyam's Diaper Service (ENTER) (555) 759-2345	
(ENTER)	Enters the diaper service's name and phone number into the insert screen. The prompt invites you to add an address.
	You choose not to add an address.
Insert	Saves your second name and displays an empty insert card screen.

Computer Museum

Buck, Mary (ENTER) (555) 002-3456	
(ENTER)	Enters Mary's name and phone number into the insert card screen. You decide not to add Mary's address.
Done	Displays the index screen.
	Your screen should now look like the first figure in this chapter.
	Now you'll delete the record for Shyam's Diaper Service.
(▼)(▼)	Moves the cursor down two lines to highlight "Shyam's Diaper Service."
Cut	Deletes the highlighted record from your phone book.
(MENU) Q	Quits the Phone Book. You're asked if you wish to save the current phone book.
n	You decide to quit without saving. To save a phone book, see "Saving A Phone Book" later in this chapter.
(↩)	Reopens the Phone Book application.

To enter a record into the phone book:

See the following table for descriptions of editing and cursor-moving keys you can use when entering records and using your phone book. Also, see "Typing Tools" later in this chapter for more editing information.

1. Press (↩), if necessary, to open the Phone Book.
2. Press Insert ((F8)) to display an insert card screen.
3. Type a name, last name first, and press (ENTER).
4. Type a phone number and press (ENTER).
5. Type optional information in the address field, such as an address. Lines wrap automatically.

6. Do one of the following:
   - Press Done (F10) to enter the record into the phone book and return to the index screen.
   - Press Insert (F8) to enter the record into the phone book and display a blank insert card screen.
   - Press ESC to return to the index screen without entering the card text you've just typed.

Editing and Cursor-Moving Keys Active in the Card Screen

Key	Description
◀	Moves left one character.
▶	Moves right one character.
▲	Moves up one line within a field or up to the previous field.
▼	Moves down one line within a field or down to the next field.
◆	Moves left one space, deleting as it moves.
DEL	Deletes the character.
CTRL-ENTER	Deletes to the end of the line.
CTRL-◀	Moves to first character in previous word.
CTRL-▶	Moves to first character in next word.
HOME	Moves to the beginning of the line.
END	Moves to the end of the line.
ENTER	Adds a carriage return and moves to the next line in a multi-line field, or completes an entry and moves to the next field.
▶|	Moves down to the next field.
PG UP	Moves to the previous card screen.
PG DN	Moves to the next card screen.
ESC	Ends editing the current field and restores its previous contents, or returns to the index.

To delete a record from the phone book:

In the index screen, highlight the record you wish to delete and press Cut (F3).

Saving A Phone Book

To avoid losing any unsaved phone book records, you must save your phone book in a file before executing a command, such as (MENU) Quit or (MENU) File Open, that can cause your records to be lost. Reasons to execute (MENU) Quit include releasing memory occupied by an open Phone Book application and executing MS-DOS commands (see "Executing MS-DOS Commands" in chapter 20).

Before you execute a command that could cause loss of phone book information, the Phone Book gives you an opportunity to save before executing the command. You may select (MENU) File Save to save your phone book at any time.

Follow these procedures to save your phone book for later use in the Phone Book application. Phone books are saved as ASCII files. (To save phone book records for use in another HP 95LX application or outside the HP 95LX, see "Writing Phone Book Records to an ASCII File" later in this chapter.)

To save a phone book in a new file:

1. Select (MENU) File Save. You'll see displayed C:_DAT*.PBK with perhaps some file names also displayed.
2. Type a file name (8 characters maximum). File names are case insensitive (A = a). Your first character will replace *. If you do not type an extension, .PBK will be supplied to identify your file as a phone book.
3. Press (ENTER) to save your phone book.

To save a phone book in an existing file:

This procedure assumes you earlier selected (MENU) File Open to open an existing phone book. After changing it, you follow this procedure to save it in the same file.

- Select (MENU) File Save. You'll see displayed C:_DAT\ *filename* .PBK where *filename* is the existing name of your phone book file.
- Press (ENTER) to save your file under its existing name.

Using a Phone Book

Finding Information

Finding information means finding the record that contains that information. To find that record, search for any information on that record. For instance, you can find a company's fax number by searching for it's phone number. Knowing a person's name allows you to find his phone number. If you've forgotten a company's name and know only that it's located in Tulsa, look at the Tulsa cards and you'll probably recognize the company.

There are three ways to find phone book information:

- By scrolling.
- By searching alphabetically (find one card containing Smith by searching for s, then m, then i, etc.).
- By searching for text (find one card containing Smith or all cards containing Tulsa).

To search by scrolling:

You can scroll through index screens for a name or phone number by using the following keys.

Highlight-Moving Keys Active in the Index Screen

Key	Description
▲	Moves highlight up one line.
▼	Moves highlight down one line.
HOME	Moves highlight to the first record in the index.
END	Moves highlight to the last record in the index.
PG UP	Moves highlight up one page.
PG DN	Moves highlight down one page.

To search the index screen alphabetically:

The alphabetic search routine described here is case insensitive. You can find "Brown" by searching for "brown" or "Brown," for instance.

1. Press Index (F10), if necessary, to display the index screen.
2. Type the first letter of the name associated with the information you seek. (You can press Goto (F5) first, then type the letter.) The first name in the phone book starting with that letter is highlighted in the index screen.
3. Type the second letter of the name. The first name starting with these two letters is highlighted.
4. Repeat these steps as necessary.
5. Press ENTER to complete the search. If the information you want appears only in the card screen, press ENTER to display the card screen.

To search for one or more occurrences of a specified text:

1. Press Find (F7) from either a card or an index screen.
2. Type the text you seek, 39 characters maximum. The search is case insensitive, so you can use all lowercase letters if you want.
3. Press ENTER, Prev (F5), or Next (F7) to begin searching the entire phone book.

ENTER and Next start the search at the next record and search towards the end of the phone book. Prev starts at the previous record and searches towards the beginning. Regardless of search direction, the search continues until a match is found or until the entire phone book is searched. Wildcard characters (*) are not recognized (for information about wildcard characters, see appendix B).

Note



If the search began from an index view, and if the search is successful, the record containing the text will be highlighted *in the index view*. You may have to press Card (F10) to see the text you seek.

After a successful search, press Find (F7), then press ENTER, Prev (F5), or Next (F7) again to search for the next occurrence of your text.

To search for all occurrences of a specified text:

1. Press Only (F6) from an index screen.
2. Type the text (39 characters maximum) you're searching for. The search is case insensitive.
3. Press ENTER. The search begins with the first record. All records whose cards contain that text, if any, are displayed as a temporary list in an index screen.
4. Save some or all of these records, if you want, by using Tag (F9) as described in "To create a smaller phone book from an existing phone book" later in this chapter.
5. Press Only (F6), then ENTER, to display the entire phone book again.

If a new record is added using the insert screen while the temporary list created with Only is displayed, that record will be added to the phone book that was searched to produce this collection. This new record will be displayed in this temporary index list only if it contains the search text.

Editing a Phone Book Record

You can change any information in a record by displaying its card screen (press ENTER or Card (F10) from the index screen), then making your changes with the help of the keys described in the earlier table "Editing and Cursor-Moving Keys Active in the Card Screen."

Working with Multiple Phone Books

You can create another phone book unrelated to an existing phone book. You can also create a new phone book that contains a selection of records from an existing phone book. Two phone books might be useful, for instance, where one contains records of friends and relatives and another is devoted to companies and people important to your work.

To start another separate phone book:

1. Save your current phone book (if you want to) by following one of the procedures in the earlier section "Saving A Phone Book."
2. Select (MENU) File New. If you decided, at step 1 above, not to save your phone book, you'll see `Save changes? (Y/N)`. Press N to lose your phone book or your recent changes. An empty index screen of your new phone book is displayed.

To open an existing phone book file:

When you open the Phone Book application, the last phone book (if any) you saved will be opened automatically. To open another phone book, use this procedure:

1. Save your current phone book (if you want to) by following one of the procedures in the earlier section "Saving a Phone Book."
2. Select (MENU) File Open. If you decided, in step 1 above, not to save your phone book, you'll see `Replace file without saving? (Y/N)`. Press Y to lose your phone book or your recent changes.
3. Highlight the displayed name of the file you want to open and press (ENTER). If the file you want to open is not displayed, see the procedure below, "To display all file names."

To display all file names:

After executing (MENU) File Save, (MENU) File Open, or any other file related command, follow this procedure to display all file names in the HP 95LX's C: and A: directories.

- To display files in the _DAT directory, type `*.*` and press (ENTER).
- To display all subdirectories and files in the `C:\` directory with the `.PBK` extension, highlight `..\` and press (ENTER).
- To display all files and subdirectories in the root directory of the RAM disk, press ◆ (backspace) repeatedly to erase all but `C:\`, type `*.*`, then press (ENTER).
- To display all files and subdirectories in the root directory of a plug-in card, press ◆ (backspace) to erase the entire line, type `a:\*.*`, then press (ENTER).
- To display all files in any subdirectory, highlight the subdirectory name (for instance, `BOOKS\`), then press (ENTER).

To create a smaller phone book from an existing phone book:

1. Highlight the index entry of a record you want to save. See the earlier section "To Search by Scrolling" for highlight moving keys.
2. Press Tag ((F9)) to identify the record as one you want to include in the new phone book. (To untag a highlighted record, press Tag ((F9)) again.) The tagged file is identified by a small diamond in the left margin.
3. Repeat the steps above to tag any other records you want saved in the same new phone book. (To untag all tagged records, press Untag ((ALT)-(F9)).)
4. Select (MENU) File Xtract. You'll see displayed C:_DAT*.PBK with perhaps some file names also displayed.
5. Do one of the following:
   - Type a file name (8 characters maximum). File names are case insensitive (A = a). Your first character will replace *. If you do not type an extension, .PBK will be supplied to identify your file as a phone book. Then press (ENTER).
   - Highlight one of the displayed file names (if any) and press (ENTER). The contents of that file will be replaced with your phone book. If the file name you want is not displayed, see the earlier procedure, "To display all file names."

Printing Phone Book Records

You can print one, some, or all phone book records (index entries or card screens) on your configured printer. For information about configuring a printer for use with the HP 95LX, see "The Printer Configuration Settings" in chapter 21.

Before printing, ensure that your printer is turned on.

To print one record:

1. Highlight the index screen entry of the record you want to print.
2. Select (MENU) Print Printer.
3. Do one of the following:
   - Select One Index to print the highlighted record's index entry.
   - Select One Card to print the highlighted record in card format.

To print several records:

1. Highlight and tag (press Tag ((F9))) each index-screen entry whose record you want to print.
2. Select (MENU) Print Printer.
3. Do one of the following:
   - Select Tagged Index to print all tagged index-screen entries.
   - Select Tagged Card to print the tagged records in card format.

The All command used to print a phone book is not affected by tagged items or by the Only command (Only ((F6))).

To print a phone book:

1. Display an index screen of the phone book you want to print.
2. Select (MENU) Print Printer.
3. Do one of the following:
   - Select All Index to print all phone book index entries.
   - Select All Card to print all phone book card screens.

Writing Phone Book Records to an ASCII File

You can save one, some, or all phone book records (index entries or card screens) in an ASCII file using Print File. You can save your complete phone book using File Save.

Use one of the following Print File procedures when you intend to use one or more phone book records in another application, either inside or outside the HP 95LX. Use File Save (see "Saving Phone Book Records" earlier in this chapter) when you intend to use the phone book within the Phone Book application.

To write one record to an ASCII File:

1. Highlight the index screen entry of the record you want to write to a file.
2. Select (MENU) Print File.
3. Do one of the following:
   - Select One Index to write the record in index format to a file.
   - Select One Card to write the record in card format to a file.

4. Do one of the following:
   - Type a file name (8 characters maximum). You can use either upper- or lowercase letters. Your first character will replace *. If you type no extension, .TXT will be supplied to identify your file as a Phone Book file. Then press (ENTER).
   - Highlight a displayed file name and press (ENTER).
   - Display another file name (see the procedure earlier in this chapter, "To display all file names"), highlight a file name, then press (ENTER).

To write several records to an ASCII File:

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1. Highlight and tag (press Tag ((F9))) each index-screen entry whose record you want to write.
2. Select (MENU) Print File.
3. Do one of the following:
   - Select Tagged Index to write to a file all tagged records in index format.
   - Select Tagged Card to write to a file all tagged records in card format.
4. Do one of the following:
   - Type a file name (8 characters maximum). You can use either upper- or lowercase letters. Your first character will replace *. If you type no extension, .TXT will be supplied to identify your file as a Phone Book file. Then press (ENTER).
   - Highlight a displayed file name and press (ENTER).
   - Display another file name (see the procedure earlier in this chapter, "To display all file names"), highlight a file name, then press (ENTER).

To write a phone book to an ASCII File:

The All command used in this procedure is not affected by tagged items or by the Only command.

1. Display an index screen of the phone book you want to write to a file.
2. Select (MENU) Print File.
3. Do one of the following:
   - Select All Index to write to a file all records in index format.
   - Select All Card to write to a file all records in card format.

4. Do one of the following:
   - Type a file name (8 characters maximum). You can use either upper- or lowercase letters. Your first character will replace *. If you type no extension, .TXT will be supplied to identify your file as a Phone Book file. Then press (ENTER).
   - Highlight a displayed file name and press (ENTER).
   - Display another file name (see the procedure earlier in this chapter, "To display all file names"), highlight a file name, then press (ENTER).

Typing Tools

Using the Clipboard in the Phone Book

The keys you use to copy, move, and delete phone book records are shown in this table. (A record consists of all the information on a card.) The **Clipboard** is the special storage location used by the keys described in the following table. A phone book entry can be pasted into a memo or into notes of either to-do items or appointments.

Keys Used to Copy and Delete Phone Book Records

Function Key	Description
Copy (F2)	Copies the highlighted record to the Clipboard.
Cut (F3)	Removes the highlighted record and stores it in the Clipboard.
Paste (F4)	Inserts Clipboard contents in the current phone book. The record will be placed in the proper sort order.

Using User Keys

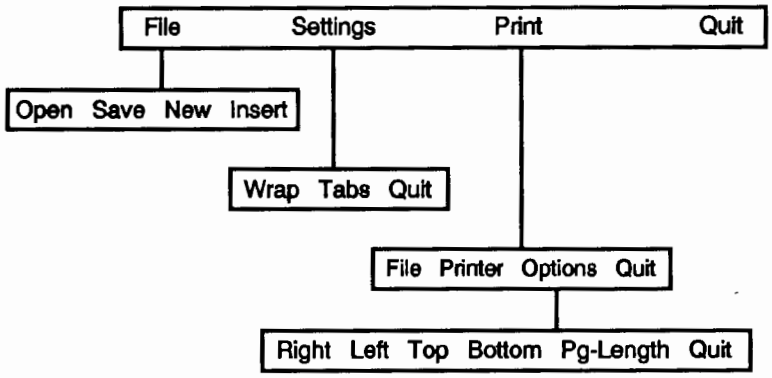
Any of the ten function keys (F1 through F10) can be assigned a sequential group of keystrokes which can then be executed ("pressed") by pressing CHAR simultaneously with that function key. This is one way to execute often used commands and to insert segments of text, such as an address, where needed. For more information, see "Creating and Using User Keys" in chapter 21.

Typing Characters Not on the Keyboard

The compose function is used to create international characters and other characters you cannot enter directly from the keyboard. A particular special character is created by pressing Comp (ALT-F1) followed by one or two specific alphanumeric keys. For information on compose sequences, see appendix F.

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The Memo Editor



The Memo Editor enables you to write or edit memos, letters, and other documents. It also enables you to print documents and save them on disk.

To open the Memo Editor, press (▤). To cancel commands, press (ESC) one or more times. For help, press Help ((F1)) at anytime. To exit the Memo Editor, select (MENU) Quit. If pressing (MENU) causes a beep, press (ESC) and try again.

Note

Before you leave the Memo Editor, save your document (see "Saving a Document" later in this chapter). Otherwise, the Memo Editor copy and the disk copy (if any) may not match. Later operations on that disk file from the Filer (printing, viewing, transferring to a PC, etc.) would be performed on an out-of-date copy.

Starting a New Document

Press [≡] to start the Memo Editor. If the screen contains text, and you wish to save it, see "Saving a Document" later in this chapter. Then select [MENU] File New to display a blank memo screen. Type your document, using the resources described in "Writing Tools" later in this chapter.

When you start typing, the **modified-since-last-saved** indicator (*) displays at the left end of the second line (just above the double line), either by itself or following the document's file name.

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Example: Writing a Memo. In this example, you'll type a memo, then make a correction.

1. Press [≡] to start the Memo Editor.
2. If the screen contains text, follow the instructions in the above section, "Starting a New Document."
3. Press [INS] (press [⇧] [DEL]), if necessary, to put the Editor into insert mode. Insert mode is indicated by `Ins` displayed in the middle of the second line on your screen. [INS] toggles between insert and overwrite (`Ovr`) modes.
4. Type the following note to Jason. To correct errors and move around the screen, use [▲], [▼], [►], [◄], [DEL], and [←] (backspace). As you type, lines wrap automatically, so you need to press [ENTER] only when you end a line before wrapping occurs (for instance, to start a new paragraph or to insert a blank line). When you press [ENTER], a line termination mark (◖) is displayed. This mark does not appear in printed memos.

   Jason:

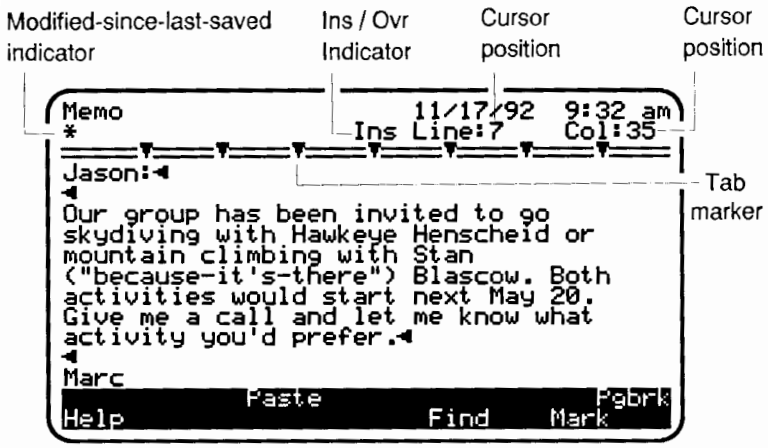
   Our group has been invited to go skydiving with Hawkeye Henscheid or mountain climbing with Stan ("because-it's-there") Blascow. Both activities would start the same day. Give me a call and let me know what activity you'd prefer.

   Marc

5. Replace "the same day" with "next May 20" by performing the following steps:
   a. Use [▲], [▼], [►], and [◄] to position the cursor on the t of the.
   b. Press Mark ([F9]).

c. Move the cursor to the y of day to highlight the text to be removed.
d. Press Cut (F3).
e. Type "next May 20" to complete the correction.

Your screen should now look like the figure below.



To delete this example, select (MENU) File New and type n in response to the prompt. To save it, see "Saving a document" later in this chapter.

Opening a Document File

To open a new document file:

1. Save your current document (if you want to) by following one of the procedures in the following section "Saving A Document."
2. Select (MENU) File New. If you decided, at step 1 above, not to save your document, you'll see Save changes? (Y/N). Press N to lose your document or your recent changes. An empty memo screen is displayed.

To open an existing document file:

1. Save your current document (if you want to) by following one of the procedures in the section below, "Saving a Document."
2. Select (MENU) File Open. If you decided, in step 1 above, not to save your document, you'll see `Replace file without saving? (Y/N)`. Press Y to lose your document or your recent changes.
3. Highlight the displayed name of the file you want to open and press (ENTER). If the file you want to open is not displayed, see the procedure below, "To display all file names."

To display all file names:

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After executing (MENU) File Open, (MENU) File Save, or any other file related command, follow this procedure to display all file names in the HP 95LX's C: and A: directories.

- To display files in the _DAT directory, type `*.*` and press (ENTER).
- To display all subdirectories and files in the `C:\` directory with the `.TXT` extension, highlight `..\` and press (ENTER).
- To display all files in the root directory of the RAM disk, press ← (backspace) repeatedly to erase all but `C:\`, type `*.*`, then press (ENTER).
- To display all files in the root directory of a plug-in card, press ← (backspace) to erase the entire line, type `a:\*.*`, then press (ENTER).
- To display all files in any subdirectory, highlight the subdirectory name (for instance, `MEMOS\`), then press (ENTER).

Saving a Document

To avoid losing any unsaved document or document changes, you must save it in a file before executing a command, such as (MENU) Quit or (MENU) File Open, that can cause your document or changes to be lost. Reasons to execute (MENU) Quit include releasing memory occupied by an open Memo Editor application and executing MS-DOS commands (see "Executing MS-DOS Commands" in chapter 20).

Before you execute a command that could cause loss of all or part of a document, the Memo Editor gives you an opportunity to save before

executing the command. You may select (MENU) File Save to save your document at any time.

Follow these procedures to save as ASCII files all or part of a document for later use in the Memo Editor. (To save a document for use in an application outside of the HP 95LX, see "Writing a Document to an ASCII File" later in this chapter.)

To save an entire document in a new file:

1. Select (MENU) File Save. You'll see displayed C:_DAT*.TXT with perhaps some file names also displayed.
2. Type a file name (8 characters maximum). File names are case insensitive (A = a). Your first character will replace *. If you do not type an extension, .TXT will be supplied to identify your file as a memo editor document.
3. Press (ENTER) to save your document.

To save part of a document in a new file:

1. Move the cursor to the beginning of the part you want to save.
2. Press Mark ((F9)). The mark indicator (Mrk) displays on the second line.
3. Move the cursor to expand the highlight to cover all the text you want to save.
4. Follow either the procedure above, "To save an entire document in a new file" or the procedure below, "To save all or part of a document in an existing file." The save operation clears the highlight from the marked text.

To save all or part of a document in an existing file:

This procedure assumes you selected (MENU) File Open to open an existing document. After revising it, follow this procedure to save it in the same file.

- Select (MENU) File Save to save your file (or the marked portion of your file—see "To save part of a document in a new file" above). You'll see displayed C:_DAT\ *filename* .TXT where *filename* is the existing name of your file.
- Press (ENTER) to save your file under its existing name.

Editing Keys

Note



(END) and (HOME) are shifted functions, so to press (CTRL)-(END), for instance, you must first press (SHIFT), then press together (CTRL) and (▶).

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Key	Description
(◀)	Moves left one character.
(▶)	Moves right one character.
(▲)	Moves up one line.
(▼)	Moves down one line.
(←)	Backspace—moves left one space deleting the previous character.
(CTRL)-(◀)	Moves to the beginning of the previous word.
(CTRL)-(▶)	Moves to the beginning of the next word.
(HOME)	Moves to the beginning of the current line.
(END)	Moves to the end of the current line.
(CTRL)-(HOME)	Moves to the beginning of the file.
(CTRL)-(END)	Moves to the end of the file.
(DEL)	Deletes the current character.
(ENTER)	Inserts a carriage-return to end the current line and moves to the first column of the next line.
(INS)	Toggles between Insert and Overwrite modes.
(PG UP)	Moves up one page.
(PG DN)	Moves down one page.
(▶|)	Inserts a tab character (insert mode) or replaces the current character with a tab character (overwrite mode), then moves text right to the next tab stop.

Inserting/Overwriting Characters

The (INS) key toggles between insert and overwrite modes. The status indicators Ins and Ovr displayed at the center of the second line on your screen indicate which mode is active.

In **insert mode**, the next character typed will be inserted before the current cursor position. In **overwrite mode**, the next character typed will be typed at the current cursor position, overwriting any character at that position.

Setting Tabs

You can set tabs at intervals from 1 to 40 characters. When you quit the Memo Editor, the tab setting is preserved, even if the current file is not saved.

1. Select (MENU) Settings Tabs. The current tab setting displays in the prompt and in the memo settings sheet.
2. To change from the default interval of 5, type an interval between 1 and 40, then press (ENTER). A tab marker, spaced at the interval you set, appears on the double-line border separating the second and fourth lines on the screen (the double-line border is the third line). The memo settings sheet is also updated.

Setting the Screen's Right Margin

Your HP 95LX is delivered with the right margin (the wrap margin for the screen) set at 40 characters, the width of your screen. You can adjust the right margin between 40 and 240 characters to accommodate files transferred to the HP 95LX from a personal computer or other source. The right margin set with this procedure affects printing only when marked text is printed. See "Printing a Document" near the end of this chapter. To display characters beyond 40 characters when the right margin is greater than 40, scroll to the right (move characters to the left) by using (▶) and (END). To scroll to the left, use (◀) and (HOME).

When you quit the Memo Editor, the right margin setting is preserved, even if the current file is not saved.

To specify the screen's right margin:

1. Select (MENU) Settings Wrap. The current right margin displays in the prompt and in the memo settings sheet.
2. Type a number from 40 to 240, then press (ENTER). The prompt and settings sheet show the new right margin.

The number of characters in a line includes trailing spaces and tabs. So you might see a word moved to the next line even though the last character of that word does not exceed the margin you set.

Highlighting Text

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Various operations (copying, moving, and deleting text; saving part of a document) require text to be highlighted. To highlight text:

1. Move the cursor to the first character of the text to be highlighted.
2. Press Mark ((F9)) to anchor the start of the highlight. The mark indicator Mrk displays on the second line of your screen.
3. Move the cursor to expand the highlight to cover all the text you want to save.

Copying, Moving, and Deleting Text

The text rearranging keys are shown in this table.

Keys Used to Copy, Move, and Delete Text

Function Key	Description
Copy ((F2))	Copies highlighted text to the Clipboard.
Cut ((F3))	Removes highlighted text from the screen and stores it in the Clipboard.
Paste ((F4))	Inserts text from the Clipboard at the current cursor position, and moves existing text to the right.
Mark ((F9))	Toggles text-marking on and off.

A move operation consists of a cut followed by a paste. A copy operation consists of a copy followed by a paste. A cut or copy operation stores the highlighted text in the **Clipboard**, a special storage location. Since a paste operation pastes a *copy* of the

Clipboard contents to your chosen destination, that text can be pasted repeatedly to various HP 95LX applications and locations.

To move or copy text to another location in the same file:

1. Highlight the text to be moved or copied. See "Highlighting Text" earlier in this chapter.
2. Press Copy (F2) if you are copying text, or press Cut (F3) if you are moving text. Tabs are stored in the Clipboard as tab characters, not as stop settings. The copy or cut operation turns off mark mode.
3. Move the cursor to the location in your document where you want the selected text placed.
4. Press Paste (F4). Tab characters are spaced according to the tab stops on the destination screen.

To delete text:

1. Highlight the text to be deleted.
2. Press Cut (F3).

Combining Files

You can insert into the Memo Editor the entire text from any ASCII file using the following procedure given sufficient HP 95LX memory. This text is inserted even if the Memo Editor is in overwrite mode.

If you want to insert text from an ASCII text file located in another HP 95LX or in a PC, copy that file into the HP 95LX's Filer application first. See "Using the Filer for Computer to Computer Communication" in chapter 20.

To insert text from another file:

1. Position the cursor in your present document at the position you want the text inserted.
2. Select (MENU) File Insert to display all files with the extension .TXT in the current directory.
3. Do one of the following:
   - To insert all the text from one of the displayed files, highlight the file name and press (ENTER).

- To insert all the text from another ASCII file, display other file names (see the earlier procedure "To display all file names"), highlight the *ASCII* file you want, then press (ENTER).

Searching for Text

You can search for any text in your current document.

1. Press Find ((F7)).
2. Type the text you want to find. The search is case insensitive—you can use all lowercase letters if you want.
3. Press Next ((F7)) or (ENTER) to initiate a search towards the end or Prev ((F5)) to search towards the beginning of your file. The search does not wrap between the beginning and end of your document. So if you start your search from somewhere in the middle of your document, search in both directions.
4. To search for another location of the text following a successful search, press Find ((F7)), then start at step 3.

Using User Keys

Any of the ten function keys ((F1) through (F10)) can be assigned a sequential group of keystrokes which can then be executed ("pressed") by pressing (CHAR) simultaneously with that function key. This is one way commands and segments of text can be stored and used where needed. For more information, see "Creating and Using User Keys" in chapter 21.

Typing Characters Not on the Keyboard

The compose function is used to create international characters and other characters you cannot enter directly from the keyboard. A particular special character is created by pressing Comp ((ALT)-(F1)) followed by one or two alphanumeric keys. For information on compose sequences, see appendix F.

Printing a Document

For information about configuring your printer, see "The Printer Configuration Settings" in chapter 21.

You can print an entire document or a highlighted portion of that document.

Before printing, you may:

- Insert page breaks into your document.
- Set the right, left, top, and bottom margins and the page length of your printout.

To insert a page break:

When a document is printed, a page break causes a page advance to the top of the next page.

1. Position the cursor at the location in your document you want a page break to occur.
2. Press Pgbrk (F10) to place a page break and a page-break symbol at that location.

To set print margins and page length:

Note



When marked text is printed to a file or a printer, the Memo Editor does not use the print margin or page length settings. The right margin is given by the screen's right margin setting (Settings Wrap). This allows printing marked text from various applications on one page.

1. Select (MENU) Print Options. The screen shows both the Print Options menu and the print settings sheet with the current settings for left, right, top, and bottom margins and for page length.
2. Select the menu option.
3. Type your choice within the displayed range (the ranges are also shown below) and press (ENTER). Right and left are measured in characters, while top, bottom, and page length are measured in lines.

Option	Range	Default Choice
Left	0 - 80	4
Right	1 - 240	76
Top	0 - 32	2
Bottom	0 - 32	2
Pg-Length	1 - 132	66

A page break command in your document (see the earlier "To insert a page break") causes the printer to advance immediately to the top of the next page, where printing continues.

19 **To print a document:**

1. If you want to print a portion of your document, highlight (mark) that portion (see "Highlighting Text" earlier in this chapter). Refer to the previous Note under "To set print margins and page length."
2. Turn on your printer.
3. Select (MENU) Print Printer. Your configured printer will print your entire document or the portion you selected.

Writing a Document to an ASCII File

You can save all or part of a document to a file by selecting either Print File or File Save.

Use Print File when you intend to use the document in another application, either inside or outside the HP 95LX. Print Options settings are used for margins and page length. Hard carriage returns are inserted at the end of each line, and tabs are expanded to spaces.

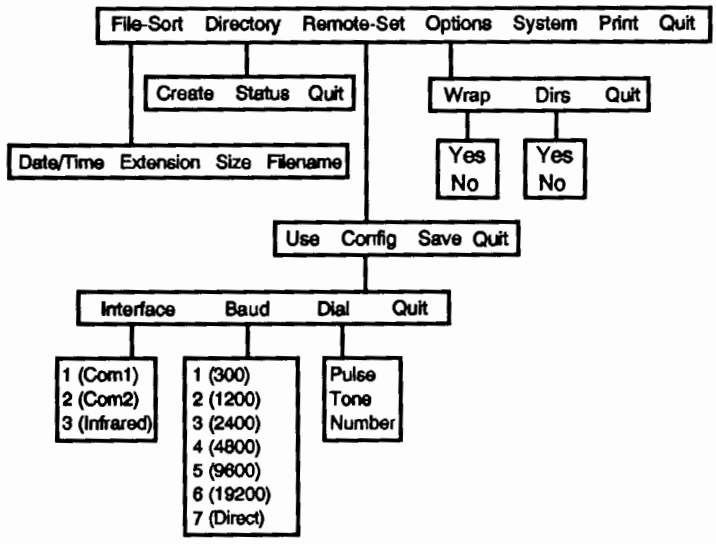
Use File Save (see "Saving a Document" earlier in this chapter) when you intend to use the document within Memo Editor. The Print Options settings described above are not used when the file is saved. No hard carriage returns are inserted, and tab characters are maintained.

To save a document for use in another application:

1. If you want to save a portion of your document, highlight (mark) that portion (see "Highlighting Text" earlier in this chapter). Refer to the previous Note under "To set print margins and page length."
2. If you want to save an entire document, make your choice of print options. See the previous procedure "To set print margins and page length."
3. Select (MENU) Print File. You'll see displayed C:_DAT*.TXT with perhaps some file names also displayed.
4. Do one of the following:
   - Type a file name (8 characters maximum). You can use either upper- or lowercase letters. Your first character will replace *. If you type no extension, .TXT will be supplied to identify your file as a Memo Editor file. Then press (ENTER).
   - Highlight a displayed file name and press (ENTER).
   - Display another file name (see the procedure earlier in this chapter, "To display all file names"), highlight a file name, then press (ENTER).

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The Filer

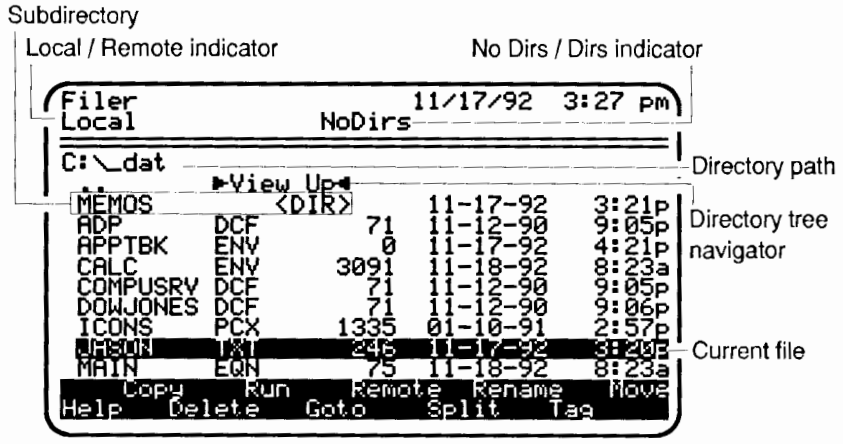


The Filer enables you to:

- Manage files and directories.
- Transfer files and directories between the HP 95LX and a PC using the Connectivity Pack.
- Run ROM and plug-in RAM based programs.
- Execute MS-DOS commands.

Starting and Leaving the Filer

To start the Filer, press (□). The display will list the subdirectories and files contained in the root directory. The following figure shows the directory structure one level down from the the root directory. It shows one subdirectory and several files contained in the directory `_dat`. (Your display may show a different file structure.) The terms used in this figure are explained in the following pages.



To quit the Filer, select (MENU) Quit. (*Quitting* the Filer when it's not in use, rather than just *leaving* it by starting another application, helps extend HP 95LX battery life.) For help, press Help ((F1)) at any time. To cancel most operations before you press (ENTER), press (ESC) one or more times.

An important feature of the Filer is its split-screen display. You can view two directories at the same time in your HP 95LX. See "Using the Split Screen" several pages ahead. You can also view at the same time directories in an HP 95LX and a PC (using the Connectivity Pack connection) and in two different HP 95LXs (using the infrared connection). See "Using the Filer for Computer to Computer Communication" towards the end of this chapter. If such a Connectivity Pack connection is made (including the installation of the software into the PC), the PC can show the same type of split screen display and can use the Filer to manage its own files.

This two-directory display makes file transfer between two directories much easier. You can highlight the file to transfer in one split-screen window and display the destination directory in the other window, then press a single function key to complete the transfer. No typing of path and file name is necessary.

File Names



The Filer uses MS-DOS file names and directory paths. For information on these, see appendix B.

Prompts



When a Filer prompt offers you a directory path and file name, you can accept all of the offering or change part or all of it. To erase part of an offered directory path or file name, use ← (backspace). To erase the entire offering, press ESC.

Working with Files

When the Filer is started, a listing of the current directory's files is displayed as shown above. The **directory path** identifies the **current directory** whose files and subdirectories are currently displayed. The **current file** is the highlighted file. In the figure above, the directory path is C:_dat, the current directory is _dat and the current file is JASON.TXT.

Viewing Files in a Directory

Use ▲, ▼, PG UP, PG DN, HOME, and END to move through the directory's list of files.

Viewing the Contents of a File

To specify a file:

You can view the contents of a file in two ways:

- Highlight the file in the directory and press ENTER.

- Press Goto (F5), type the file's path and name (including extension), then press ENTER.

Press ESC to return to the directory screen.

If the file's name can be quickly displayed on your screen, highlighting that name could be the easiest way to specify the file. Otherwise, if you know the file's path and name, it might be easier to type them after pressing Goto (F5). Using Goto (F5) might be even more desirable for often-used files if a user key were assigned that file's path and name. Then pressing that user key would display the name and path, making typing unnecessary. See "Using User Keys" at the end of this chapter.

To control line wrapping:

If a line in your viewed file is longer than the width of the HP 95LX's screen, only the first 40 characters of that line are normally displayed. You cannot scroll those off-screen characters onto the display, but you can use line wrapping to make the entire line visible.

To control line wrapping in a displayed file:

1. Select MENU Options Wrap.
2. Do one of the following:
   - Select Yes to enable line wrapping.
   - Select No to disable line wrapping.

Selecting Files for File Operations

Most file operations (copy, move, delete, and print) can be performed on single files and on several files at once. To select one file for an operation, highlight the file. To select several files for a single operation, tag the files (see the table below). To tag a file, highlight it and press Tag (F9). The tagged file is identified by a small diamond in the left margin.

When a file operation begins, the HP 95LX first looks for one or more tagged files to act upon. If it finds none, it then selects the single highlighted file. To avoid the problems left-over tags could create, the HP 95LX automatically erases any and all tags after any file

operation. So before you begin any file operation, all files should be tag-free. If you want to be certain that no tags remain, press Untag (ALT-F9) to erase any remaining tags before you select your file or files.

File Tagging Keys

Function Key	Description
Tag (F9)	Tags or untags the highlighted file.
Up (ALT-F4)	Tags the highlighted file and all preceding files in the current directory.
Down (ALT-F3)	Tags the highlighted file and all subsequent files in the current directory.
All (ALT-F5)	Tags all files in the current directory.
Untag (ALT-F9)	Removes tags from all files in the current directory.

Copying, Moving, and Deleting Files

See "Using the Split Screen" later in this chapter for information about file operations using the split screen.

Caution



The HP 95LX allows you to delete an entire directory, *including all subdirectories and files,* but only if Options Dirs *Yes* is selected. When you receive your new HP 95LX, Options Dirs *No* is selected, which prevents any operations on directories. Before performing copy, move, and delete operations on files, a safe (but not necessary) choice is to select Options Dirs *No* (unless it's already chosen). When Options Dirs No is active, NoDirs is displayed in the center of the second line of your directory, as shown in the earlier figure.

Note



In all operations, if the prompt field contains characters, ESC will clear the field. If the field is empty, ESC will cancel the operation.

To copy or move a single file:

1. Highlight the file.
2. Press Copy (F2) or Move (F10).
3. Type the destination path (and file name, if different from the current file name).
4. Press ENTER to copy or move the file.

Note



You can stop a copy, move, or delete operation in progress involving several files. To stop an operation, press CTRL-BREAK (press at the same time the CTRL and ← (backspace) keys). After pressing CTRL-BREAK, some individual file operations may have been completed. Unless the number of files is large, you must act quickly to stop the operation before it's finished.

To copy or move several files:

1. Use the keys in the earlier table, "File Tagging Keys," to tag the files you want to copy or move.
2. Press Copy (F2) or Move (F10).
3. Type a destination directory path.
4. Press ENTER to copy or move the files.

To delete a single file:

1. Highlight the file.
2. Press Delete (F3).
3. Select Yes to delete the file, or select No to cancel the delete operation.

To delete several files:

1. Use the keys in the previous table, "File Tagging Keys," to tag the files you want to delete.
2. Press Delete (F3).
3. Select Yes to delete the files, or select No to cancel the delete operation.



Renaming a File

You can rename a single file as a separate operation or as part of a single-file copy or move operation described above. During the copy or move procedure, you may type a new name following the destination path you type.

This procedure renames a file as a separate operation:

1. Highlight the file.
2. Press Rename (F8)
3. Type a new file name.
4. Press ENTER to rename the file.

Working with Directories

Viewing the Current Directory

To display information about the current directory:

1. Press MENU.
2. Select Directory Status to display the status screen.
3. Press ESC to return to the previous screen.

The directory status screen displays the following information about the active directory: the number of subdirectories under the currently displayed directory, the number of files, the number of bytes in the directory, the bytes remaining on disk, and the volume label. If there are over 100 files in the directory, this information covers only the first 100 files.

If your directory contains more than 100 files, an inc (incomplete listing) indicator appears above the directory listing. You can view *all* files in a directory regardless of the number of files it contains by selecting MENU System, then executing appropriate MS-DOS commands. Note that Filer copy, move, and delete operations on a directory affect all files in that directory, even those beyond this 100-file limit.

To choose the order files are listed in directories:

A directory always lists its subdirectories first, followed by its files. The HP 95LX offers four ways to list files. When you receive your new HP 95LX, files are listed alphabetically by file name, but you can choose any of the other three listing methods. The ordering scheme selected applies to all directory listings, those displayed in a single screen and in a split-screen, both local and remote. The procedure below defines these schemes and describes how to select each one.

1. Press (MENU).
2. Select File-Sort followed by the selection of one of the following menu commands:
   - Select Date/Time to sort according to the file-creation date and, secondarily, by file-creation time. Most recent files are listed first.
   - Select Extension to sort alphabetically according to the file's extension. Files with no extensions are listed first.
   - Select Size to sort according to the file size, in descending order.
   - Select Filename to sort alphabetically by file name.

Changing the Current Directory

To reach a higher level directory by scrolling:

There are two ways to move up the "inverted tree" directory structure towards the root directory:

Do one of the following:

- Press (ESC) to move up one level. Continue to press (ESC), if necessary, to reach the directory you seek.
- Press (▲) as needed to highlight ▶View Up◀, the **directory tree navigator**. Then press (ENTER) to reach the next higher level directory. Continue to highlight ▶View Up◀ and press (ENTER) as needed to reach the directory you seek.

To reach a lower level directory by scrolling:

1. Highlight the subdirectory you seek.
2. Press (ENTER) to make that subdirectory the current directory.
3. Repeat these steps as needed to display the directory you seek.

To reach another directory by name:

You can reach any directory within the HP 95LX, including the root directory A:\ of the plug-in RAM card. You can also, by using the Connectivity Pack, reach any directory in the remote PC, including the root directory in any drive (A:\, B:\, C:\, D:\, etc.).

1. Press Goto (F5).
2. Type the path of the directory you seek.
3. Press ENTER to display that directory.

Creating a New Directory

When you create a new directory, the current directory continues to display.

To create a new subdirectory:

1. Display the directory to which the new subdirectory will belong.
2. Select MENU Directory Create.
3. (Optional) Move the cursor to the end of the displayed path.
4. Type a directory name and press ENTER. The current directory continues to display, and now shows the new subdirectory.

To create a new directory at another level:

1. Select MENU Directory Create.
2. Change the offered path as desired, then type a directory name.
3. Press ENTER to create the new directory.

Copying, Moving, and Deleting Directories

If you want to copy or move directories using the split screen, see "Using the Split Screen" later in this chapter for information.

Note



When an operation is performed on a directory, *all* of its contents, including subdirectories and the files within them, are copied, moved or deleted.

Note



You can stop a copy, move, or delete operation in progress involving directories. To stop an operation, press CTRL-BREAK (press at the same time the CTRL and ← (backspace) keys). After pressing CTRL-BREAK, some individual operations may have been completed. Unless the number of files involved in the directory operation is large, you must act quickly to stop the operation before it's finished.

To copy or move a directory and its contents:

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1. Press MENU.
2. Select Options Dirs Yes.
3. Highlight the directory or tag several directories you want to copy or move.
4. Press Copy (F2) or Move (F10).
5. Type a directory path.
6. Press ENTER to copy or move the directory or directories.
7. Select Options Dirs No to protect against a future unwanted directory operation.

To delete a subdirectory and its contents:

1. Press MENU.
2. Select Options Dirs Yes.
3. Highlight the directory or tag the directories you want to delete.
4. Press Delete (F3).
5. Either select Yes to delete the directory or directories (including contents), or select No to cancel the operation.
6. Select Options Dirs No to protect against a future unwanted directory operation.

Using the Split Screen

The Filer's split screen display simplifies copying and moving files and other directory management tasks, whether performing operations within the HP 95LX, between an two HP 95LXs, or between an HP 95LX and a PC linked together with the Connectivity Pack or by a modem.

To toggle between a single- and split-screen display, press Split/Full (F7).

To understand the use of the split-screen display, review the following example. It shows a file copy operation between two directories within the HP 95LX. You can use a similar procedure to transfer files or directories between an HP 95LX and a PC or between two HP 95LXs. See "Using the Filer for Computer to Computer Communication" later in this chapter.

You may read this example without pressing keys, or press keys after matching on your HP 95LX the initial conditions listed below. (You may also press keys using your own choices for directory and file-to-copy.)

When this example begins, the following situation exists:

- The HP 95LX screen you are viewing is a single screen and shows the root directory C:\.
- You want to move the 1-2-3 worksheet C:\EXPENSES.WK1 to the directory C:\LOTUS.

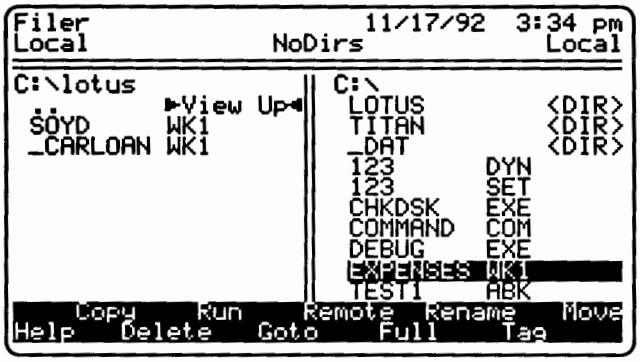
Here are the main actions demonstrated by this example:

1. Display the destination directory in one window.
2. Highlight the file to copy in the other window.
3. Copy the file.

Here are these actions described in more detail:

1. Split your screen (press Split (F7)). Both screens display the current local HP 95LX root directory C:\, but only the left window contains the highlight bar. You see the subdirectory lotus.
2. Highlight the subdirectory lotus in the left window.
3. Display the lotus directory (press ENTER). This is the destination directory.
4. Move to the right window (press ▶) and highlight the file EXPENSES.WK1. Now the file you want to copy is highlighted

and the destination directory is displayed, as shown in the figure below.



5. Press Copy (F2) to display on the top two lines, `Copy 'expenses.wk1' to: C:\lotus\expenses.wk1`.
6. Press ENTER to copy the file. In the left window, EXPENSES.WK1 appears as a file in the `C:\lotus` directory.

No typing of file names or directory paths was necessary.

Running a Program from the Filer

You can run files with extensions .EXE, .BAT, or .COM from the Filer, provided no other applications except the Filer are open. Programs written for larger displays can be run satisfactorily on the HP 95LX. The section "Accessing MS-DOS" at the beginning of Appendix B describes **cursor tracking**, a special feature that allows the HP 95LX screen to become a window that moves to view the full 80-character wide MS-DOS screen. This window will follow the cursor automatically, and you can move the window independently of the cursor by pressing ALT-►, ALT-◄, ALT-▲, and ALT-▼. You can disable this cursor-tracking feature by executing the MS-DOS command DISPCTL, described in Appendix B.

Running a Program from a Plug-in RAM or ROM Card (Drive A:)

1. Install the card. See "Inserting and Removing RAM Cards" in chapter 1.
2. Ensure that you have only the Filer application running, since otherwise you can't run a program from a plug-in card.
3. Display the directory for drive A:.
4. Highlight the executable file (extension .EXE, .BAT, or .COM) you want to run.
5. Press Run ([F4]) to run the application. If other applications are open, a message will inform you and state `Cannot launch file`. In that case, press [ESC], close all other open applications, and repeat this step.
6. To return to the Filer, quit the program, then press any key.

Running a Program from the Internal RAM Disk (Drive C:)

1. Ensure that you have only the Filer application running, since otherwise you can't run a program from drive C:.
2. Display the directory for drive C:.
3. Highlight the executable file (extension .EXE, .BAT, or .COM) you want to run.
4. Press Run ([F4]) to run the application. If other applications are open, a message will inform you and state `Cannot launch file`. In that case, press [ESC], close all other open applications, and repeat this step.
5. To return to the Filer, quit the program, then press any key.

Executing MS-DOS Commands

1. Ensure that you have only the Filer application running, since otherwise you can't access MS-DOS.
2. Select (MENU) System. You have now accessed MS-DOS.
3. Execute any HP 95LX MS-DOS internal command. You can also execute CHKDSK and FORMAT. For information on available commands, see Appendix B.
4. To return to the Filer, type `exit` at the DOS prompt, press (ENTER), then press (ENTER) again (or any key) to continue.

Using the Filer for Computer to Computer Communication

Using the Filer, you can copy and move files and directories between two HP 95LXs or between an HP 95LX and a PC, delete files and directories in either computer, and perform in either computer the other file and directory operations described earlier in this chapter. You can use the split screen—one half of the screen for each computer. For information on using the split screen, see "Using the Split Screen" earlier in this chapter.

You can also use two full screens for computer to computer communication. You switch between them by pressing the `Local/Remote` ((F6)) toggle.

The `Local` or `Remote` indicator tells whether the screen is displaying local directories (those in the computer you're operating) or remote directories (those in the computer connected by infrared, cable, or modem to the computer you're operating). In a single screen, this indicator is at the left end of the second display line (above the double line). In a split screen, each screen has its own `Local` or `Remote` indicator located at either end of the second line. Note that the computer you're operating can be an HP 95LX or a PC.

Your split screen can show two local directories, one local and one remote, but you cannot show two remote directories.

If you are using a split screen for local/remote file operations and wish to perform file operations within the local directory structure

without terminating the local-remote connection, press Full (F7) to display a single screen, then press Local (F6) if necessary, to display your local directory on a full screen. When you've finished your local directory operations, press Split (F7), then press Remote (F6) to view again your local/remote split screen.

Note



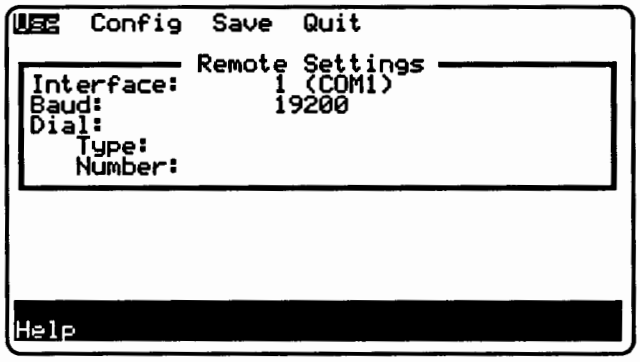
The Filer cannot run remote files; that is, you can only use Run (F4) to run executable files from a local directory. See the previous "Running a Program from the Filer."

You can transfer one or more files or directories in either direction, local to remote or remote to local.

Communicating Between the HP 95LX and a PC

Configuring the HP 95LX for Communication

The Filer application, both the one included with each HP 95LX and the one included with the Connectivity Pack, defaults to certain configuration settings. These are shown in the figure below. Each time you start the Filer, these settings will be in effect.



Preparing the Hardware

Refer to the instructions supplied with your Connectivity Pack. You need to connect the Connectivity Pack cable (part of your HP F1001A Connectivity Pack accessory) to your HP 95LX and to the IBM-compatible PC. The connectors on the cable are designed to plug directly into the two computers. The Connectivity Pack software also must be installed on the PC. Connect your modem (if any) using its own instructions.

Making and Using the Connection

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Use the default configuration settings for a direct HP 95LX to PC connection using the Connectivity Pack. Once the Connectivity Pack in installed, this one keystroke makes the connection:

Press Remote ((F6)) from the system you want to be your local system (the one you'll operate). The remote Filer will display a message that it is in server mode. The local Filer will display a local directory in the local window and the current remote directory in the remote window.

For information about using your connection for file and directory operations, see "Using the Split Screen" earlier in this chapter.

Ending an HP 95LX Communication Session

Caution



The Quit command does disconnect the remote computer, but it:

1. Does *not* save your configuration file changes.
2. Does *not* hang up your phone after a modem communication session.

Before leaving the Filer, be sure to save any configuration file changes and, if you were using a modem, issue a hangup command. See the procedure below.

To turn the Connectivity Pack connection off:

1. Press Discon ((ALT)-(F6)) to turn off the Filer connection.
2. Press Hangup ((ALT)-(F7)) if you've used a modem.

To create your own configuration file:

You must change configuration settings from those supplied if you want to communicate with a PC through a modem. Once these settings are established, you can save them in a configuration file. You can also create and save other configuration files for communication with other devices.

The procedure below tells you how to select configuration settings on your HP 95LX and on your PC for a Connectivity Pack/PC connection, either by cable or phone. These same configuration settings must be active in both your HP 95LX and the PC before communication can occur. Later procedures tell you how to save these settings in a file and how to choose a configuration file.

1. Press (MENU).
2. Select Remote-Set Config.
3. Select Interface 1 (Com1).
4. Select Baud, then select by number (1–6) one of the displayed values.
5. Do the following if you plan to use a modem:
   a. Select Dial, then select Pulse or Tone.
   b. Select Dial again, then select Number.
   c. Type the phone number you'll call using your modem. Use no other characters except space, numbers, left and right parentheses, comma, and hyphen. For instance, this is acceptable: (555) 123-4567,
6. Select Quit twice to leave the menus.

Remote-Set Config Interface and Baud Choices

Parameter	Selections Offered
Interface	1 (Com1), 2 (Com2), 3 (Infrared) (communication port choices). Choosing Infrared automatically selects both the infrared port and the optimum Baud rate of 2400.
Baud	1 (300), 2 (1200), 3 (2400), 4 (4800), 5 (9600), 6 (19200), 7 (Direct).

Note



The baud choice 7 (Direct) sets the HP 95LX's fastest transmission rate. However, the Direct rate may not work for all systems, and it cannot be used for modem connections.

To save a configuration file:

You can save your settings in a configuration file so you won't have to reset them each time you make a connection. To save them, use the procedure below:

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1. Press (MENU).
2. Select Remote-Set Save. The screen shows C:_DAT*.FCF, and one or more file names may be displayed.
3. To specify a file name and save your configuration file, do one of the following:
   - Press (ENTER) to save your file under the name of the current (highlighted) configuration file.
   - Highlight a file name (use (▲), (▼), (►), and (◄)) and press (ENTER).
   - Type a new file name, omitting the path (the path C:_DAT\ will be supplied by the Filer) and press (ENTER). The HP 95LX will supply the .FCF extension.

To choose and activate a configuration file:

Once you've saved a configuration file, follow these steps to use it in the future.

1. Press (MENU).
2. Select Remote-Set Use to display a list of configuration files.
3. Press (◄), (►), (▲), and (▼) as necessary to highlight the name of the file you want.
4. Press (ENTER) to activate the configuration settings in the chosen file.

Note

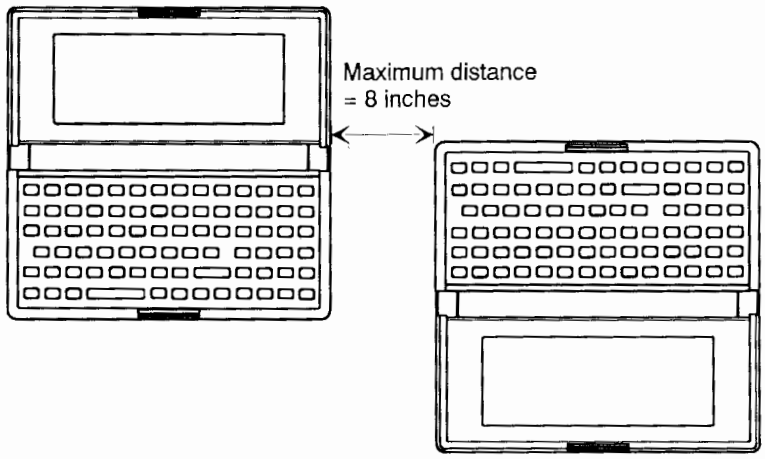


Ensure that the same settings are active in both computers. Otherwise, no communication can occur.

Communicating Between two HP 95LXs

In both HP 95LXs:

1. Press (MENU).
2. Select Remote-Set. The current remote settings sheet is displayed.
3. Select Config Interface 3 (Infrared); that is, press C I 3. This not only selects the infrared port but also sets the baud rate to the optimum infrared communication value of 2400. All configuration settings are now set correctly. Select Quit Quit to leave the menus.
4. Position the two HP 95LXs with their infrared ports directly opposite each other and separated by no more than 8 inches, as shown in the figure below. The infrared port is lined up with the third row of keys, counting from the top (the row with (7), (8), and (9)).



5. Press Remote ((F6)) to establish the infrared connection.
6. From the local HP 95LX perform any desired file or directory operation between the two HP 95LXs as described in "Using the Split Screen" earlier in this chapter.
7. Press Discon ((ALT)-(F6)) to disconnect the infrared connection when you're through communicating.

While you can always activate the infrared configuration by selecting (MENU) Remote-Set Config Interface 3 (Infrared), you can save this configuration file and then activate it as you would any other

configuration file. See "To save a configuration file" and "To choose and activate a configuration file" earlier in this chapter.

Printing Files and Directories

For information about configuring your printer, see "The Printer Configuration Settings" in chapter 21.

You can print one or more files or directories using the Filer's Print command. For files created by other HP 95LX applications, such as the Memo Editor, that application's Print command offers more printing choices than does the Filer's command.

Follow these steps to print one or more files or directories.

1. Highlight a file or directory or tag the files or directories you want to print.
2. Turn on your printer.
3. Select (MENU) Print. The contents of each selected file or a listing of each selected directory will be printed.

Typing Tools

Using User Keys

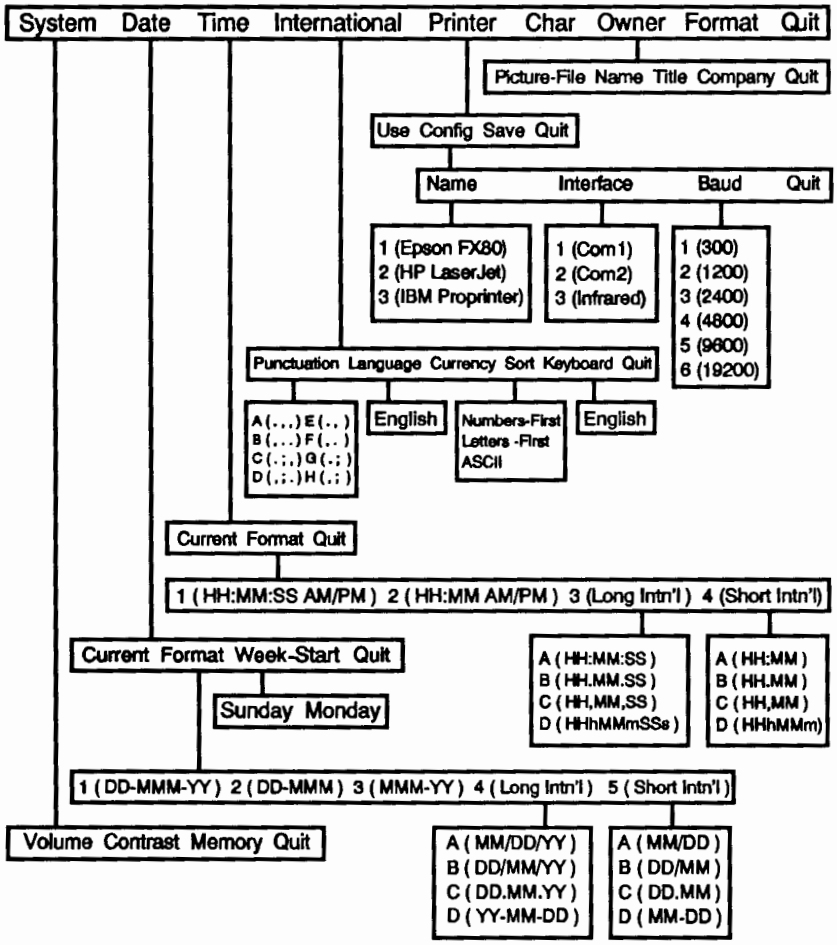
Any of the ten function keys ((F1) through (F10)) can be assigned a sequential group of keystrokes which can then be executed ("pressed") by pressing (CHAR) simultaneously with that function key. This is one way a frequently used command or segments of text, such as a file's path and name, can be stored and inserted where needed. For more information, see "Creating and Using User Keys" in chapter 21.

Typing Characters Not on the Keyboard

The **compose** function is used to create international characters and other characters you cannot enter directly from the keyboard. A particular special character is created by pressing Comp ((ALT)-(F1)) followed by one or two alphanumeric keys. For information on compose sequences, see appendix F.

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The Setup Utility

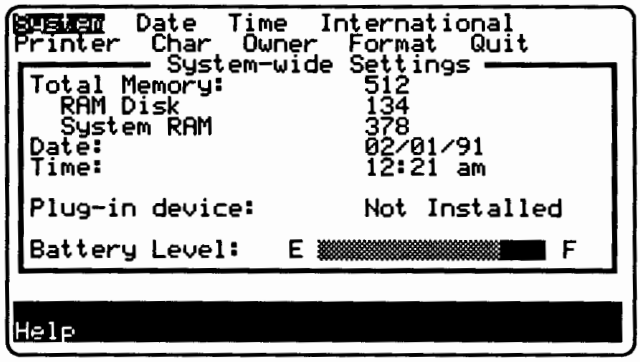


The Setup utility establishes settings for the HP 95LX:

- Volume and screen contrast.
- Memory allocation.
- Date and time and their formats.
- Language and punctuation settings.
- Sorting order (collating sequence).
- Printer configuration.
- User keys.
- Your Business Card display (or other customized image).

The Setup utility also formats RAM cards.

21 Press (SET UP) ((⌂) (□)) for the Setup menu. The display includes a list of many of the current Setup settings.

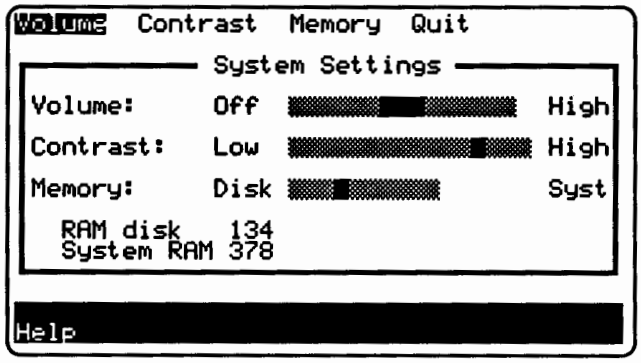


Note that Help (press (F1)) is always available.

Use (ESC) or Quit to exit a screen that you don't want to complete or use. To leave the Setup utility, use Quit from the main menu.

Specifying Volume, Contrast, and Memory

Select System for the System menu:



This settings sheet shows you the current settings for volume, display contrast, and allocation of memory (RAM).

Volume Control

To adjust the volume:

1. Select System Volume.
2. Press ◀ or ▶ to move the bar to decrease or increase the setting.
3. Press ENTER to save the setting, ESC not to.

Display Contrast

To adjust the contrast of the display:

1. Select System Contrast.
2. Press ◀ or ▶ to move the bar to decrease or increase the contrast.
3. Press ENTER to save the setting, ESC not to.

Memory Allocation

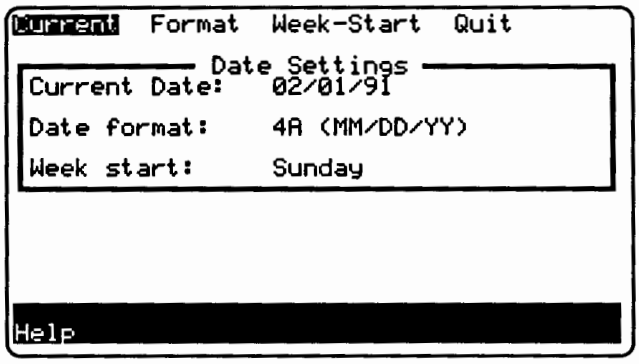
You can allocate the available random-access memory (RAM) between the operating system and the RAM disk (drive C:). (See "Managing HP 95LX Memory" in chapter 1 to learn more about the memory.)

To adjust the allocation of RAM:

1. Close ([MENU] Quit) any open applications other than Setup.
2. Select System Memory.
3. Press [◄] or [►] to increase the proportion of memory allocated to system RAM or the RAM disk by 8KB increments. With each key press, the figures for System RAM and RAM disk change. (The position of the bar reflects the relative amounts of allocated RAM.)
4. When you have the allocation you want, press [ENTER].
5. When you're prompted to reboot the system, press [ENTER] again to reboot or press [ESC] to cancel the change. The change does not take effect until the system is rebooted.

Setting the Date and Time

Select Date or Time for the Date menu or Time menu:



The Date and Time menus specify the current date or time and their formats for all applications except 1-2-3. (However, printing headers and footers in 1-2-3 is affected by the formats set here.) The Date menu also specifies the day (Sunday or Monday) that begins a week, which is relevant for the Appointment Book.

Date Settings

The current date setting establishes the current date throughout the HP 95LX. The format setting, however, does not affect 1-2-3 except in the printing of headers and footers. (1-2-3 has its own commands for format settings.)

To set the current date:

1. Select Date Current.
2. Type in the date according to the current format shown on the screen. (You can drop leading zeros.)
3. Press (ENTER).

The date **delimiters** (punctuation between numerals) can be any one of these: hyphen, slash, space, colon, period, or comma. The current date can be in any year from 1980 through 2099. You can specify years 1980 through 2079 by their last two digits—for example, 1992 can be entered as 92.

To set the date format:

1. Select Date Format.
2. Select the desired format from the menu. (Type the corresponding digit or use the arrow keys and (ENTER).)
3. If you select option 4 or 5 (Long International or Short International), you receive four more options: A, B, C, D.

The following table shows the available format options, each including an example date of August 14, 1994.

Date Formats

Label	Format	Example
1	DD-MMM-YY	14-AUG-94
2	DD-MMM	14-AUG
3	MMM-YY	AUG-94
4	Long Intn'l	
A	MM/DD/YY	08/14/94
B	DD/MM/YY	14/08/94
C	DD.MM.YY	14.08.94
D	YY-MM-DD	94-08-14
5	Short Intn'l	
A	MM/DD	08/14
B	DD/MM	14/08
C	DD.MM	14.08
D	MM-DD	8-14

These format options are the same as those available for 1-2-3.

To specify the first day of the week (for the Appointment Book):

1. Select Date Week-Start.
2. Select Sunday or Monday using ◀ and ▶.
3. Press ENTER.

Time Settings

The current time setting establishes the current time throughout the HP 95LX. The format setting, however, does not affect 1-2-3. (1-2-3 has its own commands for format settings.)

To set the current time:

1. Select Time Current.
2. Type in the time according to the current format shown on the screen.
3. Press ENTER.

The time **delimiters** (punctuation between numerals) can be any one of these: hyphen, slash, space, colon, period, comma, or h m s.

To set the time format:

1. Select Time Format.
2. Select the desired format from the menu. (Type the corresponding digit or use the arrow keys and (ENTER).)
3. If you select option 3 or 4 (Long International or Short International), you receive four more options: A, B, C, D.

The following table shows the available format options, each including an example time of 2:03:07 pm.

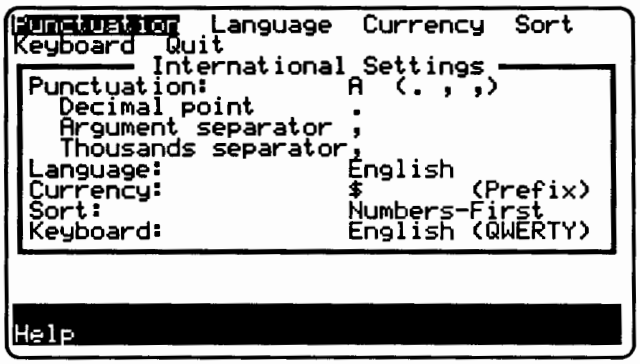
Time Formats

Label	Format	Example
1	HH:MM:SS (AM/PM)	02:03:07 pm
2	HH:MM (AM/PM)	02:03 pm
3	Long Intn'l (24 hr.)	
A	HH:MM:SS	14:03:07
B	HH.MM.SS	14.03.07
C	HH,MM,SS	14,03,07
D	HHhMMmSSs	14h03m07s
4	Short Intn'l (24 hr.)	
A	HH:MM	14:03
B	HH.MM	14.03
C	HH,MM	14,03
D	HHhMMm	14h03m

These format options are the same as those available for 1-2-3.

Setting the Punctuation and Language Conventions

Select International for the International menu:



This menu includes the current settings for punctuation, language, currency, sorting order, and keyboard mapping.

Note



In order for new punctuation, language, and currency settings to take effect in 1-2-3, you must quit 1-2-3 and then restart it. Also, the settings in any 123.CNF file present at startup take precedence over the settings made here.

Digit and Argument Separators

The Punctuation command specifies which symbols are used for the decimal point in numbers, the argument separator for @functions and advanced macro commands, and the thousands separator in numbers.

The Punctuation setting establishes the symbols used by the Calculator and the default symbols used by 1-2-3.

To specify the symbols for the decimal point, argument separator, and thousands separator:

1. Select International Punctuation.
2. Select the desired set of symbols (for decimal point, argument separator, and thousands separator) from the menu. (Type the corresponding letter or use the arrow keys and (ENTER).)

Punctuation Symbols

Label	Combination	Examples		
		Decimal Point	Argument Separator	Thousands Separator
A	. , ,	2.3	@PMT(B1,B2/12,B3)	1,234
B	, . .	2,3	@PMT(B1.B2/12.B3)	1.234
C	. ; ,	2.3	@PMT(B1;B2/12;B3)	1,234
D	, ; .	2,3	@PMT(B1;B2/12;B3)	1.234
E	. , space	2.3	@PMT(B1,B2/12,B3)	1 234
F	, . space	2,3	@PMT(B1.B2/12.B3)	1 234
G	. ; space	2.3	@PMT(B1;B2/12;B3)	1 234
H	, ; space	2,3	@PMT(B1;B2/12;B3)	1 234

These eight combinations are the same as those options given (and specifiable) in 1-2-3.

Language, Keyboard, and Currency Settings

To specify the language used for all text in the HP 95LX:

1. Close ((MENU) Quit) all applications other than Setup.
2. Select International Language.
3. Select the desired language from the menu. (Type the first letter or use the arrow keys and (ENTER).) Note that the U.S.A. model of the HP 95LX offers English only.

To specify the keyboard for the HP 95LX character set:

1. Select International Keyboard.
2. Select the desired keyboard from the list. Your keyboard selection should match the physical keyboard your HP 95LX has. Note that the U.S.A. model of the HP 95LX offers English only.

By default, the Keyboard setting agrees with the Language setting. However, in some cases, you might want to use a keyboard lay-out for one language while using your applications in another language.

To specify the currency symbol:

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1. Select International Currency.
2. Type the character (or Compose sequence) for the currency symbol. (For information on Compose sequences, see appendix E.)
3. Select Prefix or Suffix for the position of the symbol.
4. Press (ENTER).

Specifying the Sorting Order

The Sort command specifies the sorting order—called the *collating sequence*—used in 1-2-3 by the /Data Sort command. (Note that 1-2-3 sorts cells, labels, and values.)

Sorting Options

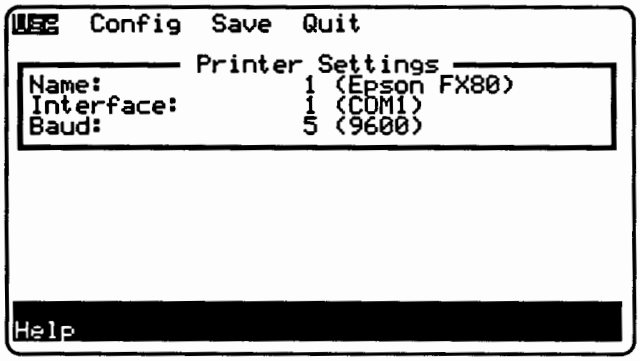
Collating Sequence	Sorting Order
Numbers-First	1. Blank cells. 2. Labels beginning with numbers, in numerical order. 3. Labels beginning with letters, in alphabetical order. Capitalization is ignored. 4. Labels beginning with other characters. 5. Values.
Letters-First	1. Blank cells. 2. Labels beginning with letters, in alphabetical order. Capitalization is ignored. 3. Labels beginning with numbers, in numerical order. 4. Labels beginning with other characters. 5. Values.
ASCII	1. Blank cells. 2. All labels using their ASCII values. Uppercase letters precede lowercase letters. 3. Values.

To change the sorting order:

1. Select International Sort.
2. Select the desired sorting order from the menu. (Type the first letter or use the arrow keys and ENTER.)

The Printer Configuration Settings

Printer configuration files in the Setup utility control the printing of all information in all files of all applications. Selecting Printer displays the current printer configuration settings. Here are the default settings:



You can change these settings using the Config command, and then optionally save them in a file using the Save command. The Use command lets you make a file you previously saved the current configuration file.

To alter the printer configuration settings:

1. Select Printer Config.
2. Select Name, Interface, or Baud.
3. Select the desired option. (Type the corresponding digit or use the arrow keys and ENTER.)

   For the Name of the printer, select a compatible *type*. Most printers are compatible with one of the three options shown. For a Kodak Diconix printer, for instance, you need to set the option switches inside the printer for either the IBM or Epson driver, then select either IBM or Epson (as the case may be) from the Name options.
4. Repeat steps 2 and 3 until all settings are correct.

Computer Museum

Printer Configuration Settings

Parameter	Meaning and Options
Name	Type of printer driver: 1(Epson FX80), 2(HP LaserJet), 3(IBM Proprinter)
Interface	Port for input/output communication: 1(Com1 serial), 2(Com2 serial), or 3(Infrared).
Baud	Baud rate: 1(300), 2(1200), 3(2400), 4(4800), 5(9600, the default), or 6(19200).

For the HP 95LX, selecting Com2 defaults to Com1.

These settings remain until you change them. You cannot change the parameters for character bits, parity bit, stop bit, and handshaking option, just as you cannot for 1-2-3. Instead, the settings on your printer should match the settings that the HP 95LX assumes: 8 bits/character, 1 stop bit, no parity, XON/XOFF handshaking enabled. Refer to the printer's owner's manual for instructions.

To save the current settings in a printer configuration file (.PCF):

1. Select Save.
2. Select or type in a file name. (If that file name already exists, you will be prompted for permission to overwrite that file.)

Unless you provide a different path or extension, printer configuration files are automatically stored in C:_DAT and given a .PCF file extension.

To select an existing configuration file:

1. Select Printer Use.
2. Use the arrow keys to highlight the name of the desired file, then press (ENTER).

The choices for configuration files are any configuration files you might have saved. Your choice remains the current configuration file until you specify a different one.

To delete a printer configuration file:

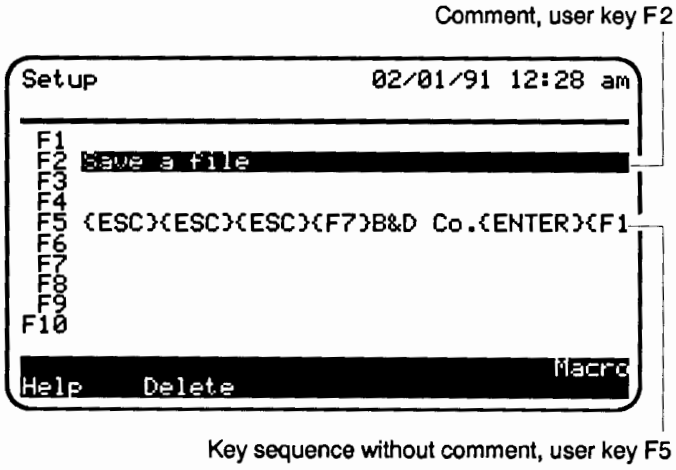
Use the Filer. See "Copying, Moving, and Deleting Files" in chapter 20.

Creating and Using User Keys

A **user key**—also called a **user-defined key**—is a function key (F1 through F10) with a CHAR function defined by you, the user. A user key is similar to a 1-2-3 macro in that it represents a set of keystrokes (letters, digits, and action keys) that you record and store for quick, automatic recall. Use the Char command in the Setup utility to define user keys for any HP 95LX application, such as the Editor, the Appointment Book, and the Calculator. (Note that user keys and 1-2-3 macros, while similar, are separate features. Also, user keys do not work when you've accessed the DOS command line.)

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Selecting Char displays the list of the current user keys, such as:



To view the list of current user keys:

Select Char in the Setup utility.

The list displays up to 36 characters of each user key or its comment line, if there is one.

To view the full text of a long user key from the list (User mode):

1. Use the arrow keys to highlight the desired user key, if necessary.
2. Press Macro (F10) or ENTER.

Defining and Editing User Keys

There are two methods for defining user keys: User mode (in Char) and Learn mode. To edit (change) a user key, use User mode.

User Mode for Defining User Keys

User mode is for writing user-key instructions and editing them. All Clipboard functions and editing keys are active. See the table of Clipboard Function Keys, later in this section.

To define a user key in User mode:

1. Display the list of user keys (select Char).
2. Use the arrow keys to highlight the desired line, if necessary.
3. Press Macro (F10) (or ENTER).
4. To describe your user key, type a comment after the highlighted Comment: field. Press ENTER to move to the next field.
5. Type the text and action keys you want to record. To specify an action key (such as cursor movement), first press Key (F6). This signals that the next keystroke is to be recorded instead of executed. Then press the desired action key. The key name in braces then automatically appears. (See the next table for valid action keys.)
6. Repeat step 5 as necessary, up to 255 keys. (Text wraps automatically.)
7. To save the user key, press Index (F10). Otherwise, press ESC.

Pressing Index (F10) Also Detects Errors. If there is an error in a user key you have just saved (by pressing Index), an error message appears.

1. Press ESC to highlight the location of the error, then correct it.
2. Press Index again.
3. Repeat steps 1 and 2 as necessary. Only *one* error is detected at a time.

Valid Actions for User Keys

A user key is not limited to text—it can include almost any sequence of keys. To record keystrokes other than text, remember to press Key (F6) first.

Valid Action Keys for User Keys
(Press F6 first.)

Keystroke	Recorded As:
▼	{DOWN}
▲	{UP}
◀	{LEFT}
▶	{RIGHT}
{	{LBRACE}
}	{RBRACE}
ALT-*key*	{Alt-*key*}
applicn. key	{SETUP}
:	{FILER}
	{COMM}
	{APPT}
	{PHONE}
	{MEMO}
	{123}
	{CALC}

Keystroke	Recorded As:
←	{BACKSP}
CTRL-*key*	{Ctrl-*key*}
DEL	{DEL}
END	{END}
ENTER	{ENTER}
ESC	{ESC}
F1 ... F10	{F1} ... {F10}
INS	{INS}
HOME	{HOME}
MENU	{MENU}
PG DN	{PGDN}
PG UP	{PGUP}
⇧ *key*	{Shift-*key*}
⇥	{TAB}

Note that application keys are valid entries—a user key can activate an application. However, user keys cannot turn the HP 95LX off, print the screen, set caps lock, or set scroll lock. Also, the CHAR sequences to record and run a user key cannot be recorded in user keys.

Editing User Keys

1. Display the list of user keys (select Char).
2. Highlight the desired user key and enter User mode (press Macro (F10) or ENTER).
3. Make your changes using any editing keys on the keyboard or the Clipboard (the four function keys in the table below).
4. To save the changes, press Index (F10).
5. To *not* save the changes, press ESC as needed.

Clipboard Function Keys

Key	Function
Copy	Copies highlighted text to the Clipboard buffer.
Cut	Deletes highlighted text from the screen and stores it in the Clipboard buffer.
Paste	Inserts text from the Clipboard buffer at the current cursor position.
Mark	Marks the beginning of highlighted text. (Use arrow keys to complete the highlighting.)

Learn Mode for Recording User Keys

This mode simply records into a user key each keystroke as you make it. Except while in User mode, you can use Learn mode in any context, in any application.

Since you execute the user key as you record it, the user key is automatically tested: you see exactly what it will do. However, no editing is possible in Learn mode (use User mode).

To record a user key in Learn mode:

1. Choose the function key for the user key by pressing ⇧ CHAR *function-key*. A two-toned sound signals the start of Learn mode. (If the chosen function key already contains instructions, or if you're in User mode, the HP 95LX will sound a beep and Learn mode will not start. You must delete a user key before you can redefine it.)
2. Perform the action(s) that you would like the user key to be able to execute later. Your keystrokes are automatically recorded as instructions. (There is a maximum of 256 keys per user key.) As each key is pressed in Learn mode, the keyboard clicks.
3. Press ⇧ CHAR *function-key* to complete the user key. The two-toned sound signals the end of Learn mode.

Executing User Keys

Since user keys can contain different kinds of information, executing a user key can mean different things. It will automatically execute almost any series of keystrokes. For example, a user key can:

- Automatically switch to a commonly used screen.
- Automatically find information in a Phone Book record.
- Automatically format a RAM card.
- Automatically enter text strings into the Appointment Book.

To execute a user key:

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Press (CHAR) *function-key*. This executes the user key assigned to that function key.

Deleting User Keys

To delete a user key:

1. Display the user-key list (select Char).
2. Highlight the user key to be deleted.
3. Press `Delete`. Type Y (for yes).

Example: Defining and Using User Keys

Define the following two user keys:

User-Key Examples

Function Key	Definition	Contents
F2	Prompt for saving a file.	{MENU} F S
F5	Look up the fax number for the B&D Co. in the Phone Book (card view).	{ESC} {ESC} {ESC} {F7} B&D Co. {ENTER} {F10}

First define F2 in User mode:

Keys:	Description:
(SET UP) C	Selects Char in Setup, displays the list of user keys with F1 highlighted.
(▼) (ENTER)	Highlights F2 and displays its contents.
Save a file (ENTER)	Type the words "Save a file" as a descriptive comment.

```
Comment:
  Save a file
```

21

Key (MENU) F S	Enters instructions to select (MENU) File Save.

```
Contents:
  {MENU}fs
```

Index	Saves the user key.

Then define F5 in Learn mode. (Suppose a record for the B&D Co. exists in the Phone Book, with the fax number in the bottom field of the card screen.)

	[Phone Book]	Opens the Phone Book.
	[Shift] [CHAR] [F5]	Starts Learn mode for the F5 user key. A two-toned sound indicates Learn mode is active.
	[ESC] [ESC] [ESC] Find B&D Co. [ENTER] Card	Ensures you're at the top level of the menu, searches for "B&D Co." and displays the card. (Note that each key press produces a click sound to remind you that Learn mode is active.)
	[Shift] [CHAR] [F5]	Completes the user key.
21	[SET UP]	Returns to the Setup utility and displays the list of two user keys.

```
Setup                              02/01/91 12:29 am

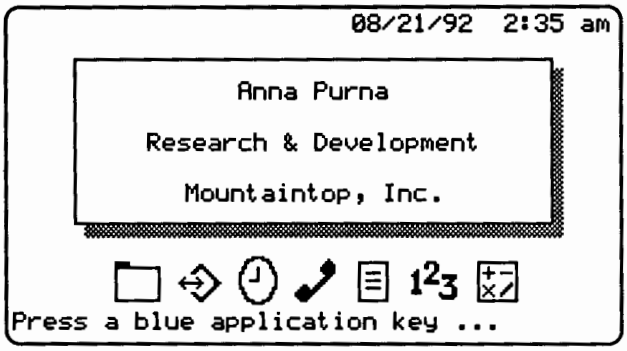
 F1
 F2 Save a file
 F3
 F4
 F5 {ESC}{ESC}{ESC}{F7}B&D Co.{ENTER}{F1
 F6
 F7
 F8
 F9
F10

                                                Macro
Help    Delete
```

Remember, once you've defined a user key, you can execute it by simply pressing [CHAR] *function-key*. Try the F2 user key you just created in the Memo Editor, for example.

Specifying a Business Card or Picture Display

The Business Card is your personalized display for the HP 95LX. It appears whenever you reset the system (press CTRL-ALT-DEL) and whenever you close *all* applications (select Quit).



You can create a monochrome graphics image to appear in place of the Business Card if you have PC graphics software that uses the .PCX file format.

To fill out a new Business Card:

1. Select Owner Name, Title, or Company.
2. Enter the new information in the highlighted field.
3. Press ENTER.

To substitute a customized graphic image for the Business Card:

1. Create the desired image in a .PCX graphics file on a PC. The .PCX file must contain a monochrome image (single plane) that is no larger than 240 pixels by 128 pixels.
2. Transfer the file to the HP 95LX using the Filer (see "Copying, Moving and Deleting Files" in chapter 20), for which you need the Connectivity Pack hardware and software. (You can also use the Datacomm application for transfer via XMODEM or Kermit protocol. See chapter 31 for information.)
3. Select Owner Picture-File.

4. Highlight the file name of the desired image file (.PCX) or type one in.
5. Press (ENTER).

To remove your graphic image and restore the Business Card:

1. Select Owner Picture-File.
2. Use (◆) to erase the *entire* file name and path (including the C:).
3. Press (ENTER).

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Formatting a RAM Card

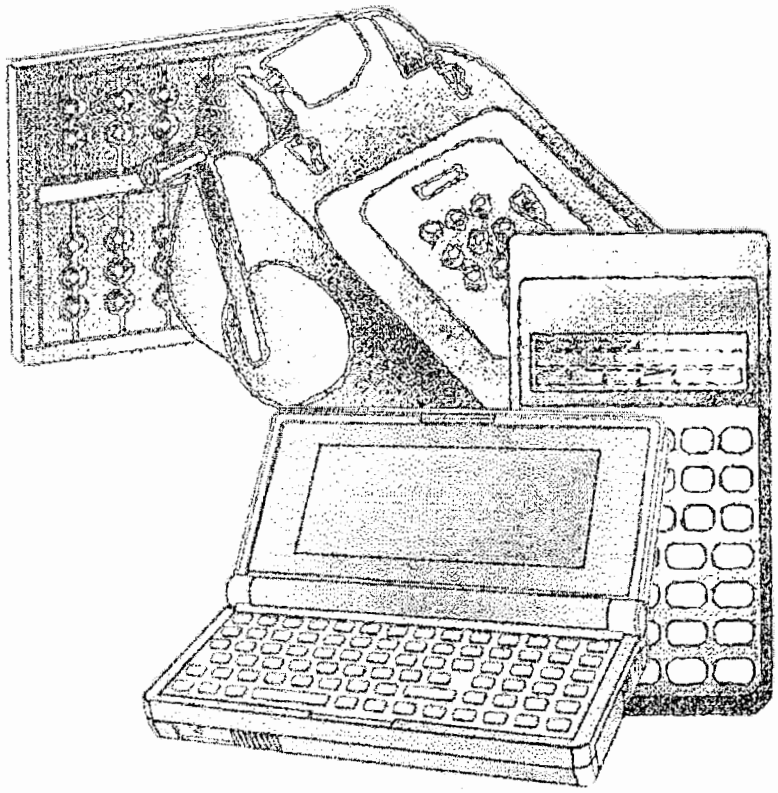
1-2-3 must be closed before you can format a RAM card on your HP 95LX.

To format a RAM card:

1. Prepare the RAM card as explained in "Preparing a RAM Card for Use" in chapter 1: install its batteries, record the date, and set the write-protect switch to read/write.
2. Insert the card into the plug-in slot.
3. Select Format and follow the instructions on the screen. (If you want to exit this screen without formatting the card, press (CTRL)-(C) or (CTRL)-(BREAK).)

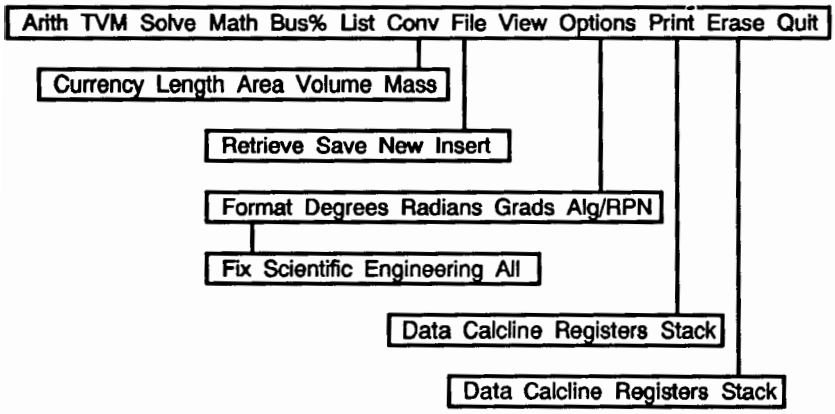
Part 4

The HP Financial Calculator



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Calculator Basics



The HP 95LX Financial Calculator application puts answers at your fingertips for problems dealing with:

- General arithmetic (chapter 23)
- Business percentage calculations (chapter 24).
- Time value of money (chapter 25).
- Interest rate conversions (chapter 25).
- Currency and other unit conversions (chapter 26).
- Solver equations that you enter (chapters 28-30).
- Function graphing (chapter 28).

This chapter covers the fundamentals of the Calculator: starting the Calculator, using the keyboard and display, storing and manipulating numbers, and using the Clipboard to move data from the Calculator to other applications.

Starting the Calculator

Press the [:] key on the second row of the keyboard to start the Calculator.

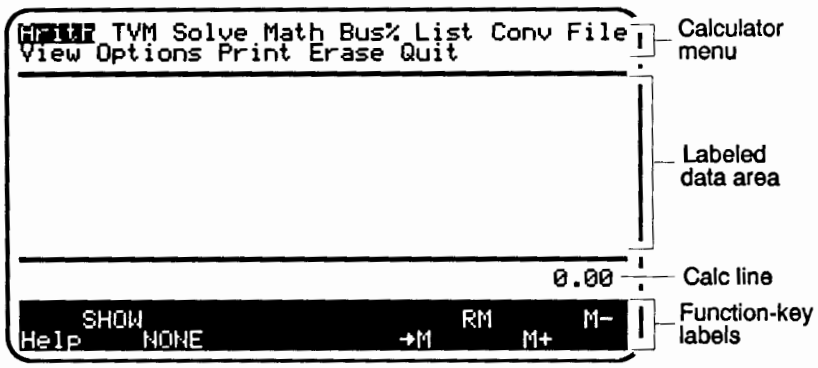
You can exit the Calculator by selecting [MENU] Quit, or you can suspend it in the background by starting another application (for example, by pressing [1 2 3]). If you leave the Calculator to go to another application, just press [:] when you want to return right where you left off.

Using the Display and Keyboard

The Calculator Display

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When you start the Calculator, the arithmetic screen is displayed. In the same way that you display the main menu in Lotus 1-2-3, press [MENU] to see the Calculator menu.



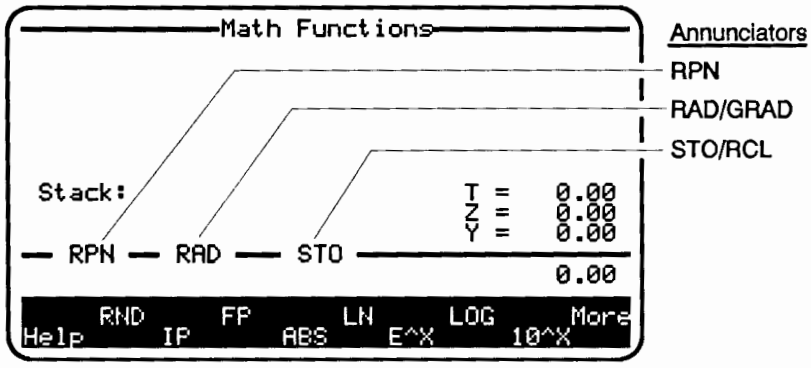
Calculator menu. To make a selection, press the key corresponding to the first letter of a word (for example, pressing S selects the Solver), or use the arrow keys to highlight a word and press ENTER. ESC lets you back out of a selection you made by mistake.

Labeled data area. This shows you the status of variables, registers, etc. that relate to the type of problem you are working on.

Calc line. This is where you enter numbers and see results.

Function-key labels. These correspond to F1 through F10 on the keyboard, and their definitions change with different menu selections. A function key label with some lowercase letters generally means that it leads you to another set of function keys; one in all uppercase letters means that it executes a Calculator function.

Immediately above the calc line is the area the Calculator uses to display **annunciators**—symbols that tell you when the Calculator is in a special state or mode.



- The **RPN annunciator** is described in appendix D.
- The **RAD/GRAD annunciator** tells you how angles are interpreted: radians (RAD), grads (GRAD), or degrees (no annunciator). This annunciator displays only in the math screen and the Solver.
- The **STO/RCL annunciator** turns on when you're storing or recalling the contents of registers.

Changing the Display Format

There are two ways you can change the format of the Calculator display:

- You can change the number of displayed decimal places.
- You can change the numeric notation.

Note



You can interchange the period and comma in numbers in all HP 95LX applications by using the Setup Utility. For information, see chapter 21.

Changing the Number of Displayed Decimal Places

When you start the Calculator the first time, numbers are displayed with two places to the right of the decimal point. To change the number of decimal places, select (MENU) Options Format Fix and then select the number of places you want displayed—from 0 to 15.

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For example, if you enter 26.47 and then press (MENU) O F F 4, it will be displayed as `26.4700`. Pressing (MENU) O F F 1 would then change the display to `26.5` (however, the number would still be stored in memory as 26.47—numbers are always stored in the Calculator with full precision).

To show numbers to their full precision, select (MENU) Options Format All. If you then enter 4, it is displayed as 4; 237.4500 is displayed as `237.45`, with the trailing zeros removed.

To temporarily view displayed numbers to their full precision, select (MENU) View. Press (ESC) to return to the previous display.

Changing the Numeric Notation

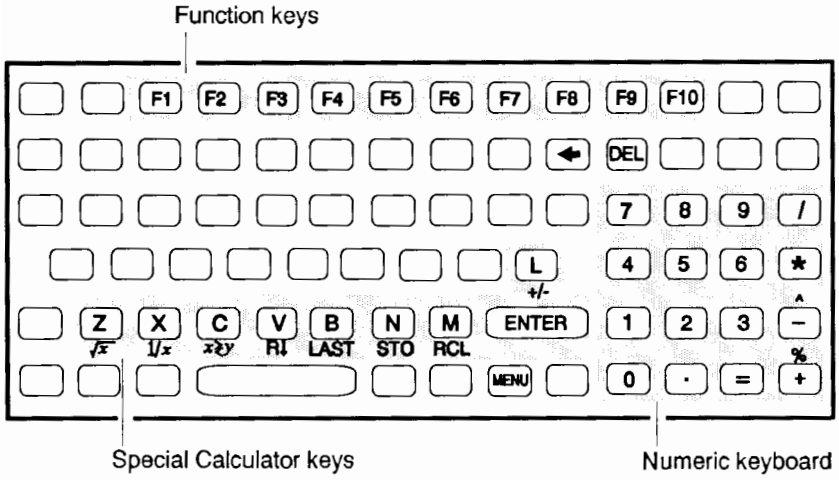
You can change the numeric notation in the calc line to either Scientific Notation (a mantissa with an exponent) or Engineering Notation (a mantissa with an exponent that is a multiple of 3).

- To change to Scientific Notation, select (MENU) Options Format Scientific and then select the number of decimal places—0 through 15.
- To change to Engineering Notation, select (MENU) Options Format Engineering and then select the number of decimal places—0 through 15.

For example, if the number 13,246.5798 is displayed in the Calculator and you press [MENU] O F S 3, the number is displayed in scientific notation as 1.325E4. If you press [MENU] O F E 3, the number is displayed in engineering notation as 13.25E3.

The Calculator Keyboard

The Calculator primarily uses three areas of the keyboard:



The Function Keys

The function keys ([F1] through [F10]) correspond to the function-key labels at the bottom of the Calculator screen. Their definitions change with each selection from the Calculator menu. [F1], however, always gives you help.

The Numeric Keypad

The numeric keypad contains the 10-key digit pad for numeric entry as well as the [=] key and math operators ([+], [-], etc.)

The Special Calculator Keys

Most of the time the alpha keys are not active within the Calculator. The Calculator takes advantage of this by redefining the bottom row of alpha keys ([Z], [X], [C], etc.) along with the [L] key to give you a set of special Calculator keys. The Calculator definitions are printed just below the corresponding keys—[Z] becomes [√x], [X] becomes [1/x], etc.

Key	Description
[√x]	Calculates the square root of the number in the calc line.
[1/x]	Calculates the reciprocal of the number in the calc line.
[x≷y]	If the calc line contains a number, exchanges that number with the result of the previous calculation (see "Using the History Stack" in chapter 23). If the calc line contains two numbers separated by an operator, swaps the order of the numbers (for example, 3/4 changes to 4/3).
[R↓]	Rolls down the history stack. (See "Using the History Stack" in chapter 23.)
[LAST]	Copies the result of the previous calculation into the current calculation. (See "Using the LAST Key" in chapter 23.)
[STO]	Copies a number from the calc line into the designated register or variable. (See "Using Registers" in chapter 23.)
[RCL]	Recalls the number from the designated register or variable. (See "Using Registers" in chapter 23.)
[+/-]	Makes a positive number negative or a negative number positive. For example, pressing [+/-] with the number 118 in the calc line changes it to -118. Pressing it a second time makes the number positive again.

Other Keys

Other keys, such as [DEL], [◆], [▲], and [▼], have specific uses that are described in procedures throughout the Calculator part of this manual.

Here's a business percentage calculation to demonstrate how the Calculator works:

Example: Calculating a Percentage Change in Costs. As the new Procurement Manager at Evett Racquets, Inc., you have the assignment of estimating the percentage increase in the raw-material cost for your new Krypton-Flex racquet over the next 5 years. The current cost is $120; the cost estimate for 5 years from now is $286. Press the following keys, read the descriptions, and watch your display to determine the percent change in costs.

Keys:	Description:
[ON]	Starts the Calculator.
[MENU] B	Selects [MENU] Bus%.
120	Enters today's cost into the calc line.
OLD	Puts the number in the calc line into the *OLD* register.
286 NEW	Enters the estimated future cost into the *NEW* register.
%CHG	Calculates the percentage change from *OLD* to *NEW* as a 138.33% increase.

```
Old value.............. OLD    = 120.00
New value.............. NEW    = 286.00
Percent change........ %CHG   = 138.33

Total amount.......... TOTAL  =   0.00
Part of total......... PART   =   0.00
Percent of total...... %TOTAL =   0.00

                                %CHG = 138.33
```

The previous example demonstrates entering data using the function keys that correspond to the variables on the screen. An alternate method for data entry involves highlighting a variable on the screen using the arrow keys, typing a number, and then pressing [▲], [▼], or [ENTER]. Then, once you've entered all the necessary data, highlighting the variable to solve for and pressing the spacebar returns the answer.

So that you can decide which method you prefer, try the same example with this "point-and-shoot" method:

Keys:	Description:
(MENU) E D	Selects (MENU) Erase Data to clear the data.
▼	Highlights the *OLD* variable.
120 ▼	Enters today's cost into *OLD* and advances the highlight to *NEW*.
286 ▼	Enters the estimated future cost into *NEW* and advances the highlight to *%CHG*.
(Spacebar)	Calculates the percentage change from *OLD* to *NEW* as a 138.33% increase.

```
Old value.............. OLD    = 120.00
New value.............. NEW    = 286.00
Percent change........ %CHG   = 138.33

Total amount.......... TOTAL  =   0.00
Part of total......... PART   =   0.00
Percent of total...... %TOTAL =   0.00

                                %CHG = 138.33
```


The point-and-shoot method is available throughout the Calculator.

When you're ready to do something else with the Calculator, simply press (MENU) to display the Calculator menu, and then make another selection.

Doing Arithmetic

Arithmetic is done in the calc line. This is a brief introduction to arithmetic; it's covered in greater detail in chapter 23.

Note



The examples in the Calculator part of this *User's Guide* use **algebraic syntax** to enter numbers. If you are familiar with Hewlett-Packard's **RPN syntax** and prefer to use it, refer to appendix D for instructions.

Example: Addition. Add 721.07 and 223.89.

Keys:	Description:
721.07 (+) 223.89	Enters the two numbers and displays them on calc line.
	721.07+223.89
(=)	Completes the calculation.
	944.96

Once the Calculator has completed a calculation, pressing another number key starts a new calculation.

Negative Numbers

To key in a negative number, type the number and then press (+/-).

Keys:	Description:
75 (+/-) (=)	Changes the sign of 75.
	-75.00
4.52 (*) 7.1 (+/-) (=)	Changes the sign of 7.1 and then completes the multiplication.
	-32.09

Using a Result in Another Calculation

As you've seen, pressing a number key when the calc line contains a result starts a new calculation. If you press an operator key instead, the Calculator continues the calculation:

Keys:	Description:
75 ⊞ 145 ⊟	Calculates 75 + 145.
	220.00
⊘ 3.5 ⊟	Divides 220 by 3.5.
	62.86

The Calculator also lets you do chain calculations (calculations based on the results of previous calculations) without using ⊟ at the conclusion of each step. "Chain Calculations" in chapter 23 explains how to do this.

Editing and Clearing the Calc Line

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Use ⊡ (backspace) to edit the calc line. When the cursor is visible—which is when you are in the process of keying in a number—⊡ deletes the last character you keyed in. When the cursor is not visible, ⊡ erases the rightmost number or operator.

To clear the calc line, press DEL.

The History Stack

The Calculator keeps a four-line record of your calculations in the **history stack**. The calc line is the bottom of this stack and is usually the only visible line. You can use these results in other calculations. How to view and use the stack is explained in "Using the History Stack" in chapter 23.

Clearing Information in Calculator Memory

(MENU) Erase enables you to clear various parts of Calculator memory:

- To erase the data associated with the current Calculator screen, select (MENU) Erase Data. For example, if you previously selected (MENU) TVM so that the TVM screen is displayed, selecting (MENU) Erase Data erases all your TVM data.
- To erase the calc line, select (MENU) Erase Calcline.
- To erase the history stack, select (MENU) Erase Stack.
- To erase the storage registers, select (MENU) Erase Registers.

Pressing (DEL) is another way to clear just the calc line.

Using the Clipboard with the Calculator

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This section covers the general use of the Clipboard within the Calculator. The Calculator Solver has a special use for it, which is described in "Using the Clipboard in the Solver" in chapter 28.

The Clipboard lets you capture a number from the calc line and move it to another HP 95LX application (or even back into the Calculator). For example, you could use the Clipboard to capture the result of a percentage calculation and insert it in a memo you're writing in the Editor.

To copy a number from the calc line into the Clipboard:

Press (CTRL)-Copy ((F2)). The rightmost number is copied into the Clipboard. (Any previous contents of the Clipboard are erased when you copy something new into it.)

To insert the contents of the Clipboard into the active HP 95LX application:

1. Position the cursor where you want the text inserted. (Except in the Solver, anything inserted into the Calculator goes into the calc line.)
2. Press Paste ((F4)). (In the Calculator and 1-2-3, press (CTRL)-Paste.)

Note



1-2-3 interprets the contents of the Clipboard as a label. So, if you move a number from the Calculator to 1-2-3 using the Clipboard, it will go into 1-2-3 as a label, not as a value. To move numbers from the Calculator to 1-2-3 that 1-2-3 would interpret as values, use STO @ and RCL @. For more information, see "Moving Values between the Calc Line and 1-2-3" in chapter 23.

When you paste the contents of the Clipboard into the calc line, only the last *number* copied into the Clipboard is pasted; all non-numeric characters are ignored.

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Arithmetic and Math Functions

Simple Arithmetic

Here are some examples of simple arithmetic in the Calculator using the keys [+], [−], [*] (times), and [/] (divide). Notice how the [=] key completes the calculation.

Keys:	Description:
[ON]	Starts the Calculator.
54.69 [+] 28.33 [=]	Adds 54.69 to 28.33 and displays the result in the calc line. 83.02
[*] 6 [−] 200 [=]	Multiplies the previous result by 6 and then subtracts 200 from that result. 298.12

Chain Calculations

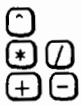
Notice in the second part of the example above that you did not need to press [=] to multiply 83.02 by 6—the multiplication was completed when you pressed the operator (in that case, [−]) for the next part of the calculation. Calculations strung together are called **chain calculations**.

Operator Priority and Pending Operations

Some chain calculations might be interpreted several different ways. For example, $9 + 12 \div 3$ has two interpretations:

$$9 + \frac{12}{3} = 13 \quad \textit{or} \quad \frac{9 + 12}{3} = 7$$

The HP 95LX uses a system of operator priority to evaluate expressions:



Highest priority
⋮
Lowest priority

The HP 95LX calculates an intermediate result when the next operator you enter has a lower or equal priority. When the next operator has higher priority, the HP 95LX retains the previous numbers. For example, in the calculation 9 (+) 12 (/) 3 (=), division has a higher priority than addition. Thus, the 9 and (+) are retained as a pending operation until the division is completed.

Example. Calculate 4×7^3 plus 5×7^2 plus 6.

Keys:	**Description:**
4 (*) 7 (^)	(^) has a higher priority than (*).
3 (+)	Calculates 4×7^3.
	1,372.00+
5 (*)	(*) has a higher priority than (+).
7 (^)	(^) has a higher priority than (*).
2 (+)	Adds 5×7^2 to 1,372.
6 (=)	Completes the calculation.
	1,623.00

If a calculation requires that operations be done in an order inconsistent with operator priority (for example, addition *before* multiplication), use parentheses. You can have a maximum of eight pending operations.

Using Parentheses in Calculations

Use parentheses when you need to postpone calculating an intermediate result until you've completed lower-priority operations. For example, suppose you want to calculate:

$$\frac{30}{85 - 12} \times 9$$

If you were to key in 30 ÷ 85 −, the Calculator would calculate the intermediate result, 0.35. However, that's not what you want. To delay the higher-priority division until you've subtracted 12, use parentheses:

Keys:	Description:
30 / (85 −	The parenthesis prevents an intermediate calculation.
	`30.00/(85.00-`
12)	Calculates 85 − 12.
	`30.00/73.00`
* 9	Calculates 30 ÷ 73.
	`0.41*9`
=	Completes the calculation.
	`3.70`

Percent

In most cases, (%) (the shifted (+) key) divides the number furthest to the right in the calc line by 100. The exception is when a plus or minus sign precedes the number. Then, the (%) key uses the rightmost number as a percent, and calculates that percent of the number preceding the plus or minus sign.

Find 27% of 85.3.

Keys:	Description:
85.3 (*) 27 (%)	Divides 27 by 100.

```
85.30*0.27
```

(=)	Calculates 27% of 85.3.

```
23.03
```

23

Example: Calculating Simple Interest. You borrow $1,250 from a relative, and agree to repay the loan in a year with 7% simple interest. How much money will you owe?

Keys:	Description:
1250 (+) 7 (%)	Interest on the loan (7% of $1250) is $87.50.

```
1,250+87.50
```

(=)	Displays the total amount you must repay at the end of 1 year.

```
1,337.50
```

Computer Museum

Other Keyboard Arithmetic

The other keyboard arithmetic keys are [√x] (the [Z] key), [1/x] (the [X] key), and [^] (the shifted [−] key). They act on the number furthest to the right in the calc line.

Keys:	Description:
4 [1/x]	Calculates the reciprocal of 4.
	0.25
20 [√x]	Calculates the square root of 20.
	4.47
1.1 [^] 2 [=]	Calculates 1.1^2.
	1.21

The [1/x] function is useful for calculating the root of a number.

125 [^] 3 [1/x]	Calculates $^1/_3$.
	125.00^0.33
[=]	Calculates the cube root of 125.
	5.00

Using the Automatic Constant in Calculations

An **Automatic Constant** is an operator (+, −, *, /, or ^) and a number or percentage that can be used for repetitive calculations. To initiate an automatic constant, press an operator twice followed by a number or percentage. Once initiated, the constant is displayed to the right of the calc line in brackets, for example [+5%].

Example. Calculate 128×3.2, 219×3.2, and 316×3.2.

Keys:	Description:
128 ⊛ ⊛ 3.2 =	Stores "*3.2" as a constant and multiplies 128 by 3.2.
	409.60 [*3.20]
219 =	Multiplies 219 by 3.2.
	700.80 [*3.20]
316 =	Multiplies 316 by 3.2.
	1,011.20 [*3.20]

Example. Calculate 10 + 10%, 11 + 10%, and 25 +10%.

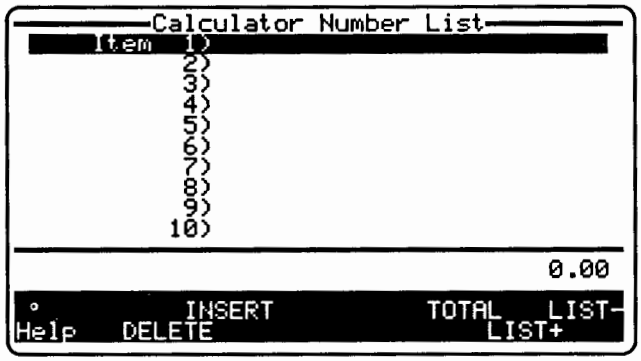
Keys:	Description:
10 ⊕ ⊕ 10 % =	Stores "+10%" as a constant and adds 10% to 10.
	11.00 [+10.00%]
=	Adds 10% to 11.
	12.10 [+10.00%]
25 =	Adds 10% to 25.
	27.50 [+10.00%]

If it causes the contents of the calc line to become too long to be viewed in the display, the constant is abbreviated as K, as in [+K%].

Pressing (DEL) clears the constant and the result from the calc line. Pressing another operator key or (←) clears just the constant and leaves the result.

Totaling a List of Numbers

The Calculator enables you to total a column of up to 100 numbers using a special screen and function keys. Select (MENU) List to see the number list screen:



To add a number to the list at the position of the highlight, type the number in the calc line and press (ENTER). (If an uncompleted calculation is in the calc line when you press (ENTER), it is completed and the result is added to the list.) Whenever you add or delete a number from the list, the current total is displayed in the calc line.

The function keys give you flexibility in manipulating the numbers in the list.

Key	Function
INSERT	Inserts the value 0.00 at the highlight, moving the rest of the list down one position.
DELETE	Deletes the value at the highlight, moving the rest of the list up one position.
TOTAL	Returns to the calc line the sum of all the items in the list.
LIST+	Enters the value in the calc line into the list at the position of the highlight and moves the highlight down one position. An existing value is overwritten.
LIST-	Negates the value in the calc line, enters it into the list at the position of the highlight, and moves the highlight down one position. (Same as pressing [+/-] [ENTER] when a single number is in the calc line.) An existing value is overwritten.

The up and down arrow keys ([▲] and [▼]), [PGUP], [PGDN], [HOME], and [END] are all active to move the highlight up and down the list. (The arrow keys can also be used to enter a number into the list at the position of the highlight by typing the number into the calc line then pressing [▲] or [▼].)

To clear the list, select [MENU] Erase Data when the list is displayed.

To leave the list screen, either select another screen within the Calculator or select another HP 95LX application altogether. The list is left intact until you clear it or until you do a system reset.

Example: Balancing a Checkbook. Use the number list feature to find the month-end balance for a checking account that had a month's activity of five checks and two deposits. It had a starting balance of $10,128.46.

Keys:	Description:
(MENU) L	Selects the number list screen.
10128.46 (ENTER)	Enters the starting balance as item 1.
52.49 LIST-	Enters the amount of the first check as a negative number.
186.10 LIST- 1000 LIST- 72.93 LIST- 200 LIST-	Enters the rest of the checks as negative numbers.
1411.77 LIST+ 67.34 LIST+	Enters the deposits into the account as positive numbers. The total for the list is updated at each entry and shows a final amount in the account of $10,096.05.

```
Item  1)              10,128.46
      2)                 -52.49
      3)                -186.10
      4)              -1,000.00
      5)                 -72.93
      6)                -200.00
      7)               1,411.77
      8)                  67.34
      9)
     10)

                TOTAL = 10,096.05
```

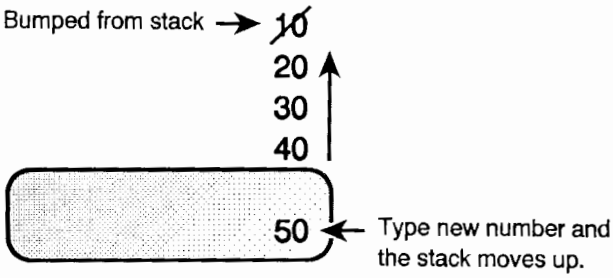
Now try using the other function keys—for example, change one of the check amounts as if you're correcting an error. Remember, when you're finished using this feature and want to go on to something else, you can quit it by selecting another feature from the Calculator menu.

Recalling Numbers to the Calc Line

Sometimes, you may want to include the result of a previous calculation in a new calculation. There are several ways to reuse numbers.

Using the History Stack

The **history stack** is a four-level record of activities within the Calculator. It includes the calc line and three levels "above" the calc line. When you start a new operation on the calc line, the previous contents move up to level 1, bumping level 1 contents to level 2, level 2 to level 3, and level 3 off the stack. Numbers are lost when bumped off the stack.



The history stack always contains four numbers. If you clear the stack, the numbers change to 0's.

The current state of the history stack can be viewed in two ways:

- By selecting (MENU) Math. The history stack is always displayed in the Math screen.
- By selecting (MENU) Arith and then pressing SHOW ((F2)). This screen can be displayed as long as you want and is updated as you work. When you want the screen to go away, press NONE ((F3)).

The (R↓) key (the (V) key when the Calculator is active) "rolls" the history stack down one line. For example, pressing (R↓) once with the above stack moves 50.00 to the top of the stack (level 3) and rolls the other numbers down one level, putting 40.00 in the calc line. Pressing (R↓) four times cycles through the entire stack.

The [x⇄y] key (the [C] key when the calculator is active) normally swaps a number in the calc line with the number in stack level 1. For example, if your stack looks like the one in the illustration above, pressing [x⇄y] puts 40.00 in the calc line and moves 50.00 to level 1.

The exception to this rule is when you have an incomplete calculation in the calc line. Then, [x⇄y] swaps the two operands. For example, pressing [x⇄y] changes 2.00/3.00 in the calc line to 3.00/2.00.

To clear the history stack (including the calc line), select [MENU] Erase Stack.

Using the LAST Key

Pressing [LAST] (the [B] key when the Calculator is active) copies the number in level 1 of the history stack into a calculation you are in the process of doing.

For example, here is one way to calculate $\frac{39 + 8}{\sqrt{123 + 17}}$:

Keys:	Description:
123 [+] 17 [=]	Calculates 123 + 17.
	140.00
[√x]	Calculates the square root of 123 + 17.
	11.83
39 [+] 8 [=] [/] [LAST]	Copies 11.83 to the calc line.
	47.00/11.83
[=]	Completes the calculation.
	3.97

Using Registers

The Calculator has 10 **registers** (storage locations), numbered 0 through 9, that can be used to store and recall numbers.

Storing and Recalling Numbers

To store or recall a number, press [STO] (the [N] key when the Calculator is active) or [RCL] (the [M] key when the Calculator is active), followed by a number in the range 0 through 9.

[STO] copies the number from the calc line to a designated register. If there is more than one number in the calc line, [STO] copies only the rightmost number. [RCL] recalls the stored number back to the calc line.

To cancel the store or recall after you've pressed [STO] or [RCL], press [ESC] or [◆].

23 The following keystrokes solve these two calculations using two registers:

$$\frac{475.6}{39.15} \qquad \frac{560.1 + 475.6}{39.15}$$

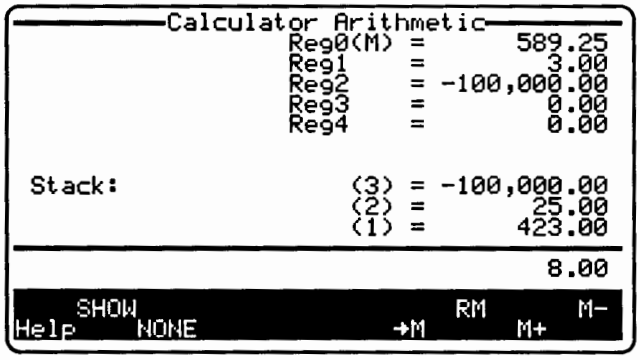
Keys:	Description:
475.6 [STO] 1	Stores 475.6 into register 1.
	`Reg1 = 475.60`
[/] 39.15 [STO] 2	Stores 39.15 (the rightmost number) into register 2.
	`475.60/39.15`
[=]	Completes the first calculation.
	`12.15`
560.1 [+] [RCL] 1	Recalls the contents of register 1.
	`560.10+475.60`

(=)	Adds the two numbers.
	1035.70
(/) (RCL) 2	Recalls the contents of register 2.
	1035.70/39.15
(=)	Completes the second calculation.
	26.45

The (STO) and (RCL) keys can also be used with variables. For example, pressing (STO) PMT (the payment function-key in the TVM screen) stores the rightmost number in the calc line into the variable *PMT*. Pressing (RCL) PMT copies the contents of *PMT* into the calc line.

Viewing Registers

The current values in the registers can be viewed at any time by selecting (MENU) Arith and then pressing SHOW ((F2)). The first time you press SHOW, registers 0-4 are displayed along with the history stack. Press it a second time to see all 10 registers. Here is a typical screen you might see:



You can continue using the calc line while the registers are displayed. However, if you want to remove them from the display, press NONE ([F3]).

Clearing Registers

In most cases, it is unnecessary to clear registers, since storing a number *replaces* the previous contents. However, you can clear a single register by storing 0 in it. To clear all the registers, select [MENU] Erase Registers.

Doing Arithmetic inside Registers

The Calculator lets you do arithmetic on numbers that are stored *inside* registers regardless of which menu is in the display. The following example stores 45.7 in register 3, multiplies that number by 2.5, and stores the result back in register 3:

23

Keys:	Description:
45.7 [STO] 3	Stores 45.7 into register 3.
	`Reg3 = 45.70`
2.5 [STO] [*] 3	Stores 114.25 (45.7 × 2.5) into register 3.
	`2.50`
[RCL] 3	Displays the contents of register 3.
	`Reg3 = 114.25`

The following table shows the options for arithmetic inside registers:

Keys	New Number in Register
[STO] [+]	old number + displayed number
[STO] [-]	old number − displayed number
[STO] [*]	old number × displayed number
[STO] [/]	old number ÷ displayed number

You can also do arithmetic on numbers stored in variables. For example, 2 (STO)(*) PMT multiplies the current contents of *PMT* by 2 and stores the product in *PMT*.

Using the M Register

Register 0 (the M register) is a special register that has its own set of "shortcut" memory keys. You can use the (STO) key-combinations and (RCL) with register 0 just like you would with the rest of the registers, or you can use the four function keys that are present whenever you select (MENU) Arith. These keys do storage operations on register 0 with a minimum of keystrokes.

Keys	Description
→M ((F7))	Stores the value in the calc line into register 0. (Same as (STO) 0.)
RM ((F8))	Recalls the contents of register 0 to the calc line. (Same as (RCL) 0.)
M+ ((F9))	Adds the value in the calc line to the old value in register 0 and stores the sum in register 0. (Same as (STO) (+) 0.)
M− ((F10))	Subtracts the value in the calc line from the old value in register 0. (Same as (STO) (−) 0.)

Example: Using the M Register. The following example stores 355.6 in register 0, and then adds 49.2 into the register. (If you want to watch register 0 as it changes in this example, press SHOW before you start.)

Keys:	Description:
355.6 →M	Stores 355.6 into register 0.

```
Reg0(M) = 355.60
```

49.2 M+ Stores 404.8 (355.6 + 49.2) into register 0.

```
                                    49.20
```

RM Displays the contents of register 0.

```
                          Reg0(M) = 404.80
```

Moving Values between the Calc Line and 1-2-3

If you're using the Calculator while you have an open 1-2-3 worksheet, you have the ability to copy values from the calc line to a 1-2-3 cell and from a 1-2-3 cell to the calc line. Any numbers copied into 1-2-3 this way are treated as values by 1-2-3.

To copy the rightmost number in the calc line to a 1-2-3 cell:

1. Press (STO) (@) from the Calculator. The open 1-2-3 worksheet is displayed.
2. Move the cell pointer to the cell you want to receive the number.
3. Press (ENTER). The number from the calc line is copied to the highlighted cell, and you're returned to the Calculator.

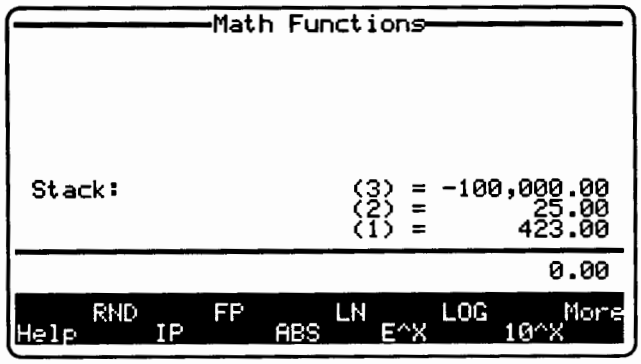
To copy a number in a 1-2-3 cell to the calc line:

1. Press (RCL) (@) from the Calculator. The open 1-2-3 worksheet is displayed.
2. Move the cell pointer to the cell with the value you want to copy.
3. Press (ENTER). The number in the highlighted cell is copied to the calc line.

If in step 2 you selected an empty cell or a cell with a label, 0.00 is returned to the calc line.

Technical Math Functions

When you select (MENU) Math, the math functions screen is displayed.



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This screen contains the current status of the history stack, the calc line, and function keys for the technical math functions. There are four sets or **pages** of function keys—pressing More ((F10)) shows you the next page, and pressing ⇧ More shows you the previous page. The Calculator remembers the current page when you leave the math functions screen so that it is displayed again when you return.

Rounding a Number. RND rounds the number in the calculator line to the number of displayed decimal places. (Before rounding, the stored version of the number may have additional non-zero digits that are not displayed.) Any subsequent calculations using that number use the rounded value.

Note that after you select (MENU) Math you may have to press More ((F10)) to get to the function keys used in this example.

Keys:	**Description:**
4.589 (+) 2.6891 (=)	Displays result to two decimal places.

7.28

(MENU) V	Selects (MENU) View to see the full number.
	7.2781
(MENU) M RND	Rounds the number to two decimal places.
	7.28
(MENU) V	Views the full number to verify that it has been rounded.
	7.28

Integer Part, Fractional Part, and Absolute Value. The following table describes three other math functions that manipulate real numbers:

23

Key	Function
IP	Integer part of the rightmost real number in the calc line.
FP	Fractional part of the rightmost real number in the calc line.
ABS	Absolute value of the rightmost real number in the calc line.

Exponential and Logarithmic Functions. There are four exponential and logarithmic functions.

Key	Function
LN	Natural (base e) logarithm of a positive number.
E^X	Natural antilogarithm; e^x.
LOG	Common (base 10) logarithm of a positive number.
10^X	Common (base 10) antilogarithm; 10^x.

Note that after you select (MENU) Math you may have to press More ((F10)) to get to the function keys used in this example.

Keys:	Description:
(MENU) M	Selects (MENU) Math for the technical math functions.
47.5 LN	Natural log of 47.5.
	3.86
E^X	Natural antilogarithm of the previous result.
	47.50

Changing the Trigonometric Mode. The trigonometric functions and polar/rectangular coordinate conversions involve angles that can be interpreted either as degrees or radians, depending on the current trigonometric mode. Annunciators just above the calc line indicate the mode—the RAD annunciator indicates Radians mode, the GRAD annunciator indicates Grads mode, and no annunciator indicates Degrees mode.

- To change to Radians mode, select (MENU) Options Radians; the RAD annunciator appears above the calc line.
- To change to Grads mode, select (MENU) Options Grads; the GRAD annunciator appears above the calc line.
- To change back to Degrees mode, select (MENU) Options Degrees; the RAD or GRAD annunciator turns off.

Trigonometric Functions. Except for π, trigonometric functions interpret angles in degrees, radians, or grads, depending on the trigonometric mode.

Key	Function	Key	Function
PI	π (3.14159265359)	ASIN	arc sine
SIN	sine	ACOS	arc cosine
COS	cosine	ATAN	arc tangent
TAN	tangent		

For the following example if the RAD or GRAD annunciator is on, select (MENU) Options Degrees to change to Degrees mode. Also, note that after you select (MENU) Math you may have to press More ((F10)) to get to the function keys used in this example.

Keys:	Description:
(MENU) M	Selects the math functions.
15 SIN	Sine of 15°.
	0.26
2.73 ATAN	Arc tangent of 2.73.
	69.88

Angle and Hour Conversions. The following table describes the four angle- and hour-conversion functions:

Key	Function
→DEG	*To degrees*; converts the number from a radian value to its decimal degree equivalent.
→RAD	*To radians*; converts the number from a decimal degree value to its radian equivalent.
→HR	*To hours*; converts the number from hours(degrees)-minutes-seconds-decimal seconds format (H.MMSSss or D.MMSSss) to decimal hours (or degrees) format.
→HMS	*To hours-minutes-seconds*; converts the number from decimal hours (or degrees) to hours(degrees)-minutes-seconds-decimal seconds format (H.MMSSss or D.MMSSss).

In the following example you may have to press More ((F10)) after you select (MENU) Math to get to the PI function key.

Keys:	Description:
(MENU) M	Selects the math functions.
1.79 (*) PI (=)	Calculates 1.79π
	5.62
More →DEG	Converts 5.62 radians to degrees.
	322.20
90.2015 →HR	Converts 90 degrees, 20 minutes, 15 seconds to decimal degrees.
	90.34

Polar/Rectangular Coordinate Conversions. These functions interpret the angle as degrees, radians, or grads, depending on the current trigonometric mode.

Key	Function
XCOORD	Stores the x-coordinate or calculates the x- and y-coordinates.
YCOORD	Stores the y-coordinate or calculates the x- and y-coordinates.
RADIUS	Stores the radius or calculates the radius and angle.
ANGLE	Stores the angle or calculates the radius and angle.

For the following example, if the RAD or GRAD annunciator is on, select (MENU) Options Degrees to change to Degrees mode. Also, note that after you select (MENU) Math you may have to press More ((F10)) to get to the function keys used in this example.

Convert the rectangular coordinates (10,−15) to polar coordinates:

Keys:	Description:
(MENU) M	Selects the math functions.
10 XCOORD	Stores the x-coordinate.
	XCOORD = 10.00
15 (+/-) YCOORD	Stores the y-coordinate.
	YCOORD = -15
RADIUS	Calculates the radius and angle.
	RADIUS = 18.03

Probability Functions. Combinations, permutations, factorials, and random numbers are included in the probability functions.

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Key	Function
X	Stores x for calculating combinations and permutations.
Y	Stores y for calculating combinations and permutations.
Cx,y	Combinations; calculates the number of different *sets* containing y items that can be taken from a larger group of x items. Different orders of the same y items are not counted separately.
Px,y	Permutations; calculates the number of different *arrangements* of y items that can be taken from a larger group of x items. Different orders of the same y items are counted separately.
N!	Calculates the factorial of the rightmost number in the calc line.
SEED	Stores a seed for the random number generator. A seed is a number that initiates the sequence of random numbers. Pressing 0 SEED uses a new seed from the system clock. To specify a particular seed, key in a non-zero number and press SEED . You can repeat a random number sequence by storing the same non-zero seed.
RAN#	Displays a random number between 0 and 1. All random numbers have 12 significant digits.

Note that after you select MENU Math you may have to press More (F10) to get to the function keys used in this example.

Keys:	Description:
MENU M	Selects the math functions.
5 X	Stores x.
	X = 5.00
3 Y	Stores y.
	Y = 3.00
Cx,y	Calculates combinations.
	Cx,y = 10.00
Px,y	Returns the number of permutations to the calc line.
	Px,y = 60.00



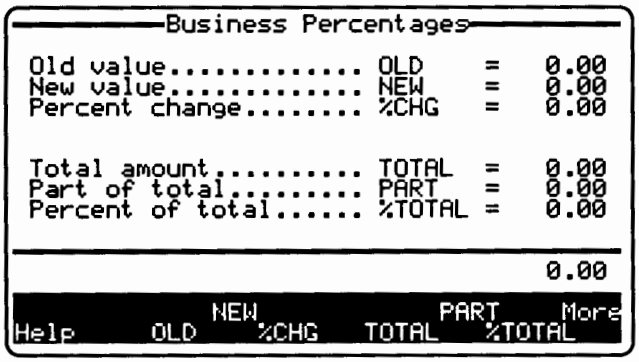
23

When you calculate either combinations or permutations, the other of the two is automatically calculated at the same time, and both are displayed near the top of the screen.

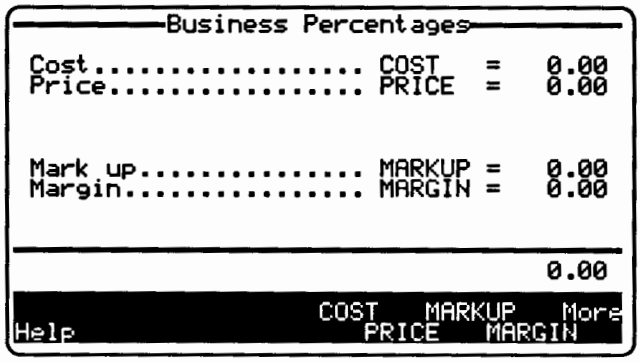
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Business Percentage Calculations

When the Calculator is active and you select (MENU) Bus% the first time, this business percentage screen appears:



This screen displays the results and function keys for percent-change and percent-of-total calculations. If you press More ((F10)) from this screen, you see the other business percentage screen, which you use for calculating markup and margin.



When you leave the business percentage screens, the Calculator remembers the last displayed screen so that it is redisplayed when you return.

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Calculating Percent Change

The percent change function keys are OLD (F3), NEW (F4), and %CHG (F5). Percent change is expressed as a percentage of the *OLD* number.

Note that after you select MENU Bus% you may have to press More (F10) to get to the function keys used in the following example. Also, this example uses the function keys to enter data; you can also use the point-and-shoot method described in chapter 22.

Example: Calculating the Percent Change. Part 1. Last year, total sales for Paddy McGowan's Fine Irish Potatoes were $110,000. This year, sales are $115,000. What is the percent change between last year's sales and this year's?

Keys:	Description:
(MENU) B	Selects (MENU) Bus%.
110000 OLD	Stores the old value.
115000 NEW	Stores the new value.
%CHG	Calculates the percent change.

```
Old value..... OLD    = 110,000.00
New value..... NEW    = 115,000.00
Percent change.... %CHG   =       4.55

Total amount...... TOTAL  =       0.00
Part of total..... PART   =       0.00
Percent of total.. %TOTAL =       0.00

                                %CHG = 4.55
```


Part 2. What would this year's sales have to be to show a 12% increase from last year? (*OLD* remains 110,000, so you don't have to key it in again.)

Keys:	Description:
12 %CHG	Stores the percent change.
NEW	Calculates the new value.

```
Old value..... OLD    = 110,000.00
New value..... NEW    = 123,200.00
Percent change.... %CHG   =      12.00

Total amount..... TOTAL  =       0.00
Part of total..... PART   =       0.00
Percent of total.. %TOTAL =       0.00

                              NEW = 123,200.00
```

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Calculating Percent of Total

The percent of total function keys are TOTAL (F7), PART (F8), and %TOTAL (F9). After you select MENU Bus%, you may have to press More (F10) to get to the function keys for this example.

Example: Calculating the Percent of Total. Part 1. Total assets for Lynn Winter's Travel Insurance are $675,840. The firm has $234,576 cash on hand. What percentage of total assets is cash on hand?

Keys:	Description:
MENU B	Selects MENU Bus%.
675840 TOTAL	Stores the amount of total assets.
234576 PART	Stores the cash-on-hand part of the assets.
%TOTAL	Calculates the percent of total.

```
Total amount..... TOTAL  = 675,840.00
Part of total..... PART   = 234,576.00
Percent of total.. %TOTAL =      34.71

                             %TOTAL = 34.71
```

Part 2. Last year, due to missed and rerouted flights, the company incurred special expenses that were 45% of operating expenses. If operating expenses were $76,249, how much were the special expenses?

Keys:	Description:
45 %TOTAL	Stores the percent of total for special expenses.
76249 TOTAL	Stores the total operating expenses.
PART	Calculates the special expenses part of the total.

```
Total amount..... TOTAL  = 76,249.00
Part of total..... PART   = 34,312.05
Percent of total... %TOTAL =     45.00

                          PART = 34,312.05
```


Calculating Markup and Margin

The Calculator enables you to calculate cost, selling price, markup, and margin. **Markup** calculations are expressed as a percent of *cost*. **Margin** is markup expressed as a percent of *price*.

Note that after you select (MENU) Bus% you may have to press More ((F10)) to get to the function keys used in the following examples.

Example: Calculating Markup. The standard markup on running shoes at Steppin' Stephens Shoe Store is 60%. They just received a shipment of running shoes costing $49 per pair. What is the retail price per pair for those shoes?

Keys:	Description:
(MENU) B	Selects (MENU) Bus%.
49 COST	Stores the cost.
60 MARKUP	Stores the markup.
PRICE	Calculates the selling price.

```
Cost.................. COST   =  49.00
Price................. PRICE  =  78.40

Mark up............... MARKUP =  60.00
Margin................ MARGIN =  37.50

                                PRICE = 78.40
```

Example: Calculating Margin. Jean's Jeans Company purchases designer blue jeans for $25 per pair. The jeans are then sold for $395. What is the margin?

Keys:	Description:
(MENU) B	Selects (MENU) Bus%.
25 COST	Stores the cost.
395 PRICE	Stores the selling price.
MARGIN	Calculates the margin.

```
Cost.................. COST   =    25.00
Price................. PRICE  =   395.00

Mark up............... MARKUP = 1,480.00
Margin................ MARGIN =    93.67

                                MARGIN = 93.67
```

Example: Using Margin and Markup Together. A food cooperative buys cases of canned soup with an invoice cost of $9.60 per case. If the co-op routinely uses a 15% markup, for what price should it sell a case of soup? What is the margin?

Keys:	Description:
(MENU) B	Selects (MENU) Bus%.
9.6 COST	Stores the cost.
15 MARKUP	Stores the markup and calculates the margin of 13.04%.
PRICE	Calculates the selling price of $11.04.

```
Cost.................. COST   =   9.60
Price................. PRICE  =  11.04

Mark up............... MARKUP =  15.00
Margin................ MARGIN =  13.04

                              PRICE = 11.04
```

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Time Value of Money and Interest Conversions

When you select (MENU) TVM within the Calculator, you get the time-value-of-money (TVM) feature, which enables you to do compound-interest, amortization, and interest-rate-conversion calculations.

- Compound interest occurs when earned interest is added to the principal at specified compounding periods, and then the combined amount earns interest. Many financial calculations are compound interest calculations—for example, savings accounts, mortgages, pension funds, leases, and annuities.
- Amortization calculations determine the amounts applied toward principal and interest in a series of payments.
- Interest-rate conversions enable you to compare nominal and effective interest rates.

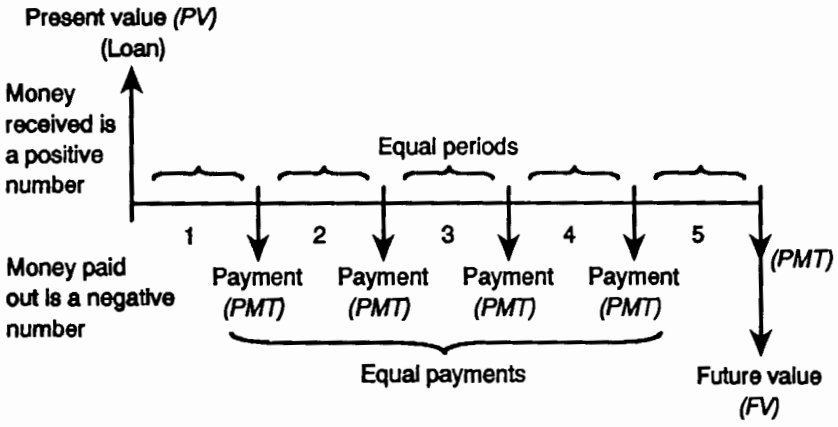
You can use TVM when there is a series of cash flows (money received or money paid) that meets these criteria:

- The dollar amount is the same for each payment.
- The payments occur at regular intervals.
- Payment periods coincide with the compounding periods.

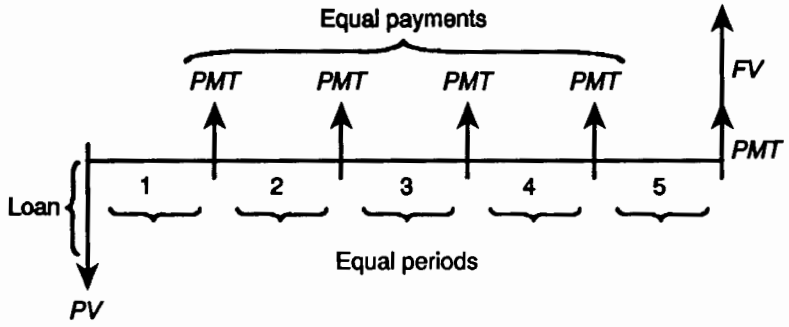
Making Cash Flow Diagrams

You can represent and understand many types of financial transactions using **cash flow diagrams**. A cash flow diagram is a time line divided into equal segments representing the compounding periods. Arrows represent the cash flows. Money received is a positive value, and money paid out is a negative value. Cash flow diagrams are used in the examples in this manual to help describe the problems.

The cash flow diagram for a transaction depends on the point of view you take in your problem statement. For example, a loan is an initial positive cash flow for the borrower, but it's an initial negative cash flow for the lender. The following cash flow diagram shows a loan from a *borrower's* point of view.



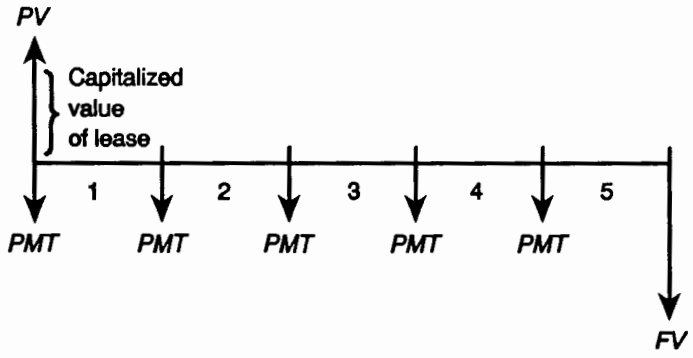
The following cash flow diagram shows a loan from a *lender's* point of view.



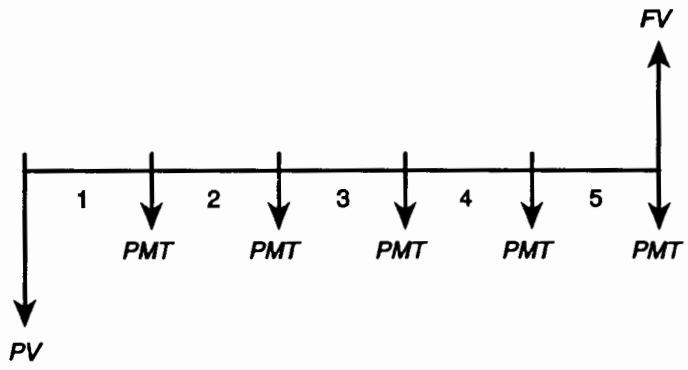
In addition, cash flow diagrams specify *when* payments occur relative to the compounding periods: at the *beginning* of each period or at the *end*. TVM provides both of these payment modes: **Begin mode** and **End mode**.

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The following cash flow diagram shows lease payments at the *beginning* of each period.



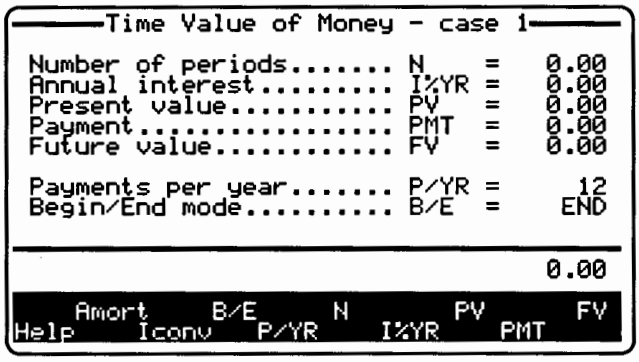
The following cash flow diagram shows deposits into an account at the *end* of each period.



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The TVM Screen

Selecting (MENU) TVM the first time displays the main TVM screen, which contains the TVM variables and their corresponding function keys:



Two of the function keys, Amort (amortization) and Iconv (interest rate conversion), bring up other screens with their own sets of function keys.

After the first time you use TVM, it starts where you last left off. If the amortization or interest conversion screen is displayed and you want to get back to the main TVM screen, press [ESC] until you get to that screen.

The TVM Function Keys

Function	Description
Amort	Brings up the amortization screen and function keys (see "Calculating Amortization" later in this chapter).
Iconv	Brings up the interest conversion screen and function keys (see "Calculating Interest Rate Conversions" later in this chapter).
B/E	Switches the payment mode between BEGIN (for payments made at the beginning of periods) and END (for payments made at the end of periods).
P/YR	Stores the number of payments or compounding periods per year. The value must be an integer in the range 1 through 999.
N	Stores or calculates the total number of payments (or compounding periods). *N* can be expressed in any unit of time—for example, days, months, or years. [◇] N multiplies the number in the calc line by *P/YR* and stores the result in *N*. For example, if *P/YR* is 12, pressing 30 [◇] N stores 360 in *N*.
I%YR	Stores or calculates the nominal *annual* interest rate as a percentage.
PV	Stores or calculates the present value of a series of future cash flows. To a lender or borrower, *PV* is the amount of the loan; to an investor, *PV* is the initial investment. *PV* always occurs at the beginning of the first period.
PMT	Stores or calculates the amount of each periodic payment. The payments are the same amount, and no payments are skipped. Payments can occur at the beginning or end of each period.
FV	Stores or calculates the future value—the amount of the final cash flow, or the compounded value of the series of previous cash flows. *FV* always occurs at the end of the last period.

Switching TVM Cases

The Calculator lets you keep two different sets of TVM variables in memory, cases 1 and 2. They are displayed one at a time, with the current case being noted at the top of the TVM screen.

To switch cases, press ▶ or ◀. The displayed case number and values in the variables change.

Clearing the TVM Variables

The Calculator retains the values stored in the TVM variables until they are changed or cleared. To clear the variables for the displayed TVM case—the other case is not affected—select MENU Erase Data. This clears *N*, *I%YR*, *PV*, *PMT*, and *FV* to 0, sets *P/YR* to 12, and sets End mode.

Making TVM Calculations

To make TVM calculations, follow this general procedure:

1. Select MENU TVM.
2. If necessary, press ESC to display the main TVM screen.
3. Check and set these TVM conditions:
   - Number of payments per year.
   - Payments at beginning or end of periods.
4. Store values for the four known TVM variables.
5. Find the unknown value.

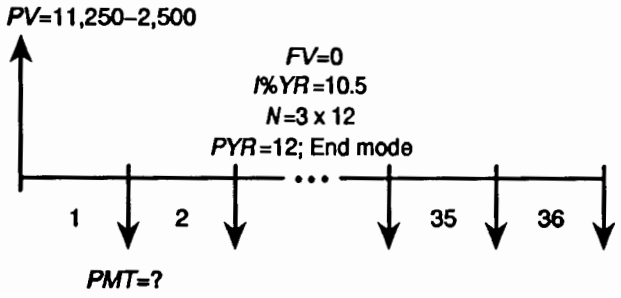
The next few pages contain a series of TVM examples. These examples demonstrate entering data using the function keys that correspond to the variables on the screen. The point-and-shoot method for data entry also works. It is demonstrated in an example in chapter 22 and involves highlighting a variable on the screen using the arrow keys, typing a number, and then pressing ▲, ▼ or ENTER. Calculating the unknown variable is done by highlighting it and pressing the spacebar.

For more keystroke examples, see "Additional TVM Examples" at the end of this chapter.

Note

The examples in this chapter assume the main TVM screen appears when you select (MENU) TVM. However, depending on where you left off in TVM the last time you used it, you may see the amortization screen or the interest conversion screen first. If this occurs, press (ESC) after you select (MENU) TVM to return to the main TVM screen.

Example: A Car Loan. Otto Tailfin is financing the purchase of a car with a 3-year loan at 10.5% annual interest, compounded monthly. The purchase price of the car is $11,250, and his down payment is $2500. What are his monthly payments? (Assume that payments start at the end of the first period.)



Keys:	Description:
(MENU) T	Selects (MENU) TVM to display the TVM screen.
(MENU) E D	Clears any prior TVM data.
3 (↑) N	Enters the total number of monthly payments.
10.5 I%YR	Enters the annual interest rate.
11250 (−) 2500 PV	Enters the amount of the loan as the present value.
0 FV	Enters 0 as the future value because the loan will be completely paid off at the end of 3 years. (This step is really not necessary because FV was set to 0 when the data was cleared above.)
PMT	Calculates the monthly payment.

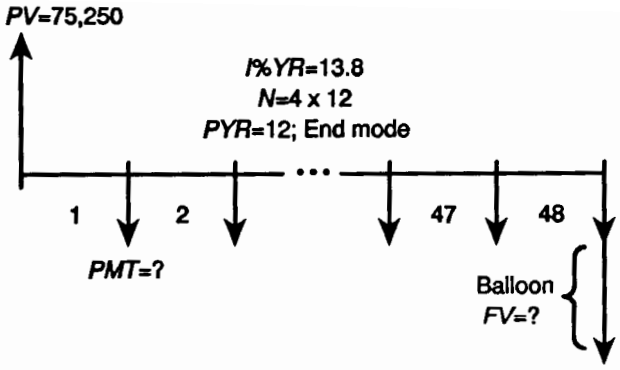
25

```
Number of periods..... N    =    36.00
Annual interest....... I%YR =    10.50
Present value......... PV   = 8,750.00
Payment............... PMT  =  -284.40
Future value.......... FV   =     0.00

Payments per year..... P/YR =       12
Begin/End mode........ B/E  =      END

                                PMT = -284.40
```

Example: A Mortgage with a Balloon Payment. Russ T. Pipes has taken out a 25-year, $75,250 house mortgage at 13.8% annual interest. He expects to sell the house in 4 years, repaying the loan in a balloon payment. Find the size of the balloon payment—the value of the mortgage after 4 years of payments.



Keys:	Description:
(MENU) T	Selects (MENU) TVM to display the TVM screen.
(MENU) E D	Clears any prior TVM data.
25 (↑) N	Enters the total number of monthly payments.
13.8 I%YR	Enters the annual interest rate.
75250 PV	Enters the amount of the mortgage as the present value.
0 FV	Enters 0 as the future value.
PMT	Calculates the monthly payment.

25

```
Number of periods.... N    =    300.00
Annual interest...... I%YR =     13.80
Present value........ PV   = 75,250.00
Payment.............. PMT  =   -894.33
Future value......... FV   =      0.00

Payments per year.... P/YR =        12
Begin/End mode....... B/E  =       END

                              PMT = -894.33
```

894.33 [+/-] PMT	Stores the actual dollars-and-cents payment, which is the computed payment rounded to 2 decimal places. (Otherwise, *PMT* would have fractional cents as previously calculated.)
4 [↔] N	Enters the number of payments made in 4 years.
FV	Calculates the balloon payment at the end of 4 years.

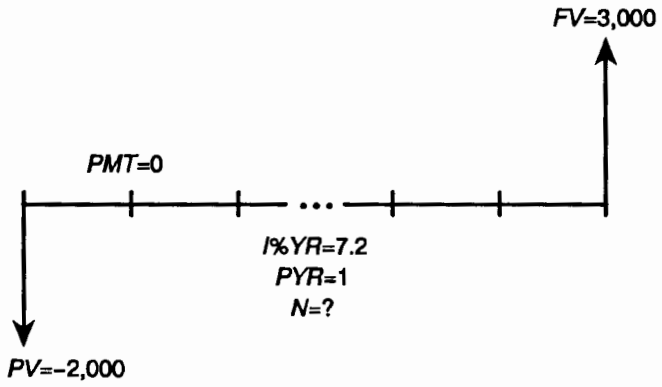
```
Number of periods... N     =       48.00
Annual interest..... I%YR  =       13.80
Present value....... PV    =   75,250.00
Payment............. PMT   =     -894.33
Future value........ FV    = -73,408.81

Payments per year... P/YR  =          12
Begin/End mode...... B/E   =         END
```

25

```
                                FV = -73,408.81
```

Example: A Savings Account. Penny Horder deposits $2000 into a savings account that pays 7.2% annual interest, compounded annually. If she makes no other deposits into the account, how long does it take for the account to contain $3000?



Keys:	Description:
(MENU) T	Selects (MENU) TVM to display the TVM screen.
(MENU) E D	Clears any prior TVM data.
1 P/YR	Sets 1 compounding period per year.
7.2 I%YR	Enters the annual interest rate.
2000 (+/-) PV	Enters the amount of the deposit.
3000 FV	Enters the future value.
N	Calculates the number of years.

```
Number of periods.... N    =       5.83
Annual interest...... I%YR =       7.20
Present value........ PV   = -2,000.00
Payment.............. PMT  =       0.00
Future value......... FV   =  3,000.00

Payments per year.... P/YR =          1
Begin/End mode....... B/E  =        END

                                N = 5.83
```

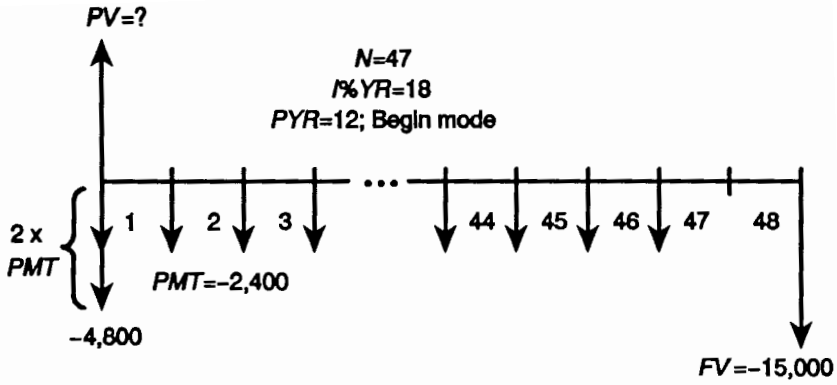
25

Since the calculated value of N is between 5 and 6, it will take 6 years of annual compounding to achieve a balance of at least \$3,000. The actual balance at the end of 6 years can be calculated:

6 N	Enters 6 as N.
FV	Calculates the balance after 6 years.

```
                              FV = 3,035.28
```

Example: A Lease. Sandy Lome is leasing farm equipment for 4 years. The monthly payment is \$2400. An additional \$2400 payment at the beginning of the leasing period replaces the final payment. The leasing agreement includes an option to buy the equipment for \$15,000 at the end of the leasing period. Calculate the capitalized value of the lease, assuming that the interest rate Lome pays to borrow funds is 18%, compounded monthly.



Make the calculation in four steps:

1. Calculate the present value for the 47 monthly payments—the initial investment required to make the monthly payments.
2. Add the advance payment to the result of step 1.
3. Calculate the present value of the buy option—the initial investment required to generate the option price after 48 months.
4. Add the values calculated in steps 2 and 3.

Step 1. Calculate the present value of the monthly payments.

Keys:	**Description:**
(MENU) T	Selects (MENU) TVM to display the TVM screen.
(MENU) E D	Clears any prior TVM data.
B/E	Set payments at the beginning of the periods.
47 N	Enters the number of payments.
18 I%YR	Enters the annual interest rate.
2400 (+/-) PMT	Enters the monthly payment.
PV	Calculates the present (capitalized) value of the 47 monthly payments.

```
PV = 81,735.58
```

Step 2. Add the additional advance payment to PV and store the answer.

[+] 2400 [=]	Adds the advance payment to PV.
[STO] 1	Stores the result in register 1.

```
Reg1 = 84,135.58
```

Step 3. Find the present value of the buy option.

48 N	Enters the number of periods.
15000 [+/-] FV	Enters the amount of buy option.
0 PMT	Clears PMT.
PV	Calculates the present value of the buy option.

```
PV = 7,340.43
```

25

Step 4. Add the results of steps 2 and 3.

[+] [RCL] 1 [=]	Calculates the present (capitalized) value of the lease.

```
91,476.00
```

Calculating Amortization

Amortization calculations determine the amounts applied toward principal and interest in a payment or series of payments. When you select [MENU] TVM and press Amort ([F2]), you get the amortization function keys:

Key	Description
GO	Calculates the amortization for a group of payments. If you enter a number in the calc line and then press GO, that number is used as the number of payments in the group; if you press GO without entering a number, the current number of payments per year (*P/YR*) is used, which is 12 unless you change it.
⇧ GO	Calculates the amortization for a number of groups, specified by the number you type in the calc line.
Adjust	Displays the amortization adjustment screen and function keys.
I%YR'	Stores or calculates a new interest rate or returns the current interest rate to the calc line.
PMT'	Stores or calculates a new payment amount or returns the current payment to the calc line.
BAL	Returns the amount of the remaining balance of the loan to the calc line. (Pressing STO BAL stores a new balance.)
INT	Returns the amount of the payments applied toward interest to the calc line.
ACCUM	Returns the amount of accumulated interest since the start of the amortization (period 0) to the calc line.
PRIN	Returns the amount of the payments applied toward principal to the calc line.
1-2-3	Specifies the current 1-2-3 worksheet as the destination for the amortization table. When an amortization table is generated, it is sent to the 1-2-3 worksheet starting at the current cell. This feature works only when a 1-2-3 worksheet is currently loaded.

25

To make amortization calculations, follow this general procedure:

1. Start TVM by selecting MENU TVM.
2. Check that these TVM conditions are set:
   - Number of payments per year.
   - Payments at beginning or end of periods.
3. Store values for three TVM variables: *I%YR*, *PV*, and *PMT*. These variables define the payment schedule. (For an adjustable rate mortgage, also store the total number of payments in *N*.)
4. Press Amort (F2) to select the amortization screen.

5. Do one of the following:
   - Simply press GO (F10) to calculate amortization for the number of periods stored in *P/YR* (which is 12 unless you changed it).
   - Enter the number of payments to amortize, then press GO (F10).
6. For an Adjustable Rate Mortgage (ARM):
   a. At the point in the schedule where the interest rate changes, adjust it by typing the new rate in the calc line and pressing I%YR' (F4).
   b. Calculate the adjusted payment by pressing PMT' (F5).
   c. Optionally press Adjust (F3) to select the amortization adjustment screen. (This screen enables you to adjust other amortization variables, if necessary, for your particular problem.)
   d. Continue using GO (F10) to calculate the adjusted amortization schedule.
   e. When you're finished, press ESC to return to the amortization screen.

To start the amortization schedule over, select MENU Erase Data and begin again.

Amortization calculations use values of *PV*, *PMT*, and *INT* rounded to the number of decimal places specified by the current display setting. However, the stored values of *PV* and *PMT* do not change. Amortization uses all 12 digits of *I%YR*.

Pressing ESC from the amortization screen returns you to the main TVM screen.

Example: Amortization Schedule for a Home Mortgage. Part 1. Rufus Leekin has taken out a 30-year, $65,000 mortgage at 12.5% annual interest. Calculate his monthly payment, and then calculate the first year's payments that are applied toward principal and interest.

Keys:	Description:
(MENU) T	Selects (MENU) TVM to display the TVM screen.
(MENU) E D	Clears any prior TVM data.
30 (↓) N	Enters the number of payments.
12.5 I%YR	Enters the annual interest rate.
65000 PV	Enters the amount of the mortgage.
PMT	Calculates the monthly payment.

```
Number of periods.... N    =    360.00
Annual interest...... I%YR =     12.50
Present value........ PV   = 65,000.00
Payment.............. PMT  =   -693.72
Future value......... FV   =      0.00

Payments per year.... P/YR =        12
Begin/End mode....... B/E  =       END
```

25

Amort	Selects the amortization screen.
GO	Calculates the amortization for the first year (12 payments).

```
Group 1      Payments 1 - 12
Payments per group: 12

Amort interest rate. I%YR' =     12.50
Amort payment....... PMT'  =   -693.72

Remaining balance... BAL   = 64,788.52
Interest............ INT   = -8,113.16
Accum. interest..... ACCUM = -8,113.16
Principal........... PRIN  =   -211.48
```

Part 2. Calculate the loan balance after $3\ ^1/_2$ years. (You've already amortized the first 12 months, so if you amortize 30 more months, you will have amortized a total of 42 months, or $3\ ^1/_2$ years.)

30 GO	Calculates the amortization for the next 30 payments.

```
Group 2      Payments 13 - 42
Payments per group: 30

 Amort interest rat. I%YR' =     12.50
 Amort payment...... PMT'  =   -693.72

Remaining balance.. BAL   =  64,129.05
Interest.......... INT   = -20,152.13
Accum. interest.... ACCUM = -28,265.29
Principal......... PRIN  =    -659.47
```

After 3 $^1/_2$ years, Rufus has an unpaid balance of $64,129.05.

Example: Adjustable Rate Mortgage. Part 1. Pete Moss took out a $100,000, 20-year ARM to purchase the building for his garden supply store. His interest rate for the first year is 8.25%. Moss expects the rate for the second year to increase to 8.75%. How would the increase affect his monthly payment for the second year?

25

Keys:	Description:
MENU T	Selects MENU TVM to display the TVM screen.
MENU E D	Clears any prior TVM data.
20 ↑ N	Enters the number of payments.
8.25 I%YR	Enters the annual interest rate.
100000 PV	Enters the amount of the mortgage.
PMT	Calculates the monthly payment.

```
PMT = -852.07
```

	Amort	Selects the amortization screen.
	GO	Calculates the amortization for the first year (12 payments).

```
Group 1       Payments 1 - 12
Payments per group: 12

Amort interest rate. I%YR' =       8.25
Amort payment....... PMT'  =    -852.07

Remaining balance... BAL   = 97,948.74
Interest............ INT   = -8,173.58
Accum. interest..... ACCUM = -8,173.58
Principal........... PRIN  = -2,051.26
```

	8.75 I%YR'	Enters the adjusted interest rate.
25	PMT'	Calculates the adjusted payment. (The number of remaining periods is updated automatically to 228.)

```
Amort interest rate. I%YR' =       8.75
Amort payment....... PMT'  =    -882.62
```

Moss's monthly payment would increase from $852.07 in year 1 to $882.62 in year 2.

Part 2. How much would Moss pay in interest the second year?

GO Calculates amortization for the second year.

```
Group 2      Payments 13 - 24
Payments per group: 12

Amort interest rat. I%YR' =       8.75
Amort payment..... PMT'  =    -882.62

Remaining balance.. BAL   =  95,844.76
Interest.......... INT   =  -8,487.46
Accum. interest.... ACCUM = -16,661.04
Principal......... PRIN  =  -2,103.98
```

Pete's interest total for the second year is $8,487.46.

Note



The previous adjustable rate mortgage example uses the variables in the main amortization screen for the calculations. This same example could be done using the amortization adjust screen. (Press Adjust (F3) from the main amortization screen to see this screen; press ESC to leave it.) The amortization adjust screen is most useful when you have a more complicated adjustment problem that requires adjusting more than just the payment or interest rate.

Example: Graduated Payment Mortgage. To purchase a vacation condominium, Biff Beamer took out a 15-year, 12.5% GPM for $95,000. His monthly payment for the first 2 years is $875, after which time the payment increases to fully amortize the loan. What will the remaining balance be at the end of the 2 years? How much will Biff's payment have to increase to fully amortize the loan by the end of the original 15-year period?



Keys:	Description:
(MENU) T	Selects (MENU) TVM to display the TVM screen.
(MENU) E D	Clears any prior TVM data.
15 (↑) N	Enters the number of payments.
12.5 I%YR	Enters the annual interest rate.
95000 PV	Enters the amount of the mortgage.
875 (+/-) PMT	Enters the monthly payment during the first 2 years.
Amort	Selects the amortization screen.
24 GO	Calculates the amortization for the first 2 years, showing a remaining balance of $98,106.01.

25

```
Group 1      Payments 1 - 24
Payments per group: 24

Amort interest rat. I%YR' =      12.50
Amort payment...... PMT'  =    -875.00

Remaining balance.. BAL   =  98,106.01
Interest.......... INT   = -24,106.01
Accum. interest.... ACCUM = -24,106.01
Principal......... PRIN  =   3,106.01
```

PMT'

Calculates the payment required to fully amortize the loan over the remaining number of periods. For the last 13 years of the loan Biff's monthly payment will be $1,275.15.

```
PMT' = -1,275.15
```

Note



The previous example involves **negative amortization**—a case in which payments are less than accrued interest for a time, causing the principal to increase by the difference between paid and accrued interest. In negative amortization the interest amounts shown in the amortization screen reflect the *accrued* interest, not the interest *paid*. As long as the payment is less than the accrued interest for the period, you can calculate the interest paid for a group of payments by multiplying the payment amount by the number of payments in the group.

Sending an Amortization Table to 1-2-3 or a Printer

The Calculator enables you to print an amortization table or send it to a 1-2-3 worksheet as the table is created.

To print an amortization table:

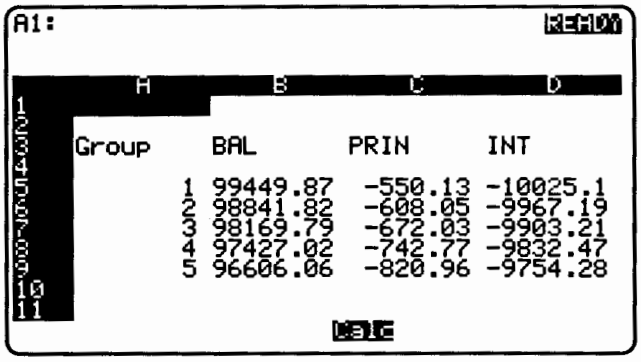
1. From the amortization screen, select (MENU) Print Data to turn printing on. When printing is on, a PRINT annunciator appears in the upper-right corner of the display.
2. Use GO and (↑) GO to generate the parts of the table you want printed. ((↑) GO is very useful here because it prints the table for the *number of groups* specified in the calc line.) The groups are printed as they are generated.
3. When you're finished printing, select (MENU) Print Data again to turn printing off. Leaving the amortization screen also turns off printing.

You cannot send an amortization table to a printer and a 1-2-3 worksheet at the same time. If output is set to go to 1-2-3, selecting (MENU) Print Data turns that feature off when it directs output to the printer.

To send an amortization table to the current 1-2-3 worksheet:

1. Select (MENU) TVM Amort and press 1-2-3 ((F10)). The current 1-2-3 worksheet is displayed.
2. Move the cell pointer to the cell where you want to start receiving input and press (ENTER). Eight amortization column headings are put into the worksheet and you are returned to the amortization screen. The amortization screen now shows a 1-2-3 annunciator in the upper-right corner of the screen to remind you that output will be sent to 1-2-3.
3. Calculate the amortization as described earlier in this chapter. Each time you press GO (or (↑) GO) the results are sent to the current 1-2-3 worksheet—a row of information is sent for each group of payments calculated.
4. When you no longer want the results sent to the current worksheet, press 1-2-3 ((F10)) again. The 123 annunciator turns off.

When you display the worksheet, you'll be able to see the amortization output. Here is an example of five groups sent to a worksheet:



The table sent to the worksheet comprises eight columns of data:

Column	Description
Group	The group number.
BAL	The remaining balance at the end of that group of payments.
PRIN	The principal paid for that group of payments.
INT	The interest paid for that group of payments.
ACCUM	The accumulated interest paid.
#PMTS	The number of payments in that group.
I%YR	The annual interest rate for that group of payments.
PMT	The periodic payment for that group.

You cannot send an amortization table to a printer and a 1-2-3 worksheet at the same time. If output is set to go to the printer, pressing 1-2-3 turns that feature off when it directs output to the current worksheet.

Calculating Interest Rate Conversions

Interest rates are generally stated as *nominal annual interest rates*. A nominal annual interest rate is an annual rate that is compounded *periodically*—for example, 18% per year, compounded monthly (12 times per year). When investments have different compounding periods, *effective interest rates* are used to compare them. The effective rate is the annual rate that would produce the same interest earnings as the nominal rate compounded P times per year. For example, earning 18% annual rate compounded monthly (nominal rate) is equivalent to earning 19.56% effective annual interest.

The Calculator lets you easily convert interest rates for comparison. When you select (MENU) TVM and press Iconv ((F3)), you get these function keys:

Function	Description
P/YR	Stores the number of payments per year.
I%YR	Stores or calculates the nominal annual rate.
EFF%	Stores or calculates the effective annual rate.
I%PER	Stores or calculates the periodic interest rate (*I%YR* ÷ *P/YR*).
CONT	Stores or calculates the Continuously-compounded rate.
360/5	Stores or calculates the rate based on the 360/365 method (a method sometimes used in the savings industry).

25 Storing any of the interest rate values *automatically* updates the others. Storing *P/YR* updates the other values based on the effective rate. Also, pressing (RCL) before a function key recalls that value to the calc line.

When you press Iconv ((F3)), the interest conversion screen appears with conversions based on the *P/YR* and *I%YR* values used in the main TVM screen. Changing any of the values on this screen updates all the other values automatically.

Pressing (ESC) from this screen returns you to the main TVM screen.

Example: Converting and Comparing Interest Rates. Rodeo star Buck Doff is considering how to invest his recent winnings. He has two investment options: One promises to pay 13.6% annual interest, compounded daily, and the other promises to pay 14.0%, compounded semi-annually. Which of Doff's options would give him the highest effective rate?

Keys:	Description:
(MENU) T	Selects TVM.
(MENU) E D	Erases any prior TVM data.
Iconv	Selects the interest conversion screen.
365 P/YR	Enters the number of compounding periods in option 1.
13.6 I%YR	Enters the nominal annual rate for option 1.

```
Payments per year..... P/YR  =    365

Nominal annual rate.... I%YR  =  13.60
Effective annual rate.. EFF%  =  14.57
```

2 P/YR	Enters the number of compounding periods in option 2.
14.0 I%YR	Enters the nominal annual rate for option 2.

```
Payments per year..... P/YR  =      2

Nominal annual rate.... I%YR  =  14.00
Effective annual rate.. EFF%  =  14.49
```

The effective annual rate for option 1 (14.57%) is higher than that for option 2 (14.49%).

Compounding Periods Different from Payment Periods

TVM in the Calculator assumes that the compounding periods and the payment periods are the same. However, regularly occurring deposits and withdrawals do not necessarily coincide with the investment's compounding periods. To solve a TVM problem where they don't coincide, first convert the interest rate to an equivalent interest rate with compounding periods that match the regular deposits or withdrawals.

Example: A Savings Account with Compounding Periods Different from Payment Periods. Starting today, Penny Horder makes monthly deposits of $25 into an account paying 5% interest compounded daily (365-day basis). At the end of 7 years, how much will Penny receive from the account?

Keys:	Description:
(MENU) T	Selects TVM.
(MENU) E D	Erases any prior TVM data.
Iconv	Selects the interest conversion screen.
365 P/YR	Enters the number of compounding periods.
5 I%YR	Enters the nominal annual rate for daily compounding. Notice the effective annual rate is automatically calculated.

```
Payments per year..... P/YR  =    365

Nominal annual rate.... I%YR  =   5.00
Effective annual rate.. EFF%  =   5.13
```

25

12 P/YR	Enters monthly compounding periods, and calculates the equivalent nominal rate for monthly compounding.

```
Payments per year..... P/YR  =     12

Nominal annual rate.... I%YR  =   5.01
Effective annual rate.. EFF%  =   5.13
```

ESC	Displays the main TVM screen.
B/E	Sets payment mode to beginning of a period.
7 ↓ N	Enters the total number of periods.
25 +/- PMT	Enters the payment per period.
0 PV	Enters the present value.
FV	Calculates the amount in Penny's account after 7 years.

```
Number of periods..... N    =     84.00
Annual interest....... I%YR =      5.01
Present value......... PV   =      0.00
Payment............... PMT  =    -25.00
Future value.......... FV   = 2,519.61

Payments per year..... P/YR =        12
Begin/End mode........ B/E  =     BEGIN

                              FV = 2,519.61
```


Example: Canadian Mortgages. In Canadian mortgages, interest is compounded semi-annually while payments are made monthly. The *Canadian mortgage factor* is calculated by converting the stated nominal interest rate (compounded semi-annually) to the nominal rate compounded monthly (the payment period). The factor is then used as the TVM variable *I%YR*.

The multinational law firm of Honig, Bradley, and Erickson has opened a Canadian office in Toronto. What is the monthly payment required to fully amortize their 30-year, $300,000 Canadian mortgage with an interest rate of 12%?

Keys:	Description:
(MENU) T	Selects TVM.
(MENU) E D	Erases any prior TVM data.
Iconv	Selects the interest conversion screen.
2 P/YR	Enters the number of compounding periods.
12 I%YR	Enters the nominal annual interest rate and calculates the effective annual rate.

```
Payments per year..... P/YR =      2

Nominal annual rate..... I%YR =  12.00
Effective annual rate... EFF% =  12.36
```

12 P/YR	Enters monthly compounding periods, and calculates the equivalent nominal rate for monthly compounding (the *Canadian mortgage factor*).

25

```
Payments per year..... P/YR =     12

Nominal annual rate..... I%YR =  11.71
Effective annual rate... EFF% =  12.36
```

ESC	Displays the main TVM screen.
30 ↔ N	Enters the total number of periods.
300000 PV	Enters the present value.
0 FV	Enters the future value.
PMT	Calculates Honig, Bradley, and Erickson's monthly payment.

```
Number of periods... N    =      360.00
Annual interest..... I%YR =       11.71
Present value....... PV   =  300,000.00
Payment............. PMT  =   -3,019.16
Future value........ FV   =        0.00

Payments per year... P/YR =          12
Begin/End mode...... B/E  =         END

                              PMT = -3,019.16
```

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Additional TVM Examples

Yield of a Discounted (or Premium) Mortgage

The annual yield of a mortgage bought at a discount or premium can be calculated given the original mortgage amount (PV), interest rate ($I\%YR$), periodic payment (PMT), balloon payment (if any) (FV), and the price paid for the mortgage (new PV).

Example: Yield of a Discounted Mortgage. Seymour Profit wishes to purchase a $100,000 mortgage from Skip Towne. Towne originally issued the mortgage at 9% interest for 20 years. Since the mortgage was issued, 42 monthly payments have been made. The loan is to be paid in full (a *balloon payment*) at the end of its fifth year. What is the yield if the purchase price of the mortgage is $79,000?

1. Calculate PMT for the fully amortized loan ($N = 20 \times 12$, $FV = 0$, $PV = -100{,}000$, and $I\%YR = 9$).

2. Calculate the balloon payment (FV). (Use PMT from step 1, $N = 5 \times 12$).

3. Store the number of payments remaining until the balloon payment as N ($5 \times 12 - 42$), and store the proposed purchase price as PV ($79,000); calculate $I\%YR$ (the annual yield).

Step 1. Calculate PMT.

Keys:	Description:
(MENU) T	Selects (MENU) TVM to display the TVM screen.
(MENU) E D	Clears any prior TVM data.
20 (↑) N	Enters the total number of monthly payments for a full 20-year mortgage.
9 I%YR	Enters the annual interest rate.
100000 (+/-) PV	Enters the amount of the original loan.
0 FV	Enters 0 as FV.
PMT	Calculates the monthly payment received from the borrower.

```
Number of periods.. N    =       240.00
Annual interest.... I%YR =         9.00
Present value...... PV   = -100,000.00
Payment............ PMT  =       899.73
Future value....... FV   =         0.00
```

Step 2. Calculate the balloon.

5 (↑) N	Enters the number of payments in 5 years.
FV	Calculates the balloon due in 5 years.

```
FV = 88,707.05
```

Step 3. Calculate the yield.

RCL N − 42 N	Enters the number of payments remaining until the balloon payment.
79000 +/− PV	Enters proposed, discounted purchase price.
I%YR	Calculates annual yield for discounted mortgage with balloon.

```
I%YR = 20.72
```

Loans With Fees

The **annual percentage rate**, APR, incorporates fees charged when a mortgage is issued, which effectively raises the interest rate. The actual amount received by the borrower (PV) is reduced, while the periodic payments remain the same.

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Example: APR of a Loan with Fees. Ernest Munnie is charged two points for the issuance of his mortgage. (One point is equal to 1% of the mortgage amount.) If the mortgage amount is $60,000 for 30 years and the interest rate is 11.5% annually with monthly payments, what APR is Ernie paying?

1. Calculate PMT, using PV=$60,000 and $I\%YR$=11.5%.
2. Adjust PV to reflect the amount of the loan minus the fees. Then, calculate the APR ($I\%YR$), using the PMT calculated in step 1 (all other values remain the same).

Step 1. Calculate *PMT*.

Keys:	Description:
(MENU) T	Selects (MENU) TVM to display the TVM screen.
(MENU) E D	Clears any prior TVM data.
30 ⓞ N	Enters the number of monthly payments.
11.5 I%YR	Enters the annual interest rate.
60000 PV	Enters the amount of the loan.
0 FV	Enters 0 as *FV* since there's no balloon payment.
PMT	Calculates the monthly payment.

```
Number of periods.... N    =    360.00
Annual interest...... I%YR =     11.50
Present value........ PV   = 60,000.00
Payment.............. PMT  =   -594.17
Future value......... FV   =      0.00
```

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Step 2. Adjust *PV* and calculate the APR.

(RCL) PV (−) 2 (%) PV	Enters the actual amount of money received by the borrower.
I%YR	Calculates the APR.

```
I%YR = 11.76
```

Example: Interest-Only Loan with Fees from the Lender's Point of View. Bill Lender is making a $1,000,000, 10-year, 10.5% (annual interest) *interest-only* loan with an origination fee of 3 points. What is the yield to Bill? Assume that the interest-only payments are made monthly. (*PMT* is $1,000,000 × 10.5 ÷ 12, *FV* is the entire loan amount, and *PV* is the loan amount minus the points.)

Keys:	Description:
MENU T	Selects MENU TVM to display the TVM screen.
MENU E D	Clears any prior TVM data.
10 ↓ N	Enters the number of monthly payments.
1000000 * 10.5 % / 12 PMT	Calculates and stores the monthly payment.
1000000 FV	Enters the entire loan amount as a balloon payment.
− 3 % = +/− PV	Enters amount borrowed (total − points) as *PV*.
I%YR	Calculates APR, the yield to the lender.

```
Number of periods. N     =        120.00
Annual interest... I%YR  =         11.00
Present value..... PV    =   -970,000.00
Payment........... PMT   =      8,750.00
Future value...... FV    = 1,000,000.00
```

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A Tax-Free Account

You can use the TVM screen to calculate the future value of a tax-free or tax-deferred account, such as an IRA or Keogh account. Current tax law will determine the extent to which the account is tax-free. The purchasing power of the future value depends on the inflation rate and the duration of the account.

N = the number of payments until retirement.

I%YR = the annual dividend rate.

PV = the present value of the retirement account.

PMT = the amount of your deposit. (It must be constant for the duration of the account.)

FV = the future value of the retirement account.

Example: Future Value and Purchasing Power of a Tax-Free Account. Part 1. Les Tacksis plans to open an individual retirement account with a dividend rate of 8.175%, and invest $2,000 at the beginning of each year until he retires in 35 years. Calculate the account balance at retirement.

Keys:	Description:
(MENU) T	Selects (MENU) TVM to display the TVM screen.
(MENU) E D	Clears any prior TVM data.
1 P/YR	Sets payments per year to 1.
B/E	Sets payment mode to BEGIN.
35 N	Enters the number of periods.
8.175 I%YR	Enters the dividend rate.
0 PV	The present value is 0 before the first payment.
2000 (+/-) PMT	Enters the annual deposit.
FV	Calculates the amount in the account at retirement.

```
Number of periods... N     =       35.00
Annual interest..... I%YR  =        8.18
Present value....... PV    =        0.00
Payment............. PMT   =  -2,000.00
Future value........ FV    = 387,640.45

Payments per year... P/YR  =           1
Begin/End mode...... B/E   =       BEGIN

                          FV = 387,640.45
```

Part 2. How much has Les paid into the account at retirement?

RCL PMT ✱
RCL N =

Calculates $PMT \times N$.

-70,000.00

Part 3. How much interest has the account earned. (The interest earned equals the difference between FV and the total amount deposited.)

+ RCL FV =

Calculates the interest part of FV.

317,640.45

Part 4. If his post-retirement tax rate is 15%, what is the after-tax future value of the account? Assume only interest is taxed.

25

✱ 15 % =

Calculates taxes, 15% of total interest.

+/- + RCL
FV =

Subtracts taxes from total FV to calculate after-tax FV.

339,994.39

Part 5. Calculate the purchasing power of this amount in today's dollars, assuming an 8% annual inflation rate.

FV
0 PMT
8 I%YR
PV

Calculates the purchasing power in today's dollars. (A negative number indicates money available to flow *from* the investor, so it represents positive purchasing power.

PV = -22,995.37

A Taxable Retirement Account

The following example calculates the future value of a *taxable* retirement account that receives regular, annual payments. The annual tax on the interest is paid out of the account. (Assume the deposits have been taxed already.)

N = the number of payments until retirement.

$I\%YR$ = the annual interest rate diminished by the tax rate: *interest rate* × (1 − *tax rate*).

PV = the current amount in the retirement account.

PMT = the amount of the annual payment.

FV = the future value of the retirement account.

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Example: Future Value and Purchasing Power of a Taxable Retirement Account. Part 1. Izzy Smart is considering investing his money with E. Norma Spayback Investment Company. They claim that if Izzy invests $3,000 with them each year for 35 years at a dividend rate of 8.175%, with dividends taxed as ordinary income, he'll be rich at retirement with close to $500,000. Exactly how much would Izzy have in the account at retirement? Assume a tax rate of 28%, and that payments begin today.

Keys:	Description:
(MENU) T	Selects (MENU) TVM to display the TVM screen.
(MENU) E D	Clears any prior TVM data.
1 P/YR	Sets payments per year to 1.
B/E	Sets payment mode to BEGIN.
35 N	Enters the number of periods.
8.175 (−) 28 (%) I%YR	Enters and stores the dividend rate diminished by the tax rate.
0 PV	The present value is 0 before the first payment.

3000 +/- PMT Enters the annual deposit.

FV Calculates the future value of the taxed account.

```
Number of periods... N    =      35.00
Annual interest..... I%YR =       5.89
Present value....... PV   =       0.00
Payment............. PMT  =  -3,000.00
Future value........ FV   = 345,505.61

Payments per year... P/YR =          1
Begin/End mode...... B/E  =      BEGIN

                              FV = 345,505.61
```

Part 2. What would be the purchasing power of that amount in today's dollars, assuming 8% annual inflation?

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0 PMT

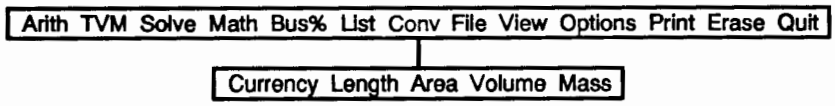
8 I%YR

PV Calculates the purchasing power in today's dollars. (A negative number indicates money available to flow *from* the investor, so it represents positive purchasing power.)

```
                              PV = -23,368.11
```

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Currency and Other Unit Conversions



The Calculator has a conversion feature that enables you to easily convert related units within the following categories:

- Currency (U.S. dollars, pounds, marks, francs, lira, pesetas, escudos, Canadian dollars, yen, and others of your own choosing).
- Length (miles, yards, feet, inches, kilometers, meters, centimeters, millimeters, nautical miles, statute miles, chains, rods, survey feet, and fathoms).
- Area (square miles, acres, square yards, square feet, square inches, square kilometers, hectares, square meters, and square centimeters).
- Volume (gallons, quarts, pints, liters, cubic yards, cubic feet, cubic inches, cubic meters, cups, fluid ounces, tablespoons, teaspoons, milliliters, Imperial gallons, bushels, and pecks).
- Mass (pounds, ounces, troy ounces, kilograms, grams, milligrams, tons, hundredweights, and metric tons).

Select (MENU) Conv from within the Calculator to bring up the main conversion menu. Then select the type of units you want.

Select (MENU) Erase Data to set all the displayed unit values to 0.

If you want to return to the main conversion menu from one of the conversion screens, press (ESC).

Converting Currencies

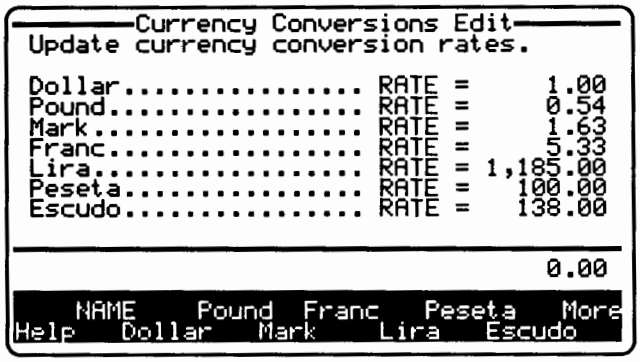
Since exchange rates change frequently, often daily, you have the ability to set the exchange rates between currencies whenever you need to. You must do this the first time you use the currency conversion feature.

Setting Exchange Rates

1. Select (MENU) Conv Currency and press Edit ((F2)) to display the currency conversions editing screen.
2. Type an exchange rate in the calc line and press the function key for the associated currency. (A rate of 0 removes a currency from consideration when you calculate exchanges.)
3. Repeat the previous step for all the desired currencies. When you're done with the currencies on the main screen, be sure to press More ((F10)) and set the rates for the rest of the currencies found there.
4. When you're finished assigning rates, press (ESC) to return to the main currency conversion screen.

The previous procedure demonstrates entering rates using the function keys. The point-and-shoot method described in chapter 22 also works here: Highlight a currency using the arrow keys, type a number, and then press (▼). When you're done entering rates, press (ESC).

Here is what a set of exchange rates might look like in the edit screen:



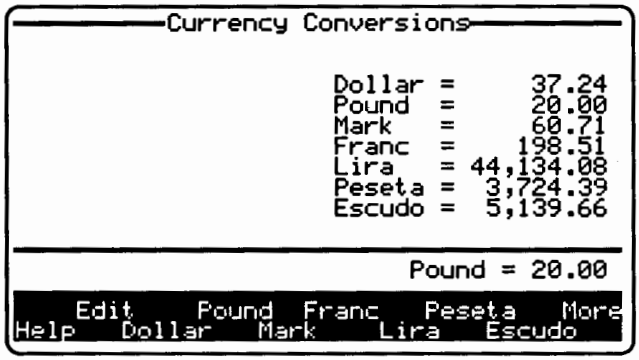
Calculating Exchanges

Once you've entered the exchange rates, you're ready to calculate conversions.

1. Select (MENU) Conv Currency to display the currency conversion screen.
2. Type the number of units in the calc line and press the function key for the corresponding currency—for example, 20 Pound. All the currencies are shown simultaneously in equivalent amounts—in this case, in amounts equal to 20 Pounds.

The point-and-shoot method of data entry—highlighting a currency, typing a number, and pressing (▼) or (ENTER)—works for calculating currencies, too.

Here is what a set of exchanges might look like:



A currency value can be returned to the calc line by pressing (RCL) followed by the function key for the currency you want.

Adding Currencies to the List

You can add up to five currencies to the list of currencies, plus you can change the name of any currency in the original list. Effectively, this means that you can create a list with any 14 currencies you want. After you make a change, follow the instructions earlier in the chapter to give the new currency an exchange rate.

Any changes you make are preserved until you change them again or until you do a system reset.

Adding a New Currency

1. Select (MENU) Conv Currency and press Edit ((F2)) to display the currency conversions editing screen.
2. Press More ((F10)) to display the next screen of currencies.
3. Use the arrow keys to highlight a line without a currency and press NAME ((F2)).
4. Type the name of the new currency and press (ENTER).
5. Type the exchange rate for the new currency and press (ENTER).
6. Repeat steps 3 and 4 for all the changes you want to make.
7. When you're finished, press (ESC) to return to the main currency conversion screen.

Changing the Name of an Existing Currency

1. Select (MENU) Conv Currency and press Edit ((F2)) to display the currency conversions editing screen.
2. Use the arrow keys to highlight the currency you want to change and press NAME ((F2)).
3. Type the new name and press (ENTER).
4. Repeat steps 2 and 3 for all the changes you want to make.
5. When you're finished, press (ESC) to return to the main currency conversion screen.

Example: Exchanging Currencies. Part 1. Change "Dollar" in the existing list to "U.S. Dollar", and add Kenya Shilling to the bottom of the list with a rate of 18.53 Shillings to 1 U.S. Dollar. (Assume U.S. Dollar has a rate of 1.00.)

Keys:	**Description:**
(MENU) C C	Selects (MENU) Conv Currency to display the currency conversion screen.
Edit	Displays the conversions editing screen
(▼)	Highlights the Dollar currency.
NAME U.S. Dollar (ENTER)	Changes the name to U.S. Dollar.
More	Displays the next screen of currencies.
(▼) (▼)	Highlights the first blank currency line.
NAME Kenya Shilling (ENTER)	Enters the name of the new currency.
18.53 (ENTER)	Enters the exchange rate for the Kenya Shilling.
(ESC)	Returns you to the main conversion screen.

```
Canadian $      =   1.16
Yen             = 140.00
Kenya Shilling =  18.53
.............   =
.............   =
.............   =
.............   =
```

Part 2. Calculate the exchange of 500 U.S. Dollars into Kenya Shillings.

Keys:	Description:
More	Displays the currency conversion screen with U.S. Dollars.
500 U.S.	Enters 500 U.S. Dollars. Note that when you enter one value the other values change to equivalent numbers automatically.
More	Displays the next set of currencies, which shows the number of Kenya Shillings.
Kenya	Returns the number of Kenya Shillings to the calc line. 500 U.S. Dollars exchanges to 9,265 Kenya Shillings at the current rate.

```
Canadian $      =    580.00
Yen             = 70,000.00
Kenya Shilling =  9,265.00
   ............  =
   ............  =
   ............  =
   ............  =

 Kenya Shilling = 9,265.00
```


Converting Other Units

Besides currency conversions, you have the ability to convert related units within the categories of length, area, volume, and mass. For example, you can convert a given number of kilometers to miles, grams to ounces, or gallons to liters.

The conversion rates between units are built into the HP 95LX, so all you need to do is enter a number for one unit, and all the related units are displayed with equivalent values automatically.

1. Select (MENU) Conv to display the menu of conversion options.

2. Select the command for the category of units you want to convert: Length, Area, Volume, or Mass.
3. Type a value and press the function key corresponding to its unit. (If the unit you want isn't currently displayed, remember that More ([F10]) displays another screen of related units for most unit types.)

The point-and-shoot method of data entry works here, too, and involves highlighting a unit, typing a number, and pressing [▼] or [ENTER].

A unit value can be returned to the calc line by pressing [RCL] followed by the function key for the unit you want.

Example: Length Conversion. How many meters are there in 1 mile?

Keys:	**Description:**
[MENU] C L	Selects [MENU] Conv Length to display the length conversion screen.
1 MILE	Enters 1 mile and displays the conversions.
[RCL] METER	Returns the number of meters to the calc line. There are 1609.34 meters in 1 mile.

```
miles..... MILE  =          1.00
yards..... YARD  =      1,760.00
feet...... FOOT  =      5,280.00
inches.... INCH  =     63,360.00
kilometers. KM   =          1.61
meters.... METER =      1,609.34
centimeters. CM  =    160,934.40
millimeters. MM  = 1,609,344.00

                    METER = 1609.34
```



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Printing Calculator Information

Arith TVM Solve Math Bus% List Conv File View Options Print Erase Quit

Data Calcline Registers Stack

This chapter covers the specific printing commands within the Calculator. To execute them you need to have a properly configured printer attached to your HP 95LX. If you need information on connecting and configuring a printer or on printing within other applications, appendix C will guide you to that information.

Note



Printing an amortization table is a special case of printing and is covered under "Sending an Amortization Table to 1-2-3 or a Printer" in chapter 25.

Select (MENU) Print to see the menu of printing commands.

Command	Description
Data	Prints the data associated with the current Calculator screen. For instance, if you're doing currency exchanges and select (MENU) Print Data, the displayed currencies with their current values are printed. You can print the data associated with every Calculator feature.
Calcline	Prints the contents of the calc line.
Stack	Prints the contents of the history stack.
Registers	Prints the contents of the storage registers.

Once printing is completed using any of these commands, you are returned to the screen from which you started the print operation.

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Using the Solver and Function Plotting

To open the Calculator, press (↕). When you're ready to leave the Calculator, select (MENU) Quit. To cancel most operations, press (ESC) one or more times. For help in using any function, press Help ((F1)). If pressing (MENU) produces no menu, press (ESC) and try again.

Introduction

You can customize your HP 95LX by entering equations into the Solver. Then you can solve for any of an equation's variables using special function keys, one for each variable, that the Solver creates for you. Type in the value, press that variable's function key, repeat for the other known variables, then press the key for the unknown variable. The Solver does the rest and displays the solution.

The Solver and 1-2-3 work together to expand the power of each. You can enter known values into individual worksheet cells related to a formula, either data cells or the formula cell, and then calculate the value of the remaining cell.

Near the end of the chapter, the power of the Solver's function plotting is demonstrated. You can plot an equation against any of it's variables, solve the equation graphically for any variable, and zoom in and out repeatedly to view minute details or very large structures.

This first example will introduce you to the power and ease of the Solver. Suppose you frequently buy carpet and must calculate how much it will cost. The price is quoted to you per square yard. Regardless of how you are doing the calculation (even if you're doing it longhand), you are using an equation.

$$\frac{PPSY \times L \times W}{9} = COST$$

where $PPSY$ = price per square yard, L = length (feet), and W = width (feet).

The Solver lets you type in this equation. When you press the Solver function key Calc ([F9]), the Solver creates a function key label for each of the variables in the equation. You can store numbers into the variables using these keys and do calculations the same way you use built-in features.

Note

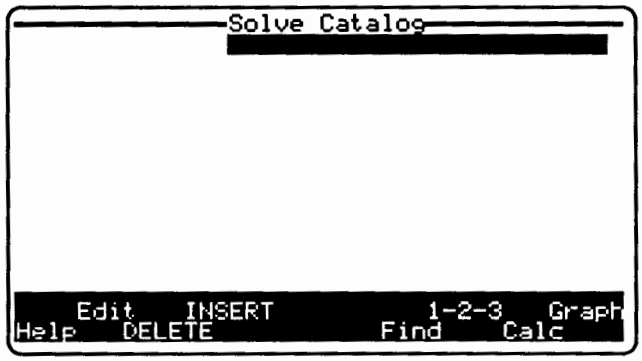


The examples in this chapter assume you get the solve catalog when you select [MENU] Solve. However, depending on where you left off in the Solver last time, you may see another Solver screen instead. If this occurs, press [ESC] repeatedly until the solve catalog is displayed.

Example: Entering an Equation and Using Its Function Keys. Part 1. Enter the above Carpet equation into the Solver.

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Keys:	Description:
[ON]	Starts the Calculator application.
[MENU] S	Selects the solve catalog. If you don't see the solve catalog screen (see the figure below) press [ESC] one or more times.

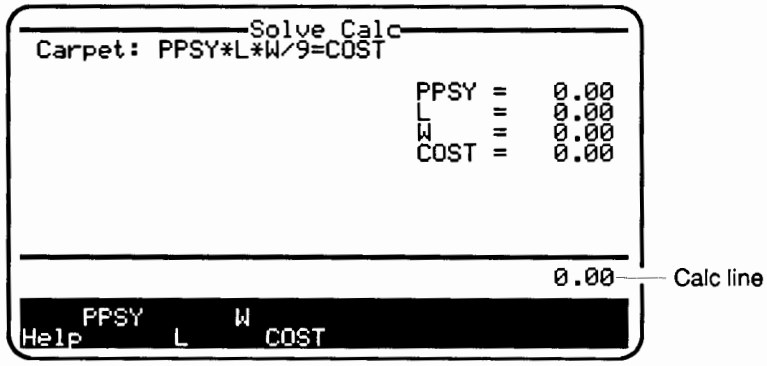


Keys:	Description:
END	Moves the highlight to the end of the catalog. If the catalog is empty, pressing END is unnecessary.
◀	Ensures the highlight is in the name field—the left-hand area of the screen where equation names are displayed.
Carpet ENTER	Enters the equation name into the name field. To correct any errors, use the editing keys, like ◀ and ◆ (backspace). If you want to correct or change the name after you've pressed ENTER, press Edit (F2), make your changes, then press ENTER again.
▶	Moves the highlight to the equation field.
PPSY ✱ L ✱ W / 9 = COST	Automatically displays another screen, the solve editor, and types the Carpet equation. To correct any errors, use the editing keys.

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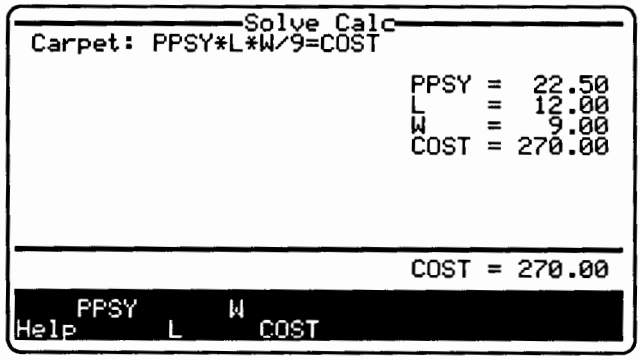
Keys:	Description:
Calc	Verifies the equation, enters it into the equation list, selects the solve calc screen, and displays the function key labels. If the Solver detects an error, the cursor in the solve editor locates the problem. Correct the error and press Calc (F9) again.
	Your screen should look like the figure below, except the calc line can contain any number.

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Part 2. Calculate the cost of carpet needed to cover a 9 foot by 12 foot room. The carpet costs $22.50 per square yard.

Keys:	Description:
22.5 PPSY	Stores the price per square yard in *PPSY*.
12 L	Stores the length.
9 W	Stores the width.
COST	Calculates the cost, \$270.00.



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Part 3. Determine the most expensive carpet you can buy if the maximum amount you can pay to carpet the room is \$300.

The following steps illustrate the "point and shoot" way to enter a value into a variable and to solve for a variable. In either case, first highlight the variable. Then, to enter a value into that variable, key in the number, and press (ENTER) or move the cursor. To solve for a highlighted variable, simply press (Spacebar).

Keys:	Description:
▲ 300 ▲ ▲ ▲	Stores $300 in *COST* and moves the cursor to the *PPSY* cell.
Spacebar	Calculates the maximum price per square yard you can pay, $25.00.

```
PPSY =  25.00
L    =  12.00
W    =   9.00
COST = 300.00
```

The Solve Catalog

Equations are stored in the Solver's **solve catalog**.

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The **current equation** is identified by the highlighted name or equation in the solve catalog. This is the equation acted upon by various function keys associated with the several Solver screens. These function keys are explained in the following table.

To display the solve catalog:

1. Select MENU Solve.
2. If the solve catalog is not displayed, press ESC repeatedly until it is.

The first figure in the chapter shows the highlight in the **equation field**. The equation **name field** is the region to the left of the equation field. This figure also shows the function key labels at the bottom of the screen.

You use ▶ and ◀ or ▶| to move the highlight between the equation and name fields of the solve catalog. Within either field, use ▲, ▼, PG UP, PG DN, HOME, and END to move between different equations or between different names.

Solve Catalog Function Keys and Highlight-Moving Keys

Function Key	Description
Edit (F2)	Allows you to edit a highlighted name or equation. Also allows you to view an entire equation that is longer than 25 characters.
DELETE (F3)	Allows you to delete a highlighted name, a highlighted equation and/or its variables, or a blank row.
INSERT (F4)	Inserts a blank row above the highlighted row. This row is ready to accept your new name and your new equation.
Find (F7)	Allows you to search the selected (highlighted) name or equation field for a specified group of characters.
1-2-3 (F8)	Displays the solve 123 screen. Allows you to "Back-Solve" a 1-2-3 worksheet; that is, make a cell containing a formula equal to a desired value by solving for a specified input cell.
Calc (F9)	Verifies the equation or expression, enters it into the equation list, selects the solve calc screen, and displays a function key label for each variable.
Graph (F10)	Displays function graphing. Allows you to graph the highlighted function with respect to a specified independent variable.
▶, ◀, or ▶|	Moves the highlight between the name and equation fields.
▲, ▼, PG UP, PG DN, HOME, END	Moves the highlight within the name or equation field.

Entering Equations

The equation list can contain as many equations as you like, limited only by the HP 95LX's memory.

To enter an equation and its name:

1. Display the solve catalog. (Select (MENU) Solve, then press (ESC) one or more times if necessary.)
2. Use (▲), (▼), (◄), and (►) if you want to move the highlight. Names (optional) are entered in the left column, equations in the right. If the highlight shows a blank line, the name or equation is entered on that line. If the highlight shows an existing entry, the name or equation is entered on a new blank line automatically inserted below that entry.
3. Type a name (optional). Only the first 12 characters will display if there is an equation on the same line. If there is no equation on that line, up to 38 characters will display.
4. Press (ENTER).
5. Type the equation. As soon as you start, the solve editor screen is automatically displayed which provides the usual editing keys ((←) (backspace), (DEL), arrow keys, etc.). You may use the typing aids in the following table, "Solve Editor Function Keys." These are for functions described in the chapter 29 table "Solver Functions." You can also type those functions in directly if you wish. Before that table is more information about typing your equation in the solve editor.
6. Choose one:
   - Press (ENTER) to enter the equation into the solve catalog's equation field.
   - Press `Calc` ((F9)) to enter the equation into the equation field and display the equation's function keys, one for each variable.

When you press `Calc` ((F9)) the Solver verifies the equation. If the equation cannot be interpreted, the Solver briefly displays: `INVALID EQUATION` and the cursor is positioned before the first character the Solver could not interpret. Check to be sure you've made no typing mistakes, and that you've followed the rules for writing equations in chapter 29.

Typing an Equation in the Solve Editor

In addition to the typing aids provided by the solve editor's function keys, the editor offers other useful abilities described below. For more detailed information about equation writing, see chapter 29.

Adding Spaces in an Equation

To improve readability, you can add spaces throughout an equation, except spaces are not allowed within variable or function names.

Adding Comments to an Equation

You can add one comment at any point in an equation. Simply start and end the comment with an exclamation point (!).

Creating Line Breaks

Press the tab key ([▶|]) to break an equation at any point to improve clarity. If you don't use [▶|], the line will automatically break when you reach the right margin of the screen.

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Creating Indented Lines

Use [▶|] or [Spacebar] to indent a line. Use [▶|] to break the end of that line (and as many following lines as you wish) to preserve the indentation. If you modify or eliminate that indentation on any line using [Spacebar] or [◆] (backspace), [▶|] will maintain that modified indentation.

Maximum Length of an Equation

The equation's length can be up to 2279 characters or 5 12-line screens. When the 456 character screen is full, a new blank line scrolls into view when needed as you continue typing.

Maximum Number of Variables in an Equation

A single equation can have up to 256 different variables.

Solve Editor Function Keys

The function names in the table below may either be typed in from the keyboard or displayed by the function keys. For example, when you're entering an equation and want to display the function PMT, you may type the function name or press from the solve editor Fin ([F6]), then PMT [F5] to display PMT(,,,,,). The commas (argument separators) and parentheses are displayed as well as the three letters. As you type in the arguments to the function, use [▶] to skip over the commas and parentheses. To display the previous set of function keys, press [ESC].

Solve Editor Function Keys

Function Key	Description
Math ([F2])	Provides typing aids for RND, IP, FP, ABS, LN, EXP, LOG, ALOG, SQRT, SQ. INV, TRN, LNP1, EXPM1, IDIV, INT, MOD, MIN, MAX, SGN, SIGMA.
Trig ([F3])	Provides typing aids for PI, SIN, COS, TAN, ASIN, ACOS, ATAN
Conv ([F4])	Provides typing aids for DEG, RAD, HR, HMS, XCOORD, YCOORD, RADIUS, ANGLE, CTIME, CDATE, DATE, DDAYS.
Prob ([F5])	Provides typing aids for COMB, PERM, FACT, RAN#.
Fin ([F6])	Provides typing aids for N, I%YR, PV, PMT, FV, SPFV, SPPV, USFV, USPV.
Other ([F7])	Provides typing aids for STOCELL, RCLCELL, CALCCELL, LENGTH, WIDTH, CPCOL, CPROW, IF, OR, XOR, AND, NOT, S, L, G.
NUM→ ([F8])	Inserts into the editor the last number or other operand displayed in the calc line. The number is inserted in full precision.
Calc ([F9])	Verifies the equation, selects the solve catalog, enters the equation into the equation list, and displays a set of function keys for the equation's variables.
Graph ([F10])	Displays the function plotting / plot conditions screen of the function graphing feature.

Editing the Equation List

To edit equation names:

1. Display the solve catalog.
2. Highlight the name you want to edit.
3. Press Edit (F2). The selected name is now in the calc line.
4. Edit the name. To cancel an edit, press ESC.
5. Press ENTER to put the edited name into the equation list.

To edit equations:

1. Display the solve catalog.
2. Highlight the equation you want to edit.
3. Press Edit (F2). The solve editor is displayed together with the selected equation.
4. Edit the equation. The editing keys in the table below are available, as are the typing aids in the previous table "Solve Editor Function Keys." To cancel an edit before making changes, press ESC. To cancel an edit after you've made changes, press ESC, then press NO (F10) to cancel your changes or YES (F6) to save them.
5. Press ENTER or Calc (F9) to replace the previous version with the edited version.

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Solve Editor Editing Keys

Function Key	Description
◀, ▶, ▲, ▼	Moves the cursor left, right, up, or down.
←	(backspace) Deletes the previous character.
DEL	Deletes the character under the cursor.
HOME	Moves the cursor to the beginning of the current line.
END	Moves the cursor to the end of the current line.
PG UP	Scrolls the screen's contents up one page.
PG DN	Scrolls the screen's contents down one page.
▶|	Starts a new line. Allows a line break at any place within an equation.

Calculating With Solver Variables

Pressing Calc (F9) creates a Solver screen dedicated to the equation highlighted in the solve catalog. A function key is dedicated to each variable, as shown in the earlier figure. If the equation contains more than nine variables, the Solver creates the function key More (F10) used to switch between sets of function keys.

To perform a calculation:

1. Display the solve catalog screen.
2. Highlight the equation you want to calculate, making it the **current equation**.
3. Press Calc (F9). This selects a new screen dedicated to the current equation. Each variable is represented by a function key.
4. Store a value in all but one of the variables. For example, in using the function keys in the earlier figure, you can store values in *PPSY*, *L*, and *W* to calculate *COST*. Or, you can store values in *PPSY*, *W*, and *COST* to calculate *L*. To store a value, key in the number and press the appropriate function key. For example, 22.50 PPSY stores 22.50 in *PPSY*.
5. Press the function key for the value you want to calculate. If the Solver is able to find a solution to the equation, the answer is displayed in the calc line.

In most cases, this is all you will need to know about how the Solver works. However, there are certain types of equations that are more difficult to solve. If, during the calculation, the display temporarily shows sets of changing numbers, such as:

```
A:1.50000000000 -
A:1.13476129834 +
```

the Solver is searching for a solution. You should read "How the Solver Works" later in this chapter.

Example: Return on Equity. The Return on Equity of a business can be defined as:

$$ROE = \frac{Operating\ income - Interest - Taxes}{Common\ equity}$$

Operating income = assets × percentage earnings on assets =
ASSET*%ERN

Interest = debt × percentage interest paid on debt = DEBT*%INT

Common equity = amount of common equity used for financing = EQTY

The Solver equation would be:

ROE=(ASSET*%ERN-DEBT*%INT-TAX)/EQTY

Find the ROE of a small firm with $2,000 in assets. The assets earned 10%, while its debt cost it 8%. The assets were financed using $500 of common equity and $1,500 of debt. The firm paid no taxes.

Keys:	Description:
MENU S	Selects the solve catalog. (If necessary, press ESC several times to display the solve catalog.)
◀	Ensures the highlight is in the name field.
Equity Gain ENTER	Enters the name of your equation into the name field.
▶	Moves the highlight to the equation field.
ROE =	
(ASSET * %	
ERN − DEBT	
* % INT −	
TAX) /	
EQTY	Types the equation.
Calc	Verifies the equation, enters the equation into the equation list, selects the solve calc screen, and displays a set of function keys for the equation's variables.
2000 ASSET	Stores the value of the assets.
10 %ERN	Stores the percentage earnings on assets.

1500 DEBT	Stores the debt.
8 %INT	Stores the percentage interest paid on debt.
0 TAX	
500 EQTY	Stores the common equity.
ROE	Calculates the return on equity.

```
ROE   =     16.00
ASSET = 2,000.00
%ERN  =     10.00
DEBT  = 1,500.00
%INT  =      8.00
TAX   =      0.00
EQTY  =    500.00
```

Erasing Data in Solver Variables

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Erasing Solver variables sets them equal to 0. To clear the variables in a particular solve calc screen, display the screen and select (MENU) Erase Data. Be sure you display the solve calc screen, not the solve catalog screen.

Note



In the solve catalog screen, you can erase *all* variables and *all* equations by selecting Erase Data.

Viewing Long Equations

The equation list shows the first 25 characters of an equation. To view the entire current equation, press Edit ((F2)) to display the solve editor screen. If your equation is longer than 456 characters, press (▼) or (PG DN) to see additional lines.

Shared Solver Variables

If two or more equations contain the same variable names, that variable is shared among the equations in which it appears. For example, suppose your equation list includes these two equations named CARPETPRICE and TOTALPRICE:

```
CARPETPRICE:PPSY*L*W/9=COST
TOTALPRICE:COST+HOURS*20.50=CHARGE
```

COST is a shared variable. You can calculate a value for *COST* using the Solver's function keys for CARPETPRICE, and then switch to the function keys for TOTALPRICE. Since the value for *COST* is shared, you do not need to store it again. After entering *HOURS*, you can calculate *CHARGE*.

No sharing occurs between built-in variables and Solver variables. For example, the *COST* user-variable in the Solver is not shared with the *COST* built-in variable in the Business Percentages screen (select (MENU) Bus%).

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Deleting Names, Equations, and Variables

To delete an empty line (containing neither name nor equation):

Highlight the empty line and press DELETE ((F3))

To delete a single name:

In the solve catalog, highlight the name you want to delete, then press DELETE ((F3)).

To delete a single equation and/or its variables:

1. Highlight the equation in the solve catalog you want to delete.
2. Press DELETE ((F3)). You're asked if you want to delete the equation, variables, or both.
3. Press EQN ((F6)), VARS ((F8)), or BOTH ((F10)). To cancel the delete command, press (ESC).

Note



When deleting one or all equations, you should first delete an equation's variables, if none are used in other equations. These variables have no purpose, but they do use memory. Deleting these variables releases memory for other uses.

If you delete the equation's variables but not the equation, the variables are created again with values of zero the next time you use the equation. If the variable is a shared variable, its value is lost to all the equations that share it. (Refer to the previous section "Shared Solver Variables.")

To delete all variables and/or all equations:

1. Select (MENU) Erase Data. You're asked if you want to erase all equations, all variables, or both.
2. Press EQN ((F6)), VARS ((F8)), or BOTH ((F10)). To cancel the Erase Data command, press (ESC).

To release all variable memory:

1. Select (MENU) Erase Data. The number of allocated variables is displayed to give you an idea of how much memory those variables are using. (The memory used by a single variable, in bytes, is 15 plus the number of characters in the variable.)
2. Press VARS ((F8)). All memory taken up by variables, whether referenced by an equation or not, is released. When you use any equation again, its variables are again created with their values set to zero.

Finding Equations

You can search for an equation in two ways:

- Scroll through the name or equation list using the highlight-moving keys (see the earlier table "Solve Catalog Function Keys and Highlight-Moving Keys").
- Use Find (F7) from the solve catalog screen.

Using Find you can search the entire name or equation list (but not both simultaneously) for a text you specify using the find function keys described below. This text can be up to 38 characters.

Search Keys Available After Pressing Find

Function Key	Description
Next (F7) or ENTER	Searches the field containing the highlight for the specified text until a match is found or the search fails. The search begins with the next entry.
Prev (F5)	Searches the field containing the highlight for the specified text until a match is found or the search fails. The search begins with the previous entry.

To find an equation:

1. Select MENU Solve to display the solve catalog screen showing the equation list.
2. Put the highlight in either the name or equation list, depending on which list you want to search. Press ▶| to move between the name and equation lists.
3. Press Find (F7).
4. Type the text you wish to find. The text can be up to 38 characters long, and the search will be case sensitive ("X" is different from "x.")
5. Press ENTER, Next (F7), or Prev (F5) to search the entire name or equation list. If the search is successful, the highlight will identify the found text. If unsuccessful, the message Characters not found will be displayed and a beep will sound.
6. Press ENTER, Next (F7), or Prev (F5) again repeatedly to search for other occurrences of this text.

Using the Clipboard in the Solver

The general use of the Clipboard in the Calculator is covered in "Using the Clipboard with the Calculator" in chapter 22. The following procedure illustrates the use of the Clipboard together with Find (F7) to simplify writing a complex equation that's similar to one already in the equation list.

To use an existing equation segment in a new equation:

You want to enter an equation into the Solver's equation list that's similar to an existing equation in that list. Your plan is to put a copy of that existing equation into the solve editor and edit it to create your new equation.

1. Use Find (F7) to highlight the existing equation in the solve catalog. (See the previous procedure, "To find an equation.")
2. Press CTRL-COPY (F2) (press CTRL and hold it down as you press COPY) to put a copy of the found equation on the Clipboard.
3. Press END to move the highlight to the end of the equation list.
4. Press CTRL-PASTE (F4) to add the copy of your found equation to the end of the list.
5. Press Edit (F2) to put this equation in the solve editor.
6. Edit the equation to create the equation you want.
7. Press ENTER or Calc (F9) to add your new equation to the equation list. If you want, press ◀ and type a name for your equation.

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Using Multiple Equation Lists

When you quit the Calculator (MENU Quit), the current solve catalog and the values of its variables are saved. When you open the Calculator again (ON), then highlight any equation in the solve catalog and press Calc (F9), you'll see the same values displayed that existed before Quit was selected.

If you want to use more than one equation list, the procedures below show you how to save and retrieve equation lists, how to create a new, empty equation list, and how to insert one equation list into another.

To save an equation list in a new file:

1. Select (MENU) File Save. You'll see displayed C:_DAT*.EQN with perhaps some file names also displayed.
2. Type a file name (8 characters maximum). File names are case insensitive (X = x). Your first character will replace *. If you type no extension, .EQN will be supplied to identify your file as an equation list.
3. Press (ENTER) to save your equation list.

To open an existing equation list file:

1. Select (MENU) File Retrieve.
2. Highlight the displayed name of the file you want to open and press (ENTER). If the file you want to open is not displayed, see the following procedure, "To display all file names."

To save an equation list in an existing file:

This procedure assumes you earlier selected (MENU) File Retrieve to open an existing equation list. After changing it, you follow this procedure to save it in the same file.

- Select (MENU) File Save. You'll see displayed C:_DAT\ *filename* .EQN where *filename* is the existing name of your file.
- Press (ENTER) to save your file under its existing name.

To create a new, empty equation list:

1. Select (MENU) File New. One of the following will happen:
   - If your current equation list is saved, a new, empty equation list will be displayed.
   - If your current equation list is not saved, a prompt asks: Clear current equation list? Do one of the following:
     - Press YES ((F6)) to lose your current list and to display a new, empty equation list.
     - Press NO ((F10)) to cancel the File New command.

To insert another equation list into your current equation list:

1. Position the cursor in your present equation list at the position you want the other list inserted.
2. Select (MENU) File Insert to display all file names with the extension .EQN in the current directory.

3. To insert all the equations from one of the displayed files, highlight the file name and press (ENTER). If the file you want is not displayed, see the procedure below, "To display all file names."

To display all file names:

After executing (MENU) File Save, (MENU) File Retrieve, or any other file related command, follow this procedure to display all file names in the HP 95LX's C: and A: directories. If necessary, press (ESC) to display the C:_DAT*.EQN prompt.

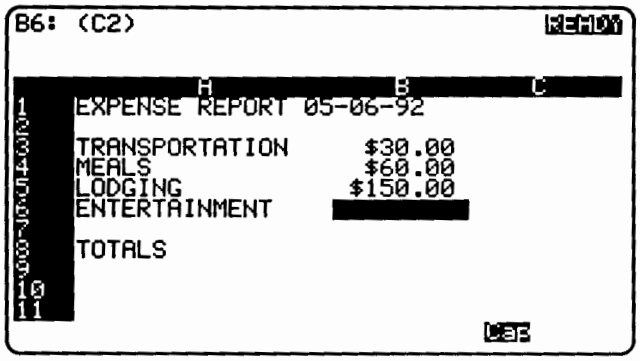
- To display files in the _DAT directory, type *.* and press (ENTER).
- To display all subdirectories and files in the C:\ directory with the .EQN extension, highlight ..\ and press (ENTER).
- To display all files and subdirectories in the root directory of the RAM disk, press (←) (backspace) repeatedly to erase all but C:\, type *.*, then press (ENTER).
- To display all files and subdirectories in the root directory of a plug-in card, press (←) (backspace) to erase the entire line, type a:*.*, then press (ENTER).
- To display all files in any subdirectory, highlight the subdirectory name (for instance, FUNCTION\), then press (ENTER).

Using the Solver in a 1-2-3 Worksheet.

A worksheet often contains a series of cells, where all but one contain variable *values* (the variable *names* are the cell names), and where that one remaining cell contains the result of a formula calculation. The formula uses the other cell names as its variables, and the contents of those other cells are the values for those variables.

Normally, the values in the variable cells are entered first, then the formula cell calculates the result. The solve catalog's 1-2-3 feature (1-2-3 ((F8))) allows this calculation order to be reversed. Rather than have the formula-cell's value *calculated last*, it's *entered first*, and a *variable-cell's* value is *calculated last*. This variable cell is called the **solve cell**, and this method of calculating for that cell's value is called **backsolving**.

Example: Adjusting a Day's Expenses. Say you want today's expenses on your trip to be no more than $300. You want this $300 to cover transportation, meals, entertainment, and lodging. You consider all but entertainment to be fixed. You're using an HP 95LX 1-2-3 worksheet to record your trip expenses, and you've already entered $30 for transportation, $60 for meals, and $150 for lodging. Before you enter the cell B8 formula, your worksheet looks like the figure below.



If you want to press keys as you follow this example, put the numbers shown in the figure in cells B3 through B5 of a new current worksheet, and leave blank the entertainment expense cell, B6. This is the solve cell. Then enter the formula @SUM(B3..B6) into cell B8. The row and column titles are not necessary for this example. At this point, the formula cell B8 is no longer blank, but shows a value of $240.00 (assuming Automatic recalculation is in effect).

Keys:	Description:
⋮⋮ MENU S	Displays the solve catalog of the Calculator application (press ESC one or more times if necessary to display the solve catalog).
1-2-3 (F8)	Displays the solve 1-2-3 screen.
Form (F8)	Displays your current worksheet in point mode and asks you to highlight the formula cell, the cell that calculates your total day's expenses. Then use ▲; ▼, ◀, and ▶ as necessary to highlight cell B8.
ENTER	Returns to the calculator's solve 1-2-3 screen and enters B8 in the solve 1-2-3 screen as the formula cell.
300 VALUE (F9)	Enters 300 as the desired total expenses calculated by cell B8.
28 Solve (F10)	Displays the worksheet in point mode and asks you to highlight the solve cell, the cell whose value you want to determine. Use the arrow keys to highlight the entertainment expense cell B6.
ENTER	Returns to the solve 1-2-3 screen and enters B6 as the solve cell, the cell whose value is to be calculated so the total (B8) equals $300. The calculation occurs automatically and gives $60 as the backsolve result—the allowable entertainment expense.
123	Displays the worksheet. Note that the solve cell B6 now shows $60.00.
⋮⋮	Returns to the calculator's solve 1-2-3 screen.

To calculate a 1-2-3 solve cell value that will produce a specified formula cell value:

This is the general procedure to perform a backsolve similar to that described in the example above.

Computer Museum

1. Create or identify a 1-2-3 worksheet segment (press 123) that includes a formula cell and the data cells representing all the variables used in the formula cell. Ensure that this worksheet is the current worksheet (the one displayed when 123 is pressed).
2. Enter values into all but one of the data cells. The remaining data cell is the solve cell.
3. Select ::) MENU Solve (and press ESC one or more times, if necessary) to display the solve catalog.
4. Press 1-2-3 (F8) to display the calculator's solve 1-2-3 screen.
5. Press Form (F8) to display the current 1-2-3 worksheet.
6. Move the cursor to highlight the formula cell.
7. Press ENTER to define that cell as the formula cell and to return to the calculator's solve 1-2-3 screen.
8. Type the value of the result you want that formula cell to calculate and press VALUE (F9).
9. Press Solve (F10) to display the current 1-2-3 worksheet.
10. Move the cursor to highlight the data cell you choose to be the solve cell—the cell whose value is to be determined.
11. Press ENTER to define that cell as the solve cell and to return to the calculator's solve 1-2-3 screen. The cell's value is calculated, displayed in the solve 1-2-3 screen, and entered in the worksheet.

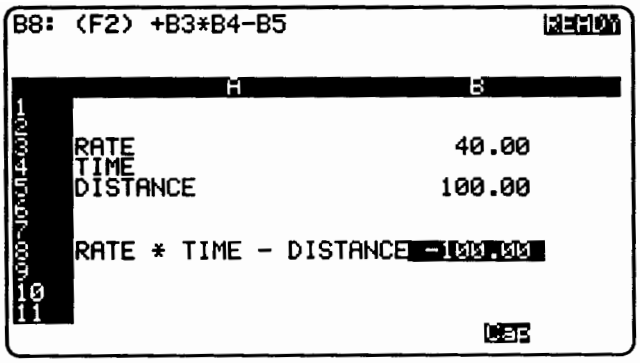
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To restore the solve cell to its previous value:

Press UNDO (F5). The solve cell is restored to the value it had just before the last backsolve took place.

Example: Creating and Using a Solver Worksheet. A 1-2-3 worksheet working with the solve 1-2-3 screen can be used to solve for any one of an expression's variables given values for the other variables. This is the same ability offered by the calc screen. Using a simple expression, this example demonstrates how to set up the solver worksheet and how to use it.

The equation used in this example is RATE * TIME = DISTANCE. The solver worksheet uses expressions, not equations, so forming left − right gives the expression (RATE * TIME) - DISTANCE. If you want to press keys as you follow this example, create the worksheet shown in the following figure. Cells B3, B4, and B5 contain values only; no formulas. Cell B8 contains the formula +B3*B4-B5. When the example starts, this worksheet is the current worksheet.



Keys:	Description:
(123)	Displays the solver worksheet containing the formula (RATE * TIME) - DISTANCE in cell B8.
(Use arrow keys)	Move the cursor to cell B3.
40	Enters 40 miles per hour into B3.
▼▼	Moves the cursor to cell B5.
100	Enters 100 miles into B5.
▼▼▼	Moves the cursor to cell B8.
(:) MENU S	(If necessary, press ESC one or more times). Displays the Calculator's solve catalog screen.
1-2-3 (F8)	Displays the Calculator's 1-2-3 screen.
Form (F8)	Displays the current 1-2-3 worksheet. The cursor highlights cell B8, the formula cell.
ENTER	Defines B8 as the formula cell and returns to the Calculator's 1-2-3 screen.
0 VALUE (F9)	Enters the value the formula cell is to calculate.
Solve (F10)	Displays the worksheet. The formula cell, B8, is highlighted.

▲ (4 times)	Highlights cell B4, TIME. This is the cell whose value is to be calculated to force cell B8 to equal zero.
ENTER	Defines B4 (TIME) as the solve cell and returns to the solve 1-2-3 screen. The calculation is performed and the display shows 2.5 hours (the `Solve result`) as the time required to cause RATE * TIME − DISTANCE (B8) to equal zero. If you return to the worksheet, you'll see that B8 now contains 0.

To set up a solver worksheet:

The example above illustrates this procedure.

1. Write down your chosen formula (like DISTANCE = RATE * TIME), then convert it to an expression by subtracting the right side from the left (like DISTANCE − RATE * TIME).
2. Reserve a set of adjacent 1-2-3 cells, one for for each variable in your expression and the last one (the formula cell) for the expression itself.
3. Enter the expression into the formula cell.
4. Select ⋮ MENU Solve (and press ESC one or more times, if necessary) to display the solve catalog.
5. Press `1-2-3` (F8) to display the calculator's solve 1-2-3 screen.
6. Press `Form` (F8) to display the current 1-2-3 worksheet.
7. Move the cursor to the formula cell.
8. Press ENTER to define that cell as the formula cell and to return to the calculator's solve 1-2-3 screen.
9. Type `0` as the result you want that formula cell to calculate and press `VALUE` (F9). Your solver worksheet is now ready to be used. The next procedure describes how this is done.

To use a solver worksheet:

This procedure starts with the worksheet set up as described in the above procedure "To set up a solver worksheet." This worksheet is now the current worksheet. You know the values of all but one of the variables, and you'll use this solver worksheet together with the

Calculator's solve 1-2-3 screen to solve for that unknown. If the solve 1-2-3 screen is not displayed, press (::) (MENU) Solve to display the solve catalog (if necessary, press (ESC) one or more times), then press 1-2-3 ((F8)).

1. Press (123) to display the solver worksheet.
2. Enter values into all but one of the variable's cells.
3. Move the cursor to the unknown variable's cell.
4. Press (::) Solve ((F10)) (RETURN) and see the solution in the calc line labeled `Solve result`. If the expression in the worksheet's formula cell does not evaluate to zero exactly, that cell will contain a very small number.
5. To solve for another variable, repeat these steps.

How the Solver Works

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The operation of the Solver is explained in the earlier section, "Calculating with Solver Variables." This section explains Solver operation in more detail.

The Solver has two ways of finding an answer—**direct** solutions and **iterative** solutions.

Initially, the Solver tries to find a *direct* solution by rearranging the equation and then solving for the variable. If the Solver finds a direct solution, the HP 95LX displays the answer on the command line, and no other information is displayed.

If the Solver is unable to find a direct solution, the Solver tries to find an *iterative* solution. (*Iterative* refers to the repetitive numerical procedures used.) This involves searching for the answer by estimating a set of answers, seeing how close they are to a solution, and then making another set of estimates. The HP 95LX displays the current estimates while the Solver is searching for an answer iteratively. You should keep in mind that *there may be more than one solution to an equation*, and that it may be necessary for you to enter guesses in order to influence which solution the Solver finds.

If the displayed estimates don't appear to be proceeding towards a number you judge to be a reasonable answer, you may want to stop the iterative process, enter your own guesses, and restart the search

(refer to the following sections: "Halting and Restarting an Iterative Search" and "Entering Guesses."

Since the process of finding an iterative solution is very complex, there are four possible outcomes that you should be aware of:

- The HP 95LX displays an answer but displays no message. It is very likely that the Solver has found a solution. The HP 95LX may display additional information if you repeat the calculation by pressing the function key for the variable you solved for.
- The HP 95LX displays an answer and automatically displays a message. The Solver has found a possible solution, but you must use judgement in interpreting the results.
- The HP 95LX displays TRY AGAIN. BAD GUESSES: and the guesses the Solver used when the calculation was started (or restarted). This indicates that the Solver cannot begin the search with the current guesses. (See the following section "Entering Guesses."
- The HP 95LX displays SOLUTION NOT FOUND because the Solver was unable to find a solution. Check to see if your equation and stored values are correct. If the equation is correct, you may be able to find a solution by entering very good guesses.

Halting and Restarting an Iterative Search

When the Solver is searching for an iterative solution (in other words, when the Solver is displaying sets of estimates), you can halt the calculation by pressing any key. The HP 95LX displays the best estimate the Solver has found so far, and the message INTERRUPTED. You can restart the search from where it left off by pressing the function key for the variable you are solving for. Or, you can restart the search using your own guesses (see "Entering Guesses," below).

Entering Guesses

Entering your own guesses serves two purposes. First, it can save time by telling the Solver where to start searching. Second, if more than one solution exists, entering guesses can help the Solver select the answer you want. The closer your guesses are to the answer you want, the better chance the Solver has of finding it.

You can enter guesses at these times:

- Before beginning the calculation, after you've stored a value for every variable except the unknown variable.
- After you've halted the iterative search.
- After the Solver has returned an answer, and you want to begin searching for another answer somewhere else.

You can enter one or two guesses. If you enter one guess, the Solver makes a second guess. If you enter two guesses, the Solver starts searching for a solution in the range between the two guesses. The Solver works most efficiently when the answer is between your two guesses. For example, if you know the answer is between 5 and 12, you should enter 5 and 12 as the starting guesses.

To enter one guess:

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Key in the value and press the function key twice. For example, 4.5 A A enters 4.5 as a guess for a variable named *A* and starts the calculation.

To enter two guesses:

1. Key in the first guess and press the function key.
2. Key in the second guess and press the function key twice.

Example: Calculating Profit for a Manufacturing Operation. The following Solver equation calculates the profit from a piano-manufacturing operation:

```
PROFIT=PRICE*QUAN-VARCOST*QUAN-FIXED
```

where

PROFIT = profit for the manufacturing operation.
PRICE = the retail price of a piano.
QUAN = the number of pianos sold.
VARCOST = variable costs (per piano).
FIXED = fixed costs.

The Bill Johnson Piano and Dog Whistle Corporation sells pianos for $6,000. Variable costs are $4,100; fixed costs per year are $112,000. How many pianos must Bill Johnson sell this year in order to earn a profit of $130,000? (In past years, Johnson has had to sell between

100 and 200 pianos to make an acceptable profit. You can use this information as initial guesses.)

Keys:	Description:
MENU S	Selects the solve catalog. If you don't see the solve catalog, press ESC one of more times.
◀	Ensures the highlight is in the name field.
Piano ENTER	Enters the equation name into the name field.
▶	Moves the highlight to the equation field.
PROFIT=	
PRICE *	
QUAN −	
VARCOST *	
QUAN − FIXED	Types the equation.
Calc	Verifies the equation, enters the equation into the equation list, selects the solve calc screen, and displays a set of function keys for the equation's variables.
6000 PRICE	Stores the price.
4100 VARCOS	Stores the variable costs.
112000 FIXED	Stores the fixed costs.
130000 PROFIT	Stores the profit.

```
PROFIT  = 130,000.00
PRICE   =   6,000.00
QUAN    =       0.00
VARCOST =   4,100.00
FIXED   = 112,000.00
```

The next two steps are optional. They enter guesses for *QUAN*. If the Solver must do an iterative search to solve for *QUAN*, it will begin the search using the estimates 100 and 200 you'll enter.

Keys:	Description:
100 QUAN	Enters the first guess for *QUAN*.
200 QUAN	Enters the second guess for *QUAN*.
QUAN	Solves for *QUAN* iteratively. The initial guesses replace the calc line very briefly, then the final value is displayed in the calc line and higher on the screen between PRICE and VARCOST.

QUAN = 127.37

Function Plotting

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The Solver's function plotting lets you draw a graph and determine roots of an equation or mathematical expression. You can autoscale the graph so the curve is sure to appear in the display. You can also zoom in and zoom out to see more detailed or wider views of the graph, and you can display the coordinates of any point on the graph.

This example will illustrate some of these features:

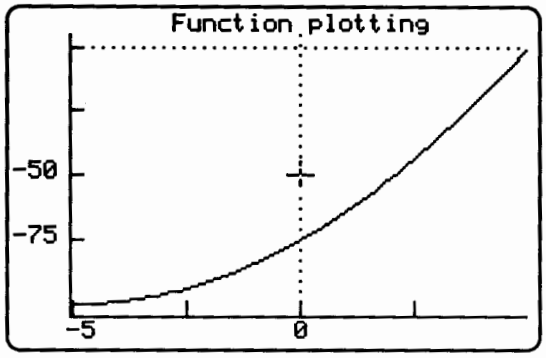
Example: Finding the Roots of an Equation. This example shows how to find graphically the two roots of the following equation:

$x^2 + 10x = 75$

Keys:	Description:
MENU S	Displays the solve catalog screen. If it's not displayed, press ESC one or more times.
▶	Ensures that the highlight is in the equation field, not the name field.
x ^ 2 + 10 *	
x = 75	Enters the equation into the solve editor.

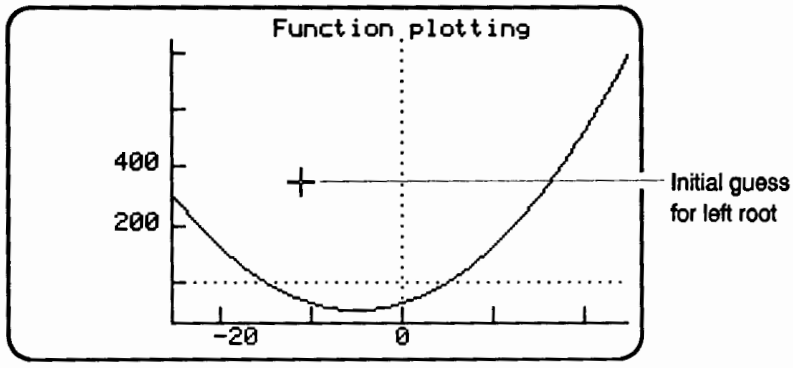
ENTER	Enters the equation into the equation list in the solve catalog screen. The equation you entered is highlighted. The highlighted equation or expression is the one whose graph will be plotted.
Graph	Displays the function plotting screen.
MENU E D	Initializes the function plotting data. The plot-variable is x.
AUTO	Plots the equation as the expression x ^ 2 + 10 * x − 75. Note that the equation is converted to an expression by subtracting the right side from the left. The minimum and maximum x-values (the left and right boundaries) are those specified by XMIN and XMAX in the function plotting screen. The minimum and maximum y-values (the bottom and top boundaries) are chosen by the AUTO function to ensure that the curve is displayed on the screen.
ESC	Returns to the function plotting screen. This screen shows that AUTO set these values: YMIN = −105 and YMAX = 5.
DRAW (F4)	Redraws the graph.

Your screen now looks like this:



Keys:	Description:
28 ⌂ −	Zooms out and autoscales the y-axis in one operation. The range covered by the x-axis is increased by 5 times, and the y-axis range is automatically chosen (autoscaled) to ensure that the curve appears on the screen. Both roots are now shown (where the curve crosses the x-axis).
◀ (4 times)	Moves the cursor to an x-value near the left root. The cursor position now locates an initial guess for this root. (The initial guess is determined only by the x-value of the cursor's position, so there's no need to move the cursor to a y-value close to zero.)

The figure below shows how your screen looks now:



Keys:	Description:
Spacebar	Solves for the left root and displays its value, −15.
▶ 7 times	Moves the cursor to locate an initial guess for the right root.
Spacebar	Solves for the right root and displays its value, 5.

How Function Plotting Works

Function plotting plots values of a function for a number of evenly spaced values of the plot variable (independent variable) measured along the x-axis. When the graph is drawn, these function values or points are connected by straight lines. The number of these plotted points is determined by RES (resolution), the plot boundaries are given by XMIN, XMAX, YMIN, and YMAX, and the plot variable is given by XVAR. These values are shown in the screen that displays plot conditions.

The number of evenly spaced values (points) of the plot variable XVAR is determined by the value of RES. For instance, a RES value

of 10 means that the XVAR values between XMIN and XMAX are divided into 10 equal parts. If XMIN is -50 and XMAX is +50, the function would be plotted for x-values of -50, -40, -30, ... +40, and +50, and each of these plotted points would be connected by straight lines to produce the graph.

Selecting the Expression to Plot

Every graph is a plot of a function versus an independent variable (the XVAR value). You select a function or an equation to plot (the current equation) from the Solver's equation list. If you plot an equation of the form y = f(x), the function f(x) is plotted. If you plot an equation of the form expression = expression (such as $x^3 + 10x = 5x^2 + 75$), the HP 95LX automatically changes it into a single expression (no equal sign) by *subtracting the right side of the equation from the left side* ($x^3 + 10x - 5x^2 - 75$). The value of this expression is then plotted against XVAR.

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This table shows examples of how equations would be converted to expressions by function plotting, and what choices you would have for the independent variable, XVAR.

Expression or Equation in Equation List	What's Plotted as y-value	XVAR Choices
y = sin(x)	sin(x)	y, x
sin(x)	sin(x)	x
(PPSY*L*W)/9 = COST (first example in chapter)	(PPSY*L*W)/9 − COST	PPSY, L, W, COST
(PPSY*L*W)/9	(PPSY*L*W)/9	PPSY, L, W

Setting the Plot Conditions

Function plotting uses two screens, one that shows plot conditions and one that shows the graph. You set the plot conditions on the first of these two screens, the one you reach from the solve catalog by pressing Graph (F10). The function keys provided by this first function plotting screen are described in the table below.

Keys Active in the Function Plotting / Plot Conditions Screen

Key	Description
AUTO (F3)	Sets the upper and lower boundaries of the graph (YMAX and YMIN) to ensure that the curve will appear in the display, then draws the graph of the current equation. Using AUTO (F3) is generally the easiest way to begin plotting an equation.
DRAW (F4)	Draws the graph of the current equation using the values of the variables described below in this table.
XMIN (F5)	Defines the left boundary of the graph; the minimum x-axis value or XMIN. To change this value, type the value and press XMIN (F5).
XMAX (F6)	Defines the right boundary of the graph; the maximum x-axis value or XMAX. To change this value, type the value and press XMAX (F6).
YMIN (F7)	Defines the lower boundary of the graph; the minimum y-axis value or YMIN. To change this value, type the value and press YMIN (F7).
YMAX (F8)	Defines the upper boundary of the graph; the maximum y-axis value or YMAX. To change this value, type the value and press YMAX (F8).
XVAR (F9)	Specifies the independent variable. Pressing XVAR cycles through the equation's variables, specifying each in turn as the independent variable.
RES (F10)	Determines the resolution; the number of XVAR values for which the function is plotted. Larger values of RES provides greater accuracy but the graph is drawn more slowly. To change this value, type the value and press RES (F10).

To reset function-plotting conditions to initial values:

When you first use function plotting, the graph boundaries and the resolution have these initial values:

XMIN = −5.00
XMAX = 5.00
YMIN = −3.00
YMAX = 3.00
RES = 60.00

To return to these values:

Select (MENU) Erase Data.

Drawing the Graph

1. Highlight an equation (or function or expression) in the solve catalog's equation list.
2. Press Graph ((F10)) to display the first function-plotting screen.
3. Select (MENU) Erase Data to set the plot conditions to initial values, or if you know the range of interest, enter values for XMIN and XMAX (use XMIN ((F5)) and XMAX ((F6))).
4. Press AUTO ((F3)) to draw the graph.

Another approach is to set XMIN, XMAX, YMIN, and YMAX yourself and press DRAW ((F4)).

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Interacting with the Graph

Once the graph is drawn , you can use specially defined keys to zoom in, zoom out, define a specific part of the graph to enlarge, find the function's roots, and perform other operations. These special keys and their actions are described in the table below.

Keys Active in the Function Plotting / Interactive Graphics Screen

Key	Description
▲, ▼, ◀, ▶	Moves graphics cursor around the graph by jumps.
⇧▲, ⇧▼, ⇧◀, ⇧▶	Moves the graphics cursor around the graph by individual dots (pixels).
+	Zooms in by a factor of 5.
−	Zooms out by a factor of 5.
*	Centers the graph at the graphics cursor position.
⇧+	Zooms in by a factor of 5 and autoscales the y-axis.
⇧−	Zooms out by a factor of 5 and autoscales the y-axis.
⇧*	Centers the graph at the graphics cursor position and autoscales the y-axis.
(	Sets a mark (×) that remains when the cursor is moved. This mark can be used in two ways: 1. The mark defines one corner of a zoom box. The cursor is moved to define the diagonally opposite corner of this box. When) is pressed, the area defined by the zoom box expands to fill the whole screen. 2. The mark defines the first of two guesses for a root. The cursor is moved to define the second guess. When Spacebar is pressed, the Solver uses these two guesses to start the search for a root, which is then displayed.
)	Enlarges to full screen the portion of the graph defined by the zoom box (by the mark (×)—see (above—and the graphics cursor position).

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Keys Active in the Function Plotting / Interactive Graphics Screen - continued

Key	Description
⇧ (	Enlarges to full screen the x-axis portion of the graph defined by the zoom box (by the mark (×) and the graphics cursor position); then autoscales the y-axis.
Spacebar	Solves for a root using either one or two guesses chosen as follows: 1. One guess is provided by the XVAR value of the cursor's position when Spacebar is pressed. 2. The first of two guesses is provided by the XVAR value of a mark (×) produced at the cursor's position when (is pressed. The second guess is provided by the XVAR value of the cursor's position when Spacebar is pressed.
Q	When pressed repeatedly, rotates through three graph display modes: ■ Standard mode, showing labeled axes only. ■ Coordinate mode, where the coordinates of the cursor position are displayed as the cursor moves throughout the interactive graphics screen. ■ Trace mode, where the cursor traces the function as you press ▶ and ◀, and the value of the function is displayed for each cursor position (for each XVAR-value).
ESC	Exits the graph and displays the function plotting / plot conditions screen.

Keys Active in the Function Plotting / Interactive Graphics Screen - continued

Key	Description
x [ENTER] or [ENTER]	Enters the x-value of the cursor's position into the calc line. To exit the graph and view the calc line, press [ESC].
y [ENTER]	Enters the y-value of the cursor's position into the calc line. To exit the graph and view the calc line, press [ESC].
x [ENTER] y [ENTER]	(Alternately, you can press [ENTER] y [ENTER].) Enters both the x-value and the y-value of the cursor's position into the history stack. To view the stack, press [MENU] M. Since the x-value was entered first, the x-value is in level 1 and the y-value is in the calc line.

Note



The Solver interprets all expressions with an equal sign as left − right, but graphics ignores the left side for equations of the form: single variable = expression. See the earlier section "Selecting the Expression to Plot."

To zoom in (to view a smaller region of the graph in more detail):

1. Draw the graph (see the earlier "Drawing the Graph").
2. Do one of the following:
   - Press [↑] [+] (or [+]) one or more times to zoom in. Each pressing of [↑] [+] zooms in by a factor of 5 and autoscales the y-axis. Each pressing of [+] zooms in on both axes by a factor of 5.
   - Use an x, y zoom box.
     a. Move the cursor to one corner of the area you wish to expand.
     b. Press [(]
     c. Move the cursor to the diagonally opposite corner.
     d. Press [)] to enlarge the defined area to fill the entire screen.
   - Use an x, autoscale-y zoom box.
     a. Move the cursor horizontally to an x-value that defines one end of the x-range you want to expand.

b. Press (.
c. Move the cursor horizontally to an x-value that defines the other end of the x-range you want to expand.
d. Press ↑) to enlarge the defined area to fill the entire screen and then autoscale the y-axis.

To zoom out (to view a larger region of the graph in less detail):

1. Draw the graph (see the earlier "Drawing the Graph").
2. Press ↑ − (or −) one or more times to zoom out. Each pressing of ↑ + zooms out by a factor of 5 and autoscales the y-axis. Each pressing of + zooms out on both axes by a factor of 5.

To display the coordinates of any point on the screen:

1. Draw the graph (see the earlier "Drawing the Graph").
2. Press ◎ one of more times to select coordinate mode. COORD will be displayed in the upper-left corner of the screen.
3. Press ▶, ◀, ▲, ▼, ↑ ▶, ↑ ◀, ↑ ▲, or ↑ ▼ (hold down ↑ and press ▶, ◀, ▲, or ▼ repeatedly) to select the point you want. Then read on the screen the coordinates of that point.

To display a function's value for any point on the curve:

1. Draw the graph (see the earlier "Drawing the Graph").
2. Press ◎ one or more times to select trace mode. TRACE will be displayed in the upper-left corner of the screen.
3. Press ▶, ◀, ↑ ▶, or ↑ ◀ (hold down ↑ and press ▶ or ◀ repeatedly) to display the x-value you want. Then read on the screen the corresponding function value.

To digitize a point's coordinates (to display the coordinates with full accuracy):

You can separately digitize an x-coordinate or a y-coordinate, or you can digitize a point.

1. Move the cursor to the desired x-value, y-value, or point.
2. Do one of the following (the display will not change):
   - Press x ENTER or ENTER to digitize the x-value.
   - Press y ENTER to digitize the y-value.
   - Press both x ENTER (or ENTER) and y ENTER, in turn, to digitize a point.

The coordinate or coordinates will be entered into the calculator's history stack. To view this stack, press (MENU) M. If you enter the x-coordinate first, the x-value will be in level 1 and the y-value in the calc line.

To solve for the roots of a function graphically:

1. Draw the graph (see the earlier "Drawing the Graph").
2. Do one of the following:
   - Move the cursor to an XVAR value close to a root (where the curve crosses the x-axis). This locates an initial guess for the root. Often zooming out helps to find all roots.
   - (Optional for cases where the root is not as easily found) Press (ENTER) to mark (×) the first guess, then move the cursor to another XVAR value to define a second guess. These two guesses should be on either side of the expected location of the root.
3. Press (Spacebar) to display the value of the root. If a "questionable solution" is found (a gap, pole, etc.), the top line will display a message to that effect followed by the x and y coordinates.
4. Repeat the last two steps to solve for any additional roots.

To study the behavior of a function:

1. Enter the function you wish to study into the equation list.
2. Press Graph ((F10)) to display the first function plotting screen.
3. Analyze the function graphically using the procedures in this Function Plotting section and the keys active in the interactive graphics screen (described the earlier table).

To find the coordinates of an extremum (maximum or minimum):

An extremum is a point on a graph where the sign of the curve's first derivative changes (where a graph shows a local maximum or minimum). This procedure shows you how to zoom in repeatedly on the area containing the extremum until your measurement of its coordinates achieves the desired accuracy.

1. Draw the graph (see the earlier "Drawing the Graph").
2. Display the extremum on the graph if it is not already visible. Use the keys described in the earlier table "Keys Active in the Function Plotting / Interactive Graphics Screen" to display the section of the graph containing the extremum. Zooming out on the graph one or

more times (press − or ↑ −) is often a good way to start if the extremum is not visible.

3. Press ◎ one or more times to select trace mode.
4. Move the cursor to the point of the extremum to display its coordinates.
5. Define a tight x, autoscale y zoom box around the extremum (move the cursor just to the left of the extremum, press (, then move the cursor horizontally just to the right of the extremum to define the new x-range. The smaller the x-range containing the extremum, the greater zoom you'll create. Finally, press ↑) to enlarge the defined x-range to the entire width of the screen and to autoscale the y-axis.
6. Move the cursor to the point of the extremum.
7. If these coordinates show the accuracy you want, you can move the coordinates of the extremum to the calc line with x ENTER y ENTER; that is, digitize—see the earlier procedure "To digitize a point's coordinates (to display the coordinates with full accuracy)." If you want more accurate coordinates, zoom in again (repeat steps 5 and 6) until they are accurate enough.

Note



If the number of places used to display the coordinates prevents you from seeing the accuracy you want, you can usually show between 6 and 8 decimal places for each coordinate, depending on the sign of the mantissa and exponent. Select MENU Options Format Scientific, then select 6, 7, or 8 and redraw. If still more places are needed, digitize and compare on the stack.

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Writing Solver Equations

Introduction

Sometimes an equation printed in a book or written out longhand has to be adapted before it can be typed into the equation list. For example, examine the following equation for calculating the annual percent yield on a T-bill, given the purchase price. This price is in terms of full units of $10,000.

$$\frac{Percent\ annual\ yield}{100} = \frac{\$10,000 - Price}{Price} \times \frac{360\ days}{Days\ to\ maturity}$$

This equation requires several changes before the Solver can understand it. In addition, an enhancement can be added to make the calculation easier; a Solver **function** can be included to calculate *Days to maturity*. The following section discusses how these changes are incorporated into the equation.

Rules for Writing Equations

The rules for writing equations use several terms:

- *Variables* are the named items for which you store or calculate values.
- *Constants* are numbers—for example, $10,000, 360 days.
- *Operators* perform arithmetic—for example, *, and −.
- *Functions* do calculations using mathematical capabilities built into the Solver—for example, SQRT(*x*), USPV(*i%,n*), and DDAYS(*d1,d2,cal*).

Length of Equations

An equation cannot exceed 2279 characters and cannot contain more than 256 different variables. There are no other limits as long as there is sufficient memory to store it.

Variable Names

Solver variable names can be a maximum of 15 characters long and must be all one word (no spaces allowed). The following characters are not allowed in variable names: +, −, *, /, ^, (,), <, >, =, :, ;, !, {, }, [,], and |. Also, the character currently defined as argument separator (, in US mode and . in European mode) is not allowed in variable names. You cannot use NOT, AND, OR, or XOR as variable names, nor can you use the names of functions that have no arguments as variable names. A variable name cannot begin with a number.

For example, you could rewrite the T-bill equation as:

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$$\frac{\%Yield}{100} = \frac{\$10,000 - Price}{Price} \times \frac{360\ days}{DTM}$$

Note the shortened names using both uppercase and lowercase letters: *%Yield*, *Price*, *DTM*.

Note



Variable names are case sensitive. For example, the variable *%Yield* is not the same as another variable named *%YIELD*.

The first four or five characters of the variable names become function key labels. Therefore, make sure no two variables have the same first four or five characters.

Constants

Constants must be keyed in as numbers without digit separators or other characters. For example:

$$\frac{\%Yield}{100} = \frac{10000 - Price}{Price} \times \frac{360}{DTM}$$

Note the properly written numbers: 10000, 360.

Functions

An equation can contain any of the functions shown in the "Solver Functions" table later in this chapter. For example, rather than computing *DTM* yourself, you can use the Solver function DDAYS with arguments *SDATE* (settlement date), *MDATE* (maturity date), and 3 (designating the 360-day calendar):

$$\frac{\%Yield}{100} = \frac{10000 - Price}{Price} \times \frac{360}{\text{DDAYS(SDATE, MDATE, 3)}}$$

Operators, Parentheses, and the Order of Calculations

When necessary, use parentheses to control the order of calculations. Without parentheses, the Solver does calculations using the same rules as those used by an algebraic calculator. These rules are:

Functions First. For example, when solving for *D* in the equation `A*SQRT(B+C)=D`, the Solver calculates $\sqrt{(B+C)}$ and then multiplies the answer by *A*.

Exponentiation before Multiplication and Division. For example, an equation typed in as `A*B^3=C` is interpreted as $A \times B^3 = C$. *B* is raised to the 3rd power and *then* multiplied by *A*. To raise $A \times B$ to the 3rd power, write the equation: `(A*B)^3=C`.

Multiplication and division before addition and subtraction. For example, an equation typed in as `A+B/C=12` is interpreted as:

$$A + \frac{B}{C} = 12$$

To divide the sum $A + B$ by *C*, type the equation: `(A+B)/C=12`.

The T-bill equation can be written:

```
%Yield/100=(10000-Price)/Price*
360/DDAYS(SDATE,MDATE,3)
```

A good rule is: when in doubt, use parentheses. So, if you were unsure of how the T-bill equation written above would be interpreted, you could type it as:

```
%Yield/100=((10000-Price)/Price)*
(360/DDAYS(SDATE,MDATE,3))
```

The extra parentheses don't change the meaning of the equation, but they may make it easier to understand.

You cannot use parentheses for "implied" multiplication. For example, an equation printed in a book as $P_{SN} = P_S(1 - F)$ can be typed into the Solver as `PSN=PS*(1-F)`. The * sign must be inserted between `PS` and the parenthesis.

Spaces and Line Breaks

You can use spaces to make the equation more readable as long as there are no spaces inside variable names and function names. The following version of the T-bill equation is easier to read:

```
%Yield / 100 = ((10000 - Price) / Price) *
(360 / DDAYS (SDATE, MDATE, 3))
```

You can also create a line break in an equation using the tab key (▶|).

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Conditional Expressions and Logical Operators

The Solver IF function, in combination with the logical operators in the table "Operators Used in Conditional Expressions" later in this chapter, allow equations to do certain decision-making operations (see the section "Conditional Expressions (IF Function)") later in this chapter. You cannot use logical operators as variable names. For example, you cannot name a variable AND, but *CANDY* and *LAND* are acceptable variable names.

Date Formats

The functions CDATE, DATE, and DDAYS (defined in the Solver Functions table in the next section), either return a date or use one or more dates as arguments. The format in which these dates are expressed depends on the date format set in the Setup Utility (see "Setting the Date and Time" in chapter 21). The Setup Utility date formats shown in the second and third columns give the Calculator date formats shown in the first column.

Date Formats: Calculator vs. Setup Utility

Calculator	Setup Utility	
DD.MMYYYY	1(DD-MMM-YY)	2(DD-MMM)
	3(MMM-YY)	4B(DD/MM/YY)
	4C(DD.MM.YY)	5B(DD/MM)
	5C(DD.MM)	
MM.DDYYYY	4A(MM/DD/YY)	5A(MM/DD)
YYYY.MMDD	4D(YY-MM-DD)	5D(MM-DD)

Solver Functions

The following table lists the Solver functions. Lowercase characters in parentheses stand for numbers, variable names, or numeric expressions that the functions use to do their calculations.

Solver Functions

Function	Description
ABS(x)	Absolute value.
ACOS(x)	Arc cosine.[1]
ALOG(x)	Common (base 10) antilogarithm; 10^x
ANGLE(x,y)	Returns polar coordinate angle $\measuredangle$ given (x,y) rectangular coordinates.[1]
ASIN(x)	Arc sine.[1]
ATAN(x)	Arc tangent.[1]
CALCCELL (*input list*, *output range*, *row*, *col*)	You can specify *row*, *col*, just *row*, or neither. *input list* is zero or more inputs to the worksheet of the form: [*expr*, *range*, *row*, *col*]. For each input, the expression is evaluated and stored in the appropriate cell in the worksheet. Then the worksheet is recalculated, and the value of the output cell is returned.[2]
CDATE	Current date.[3]
COMB(x,y)	Number of combinations of x items taken y at a time.
COS(x)	Cosine.[1]
CPCOL	Returns the worksheet column number of the current cell pointer.[2]
CPROW	Returns the worksheet row number of the current cell pointer.[2]

1 Uses the current angle mode—degrees, radians, or grads. To change the angle mode, select (MENU) Options.

2 See the section "Solver Functions that Access 1-2-3 Worksheets" near the end of this chapter.

3 Uses the current date format, DD.MMYYYY, MM.DDYYYY, or YYYY.MMDD. See the earlier section "Date Formats."

Solver Functions (continued)

Function	Description
CTIME	Current time in HH.MMSS, 24-hour format.
DATE(*date,n*)	The date *n* days after (when *n* is positive) or before (when *n* is negative) the specified *date*.[1]
DDAYS(*d1,d2,cal*)	The number of days between dates *d1* and *d2*.[1] *cal* designates the calendar: ■ *cal*=1 for the actual calendar, which recognizes leap years. ■ *cal*=2 for the 365-day calendar, which ignores leap years. ■ *cal*=3 for the 360-day calendar, which uses 12, 30-day months.
DEG(*x*)	Converts *x* in radians to decimal degrees.
EXP(*x*)	Natural antilogarithm; e^x.
EXPM1(*x*)	$e^x - 1$.
FACT(*x*)	Factorial; *x* is an integer ≥ 0.
FP(*x*)	Fractional part.
FV(*n,i%yr,pv, pmt,p/yr,m*)	TVM function for FV.[2]

1 Uses the current date format, DD.MMYYYY, MM.DDYYYY, or YYYY.MMDD. See the earlier section "Date Formats."

2 See the section "The TVM Functions" later in this chapter.

Solver Functions (continued)

Function	Description
G(x)	The GET function returns the contents of x.
HMS(x)	Converts x in decimal hours (degrees) to H.MMSS (D.MMSS) format.
HR(x)	Converts x in H.MMSS (D.MMSS) format to decimal format.
IDIV(x,y)	Integer part of the quotient $x \div y$.
IF(*con,alg1,alg2*)	If conditional expression *con* is true, use algebraic expression *alg1*; otherwise, use *alg2*. (IF is discussed later in this chapter.)
INT(x)	The greatest integer less than or equal to x.
INV(x)	Reciprocal, $1/x$.
IP(x)	Integer part.
ITEM(*range,row, col*)	Returns the value of the designated worksheet cell. Identical to RCLCELL. ITEM is included for compatibility with the HP 19BII.[1]
I%YR(*n,pv,pmt, fv,p/yr,m*)	TVM function for *I%YR*.[2]
L(x,*alg*)	The LET function evaluates the algebraic expression *alg*, stores the result in x, and also returns that result as the value of the L function.
LENGTH(*range*)	Returns the number of worksheet rows in the given range. Identical to SIZES.[1]
LN(x)	Natural (base e) log of x.
LNP1(x)	ln $(1 + x)$.
LOG(x)	Common (base 10) log of x.

1 See the section "Solver Functions that Access 1-2-3 Worksheets" later in this chapter.

2 See the section "The TVM Functions" later in this chapter.

Solver Functions (continued)

Function	Description
MAX(x,y)	Larger of x and y.
MIN(x,y)	Smaller of x and y.
MOD(x,y)	The remainder of the division $x \div y$; MOD(x,y) = $x - y \times \text{INT}(x \div y)$.
N(*i%yr,pv,pmt, fv,p/yr,m*)	TVM function for N.[1]
PERM(x,y)	Permutations of x items taken y at a time.
PI	π; 3.141592653589793 (16 digits).
PMT(*n,i%yr,pv, fv,p/yr,m*)	TVM function for PMT.[1]
PV(*n,i%yr,pmt, fv,p/yr,m*)	TVM function for PV.[1]
RAD(x)	Converts x in decimal degrees to radians.
RADIUS(x,y)	Returns polar coordinate radius R given (x,y) rectangular coordinates.
RAN# or RAND	Pseudo-random number ($0 \leq r < 1$).
RCLCELL (*range,row,col*)	You can specify *row* and *col*, just *row*, or neither. Returns the value of the designated worksheet cell. Identical to ITEM.[2]
RND(x,y)	x is rounded to y decimal places (when $0 \leq y \leq 15$) or to $\lvert y \rvert$ significant digits (when $-16 \leq y \leq -1$). When y equals 16, x is rounded to the number of decimal places given by the current display setting.
S(*var*)	*var* is a variable; S(*var*) is used with the IF function to create a set of function keys from more than one equation. (S is discussed later in this chapter.)

Computer Museum

1 See the section "The TVM Functions" later in this chapter.

2 See the section "Solver Functions that Access 1-2-3 Worksheets" later in this chapter.

Solver Functions (continued)

Function	Description
SGN(x)	Sign of x (+1 if $x>0$, 0 if $x=0$, −1 if $x<0$).
SIGMA ($cv,c1,c2,s,alg$)	Sums values of the algebraic expression (alg) for values of the counter variable (cv). cv starts with value $c1$ and is incremented in steps of s, to a final value of $c2$. (SIGMA is discussed later in this chapter.)
SIN(x)	Sine.[1]
SIZES(*range*)	Returns the number of worksheet rows in the given range. Identical to LENGTH. SIZES is included for compatibility with the HP 19BII.[2]
SPFV($i\%,n$)	Future value of a single $1.00 payment; equivalent to $(1+i\%\div 100)^n$. n is the number of compounding periods, $i\%$ is the interest rate per compounding period, expressed as a percentage.
SPPV($i\%,n$)	Present value of a single $1.00 payment; equivalent to $1\div$SPFV($i\%,n$). n is the number of compounding periods. $i\%$ is the interest rate per compounding period, expressed as a percentage.
SQ(x)	x^2
SQRT(x)	$\sqrt{x}$
STOCELL(*expr, range,row,col*)	You can specify *row*, *col*, just *row*, or neither. Evaluates the expression and stores the result in the designated worksheet cell. The worksheet is not recalculated.[2]
TAN(x)	Tangent.[1]

1 Uses the current angle mode—degrees, radians, or grads. To change the angle mode, select MENU Options.

2 See the section "Solver Functions that Access 1-2-3 Worksheets" later in this chapter.

Solver Functions (continued)

Function	Description
TRN(x,y)	x is truncated to y decimal places (when $0 \leq y \leq 15$) or to $\|y\|$ significant digits (when $-16 \leq y \leq -1$). When y equals 16, x is truncated to the number of decimal places given by the current display setting.
USFV($i\%,n$)	Future value of a uniform series of \$1.00 payments; equivalent to (SPFV($i\%,n$)−1) ÷ ($i\%$ ÷ 100). n is the number of payments. $i\%$ is the periodic interest rate, expressed as a percentage.
USPV($i\%,n$)	Present value of a uniform series of \$1.00 payments; equivalent to USFV($i\%,n$) ÷ SPFV($i\%,n$). n is the number of payments. $i\%$ is the periodic interest rate, expressed as a percentage.
WIDTH(*range*)	Returns the number of worksheet columns in the given range.[1]
XCOORD($R,\measuredangle$)	x-coordinate of polar coordinates. (Uses the current angle mode—degrees or radians.)
YCOORD($R,\measuredangle$)	y-coordinate of polar coordinates. (Uses the current angle mode—degrees or radians.)

1 See the section "Solver Functions that Access 1-2-3 Worksheets" later in this chapter.

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Example: Calculating Purchasing Power After Inflation. The following equation, written as it might appear in a book, calculates the future value (*FVAL*) of a sum (*PVAL*) after any number of years (*YEARS*), given a constant percentage rate of inflation (*INFL*).

$$FVAL = \frac{PVAL}{(1 + \frac{INFL\%}{100})^{YEARS}}$$

Compare the denominator of the equation with the equation for the SPFV function in the preceding table. (The SPFV function calculates the future value of a single $1 payment.) Notice that if you replace *i%* and *n* in the SPFV equation with *INFL%* and *YEARS*, the two are identical. Thus, the Solver equation can be written:

```
FVAL=PVAL/SPFV(INFL%,YEARS)
```

Part 1. Calculate the purchasing power of $10,000 after 10 years of 7% inflation per year.

Keys:	Description:
⊞	Starts the Calculator application.
MENU S	(Press ESC one or more times if necessary.) Displays the Solve Catalog.
▶	Ensures that the highlight is in the equation field, not the name field.
FVAL = PVAL / SPFV (INFL%, YEARS)	Types the equation into the Solve Editor (the Editor is automatically displayed when you start typing).
Calc	Verifies the equation, enters it into the equation list, selects the Solve Calc screen, and displays the function key labels.
10000 PVAL	Stores the original amount.
7 INFL%	Stores the inflation rate.
10 YEARS	Stores the number of years.
FVAL	Calculates the purchasing power in 10 years.

```
FVAL  =  5,083.49
PVAL  = 10,000.00
INFL% =      7.00
YEARS =     10.00
```

Part 2. What would the inflation rate have to be for the purchasing power to be reduced by only $2000 over the 10-year period?

Keys:	Description:
8000 FVAL	Stores desired purchasing power.
INFL%	Calculates the inflation rate. The Solver searches for an iterative solution and displays intermediate estimates. See "How the Solver Works" in chapter 28.

```
FVAL  =  8,000.00
PVAL  = 10,000.00
INFL% =      2.26
YEARS =     10.00
```

Conditional Expressions (IF Function)

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Equations can include conditional expressions using the IF function. For example, the Solver accepts the equation: BONUS=IF(SALES>3000,.02*SALES,.01*SALES). The two commas inside the parentheses stand for "THEN" and "OR ELSE." According to this equation, if *SALES* is greater than 3000, then *BONUS* equals .02 × *SALES*; otherwise, *BONUS* equals .01 × *SALES*.

In general, the form of the IF function is:

IF(*conditional expression* , *algebraic expression* , *algebraic expression*)

A conditional expression can also be an algebraic expression. If the algebraic expression evaluates to zero, it is interpreted as false. Otherwise, true. For example, if A equals − 1 in the algebraic expression A+1, the expression is false. If A equals any other number, the expression is true.

The logical and relational operators that can be used in conditional expressions are described in the table below:

Operators Used in Conditional Expressions

Logical Operators	Relational Operators
NOT	> Greater than
AND	< Less than
OR	= Equal to
XOR	>= Greater than or equal to
	<= Less than or equal to
	<> Not equal to

Order of Logical Operations

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Logical operations are done after arithmetic operations (addition, subtraction, etc.). For example, the expression

$A+1$ OR $B=5$

is true if $A<>-1$ and/or $B=5$. The expression is false only if $A=-1$ and $B<>5$.

When there are two or more logical operators, they are done in the order NOT first, then AND, and finally OR or XOR. Thus, the expression

$A=360$ AND $B=12$ OR $A=365$

is true if A equals 360 and B equals 12, or if A equals 365.

Example: An Equation With a Conditional Expression. Use the *BONUS* Solver equation to calculate the bonus for a salesperson who generated $5000.00 in sales last month.

```
BONUS=IF(SALES>3000,.02*SALES,.01*SALES)
```

Enter the equation (press ESC, if necessary, to display the solve catalog screen), then press Calc (F9).

Note that the symbol following SALES is the "greater than" symbol >.

Keys:	Description:
5000 SALES	Stores the sales.
BONUS	Calculates the bonus (.02 × *SALES*).

```
BONUS =    100.00
SALES = 5,000.30
```

Here are several additional examples of equations using conditional expressions:

Equation: B=IF(7<A AND A<=15,2*A/6,3*A+10)+C
Meaning: If A is greater than 7 and less than or equal to 15, then $B=(2\times A\div 6)+C$. Otherwise, $B=(3\times A+10)+C$.

Equation: VALUE=FIRST+IF(NOT FIRST=0,1/FIRST,0)
Meaning: If *FIRST* is unequal to 0, then $VALUE=FIRST+(1\div FIRST)$. If $FIRST=0$, then $VALUE=FIRST$.

Equation: T=W*IF(A=0 XOR B=0,A+B,A*B)
Meaning: $T=W\times(A+B)$ if A or B, but not both, equals 0. Otherwise, $T=W\times A\times B$. In other words,

When $A=0$ and $B\neq 0$, $T=W\times B$
When $A\neq 0$ and $B=0$, $T=W\times A$
When $A=0$ and $B=0$, $T=0$
When $A\neq 0$ and $B\neq 0$, $T=W\times A\times B$.

Example: Using One IF Function Inside Another. An IF function can be used as the argument of another IF function. For example, suppose a corporation uses a rating system to determine salary. Employees are rated on a scale 1 through 3, and are given the following annual percent raise based on their rating:

Rating	Percent Salary Increase
1	3%
2	6%
3	10%

The following equation calculates a new salary based on the previous salary and rating:

```
NSAL=OSAL*(1+IF(R=1,.03,IF(R=2,.06,.1)))
```

where

NSAL = the new salary.
OSAL = the previous salary.
R = the rating; 1, 2, or 3.

If *R* = 1, the equation uses `.03`.
If *R* = 2, the equation uses `.06`.
If *R* ≠ 1 or 2, the equation uses `.1`.

Calculate the new annual salary for an employee with rating 2 who currently earns $27,500 annually.

Enter the equation (press ESC, if necessary, to display the solve catalog screen) then press `Calc` (F9).

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Keys:	Description:
27500 `OSAL`	Stores the old salary.
2 `R`	Stores the rating.
`NSAL`	Calculates the new salary.

```
NSAL = 29,150.00
OSAL = 27,500.00
R    =      2.00
```

Creating Function Keys for Multiple Equations (S Function)

The S (solving for) function is used with the IF function to group equations and to specify the conditions under which one or the other is used. For example, consider these two equations for calculating gross pay:

Wage pay based on an hourly wage:	*Salary* pay based on a fixed salary plus a 5% sales commission:
`WPAY=WAGE*HRS`	`SLPAY=SALRY+.05*SALES`
where:	where:
WPAY = gross wage pay. *WAGE* = hourly wage. *HRS* = hours worked.	*SLPAY* = gross salary pay. *SALRY* = the fixed salary. *SALES* = sales.

To use the S function, the equations must first be rearranged to place 0 on one side of each equation:

```
WPAY-WAGE*HRS=0
SLPAY-SALRY-.05*SALES=0
```

To create one set of function keys that can be used for either equation:

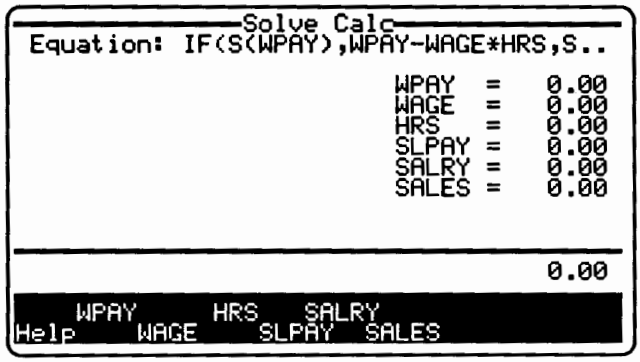
```
IF(S(WPAY),WPAY-WAGE*HRS,SLPAY-SALRY-.05*SALES)=0
```

`IF(S(WPAY)` asks: Solving for *WPAY*?
If the answer is "yes" (true), the expression `WPAY-WAGE*HRS` is used.
If the answer is "no" (false), the expression `SLPAY-SALRY-.05*SALES` is used.
The `=0` ending to this equation is optional. If it's omitted, =0 is implied.

The S function appears within the IF function in the conditional expression. In this case, the conditional expression is true if you solve for *WPAY*, and false if you solve for anything else. The algebraic expressions in the IF function are the two equations, rewritten to gather all the terms on one side of the equation, so that each expression is equal to 0.

The IF function can be set equal to an expression common to both equations. For example, the equations `X+Y+(10/A)=Z` and `Q+R+(10/A)=T` can be combined to `IF(S(X) OR S(Y) OR S(Z),X+Y-Z,Q+R-T)=-10/A`. Note that the Solver uses the second equation when solving for *Q*, *R*, *T*, or *A*.

Example: Using the S function. Part 1. Enter the combined equation discussed earlier: `IF(S(WPAY),WPAY-WAGE*HRS,SLPAY-SALRY-.05*SALES)=0` and then press `Calc` (F9). The HP 95LX displays:



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Calculate the weekly pay for an employee working 35 hours for $6.75 per hour.

Keys:	Description:
6.75 `WAGE`	
35 `HRS`	Stores wages and hours.
`WPAY`	Calculates wage pay.

```
WPAY = 236.25
WAGE =   6.75
HRS  =  35.00
```

Part 2. Calculate the monthly pay for an employee with a base salary of $1,800 who generated $5,000 in sales.

Keys:	Description:
1800 SALRY	
5000 SALES	Stores salary and sales.
SLPAY	Calculates salary pay.

```
SLPAY = 2,050.00
SALRY = 1,800.00
SALES = 5,000.00
```

The TVM Functions

The five solver TVM functions allow you to write equations that do calculations analogous to the calculations done in the TVM Calculator application:

N (*i%yr*, *pv*, *pmt*, *fv*, *p/yr*, *m*)
I%YR (*n*, *pv*, *pmt*, *fv*, *p/yr*, *m*)
PV (*n*, *i%yr*, *pmt*, *fv*, *p/yr*, *m*)
PMT (*n*, *i%yr*, *pv*, *fv*, *p/yr*, *m*)
FV (*n*, *i%yr*, *pv*, *pmt*, *p/yr*, *m*)

Each function calculates one TVM value, given the values for all the others. The parameters of the functions (the contents of the parentheses) are defined identically (with one exception) to the Calculator application's TVM variables described in the table "The TVM Function Keys" near the front of chapter 25. The exception is that *m* stands for the Begin/End mode (B/E), described in the table in chapter 25. Use *m*=1 for Begin mode, *m*=0 for End mode. For example, the first function calculates N (the total number of payments or compounding periods), given the annual percentage interest rate, present value, payment amount, future value, number of payments per year, and the Begin/End mode.

You can give the parameters any legal variable name; for example you can use *LOAN* in place of *pv*. Parameters can also be algebraic

expressions. For example, the following equation calculates the monthly payment for a car loan:

```
CARPMT=PMT(MONTHS,I%YR,PRICE-DOWN,0,12,0)
```

MONTHS is the number of monthly periods (n).
DOWN is the down payment.
PRICE is the purchase price.
PRICE-DOWN is the present value (pv).
The first 0 is the final value (fv).
12 is the payments/year (p/yr).
The final 0 specifies End mode.

Notice that PMT is *not* a variable in the equation—it is the name of the function.

The Solver TVM variables are not shared with the variables in the Calculator's TVM application. For example, the variable *I%YR* in the *CARPMT* equation is separate from the TVM variable *I%YR*.

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Example: Homeowner's Monthly Payment Estimator. Monthly house payments often include payments for taxes and insurance. The following Solver equation calculates the payment, assuming that the assessed value of the house equals its purchase price.

```
PAYMT=PMT(N,I%YR,PRICE-DOWN,0,12,0)-
TAX*PRICE/12000-INSUR/12
```

where

PAYMT = monthly house payment.
N = total number of payments to repay the mortgage.
I%YR = annual interest rate.
PRICE = purchase price of the house.
DOWN = down payment.
TAX = tax rate per $1,000 assessed value.
INSUR = cost of insurance per year.

The minus signs before TAX and INSUR are necessary in order for the taxes and insurance to increase the payment amount (*PAYMT*), since the value calculated by the PMT function is a negative number (see "Making Cash Flow Diagrams" near the front of chapter 25).

For example, suppose you put 10% down on a $65,000 house, and take out a $10\frac{1}{4}$%, 35-year loan. If the tax rate is $25 per thousand, and insurance is $600 per year, what are your monthly payments?

Enter the equation and press Calc ((F9)).

Keys:	Description:
35 (*) 12 N	
10.25 I%YR	
65000 PRICE	Stores number of periods, interest rate, and house price.
(*) 10 (%) DOWN	Calculates and stores the down payment.
25 TAX	Stores the tax rate.
600 INSUR	Stores insurance.
PAYMT	Calculates monthly payment.

```
PAYMT =   -699.55
N     =    420.00
I%YR  =     10.25
PRICE = 65,000.00
DOWN  =  6,500.00
TAX   =     25.00
INSUR =    600.00
```

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Example: **Using the Solver to Calculate APR of a Loan With Fees.** The following equation uses a TVM Solver function to calculate the APR (*annual percentage rate*) of a loan with fees. (Using the TVM Calculator application to calculate APR is covered in the section "Loans with Fees" near the end of chapter 25).

```
APR=I%YR(N,LOAN-
FEES,PMT(N,I%YR,LOAN,0,12,0),0,12,0)
```

where

N = the total number of payments for the loan.
LOAN = the loan amount.
FEES = the sum of all the fees for the loan.
I%YR = the annual interest rate.

Notice that I%YR appears twice in the equation—as the TVM function, and as a variable. The two occurrences are independent of one another.

Use the APR Solver equation to calculate APR for a $60,000, 30-year mortgage. The annual interest rate is $11\frac{1}{2}$%, and the borrower is charged two points (2% of the mortgage amount) in fees.

Enter the equation and press Calc ((F9)).

Keys:	Description:
30 (*) 12 N	Stores number of payments.
60000 LOAN	Stores mortgage amount.
(*) 2 (%) FEES	Calculates and stores the fees.
11.5 I%YR	Stores the annual interest rate.
APR	Calculates APR.

```
APR  =     11.76
N    =    360.00
LOAN = 60,000.00
FEES =  1,200.00
I%YR =     11.50
```

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The Summing Function (SIGMA)

The SIGMA function provides the ability to do a variety of summing operations. The function has the form:

SIGMA(*counter variable* , *starting value* , *ending value* , *step size* , *algebraic expression*)

The **counter variable** takes on a series of values, beginning with the **starting value**, and incrementing according to the **step size**, until it passes the **ending value**. For each value of the counter, the **algebraic expression** is evaluated, and the value is added to the previous value. The function returns the final summation. The counter variable is not represented by a function key.

The following equation contains a counter I and two other variables, X and *THESUM*:

```
THESUM=SIGMA(I,1,6,1,I*X)
```

The counter I runs from 1 through 6 in steps of 1—that is, 1, 2, 3, 4, 5, 6. For each value I, $I \times X$ is calculated and added to the sum. If you store 3 in X and then solve for *THESUM*, the Solver calculates *THESUM* = 63; that is, 3 + 6 + 9 + 12 + 15 + 18.

Creating Solver Files on a PC or Another Editor

An equation list may be created using an editor outside of the Solve application. Each name/equation line entry is bounded by curly brackets. The vertical line (press [|]; that is, [Shift] [|]) is used to separate the name from the equation. If the line entry consists of a name only, the vertical line follows the name. If the line entry consists of an equation only, no vertical line is used.

Consider the following to be the contents of a word processor or editor file. This file defines four lines of an equation list.


```
{Graph#1|x^3-5*x^2-10*x+z} {Note Price|}
{y=sin(x)} {Graph#2|x^4-60*x^3-595*x^2-1770*x-
1656}
```

(The spaces are inserted for clarity only.) When this file is retrieved or inserted into the equation list (see "Saving and Retrieving Equations" in chapter 28), the four added lines will look like this:

```
Graph#1        x^3-5*x^2-10*x+z
Note Price
               y=sin(x)
Graph#2        x^4-60*x^3-595*x^2-1770*x-1656
```

Solver Functions that Access 1-2-3 Worksheets

The seven solver 1-2-3 functions allow communication between the Solver and 1-2-3 worksheets, giving the Solver new powers. The worksheet must be the current worksheet (the one displayed when (1-2-3) is pressed) and the worksheet must be in ready mode (READY must be displayed in the upper-right corner of the worksheet screen).

The example following the explanations illustrates the use of CALCCELL.

The parameters used by these functions are:

expr = a value, variable name, or mathematical expression whose calculated value is acted upon by the function.

range = a 1-2-3 range name or cell address (like B7).

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row, *col* = the offsets (relative cell addresses) from the upper left corner of the given range. Non-integer values for *row* and *col* are rounded to the nearest integer and negative values are allowed.

Some examples:
(B3, 1, 1) refers to cell B3
(B3, 0, 0) refers to cell A2
(B3, -1, 0) refers to cell A1
(B3, 2, 3) refers to cell D4

An error is reported if the resulting cell reference is not within the bounds of the worksheet. If *col* is not specified, column 1 is assumed. If neither *row* nor *col* are specified, they are both assumed to be 1.

Press (MENU) Solve Edit Other to see the typing-aid function keys for these functions. The names and key numbers for the typing aids are shown by each solver 1-2-3 function below.

STOCELL (*expr*, *range*, *row*, *col*) STOCEL ((F2))

You can specify *row*, *col*, just *row*, or neither. Evaluates the expression and stores the result in the designated worksheet cell. The worksheet is not recalculated.

RCLCELL (*range*, *row*, *col*) RCLCEL (F3)

You can specify *row* and *col*, just *row*, or neither. Returns the value of the designated worksheet cell. Identical to ITEM, which is included for compatibility with the HP Business Consultant II (the HP 19B II Financial Calculator). (The Business Consultant II uses its SUM list rather than a 1-2-3 worksheet.)

CALCCELL (*input list*, *output range*, *row*, *col*) CALCCE (F4)

You can specify *row*, *col*, just *row*, or neither. *input list* is zero or more inputs to the worksheet of the form: [*expr*, *range*, *row*, *col*]. For each input, the expression is evaluated and stored in the appropriate cell in the worksheet. Then the worksheet is recalculated, and the value of the output cell is returned.

LENGTH (*range*) LENGTH (F5)

Returns the number of worksheet rows in the given range. Identical to SIZES, which is included for compatibility with the HP Business Consultant II.

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WIDTH (*range*) WIDTH (F6)

Returns the number of worksheet columns in the given range.

CPCOL CPCOL (F7)

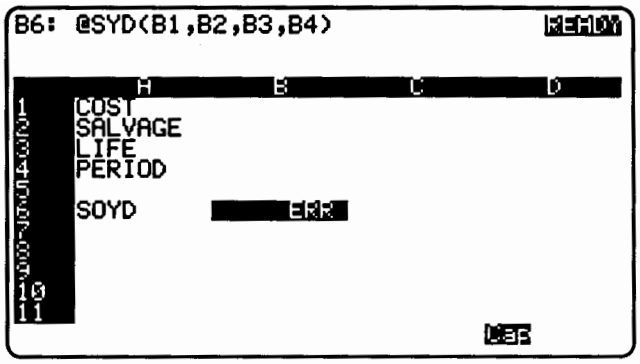
Returns the worksheet column number of the current cell pointer.

CPROW CPROW (F8)

Returns the worksheet row number of the current cell pointer.

Example: Depreciation. CALCCELL can be used to tap the power of 1-2-3 in a Solver equation. For example, suppose you want to compute depreciation (sum of years digits) in Solver. You can use CALCCELL to access the @SYD function in 1-2-3.

1. Create the 1-2-3 worksheet shown in the figure below. The ERR message in cell B6 when you enter the SOYD function in that cell is normal in this case. The SOYD function is not valid when all its variables equal zero.



2. Display the Solver equation list and enter this equation:

   CALCCELL([COST,B1], [SALVAGE,B2], [LIFE,B3], [PERIOD,B4], B6) = SOYD

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   This use of CALCCELL is explained at the end of this example.

3. Press Calc (F9) and enter:

   10000 into COST (F2)
   2000 into SALVAG (F3)
   5 into LIFE (F4)
   2 into PERIOD (F5)

4. Press SOYD (F6) to get the solution:
   SOYD = 2133.33.

You now have a depreciation application in Solver. As with any Solver equation, you can solve for any of the variables, not just SOYD. Look at the worksheet and see that whatever results are computed in Solver also appear in 1-2-3.

Here is an explanation of this example's use of CALCCELL; that is, what are the meanings of the various elements of CALCCELL([COST,B1], [SALVAGE,B2], [LIFE,B3], [PERIOD,B4], B6)?

As stated above, the elements of CALCCELL are (*input list*, *output range*, *row*, *col*)

The *input list* is [COST,B1], [SALVAGE,B2], [LIFE,B3], [PERIOD,B4].

The ***output range*** is B6. The output range can be either a range name or a cell address, like B6.

The *row, col* entries are not needed, since the there is no offset from the cell address. If neither *row* nor *col* are specified, both are assumed to be 1 (no offset).

To explain further the inputs to the worksheet that make up the ***input list***, consider one of those inputs, `[COST,B1]`. The elements of one input are [*expr*, ***range***, *row*, *col*]. In this case, the expression is a variable name, *COST*. The range is a cell address, B1. Since no row nor column is specified, the offsets for both are 1; that is, there are no offsets. Cell B1 will contain the value for *COST*.

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Solver Examples

Introduction

This table lists the example equations in this chapter and the functions they use.

Solver Examples

Example	Solver Functions Used
Simple Annual Interest	DDAYS, IF
Loan With an Odd (Partial) First Period	PV, FP, IF
Canadian Mortgages	FV
Advance Payments (Leasing)	USPV, SPPV
Price of an Insurance Policy	
Discounted Notes	DDAYS
Moving Average	SIGMA, RCLCELL, MAX, MIN
Chi-Squared (χ^2) Statistics	SIGMA, RCLCELL, LENGTH
Economic Ordering Quantity	SQRT
Simulating a Toss of Dice	IP, RAN#
Distance Between Two Locations	ACOS, SIN, HR, COS

Solver Examples (continued)

Example	Solver Functions Used
Number of Days Until a Special Day	DDAYS, CDATE, FP, IF
Finding Several Solutions to an Equation	

Simple Annual Interest

The following equation calculates the amount due for a loan with simple annual interest, given the duration of the loan. Both the principal and interest are paid in a lump sum at the end of the loan period. This LOAN,DAYS equation assumes a 365-day calendar basis.

```
DEBT = LOAN + LOAN * I% / 100 * DAYS / 365
```

where

DEBT = the total owed at the end of the loan period.
LOAN = the original amount (principal) lent.
I% = the annual interest rate as a percent.
DAYS = the number of days of the loan.

If you know the dates for the course of the loan, rather than the number of days, use this LOAN,DATES equation:

```
DEBT = LOAN + LOAN * I% / 100 *
DDAYS(DATE1,DATE2,IF(BASIS=365,1,3)) / BASIS
```

where

DATE1 = the date the loan commences.
DATE2 = the date the loan ends.
BASIS = 360 for a 360-day basis.
BASIS = 365 for a 365-day basis.

Example: Simple Interest for a Specified Number of Days. You lend a friend $450 for 60 days, charging 7% simple annual interest (calculated on a 365-day basis). What is the total amount she will owe you in 60 days?

Starting from the solve calc screen for the LOAN,DAYS equation:

Keys:	Description:
450 LOAN	Stores loan amount.
7 I%	Stores interest rate.
60 DAYS	Stores term of loan.
DEBT	Calculates amount due in 60 days.

```
DEBT = 455.18
LOAN = 450.00
I%   =   7.00
DAYS =  60.00
```

Example: Simple Interest From the Dates of the Loan. On March 26, 1992, you borrow $1,200 from a relative. You promise to repay the loan, with 8% simple interest (to be calculated on a 365-day basis), on June 12, 1993. How much will you owe?

Starting from the solve calc screen for the LOAN,DATES equation:

Keys:	Description:
1200 LOAN	Stores loan amount.
8 I%	Stores interest rate.
3.261992 DATE1	Stores date of loan.
6.121993 DATE2	Stores repayment date.
365 BASIS	Stores calendar basis.
DEBT	Calculates amount to be repaid.

```
DEBT  = 1,316.52
LOAN  = 1,200.00
I%    =     8.00
DATE1 =     3.26
DATE2 =     6.12
BASIS =   365.00
```

Loans With an Odd (Partial) First Period

The Calculator's TVM application requires all payment periods to be the same length. However, situations exist in which the first payment period does not equal the remaining periods. That period (from the date that interest begins accruing to the date of the first payment) is sometimes called an **odd** or **partial first period**.

The following Solver equation named ODDPER does calculations involving an odd first period, using simple interest for the odd period. The equation is valid for 0 to 59 days from inception to first payment, and assumes a 30-day month.

You do not need to specify Begin or End mode. If the odd period is less than 30 days, Begin mode is assumed. If the odd period is between 30 and 59 days, inclusive, End mode is assumed.

```
(I%YR/100/P_YR*FP(DAYS/30)+1)*PV -
PV(N,I%YR,PMT,FV,P_YR,IF(DAYS<30,1,0))=0
```


where

I%YR = the nominal annual interest rate, as a percentage.
P_YR = the number of payment periods per year.
DAYS = the actual number of days until the first payment is made.
PV = the loan amount.
N = the total number of payment periods.
PMT = the periodic payment.
FV = the balloon payment.

Example: Loan With an Odd First Period. A 36-month loan for $4,500 has an annual interest rate of 15%. If the first payment is made in 46 days, what is the monthly payment amount?

Keys:	Description:
15 I%YR	Stores annual interest rate.
12 P_YR	Stores number of payments per year.
46 DAYS	Stores days until first payment.
4500 PV	Stores loan amount.

36 N	Stores 36 payment periods.
0 FV	Stores no balloon payment (no final value).
PMT	Calculates monthly payment amount.

```
I%YR =     15.00
P_YR =     12.00
DAYS =     46.00
PV   = 4,500.00
N    =     36.00
PMT  =   -157.03
FV   =      0.00
```

Example: Loan With an Odd First Period Plus Balloon. A $10,000 loan has 24 monthly payments of $400, plus a balloon payment of $3,000 at the end of the 24th month. If the payments begin in 8 days, what annual interest rate is being charged?

Starting from the solve calc screen for the same ODDPER equation:

Keys:	Description:
12 P_YR	Stores number of payments per year.
8 DAYS	Stores days until first payment.
10000 PV	Stores loan amount.
24 N	Stores 24 payment periods.
400 (+/-) PMT	Stores periodic payment.
3000 (+/-) FV	Stores balloon payment.
I%YR	Iterative solution for annual interest rate.

```
I%YR =     19.67
P_YR =     12.00
DAYS =      8.00
PV   = 10,000.00
N    =     24.00
PMT  =   -400.00
FV   = -3,000.00
```

Canadian Mortgages

In Canadian mortgages, interest is compounded semi-annually while payments are made monthly. The following Solver equation named CAN can be used to calculate Canadian mortgages.

Canadian mortgages can also be calculated using the Calculator's TVM application. See the section "Compounding Periods Different from Payment Periods" in chapter 25 for an example.

```
FV(N,((1+CI%YR/200)^(1/6)-1)*1200,PV,PMT,12,0)=FV
```

where

N = total number of payment periods for the life of the loan.
CI%YR = annual (Canadian) interest rate as a percent.
PV = the loan amount, or present value.
PMT = periodic payment amount.
FV = remaining balance, or future value.

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Example: Calculating the Payment for a Canadian Mortgage. What is the monthly payment required to fully amortize a 30-year, $50,000 Canadian mortgage if the interest rate is 9%?

Starting from the solve calc screen for this example's equation:

Keys:	Description:
30 (*) 12 N	
9 CI%YR	
50000 PV	
0 FV	Stores known values.
PMT	Calculates the payment.

```
N      =     360.00
CI%YR  =       9.00
PV     =  50,000.00
PMT    =    -396.42
FV     =       0.00
```

Example: Calculating the Interest Rate for a Canadian Mortgage. A Canadian mortgage has monthly payments of $612.77 with a maturity of 25 years. The principal amount is $75,500. What is the annual interest rate?

Keys:	Description:
612.77 (+/-) PMT	
75500 PV	
25 (*) 12 N	
0 FV	Stores known values.
CI%YR	Calculates annual interest rate.

```
N      =    300.00
CI%YR  =      8.75
PV     = 75,500.00
PMT    =   -612.77
FV     =      0.00
```


Advance Payments (Leasing)

Occasionally payments are made in advance, such as in leasing. Leasing agreements sometimes call for the extra payments to be made when the transaction is closed. A residual value (salvage value) can also exist at the end of the normal term.

The following equation named ADV calculates the monthly payment and the annual yield when one or more payments are made in advance. It can be modified to accommodate periods other than monthly by changing the number 12 to the appropriate number of payment periods per year.

```
PMT=(-PV-FV*(SPPV(I%YR/12,N)))/
(USPV(I%YR/12,N-#ADV)+#ADV)
```

where

PMT = the monthly payment amount.
PV = the value of the equipment.
FV = the residual value.
$I\%YR$ = the annual interest rate as a percent.
N = the total number of payments.
$\#ADV$ = the number of advance payments.

Example: Leasing With Advance Payments. Equipment worth $750 is leased to you for 12 months. The equipment is assumed to have no salvage value at the end of the lease. You agree to make three payments at the time of closing. What is the monthly payment if the annual interest rate is 10%?

Starting from the solve calc screen for this example's equation:

Keys:	Description:
750 PV	
12 N	
0 FV	
3 #ADV	
10 I%YR	Stores known values.
PMT	Calculates monthly payment.

```
PMT   = -64.45
PV    = 750.00
FV    =   0.00
I%YR  =  10.00
N     =  12.00
#ADV  =   3.00
```

Price of an Insurance Policy

The price of an insurance policy, other than term life insurance, is rarely apparent at first glance. The price should include not only the premium payments, but also the interest that could have been earned on the cash value or **savings portion** of the policy.

The following equation named POLICY calculates the price per $1,000 of protection for one policy year and the interest rate earned on the savings portion of the policy.

Reference: Joseph M. Belth, *Life Insurance—A Consumer's Handbook*, Indiana University Press, 1973, p. 234.

```
INS=((PREM+LVAL)*(1+I%/100)-VAL-DIV)/(.001*(FACE-
VAL))
```

where

INS = the price per $1,000 of protection in one policy year.
PREM = the annual premium amount.
LVAL = the value of the policy at the end of last year.
I% = the rate of return, as a percent.
VAL = the value of the policy at the end of the current year.
DIV = the dollar value of the dividend for one year.
FACE = the face value of the policy for one year.

To calculate the price, assume some value for interest—for example, the interest rate you could earn on a one-year savings certificate after tax. Similarly, to calculate interest, assume a price per $1,000 of protection per year for alternative insurance; for example, a low-cost term policy of the one-year renewable type.

Even complex policies like minimum-deposit plans can be analyzed with this procedure. Use policy surrender values for cash values and the actual (after-tax) amounts for payments (premiums) and dividends.

Example: Price of an Insurance Policy. Part 1. You are evaluating your $50,000 insurance policy. The premium of $1,010 is due at the beginning of the year, and a dividend of $165 is received at the end of the policy year. The cash value of the policy is $3,302 at the beginning of the year, and it will grow to $4,104 by the end of the year. You can earn 6% on a savings account. What is the price per $1,000 protection per year?

Starting from the solve calc screen for the POLICY equation:

Keys:	Description:
1010 PREM	Stores annual premium.
3302 LVAL	Stores value of policy at end of last year.
6 I%	Stores interest rate you could get elsewhere.
4104 VAL	Stores value of policy at end of this year.
165 DIV	Stores annual dividend.
50000 FACE	Stores face value of policy.
INS	Your protection cost: $6.57 per $1,000 face (protection) value.

```
INS  =      6.57
PREM =  1,010.00
LVAL =  3,302.00
I%   =      6.00
VAL  =  4,104.00
DIV  =    165.00
FACE = 50,000.00
```

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Part2. Insurance protection could be purchased for $3 per $1,000 face value. Calculate the rate of return on your savings, using the same equation:

3 INS	Stores price of alternate protection.
I%	Calculates rate of return on your savings.

```
INS  =      3.00
PREM =  1,010.00
LVAL =  3,302.00
I%   =      2.20
VAL  =  4,104.00
DIV  =    165.00
FACE = 50,000.00
```

Discounted Notes

A note is a written agreement to pay the buyer of the note a sum of money plus interest. Notes do not have periodic coupons, since all interest is paid at maturity. A discounted note is a note that is purchased below its face value. In the following two equations, the calendar basis is actual/360. To find the price given the discount rate, use the following NOTE,PRICE equation:

```
PRICE=RV-(DISC*RV*DDAYS(SETT,MAT,1)/36000)
```

To find the yield given the price (or to find the price given the yield), use the NOTE,YIELD equation:

```
YIELD=(RV-PRICE)/PRICE*36000/DDAYS(SETT,MAT,1)
```

where

PRICE = the purchase price per $100 face value.
YIELD = the yield as an annual percentage.
RV = the redemption value per $100.
DISC = the discount rate as a percent.
SETT = the settlement date (in current date format).
MAT = the maturity date (in current date format).

Example: Price and Yield of a Discounted Note. What are the price and yield of the following U.S. Treasury Bill: settlement date July 16, 1991; maturity date December 17,1991; discount rate 8.7%? (Assume month/day/year format.)

Starting from the solve calc screen for the NOTE,PRICE equation:

Keys:	Description:
7.161991 SETT	
12.171991 MAT	
8.7 DISC	
100 RV	Stores known values.

PRICE Calculates price.

```
PRICE =  96.28
RV    = 100.00
DISC  =   8.70
SETT  =   7.16
MAT   =  12.17
```

Starting from the solve calc screen for the NOTE,YIELD equation:

YIELD Calculates yield.

```
YIELD =          9.04
```

30 Moving Average

Moving averages are often used to predict trends in data over time. In moving average calculations, a specified number of values are averaged. Each time a new value is acquired, the oldest is discarded.

The following Solver equation named MOVAVG calculates the moving average of data stored in a 1-2-3 worksheet.

```
MAVG=SIGMA(I,MAX(1,LAST-N+1),LAST,1,RCLCELL
(name,I))/MIN(LAST,N)
```

where

N = the number of values averaged in each calculation.
LAST = the entry number of the most recent value to be averaged.
name = the range name of the first data cell.

Example: Moving Average. Calculate a three-month moving average for the number of units manufactured during the first half of the year. Manufacturing volumes were:

January	February	March	April	May	June
4400	5360	2900	3670	4040	3200

If you want to preserve the current worksheet, save it to a file before erasing.

Keys:	Description:
(123)	Starts 1-2-3.
(MENU) WEY	Erases the worksheet and moves to cell A1.
(MENU) RNCVOL (ENTER)	Creates the range name VOL for cell A1.
(ENTER)	Names first cell of data range.
4400 (▼)	
5360 (▼)	
2900 (▼)	
3670 (▼)	
4040 (▼)	
3200 (▼)	Enters data.
(:) (MENU) S (END)	Displays solve catalog and highlights bottom of equation list. If the solve catalog screen is not displayed, press (ESC) one or more times.

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Type the equation, substituting VOL for *name*, and press Calc ((F9)) to display the solve calc screen. Then:

Keys:	Description:
3 N	Stores number of points.
3 LAST	Stores entry number of last entry to be averaged.
MAVG	Calculates an average of 4,220.00 for months 1, 2, and 3.
4 LAST	"Moves" *LAST* down one entry.
MAVG	Calculates an average of 3,976.67 for months 2, 3, and 4.

5 LAST	"Moves" *LAST* down one entry.
MAVG	Calculates an average of 3,536.67 for months 3, 4, and 5.
6 LAST MAVG	Calculates an average of 3,636.67 for months 4, 5, and 6.

```
MVAG = 3,636.67
LAST =     6.00
N    =     3.00
```

Chi-Squared Statistics

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The Chi-squared statistic is a measure of the goodness of fit between data and an assumed distribution. The statistic can be assumed to be Chi-squared distributed with $n-1$ degrees of freedom if n or some of the E_i values are large. It is used to test whether a set of observed frequencies differs from a set of expected frequencies sufficiently to reject the hypothesis under which the expected frequencies were obtained. In other words, you are testing whether discrepancies between the observed frequencies (O_i) and the expected frequencies (E_i) are significant, or whether they may reasonably be attributed to chance. The equation is:

$$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

If there is close agreement between the observed and expected frequencies, χ^2 is small; if the agreement is poor, χ^2 is large.

The following Solver equations calculate χ^2 using data in a 1-2-3 worksheet.

If the expected values vary:

```
CHI2=SIGMA(I,1,LENGTH(name),1,(RCLCELL(name,I)
-RCLCELL(name,I,2))^2/RCLCELL(name,I,2))
```

If the expected value is a constant:

```
CHI2=SIGMA(I,1,LENGTH(name),1,(RCLCELL(name,I)
-EXPT)^2/EXPT)
```

where

CHI2 = χ^2
name = the range name of the data containing the observed values in one column and (for the second equation), the expected values in an adjacent column to the right.
EXPT = the expected value, if constant.

Example: χ^2. To determine whether a suspect die is biased, you toss it 120 times and observe the following results. (Since the expected frequency is the same for each number, 120/6, you'll analyze your data using the second equation.)

Number	1	2	3	4	5	6
Observed Frequency	25	17	15	23	24	16

If you want to preserve the current worksheet, save it to a file before erasing.

30

Keys:	**Description:**
(123)	Starts 1-2-3.
(MENU) WEY	Erases the worksheet and moves to cell A1.
25 (▼)	
17 (▼)	
15 (▼)	
23 (▼)	
24 (▼)	
16 (▼)	Enters data.



HOME MENU	
RNC DATA	
ENTER END ▼	
ENTER	Names the range.
⋮ MENU S END	Displays solve catalog and highlights bottom of equation list. If the solve catalog screen is not displayed, press ESC one or more times.

Type the second equation, substituting DATA for *name*, and press Calc (F9) to display the solve calc screen. Then:

Keys:	Description:
120 / 6 EXPT	Stores expected value.
CHI2	Calculates χ^2. If the Solver doesn't display SOLVING, press CHI2 again.

```
CHI2 =   5.00
EXPT =  20.00
```

The number of degrees of freedom is $(n-1) = 5$. Consult statistical tables to find χ^2 to a significance level of 0.05 with 5 degrees of freedom. The table shows that $\chi^2_{0.05,5} = 11.07$. Since the computed value (5.00) is less than 11.07, you can conclude that, to a 0.05 significance level (95% probability), the die is fair.

Economic Ordering Quantity

The **economic ordering quantity** is the optimum quantity to order each time an order is placed. It is based on the cost of placing and receiving an order, annual sales, carrying costs (including warehousing costs, interest on funds tied up in inventory, insurance, and obsolescence), and the purchase price of the goods.

The following Solver equation calculates economic order quantity:

```
EOQ=SQRT(2*FIXCO*SALES/(CARRY%/100*PRICE))
```

where

EOQ = the economic ordering quantity.
FIXCO = the fixed costs of placing and receiving an order.
SALES = the annual unit sales.
CARRY% = the carrying costs as a percentage of inventory.
PRICE = the purchase price per unit of inventory.

Example: Economic Ordering Quantity. Your annual sales are 10,000 units. The purchase price per unit is $4.73. Carrying cost is 20% of inventory value and the cost of placing and receiving an order is $35. Calculate the economic ordering quantity.

Starting from the solve calc screen for this example's equation:

Keys:	**Description:**
35 FIXCO	Stores fixed cost of placing order.
10000 SALES	Stores annual unit sales.
20 CARRY%	Stores carrying cost.
4.73 PRICE	Stores price per unit.
EOQ	Calculates economic ordering quantity.

```
EOQ    =     860.21
FIXCO  =      35.00
SALES  = 10,000.00
CARRY% =      20.00
PRICE  =       4.73
```

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Simulating a Toss of Dice

The Solver random number function RAN# can simulate the toss of one or more six-sided dice. The equation:

```
TOSS=IP(RAN#*6+1)
```

generates integers in the range 1 through 6. Similarly,

```
TOSS=IP(RAN#*6+1)+IP(RAN#*6+1)
```

simulates the toss of two dice and gives the sum of both.

1. Type the equation for the appropriate number of dice and press Calc (F9).
2. Press TOSS as many times as desired to see the results of the tosses.

Distance Between Two Locations

The following Solver equation calculates the approximate statute miles between two places, given their longitudes and latitudes. The longitudes and latitudes are entered in degrees-minutes-seconds format (D.MMSS); South Latitude and East Longitude are negative numbers. The HP 95LX must be in Degrees mode.

```
DISTANCE=69.0466*ACOS(SIN(HR(LT1))
*SIN(HR(LT2))+COS(HR(LT1))*
COS(HR(LT2))*COS(HR(LG1)-HR(LG2)))
```


where

LG1, *LT1* = the longitude and latitude of the first place.
LG2, *LT2* = the longitude and latitude of the second place.

Example: Calculating the Distance Between Two Places. Find the statute miles between Philadelphia, Pennsylvania (40°35′N, 75°10′W) and Corvallis, Oregon (44°35′N, 123°16′W).

If the RAD or GRAD annunciator is displayed, select (MENU) Options Degrees to set Degrees mode.

Starting from the solve calc screen for this example's equation:

Keys:	Description:
40.35 LT1	
75.10 LG1	Stores latitude and longitude for Philadelphia.

44.35 LT2	
123.16 LG2	Stores latitude and longitude for Corvallis.
DISTAN	Calculates statute miles.

```
DISTANCE = 2,425.31
LT1      =    40.35
LT2      =    44.35
LG1      =    75.10
LG2      =   123.16
```

Number of Days Until a Special Day

The following equation named WHEN? calculates the number of days between today's date and some other meaningful date within one year from today—for example, Christmas. For accurate results, the system clock must be set to today's date (see "Setting the Time and Date" in chapter 21).


```
SANTA= DDAYS(CDATE,12.25+.01*
FP(CDATE*100+IF(CDATE<=12.25+.01,0,1E-4)),1)
```

Note that 12.25 represents Christmas. For other special days, replace 12.25 with the special day, expressed in MM.DD format.

Example: Number of Days to Christmas. If today is April 20, 1992, how many days remain until Christmas?

Starting from the solve calc screen for this example's equation:

Keys:	Description:
SANTA	Calculates number of days until 12/25/1992.

```
SANTA = 249.00
```

Finding Several Solutions to an Equation

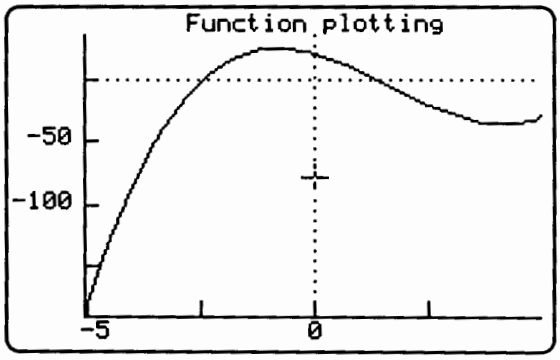
Example: Solving A Cubic Equation. The equation $x^3 - 5x^2 = 10x - z$ can have more than one solution for x. The Solver can find each solution or root using function plotting. The procedure below shows one way to do this. (Function plotting is covered near the end of chapter 28.)

You'll plot this equation for a particular value of z.

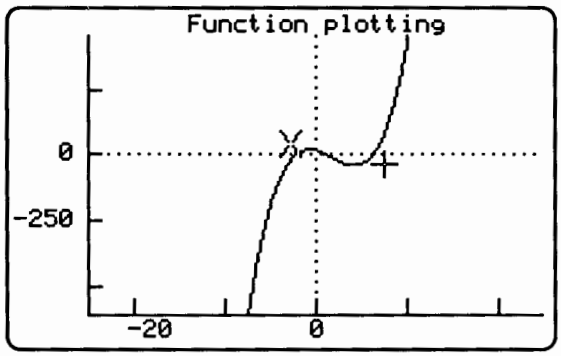
1. Select (MENU) Solve to display the solve catalog. If necessary, press (ESC) one or more times.
2. Type `x^3-5*x^2=10*x-z` into the solve editor.
3. Press `Calc` ((F9)) to enter the expression into the equation list and display function key labels for x and z.
4. Type 20 and press `z` ((F3)) to assign the value 20 to z.
5. Press (ESC) to display the solve catalog
6. Press `Graph` ((F10)) to display the function plotting screen.
7. Select (MENU) Erase Data to set the function-plotting conditions to initial values.
8. Press `AUTO` ((F3)) to auto-plot the equation. YMIN and YMAX will be chosen to ensure that the curve is shown on the screen.

   Function plotting accepts both equations and expressions, but it converts equations into expressions before plotting by subtracting the right side of the equation from the left side. So the graph you see is actually a plot of $x^3 - 5x^2 - 10x + 20$ against values of x.

   Your screen should look like this:

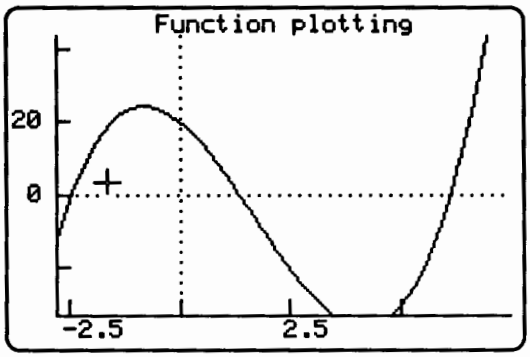


9. Press [-] to zoom out five times and to show the curve crossing the x-axis three times (to show the three x-values where the expression equals zero).
10. Start the definition of a zoom box by moving the cursor to the upper-left corner of an imaginary box that includes all three x-axis crossings (all three roots). To move the cursor by jumps, press an arrow key. To move the cursor by individual dots (pixels) on the screen, press and hold [◇] while pressing an arrow key.
11. Press [(] to fix this upper-left corner.
12. Move the cursor to locate the lower-right corner of the zoom box. Your screen should look something like this:



13. Press [)] to enlarge the boxed area to full-screen size.

14. Move the cursor near the left root. Your screen should look something like this:



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15. Press (Spacebar). You'll see displayed the root:

    $x = -2.44$

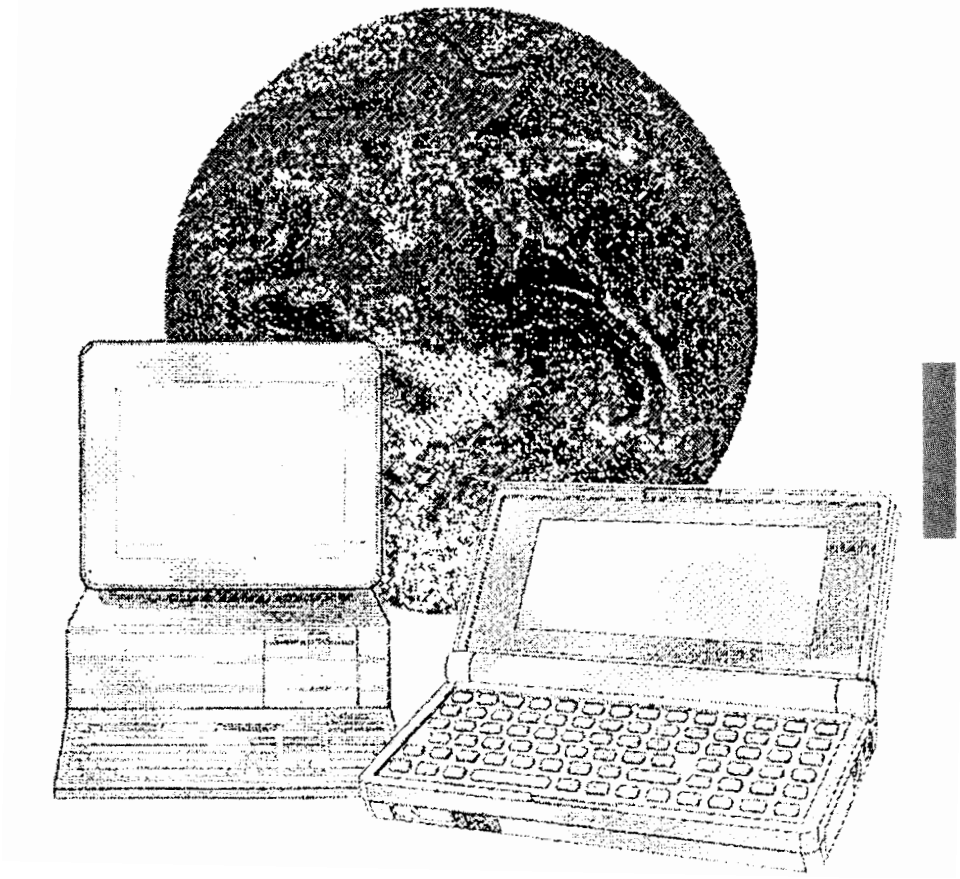
16. Find the other two roots in a similar way—move the cursor near each root and press (Spacebar). You'll see each of these roots displayed in turn:

    $x = 1.34$
    $x = 6.10$

17. Press (ESC) (ESC) to return to the solve catalog.

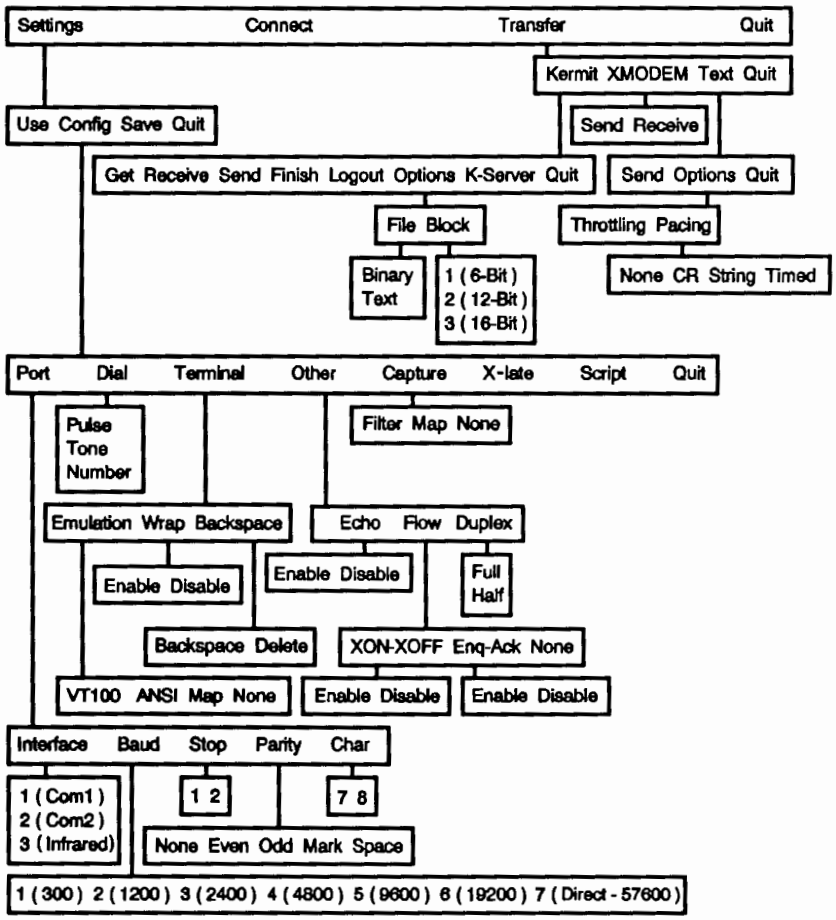
Part 5

Data Communications



31

Datacomm


Settings
Connect
Transfer
Quit
Kermit XMODEM Text Quit
Use Config Save Quit
Send Receive
Get Receive Send Finish Logout Options K-Server Quit
Send Options Quit
File Block
Throttling Pacing
Binary
Text
1 (6-Bit)
2 (12-Bit)
3 (16-Bit)
None CR String Timed
Port
Dial
Terminal
Other
Capture
X-late
Script
Quit
Pulse
Tone
Number
Filter Map None
Emulation Wrap Backspace
Echo Flow Duplex
Enable Disable
Enable Disable
Full
Half
Backspace Delete
XON-XOFF Enq-Ack None
VT100 ANSI Map None
Enable Disable
Enable Disable
Interface
Baud
Stop
Parity
Char
1 (Com1)
2 (Com2)
3 (Infrared)
1 2
7 8
None Even Odd Mark Space
1 (300) 2 (1200) 3 (2400) 4 (4800) 5 (9600) 6 (19200) 7 (Direct - 57600)

The Datacomm application turns your HP 95LX into a computer terminal and lets you:

- Access electronic information services, such as CompuServe™ and GEnie.
- Access information networks, such as your company's electronic mail system.
- Transfer files using Kermit or XMODEM protocols, or as straight ASCII text.

In addition to these features, the Datacomm application gives you the abilities to save information you receive in a capture file, to translate characters from a different character set using a translation file, and to automate logon using a script file.

Here's the general procedure for using your HP 95LX Datacomm:

1. Press (→) to start the Datacomm application.
2. Select (MENU) Settings Config and configure your HP 95LX to match the host-system requirements.
3. Prepare the hardware for connection. For this step you need the HP 82222A Serial Interface Cable (available as part of the HP F1001A Connectivity Pack or separately from your HP dealer) and most likely a modem and corresponding cable adapters.
4. Select (MENU) Connect to make the connection to the host system, and then access whatever information you need.
5. If you're using a modem, logout of the host and end the modem connection by pressing Hangup ((CTRL)-(F7)).

The steps in the above procedure are covered in greater detail throughout the rest of this chapter.

The function keys in Datacomm are reserved for programmable VT-100 keys. Therefore, the HP 95LX Datacomm functions are accessed as (CTRL)-key sequences. For example, Datacomm help is accessed by (CTRL)-(F1).

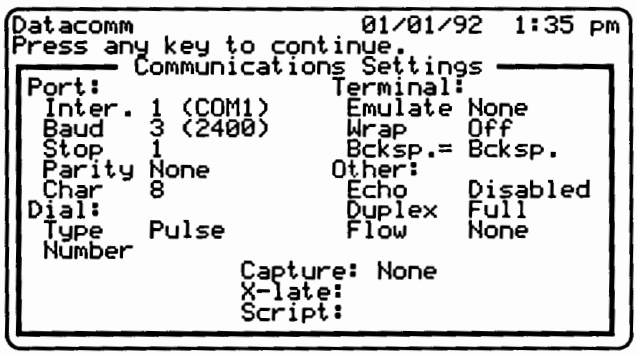
Use (ESC) to exit a menu that you don't want to complete or use. Select (MENU) Quit, on the other hand, to terminate the connection with the remote computer and get out of Datacomm altogether. *Quitting* Datacomm when it's not in use, rather than just *leaving* it by starting another application, helps extend HP 95LX battery life. (Note that quitting Datacomm *does not* issue a modem hangup command. If necessary, that must be done before exiting Datacomm.)

Configuring for Datacomm

Before you configure your HP 95LX for Datacomm, you need to know:

- What terminal type you want to emulate—ANSI, VT-100, no emulation (None), or no emulation with displayable control characters (Map).
- Whether you want the HP 95LX screen to automatically wrap text within the 40-column screen display or to act as a window into an 80-column terminal screen.
- What the host system requirements are for the serial communication parameters (baud, parity, number of stop bits, etc.).
- If you are using a modem, what the host system phone number is, as well as whether you'll use pulse or tone dialing.
- Any other special host system requirements, such as Enq-Ack or XON-XOFF flow control.

Within Datacomm you can view the settings sheet for the current configuration by pressing Set ((CTRL)-(F2)). Here are the default settings for the HP 95LX:



When you've used Set to view the current configuration, pressing any key returns you to your previous display.

Configurations for certain information services are built into the HP 95LX in the form of **configuration files**. "Choosing a Configuration File" later in this chapter describes how to activate these configurations.

Setting the Terminal Type

Here are the four settings you have to choose from:

Type	Description
VT100	Emulates a VT-100 terminal.
ANSI	Emulates an ANSI terminal.
None	Emulates a "dumb" terminal (sometimes called "glass tty" or just "tty"). Control codes for other than CR (carriage return), BS (backspace), BEL (beep), HTAB (hard tab), and LF (line feed) are ignored.
Map	Emulates a "dumb" terminal, but control codes for other than CR (carriage return), BS (backspace), BEL (beep), HTAB (hard tab), and LF (line feed) are mapped to displayable characters. For example, control code 1 is displayed as ^A, control code 2 as ^B, and so on.

To choose a terminal setting:

1. Select (MENU) Settings Config Terminal Emulation to display the configuration settings sheet and, in the top line of the display, the list of terminal choices.
2. Highlight the terminal type you want to emulate.
3. Press (ENTER). The configuration settings sheet changes to reflect the new choice.

If you're not sure what terminal type to emulate for a given task, try the commonly accepted VT-100 setting.

Changing the Definition of Backspace for ANSI and VT-100 Emulation

By default, (←) (the backspace key) operates as a normal backspace key during terminal emulation—it moves the cursor one character to the left. If you selected ANSI or VT-100 emulation, you may want to change how this works.

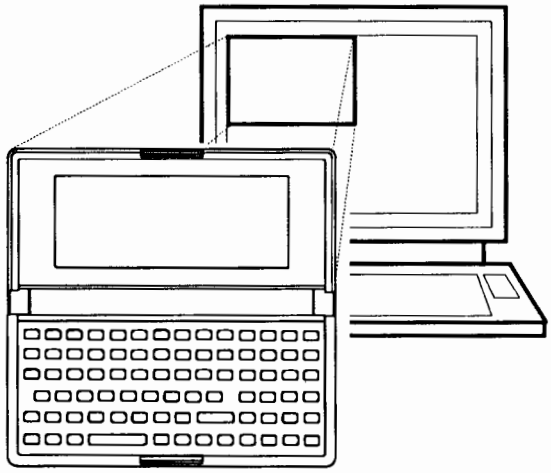
Select Settings Config Terminal Backspace, and then at the prompt do one of the following:

- Select Delete to define ◄ to erase the current character (like the DEL key).
- Select Backspace to define ◄ to act like the usual backspace key.

The configuration settings sheet shows the current definition of the backspace key.

Wrapping the Received Text

Unless you change the setting, the HP 95LX automatically acts as a 40-column window into an 80-column terminal screen. This means that you are seeing about $^1/_4$ of the full terminal display at any given time.



This mode allows the HP 95LX to work with systems that require a full 80-character by 25-line screen—for example, some order-entry and electronic-mail applications that paint forms across all 80 columns.

Here are the keys you use to move the HP 95LX window around the larger screen:

Key	Description
▲	Moves the window up one line.
▼	Moves the window down one line.
▶	Moves the window right one column.
◀	Moves the window left one column.
CTRL-▶	Moves the window right one frame (40 columns).
CTRL-◀	Moves the window left one frame.
HOME	Returns to the current cursor position.
PG DN	Moves the window down one frame (16 rows).
PG UP	Moves the window up one frame.

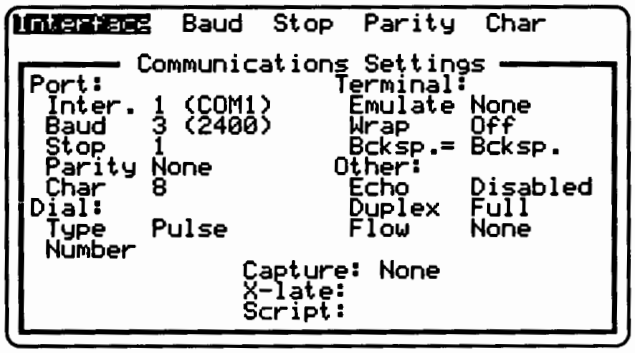
If, however, you are working with a system that does not require use of all 80 columns, you can select line wrapping, which causes all incoming data to be wrapped at column 40 and scrolled at line 16. In this mode the HP 95LX window can be moved using the up-and-down keys in the previous table (the right-and-left keys are inactive).

Select MENU Settings Config Terminal Wrap Enable to turn on line wrapping. Select MENU Settings Config Terminal Wrap Disable to turn it off.

The configuration settings sheet displays the current state of line wrapping.

Setting the Serial Communication Parameters

The serial-port configuration parameters are accessed by selecting MENU Settings Config Port. The configuration settings sheet is displayed with the current settings.



The menu at the top of the display contains the commands representing the serial port parameters:

Command	Description
Interface	Sets the communication port (Com1, Com2, or Infrared). Com1 and Com2 both select com1 in the HP 95LX, while Infrared forces the other parameters to be compatible with infrared hardware.
Baud	Sets the transmission speed (300, 1200, 2400, 4800, 9600, 19200, or Direct—57600).
Stop	Sets the number of stop bits (1 or 2).
Parity	Sets the parity (None, Even, Odd, Mark, or Space).
Char	Sets the number of bits in a character (7 or 8).

To change a setting:

1. Select a command (for example, Baud).
2. Use the cursor keys to highlight the desired value (for example, 9600).
3. Press (ENTER).

Repeat these steps as necessary for all the parameters you need to set for the given host.

Setting the Modem Dialing Parameters

If you're using a modem, you need to specify the phone number for the host system and the telephone dialing type (Pulse or Tone).

1. Select (MENU) Settings Config Dial Number.
2. Type in the phone number and press (ENTER).
3. Do one of the following:
   - Select Dial Pulse for pulse dialing.
   - Select Dial Tone for tone dialing.

After you select the dialing type, you are returned to the Settings Config menu. The configuration settings sheet reflects the changes you made.

Setting Other Configuration Parameters

Under certain conditions you may want to use these commands to set one or more of the HP 95LX's Other configuration parameters:

Command	Description
Echo	Enables or disables local character echoing.
Flow	Sets the communication line flow control. Select XON-XOFF, Enq-Ack, or none.
Duplex	Sets the duplex transmission. Select Full or Half.

To set these parameters select (MENU) Settings Config Other, followed by the commands for the settings you desire. The configuration settings sheet changes to reflect the settings you make.

Using Datacomm Configuration Files

Once you've set all the parameters to the settings you want, you're ready to hook up your hardware. However, you may want to save your configuration settings in a file, first, so that the next time you need that particular configuration, you can simply load the file and avoid all the resetting procedure. This section explains how to do that.

Saving a Configuration in a File

When you save a Datacomm configuration in a file, all settings are saved—including the terminal type, the line wrapping setting, the serial communication settings, the modem dialing instructions, etc. Unless another path or file extension is specified, a saved file automatically resides in the C:_DAT subdirectory and is given a .DCF (Datacomm Configuration File) extension.

1. Configure your HP 95LX as desired for Datacomm.
2. Select (MENU) Settings Save.
3. At the prompt, do one of the following:
   - Accept the default name by pressing (ENTER).
   - Use the cursor keys to highlight one of the file names shown near the top of the display and select it by pressing (ENTER).
   - Type a new name (maximum eight characters with no extension) and press (ENTER).

Note



If the file name you choose to use already exists, you will be asked whether or not you want to *overwrite* its contents with the current settings, losing the old contents. If you respond no to that prompt, you can then select another file name.

Choosing a Configuration File

You can make a previously-saved configuration the current configuration by using the Settings Use command.

1. Select (MENU) Settings Use.
2. Type in the file name, or highlight the desired file name in the list shown near the top of display.
3. Press (ENTER) to make that configuration current.

In addition to configuration files you create, the HP 95LX has several files built in for popular information services. These files exist in the C:_DAT subdirectory with .DCF extensions, so they are part of the list described in step 2 above. The files are recognizable by their names—COMPUSRV.DCF for CompuServe—so you can search through the list to find the one you want. Before you use one of these files, you must have an account with the information service, and you must add the appropriate phone number to the file.

Preparing the Hardware

Once your HP 95LX is configured for Datacomm, you are ready to hook up the hardware needed for a connection.

You can use the HP 82222A Serial Interface Cable to connect directly to the host system, or you can use the cable, a null modem adapter, and a Hayes-compatible modem to connect to the host. Attach the 4-pin end of the serial cable to the HP 95LX and the other end of the cable to the other device.

Note



Hooking up cables, adapters, and peripheral devices can be a tricky procedure because the required adapters can vary with different peripherals. If you need help with this process, contact a local electronics dealer or the manufacturer of the equipment you're trying to connect.

The following table shows the pin assignments for the peripheral end of the serial cable. This information is important if you need to get help connecting to a host system or other device.

Pin No.	Used for
1	Not used
2	Transmit data (from the HP 95LX)
3	Receive data (to the HP 95LX)
4	Not used
5	Signal ground
6-9	Not used

There are two limitations to keep in mind when connecting the HP 95LX to a another device:

- The HP 95LX supports only software handshaking, *not hardware handshaking*. If the other device *requires* hardware handshaking, contact the manufacturer to see if there is method to work around this limitation.
- The HP 95LX is designed to use the HP 82222A serial cable. If you try to use a longer serial cable, you may get poor data transmission to the other device.

Accessing Information from a Host System

Once your HP 95LX is properly configured and the hardware is properly set up, you are ready to make the Datacomm connection to the host system and get the information you need.

Making the Connection

Select (MENU) Connect to initiate data communications.

- If the current configuration contains a phone number, Datacomm assumes that the connection is via modem and executes the modem command to dial the number.
- If the current configuration does not contain a number, Datacomm attempts to establish a direct connection.

When the connection to the host system is made, any script file specified in the current configuration is run. (For information on script files, see "Automating Logon with a Script File" later in this chapter.)

If no script file exists, press (ENTER) and proceed to log on and then get whatever information you need from the host system. (If you want to transfer files, see "Transferring Files" later in this chapter.)

Capturing Data in a File

Datacomm gives you the ability to capture received data in a file, as well as the ability to filter out of the capture file certain control codes.

Turning Capture On and Off

Press Capture (CTRL-F5) to turn capturing on. When you turn it on, you are prompted for the name of the file in which to put the received data—either highlight a file name from the displayed list and press ENTER, or type in a new name and press ENTER.

Note



Unless you type in a specific file extension, files used to capture data are automatically given the extension ".cap" for easy identification. Also, unless you type in a different path with the file name, a capture file is automatically saved in the C:_DAT subdirectory.

If the file you choose for capturing already exists, new data is appended to the end of that file.

When you're done capturing data, press Capture (CTRL-F5) again to turn capturing off and close the capture file.

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Filtering Captured Data

Select Settings Config Capture to specify how you want received data to be filtered. Here are the three options:

Option	Description
Filter	ASCII control codes are not written to the capture file—they are filtered out.
Map	Control codes are mapped to displayable characters in the capture file. For example, control code 1 is written as ^A, 2 as ^B, 3 as ^C, and so on.
None	No filtering. All characters received are written to the capture file.

None is the default state for filtering captured data. If you make another choice, it becomes part of the current Datacomm configuration and is preserved until you change it again.

Ending a Datacomm Session

Neither of the following actions logs you off the remote system. So, if it's necessary to do so, log off the remote system before doing one of the following:

- If you're connected via modem and are ready to end the session, press Hangup ((CTRL)-(F7)) to issue the modem hangup command.
- If you have a direct connection and want to end the session, no special action is necessary—just disconnect the cable when it's convenient.

To actually exit the Datacomm application, select (MENU) Quit.

Caution



The Quit command *does not* issue the modem phone Hangup command, so before you select Quit you should break a modem connection by pressing Hangup ((CTRL)-(F7)).

You can run other HP 95LX applications without exiting Datacomm, preserving your current configuration settings for later. If you decide to quit Datacomm using the Quit command, any unsaved configuration changes will be lost and you'll have to reconfigure the next time you press (⇨).

Also, if you start the Filer while data is being received, the data will probably be lost.

Transferring Files

With an established connection to another computer, you can transfer files between your HP 95LX and that computer using XMODEM or Kermit protocols, or as straight ASCII text.

Note



If you are connected to a PC that has the HP Connectivity Pack software, a simpler file-transfer method involves using the Filer application. See chapter 20 for information.

Using XMODEM Protocol

When you select (MENU) Transfer XMODEM you see the two XMODEM commands.

Command	Description
Send	Sends a file to the remote host.
Receive	Receives a file from the remote host.

To transfer a file using XMODEM protocol:

1. Set the HP 95LX configuration parameters as required by the host system. (See "Configuring for Datacomm" earlier in this chapter.)

Note



XMODEM protocol requires systems to be set to transfer 8-bit characters, so select Settings Config Port Char 8 when you set the configuration parameters. If the Char parameter is set to 7, the transfer will fail. All other settings should be the same as set on the host system. Also, 57600 baud is not recommended for XMODEM transfers.

2. Make the connection to the host system via modem or direct connection. (See "Preparing the Hardware" earlier in the chapter.)
3. Select (MENU) Connect and then, if necessary, log on to the host.
4. Run the program on the host that contains XMODEM protocol.
5. Execute the host Send command (if you're transferring a file *to* the HP 95LX) or Receive command (if you're transferring a file *from* the HP 95LX).
6. Select (MENU) Transfer XMODEM Receive (if you're transferring a file *to* the HP 95LX) or (MENU) Transfer XMODEM Send (if you're transferring a file *from* the HP 95LX). While the transfer is underway, a status screen displays and continuously updates a byte counter for how much of the file has been transferred. When the transfer is complete, press any key to clear the status screen.
7. When you're done transferring files, end the Datacomm session. (See "Ending the Datacomm Session" earlier in this chapter.)

Using Kermit Protocol

When you select (MENU) Transfer Kermit you see the Kermit menu.

Command	Description
Get	Gets a file from a remote server. Accepts wildcards to get a group of files.
Receive	Receives a file from the remote host.
Send	Sends a file to the remote host (whether it's a server or not). *Does not* accept wildcards to send a group of files.
Finish	Puts a remote Kermit server in Kermit command mode.
Logout	Causes a remote Kermit server to log the HP 95LX user out. (A Hangup command is not executed for a modem attached to the HP 95LX, but may be executed for a modem attached to the remote host.)
Options	Accesses the Kermit parameters File and Block. (See the next table for information.)
K-Server	Puts the HP 95LX in Kermit server mode. (Pressing (ESC) on the HP 95LX exits server mode.)

The Options command specifies the Kermit File and Block options:

Option	Description
File	Selects the type of file to be transferred: Binary or Text.
Block	Selects the block check type to use: 6-bit checksum, 12-bit checksum, or 16-bit CCITT CRC.

To transfer a file using Kermit protocol:

1. Set the HP 95LX configuration parameters to match the host system. (See "Configuring for Datacomm" earlier in this chapter.) Hints: If you set parity to None, also select 8-bit characters in the HP 95LX; if you set parity to Even, Odd, Mark, or Space, select 7-bit characters in the HP 95LX. Also, 57600 baud is not recommended for Kermit transfers.
2. Make the hardware connection to the host system via modem or direct connection. (See "Preparing the Hardware" earlier in this chapter.)
3. Select (MENU) Connect and then log on to the host.

4. Run the program on the host (which could be another HP 95LX) that contains Kermit protocol.
5. Execute the host Server command to make the remote system the server.
6. Select (MENU) Transfer Kermit Send (if you're transferring a file *from* the HP 95LX) or (MENU) Transfer Kermit Get (if you're transferring a file *to* the HP 95LX). While the transfer is underway, a status screen displays and continuously updates a byte counter for how much of the file has been transferred. When the transfer is complete, press any key to clear the status screen.
7. When you're done transferring files, select (MENU) Transfer Kermit Logout to log out of the remote server.
8. End the Datacomm session. (See "Ending a Datacomm Session" earlier in this chapter.)

Transferring Without a Protocol

This feature enables your HP 95LX to send an ASCII file to a remote host that does not have the HP Connectivity Pack software or does not support Kermit or XMODEM protocols. The Flow settings ((MENU) Settings Config Other Flow) can be used to control the handshaking of data to the host system. Also, note that 57600 baud is not recommended for this type of transfer.

When you select (MENU) Transfer Text you see the menu of commands for sending a file as ASCII text without any special protocol.

Command	Description
Send	Transmits a file to the remote host.
Options	Accesses the Throttling and Pacing settings for the text transfer. (See the next table for information.)

The Options command lets you specify the Throttling and Pacing for the text transfer:

Command	Description
Throttling	Sets the time delay between transmitted characters in milliseconds (0-1000). Throttling is used to slow transmission so that the HP 95LX does not overrun a "slow" host. The default value is 0 (no delay between characters). The Throttling setting is unaffected by the Pacing setting.
Pacing	Sets the pace of the transmission by causing the HP 95LX to wait for a pacing sequence from the host every time a new line character is sent. The Pacing settings to choose from are: ■ *None*. No pacing—the HP 95LX transmits lines as fast as possible. ■ *CR* (Carriage Return). The HP 95LX waits for a carriage return from the host before sending the next line. ■ *String*. The HP 95LX waits for the specified string from the host before sending the next line. ■ *Timed*. The HP 95LX waits the specified number of milliseconds (0-1000) before sending the next line.

Throttling and Pacing work together in that characters are transferred at the throttling rate until a new line character is sent, at which point the next line of characters is not sent until the Pacing conditions are met.

The Throttling and Pacing settings do not affect any Flow handshaking that's enabled (either XON-XOFF or Enq-Ack).

To transmit a file from the HP 95LX as ASCII text:

1. Set the HP 95LX configuration parameters as required by the host system. (See "Configuring for Datacomm" earlier in this chapter.)
2. Make the hardware connection to the host system via modem or direct connection. (See "Preparing the Hardware" earlier in this chapter.)

3. Select (MENU) Connect and then log on to the host.
4. Redirect the host's input from its keyboard to its serial port.
5. Optionally select (MENU) Transfer Text Options to set the Throttling and Pacing for the transfer.
6. Select (MENU) Transfer Text Send to transmit a file to the host. While the transfer is underway, a status screen displays and continuously updates a byte counter for how much of the file has been transferred. When the transfer is complete, press any key to clear the status screen.
7. When you're done transferring files, redirect the host's input back to its keyboard.
8. End the Datacomm session. (See "Ending a Datacomm Session" earlier in this chapter.)

Automating Logon with a Script File

A **script file** enables you to automate the procedure for logging on to a host that you frequently use. When you include the name of a script file as part of your current configuration, the script is executed as soon as a connection is made to the host system.

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Here is a sample script file that would log Clark Mondich on to his electronic mail system:

```
Hello |
{Enter your login name:}
C.Mondich |
{Enter your password:}
Jaguar |
```

Once you know the host procedure and requirements for logging on, you can create a script file using the Memo Editor, saving the file in the C:_DAT subdirectory. Here are the special script characters you can use when creating a script file:

Character	Description
{ ... }	The left and right curly braces are used to enclose a string of characters that comes from the host. A string in curly braces instructs the HP 95LX to wait until an exact match of that string is received and then continue with the script. If a matching string is not received within 30 seconds, the script quits execution.
^	Indicates that the uppercase character following it is a control character. For example, ^A represents control-A. (If you want to represent the character ^, use ^^. If you want to represent control-^, use #1E.)
#	Interprets the two characters following it as the hex number to represent the corresponding 8-bit character. For example, #1E represents control-^. (If you want to represent the character #, use ##.)
|	Represents a carriage return.
~	Causes a 1-second pause.
@e	Turns echo pacing on. (Echo pacing requires the host to "echo" back each sent character before another one is sent.)
@n	Turns echo pacing off.
@b	Sends a break signal for 1 second.
@@	Sends a single @ character.
@f[*path*]	Sends the file identified by the DOS path *as is*—no characters are translated, including control characters. You must include the square brackets around the path, which includes the file name.

Note



If you are communicating by modem, the first entries you put in the script should be a series of pauses to allow time for the host system to answer the phone.

To write and save a script file:

1. Press (Memo) to start the Memo Editor.
2. Select (MENU) File New to open a new, unnamed Memo Editor file.
3. Type the script file for logging on to the particular system.
4. Select (MENU) File Save and type the C:_DAT\ path followed by a file name with a .LCF file extension. An example of the path and a file name is `C:\_DAT\EMAIL.LCF` .
5. Press (ENTER).

To add a script file to the current Datacomm configuration:

1. Select (MENU) Settings Config Script.
2. Use the arrow keys to highlight the desired file name. (If you prefer, you can type the name of the script file.)
3. Press (ENTER).

Once (ENTER) is pressed, the Script parameter in the configuration settings sheet shows the script file name.

As part of the current configuration, the script file can become part of a saved configuration file for later use with a particular remote system. (See "Saving a Configuration in a File" earlier in this chapter for information.)

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To remove a script file from the current Datacomm configuration:

1. Select (MENU) Settings Config Script.
2. Use (←) to erase the *entire* default path name (including the C:).
3. Press (ENTER). The settings sheet is updated to reflect the change.

Script files can be used for procedures other than logging on. To use one for a specific procedure *after* the HP 95LX is connected to the host, press Run ((CTRL)-(F3)), type the file name of the script file to run, and press (ENTER). (You don't need to type the path as long as the script file is located in the C:_DAT subdirectory.)

Using the Character Translation Facility

If a remote system you are communicating with doesn't use the code page 850 character set (the character set in the HP 95LX), you may need to translate some misinterpreted characters into the characters they're meant to be. For example, suppose the remote system uses decimal code 199 to represent the character ú. When that character is transferred to the HP 95LX, you'll see Ã (the HP 95LX character for decimal code 199). A Character Translation Facility (CTF) file enables you to translate misinterpreted characters like that into the correct characters.

You need to create a CTF file and then make it part of your current Datacomm configuration to make it active.

To create a CTF file:

1. Identify the characters causing the problem and determine their decimal or hexadecimal character numbers on both the HP 95LX and the remote system. (Appendix E contains the HP 95LX character set.)
2. Use the Memo Editor to create the CTF file—refer to the following example file and command table.
3. When you're finished, save the file with a descriptive name and a .CTF file extension in the C:_DAT subdirectory. An example of the path and a file name is `C:\_DAT\HOST1.CTF` .

The following is a sample CTF file:

```
# This is a partial codepage 850 to 860 translation.
# Values from codes 128 to 143 that need translation
# will be performed
# Codes received will display exact character matches
RADIX 10
RCONV 132 198
RCONV 134 181
RCONV 137 210
RCONV 139 214
RCONV 140 226
RCONV 142 199
RCONV 143 182
# Codes transmitted are nearest equivalent characters
TCONV 132 160
TCONV 134 131
TCONV 137 136
TCONV 139 161
TCONV 140 161
# End of example Character Translation File
```

Note



The above sample file exists in your HP 95LX and can be edited to create a CTF file for your specific needs. To do this, load the file C:_DAT\SAMPLE.CTF into the Memo Editor and make the necessary changes. Then, save and rename the file as described in step 3 above.

Some formatting rules to notice from the above sample file are:

- You must start the file with the RADIX command.
- Each command must be on a line by itself. (Blank lines are ignored, so you can add them between commands to enhance readability.)
- At least one space is necessary between the command and each input. (Multiple blank spaces are ignored, so they can be added for readability, too.)
- Lines with just numbers assume the previous command.
- Lines starting with # are ignored and treated as comment lines.

Here are descriptions of the commands available to use in a CTF file:

Computer Museum

Command	Description
#	Indicates a comment line, which is ignored in the file.
RADIX	Indicates whether the numbers used as input for the rest of the commands are interpreted as decimal codes or hexadecimal codes. You must use either `RADIX 10` (decimal) or `RADIX 16` (hexadecimal). (The examples in this table assume RADIX 10.)
RCONV	Specifies that a character received by the HP 95LX is to be converted to another character. It takes two inputs: the first number is the character code that should be translated, and the second is the code to be substituted. For example, `RCONV 36 156` causes character code 36 to be translated to 156 (the £ character in code page 850) when it's received.
TCONV	Specifies that an HP 95LX character is to be translated before it is transferred. It takes two inputs: the first number is the character code to be translated, and the second is the code to be substituted. For example, `TCONV 124 132` causes the HP 95LX | character (code 124 in code page 850) to be translated so that the receiving system gets code 132.
RTCONV	Combines related RCONV and TCONV commands by specifying both the receive and transmit conversions in a single command. It takes three inputs: the first number is the character code to translate when it's received by the HP 95LX; the second is the code to substitute for that character; and the third is the HP 95LX character to translate into the first number for transmission. For example, `RCONV 131 140` and `TCONV 140 131` can be combined into `RTCONV 131 140 140`. This command causes character code 131 to be translated into code 140 whenever it's received by HP 95LX; and whenever the HP 95LX code 140 is to be transmitted, it is first converted back to code 131 for the remote system.

Before the settings in a CTF file become active, the file must be made part of the current configuration.

To add a CTF file to the current Datacomm configuration:

1. Select (MENU) Settings Config X-late.
2. Use the arrow keys to highlight the desired file name. (If you prefer, you can type the name of the CTF file.)
3. Press (ENTER).

Once (ENTER) is pressed, the X-late parameter in the configuration settings sheet shows the CTF file name.

As part of the current configuration, the character translation settings can become part of a saved configuration file for later use with a particular remote system. (See "Saving a Configuration in a File" earlier in this chapter for information.)

Note



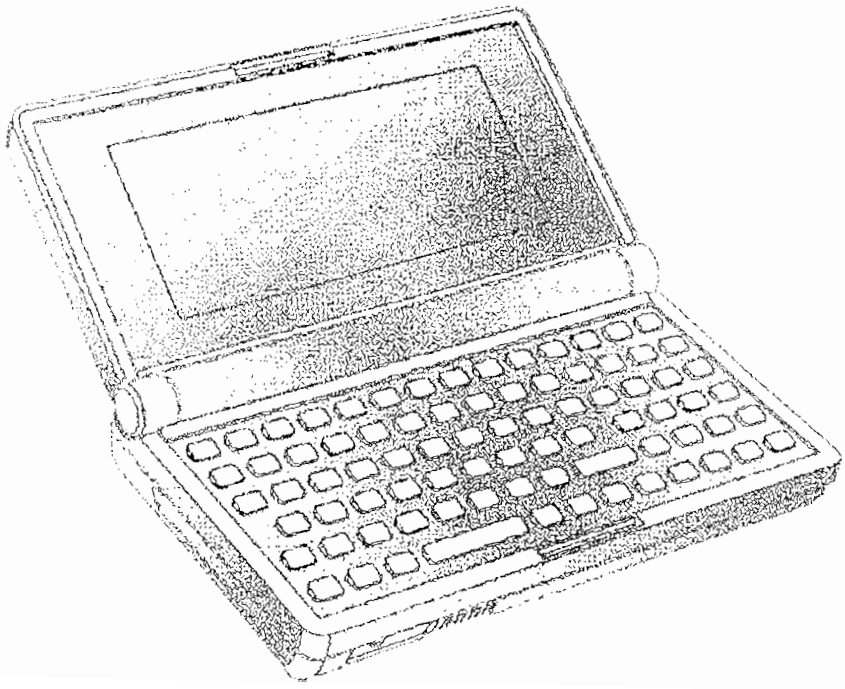
If a command or syntax error exists in a CTF file, the file will be rejected when it's run, and the HP 95LX will revert to a state of no character translation.

To remove a CTF file from the current Datacomm configuration:

1. Select (MENU) Settings Config X-late.
2. Use (◆) to erase the *entire* default path name (including the C:).
3. Press (ENTER). The settings sheet is updated to reflect the change.

Part 6

Appendixes and Index



A

Support, Batteries, and Service

Customer Support

If you have questions about how to use your HP 95LX, first use this *User's Guide* by checking the contents and index to guide you to the right page for an answer. If you can't find an answer in the manual, you can contact Hewlett-Packard's Customer Support department at the address or phone number on the inside back cover of this manual.

When to Replace Batteries

When a low-battery condition exists, your work will be interrupted with a warning message telling you that the plug-in RAM card battery, the HP 95LX backup battery, or the main HP 95LX batteries need replacing. *Replace the indicated batteries as soon as possible after the message first appears.*

Battery life can be prolonged by quitting Filer and Datacomm after each use and utilizing the AC adapter whenever possible, especially during data transfers. A 9-volt AC adapter is available from your Hewlett-Packard dealer (model number HP 82241A).

Caution



If the main batteries run completely down, the unit will draw power from the backup battery. In this condition the backup battery, depending on its charge, may only last a few days. Therefore, it's important to replace low batteries as soon as possible to avoid data loss.

Even if a low-battery message doesn't appear, you should replace the HP 95LX backup battery and any RAM card batteries a year after

you install them. When you install a fresh battery, you might want to set an appointment using the Appointment Book for 1 year from that date to remind you to replace it.

Changing Batteries

Battery Types

HP 95LX Batteries. Any brand of 1.5-volt, size AA batteries. *Be sure that both batteries are of the same brand and type.* Fresh batteries should last 1 to 2 months with typical use.

The use of rechargeable batteries is not recommended.

HP 95LX Backup Battery. 3-volt CR2032 coin cell. If fresh main batteries are maintained, the backup battery should last a year before you replace it.

RAM Card Battery. 3-volt CR2025 coin cell. A fresh RAM card battery should last a year before you replace it.

Changing HP 95LX Batteries

These instructions are for changing the HP 95LX main and backup batteries. The instructions for replacing a RAM card battery are found later in this appendix under "Changing a RAM Card Battery."

Caution



Do not remove both the main batteries and the backup battery at the same time—and do not remove the main batteries if the backup battery is dead—complete HP 95LX memory loss would likely result.

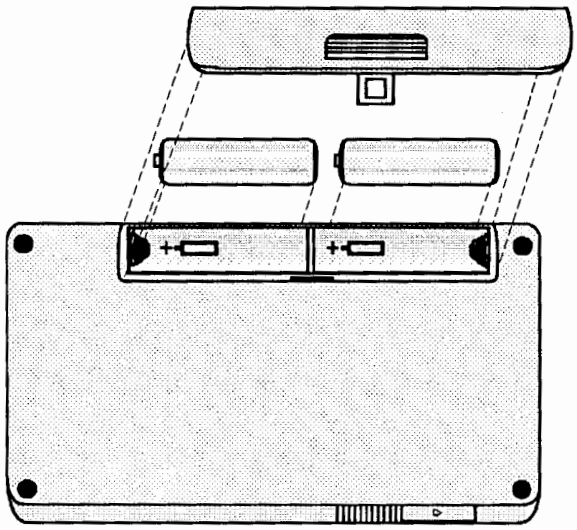
Warning



Do not mutilate, puncture, or dispose of batteries in fire. The batteries can burst or explode, releasing hazardous chemicals. Discard used batteries according to the manufacturer's instructions.

Changing the Main HP 95LX Batteries

1. Turn the HP 95LX off and close the case.
2. Remove the battery cover on the bottom of the HP 95LX.



3. Remove the old batteries.
4. Install two fresh AA batteries, orienting them as shown by the symbols in the battery compartment.
5. Replace the cover.

If the low-battery message still appears when you turn the HP 95LX on, go back over the procedure and check the orientation of the batteries as shown in step 4—you may have put the batteries in backwards.

Changing the HP 95LX Backup Battery

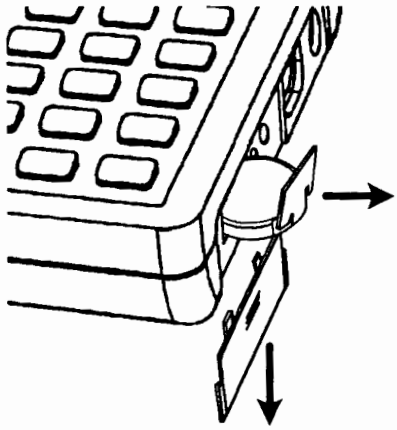
Caution



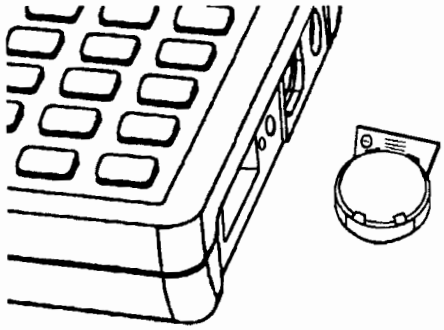
Do not remove both the main batteries and the backup battery at the same time—complete HP 95LX memory loss would likely result.

1. Turn the HP 95LX off.

2. Remove the backup-battery cover and pull out the battery tray.



3. Remove the old battery from the tray and insert a fresh, 3-volt CR2032 coin cell. Be sure the "+" on the battery is facing down in the tray.



4. Insert the battery tray back into the HP 95LX and replace the cover.
5. Turn the HP 95LX on. If the battery-low message is still present in the display, go back over the procedure and check the battery orientation as shown in step 3—you may have put the battery in the tray upside down.

Changing a RAM Card Battery

Under typical use, a RAM card's battery should last about 1 year. Be sure to mark the card with the battery-installation date, and, in case the RAM card is not in your HP 95LX when the battery needs replacement, set an alarm using the Appointment Book application for about 10 months from that date to remind you to install a fresh battery.

To change a RAM card battery:

1. With the RAM card in the plug-in card slot, turn your HP 95LX on.

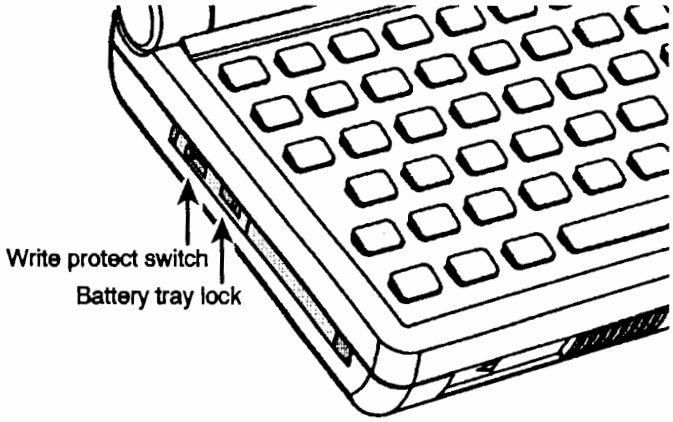
Caution



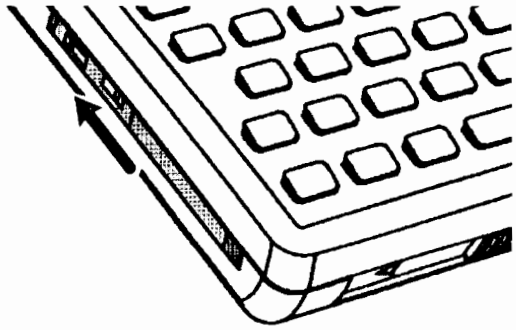
RAM card memory may be lost when you remove a RAM card battery unless the card is in an HP 95LX that is turned on.

---

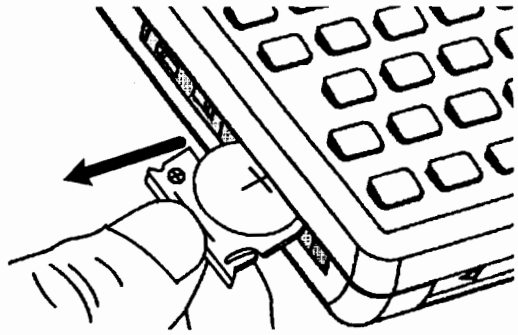
2. Locate the battery tray lock on the RAM card.



3. Unlock the RAM card battery tray.

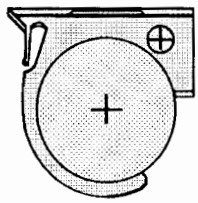


4. Using a fingernail, pull the battery tray out of the card.



A

5. Remove the old battery and insert a fresh, 3-volt CR2025 coin cell. Be sure the "+" on the battery is on the same side as the "+" on the battery tray.

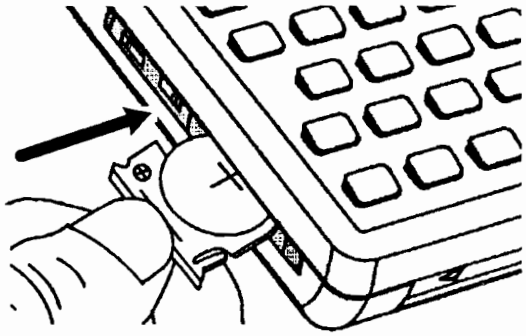


Warning

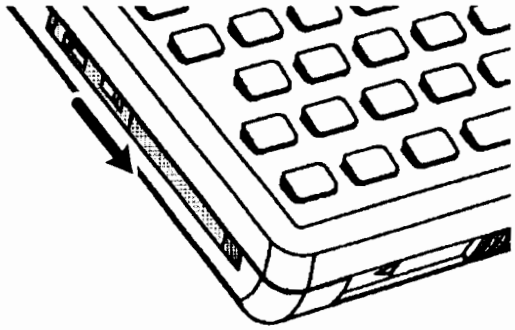


Do not mutilate, puncture, or dispose of batteries in fire. The batteries can burst or explode, releasing hazardous chemicals. Discard used batteries according to the manufacturer's instructions.

6. Insert the battery tray back into the card. Be sure the "+" side faces up.



7. Relock the battery tray.



Once the fresh battery is in the RAM card and your HP 95LX is turned off, you can remove the card temporarily to mark it with the battery installation date. It's also a good idea to set an alarm for 1 year from that date to remind you to change the battery again.

Environmental Limits for the HP 95LX and Plug-In Cards

To maintain product reliability, avoid getting the equipment wet and observe the following temperature and humidity limits for the HP 95LX and Hewlett-Packard plug-in cards:

- Operating temperature: 0° to 40°C (32° to 104°F).
- Storage temperature with data retention: 0° to 60°C (32° to 140°F).
- Operating and storage humidity: 90% relative humidity at 40°C (104°F) maximum.

You will likely lose data below 0°C (32°F), but you can have storage temperatures down to −20°C (−4°F) without damaging the hardware.

Noise Declaration. In the operator position under normal operation (per ISO 7779): LpA < 70dB.

Testing HP 95LX Operation

If the display can be turned on, yet you suspect that your HP 95LX is not working properly, you should first install fresh batteries as described earlier in this appendix. Then, if the problem still exists, try resetting the machine as described in "Resetting Your HP 95LX" in chapter 1. If both of these procedures fail to alleviate the problem, you should run a series of diagnostic tests called the **self test**.

Caution



Before you run the self test, close all applications, saving any changes you've made. The self test causes a system reset to occur, so files or changes to files not already saved will be lost when you run it.

To run the self test:

1. Press (OFF) to turn the unit off.
2. Hold down the (ESC) key, press and release (ON), and then release (ESC). This displays the self-test screen.

Note



The self-test screen contains several messages and test options that are useful only to the factory. If you accidentally start one of these test options, press ⊙ to terminate the test.

3. Start the series of tests by pressing the spacebar followed by (ENTER). *Do not press any keys during the tests.* Your HP 95LX will cycle through all the tests listed in the display except the Keyboard test.
   - Except for the Serial Port test and possibly the Plug-in test, OK will appear next to each test as it is passed. The Plug-in test will display No card if one is not present, and the Serial Port test will display No loop.
   - If the term Bad appears next to any of the tests, repeat steps 1 through 3 above to see if the message is duplicated. If the Bad message is duplicated, your unit probably requires service. See "If Your HP 95LX Requires Service" later in this appendix for instructions.
4. When the tests are finished, exit the self-test screen by pressing (ESC).

Limited One-Year Warranty

What Is Covered

The HP 95LX (except for the batteries, or damage caused by the batteries) *and HP 95LX accessories are warranted by Hewlett-Packard against defects in materials and workmanship for one year from the date of original purchase.* If you sell your unit or give it as a gift, the warranty is automatically transferred to the new owner and remains in effect for the original one-year period. During the warranty period, we will repair or, at our option, replace at no charge a product that proves to be defective, provided you return the product, shipping prepaid, to a Hewlett-Packard service center. (Replacement may be made with a newer model of equal or better functionality.)

This warranty gives you specific legal rights, and you may also have other rights that vary from state to state, province to province, or country to country.

What Is Not Covered

Batteries, and damage caused by the batteries, are not covered by the Hewlett-Packard warranty. Check with the battery manufacturer about battery and battery leakage warranties.

This warranty does not apply if the product has been damaged by accident or misuse or as the result of service or modification by other than an authorized Hewlett-Packard service center.

No other express warranty is given. The repair or replacement of a product is your exclusive remedy. **ANY OTHER IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS IS LIMITED TO THE ONE-YEAR DURATION OF THIS WRITTEN WARRANTY.** Some states, provinces, or countries do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. **IN NO EVENT SHALL HEWLETT-PACKARD COMPANY BE LIABLE FOR CONSEQUENTIAL DAMAGES.** Some states, provinces, or countries do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Products are sold on the basis of specifications applicable at the time of manufacture. Hewlett-Packard shall have no obligation to modify or update products, once sold.

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Consumer Transactions in the United Kingdom

This warranty shall not apply to consumer transactions and shall not affect the statutory rights of a consumer. In relation to such transactions, the rights and obligations of Seller and Buyer shall be determined by statute.

If Your HP 95LX Requires Service

Hewlett-Packard maintains service centers in many countries. These centers will repair a unit, or replace it with the same model or one of equal or better functionality, whether it is under warranty or not. There is a service charge for service after the warranty period. Units normally are serviced and reshipped within 5 working days.

Note



If the contents of your HP 95LX's memory are important, you should back up the memory on a plug-in RAM card, another HP 95LX, or a PC before sending the unit in for repair.

In the United States. Send the unit to the Corvallis Service Center listed on the inside of the back cover.

In Europe. Contact your Hewlett-Packard sales office or dealer, or Hewlett-Packard's European headquarters (address below) for the location of the nearest service center. *Do not ship the unit for service without first contacting a Hewlett-Packard office.*

Hewlett-Packard S.A.
150, Route du Nant-d'Avril
P.O. Box CH 1217 Meyrin 2
Geneva, Switzerland
Telephone: 022 780.81.11

In Other Countries. Contact your Hewlett-Packard sales office or dealer or write to the Corvallis Service Center (listed on the inside of the back cover) for the location of other service centers. If local service is unavailable, you can ship the unit to the Corvallis Service Center for repair.

All shipping, reimportation arrangements, and customs costs are your responsibility.

Service Charge

Contact the Corvallis Service Center (inside back cover) for the standard out-of-warranty repair charges. This charge is subject to the customer's local sales or value-added tax wherever applicable.

Products damaged by accident or misuse are not covered by the fixed charges. These charges are individually determined based on time and material.

Shipping Instructions

If your HP 95LX requires service, ship it to the nearest authorized service center or collection point.

- Include your return address and a description of the problem.
- Include proof of purchase date if the warranty has not expired.
- Include a purchase order, check, or credit card number plus expiration date (VISA or MasterCard) to cover the standard repair charge.
- Ship your unit postage *prepaid* in adequate protective packaging to prevent damage. Shipping damage is not covered by the warranty, so we recommend that you insure the shipment.

Warranty on Service

Service is warranted against defects in materials and workmanship for 90 days from the date of service.

Service Agreements

In the U.S., a support agreement is available for repair and service. For additional information, contact the Corvallis Service Center (see the inside of the back cover).

B

MS-DOS in the HP 95LX

This appendix contains information about MS-DOS files and directories, and a listing of MS-DOS commands available to you in the HP 95LX.

Accessing MS-DOS

You can access the MS-DOS prompt through the Filer by selecting (MENU) System. All other built-in applications must be closed before you can get to the MS-DOS prompt. The default prompt in the HP 95LX is C>.

The HP 95LX display shows you part of the full MS-DOS screen, which is 80 characters wide. Whenever the cursor moves out of the HP 95LX portion of the screen, the HP 95LX window adjusts to show the portion of the MS-DOS screen that the cursor moved into. That way, the cursor is never out of the HP 95LX display. This feature is called **cursor tracking**. If you prefer, you can disable it by using the DISPCTL command, described in "Special HP 95LX DOS Commands" later in this appendix.

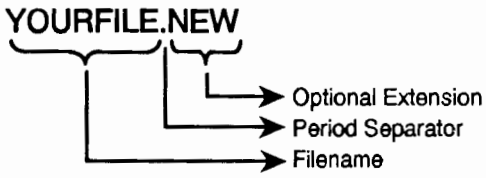
You can move the HP 95LX window around the MS-DOS screen without regard to the cursor position by using ALT-arrow key combinations. For example, pressing (ALT)-(▶) moves the HP 95LX window one character to the right. The shifted arrow keys can also be used with the (ALT) key. For example, pressing (ALT)-(END) ((⇧) (ALT)-(▶)) moves the HP 95LX window to the far right of the MS-DOS screen. You can disable ALT-arrow key movement by using the DISPCTL command, described in "Special HP 95LX DOS Commands" later in this appendix.

Experiment with these features to get a good feel for how they work.

Files and Directories

Naming Files

A *filename* has from one to eight characters. An *extension* to a file name is one to three additional characters separated from the file name by a period. For example:



There is no distinction between uppercase and lowercase characters in file names and extensions.

Invalid Characters

File names and extensions cannot include these characters:

. (denotes extension)	[ ]	?
/ or \	| (vertical bar)	=
"	+	*
:	;	< or >
space	, (comma)	

B

Reserved File Names

Avoid using the following file names. They are already used by the operating system: AUX, CLOCK$, COM1, COM2, COM3, COM4, CON, LPT1, LPT2, LPT3, NUL, and PRN.

Reserved Extensions

The following extensions are reserved. You can use them if you're creating any of the indicated file types:

.BAK	Backup files.
.BAT	MS-DOS batch files.
.CHK	Assigned to files recovered by CHKDSK.
.COM, .EXE	Program files.
.MAP	Default extension for list files created by MS-LINK.
.OVL	MS-DOS uses this extension for overlay files.
.REC	MS-DOS uses this extension for RECOVERed files.
.SYS	Used for device drivers.
.$$$	MS-DOS uses this extension for temporary files.

Special HP 95LX Extensions

The following extensions are used by certain types of files associated with the built-in applications. They are discussed in more detail in the chapters for those applications.

.ABK	Appointment Book files (chapter 17).
.CTF	Character translation files for Datacomm (chapter 31).
.DCF	Datacomm configuration files (chapter 31).
.EQN	Solver equation files (chapter 28).
.FCF	Filer configuration files (chapter 20).
.LCF	Script (logon configuration) files for Datacomm (chapter 31).
.PBK	Phone Book files (chapter 18).
.PCF	Printer configuration files (chapter 21).
.PCX	Graphics (business card) files (chapter 21).
.TXT	Memo files (chapter 19).

Wildcards

The *wildcard* symbols are * and ?. Use * to substitute for an entire file name or extension, or for one or more consecutive characters at the end of a file name or extension.

Use ? to substitute for a single character anywhere in a file name or extension. (You can use up to eight ? symbols in a file name and up to three in an extension.)

Uses of Wildcards

Option	Interpretation
.	All file names.
*.AAA	All file names that have AAA for an extension.
MYFILE?	Any file name(s) beginning with MYFILE followed by any other single character (but with no extension).
MYFILE*.??	Any file name(s) beginning with MYFILE followed by any other characters and a two-character extension.
??FILE*.ABC	Any file name(s) beginning with any two characters followed by FILE and any other character(s) and an extension of ABC.

Directories

The following table contains definitions of terms used in the subsequent sections on directories.

Term	Meaning
drive designator	The letter assigned to a disk drive followed by a colon; for example, A:, or C:.
root directory	The "main" directory on any disk created by the MS-DOS operating system. The root directory is indicated by a drive designator and a backslash. For example, A:\ is the root directory on drive A:.
subdirectory	Any directory that is nested in another directory.
parent directory	Any directory that contains subdirectories.
path	The list of directories that MS-DOS has to go through to reach a specific file.

Limitations

A directory can contain any mixture of files and other directories. The path from the root directory to a file can contain up to 64 characters.

The characters you *cannot* use in a directory name are the same as those shown in the "Invalid Characters" listing earlier in this chapter.

Creating Directories

The root directory is automatically created when you format a disk. To create other directories, use the MS-DOS MKDIR (or MD) command.

The Active Drive

This is the drive that MS-DOS accesses for commands and file names unless you specify otherwise. Change from one drive to another by typing the desired drive designator (such as A: or C:) at the MS-DOS prompt.

The Current Directory

This is the directory (or subdirectory) in the active drive that MS-DOS accesses for commands and file names unless you specify otherwise. To change from one directory to another, use the MS-DOS CHDIR (or CD) command.

The built-in HP 95LX applications do not use the MS-DOS active drive and current directory. The active drive and current directory are used only when you execute commands from the MS-DOS prompt.

MS-DOS Commands in the HP 95LX

MS-DOS commands are always executed from the MS-DOS prompt. The standard prompt identifies the active drive and is followed by the flashing cursor. To execute a command, just type the command name. Any command can be typed in any combination of uppercase or lowercase characters. Pressing (ENTER) executes a typed command.

The syntax symbols used in this section are explained in the following table.

Symbol	Meaning
d:	Drive designator.
path	List of directories that MS-DOS must go through to get to a specific file or directory.
filename	Name of a file, including extension.
[ ]	Word enclosed in brackets is optional.
< >	Data enclosed in angle brackets must be entered.
{ }	Indicates a choice between two or more entries.
|	Indicates a choice must be made between two entries (ON|OFF).
...	Indicates an entry may be repeated.

Command arguments and options that appear in uppercase must be typed using the exact letters shown—however, either uppercase or lowercase letters are acceptable. For example, the syntax for the DIR command is DIR [<*d*:>][*path*][<*filename*>] [/P] [/W]. The option /P, since it is shown in uppercase, must be typed using the letter P or p. Thus, the following are all acceptable:



DIR /P
Dir /P
DIR /p

Although the syntax statements in this manual are sometimes shown on several lines, they should be typed on a single line.

BREAK

BREAK [ON|OFF]

Extends CTRL-BREAK and CTRL-C checking to include disk operations, clock accesses, memory management, etc. If a program bypasses MS-DOS for character and disk operations, BREAK ON may not enable you to interrupt the program.

To determine break status, execute BREAK without ON or OFF.

CHDIR or CD

CHDIR [<*d*>:][<*path*>]

Changes the current directory on the active or specified drive.

CHDIR \ returns you to the root directory.
CHDIR displays the path to the current directory.
CHDIR <*d*>: displays the current directory on drive <*d*>.
CHDIR .. returns you to the parent directory of the current subdirectory.

CHKDSK

CHKDSK [<*d1*>:][<*path1*>]<*filename1*> [/F] [/V]

/F	If CHKDSK finds errors it can fix, it prompts you to specify whether to correct the errors. (Don't use /F when you're redirecting CHKDSK output to a device or file for later use.)
/V	Results in a display of all file and subdirectory names on the disc.

CHKDSK tests the integrity of a disk or file and displays a status report.

To check the entire contents of a single subdirectory use a wildcard (*.*). A path without a file name or wildcard will be interpreted as a file name and result in the `File not found` message.

CHKDSK is an external command that resides in the root directory of the C: drive. Therefore, you need to specify C:\CHKDSK (or include C:\ on your PATH) to execute it.

CLS

CLS

Moves the cursor to the upper left corner and clears the screen.

COMMAND

COMMAND [*device*] [/P] [/E:<*nnnnn*>] [/C<*command*>]

device	The name of a character device to be used instead of CON for command processor input and output.
/P	Causes the second version of COMMAND.COM to be permanent. That is, prevents EXIT from returning you to any other command processor. To nullify the effect of /P, execute a system reset (press CTRL, ALT, and DEL at the same time).
/E	Causes MS-DOS to set the size of the environment. *nnnnn* is a base 10 integer in the range 160 to 32768, rounded up to the nearest paragraph boundary. The default is 160.
/C	Causes the new command processor to execute the specified <*command*> then return to the original command processor.

Installs a second version of the COMMAND.COM (MS-DOS) command processor.

If you specify /P and /C in the same command, /P is ignored.

Note



The command processor on the HP 95LX runs from ROM, and if it is referenced by the name COMMAND (without an extension), it will be found by a special ROM search without any program being loaded off disk. To support references to the name COMMAND.COM (with an extension), an interface program with this name is included in the root directory of the C: drive.

COPY (Accepts Wildcards)

COPY [/A] [/B] [<*d1*>:][<*path1*>]<*filename1*> [/A] [/B] [<*d2*>:][<*path2*>][<*filename2*>] [/A] [/B] [/V]

/A	Copies the file as ASCII, up to the first end-of-file (CTRL-Z). *Any remaining part of the file is not copied.* When /A is used with a target file, an end-of-file marker is appended to the file.
/B	Copies the files as Binary. When specified for a source file, copies the entire file (based on the directory file size), including all end-of-file markers. For a target file, no end-of-file marker is appended to the file.
/V	Verifies the copy of the file in the same way as the VERIFY command.

Used to copy one or more files from one disk or directory to another. Also can be used to make a copy in the same directory with a different name. COPY can be used to transfer data between system devices by substituting a device name for <*filename*> as appropriate. (For example, CON is the console device and PRN is the system printer.)

If the target file already exists, its contents will be *replaced* by a copy of the source file.

The position of the /A and /B options on the command line determines the files affected by them. The /A and /B options affect the file immediately preceding them and any files following them until another /A or /B is encountered.

B

To concatenate two or more files into one, use +. For example:

```
COPY sample1+sample2+sample3 A:\demodisk
```

concatenates the three files into one file named *sample1*, which is placed in the *demodisk* directory on the A: drive.

When using COPY with wildcards, the target file will be destroyed if it is selected by a wildcard in the source specifier.

CTTY

CTTY <*device*>

CTTY enables you to change the standard I/O device to another valid I/O device. <*device*> can be any standard MS-DOS I/O device, or an optional character device driver you indicate by the DEVICE command in the CONFIG.SYS file.

The assigned device must be a character I/O device capable of both input and output. Also, programs that access the hardware directly or use BIOS I/O routines are not affected by CTTY.

To return command inputs to the console execute CTTY CON.

DATE

DATE [<*mm*>-<*dd*>-<*yy*>]

Displays or sets the current system date. When you want to view the system date without resetting it, ignore the Enter new date prompt and press (ENTER).

The date format may be changed by the COUNTRY command in the CONFIG.SYS file.

DEL (Accepts Wildcards)

DEL [<*d*>:][<*path*>]<*filename*>

Erases one or more files from a disk. If you don't specify a file name or a wildcard, DEL assumes that you want to delete all files in the specified directory or subdirectory.

DEL cannot delete files with hidden or read-only attributes.

DIR

DIR [<*d*>:][<*path*>][<*filename*>] [/P] [/W]

/P	Shows the directory one page at a time.
/W	Lists only the file names and subdirectories in a directory, three names to a line. (Excludes time, date, and subdirectory indication.)

Lists the current or specified directory contents and the amount of free space on the corresponding drive. Accepts wildcards.

Note that in the HP 95LX the /P and /W options have been modified to work with the HP 95LX screen.

DIR does not list "hidden" files.

ERASE (see DEL)

EXIT

EXIT

Lets you change from the present command processor to the previous command processor. If COMMAND.COM was executed from the Filer, EXIT returns you to the Filer. It does not execute if no previous command processor is active.

FORMAT

Caution FORMAT destroys any data on the card or disk being formatted.



FORMAT <*d*>: [/V] [/P] [/R:<*ss*>] [/E] [/Q]

Prepares a plug-in RAM card for use, or reinitializes the RAM disk (drive C:). You must specify a drive designator (<*d*>).

B

/V	Prompts you for a volume label.
/P	Formats a card as a "pseudo-floppy" (no PCMCIA CIS information). Frees an extra sector on the card for data storage, but may cause the formatted card *not* to be compatible with non-HP computers that adhere to the PCMCIA format standard. Has no effect on drive C:.
/R:<*ss*>	Formats with the specified number of sectors allocated for the root directory. The default is 4 sectors, which allows for up to 64 files in the root directory (16 files per sector); this option enables you to change that number of sectors.
/E	Formats while erasing all the data sectors (sets them to zero). Does not allow for any possible data recovery after formatting.
/Q	Formats while suppressing all prompts and outputs.

MKDIR or MD

MKDIR [<*d*>:][<*path*>]<*dirname*>

Creates a new subdirectory on a disk. MKDIR assumes that the path starts with the current directory unless you specify otherwise. Specifying \ at the beginning of the path tells MKDIR to begin the path at the root directory. Any path from the root directory is limited to 64 characters, including the drive designator.

PATH

PATH [[<*d1*>:]<*path1*>[;[<*d2*>:]<*path2*> ...]]

Identifies additional directories for MS-DOS to search if it cannot find a command, program, or batch file in the current directory.

Executing PATH ; cancels an existing search path. Executing PATH alone displays the current search path.

PROMPT

PROMPT [<*text*>]

Changes the MS-DOS prompt. You can use text with or in addition to the following:

Character	Prompt
$$	The "$" character.
$_	A carriage return/line feed sequence.
$B	The "|" character.
$D	Current system date.
$E	ASCII escape code (1BH).
$G	The ">" character.
$H	The backspace character.
$L	The "<" character.
$N	Active drive.
$P	Current directory.
$Q	The "=" character.
$T	Current system time.
$V	MS-DOS version number.

To return to the MS-DOS default prompt, execute PROMPT without any parameters.

RENAME or REN (Accepts Wildcards)

B

RENAME [<*d1*>:][<*path1*>]<*filename1*> <*filename2*>

Changes the name of a file. Only the source file can have the (optional) drive designator and/or path.

RMDIR or RD

RMDIR [<*d*>:][<*path*>]<*dirname*>

Removes an empty subdirectory from a disk. Does not remove the root or current directory.

A subdirectory is not empty if it contains "hidden" files.

SET

SET [<*name*>=[<*value*>]]

Adds or deletes strings from the MS-DOS environment. Executing SET without any parameters displays the current MS-DOS environment.

To delete a string, execute SET <*name*> = (*followed by no parameters*).

Executing SET with a new <*value*> for an existing <*name*> replaces the <*value*> for that <*name*>.

TIME

TIME [<*hh*>[:<*mm*>[:<*ss*>[<.*xx*>]]]]

Displays or sets the system time. When you want to view the system time without resetting it, ignore the `Enter new time` prompt and press (ENTER).

TIME uses 24-hour time format to set the time. The time format may be changed by the COUNTRY command in the CONFIG.SYS file.

TYPE

TYPE

TYPE [<*d*>:][<*path*>]<*filename*>

Displays the contents of a file. To pause the display, press (CTRL)-(S).

TYPE does not accept wildcards.

VER

VER

Displays the version number of the MS-DOS operating system installed in your HP 95LX.

VERIFY

VERIFY [ON|OFF]

Displays the current status of the MS-DOS disk write-verify switch, or turns the switch on or off. (Resetting the system turns the VERIFY switch off.) VERIFY may be turned on or off by a system call in an application program.

VOL

VOL [<*d*>:]

Displays the volume label of the specified or active drive.

Special HP 95LX DOS Commands

There are three commands in the HP 95LX that are not part of standard MS-DOS 3.2.

DISPCTL

DISPCTL [+C|-C] [+K|-K]

Enables or disables the ALT-arrow key movement and/or the automatic cursor tracking while in the MS-DOS command processor.

+C	Enables cursor tracking.
-C	Disables cursor tracking.
+K	Enables ALT-arrow key movement.
-K	Disables ALT-arrow key movement.

Both options can be used together, but you must use at least one of them with the command.

For more information on cursor tracking and ALT-arrow key movement, see "Accessing MS-DOS" at the beginning of this appendix.

PASSWORD

PASSWORD [/A|/M|/D]

/A	Sets auto-lock mode. If a password has been set, makes password protection active whenever the HP 95LX is turned on.
/M	Sets manual-lock mode. If a password has been set, makes password protection active only when the HP 95LX was turned off by (ALT)-(OFF).
/D	Deactivates password protection.

When PASSWORD is selected without an option, it starts the procedure for setting or changing a password. For a description of that procedure, see "Activating Password Protection" at the end of chapter 1.

SERCTL

SERCTL {/O|/W|/I}

Controls power to the infrared (I/R) and wired serial ports. This command is for use when running programs from the MS-DOS prompt; the built-in applications handle powering the ports automatically.

/O	Turns off power to the active port. Turning off the I/O ports while in the MS-DOS command processor results in significant power savings, thus extending battery life.
/W	Powers up and activates the wired serial port. Does not affect the baud setting.
/I	Powers up and activates the infrared (I/R) port. Changes the baud setting to 2400.

Batch Processing

A batch file is a series of MS-DOS commands, batch commands, and/or executable file names, placed in a single file and executed with one command. The response to any command prompt generated by a batch file must be typed from the keyboard. (The response cannot be included in the batch file.)

A batch file must have a .BAT extension.

Creating and Using a Batch File

Use either a text processor that stores text in ASCII format (like the Memo Editor) or use the COPY command.

To create a batch file with COPY:

1. From the MS-DOS prompt, execute

   COPY CON <*filename*>.bat

2. Type each batch file command on a separate line. (Press ENTER after each command.)
3. Press CTRL-Z and then ENTER to close and save the file.

To execute a batch file, type the batch file name from the MS-DOS prompt and press ENTER.

To terminate a batch file, press CTRL-BREAK or CTRL-C.

Automatic Execution

To automatically execute MS-DOS commands during the startup process:

1. Change the shell to COMMAND (see the SHELL command under "System Configuration" later in this appendix.)
2. Create a batch file named AUTOEXEC.BAT that contains the MS-DOS commands you want executed.
3. Make sure the AUTOEXEC.BAT file is located in the root directory of the default drive (see "System Configuration" later in this appendix for a discussion of the default drive).

Caution



If you use AUTOEXEC.BAT in this way, the HP 95LX built-in applications become unavailable. For more information on this, refer to the description of the SHELL command later in this appendix.

Replaceable Parameters

The ten positional parameters are %0 through %9. The name of the batch file you're executing always replaces %0; the first parameter after the batch file name replaces %1; the second parameter replaces %2; and so on. For example, consider the following batch file named SAMPLE.BAT:

```
TYPE %0.bat
DIR %1
CHKDSK %2
COPY %1*.* %2
```

If you use the command SAMPLE A: B: to execute the file, the following matches occur:

```
%0 = SAMPLE
%1 = A:
%2 = B:
```

Batch Command Descriptions

Except for the FOR, ECHO, and REM commands, batch commands can be used *only* within batch files.

ECHO

ECHO [ON|OFF|<*message*>]

The optional <*message*> text, when included, is always displayed regardless of the ON|OFF setting. Most other messages will not be displayed while the ECHO OFF mode is active. To echo a blank line, use (ALT) 255 for <*message*>.

Executing ECHO without any parameter displays the current ECHO state (ON or OFF).

FOR ... IN ... DO

FOR %%<*variable*> IN (<*set*>) DO <*command*>

<*variable*>	Can be any single character (other than 0 through 9).
<*set*>	Represents a series of values such as file names separated by spaces or a file name with wildcard characters.
<*command*>	A single MS-DOS command or executable file, sometimes followed by a blank space and the %%<*variable*> data.

If you execute FOR from the MS-DOS prompt instead of in a batch file, use only one % in front of the variable.

GOTO

GOTO <*label*>

Transfers execution to the line following the line containing the specified label. Can be used with IF for conditional branching.

For a conditional branch, the label must begin with a colon and have from one to eight additional characters. For example, the following batch file executes ECHO ON.

```
GOTO BRANCH2
:BRANCH1
ECHO OFF
:BRANCH2
ECHO ON
```

IF

IF [NOT] <*condition*> <*command*>

Enables conditional execution of MS-DOS commands in batch files. IF can be used to test for the following conditions:

- ERRORLEVEL <*number*> is true if the last program finished with *exit code* ≥ <*number*>.
- <*string1*>==<*string2*> is true if two strings are identical.
- EXIST [<*d*>:] [<*path*>] [<*filename*>] is true if <*filename*> exists.

PAUSE

PAUSE [<*message*>]

The message can have up to 121 characters. If ECHO OFF has been invoked, PAUSE and the <*message*> will not be displayed. However, the `Strike a key when ready...` prompt will still appear.

REM

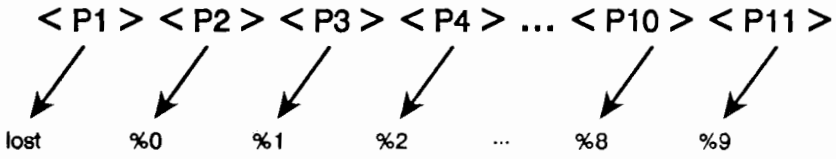
REM [<*message*>]

The <*message*> can have up to 123 characters. If ECHO OFF has been invoked, REM and the <*message*> will not be displayed.

SHIFT

SHIFT

Each of the values assigned to a replaceable parameter is shifted to the next lowest parameter:



System Configuration

The HP 95LX first searches the A: drive and then the C: drive for a CONFIG.SYS file. If a CONFIG.SYS file is found on drive A:, that drive becomes the default drive. Otherwise, C: is the default drive (whether or not it contains a CONFIG.SYS file).

The system configuration commands (except BREAK) are used only in the CONFIG.SYS file.

Configuration Command Descriptions

BREAK

BREAK = ON

or

BREAK = OFF

This command is functionally identical to the MS-DOS BREAK command. The standard setting is OFF. You can use this command in either the CONFIG.SYS file or as an MS-DOS command. To check the status of BREAK, execute BREAK.

BUFFERS

BUFFERS = <*n*>

MS-DOS automatically sets the number of buffers to a default determined by the HP 95LX unless there is a BUFFERS command in your CONFIG.SYS file. You can specify from 1 to 99 buffers.

COUNTRY

COUNTRY = <*nnn*>

Affects only the format for the system time and date, currency symbol, and decimal separator.

Country Codes

Country	Code	Country	Code
Australia	061	Netherlands	031
Belgium	032	Norway	047
Canadian French	002	Portugal	351
Denmark	045	Spain	034
Finland	358	Sweden	046
France	033	Switzerland	041
Germany	049	United Kingdom	044
Israel	972	United States	001
Italy	039		
Middle East	785		

These country settings are not used by the HP 95LX built-in applications, which instead use the settings from the Setup Utility. See chapter 21 for more information.

DEVICE

DEVICE = [<*d*>:][<*path*>]<*filename*> [<*parm1*> ...]

The DEVICE command loads an installable device driver onto the system by specifying the file that contains it.

FILES (File Handles)

FILES = <*n*>

<*n*> is the number of files that can be open concurrently via handles for the entire system. (The maximum for a process is 20.)

The range is from 5 to 255. MS-DOS default is 20.

LASTDRIVE

LASTDRIVE = <*d*>

<*d*> is the *last* valid drive designator. Valid drives are A to Z. The default is F.

SHELL

SHELL = [<*d*>:][<*path*>]<*filename*> [<*parm1*> ...]

SHELL enables you to specify an alternate command processor.

The HP 95LX does not use the MS-DOS command processor (COMMAND) as its default shell. Instead, it uses $SYSMGR, which is the controlling program for the built-in applications. To change the shell to COMMAND, insert the line SHELL = COMMAND /P in your CONFIG.SYS file. Then the HP 95LX will start after a system reset using COMMAND—however, the built-in applications will not be available. To make them available, you must type $SYSMGR in the command line and press ENTER. (Once you execute $SYSMGR, you cannot exit it to return to the command processor. However, you can use the System command in the Filer to invoke another copy of COMMAND.)

If you want to execute some MS-DOS commands on start up and then invoke the built-in applications, you can put the commands, followed by the $SYSMGR command, in an AUTOEXEC.BAT file.

STACKS

STACKS = <*n*> , <*s*>

STACKS enables you to override the default number of stack frames and their sizes.

<*n*>	The number of stack frames. Valid values are 8 to 64. The default is 9.
<*s*>	The size (in bytes) of each stack frame. Valid values are 32 to 512. The default is 128.

MS-DOS uses a stack frame from the stack pool each time a hardware interrupt occurs, then returns the stack frame to the pool.

Caution



Do not decrease the number or size of the stack frames below the default values. Doing so could cause a system failure.

MS-DOS Function Key Descriptions

In the table below, <*c*> represents any character.

Function Key	Function
F1 or ▶	Character pointed to by template pointer copied to command line; pointer advances one character.
F2<*c*>	Starting at template pointer, characters copied from template to command line until specified character is found.
F3	Starting at template pointer, characters copied from template to command line until last character in template is reached.
F4<*c*>	Moves template pointer forward to the specified character. Pointer does not move if character not found.
F5	Moves command line contents to template. (Former template contents are lost.)
F6 (or CTRL-Z)	End-of-file marker.
⇧ INS	Turns insert mode on or off.
DEL	Deletes character indicated by template pointer.
ESC	Cancels current command. (No change to template.)
◀	Moves cursor and template pointer one character to the left.

Control Characters

Keys	Function
CTRL-BREAK	Cancels current command or current command line (before ENTER is pressed).
CTRL-C	Stops current process or terminates current command line.
CTRL-H	Deletes last character from command line and terminal screen.
CTRL-J	Inserts end-of-line without clearing command line.
CTRL-P	Turns output from terminal to line printer on or off.
CTRL-S	Suspends output display on terminal; press any key to restart.
CTRL-Z	End-of-file marker.



B

Note



Hooking up cables to printers can be a tricky procedure because various adapters (null modem adapters, gender changers, etc) can be required by various printers. If you need help with this process, refer to the printer documentation or printer manufacturer. The following table shows the pin assignments for the printer end of the serial cable. This information is important if you need to get help.

Pin No.	Used for
1	Not used
2	Transmit data (from the HP 95LX)
3	Receive data (to the HP 95LX)
4	Not used
5	Signal ground
6-9	Not used

There are two limitations to keep in mind when connecting the HP 95LX to a serial printer:

- The HP 95LX supports only software handshaking, *not hardware handshaking*. If your printer *requires* hardware handshaking, contact the printer manufacturer to see if there is method to work around this limitation.
- The HP 95LX is designed to use the HP 82222A serial cable. If you try to use a longer serial cable, you may get poor data transmission to the printer.

At the time of this writing, there are no IR printers available for the HP 95LX, although there is an IR port available.

Printer Configuration Settings

The Setup Utility ([⌂] [▭]) specifies the type (or name) of the printer, the interface type, and the baud rate you are using. The default settings are EpsonFX80, COM1 (serial), and 9600 baud. (See "The Printer Configuration Settings" in chapter 21 for more information.)

Setup automatically assumes your printer uses 8 bits/character, ' stop bit, no parity, and XON/XOFF handshaking enabled. If yc

printer does not agree, you must change its settings (according to specifications in the printer's owner's manual).

Printing the Display Screen

The easiest way to get a print-out from any application is to print the screen. Press (PRT SC) ((⇧) (ESC)).

This method works for text but not for graphics images, such as a graph or a customized graphics image for your Business Card.

Printing Information from an Application

To print out something other than the full screen (such as a range within a 1-2-3 worksheet or a file created by the Memo Editor), select Print Printer in that application.

The Filer Uses the Print Command

The Filer displays directories of files and can be used to print any ASCII files within the displayed directory. You can highlight a single file or tag a group of files, and then select Print once. See "Printing Files and Directories" near the end of chapter 20.

1-2-3 Uses the /Print Command

You can define a range and print it using /Print Printer Go, or copy multiple ranges to a text file using /Print File. You can then print out the text file using the Filer. See chapter 9 for more information.

To establish the page format for print-outs, use /Worksheet Global Default Printer AutoLF, Left, Right, Top, Bottom, Pg-Length, and Wait. See chapter 13.

PrintGraph is not provided with the HP 95LX. However, you can save a graph in a .PIC file, transfer the file to a PC with 1-2-3 PrintGraph (or to another application that prints .PIC files), and print it there.

The Appointment Book and the Phone Book Use the Print Command

You specify the date(s) of appointments or ToDo items, or specify desired phone records, and print them out using Print Printer. You can also copy multiple appointments, records, and items to a text file using Print File. You can then print out the text file using the Filer or the Memo Editor. See "Printing Appointments and To-Do Items" in chapter 17 and "Printing Phone Book Records" in chapter 18.

The Memo Editor Uses the Print Command

You can print out a text file or marked portions of it using Print Printer. To establish the page margins for your output, use Print Options. See "Printing a Document" in chapter 19.

The Calculator Uses the Print Command

You can print out the complete application area, even if it extends over several pages of function keys. See chapter 27.

D

Using RPN with the Calculator

Introduction

The Calculator application in the HP 95LX operates in either algebraic or RPN mode. This appendix is for those who want to review or learn how to use RPN. **Reverse Polish Notation** (RPN) is based on an unambiguous, parentheses-free mathematical logic known as "Polish Notation," developed by the Polish logician Jan Lukasiewicz (1878–1956). While conventional algebraic notation places the operators *between* the relevant numbers or variables, Lukasiewicz's notation places them *before* the numbers or variables. For optimal efficiency of the stack, we have modified that notation to specify the operators *after* the numbers. Hence the term *Reverse Polish Notation*, or *RPN*.

Where to Learn More About RPN

There are several easy-to-follow books designed to explain RPN to the beginner. Here is one such book:

ENTER by Jean-Daniel Dodin

It's available at the time of this writing from:

EduCALC
27953 Cabot Road
Laguna Niguel, CA 92677 USA

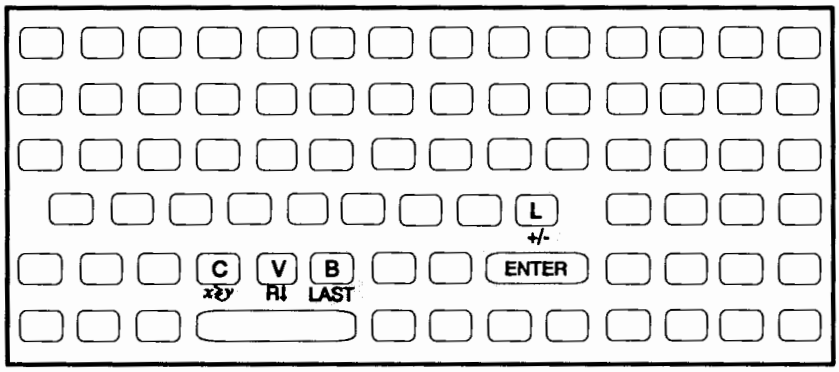
Telephone: 800 633-2252 (Credit card orders only)

How to Use RPN

Switching Between Algebraic (Alg) and RPN Modes

1. Press (MENU).
2. Select Options Alg/RPN to switch from one mode to the other. To indicate RPN mode, the RPN indicator is displayed at the lower left of the screen whenever the calc line is present. If this indicator is not displayed, algebraic mode is set.

Where the RPN Functions Are



D

Function Name	Definition	Key to Use
ENTER	Enters and separates one number from the next.	(ENTER)
LAST X	Recalls last number in X-register.	(LAST)
R↓	Rolls down stack contents.	(R↓)
X <> Y	X-register exchanges with Y-register.	(x≷y)
CHS	Changes sign.	(+/-)

Arithmetic Topics Affected by RPN

Only the following operators work differently in RPN than in Algebraic mode:

- Two-number arithmetic ([+], [−], [*], [/], [^]).
- The percent function ([%]).
- The LAST X function ([LAST]).

If you act on a number in the calc line (the bottom available line in the display) in one of the ways listed above, the order you type keys will depend on whether you're in RPN or Algebraic mode.

It makes no difference whether you *type* that number into the HP 95LX's calc line or whether you *recall* it from a storage register. The keystrokes you use to act on that number will depend only on the mode you're using, Algebraic or RPN, not on whether the number is typed or recalled.

Two-Number Arithmetic

Here are some examples of two-number arithmetic. Notice that

- [ENTER] separates numbers that you key in.
- The operator ([+], [−], etc.) *completes* the calculation.

Note that one-number functions (such as [√x]) work the same in Algebraic and RPN modes.

If RPN is not displayed at the lower left of the screen, set RPN mode by selecting [MENU] Options Alg/RPN.

To Calculate:	Press:	Display:
$12 + 3$	12 [ENTER] 3 [+]	15.00
$12 - 3$	12 [ENTER] 3 [-]	9.00
12×3	12 [ENTER] 3 [*]	36.00
$12 \div 3$	12 [ENTER] 3 [/]	4.00
$\sqrt{12}$	12 [√x]	3.46
$1/12$	12 [1/x]	0.08
12^2	12 [ENTER] 2 [^]	144.00
$12^{1/3}$ (cube root)	12 [ENTER] 3 [1/x] [^]	2.29

You do not need to use [ENTER] before an operator, only *between keyed-in numbers.* Key in *both* numbers (separated by [ENTER]) before pressing the operator key.

Note



You can use [=] instead of [ENTER] as a number separator. It's good practice to use [=] when working in the Solver, since [ENTER] enters a value into a highlighted variable. (This is demonstrated in part 3 of the first solver example in chapter 28.)

Say you're in RPN mode and you happen to have the variable X highlighted in the Solver's solve calc screen. You want to perform some arithmetic in the calc line unrelated to the highlighted variable. In calculating 22.5/3.7, for instance, you'd normally press 22.5 [ENTER] 3.7 [/]. In this case, [ENTER] not only separates 22.5 and 3.7, it also enters 22.5 into X.

To protect against entering unwanted values into Solver variables, use [=] to separate two numbers rather than [ENTER].

The Percent Function

The [%] key calculates percentages *without* using the [*] key. Combined with [+] or [−], it adds or subtracts.

To Calculate:	Press:	Display:
27% of 200	200 [ENTER] 27 [%]	54.00
200 less 27%	200 [ENTER] 27 [%] [−]	146.00
12% greater than 25	25 [ENTER] 12 [%] [+]	28.00

Compare these keystrokes in RPN and Algebraic modes:

	RPN Mode	Algebraic Mode
27% of 200	200 [ENTER] 27 [%]	200 [*] 27 [%] [=]
200 less 27%	200 [ENTER] 27 [%] [−]	200 [−] 27 [%] [=]

No Parentheses Used for Chain Calculations

As you key in a calculation, intermediate results are stored until you need them. The earlier cube root ($12^{1/3}$) and percentage addition (12% greater than 25) examples are two simple examples of chain calculations.

For another example, calculate $7 \times (12 + 3)$.

Start the calculation by finding $12 + 3$. Notice that you don't need to press [ENTER] to save this intermediate result (15) before proceeding. Since it is a calculated result, it is saved automatically—*without using parentheses*.

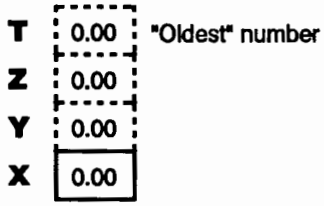
Keys:	Display:	Description:
12 [ENTER] 3 [+]	15.00	Intermediate result.
7 [*]	105.00	Pressing the function key produces the answer.

Now study these two examples. Note the automatic storage *and retrieval* of intermediate results.

To Calculate:	Press:	Display:
360 ÷ (750 × 12)	360 [ENTER] 750 [ENTER] 12 [*] [/]	0.04
{(456 − 75) ÷ 18.5} × (68 ÷ 1.9)	456 [ENTER] 75 [−] 18.5 [/] 68 [ENTER] 1.9 [/] [*]	737.07

The Stack

The four-level stack is the key to the automatic storage of intermediate results, demonstrated in the examples above. Each level is a storage location, called a **register**. These four registers are "stacked" on top of each other, and comprise a work area for calculations. The registers—labeled X, Y, Z, and T—store and manipulate four current numbers. The "oldest" number is the one in the T-register (T for "top").



The number you see in the display is in the **X-register**. The X-register contains the most "recent" number.

D

To watch the stack in action:

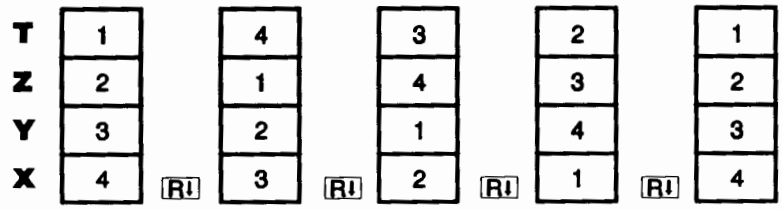
From the Calculator application, select [MENU] Math to see the four levels of the stack on the Calculator Registers screen. The X-register is shown in the calc line, while registers Y, Z, and T are displayed just above the calc line. As you perform RPN calculations, you can see the stack in action by watching this screen.

To review the stack (roll down):

The [R↓] (**roll down**) function (the primary function of V) lets you review the entire contents of the stack by "rolling" the contents downward, one register at a time.

To roll a full stack:

Suppose the stack is filled with 1, 2, 3, 4 (press 1 [ENTER], 2 [ENTER], 3 [ENTER], 4). Pressing [R↓] four times rolls the numbers all the way around and back to where they started:



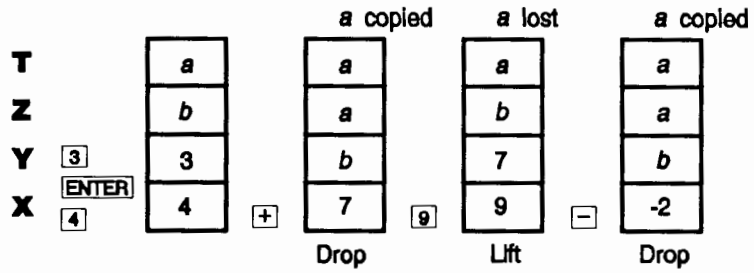
When you press [R↓], the value in the X-register rotates around into the T-register. Notice that the *contents* of the registers are rolled, while the registers themselves maintain their positions.

To exchange the X- and Y-registers in the stack:

The [x≷y] function (in the Calculator application, press C) swaps the contents of the X- and Y-registers without affecting the rest of the stack. Pressing [x≷y] again restores the original order of the contents. The [x≷y] function is used primarily to swap the order of numbers in a calculation. For example, an easy way to calculate $9 \div (13 \times 8)$ is to press 13 [ENTER] 8 [*] 9 [x≷y] [/]. (The answer: 0.09.)

Arithmetic—How the Stack Does It

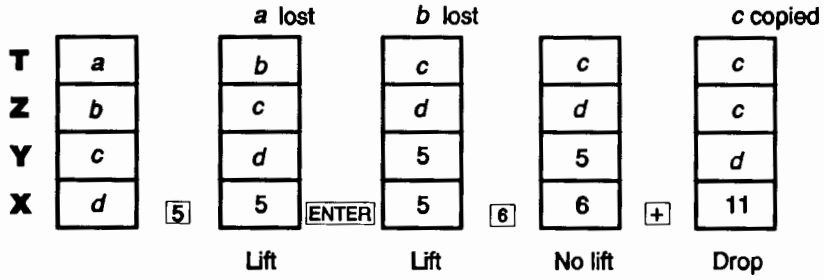
The contents of the stack move up and down automatically as new numbers enter the X-register (**lifting the stack**), and as operators combine two numbers to produce one new number in the X-register (**dropping the stack**). See how a full stack drops, lifts, and drops its contents while calculating (*a* and *b* represent values already on the stack).



- Notice that when the stack drops, it replicates the contents of the T-register and overwrites the Z-register.
- When the stack lifts, it pushes the top contents out of the T-register, and that number is lost. This shows that the stack's memory is limited to four numbers for calculations.
- Because of the automatic movement of the stack, you do *not* need to clear the display before doing a new calculation.

To learn how ENTER works:

When ENTER separates two numbers, what happens in the stack? To find out, study the figure below to see what happens when 5 is added to 6:



To use a number twice in a row:

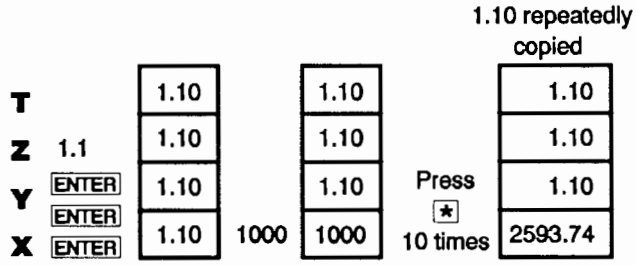
You can use the replicating feature of ENTER to other advantages. To add a number to itself, key in the number and press ENTER +.

To fill the stack with a constant:

The replicating effect of [ENTER], together with the replicating effect (from T into Z) of stack drop, allows you to fill the stack with a numeric constant for calculations. To see how this works, calculate how $1000 will grow over 10 years at a 10%/year compound growth rate:

1. Press 1.1 [ENTER] [ENTER] [ENTER]. This fills the stack with the number 1.1 (the factor by which your balance will grow each year).
2. Key in your beginning balance, 1000, but *don't* press [ENTER].
3. Press [*] ten times and see your ending balance of 2593.74.

As the figure below shows, the first step filled all four stack levels with 1.1. The second step replaced the 1.1 in the X-register with 1000. Then, each time you pressed [*], the number in the X-register was multiplied by the 1.1 in the Y-register, the number in Z dropped to Y, and the value in T replicated to Z.



To clear numbers:

To clear the calc line, press [DEL].
To clear all data from the stack, including the calc line, select [MENU] Erase Stack.

The LAST X Register

The LAST X register is a companion to the stack: It stores the number that had been in the X-register *just before the last numeric operation* (such an a [*] operation). Pressing [LAST] returns this value to the X-register. This ability to recall the "last x" value has two main uses:

- Correcting errors: retrieving a number that was in the X-register just before an incorrect calculation.
- Reusing a number in a calculation, where that number is in the X-register just before executing the arithmetic operation.

Example: Using (LAST) to Reuse a Number. Calculate this expression:

$$\frac{96.74 + 52.39}{52.39}.$$

Keys:	Description:
(MENU) A	Displays the calculator arithmetic screen. (If RPN is not displayed in the lower left of the screen, select (MENU) Options Alg/RPN).
96.74 (ENTER)	Enters 96.74 into the calculator line.
52.39 (+)	Adds 52.39 to 96.74. The calculator line now shows the sum, 149.13.
(LAST)	Retrieves the number before the (+) operation, saved in LAST X. The calculator line now shows 52.39.
(/)	Divides 52.39 into 149.13. The 2.85 result is displayed.

Chain Calculations

D

The automatic lifting and dropping of the stack's contents let you retain intermediate results without storing or reentering them, and without using parentheses, This in an advantage the RPN stack has over algebraic calculator logic. Other features of RPN include the following:

- You never work with more than two numbers at a time.
- (ENTER) separates two numbers keyed in sequentially.
- Pressing an operator key executes that operation immediately.
- Intermediate results appear as they are calculated, so you can check each step as you go.
- Intermediate results are automatically stored. They reappear automatically as they are needed for the calculation—the last result stored is the first to come back out.

- You can calculate in the same order as you would with pencil and paper—that is, from the innermost parentheses outward:

  $4 \div [14 + (7 \times 3) - 2] = 0.12$

  can be solved as 7 [ENTER] 3 [*] 14 [+] 2 [−] 4 [x≷y] [/]

Exercises

Here are some extra problems that you can do to practice using RPN.

Calculate: $(14 + 12) \times (18 - 12) \div (9 - 7) = 78.00$

A solution: 14 [ENTER] 12 [+] 18 [ENTER] 12 [−] [*] 9 [ENTER] 7 [−] [/]

Calculate: $23^2 - (13 \times 9) + (1 \div 7) = 412.14$

A solution: 23 [ENTER] 2 [^] 13 [ENTER] 9 [*] [−] 7 [1/x] [+]

Calculate: $\sqrt{(5.4 \times 0.8) \div (12.5 - 0.7^3)} = 0.60$

A solution: 5.4 [ENTER] .8 [*] .7 [ENTER] 3 [^] 12.5 [x≷y] [−] [/] [√x]
or
5.4 [ENTER] .8 [*] 12.5 [ENTER] .7 [ENTER] 3 [^] [−] [/] [√x]

Calculate: $\sqrt{\frac{8.33 \times (4 - 5.2) \div [(8.33 - 7.46) \times 0.32]}{4.3 \times (3.15 - 2.75) - (1.71 \times 2.01)}} = 4.57$

A solution: 4 [ENTER] 5.2 [−] 8.33 [*] [LAST] 7.46 [−] .32 [*] [/] 3.15 [ENTER] 2.75 [−] 4.3 [*] 1.71 [ENTER] 2.01 [*] [−] [/] [√x]

D

Selected Examples

The following examples have been converted to RPN keystrokes. They've been selected from "Additional TVM Examples" in chapter 25.

These examples illustrate how to convert algebraic to RPN keystrokes in less common situations: with [%] and with [RCL].

Example: APR of a Loan With Fees. Ernest Munnie is charged two points for the issuance of a mortgage. (One point is equal to 1% of the mortgage amount.) If the mortgage amount is $60,000 for 30 years and the interest rate is $11\frac{1}{2}\%$ annually with monthly payments, what APR is Ernie paying?

1. Calculate *PMT*, using *PV*=$60,000 and *I%YR*=$11\frac{1}{2}\%$.
2. Adjust *PV* to reflect the amount of the loan minus the fees. Then, calculate the *APR* (*I%YR*), using the *PMT* calculated in step 1 (all other values remain the same).

Step 1. Calculate *PMT*

Keys:	**Description:**
(MENU) T	Displays the TVM function keys.
(MENU) E D	Erases previous values, sets 12 payments per year, and sets End mode. You don't need to erase previous values. We do it here to improve example clarity.
30 (↶) N	Stores 360, the number of monthly payments (displayed near the top-right corner of your screen).
11.5 I%YR	Stores interest rate.
60000 PV	Stores amount of loan.
0 FV	No balloon payment.
PMT	Calculates monthly payment.

D

```
Number of periods.... N    =    360.00
Annual interest...... I%YR =     11.50
Present value........ PV   = 60,000.00
Payment.............. PMT  =   -594.17
Future value......... FV   =      0.00

Payments per year.... P/YR =        12
Begin/End mode....... B/E  =       END
```

Step 2. Adjust *PV* and calculate *APR*.

RCL PV	Recalls amount of loan.
2 % − PV	Reduces loan amount by the two points charged and stores actual amount received by borrower.
I%YR	Calculates *APR*.

```
Annual interest..... I%YR =     11.76
Present value....... PV   = 58,800.00
```

Example: Interest-Only Loan With Fees From the Lender's Point of View. Bill Lender is making a $1,000,000 10-year, 10.5% (annual interest) *interest-only* loan with an origination fee of 3 points. What is the yield to Bill? Assume that the interest-only payments are made monthly. (*PMT* is $1,000,000 × 10.5% ÷ 12, *FV* is the entire loan amount, and *PV* is the loan amount minus the points.)

Keys:	**Description:**
MENU T	Displays the TVM function keys.
MENU E D	Erases previous values, sets 12 payments per year, and sets End mode.
10 ◇ N	Stores 120, the total number of payments.
1000000 ENTER	
10.5 % 12 /	
PMT	Calculates and stores monthly payment.

```
Number of periods..... N    =   120.00
Annual interest....... I%YR =     0.00
Present value......... PV   =     0.00
Payment............... PMT  = 8,750.00
Future value.......... FV   =     0.00

Payments per year..... P/YR =       12
Begin/End mode........ B/E  =      END
```

R↓ FV	Stores entire loan amount as balloon payment.
3 % − +/-	
PV	Stores amount borrowed (total minus points).
I%YR	Calculates APR, the yield to lender.

```
Number of periods. N    =        120.00
Annual interest... I%YR =         11.00
Present value..... PV   =   -970,000.00
Payment........... PMT  =      8,750.00
Future value...... FV   = 1,000,000.00
```

Example: **Future Value and Purchasing Power of a Tax-Free Account.** Les Tasksis opens an individual retirement account with a dividend rate of 8.175%, and invests $2,000 at the beginning of each year for 35 years.

Part 1. Calculate the account balance at retirement.

Keys:	Description:
MENU T	Displays the TVM function keys.
MENU E D	Erases previous values and sets 12 payments per year.
B/E	Sets Begin mode.
1 P/YR	Sets 1 payment per year.
35 N	Stores number of payment periods until retirement.
8.175 I%YR	Stores dividend rate.
0 PV	Present value of account (before first payment) is zero.
2000 +/- PMT	Stores annual deposit.

D

FV Calculates amount in account at retirement.

```
Number of periods... N    =      35.00
Annual interest..... I%YR =       8.18
Present value....... PV   =       0.00
Payment............. PMT  =   -2000.00
Future value........ FV   = 387,640.45

Payments per year... P/YR =          1
Begin/End mode...... B/E  =      BEGIN
```

Part 2. How much has Les paid into the account at retirement?

RCL PMT
RCL N
✱ Calculates $PMT \times N$.

```
-70,000.00
```

Part 3. How much interest has the account earned? (The interest earned equals the difference between FV and the total amount deposited.)

RCL FV + Calculates interest you will earn.

```
317,640.45
```

Part 4. If his post-retirement tax rate is 15%, what is the after-tax future value of the account? Assume only interest is taxed.

15 % Calculates taxes, 15% of total interest.

```
47,646.07
```

[+/-] [RCL]	
[FV] [+]	Subtracts taxes from total FV to calculate after-tax FV.
[FV]	Stores after-tax FV.

```
                                  FV = 339,994.39
```

Part 5. Calculate the purchasing power of this amount in today's dollars, assuming an 8% annual inflation rate.

0 [PMT]	For this calculation there are no periodic payments.
8 [I%YR]	
[PV]	Purchasing power is $22,995.36.

```
Number of periods... N    =      35.00
Annual interest..... I%YR =       8.00
Present value....... PV   = -22,995.36
Payment............. PMT  =       0.00
Future value........ FV   = 339,994.39
```

Example: **Future Value and Purchasing Power of a Taxable Retirement Account.** Izzy Smart is considering investing his money with E. Norma Spayback Investment Company. They claim that if Izzy invests $3,000 with them each year for 35 years at a dividend rate of 8.175%, with dividends taxed as ordinary income, he'll be rich at retirement with close to $500,000. Exactly how much would Izzy have in the account at retirement? Assume a tax rate of 28%, and that payments begin today.

Part 1. Calculate the future value of the taxed retirement account.

Keys:	Description:
(MENU) T	Displays the TVM function keys.
(MENU) E D	
B/E	Clears previous values and sets Begin mode.
1 P/YR	Sets 1 payment/year.
35 N	Stores years until retirement.
8.175 (ENTER)	
28 (%) (−) I%YR	Calculates and stores interest rate diminished by tax rate.
0 PV	Stores 0 for present value.
3000 (+/−) PMT	Stores annual payment.
FV	Calculates future value of the taxed retirement account.

```
Number of periods... N    =      35.00
Annual interest..... I%YR =       5.89
Present value....... PV   =       0.00
Payment............. PMT  =   -3000.00
Future value........ FV   = 345,505.61

Payments per year... P/YR =          1
Begin/End mode...... B/E  =      BEGIN
```

Part 2. What will be the purchasing power of that amount in today's dollars, assuming 8% annual inflation?

D

0 PMT	
8 I%YR	
PV	Purchasing power is $23,368.11

```
PV = -23,368.11
```

E

HP 95LX Character Set

This appendix contains a table defining your HP 95LX character set as well as instructions for generating special characters.

The HP 95LX character set is equivalent to code page 850, the IBM PC multilingual character set. (Note that your HP 95LX contains MS-DOS 3.22, which does not support code-page switching.) All the HP 95LX applications use this set except 1-2-3, which uses LICS, the Lotus International Character Set. Most LICS characters are included in code page 850; the few that are not will not display on the HP 95LX. For more information about LICS, including a table of LICS characters, see appendix F.

The Character Set Table

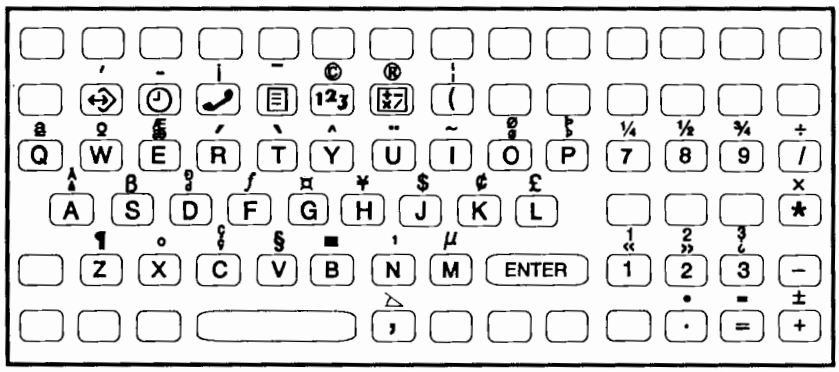
The following page contains the full HP 95LX character set.

Decimal Value	→	0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
Hex Value	↓	0	1	2	3	4	5	6	7	8	9	A	B	C	D		
0	0		▼		0	@	P	`	p	Ç	É	á	▒	└	ð	Ó	-
1	1	☺	▲	!	1	A	Q	a	q	ü	æ	í	▒	┴	Ð	ß	±
2	2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▓	┬	Ê	Ô	=
3	3	♥	‼	#	3	C	S	c	s	â	ô	ú	│	├	Ë	Ò	¾
4	4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	─	È	õ	¶
5	5	♣	§	%	5	E	U	e	u	à	ò	Ñ	Á	┼	ı	Õ	§
6	6	♠	▬	&	6	F	V	f	v	å	ù	ª	Â	ã	Í	µ	÷
7	7	•	↨	'	7	G	W	g	w	ç	ù	º	À	Ã	Î	þ	¸
8	8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	©	╚	Ï	Þ	°
9	9	○	↓	)	9	I	Y	i	y	ë	Ö	®	╣	╔	┘	Ú	··
10	A	◙	→	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Û	•
11	B	♂	←	+	;	K	[	k	{	ï	ø	½	╗	╦	▉	Ù	¹
12	C	♀	∟	,	<	L	\	l	|	î	£	¼	╝	╠	ý	³
13	D	♪	↔	-	=	M	]	m	}	ì	Ø	¡	¢	═	¦	Ý	²
14	E	♫	▲	.	>	N	^	n	~	Ä	×	«	¥	╬	Ì	¯	■
15	F	☼	▼	/	?	O	_	o	⌂	Å	ƒ	»	┐	¤	▉	´	

Generating Special Characters

There are two primary ways to generate special characters on your HP 95LX:

- By using the ALT key in combination with a character code. For example, in the character set table on the previous page you can see that the character code for the ® symbol is 169 (decimal value 160 across plus decimal value 9 down). So, to generate ® on your HP 95LX, you would hold down ALT while you type 169.
- By pressing the CHAR key and then another key. For example, pressing CHAR L generates £. Many, but not all special characters in the HP 95LX character set can be generated using the CHAR key. Here is the keyboard with those available:



Note that a few keys have shifted CHAR definitions in addition to regular CHAR definitions. For example, pressing CHAR 1 generates ≪, while pressing ⇧ CHAR 1 generates a small number 1 (^{1}).

Generating Accented Characters. The keys R, T, Y, U, and I represent accent marks when used with the CHAR key. When you press one of these keys, it prepares the HP 95LX to generate an accented form of the next key you press. For example, pressing CHAR U followed by A generates ä.

Computer Museum

F

Lotus International Character Set (LICS)

1-2-3 uses the Lotus International Character Set to display, store, and print characters. You can use LICS codes to enter text characters that are not on your keyboard.

There are 256 LICS codes (decimal codes 0 through 255) that are divided into three groups:

- Codes 0 through 31 represent control characters and not LICS characters. Although these control characters are used internally by 1-2-3, general use of these characters in the worksheet is not supported.
- Codes 32 through 127 represent the ASCII characters 32 through 127. They are shown in the first table in this appendix, "Standard ASCII Characters."
- Codes 128 through 255 represent various international characters and special symbols, such as £ (British pound) and π (pi). These are listed in the second table in this appendix, "International Characters and Special Symbols."

Displaying and Printing LICS Characters

If your HP 95LX cannot display a LICS character, or if your printer cannot print a LICS character, the HP 95LX uses a **fallback presentation** for that character. The intention of the fallback presentation is to represent the LICS character as closely as possible using characters that are available on your monitor or printer. For example, if you use the © symbol and your printer cannot print it, the HP 95LX might display (c) or c as the fallback presentation (depending on the capabilities of your printer).

Entering LICS Characters

There are three ways to include a LICS character in a text entry. The method you use depends on the specific LICS character you want to enter.

- You can enter any LICS character using the 1-2-3 @CHAR function and the LICS code for the character, as described in the following section "Using @CHAR."
- You can enter many LICS characters using compose sequences, as described later in this appendix in "Using Compose Sequences." The tables in this appendix list the compose sequences for the characters that have them.
- You can enter the LICS characters that represent standard ASCII characters (codes 32 through 127) by pressing the appropriate character key on your keyboard.

Using @CHAR

@CHAR(x) returns the character that the LICS code x produces. You can enter any LICS character in the worksheet using the @CHAR function and the LICS code for the character. For example, the LICS code for © is 169 (taken from the "International Characters and Special Symbols" table). To enter © in a worksheet, type @CHAR(169) and press ENTER.

If you want to combine a LICS character with other text, however, you must use the @CHAR function in a string formula. For more information on the @CHAR function, see @CHAR in chapter 14.

Using Compose Sequences

A compose sequence is a series of keystrokes you use in combination with the COMPOSE key (ALT-F1 in most HP 95LX applications) to enter a LICS character. The tables in this appendix list the compose sequences for the characters that have them. You enter one of these characters by pressing COMPOSE (ALT-F1) and then typing the sequence of keystrokes listed for that character. For example, to enter the character £ (British pound) in a cell, look up the compose sequence for £ in the "International Characters and Special Symbols" table. You will find the compose sequence is L=. Press COMPOSE (ALT-F1), type L=, and press ENTER to complete the entry.

You can use this technique to combine LICS characters with other text in a label.

Printing Characters That Aren't in LICS

If your printer has full backspacing capability, you can use the merge character, COMPOSE ([ALT]-[F1]) mg, to print characters that are not in LICS. Essentially, a merge character tells 1-2-3 to overstrike one character on another. After printing the first character you specify, 1-2-3 prints a backspace (or the equivalent), and then prints the next character you specify. For example, to create a z with an acute accent, you would type z, press COMPOSE ([ALT]-[F1]), and type mg' —mg is the merge character and ' (apostrophe) is the character you want 1-2-3 to overstrike on the z.

You can also use the merge character to underline a character. For example, suppose you want to enter the word LOTUS in a 1-2-3 cell and underline each letter:

1. Move the cell pointer to the cell where you want to enter the label.
2. Type L, press COMPOSE ([ALT]-[F1]), and type mg_.
3. Type O, press COMPOSE ([ALT]-[F1]), and type mg_.
4. Type T, press COMPOSE ([ALT]-[F1]), and type mg_.
5. Type U, press COMPOSE ([ALT]-[F1]), and type mg_.
6. Type S, press COMPOSE ([ALT]-[F1]), and type mg_.
7. Press [ENTER] to complete the label.

Note



Although you can overstrike any printable character with any other, the result may not always look the way you expected.

LICS Tables

Standard ASCII Characters

The following table defines LICS codes 32 through 127, which represent standard ASCII characters. It also lists all possible compose sequences. (For information on compose sequences, see "Entering LICS Characters" earlier in this appendix.)

LICS Code	Character	Compose Sequence	LICS Code	Character	Compose Sequence
32	space		56	8	
33	!		57	9	
34	"		58	:	
35	#	++	59	;	
36	$		60	<	
37	%		61	=	
38	&		62	>	
39	'		63	?	
40	(		64	@	aa or AA
41	)		65	A	
42	*		66	B	
43	+		67	C	
44	,		68	D	
45	–		69	E	
46	.		70	F	
47	/		71	G	
48	0		72	H	
49	1		73	I	
50	2		74	J	
51	3		75	K	
52	4		76	L	
53	5		77	M	
54	6		78	N	
55	7		79	O	

LICS Code	Character	Compose Sequence
80	P	
81	Q	
82	R	
83	S	
84	T	
85	U	
86	V	
87	W	
88	X	
89	Y	
90	Z	
91	[	
92	\	
93	]	
94	^	
95	_	
96	`	
97	a	
98	b	
99	c	
100	d	
101	e	
102	f	
103	g	

LICS Code	Character	Compose Sequence
104	h	
105	i	
106	j	
107	k	
108	l	
109	m	
110	n	
111	o	
112	p	
113	q	
114	r	
115	s	
116	t	
117	u	
118	v	
119	w	
120	x	
121	y	
122	z	
123	{	(-
124	|	^/
125	}	)-
126	~	—
127	delete	

International Characters and Special Symbols

The following table defines LICS codes 128 through 255, which represent international characters and special symbols. It also lists all possible compose sequences. (For information on compose sequences, see "Entering LICS Characters" earlier in this appendix.)

Note



Certain characters in the table are either uppercase or lowercase—(UC) or (LC) are added to denote case where appropriate. Also, unknown characters are shown as ■.

LICS Code	Character	Compose Sequence
128	` (UC)	` spacebar
129	´ (UC)	' spacebar
130	^ (UC)	^ spacebar
131	¨ (UC)	" spacebar
132	~ (UC)	~ spacebar
133	■	
134	■	
135	■	
136	■	
137	■	
138	■	
139	■	
140	■	
141	■	
142	■	
143	■	
144	` (LC)	spacebar `
145	´ (LC)	spacebar '
146	^ (LC)	spacebar ^
147	¨ (LC)	spacebar "
148	~ (LC)	spacebar ~
149	ı	i spacebar
150	_ (ordinal)	_ spacebar
151	▲	ba
152	▼	ea
153	■	
154	hard space	spacebar spacebar
155	←	mg
156	■	
157	■	
158	■	
159	■	
160	Guilder	ff
161	¡	!!
162	¢	c| C| c/ or C/
163	£	l= L= l- or L-
164	“	"^
165	Yen	Y= y= Y- or y-
166	Peseta	PT pt or Pt
167	§	SO so So or s0
168	¤	XO xo Xo or x0
169	©	CO co Co or c0
170	ª	a_ or A_
171	«	< <
172	Δ	dd or DD
173	π	PI pi or Pi
174	≥	>=
175	÷	:-
176	°	^0
177	±	+-
178	²	^2
179	³	^3
180	”	"v
181	μ	/u
182	¶	!P or !p
183	·	^.
184	™	TM Tm or tm
185	¹	^1
186	º	o_ or O_
187	»	> >
188	¼	14
189	½	12
190	≤	=<
191	¿	? ?
192	À (UC)	A‘
193	Á (UC)	A’
194	Â (UC)	A^
195	Ã (UC)	A~
196	Ä (UC)	A"
197	Å (UC)	A*
198	Æ (UC)	AE
199	Ç (UC)	C,

F

LICS Code	Character	Compose Sequence
200	È (UC)	E‘
201	É (UC)	E’
202	Ê (UC)	E^
203	Ë (UC)	E"
204	Ì (UC)	I‘
205	Í (UC)	I’
206	Î (UC)	I^
207	Ï (UC)	I"
208	Ð (UC)	D-
209	Ñ (UC)	N~
210	Ò (UC)	O‘
211	Ó (UC)	O’
212	Ô (UC)	O^
213	Õ (UC)	O~
214	Ö (UC)	O"
215	OE ligature (UC)	OE
216	Ø (UC)	O/
217	Ù (UC)	U‘
218	Ú (UC)	U’
219	Û (UC)	U^
220	Ü (UC)	U"
221	Ÿ (UC)	Y"
222	Þ (UC)	P-
223	ß (LC)	ss
224	à (LC)	a‘
225	á (LC)	a’
226	â (LC)	a^
227	ã (LC)	a~

LICS Code	Character	Compose Sequence
228	ä (LC)	a"
229	å (LC)	a*
230	æ (LC)	ae
231	ç (LC)	c,
232	è (LC)	e‘
233	é (LC)	e’
234	ê (LC)	e^
235	ë (LC)	e"
236	ì (LC)	i‘
237	í (LC)	i’
238	î (LC)	i^
239	ï (LC)	i"
240	ð (LC)	d-
241	ñ (LC)	n~
242	ò (LC)	o‘
243	ó (LC)	o’
244	ô (LC)	o^
245	õ (LC)	o~
246	ö (LC)	o"
247	oe ligature (LC)	oe
248	ø (LC)	o/
249	ù (LC)	u‘
250	ú (LC)	u’
251	û (LC)	u^
252	ü (LC)	u"
253	ÿ (LC)	y"
254	þ (LC)	p-
255	■	

TigerFox

TigerFox is a game built into the HP 95LX. The best way to learn it is to play it, experimenting with different strategies and styles. This appendix contains information to get you started.

The Object of the Game

In TigerFox you move about in a maze pursuing a fox while a tiger is pursuing you! You get points for erasing the fox's trail and for catching the fox after all his trail is erased. You lose points for catching the fox when some of his trail remains, and the tiger gets points for catching you. The object of the game is simply to score as many points as you can. The game ends when the tiger's score is higher than yours.

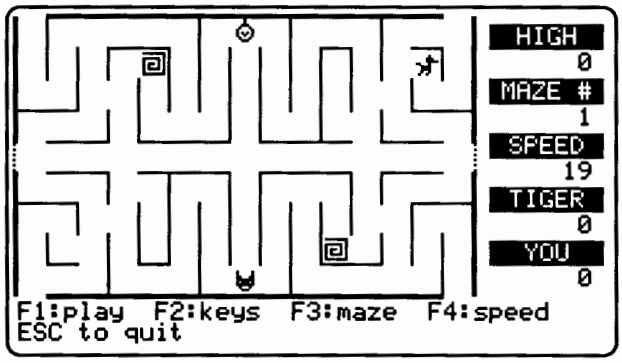
- You get 1 point per dot for erasing the fox's trail.
- You get 100 points for catching the fox with no trail left.
- You lose 250 points for catching the fox without erasing all his trail.
- The tiger gets 250 points for catching you.

Preparing to Play

To start TigerFox do the following:

1. Close all HP 95LX applications.
2. Press (▭) to start the Filer.
3. Use (▼) to highlight the file TF.COM.
4. Press RUN ((F4)).

Here's the first screen you'll see:



You are at the middle top, the tiger is at the middle bottom, and the fox is at the upper-right corner of the maze. Also, notice spiral-shaped maze changers that, if you run into them, lead you to other mazes. (There are 45 different mazes.)

G

At the right of the display is the status area, and at the bottom are the descriptions of the active function keys.

F1:play	Starts play.
F2:keys	Redefines the two movement keys.
F3:maze	Selects the next maze. ((⇧) (F3) selects the previous maze.)
F4:speed	Increases the speed of movement. ((⇧) (F4) decreases the speed.)

During the game, you control your movement by changing your direction, not your speed. (You're moving all the time, unless you're blocked by a wall ... or eaten by the tiger.) The ◀ key rotates you $^1/_4$ turn to the left (counterclockwise) each time you press it, and the ▶ key rotates you $^1/_4$ turn to the right (clockwise) each time you press it. You automatically try to move the direction you're pointing. (Note that you can redefine these movement keys to be any keys you want by using F2.)

Two other keys are worth noting:

Spacebar	Temporarily suspends play. Pressing any key resumes play.
ESC	Quits the game and returns you to the Filer.

Now ... Let's Play

If you followed the instructions under "Preparing to Play," you should see the maze on the screen. If this is one of your first times playing, you might want to use ⇧ F4 to reduce the speed to a more comfortable level until you get used to moving around the maze.

When you're ready, press F1 and then any other key to start play. Have fun!

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Part 3: The Personal Information Manager

Part 4: The HP Financial Calculator

Part 5: Data Communications

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