

USING LOTUS® SPREADSHEET FOR DESKMATE®



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Using Lotus® Spreadsheet for DeskMate®



Dennis Taylor

Que® Corporation
Carmel, Indiana

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Library of Congress Catalog No.: 90-61527

ISBN: 0-88022-575-0

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94 93 92 91 90 8 7 6 5 4 3 2 1

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About the Author

Dennis Taylor is an independent PC consultant and teacher living in Boulder, Colorado. He has taught over 5000 hours of classes and seminars in personal computer topics for clients such as IBM, AT&T, US West, Texaco, Levi Strauss & Co., and the University of Colorado. He has written workbooks for AT&T and Businessland, and is the revision author of *1-2-3 Release 2.2 QuickStart* and the technical editor of *1-2-3 Release 2.2 Quick Reference Guide*, both published by Que Corporation.

Publishing Director

David P. Ewing

Product Line Director

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Editors

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Schoolbook by reVisions Plus, Inc.,
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Conventions Used in this Book

A number of conventions are used in *Using Lotus Spreadsheet for DeskMate* to help you learn the program. An example is provided for each convention to help you distinguish among the different elements in Lotus-DM.

References to keys are as they appear on the keyboard of the IBM personal computer. The function keys, F1 through F10, are used for special situations in Lotus-DM, such as accessing a menu from the main menu bar. In the text, the name of the key is usually followed by the key number in parentheses: File (F2).

Direct quotations of words that appear on-screen are printed in a special typeface; field names in dialog boxes also appear in this special typeface. Information you are asked to type is printed in **boldface**.

Elements printed in uppercase letters include range names (for example, SALES), @functions (@SUM), modes (READY), and cell references (A1..A5).



Note: Notes in the text are indicated by a special check-box icon that makes locating these bits of information easier.

Introduction

Since 1983, Que has helped more than two million spreadsheet users learn the commands, features, and functions of Lotus 1-2-3. *Using 1-2-3*—through three editions—has become the standard guide to Lotus 1-2-3 for both new and experienced users worldwide.

With the publication of *Using Lotus Spreadsheet for DeskMate*, Que uses this experience to bring you the most comprehensive tutorial and reference available for the new Lotus Spreadsheet for DeskMate (Lotus-DM). Que's unprecedented experience with Lotus spreadsheets—including 1-2-3, Symphony, and now, Lotus-DM—has resulted in this high-quality, informative book.

Because Lotus-DM is based on 1-2-3, much of the knowledge and experience accumulated from years of using 1-2-3 goes into this book. This experience, combined with the editorial expertise of the world's leading publisher of books on Lotus spreadsheets, brings you outstanding tutorial and reference information.

Using Lotus Spreadsheet for DeskMate is the best available guide to Lotus-DM. Whether you are using Lotus-DM for inventory control, statistical analysis, or portfolio management, this book is designed for you. Like other editions of the *Using 1-2-3* series, *Using Lotus Spreadsheet for DeskMate* leads you step by step from spreadsheet basics to the advanced features of the program.

Whether you are a new user of spreadsheets or an experienced user of 1-2-3 now using Lotus-DM, this book will occupy a prominent place next to your computer as a valued reference to your most-used spreadsheet program.

Who Should Read This Book

Using Lotus Spreadsheet for DeskMate is written and organized to meet the needs of a wide range of readers, from first-time users of Lotus-DM to experienced Lotus 1-2-3 users who want to use Lotus-DM.

If Lotus-DM is your first spreadsheet package, this book helps you learn all the basics so that you can quickly begin using the software. In particular, the first five chapters teach you basics of Lotus-DM commands, special uses of the keyboard, features of the Lotus-DM screen, and methods for creating and modifying Lotus-DM worksheets.

Whether you are new to Lotus-DM or an experienced 1-2-3 user, *Using Lotus Spreadsheet for Deskmate* provides tips and techniques to help you get the most from Lotus-DM.

How This Book Is Organized

Flip quickly through this book; you can get a sense of its organization and layout. The book is organized to follow the natural flow of learning and using Lotus-DM.

Part I: Building the Worksheet

Chapter 1, "An Overview of Lotus-DM," presents a general look at the uses, features, and commands in Lotus-DM. This chapter also introduces the general concepts of Lotus-DM as a spreadsheet program and explains the program's major uses: creating worksheets, databases, and graphics.

Chapter 2, "Getting Started," helps you begin using Lotus-DM for the first time, including how to start and exit from the program, the special uses of the keyboard, the features of the Lotus-DM screen display, and how to get on-screen help.

Chapter 3, "Learning Worksheet Basics," introduces the concepts of worksheets and files, teaches you how to move the cell pointer around the worksheet, and explains how to enter and edit data.

Chapter 4, "Using Fundamental Lotus-DM Commands," teaches you how to use the Lotus-DM menus to access the fundamental commands for building worksheets. You also learn how to save and retrieve worksheet files.

Chapter 5, "Formatting Cell Contents," shows you how to change the way data appears on-screen, including the way values, formulas, and text are displayed. You also learn how to suppress the display of zeros in a worksheet.

Chapter 6, "Managing Files," explains the commands related to saving, erasing, and listing files. You also learn ways to combine data from several files and extract data from one file to another.

Part II: Creating Reports and Graphs

Chapter 7, "Printing Reports," shows you how to print a report immediately or create a file to be read by another program. You learn how to create a basic report, and then how to enhance it by using commands to add elements such as headers and footers. You also learn how to change margins and how to change the type size used for reports.

Chapter 8, "Creating and Displaying Graphs," shows you how to take advantage of Lotus-DM's graphics capabilities by creating basic line, bar, stacked-bar, XY, and pie graphs. You also learn how to enhance basic graphs in a variety of ways, including adding legends and titles, changing scale, and displaying graphs in color.

Chapter 9, "Printing Graphs," teaches you how to use the PrintGraph program to print graphs and to improve the appearance of printed graphs. You also learn how to tailor PrintGraph to your particular hardware setup.

Part III: Using Lotus-DM as a Database Manager

Chapter 10, "Managing Data," introduces the advantages of Lotus-DM's database capabilities and shows you how to create, modify, and maintain data records, including sorting, locating, and extracting data. You also learn about the special commands and features of Lotus-DM data management, such as database statistical functions, parsing data to use in the worksheet, and regression analysis.

Part IV: Quick Reference

The Function Reference section is a quick, easy-to-use, comprehensive guide to the 89 @functions available in Lotus-DM. @functions fall into these general categories: mathematical (including general, logarithmic, and trigonometric), statistical, financial, accounting, logical, special, date, time, and string functions. For easy reference, the @functions are organized in this section in alphabetical order; each @function is explained and demonstrated with examples.

The Appendix of this book shows you how to install Lotus-DM for your hardware and operating system.

Other Titles To Enhance Your Personal Computing

Although *Using Lotus Spreadsheet for DeskMate* is a comprehensive guide, no single book can fill all your Lotus-DM and personal computing needs. Que Corporation publishes a full line of microcomputer books that complement the material found in this book.

Several Que books can help you learn and master your operating system. *Using DOS* is an excellent guide to the DOS operating system. If you prefer to get up and running with DOS fundamentals quickly, try *MS-DOS QuickStart*. This graphics-based tutorial helps you teach yourself the fundamentals of DOS.

You are probably using Lotus-DM on a personal computer equipped with a hard-disk drive. The key to efficient computer use is effective hard-disk management. Que's *Using Your Hard Disk* shows you how to get the most from your hard disk by streamlining your use of directories, creating batch files, and more. This well-written text is an invaluable addition to your library of personal-computer books.

As you may be aware, Lotus-DM runs faster on more powerful computing equipment. If you find that your current computer hardware does not give you the level of performance you want, examine Que's *Upgrading and Repairing PCs*. This informative text shows you how to get the most from your current hardware and how to upgrade your system to get the most from high-powered software. Mark Brownstein called this book "one of the best books about the workings of personal computers I've ever seen; it will be a useful, easy-to-read, and interesting addition to most anyone's library."

All these books can be found in better bookstores worldwide. In the United States, call Que at 1-800-428-5331 to order books or obtain further information.

Using Lotus Spreadsheet for DeskMate follows the Que tradition of providing quality text targeted appropriately for the Lotus-DM user. Although dedicated to this goal, Que ultimately has only one way of improving—by hearing from you. Let Que know how you feel about this book or any other Que title. Que wants to keep improving its books, and you are the best source of information.

Part I

Building the Worksheet

This Part Includes:

An Overview of Lotus-DM

Getting Started

Learning Worksheet Basics

Using Fundamental Lotus-DM Commands

Formatting Cell Contents

Managing Files

6 Part I: Building the Worksheet

An Overview of Lotus-DM

For more than six years, Lotus 1-2-3 has been the dominant spreadsheet software product used with the DOS operating system. It has become the standard by which other spreadsheet programs are measured.

To remain the leader in microcomputer spreadsheet software, Lotus Development Corporation developed Lotus Spreadsheet for DeskMate (Lotus-DM), based on the best-selling Lotus 1-2-3 series. Not only does Lotus-DM maintain the overall functionality, command structure, and screen and keyboard features of 1-2-3, it also utilizes the features of Tandy Corporation's DeskMate graphical user interface to simplify the building of spreadsheets and greatly reduce learning time. A major difference between Lotus 1-2-3 and Lotus-DM is that Lotus-DM takes full advantage of a pointing device (such as a mouse). Many people prefer to use a mouse instead of the keyboard because the mouse can be more intuitive and faster. More and more software packages are being introduced that can be operated with either a keyboard or a mouse.

What is DeskMate?

DeskMate is a graphical interface: it uses pull-down menus and pop-up dialog boxes. It's a visual approach to using computers so that you don't have to rely on your memory to recall a bewildering array of commands and symbols. You spend less time learning *how* to use the software and more time actually *using* it.

Additionally, DeskMate is a collection of software programs that includes a spelling checker, an on-screen calculator, a "to do" list, an address book, a word processor, a corkboard (for notes), a calendar, an alarm (reminder), and a small worksheet. All these features are designed to use similar graphical features; if you learn how to use one of them, you are well on your way to learning others. Because an increasing number of popular programs have been redesigned to work in the DeskMate environment, your incentive for using some of these programs is enhanced.

If you have purchased the DeskMate software, you can take advantage of the address book, calendar, and other features. When you use Lotus-DM with DeskMate, you have both a powerful spreadsheet and access to a broad group of utility programs that have a similar look and “feel.” The DeskMate environment facilitates the sharing of data among programs within this environment.

Cue:

You can use Lotus-DM even if you don’t have the DeskMate software.

If you do not have DeskMate installed on your computer, you can still use Lotus-DM because it contains what is known as a *run-time version* of DeskMate. The run-time version does not give you access to any of the DeskMate features such as the word processor and corkboard; the run-time version simply enables you to use Lotus-DM by taking advantage of all the graphical features that are the hallmark of DeskMate.

What is Lotus-DM?

Reminder:

You can use Lotus-DM to create three kinds of applications: worksheets, databases, and graphs.

The reasons for Lotus 1-2-3’s popularity apply equally to Lotus-DM. Lotus-DM provides users with three fundamental applications integrated in one program. Without having to learn three separate kinds of software, you can perform financial analysis with a Lotus-DM worksheet, create database applications, and create graphs. Commands for all three applications are combined in a single menu system for easy access. When you select a command, you are presented with logical alternatives to guide you through each step of a task.

This chapter presents an overview of Lotus-DM. Specifically, you learn about the following topics:

- ❑ The general capabilities of Lotus-DM (presented especially for readers new to Lotus-DM)
- ❑ Features that identify Lotus-DM as a spreadsheet program, including creating, modifying, and using Lotus-DM worksheets
- ❑ File-management capabilities and worksheet and file protection
- ❑ The creation of Lotus-DM reports, graphs, and databases
- ❑ The hardware and operating system requirements for Lotus-DM

If you have used Lotus 1-2-3, you will find Lotus-DM no different in its primary functions. You can use Lotus-DM to create simple to complex financial applications; to organize, sort, extract, and find information; and to create and print graphs.

Using Lotus-DM as an “Electronic” Accountant’s Pad

You can think of Lotus-DM as an electronic accountant’s pad or an electronic spreadsheet. Whenever you start Lotus-DM, your computer screen displays a column-and-row area into which you can enter text, numbers, or formulas—just as an accountant can on a sheet of a columnar pad with the help of a calculator (see fig. 1.1).

The *worksheet* is the basis of Lotus-DM. Whether you are working with a database application or creating graphs, you complete both operations within the structure of the worksheet. Graphs are created from data entered in the worksheet, and database operations are performed on data organized into the worksheet’s column-and-row format.

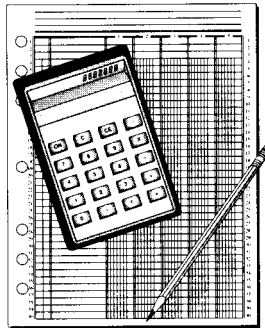


Fig. 1.1.
***Lotus-DM as an
accountant's
columnar pad.***

Regardless of the application, you initiate all commands from the menu bar (see fig. 1.2). You also enter data in the same way for all operations. All data—text, numbers, and formulas—is stored in individual cells in the worksheet. The location of a cell is indicated by the intersection of a column and row on the worksheet. If you type a number in the cell two rows down from the top border and three columns to the left of the left border, you are entering the number in cell C2 (see fig. 1.3). Columns in the worksheet are marked by letters from A to IV; rows are marked by numbers from 1 to 8,192.

Reminder:
You enter all data into a worksheet, regardless of how you want to use the data.

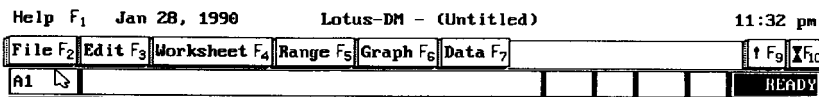
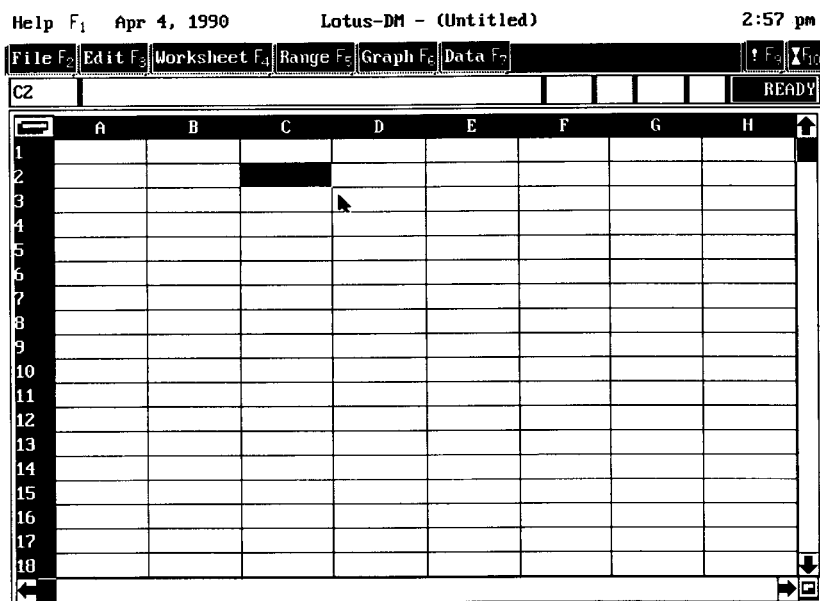


Fig. 1.2
***The
Lotus-DM
Menu bar.***

Fig. 1.3.
A Lotus-DM
worksheet cell.



Potentially, you can fill more than 2,000,000 cells in a single worksheet. Most likely, few users need or have computer equipment to handle this much data. At the minimum, Lotus-DM requires 512 kilobytes (K) of memory. See table 1.1 for a complete list of Lotus-DM specifications. Also, see the section “Understanding Lotus-DM Hardware Requirements and Options” later in this chapter.

Table 1.1
Lotus-DM at a Glance

Published by	Lotus Development Corporation 55 Cambridge Parkway Cambridge, Massachusetts 02142
System Requirements	Tandy Personal Computer or PC compatible supported by DeskMate (most computers that can run DOS)
Display	VGA, EGA, or CGA color or monochrome, and a graphics board, if not built into your system
Disk Drives	Single or dual floppy disk drives, or one hard disk drive and a floppy drive

Table 1.1 (continued)

Memory	512K RAM; expanded memory is not supported
Operating System	DOS Version 3.2. or later DeskMate Version 3.0 or later
Price	\$495



Note: You must have DOS installed on your computer to use Lotus-DM. If you have DeskMate installed on your computer, make sure that it is version 3.0 or later. If you don't have DeskMate, you can install Lotus-DM with a run-time version of DeskMate. If you use the run-time version of DeskMate, you cannot use DeskMate features such as the desktop calendar and calculator.

Creating Formulas

Because Lotus-DM's primary use is financial applications, its capability to develop formulas is one of its most sophisticated and yet easy-to-use features. You can create a formula as simple as adding the values in two cells of a worksheet:

+A1+B1

When you enter this formula in another cell, such as C1, the value stored in cell A1 is added to the value stored in B1. The formula does not depend on the specific values contained in A1 and B1, but adds whatever values are entered. If A1 contains the value 4, and B1 the value 3, the formula computes to 7. If you change the value in A1 to 5, the formula automatically recalculates to 8. You can create formulas with the following operators: addition (+), subtraction (–), multiplication (*), division (/), and exponentiation (^). Creating formulas is discussed in Chapters 3 and 4.

In addition to entering formulas that calculate numeric results, you can access data from one worksheet file for use in another worksheet file. See Chapter 6 for more information on combining data from different files.

Recalculating Formulas in Lotus-DM

Cue:
Lotus-DM can recalculate formulas automatically whenever you change relevant data.

As you create formulas, Lotus-DM recalculates and updates the worksheet. Normally, Lotus-DM recalculates the file whenever you change any cell. This feature is called *automatic recalculation*. Large worksheets can take a long time to recalculate, however, slowing work greatly. If you find that automatic recalculation slows you down, you can choose manual recalculation, a feature that allows you to make changes and entries throughout the worksheet without any formulas being recalculated; when you're ready to have all the formulas recalculated, you press a special key combination.

Playing "What If" with Lotus-DM

Because Lotus-DM remembers the relationships between cells and does not simply calculate values, you can change a value in a cell and see what happens when your formulas automatically recalculate. This "what if" capability makes Lotus-DM an incredibly powerful tool for many types of analysis. You can, for example, analyze the effect of an expected increase in the cost of goods and determine what kind of price increase may be needed to maintain your current profit margins.

Using Lotus-DM Functions

Reminder:
Lotus-DM provides 90 functions that let you create complex formulas for a wide range of applications.

Without the capabilities to calculate complex mathematical, statistical, logical, financial, and other types of formulas, building applications in Lotus-DM would be difficult. Lotus-DM, however, provides 90 functions that let you create complex formulas for a wide range of applications, including business, scientific, and engineering applications. Instead of entering complicated formulas containing operators and parentheses, you can use functions as a shortcut to creating such formulas.

All functions in Lotus-DM begin with the @ sign followed by the name of the function—for example, @SUM, @RAND, @ROUND. Many functions require that you enter an *argument* (the specifications of the functions needed to calculate the formula) after the function name.

Functions fall into seven categories: mathematical and trigonometric, statistical, financial and accounting, logical, special, date and time, and string.

Mathematical Functions

The mathematical functions, which include logarithmic and trigonometric functions, provide convenient tools that let you easily perform a variety of standard arithmetical operations such as adding and rounding values or calculating square roots. For engineering and scientific applications, Lotus-DM includes all standard trigonometric functions, such as those to calculate sine (@SIN), cosine (@COS), and tangent (@TAN).

Statistical Functions

Lotus-DM includes a set of seven statistical and seven database statistical functions that allow you to perform standard statistical calculations on your worksheet data or in a Lotus-DM database. You can find minimum and maximum values (@MIN and @MAX), calculate averages (@AVG), and compute standard deviations and variances (@STD and @VAR). Database statistical functions are specialized versions of the statistical functions; these functions all begin with the characters @D (for example, @DSUM) and are used in database applications.

Financial Functions

Financial functions allow you to perform a series of discounted cash flow, depreciation, and compound-interest calculations that considerably ease the burden and tedium of investment analysis and accounting or budgeting for depreciable assets. Specifically, the Lotus-DM functions include two that calculate returns on investments (@IRR and @RATE), one that calculates loan investments (@PMT), two that calculate present values (@NPV and @PV), one that calculates future values (@FV), two that perform compound-growth calculations (@TERM and @CTERM), and three that calculate asset depreciation (@SLN, @DDB, and @SYD).

Reminder:
Lotus-DM provides functions that you can use to perform financial analysis.

Logical Functions

The logical functions let you add standard Boolean logic to your worksheet and use the logic either alone or as part of other worksheet formulas. Essentially, each of the logical functions allows you to test whether a condition—either one you've defined or one of Lotus-DM's predefined conditions—is true or false. The @IF function, for example, tests a condition and returns one result if the condition is true and another if the condition is false.

Special Functions

Special functions are tools for dealing with the worksheet itself. For example, one special function returns information about specific cells. Others count the number of rows or columns in a range. @CELL and @CELLPOINTER can return up to 10 different characteristics of a cell, including type (blank, value, or label), address, prefix, format, and width of a cell.

Date and Time Functions

The date and time functions allow you to convert dates, such as June 7, 1990, and times, such as 11:00 A.M., to serial numbers, and then use the serial numbers to perform date and time arithmetic. These functions are a valuable aid when dates and times affect worksheet calculations and logic. Date and time functions also are useful for documenting worksheets and reports. For example, you can enter date and time functions that display the current date and time in your worksheet. If you include the cells that contain these functions in the print range when you print a report, the report shows the date and time at which you prepared the report.

String Functions

String functions help you manipulate text. You can use string functions to repeat text characters, to convert letters in a string to uppercase or lowercase, and to change strings to numbers or numbers to strings. You also can use string functions to locate, extract, or replace characters.

Using the Lotus-DM Menu Bar

The worksheet is the basis for all applications you create, modify, and print in Lotus-DM. You enter data in the form of text, numbers, and formulas into your worksheet; a single menu bar lets you format, copy, move, print, create a graph, and perform database operations on this data. In addition to the activities accessed by the menu bar, Lotus-DM provides menu commands that allow you to save and open your worksheet as a file on disk, manage and change files, and read files in formats different from a Lotus-DM worksheet file format.

The menu bar is always displayed at the top of the screen. You access commands on the menu by pressing the function key next to the desired command. Alternatively, you can use the mouse to point to the box containing the com-

mand you want to access and then click the mouse. A pull-down menu of other options appears (see fig. 1.4). You can access commands from the pull-down menus in one of three ways:

- ❑ Press the key corresponding to the first letter of the desired command. If more than one command starts with that letter, press the letter key until the command you want is highlighted. Then press Enter.
- ❑ Press the up and down arrows (↑ and ↓) to highlight the desired command. Then press Enter.
- ❑ Point to the command with the mouse pointer and click the left mouse button.

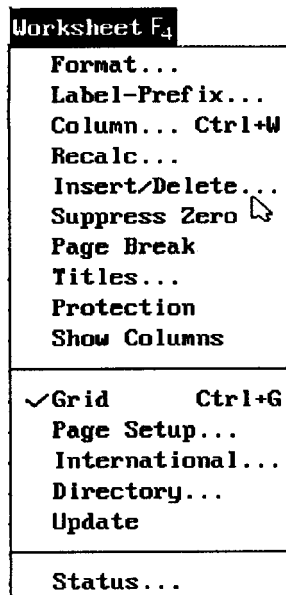


Fig. 1.4.
The Worksheet
pull-down menu.

You can use any of these methods to select an option from a pull-down menu. This book uses the phrase *select the command* or *choose the command* to refer to these methods.



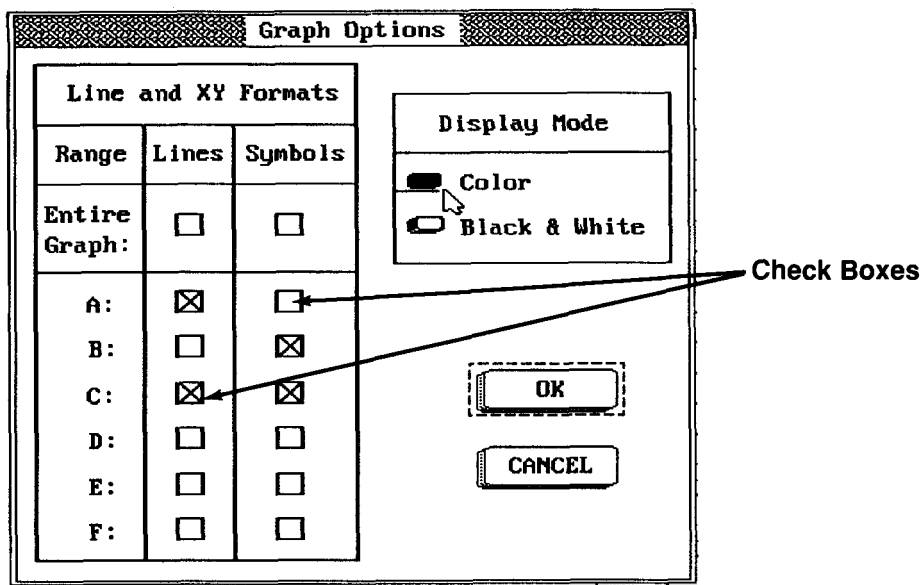
Note: Throughout this book, the term *click* is used to refer to the action of pressing the left button on the mouse (whether the mouse has two or three buttons). The terms *point and click* and *point and double-click* refer to the complete action required to select particular commands, make selections, or activate features.

Reminder:
Lotus-DM has more than 400 commands that enable you to perform many operations.

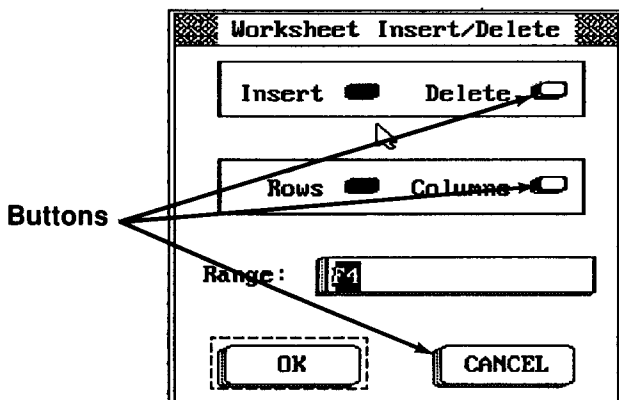
The commands in the menu bar lead to many sublevels of commands; more than 400 commands in total. You use some commands frequently whenever you create or modify a worksheet application. Other commands, such as specialized database commands, you may rarely or never use. Throughout this book, new commands are highlighted and discussed. The following sections briefly introduce the commands you probably will use most frequently—those commands used to create and modify worksheet applications.

As you explore Lotus-DM's menu bar, notice that if you choose a command followed by three dots, you see a dialog box. A dialog box typically provides you with additional selections or options. Using a mouse or the keyboard arrow keys, you can highlight choices and affirm your selection with the **OK** button in the dialog box. Dialog boxes use two types of presentations for options: check boxes and buttons. A *check box* contains a number of options from which you can choose some, all, or none. If you use a mouse, you can click those items you want; if you use the keyboard, use the **Tab** key or the arrow keys to highlight the selections, and then press the space bar to mark the selection (see fig. 1.5).

Fig. 1.5.
The Graph Options dialog box containing check boxes for lines and symbols.



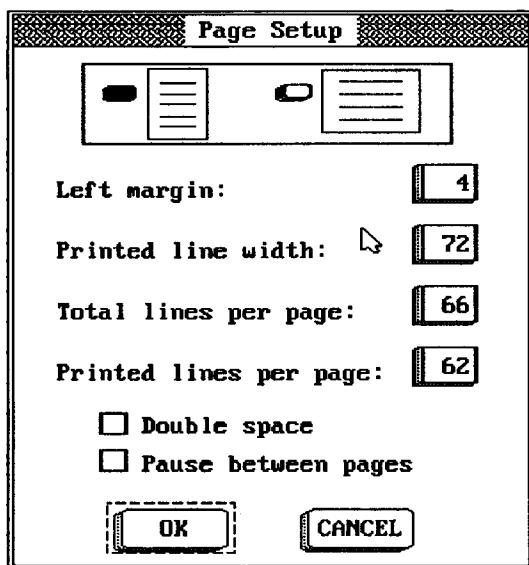
Buttons are used for mutually exclusive selections. In the Worksheet Insert/Delete dialog box shown in figure 1.6, you can choose the Insert or the Delete option, but you cannot choose both. Likewise, you can choose **Rows** or **Columns**, but not both.



*Fig 1.6
The Worksheet
Insert/Delete dialog
box with buttons.*

In addition to listed options from which you select, your use of dialog boxes may include typing file names, range names, or directory locations.

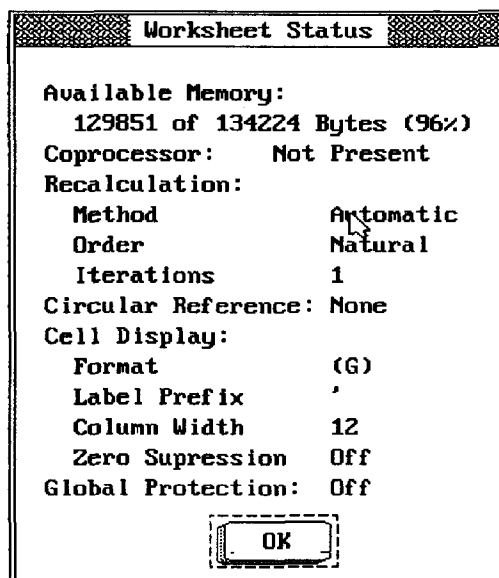
Dialog boxes are also informational. For commands that require you to make more than one option selection, the dialog box shows the current settings. The dialog box that appears when you select the File Page Setup command, for example, shows you the status of six different settings (see fig. 1.7).



*Fig. 1.7.
The Page Setup
dialog box
showing the
current
settings that
can be
changed.*

The Worksheet Status command shows you a screen consisting of global settings, with no options whatsoever (see fig. 1.8). At a glance, you can tell the amount of memory available in RAM and the global settings for numeric formats, column-width, and the type of recalculation method being used.

Fig. 1.8.
The Worksheet
Status dialog
box showing
global settings
that cannot be
changed.



Using File Commands

The type of file you create most often with Lotus-DM is a *worksheet file*. This type of file saves all the data, formulas, and text entered into a worksheet and also saves such things as format of cells, alignment of text, names of ranges, and protection status. Worksheet files are stored with the extension WK1. You also can create and save two other types of files: *text files* (denoted with the extension PRN) and *graph-image files* (denoted with the extension PIC). All three of these extensions are used in the same manner as they are in Lotus 1-2-3 Releases 2.0, 2.01, and 2.2.

The File (F2) commands provide a wide range of file management, modification, and protection capabilities. Some File commands are similar to operating-system commands, such as those that enable you to erase or list files. Other commands relate to specific Lotus-DM tasks and applications. You can, for example, combine data from several files and extract data from one file to another file.

Using Other Program Files with Lotus-DM

In addition to options for managing, modifying, and protecting files, you can use the File Translate command to translate several file formats that differ from the Lotus-DM worksheet file format. You can, for example, convert dBASE III files, DeskMate worksheets, and files in DIF format and use them in Lotus-DM.

You do not have to use the File Translate command to read worksheet files created by Lotus 1-2-3 Releases 1A, 2.01, and 2.2 or Symphony Versions 1.1, 1.2, and 2. See Chapter 6 for a complete discussion of File commands.

Creating a Backup File in Lotus-DM

Two of the most important File commands are File Save and File Save As. These commands allow you to save the file in memory to disk so that you can retrieve and use the file again. The File Save command is used to update existing files. File Save As is used to name and save files for the first time or to create a new file that is a variation of an old file with a different name. File Save As encourages the concept of *backup files*—storing similarly constituted worksheets under different names.

Printing Reports

After you create your worksheets, you often want to create reports from the data you entered. By using Lotus-DM's Print features, found in the File (F2) and Worksheet (F4) commands, you can print an entire worksheet or any part of the worksheet. In addition to sending data files directly from Lotus-DM to the printer, you can save worksheet data in a text file so that the data can be incorporated in another program, such as a word processing program.

The Print commands in Lotus-DM include options for developing page-layout features—setting margins, indicating text for headers and footers, telling Lotus-DM to print certain column or row data on every page, setting the length of the page, and printing data as displayed on-screen or in formula notation.

Using Edit Commands

The Edit (F3) commands fall into two general categories: those that relate strictly to Lotus-DM, as do most commands; and those that utilize DeskMate features. Even if you only have the run-time version of Lotus-DM, you can use these DeskMate features. The Edit Cut, Edit Copy, and Edit Paste commands all use the concept of a *clipboard*, a storage area in DeskMate where you copy

or move data to or from. Ultimately, this concept allows the sharing of data between Lotus-DM and other programs running under the DeskMate environment.

Two other Edit commands are commonly used to create and modify worksheet applications. Both the Edit Copy Range and Edit Move Range commands let you copy and move data from one cell or range of cells to another in the worksheet.

Reminder:
Use the Edit Copy Range command to copy text, numbers, formatting, and formulas.

The Edit Copy Range command can save you hours of time by letting you duplicate text, numbers, formatting, and formulas. Edit Copy Range is one of the most powerful commands in Lotus-DM, and copying formulas is surely one of the most important functions of this command. You can create a few key formulas and then copy them to other parts of the worksheet.

When you use the Edit Move Range command, not only can you move the contents of one cell to another, you can move the contents of a large range of cells to another area of the worksheet.

Using Worksheet and Range Commands

Understanding the Lotus-DM worksheet structure and the effect of certain commands on the worksheet is one of the first steps in using Lotus-DM successfully. When you begin to investigate the Lotus-DM menu bar, you find that some commands affect the whole worksheet, and other commands affect only a portion or block of cells in the worksheet, referred to as a *range*.

As a new Lotus-DM user, keep in mind whether you want a command to affect the entire worksheet or just a specific range. The following sections discuss both Worksheet and Range commands.

Using Worksheet Commands

Reminder:
Use Worksheet commands to affect the entire worksheet or rows and columns.

The Worksheet (F4) command on the Lotus-DM menu bar allows you to make changes to either the whole worksheet or to the columns and rows in the worksheet. With Worksheet commands, you can specify the way numbers and formulas appear in a worksheet—in percentage format, currency format, comma format, and so on. Other commands that affect the overall worksheet include those for inserting and deleting columns and rows.

Some Worksheet commands let you change the way data and graphs appear on-screen. You can, for example, freeze certain columns or rows so that they remain on-screen even though you move the cell pointer to other areas of the worksheet. Another Worksheet command displays a status report showing such information as how much memory is available and what settings are in effect for the worksheet.

Protecting Files and Worksheets

Lotus-DM allows you to assign a password to a file so that file retrieval is restricted to only those who know the password. You may, however, want to give other users access to a file but restrict their ability to make changes or delete—intentionally or unintentionally—data in the application. The Worksheet Protection and Range Protect/Unprotect commands allow you to protect any area of your worksheet from change. (See Chapter 4 for more information on Worksheet Protection and Range Protect/Unprotect.)

Cue:

Protect your files with a password so that only those who know the password can retrieve the file.

Using Range Commands

Rather than making changes to the entire worksheet, sometimes you may want to affect a smaller section of the worksheet. Range (F5) commands can affect a single cell or a range of cells.

One of the most useful Range commands lets you attach a name to a single cell or a range of cells. By giving a column of numbers the name QTR1, for example, you can create a formula that totals the numbers by simply entering the function @SUM followed in parentheses by the range name—@SUM(QTR1). Range names also are useful for printing. Rather than defining the exact cell boundaries for an area you want to print, you can give that area a name and enter the name when you are prompted for a print range. Other uses for range names include naming parts of a worksheet so that you can easily move the cell pointer from one area to another. As you become accustomed to using range names, you find many occasions when range names simplify and save time as you create and use worksheet applications.

Reminder:

Use Range commands to change one cell or a range of cells.

Range commands offer many other capabilities. For instance, you can use Range commands to control the way data in one cell or a range of cells appears on-screen and prints. You can, for example, change the way numbers and formulas are displayed; indicate whether you want text to be aligned to the left, right, or center of the cell; and justify the right margin of a block of text that spans many rows of the worksheet. You also can change data displayed in column format to row format and vice versa.

In addition, you use Range commands to protect certain areas of the worksheet so that you or other users do not accidentally change, erase, or overwrite data.

Using Graph Commands

When Lotus 1-2-3 was first introduced in 1983, business users quickly recognized the advantages of using worksheet data in graphs produced by the same

worksheet program. Lotus-DM lets you create five types of graphs: line, bar, XY, stacked-bar, and pie graphs.

Beyond creating a simple graph, Lotus-DM Graph (F6) commands let you enhance and customize graphs for your needs. You can, for example, add titles to label data points, change the format of values displayed on a graph, create a grid, and change the scaling along the x-axis or y-axis. By naming the settings you enter to create a graph and saving them with that name, you can redisplay the graph whenever you access the file in the future.

Lotus-DM also gives you the option of saving the graph for printing on a printer or plotter. When you save a graph, Lotus-DM gives the file a special PIC extension. You later can print this file by using Lotus-DM's separate PrintGraph program, accessible from within Lotus-DM, from DeskMate, or from DOS.

The PrintGraph program offers several formatting options. For example, you can change the size of the graph, choose two fonts from among a selection of different styles, and select whether to print the graph upright or rotated across the length of the paper. You can find more information about PrintGraph in Chapter 9.

Using Data Commands and Functions

The column-and-row structure used to store data in the Lotus-DM worksheet is similar to the structure of a relational database. Lotus-DM provides true database-management commands and functions that you can use to sort, query, extract, and perform statistical analysis on data. One important advantage of Lotus-DM's database manager over independent database programs is that its commands are similar to the other commands used in the Lotus-DM program. You can, therefore, learn how to use the Lotus-DM database manager along with the rest of the Lotus-DM program.

After you build a database in Lotus-DM (which is no different from building any other worksheet application), you can perform a variety of functions on the database. For example, you can add records or fields to a database using selected options in the Worksheet Insert/Delete command. Editing the contents of a database cell is as easy as editing any other cell; you simply move the cell pointer to that location, press Edit (Ctrl-F2), and type the new entry.

You also can use the Data (F7) commands to sort data on primary and secondary keys, in ascending or descending order, or using alphabetic or numeric keys. In addition, you can perform various kinds of mathematical analyses on a field of data over a specified range of records using database functions. For example, you can count the number of times database records match a set of criteria (@DCOUNT); compute a mean (@DAVG), variance (@DVAR), or

Reminder:

Use database functions to analyze your database records.

standard deviation (@DSTD); and find the maximum or minimum value in the range (@DMAX or @DMIN). The capacity to perform a statistical analysis on a database is an advanced feature of database-management systems on any microcomputer.

Other database operations require database commands, such as Data Query Unique and Data Query Find Next (or Previous). You can query a Lotus-DM database in several ways. After specifying the criteria on which you are basing your search, you can ask the program to point to each selected record in turn, or to extract the selected records to a separate area of the worksheet. You also can ask the program to delete records that fit your specified criteria.

The Data Query commands require that you specify one or more criteria for searching the database. The criteria refer to a field in the database and set the conditions that data must meet to be selected. Lotus-DM allows a great deal of latitude in defining criteria. You can include in the criteria range as many as 256 cells across, each containing multiple criteria. Criteria can include complex formulas as well as simple numbers and text entries. You can use the AND and OR operators to join two or more criteria. You also can include wild-card characters that stand for other characters in the criteria.

The combination of database functions and Lotus-DM's database commands make the program a capable data manager. Lotus-DM's data-management capabilities, however, do not put the program in competition with more sophisticated database languages such as dBASE III Plus, dBASE IV, Paradox, or R:base. These programs use a database language to translate the user's requests to the computer. By comparison, Lotus-DM's data management is fairly simple. (Lotus-DM's data management capabilities are covered in Chapter 10.)

Using the Data Table Command

One of the most useful, but most misunderstood, Data command is Data Table. A *data table* is simply a way to look at all the outcomes of a set of conditions without having to enter each set into the equation manually. The Data Table command allows you to build a table that defines the formula you want to evaluate and contains all the values you want to test. A data table is similar to the X-Y decision grids you probably built as a math student in high school.

You can use the Data Table command to structure a variety of "what if" problems. You also can combine this command with Lotus-DM's database and statistical functions to solve far more complex problems. (Chapter 10 explains the Data Table command and gives examples that help you master this powerful tool.)

Figuring Multiple Regression and Simultaneous Equations

Lotus-DM's multiple regression command significantly expands the program's capabilities for statistical analysis. If you use regression analysis, the Regression command can save you the cost of a stand-alone statistical package. For business applications, the Data Regression command probably meets all your regression-analysis needs.

You can use the Data Matrix commands to solve systems of simultaneous equations. These commands, although likely to be of greater interest to scientific and engineering users, are available if needed.

Understanding Lotus-DM Hardware Requirements and Options

Lotus-DM is capable of running on computer systems configured with just two floppy disks, a monochrome monitor, and 512K of random-access memory (RAM). However, if you use Lotus-DM for serious business purposes, you are likely to have much more sophisticated hardware. In the following sections, the minimum requirements are described as well as some of the more useful options.

Operating System and Hardware Requirements

Lotus-DM can run on any 8088-, 8086-, 80286-, or 80386-based personal computer compatible with Tandy or IBM personal computers. For reasons of greater responsiveness and ease of use, a computer with an 80286 (or later) processor is recommended. Your system must have at least two floppy disk drives, or one floppy disk drive and one hard disk drive. You also need a keyboard and a monochrome or color monitor with graphic capabilities.

The minimum amount of RAM required by Lotus-DM is 512K. If your computer has more than 512K of RAM, you can open larger files in Lotus-DM.

Lotus-DM runs under DOS, Version 3.2 or later. If you have DeskMate Version 3.0 or later installed on your computer, you can install Lotus-DM to work with that environment. If you do not have DeskMate, you can install Lotus-DM with the run-time version of DeskMate.

Hardware Options

Lotus-DM supports a variety of video displays and printers. It supports the majority of display systems available on the market today. These systems include the following:

- ☐ Monochrome Display Adapter (MDA)
- ☐ Color Graphics Adapter (CGA)
- ☐ Multicolor Graphics Array (MCGA)
- ☐ Enhanced Graphics Adapter (EGA)
- ☐ Video Graphics Array (VGA)

Lotus-DM supports popular dot-matrix, laser, and other types of printers as well as plotters. When you use the Setup (F10) command, you can view a complete list of the printers that Lotus-DM supports.

Appropriate hardware helps you maximize the capabilities of Lotus-DM. If your computer has less than 640K RAM, you should consider upgrading to that amount. If you perform calculations that are math intensive, consider adding a math coprocessor to your computer. If you have an 8088- or 8086-based computer, you should add an 8087 coprocessor; if you have an 80286-based computer, you should add an 80287 coprocessor; if you have an 80386-based computer, you should add an 80387 coprocessor.

These hardware extras greatly increase the practical size of Lotus-DM's spreadsheet and speed its calculations.

Lotus-DM is a graphical software package. You will find that it is much easier to use if your computer is equipped with a mouse. A *mouse* is a device you can purchase that enables you to point to and highlight cells or commands more intuitively than by using the keyboard.

Chapter Summary

Lotus-DM is a flexible, powerful spreadsheet program that rivals Lotus 1-2-3. However, Lotus-DM has an extra dimension not found in 1-2-3, namely, the ease of using a mouse.

This chapter has described, in general terms, the capabilities that make Lotus-DM an impressive program. Turn now to the rest of this book to learn how to use Lotus-DM's features quickly and productively.

Getting Started

This chapter helps you get started using Lotus-DM for the first time. If you are new to computers, several books published by Que Corporation can give you a basic introduction to your operating system. The *MS-DOS QuickStart* provides a visually oriented approach to learning MS-DOS. Other Que titles that can serve as a reference when learning DOS include *Using DOS*, by David Solomon, and *MS-DOS User's Guide*, Special Edition.

If you are familiar with Lotus 1-2-3 but new to Lotus-DM, you may find the introductory material in this chapter too basic. If you want to begin using Lotus-DM immediately, first read through the tables in this chapter, and then skip to Chapter 3.

This chapter covers the following topics:

- ☐ Starting and exiting Lotus-DM
- ☐ Understanding the computer keyboard and the Lotus-DM screen display
- ☐ Using a mouse instead of the keyboard
- ☐ Finding on-screen help

Before you begin, be sure that Lotus-DM is installed on your computer system. Follow the instructions in Appendix A to complete the installation for your system. Lotus-DM can be installed as a run-time version (without the presence of the DeskMate software) or as a program that you access from the DeskMate environment (when you do have the DeskMate software on your system).

Cue:
Appendix A contains complete installation instructions.

Starting Lotus-DM from the Operating System

If you have Lotus-DM installed on your system, but you do not have DeskMate software, you can start Lotus-DM directly from the operating system. The

Reminder:
Start
Lotus-DM
from DOS by
typing
LOTUS-DM

Lotus-DM program is stored in a subdirectory named LOTUS-DM. To start Lotus-DM, use the following steps:

1. Change to the drive on which you installed Lotus-DM. On most systems, this is drive C, but you may have installed Lotus-DM on drive D, E, or another drive. If Lotus-DM is installed on drive C and drive C is not the current drive, type **C:** and press Enter.
2. Type **CD \LOTUS-DM** and press Enter to change to the LOTUS-DM directory.
3. Type **LOTUS-DM** and press Enter to start Lotus-DM.

Cue:
Create a batch
file to start
Lotus-DM from
DOS.

To simplify this process, you can create a start-up batch file or add Lotus-DM to a start-up menu. You can use a text editor or word processor to create a batch file. The specific instructions depend on the program you use.

The following steps show one way to create a start-up batch file by using the DOS COPY command. For the following example, assume that your batch files are kept in the BATCH directory.

1. Change to the directory in which you keep your batch files. Type **CD \BATCH** and press Enter.
2. Type **COPY CON LOTUS-DM.BAT** and press Enter.
3. Type **C:** (or the name of the drive on which you have installed Lotus-DM) and press Enter.
4. Type **CD \LOTUS-DM** and press Enter.
5. Type **LOTUS-DM** and press Enter.
6. Type **CD** and press Enter.
7. Press the F6 key to signify the end of the file in DOS; press Enter.

After creating this batch file, you need only type **LOTUS-DM** and press Enter to start Lotus-DM. If you also include C:\BATCH in your PATH command, you can start Lotus-DM from any subdirectory.

After you start Lotus-DM, the Tandy logo appears for a few seconds as the program loads. Then a blank worksheet appears, and you are ready to start using Lotus-DM.

Starting Lotus-DM from DeskMate

Make sure that you have followed the instructions in Appendix A to install Lotus-DM so that it can be run from DeskMate. Enter the DeskMate environ-

ment (refer to the DeskMate manual if you are not familiar with this process); if your DeskMate files are stored in a directory called DESKMATE, for example, type **CD \DESKMATE** at the operating system prompt, press Enter, type **DESK**, and press Enter again.

You can start Lotus-DM from DeskMate by using one of three methods:

- ☐ Select the File (F2) command by pointing and clicking with the mouse or by pressing F2. Then select Run (point and click with the mouse or use the down arrow to highlight the command and press Enter). You then see a box entitled **Run File**; use the mouse or the Tab or arrow key to point to the **Program** field; type **LOTUS-DM** and press Enter.
- ☐ Use the mouse or arrow keys to point to the Lotus-DM list box and press Enter. Refer to the DeskMate manual for instructions to display the Lotus-DM list box if it is not present.
- ☐ Point to Lotus-DM.PDM in the Programs list box and press Enter. Refer to the DeskMate manual for instructions to display the Programs list box if it is not present.

No matter which method you choose, the Tandy logo appears for a few seconds as the program loads. Then a blank worksheet appears, and you are ready to start using Lotus-DM.

Exiting Lotus-DM

To exit Lotus-DM, you use the Esc key or the Lotus-DM File Exit command. Either method displays additional screens that ask for verification of the action. Whether you are using the run-time version of Lotus-DM or whether you started Lotus-DM from DeskMate, you can use either method of exiting.

Reminder:
Exit Lotus-DM by pressing Esc or selecting File Exit.

Exiting with the Esc Key

Using the Esc key is the simpler and faster method of exiting. When you press Esc, one of two dialog boxes displays. If you have saved all your work (either new files or changes to old files), you see the Leave Lotus-DM dialog box with the choices OK or Cancel (see fig. 2.1). Choose OK to leave the program; choose Cancel to cancel the exit request.

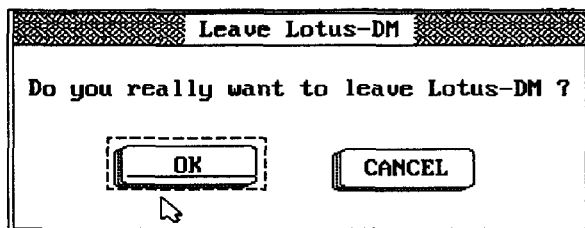
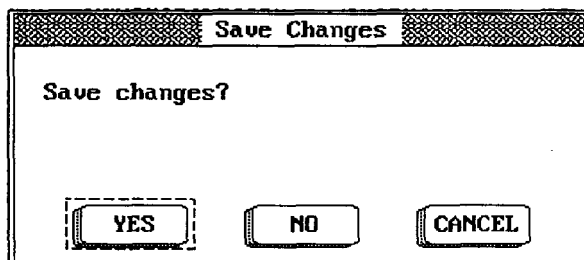


Fig. 2.1.
The Leave Lotus-DM dialog box.

If you haven't saved your work, you see the Save Changes dialog box (see fig. 2.2). If you want to save the current file before you exit, choose Yes. (The commands to save files are introduced in Chapter 4 and covered in detail in Chapter 6.) If you do not want to save the current file but still want to quit, choose No. If you want to cancel your exit request, select Cancel.

Fig. 2.2.
The Save Changes dialog box.

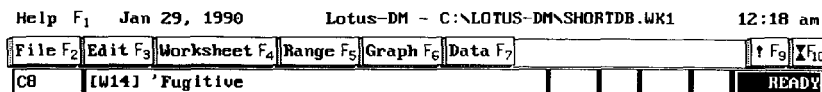


Exiting with the File Exit Command

Lotus-DM commands and their menus are explained extensively throughout this book. At this point, however, you need to know how to use only one command.

Look at the menu bar across the top of the screen just below the date and time (see fig. 2.3). The menu bar contains six options—each followed by a function-key designator (F2, F3, and so on). You can access any of these commands by pressing the appropriate function key or by clicking the command with the mouse.

Fig. 2.3.
The Lotus-DM menu bar.



To use the File Exit command, select the File command with keyboard or mouse, then point to the Exit option. If you use the keyboard, press the down arrow until the Exit option is highlighted, or press the letter E. When the option is highlighted, press Enter. If you use a mouse, point to the Exit option and click.

If you made changes to your worksheet and did not save it, Lotus-DM prompts you to verify this choice before you exit (see fig. 2.2).

If you want to save the current file before exiting, choose Yes. (The commands to save files are introduced in Chapter 4 and covered in detail in Chapter 6.) If you do not want to save the file but still want to quit, choose No. If you want to cancel the exit request, select Cancel.

Understanding the Lotus-DM Keyboard

The most common configurations for keyboards on Tandy, IBM, and IBM-compatible personal computers are shown in figures 2.4 and 2.5. The Enhanced Keyboard, shown in figure 2.5, is now the standard keyboard on all new Tandy, IBM PC, and most compatible machines. Some compatibles, especially laptops, have different keyboards.

The keyboards are divided into three sections: the alphanumeric keyboard in the center, the numeric keypad on the right, and the function keys on the left or across the top. In addition to these sections, special keys can be found in various locations. On the Enhanced Keyboard only, you can find a separate pad of cursor-movement keys.

Most keys in the alphanumeric section match the keys on a typewriter, and most maintain their normal functions in Lotus-DM. Several keys, however, take on new and unique functions or are not found on typewriter keyboards.

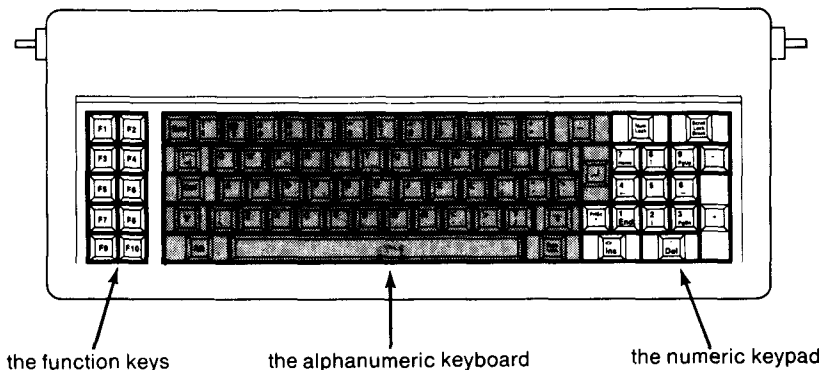
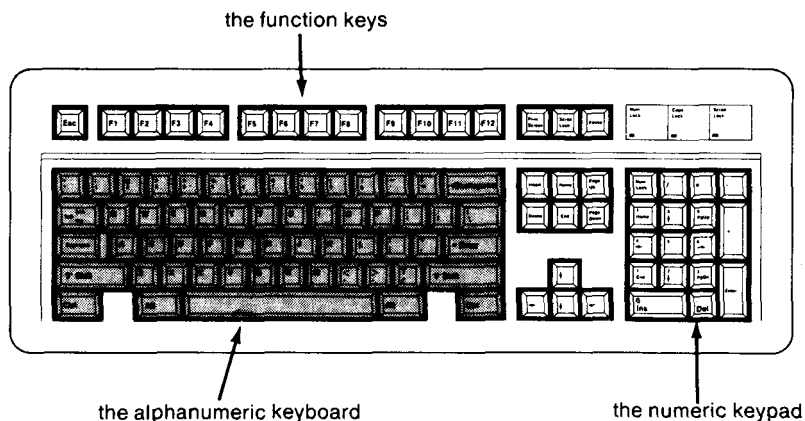


Fig. 2.4.
The original IBM
PC keyboard.

You use the keys on the numeric keypad (on the right side of the keyboard) to enter numbers or to move the cell pointer around the screen.

The function keys perform special actions. For example, you can use these keys to access Lotus-DM's editing functions, display graphs, and call up help messages. These keys are located across the top of the Enhanced Keyboard and on the left side of other keyboards.

Fig. 2.5.
The Enhanced Keyboard, currently on most Tandy, IBM, and IBM-compatible computers.



The special keys you can use with Lotus-DM include Del (Delete), Esc (Escape), Num Lock, Break, and Pause. These keys are located in different places on different keyboards. Locate them on your particular keyboard.













Reminder:
The Enhanced Keyboard has a numeric keypad to enter numbers and a separate cursor keypad to move around the worksheet.

Only the Enhanced Keyboard has a separate pad of cursor-movement keys—the keys with up, down, left, and right arrows. With the Enhanced Keyboard, you can press Num Lock to put the numeric keypad into number mode and use the special cursor-movement keys to move easily around the worksheet.

The Alphanumeric Keyboard

Although most of the alphanumeric keys shown in figures 2.4 and 2.5 have the same functions as on a typewriter, several keys have special functions in Lotus-DM. These keys and their functions are listed in table 2.1. The meaning of these keys becomes clearer in later chapters.

Table 2.1
Operation of Special Alphanumeric Keys

<i>Key</i>	<i>Function</i>
	Moves cell pointer one screen to the right.
 	Moves cell pointer one screen to the left.
	Shifts the letter keys to uppercase. Unlike the Shift-Lock key on a typewriter, Caps Lock has no effect on numbers and symbols.
	Used with another key, shifts the character produced. Used with a letter, produces an uppercase letter. Used with a number or symbol, produces the shifted character on that key. Used with the numeric keypad, produces a number. Used with Caps Lock and a letter, produces a lowercase letter. Used with Num Lock and the numeric keypad, produces a cursor-movement action.
	A special type of Shift key. Used with several keys to change their functions. Used with the function keys, activates special features in Lotus-DM (see table 2.2).
	A special type of Shift key. Used with the function keys, provides different functions (see table 2.2)
	During cell definition or editing, erases the preceding character. Displays the previous help screen when using Help.
	When used as the first character in a cell entry, signifies a repeating character (see Chapter 3).
 	Used to begin highlighting a range in POINT mode. The range is anchored at the current cell.
	When used in a range address, separates the address of the cell at the beginning of the range from the address of the cell at the end of the range. In POINT mode, moves the anchor cell to another corner of the range.

The Numeric Keypad and the Cursor-Movement Keys

The keys in the numeric keypad on the right side of the older-style keyboards are used mainly for cursor-movement (see fig. 2.4). With Num Lock off, you use these keys as movement keys. With Num Lock on, these keys act as number keys. You can reverse the setting of Num Lock by holding the Shift key while you press one of the numeric keys. The Enhanced Keyboard has separate keys for cursor-movement (see fig. 2.5). The functions of the cursor-movement keys are explained in Chapter 3; the other special keys on the numeric keypad are discussed later in this chapter.

The Function Keys

The 10 function keys, F1 through F10, are used for special actions in Lotus-DM. These keys are located across the top of the Enhanced Keyboard and on the left side on the other keyboards (see figs. 2.4 and 2.5). The Enhanced Keyboard has 12 function keys, but Lotus-DM uses only the first 10. You can use these keys alone or with the Ctrl or Alt key for various applications. Table 2.2 lists the function keys and an explanation of each key's action.



Note: Keys separated by a hyphen are to be pressed in this fashion: press and hold the first key, press the second key, and then release both keys.

Table 2.2
Operation of Function Keys




















<i>Key</i>	<i>Function</i>
	Accesses the on-line Help facility
	Activates a pull-down menu of File commands
	Activates a pull-down menu of Edit commands
	Activates a pull-down menu of Worksheet commands
	Activates a pull-down menu of Range commands
	Activates a pull-down menu of Graph commands
	Activates a pull-down menu of Data commands
	Not used in Lotus-DM, but appears for compatibility with other DeskMate software

Table 2.2 (continued)




<i>Key</i>	<i>Function</i>
	Activates the Setup accessory
 (Help)	Accesses the on-line Help facility
 (Edit)	Puts Lotus-DM into EDIT mode to change the current cell
 (Name)	Displays a list of names anytime a command can accept a range name or a file name
 (Abs)	Changes a cell or range address from relative to absolute to mixed
 (GoTo)	Moves the cell pointer to a specified cell address or range name
 (Query)	In READY mode, repeats the last Data Query command
 (Table)	In READY mode, repeats the last Data Table command
 (Calc)	In READY mode, recalculates all formulas in the current worksheet; if entering or editing a formula, converts the formula to its current value
 (Graph)	Displays the current graph if one exists
 (Compose)	Creates international characters that cannot be typed directly using the keyboard

The Special Keys

The special keys provide some important Lotus-DM functions. For example, Esc cancels a menu or an entry, and Del deletes a character when you are editing a cell or deletes all data in a selected range.

Some special keys change the actions of other keys. Num Lock changes the action of the keys on the numeric keypad from movement keys to number keys. The functions of the special keys are listed in table 2.3.

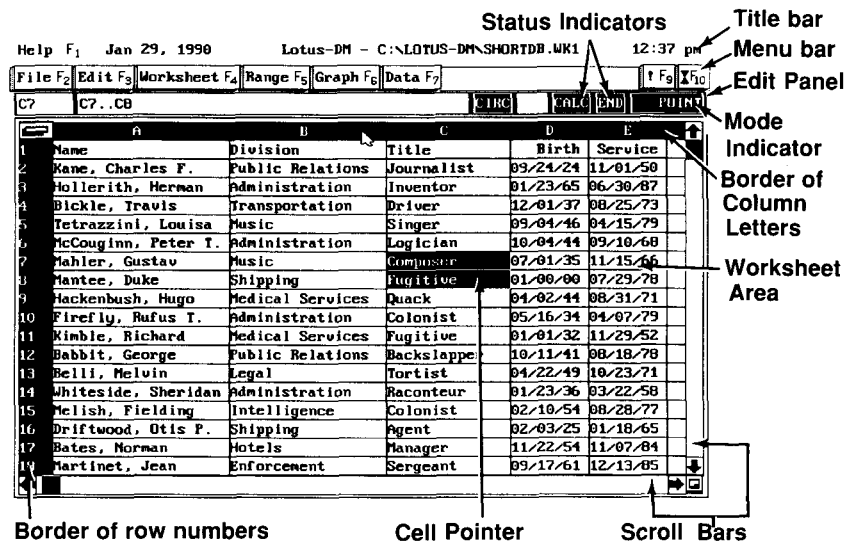
Table 2.3
Operation of Special Keys

Key	Function
	When editing a cell, deletes one character at the cursor. If you select a range and press Del, you erase the contents of all cells in that range.
	When accessing the menu bars, cancels the current menu or dialog box and returns to READY mode. When entering or editing data in a cell, clears the edit line. Returns from the on-line Help facility. Begins the process of exiting from Lotus-DM.
	Shifts the actions of the numeric keypad from cursor-movement keys to numbers.

Understanding the Lotus-DM Screen Display

The main Lotus-DM display is divided into four parts: three bars at the top of the screen (title bar, menu bar, and edit panel) and the worksheet area itself (see fig. 2.6). On the top and left sides of the worksheet are reverse-video borders that contains the letters and numbers that mark columns and rows. Along the bottom and right sides of the worksheet are panels that contain scroll bars you can use with a mouse to reposition the cell pointer.

Fig. 2.6.
The Lotus-DM
display screen.



The *cell pointer* marks the location of the current cell in the worksheet area. A *cell* is the intersection of a column and a row. When you enter data into the worksheet, the data goes into the location marked by the cell pointer.

The Title Bar



The top line of the screen is called the *title bar*, consisting of the following information: a reminder that the Help utility is accessible through the F1 key; the system date; the product name; the name of the current file (if the file is not yet named, the word `UNTITLED` appears); and the system time. To change the system date or time, use the Setup accessory, described later in this chapter.

The Menu Bar

Below the title bar is a row containing the commands used in Lotus-DM. Next to each of the six commands is a function key indicator. To access the File commands, press F2; to access the Edit commands, press F3, and so on. If you prefer to use a mouse, simply point to the desired command and click. For more information about the use of commands, see Chapter 4.

Reminder:

Press a function key to access a command on the menu bar.

On the right side of the menu bar, notice the ! (F9) and  (F10) options. ! (F9) is inactive in Lotus-DM and is present only for compatibility with other DeskMate software;  (F10) is used to access the Setup accessory, described later in this chapter (see the DeskMate manual for even more detail). The F8 key has no function on the menu bar. Although Help (F1) does not appear on the menu bar, you press F1 to access the Help facility.

The Edit Panel

The *edit panel* is immediately above the reverse-video border of column letters. The edit panel contains information about the current cell. This information can include the address of the cell, the cell's contents, and the protection status (U if unprotected or PR if protected). The cell's address is the column and the row in the form C#, where C is the column letter and # is the row number (for example, B4, AB100, or IV8192). The format and column width (displayed as [Wxx], where xx is replaced by the width of the column) are included if they differ from the default; format and column-width attributes are explained in later chapters.

The Mode Indicators

The *mode indicator* is located to the right of the edit panel. This indicator tells you what mode Lotus-DM is in and what you can do next. Table 2.4 lists the mode indicators and their meanings.

Table 2.4
Mode Indicators

<i>Mode</i>	<i>Description</i>
EDIT	You are editing a cell entry.
ERROR	Lotus-DM encountered an error. From the displayed Error dialog box, choose OK to edit an incorrect entry, or choose HELP to display information about correcting the error.
LABEL	You are entering a label into a cell.
POINT	Either Lotus-DM prompted you to select a range, or you used the cursor-movement keys to specify a range while entering a formula. You can type the cell coordinates or the name of the range, or highlight the range using the cursor-movement keys; then press Enter.
READY	Lotus-DM is waiting for your next entry or command.
VALUE	You are entering a number or a formula into a cell.

The Status Indicators

Lotus-DM displays *status indicators* in the middle and right side of the edit panel, just to the left of the mode indicator. These indicators give you information about the state of the system. Each indicator displays in reverse video in a specific area. These indicators and their meanings are listed in table 2.5.

Table 2.5
Status Indicators

<i>Indicator</i>	<i>Description</i>
CALC	The file is set to Manual Recalculation, and changes have been made since the worksheet was last recalculated. This indicator warns you that parts of the file may not be current. Press Calc (Ctrl-F9) to force a recalculation and clear this indicator. When CALC appears, you do not have to recalculate immediately. Finish making all entries, and before printing, press Calc (Ctrl-F9). The CALC indicator does not appear if recalculation is set to Automatic.
CIRC	You have a circular reference in the worksheet. Use the Worksheet Status command to find one of the cell addresses in the circular reference.
END	You pressed the End key to use with an arrow key to move across the worksheet.
MEM	You have fewer than 4,096 characters of memory left.

Using the Lotus-DM Help Feature

Lotus-DM provides on-line help at the touch of a key. You can be in the middle of any operation—even executing a command or editing a cell—and press the Help (F1) key to view information on what to do next. If you press Help in READY mode, the Help Index appears (see fig. 2.7). Choose any of the topics in the Help Index to move to other help screens. Figure 2.8 shows the screen that appears if you ask for help concerning the Worksheet commands.

Cue:
No matter what you're doing, press Help (F1) to get context-sensitive help.

Fig. 2.7.
The Help Index screen.

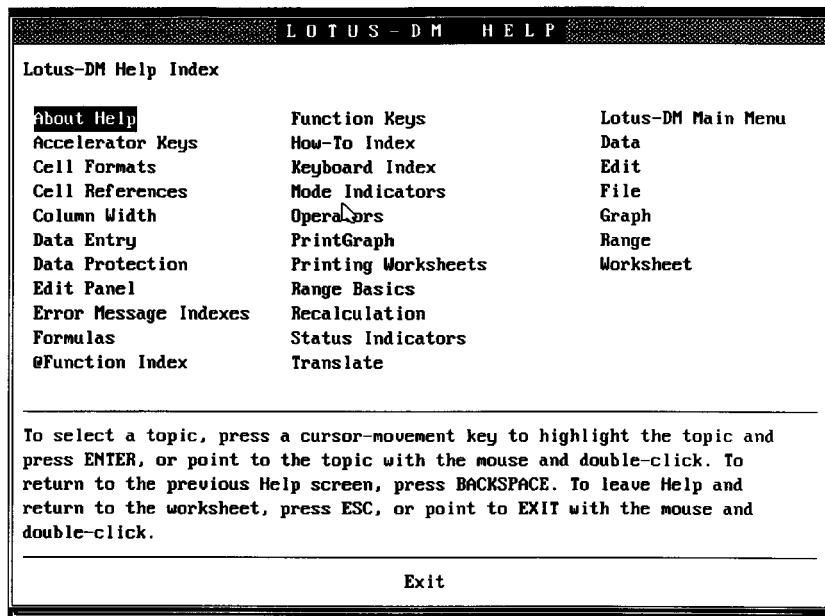
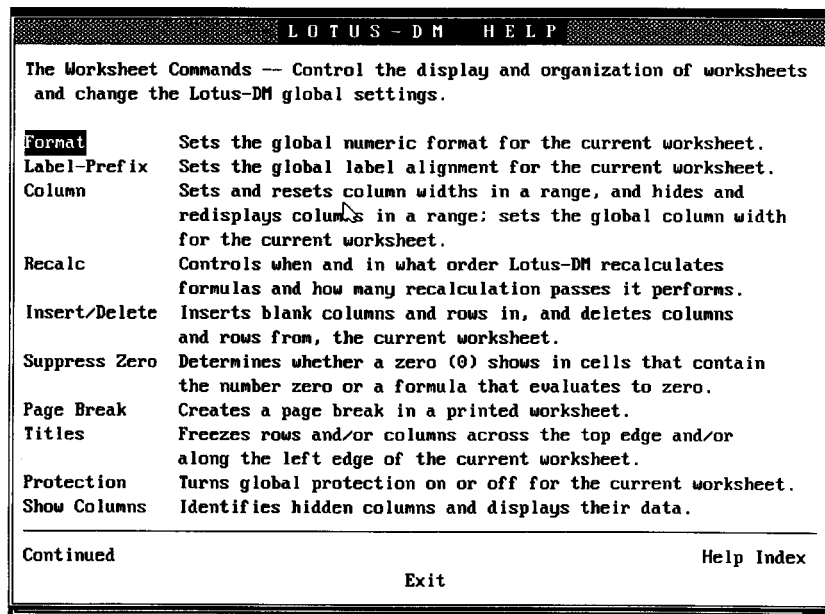


Fig. 2.8.
A context-sensitive help screen that explains the Worksheet commands.



Certain parts of the help screen identify additional help topics. These topics are displayed in **bold** on a monochrome monitor or in a different color on a color monitor. To get more information about a topic, use the arrows keys or the mouse to select that topic. One or more additional topics are always located at the bottom of the screen; one of these topics is always the option to return to the Help Index.

Press the Backspace key to view the preceding help screen. Press the Esc key to return to the Lotus-DM worksheet when you are finished with the Help facility.

Using the Setup Accessory

Choose **X**(F10) from the menu bar at the top of the screen to access the Setup option. You use the Setup accessory to change the date and time displayed on your system, alter screen colors, and set up the mouse, modem, and printer. If you acquire another printer, you have to access Setup and prepare Lotus-DM to accommodate the new hardware.

Reminder:
Select Setup (F10) to use the Setup accessory.

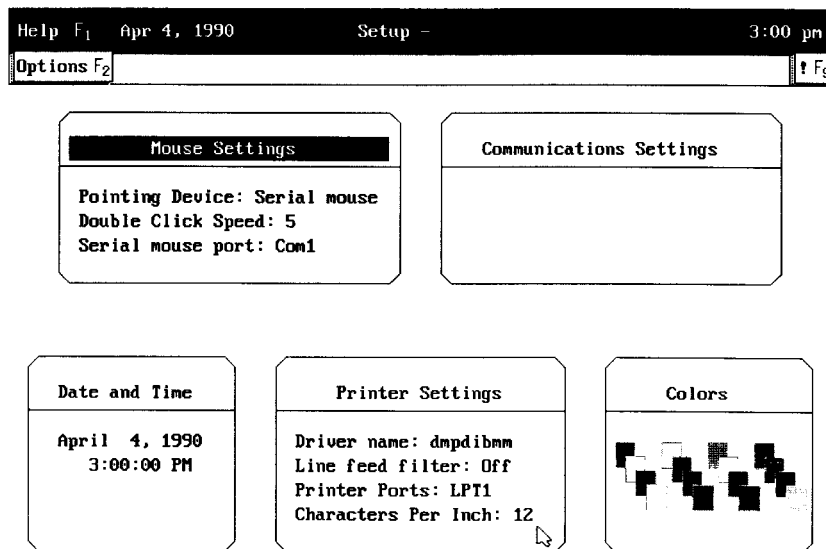
Access Setup by choosing **X**(F10) from the menu bar and selecting Setup. A screen with five boxes and a single command on a menu bar appears (see fig. 2.9). Although Setup has five options, only four are implemented. The boxes show the current settings for the various options. Access these options by selecting Options (F2) from the menu bar. A pull-down menu with the following commands appears:

- ☐ Communications (not implemented)
- ☐ Color
- ☐ Mouse
- ☐ Printer
- ☐ Date and Time
- ☐ Exit

Each of these commands is explained in the following sections (refer to the DeskMate manual for even more detail). The Communications command is not operative in Lotus-DM but is present because the Setup accessory can be activated from other modules in DeskMate that do support communications.

When you finish making changes to the dialog boxes that appear when you select the commands, press Enter—or click the mouse on the button labeled OK—to save the changes to disk.

Fig. 2.9.
The Setup
Screen



The Colors Command

Cue:
Change the
screen colors
to suit your
tastes.

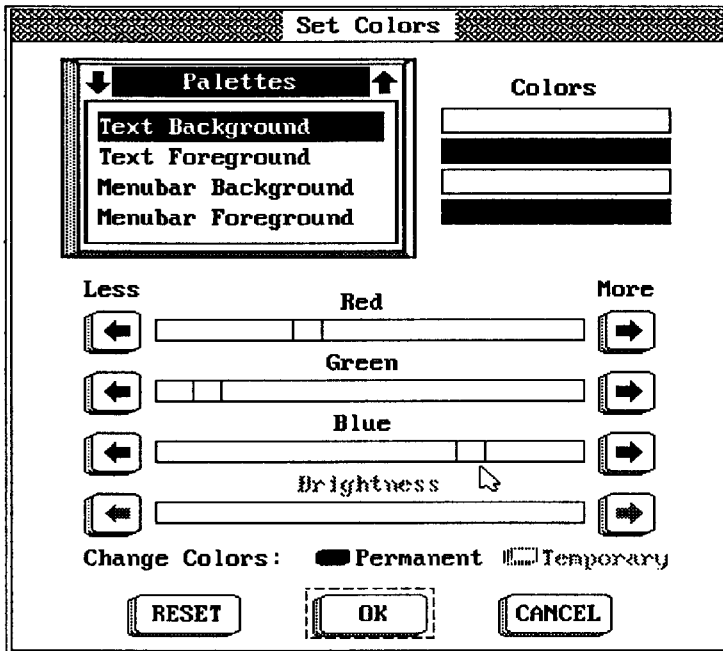
You can change the color (or the intensity of black and white on monochrome displays) using the Colors command in the Setup accessory. Select Colors from the Options pull-down menu to display the Set Colors dialog box (see fig. 2.10). Use this dialog box to alter the current use of color in Lotus-DM.

The dialog box has a **Palettes** selection box which lists four areas of the screen that you can change. You can change the Text Foreground, Text Background, Menubar Background, and Menubar Foreground. Use the mouse or the arrow and Enter keys to select the area of the screen you want to change.



Note: If you have a monochrome monitor, you can change only two palettes: Text Background and Text Foreground.

After you make a palette selection, go to the lower part of the Set Colors dialog box. Use the arrow keys or the mouse to move the white rectangles on the color bars to vary the intensity of red, blue, or green. The colors change on-screen as you move the white rectangles in different combinations. When you have specified one color palette to your liking, return to the **Palettes** selection box and choose another area of the screen to modify. If you are dissatisfied with the colors you select, choose Reset to return all four palettes to their default color settings.



*Fig. 2.10.
The Set
Colors
dialog box.*

The Mouse Command

The Mouse command allows you to identify the type of mouse you are using and the speed at which you double-click the mouse. From the Options pull-down menu, select the Mouse command to display the Setup Mouse Device dialog box (see fig. 2.11).

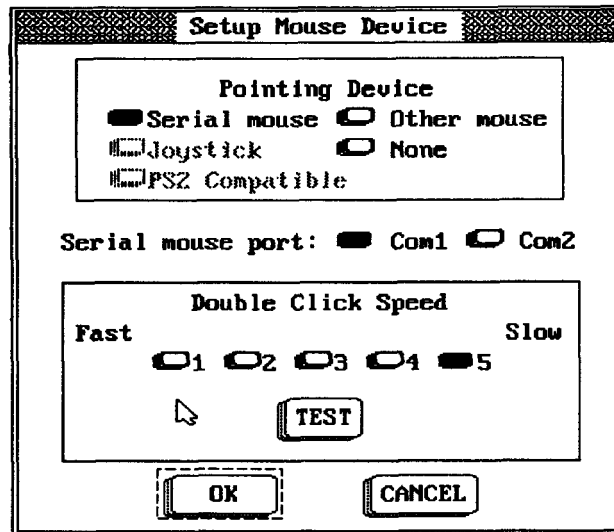
In the **Pointing Device** selection box are five types of mouse devices. Select the appropriate option for your system. Most people use a serial mouse; if you select that option, you also must specify the communications port (select COM1 or COM2 as the serial port).

The double-click speed is based on personal preference. Select a number from 1 to 5; the lower the number, the faster the program expects you to double click. When you have selected a number, double click the Test button; if the button does not respond, you may want to change the speed.

Choose OK to confirm your choices or Cancel to leave the dialog box without keeping the changes you made.

Cue:
Make the mouse respond to the way you double click.

Fig. 2.11.
The Setup Mouse
Device dialog box.



The Printer Command

Use the Printer command to specify the type of printer you are using. Select Printer from the Options pull-down menu to display the Setup Printer dialog box (see fig. 2.12). The `Printers` selection box offers the following choices: LaserJet, IBM Graphic, Tandy Daisywheel, IBM Daisywheel, ASCII, ProPrinter II, Proprinter XL24, Tandy dot-matrix printer (DMP) 105/106, IBM DMP 130/132, DMP 200, IBM DMP 430, IBM DMP 440, Diablo 630, Other, and None. Choose ASCII if the printer you use is not on the list.

Choose `Line feed filter` only if you have tried to print with the current settings and have irregular paper advancement or lines printing on top of one another.

You have three choices for the number of characters to be printed per inch: 10 (equivalent to Pica on a typewriter), 12 (also known as Elite), and Condensed (16.7 characters per inch, or about 132 characters per line on 8 1/2-inch paper).

The `Printer Ports` selection pertains to the connector on your computer to which the printer is attached. Most systems connect the printer to LPT1, but you should verify this selection for your configuration.

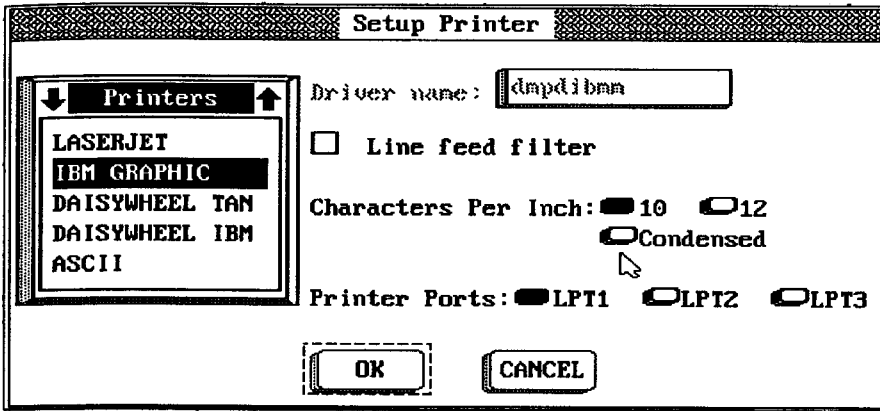


Fig. 2.12.
The Setup Printer
Dialog Box.

The Date and Time Command

The system date and time are always displayed on the top line of the Lotus-DM screen. These settings become part of the identifying information of files whenever you create new files or update old ones. If either the time or date displayed on-screen is incorrect, or if you want to change the time or date for any reason, select Time and Date from the Options pull-down menu. The Set Date and Time dialog box appears (see fig. 2.13).

Cue:
Make sure that the time and date are accurate so that files can be identified with meaningful information.

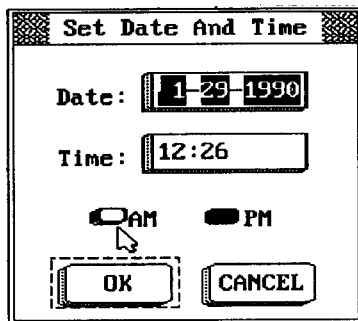


Fig. 2.13.
The Set Date
and Time
dialog box.

Type the date in MM DD YYYY format (no slashes or hyphens); type the time in HH:MM format. Use the mouse or arrow keys to move the cursor. You don't have to type leading zeroes for single-digit months or days, and you don't have to type the minutes if the time is on the hour. Typing seconds is also unnecessary. For example, if the time is exactly eight o'clock, you can type 8

and press Enter. Select either `AM` or `PM` and select OK to implement the changes. Notice that the new time and date are displayed at the top of the screen. Changes made in the Set Date and Time dialog box are reflected in the DOS system time and date.

Chapter Summary

This chapter presents the information you need to use Lotus-DM for the first time. You learn how to start and exit Lotus-DM from either the operating system or the DeskMate environment. The features of the Lotus-DM display and keyboard are discussed also. In addition, you learn how to use the on-line Help facility, the Setup accessory, and the Translate command.

This chapter sets the stage so that you can begin to use Lotus-DM. The next chapter presents information on entering and editing data and moving around worksheets.

Learning Worksheet Basics

This chapter presents the skills needed to use Lotus-DM, the powerful electronic spreadsheet. If this is your first experience with spreadsheet software, you learn how to use a spreadsheet for data analysis. If you are familiar with electronic spreadsheets but are new to Lotus-DM, you find information in this chapter to help you understand the conventions and features of the program.

In this chapter, you learn the basics for using Lotus-DM. Information is presented in an order best suited for those learning to create spreadsheet applications for the first time. The chapter begins by showing you how to move around the worksheet so that you can easily perform such actions as entering, changing, moving, and copying data. You also learn how to move the cell pointer and display any part of the large 256-column-by-8,192-row worksheet area.

In addition to teaching you the different ways of moving around the Lotus-DM worksheet, this chapter introduces entering and editing data. Specifically, you learn how to make the data in your worksheets understandable by entering titles, headings, names, comments, descriptions, and a variety of other entries, called *labels*. Finally, this chapter teaches you how to tap the real power of Lotus-DM by creating formulas.

In this chapter, you learn how to do the following:

- ☐ Work with worksheets and files
- ☐ Move the cell pointer around the worksheet
- ☐ Enter data
- ☐ Edit data

Understanding Worksheets and Files

When you first start Lotus-DM, you begin with a blank worksheet file and build a worksheet in the computer's memory. To keep your worksheet, you save it in

a file on disk with a file name. (Chapter 6 covers files in detail.) In Lotus-DM, a *file* consists of one worksheet.

Whenever you enter data into the worksheet, the entry goes into the cell at the location of the cell pointer. This location is called the *current cell*. To move around the worksheet, you move the cell pointer. By moving the cell pointer, you control where you place data in the worksheet. In figure 3.1, for example, any data you type goes into cell D5 until you move the cell pointer.

Fig. 3.1.
A sample
worksheet
with numbers,
labels, and
formulas.

Help F₁ Jan 29, 1990 Lotus-DM - C:\123\CLASS\IBMEX4.WK1 12:54 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ t F₉ X F₁₀

D5 +D3=C5 READY

	A	C	D	E	F	G	H	I
1			REGION and Percentage Allocation					
2		TOTAL	Northeast	South	Midwest	Southwest	West	
3	ITEM	VOLUME	30%	25%	20%	15%	10%	
4								
5	Jeans #305	5000	1500	1250	1000	750	500	
6	Jeans #403	4000	1200	1000	800	600	400	
7	Jeans #501	40000	12000	10000	8000	6000	4000	
8	Jeans #702	12000	3600	3000	2400	1800	1200	
9	Belt #111	7000	2100	1750	1400	1050	700	
10	Belt #128	9000	2700	2250	1800	1350	900	
11	Shirt #12	16000	4800	4000	3200	2400	1600	
12	Shirt #13	17500	5250	4375	3500	2625	1750	
13	Coat #200	13000	3900	3250	2600	1950	1300	
14	Coat #300	2000	600	500	400	300	200	
15	Shoes #27	7500	2250	1875	1500	1125	750	
16								
17								
18								

Reminder:
The name of the
current file is
displayed at the
top middle of
the screen.

The current date is displayed in the top left of the screen. The current file name is displayed in the top middle of the screen. The current time is displayed in the top right of the screen.

Formulas are operations or calculations you want Lotus-DM to perform on the data. Formulas make Lotus-DM an electronic worksheet, not just a computerized method of displaying data. You enter the numbers and formulas, and Lotus-DM performs the calculations. When you change a number, Lotus-DM changes the results of all the formulas that use that number. When you change the number in D3 or C5 in figure 3.1, the results of all the cells that contain formulas that depend on these cells change automatically.

Using the Workspace

The *workspace* is the space available in your worksheet. The potential size of the workspace is formidable—256 columns and 8,192 rows. This large work area gives you flexibility when you design worksheets. You do not have to crowd everything together to save space. You can lay out different parts of the worksheet in different places to make the data easier to use and understand.

If you build a worksheet that uses all possible rows and columns, you produce a worksheet that is complex, difficult to use, and possibly too large for your computer's memory. A typical large worksheet may contain information about thousands of employees or inventory items. This type of worksheet uses a few columns and many rows. Another large worksheet may contain a series of related reports; this worksheet may use many columns but just a few rows.

Start out by building small, simple worksheets. As you increase your skills with Lotus-DM, you will feel comfortable building larger, more complex worksheets. The generous workspace lets you build your worksheets without worrying about running out of room.

Moving around the Worksheet

You can use several methods to move the cell pointer quickly anywhere in the worksheet. Remember that moving around the worksheet means moving the *cell pointer*—the bright rectangle that highlights and identifies an entire cell. Characters within the cell pointer appear in reverse video on the highlighted background. Any data typed into the worksheet goes into the cell at the location of the cell pointer. The *cursor*—the blinking line in the edit panel when you enter or edit data in a cell—shows you the position of the next character typed.

Because you can enter data only at the location of the cell pointer, you must know how to move the cell pointer to the location you want. Because you can display only a small part of the worksheet at any one time, you also must know how to move the cell pointer so that you can see different parts of the worksheet at different times.

You can move the cell pointer by using the keyboard or a mouse. Table 3.1 lists the keys that move the cell pointer. Table 3.2 (included later in this chapter) lists the movement keys that move the cursor in EDIT mode. Many of the same keys move either the cell pointer or the cursor, depending on the current mode. These keys are often called *pointer-movement keys* when they move the cell pointer, and *cursor keys* when they move the cursor. This terminology can be confusing if you do not realize that these terms refer to the same keys.

Reminder:

You can use one of several methods to move the cell pointer quickly around the worksheet.

Reminder:

The same keys are used to move the cell pointer and the cursor, depending on the current mode.



Note: Keys separated by a hyphen are to be pressed together; that is, you press and hold the first key and then press the second key. Keys separated by a space are to be pressed consecutively; that is, you press and release the first key and then press and release the second key.

Table 3.1
Worksheet-Movement Keys

Key	Description
	Moves the cell pointer one cell to the right
	Moves the cell pointer one cell to the left
	Moves the cell pointer one cell up
	Moves the cell pointer one cell down
or	Moves the cell pointer right one screen
or	Moves the cell pointer left one screen
or	
	Moves the cell pointer up one screen
	Moves the cell pointer down one screen
	Moves the cell pointer to the home position (usually cell A1)
	Moves the cell pointer to the lower right corner of the active area.
, , , ,	Moves the cell pointer in the direction of the arrow to the next cell that contains data (the intersection between a blank cell and a cell that contains data)
(GoTo)	Prompts for a cell address or range name and then moves the cell pointer directly to that cell

The function of the movement keys varies depending on the mode that is currently active:

<i>Mode</i>	<i>Function of Movement Keys</i>
READY or POINT	The movement keys move the cell pointer.
LABEL or VALUE	Some of the movement keys (↑, ↓, Tab, Shift-Tab) end the entry, return to READY mode, and move the cell pointer. Others keys simply end the entry and return to READY mode.
EDIT	Some movement keys move the cursor in the edit panel; other movement keys end the edit, return to READY mode, and move the cell pointer.

This section discusses the movement of the cell pointer. Cursor movement is covered later in this chapter in "Editing Data in the Worksheet."

The current cell address is displayed in the edit panel, just below the menu bar at the top left corner of the screen in a format that indicates the column and row locations. In figure 3.1, D5 represents the column letter (D) and the row number (5).

Using the Basic Movement Keys

The four directional-arrow keys that move the cell pointer are located on the numeric keypad and on the separate pad of the Enhanced Keyboard. The cell pointer moves in the direction of the arrow on the key. When you hold down the arrow key, the cell pointer continues to move in that direction. When the pointer reaches the edge of the screen, the worksheet continues to scroll in the direction of the arrow. When you try to move past the edge of the worksheet, Lotus-DM beeps a warning.

You can use several other keys to page through the worksheet. Press the PgUp and PgDn keys to move up or down one full screen. Press Tab or Ctrl- → (hold the Ctrl key and press the right-arrow key) to move one full screen to the right; press Shift-Tab (hold the Shift key and press Tab) or Ctrl- ← (hold the Ctrl key and press the left-arrow key) to move one full screen to the left.

Press the Home key to move the cell pointer directly to the home position—usually cell A1. In Chapter 4, you learn how to lock titles on-screen; locked titles can change the home position. The other keys listed in table 3.1 are covered in the following sections.

Using the End Key

Cue:
Use the End key to move directly to the end of a list of data.

The End key is used in a special way in Lotus-DM. When you press and release the End key, the END status indicator appears at the far right side of the edit panel. If you then press one of the arrow keys, the cell pointer moves in the direction of the arrow key to the next intersection of a blank cell and a cell that contains data. The cell pointer always stops on a cell that contains data if possible. When there are no cells that contain data in the direction of the arrow key, the cell pointer stops at the edge of the worksheet.

For example, figure 3.2 shows the cell pointer in cell B3. The END status indicator on the right side of the edit panel shows that the End key has been pressed. If you now press the right-arrow key, the cell pointer moves right to the first cell that contains data. In this case, the cell pointer moves to D3, as shown in figure 3.3. If you press the End key and then the right-arrow key again, the cell pointer moves to the last cell that contains data before a blank cell. In this case, the cell pointer moves to G3, as shown in figure 3.4.

Fig. 3.2.
The END
status
indicator.

Help F₁ Jan 29, 1990 Lotus-DM - (Untitled) 1:06 pm

File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇					↑ F ₉	↓ F ₁₀
B3										END	READY
	A	B	C	D	E	F	G	H			
1											
2				38444	59205	79966	100727				
3				40041	60802	81563	102324				
4				41638	62399	83160	103921				
5				43235	63996	84757	105518				
6				44832	65593	86354	107115				
7				46429	67190	87951	108712				

Fig. 3.3.
Using End- →
to move the
cell pointer
to the first
cell that
contains
data.

Help F₁ Jan 29, 1990 Lotus-DM - (Untitled) 1:07 pm

File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇					↑ F ₉	↓ F ₁₀
D3											READY
	A	B	C	D	E	F	G	H			
1											
2				38444	59205	79966	100727				
3				40041	60802	81563	102324				
4				41638	62399	83160	103921				
5				43235	63996	84757	105518				
6				44832	65593	86354	107115				
7				46429	67190	87951	108712				

Help F₁ Feb 24, 1990 Lotus-DM - (Untitled) 5:54 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀

G3 (,0) @SUM(F3..D3) READY

	A	B	C	D	E	F	G	H
1								05/13/90
2								
3				30,046	25,650	72,273	127,969	
4				35,230	22,970	68,228	126,428	
5				32,487	23,416	72,225	128,128	
6				38,955	32,544	78,497	149,996	
7				36,135	31,392	74,629	142,156	
8				35,822	26,497	77,287	139,606	
9				36,931	31,815	68,642	137,388	
10				39,242	33,918	78,751	151,911	
11				38,443	29,248	84,908	152,599	
12				31,289	20,163	87,746	139,198	
13				36,013	34,150	75,562	145,725	
14				35,356	23,812	85,328	144,496	
15								
16								
17								
18								

Use the End key to move to the first or last cell in a range

Fig. 3.4.
Using End-→ to move the cell pointer to the last cell that contains data.

When no other data is in the worksheet and you press End-→ again, the cell pointer moves to the end of the worksheet to cell IV3. If you press End-↓ from G3, the cell pointer moves to G14.

The End key works the same way with the left-arrow and up-arrow keys. Look at figure 3.4; pressing End-← takes you to D3. From D3, End-↑ takes you to D1 (the edge of the worksheet).

When you press the End key, the END indicator stays on until you press an arrow key or the End key again. If you press End in error, just press End again to turn off the END status indicator.

When you press End-Home, the cell pointer moves to the lower right corner of the active area. The *active area* includes all rows and all columns that have data or cell formats. When you press End-Home in figure 3.4, the cell pointer moves to H17. This cell is the end of the active area even though it is a blank cell. Notice the entries in column H (in H1) and in row 17 (in A17). Use End-Home to locate the end of the active area when you want to add a section to your worksheet and not interfere with any existing data.

Using GoTo To Jump Directly to a Cell

You can use GoTo (Ctrl-F5) to jump directly to any cell in the worksheet. When you press GoTo (Ctrl-F5), Lotus-DM prompts you for a cell address. When you type the cell address, the cell pointer moves directly to that address. The address is in the format of the column letter from (A to IV) and the row number from (1 to 8,192.)

If you have a large worksheet, you may have to press one of the pointer-movement keys many times to move from one part of the worksheet to another. With GoTo (Ctrl-F5), you can move across large parts of the worksheet at once.

Cue:
You can use
range names
with GoTo
(Ctrl-F5).

With a large worksheet, you may have difficulty remembering the addresses of each part of the worksheet. This can make the use of GoTo difficult. You can, however, use range names with GoTo, so that you don't have to remember cell addresses.

You can assign a range name to a cell or a rectangular group of cells. A *range name* is an English synonym for a cell address; for example, you can assign cell B56 the range name PROFIT. Then you can press GoTo (Ctrl-F5) and type the range name instead of the cell address. When the range name refers to more than one cell, the cell pointer moves to the upper left corner of the range. You can find more information about ranges and range names in Chapter 4.

Using the Mouse

In nearly all cases where you use the keyboard to control cell-pointer or cursor movement, you can use a mouse instead. Depending on your experience with computers or your manual dexterity, you may find a mouse either awkward and unwieldy or fast and "natural." The trend in recent years has been toward software that uses a mouse as well as a keyboard.

In Lotus-DM, you can use a mouse to control the location of the cell pointer simply by moving the mouse so that the moving arrow on the screen is positioned at the desired cell. Click the left mouse button, and the cell becomes highlighted.

Cue:
Press End-Home,
or point and click
with the mouse on
the last active cell
icon, to find the
end of the active
area.

Remember that you can use End-Home to move the cell pointer to the lower right corner of the active area. You also can move to this location with the mouse; point and click in the lower right corner of the screen—on the *last active cell* icon.

In the upper left corner of the worksheet, at the intersection of the column letters and the row numbers, is the *entire sheet selector* icon. This icon can be used only with the mouse. When you click the icon, the entire active part of the worksheet is selected. Use this icon to highlight the active worksheet before you select a command you want to apply to the entire worksheet.

You can use the mouse to move the cell pointer to a cell not currently on the screen. Move the mouse in the direction desired or point to one of the four arrows in the scroll bars located on the bottom and at the right side of the screen, then click (see fig. 3.5). In both scroll bars, an *elevator box*—a shaded rectangle—is located between the two arrows. By clicking the mouse on either side of this box, the cell pointer responds. The elevator box represents the approximate location of the cell pointer between the first and last rows or the leftmost and right most columns in a worksheet.

Another technique for moving the cell pointer is to point to one of the elevator boxes, hold the mouse button, and drag the arrow in the desired direction; when you release the mouse button, the cell pointer appears in its new location. With a little practice, you can become adept at moving the cell pointer quickly to distant locations.

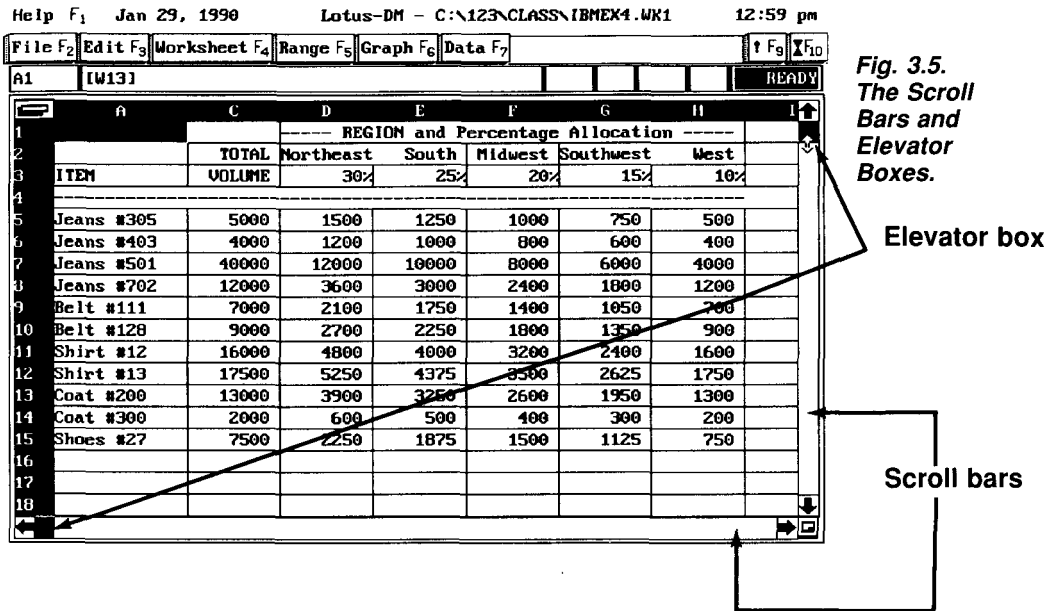


Fig. 3.5.
The Scroll
Bars and
Elevator
Boxes.

Entering Data into the Worksheet

To enter data into a cell, move the cell pointer to that cell, type the entry, and then press Enter. As you type, the entry appears in the edit panel at the top of the screen. When you press Enter, the entry appears in the current cell and in the edit panel. If you enter data into a cell that already contains information, the new data replaces the earlier entry.

Cue:
Use the movement keys to complete an entry and move to the next cell.

If you plan to enter data into more than one cell, you do not have to press Enter and then move the cell pointer to the next cell. You can enter the data and move the cell pointer with one keystroke; just press one of the arrow keys after typing the entry. If you want the cell pointer to move to the left as you complete an entry, press the left arrow key until the action is completed.

The two types of cell entries are labels and values. A *label* is a text entry. A *value* is either a number or a formula. Lotus-DM determines the type of cell entry from the first character you type. Lotus-DM treats the entry as a value (a number or a formula) if you begin an entry with one of the following numeric characters:

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

If you begin an entry with any other character, Lotus-DM treats the entry as a label. As soon as you type the first character, the mode indicator changes from READY to either VALUE or LABEL.

Entering Labels

Labels make the numbers and formulas in your worksheets understandable. The labels in figure 3.5 tell you what the data means. In figures 3.2 through 3.4, the numbers and formulas have no labels, and you have no idea what this data represents.

Because a label is a text entry, it can contain any string of characters and can be up to 240 characters long. Labels can include titles, headings, explanations, and notes, all of which can help make your worksheet more understandable.

When you enter a label, Lotus-DM adds a label prefix to the beginning of the cell entry. The label prefix is not visible in the worksheet, but is visible in the edit panel (see fig. 3.6). Lotus-DM uses the label prefix to identify the entry as a label and to determine how it is displayed and printed.

You can assign one of the following five label prefixes:

- ' Left-aligned (default)
- " Right-aligned
- ^ Centered
- \ Repeating
- | Left-aligned and nonprinting

When you enter a label, Lotus-DM by default adds the apostrophe (') for a left-aligned label. To use a different label prefix, you must type the prefix as the first character of the label.

In figure 3.6, column A shows examples of the different label prefixes so that you can compare how they display. Columns C through E show how to use these label prefixes in a typical worksheet. A column of descriptions such as C6..C12 usually looks best when left-aligned—the normal way to line up text. Column headings should align with the data below. The heading in C4 is left-aligned to match the Payee descriptions.

Help F1 Apr 4, 1990 Lotus-DM - (Untitled) 3:16 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

A5 [W24] 'left READY

	A	B	C	D	E
1			Expense Log		
2			This does not include allocated expense		
3					
4			Payee	Date	Amount
5	left				
6		right	ABC Co	06/12/90	264.98
7		centered	Taylor & Rusch	06/13/90	567.00
8	repeatrepeatrepeatrepeat		Torque Ind	06/13/90	678.56
9	nonprinting		Main Supply	06/16/90	34.99
10			ZXC Plumbing	06/19/90	238.00
11			Main Supply-return	06/20/90	(34.99)
12			ZXC Plumbing	06/20/90	256.00
13					
14			Total		2,004.54
15					
16					
17					
18					

Fig. 3.6.
Examples of
different
label
prefixes.

When the entries fill the cell width, as do the dates in column D, the column heading can be aligned either left, right, or center. In this example, the date heading is centered. A centered label is best when the column heading is shorter than the data below it. Because numbers and numeric formulas are always right-aligned, the Amount column heading in E4 is right-aligned.

The dashed lines in rows 5 and 13 are repeating labels. Repeating labels fill the entire width of the cell. When you change the column width, the label length changes to fill the new column width.

The note in C2 has a nonprinting label prefix. The prefix displays left-aligned but does not print when the print range starts in the same row as the label. In this example, when the print range starts in C1, the note in C2 does not print. When the print range starts in A1, the note does print. Printing and nonprinting labels are covered in more detail in Chapter 7.

Cue:

Use right-aligned labels for column headings over columns of numbers or numeric formulas.

Caution:

A nonprinting label prints unless it is in the leftmost column of a print range.

Reminder:

You must type a label prefix to make another label prefix the first character of the label.

If you want to use a label prefix as the first character of a label, first type a label prefix and then type the desired label prefix as the first character of the label. If you type `\015` into A20, the cell displays 015015015015015015 as a repeating label. If you want the cell to display `\015`, you must first type a label prefix, for example, the apostrophe ('), and then type `\015`.

Reminder:

You must type a label prefix before an entry that looks like a valid formula to prevent it from being treated as a formula.

You must type a label prefix if you want the first character of the label to be a numeric character. If not, as soon as you type the numeric character, Lotus-DM switches to VALUE mode and expects a valid number or formula. If the label is a valid formula, Lotus-DM evaluates it. If the label is an invalid formula, Lotus-DM refuses to accept the entry and displays an error dialog box.

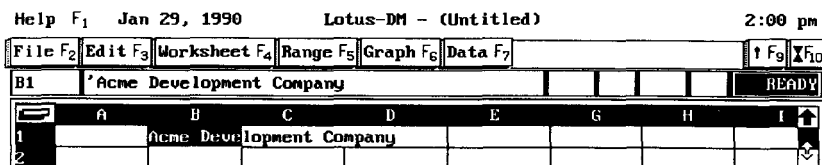
For example, you must type a label prefix to precede the label `15.25/3.5`. If you do not, Lotus-DM treats the entry as a formula and displays the result of 5.25 divided by 3.5, which is 1.5. You must type a label prefix to precede the label `8.5 x 11 inch paper`, or Lotus-DM treats the label as an invalid formula. You often encounter this problem when you enter an address such as `11711 N. College Ave.`

Reminder:

A long label displays across blank cells to its right.

When a label is longer than the cell width, the label continues across the cells to the right as long as these cells are blank. The cell display can even continue into the next window to the right as long as all these cells are blank. The label in cell B1 of figure 3.7 is longer than what can be displayed in the cell. You can see the continuation of the label in the next cell to the right.

Fig. 3.7.
A long label continuing into the next cell.



Lotus-DM includes several commands you can use to change many label prefixes at one time. This subject is covered in Chapter 5.

Entering Numbers

To enter a valid number, you can type any of the 10 digits (0 through 9) and the following characters:

+ - () \$. %

Guidelines for Entering Numbers

1. You can start the number with a plus sign (+); the sign is not stored when you press Enter.

+123 is stored as 123

2. You can begin the number with a minus sign (-); the number is stored as a negative number.-123 is stored as -123

3. You can place the number within parentheses (); the parentheses are dropped when the number is displayed.

(123) is stored as 123

4. You can begin the number with a dollar sign (\$); the sign is not stored when you press Enter.

\$123 is stored as 123

5. You can include one decimal point (.).

.123 is stored as 0.123

6. The number can end with a percent sign (%); the number is divided by 100, and the percent sign is dropped.

123% is stored as 1.23

7. You can type a number in scientific notation. A number is stored in scientific notation only when it requires more than 14 digits.

123E3 is stored as 123000

1.23E30 is stored as 1.2E+30

123E-4 is stored as 0.0123

1.23E-30 is stored as 1.23E-30

8. If you enter a number with 15 digits, it is displayed as entered but stored in scientific notation.

123456789012345 is displayed as entered but stored in scientific notation (1.234E+15)

9. If you enter a number with more than 15 digits, it is stored and displayed in scientific notation.

1234567890123456 is stored and displayed in scientific notation (1.235E+15)

When the number is too long to display normally in the cell, Lotus-DM tries to display what it can. If the cell uses the default General format and the integer part of the number can fit in the cell width, Lotus-DM truncates any part of the decimal part of the number that does not fit. In figure 3.8, the numbers in columns C, D, and E are the same; only the column widths are different. In cell E5, the number 25.54321 is truncated to 25. In cell C6, the number 1675.1234568 is truncated to 1675.123. Cell formats are described in detail in Chapter 5.

Fig. 3.8.
*Truncated numbers
and asterisks
displayed in place of
numbers too long
for the cell width.*

Help F₁ Feb 24, 1990 Lotus-DM - C:\LOTUS-DM\CH30308.WK1 11:42 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ X F₁₀

C8 (,2) +DB8 READY

	A	B	C	D	E	F
1						
2	Format	Column Widths	9		27	4
3						
4	General		1.2E+08	123456789	*****	
5	General		25.54321	25.54321	25.	
6	General		1675.123	1675.1234568	*****	
7	General		1.2E+26	1.2345679000E+26	*****	
8	Comma with 2 decimals	*****		62,045.98	*****	
9	General		1.2E+14	123456789012345	*****	
10						
11						
12						
13						
14						
15						
16						
17						
18						

Reminder:
When the column width is too narrow to display a number, Lotus-DM displays asterisks (*).

When the cell uses the default General format and the integer part of the number does not fit in the cell, Lotus-DM displays the number using scientific notation. Examples are shown in cells C4, C7, and C9 in figure 3.8. When the cell uses a format other than General or the cell width is too narrow to display in scientific notation, and the number cannot fit into the cell width, Lotus-DM displays asterisks (*) as shown in figure 3.8.

Entering Formulas

The real power of Lotus-DM comes from its capability to perform calculations on formulas you enter. In fact, formulas make Lotus-DM an electronic spreadsheet—not just a computerized way to assemble data for reports. You enter the numbers and formulas into the worksheet; Lotus-DM calculates the results of all the formulas. As you add or change data, you never have to recalculate the effects of the changes; Lotus-DM does it automatically. Refer back to figure 3.1;

if you change the Total Volume figures, the Region and Percentage Allocation figures change automatically.

You can enter formulas that operate on numbers, labels, and other cells in the worksheet. Like labels, a formula can be up to 240 characters long.

You can use one of three different types of formulas: numeric, string, and logical. *Numeric formulas* work with numbers, other numeric formulas, and numeric functions. *String formulas* work with labels, other string formulas, and string functions. *Logical formulas* are TRUE/FALSE tests that can test either numeric or string values. This chapter covers each type of formula.

Formulas can operate on numbers in the cell, such as 8+26. This formula uses Lotus-DM just like a calculator. A more useful formula uses cell references in the calculation. The formula in cell F1 in figure 3.9, for example, is +B1+C1+D1+E1. The edit panel shows the formula, and the worksheet shows the result of the calculation—in this case, 183. The power and usefulness of this formula is that the result in cell F1 changes automatically any time you change any of the numbers in other cells. This single fact explains the power of the Lotus-DM electronic spreadsheet.

Reminder:

The formula displays in the edit panel; the result of the calculation displays in the worksheet.

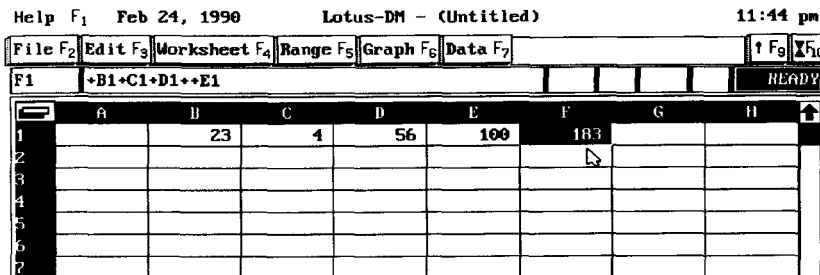


Fig. 3.9.
A formula displayed in the edit panel; the result of the calculation displayed in the worksheet.

Notice that the formula begins with a plus sign (+B1). If you entered the formula as B1+C1+D1+E1, Lotus-DM assumes that you are entering a label and does not perform a calculation.

Using Operators in Numeric Formulas

A *formula* is an instruction to Lotus-DM to perform a calculation. You use *operators* to specify the calculations to perform. The numeric operators include addition, subtraction, multiplication, division, and exponentiation (raising a number to a power). The formula in figure 3.9 uses the plus sign, the addition operator. The simplest numeric formula uses just the plus sign (+) to repeat the value in another cell. In figure 3.8, cell C8 contains the simple formula +D8.

This simple formula repeats in cell C8 the value in cell D8 (except that in the figure, the value is too long to be displayed as a value; Lotus-DM displays the value 62,845.00 as asterisks in cell C8).

When Lotus-DM evaluates a formula, it calculates terms within the formula in a specified sequence. The following numeric operators are listed in order of precedence:

<i>Operator</i>	<i>Meaning</i>
\wedge	Exponentiation
+, -	Positive, Negative
*, /	Multiplication, Division
+, -	Addition, Subtraction

Cue:
Use parentheses
in a formula to
change the order
of precedence of
the calculations.

When a formula uses all these operators, Lotus-DM calculates the exponentials first and then works down the list. If two operators are equal in precedence, it makes no difference which is calculated first. Order of precedence has a definite effect on the result of many formulas. To override the order, use parentheses. Operations inside a set of parentheses are always evaluated first.

The following examples show how Lotus-DM uses parentheses and the order of precedence to evaluate complex formulas. In these examples, numbers are used instead of cell references to make it easier to follow the calculations.

<i>Formula</i>	<i>Evaluation</i>	<i>Result</i>
$5+3*2$	$5+(3*2)$	11
$(5+3)*2$	$(5+3)*2$	16
-3^2*2	$-(3^2)*2$	-18
$-3^(2*2)$	$-(3^(2*2))$	-81
$5+4*8/4-3$	$5+(4*(8/4))-3$	10
$5+4*8/(4-3)$	$5+((4*8)/(4-3))$	37
$(5+4)*8/(4-3)$	$(5+4)*8/(4-3)$	72
$(5+4)*8/4-3$	$(5+4)*(8/4)-3$	15
$5+3*4^2/6-2*3^4$	$5+(3*(4^2)/6)-(2*(3^4))$	-149

Using Operators in String Formulas

String formulas have different rules than numeric formulas. A *string* is either a label or a string formula. You can use only two string formula operators. You can repeat another string, or you can join (concatenate) two or more strings.

The simplest string formula uses only the plus sign (+) to repeat the string in another cell. In figure 3.10, the formula in cell A6 is +A3. The formula to repeat a numeric cell and to repeat a string cell is the same.

The string concatenation operator is the ampersand (&). The formula in cell A7 in figure 3.10 is +A3&B3. The first operator in a string formula must be a plus (+) sign; any other operators in the formula must be ampersands (&). If you do not use the ampersand, but use any of the numeric operators, Lotus-DM treats the formula as a numeric formula. A cell that contains a label has a numeric value of zero. The formula +A3+B3 in the worksheet in figure 3.10 would be treated as a numeric formula and evaluate to 0.

When you use an ampersand (&) in a formula, Lotus-DM treats it as a string formula. If you also use any numeric operators (after the plus sign at the beginning), Lotus-DM considers it an invalid formula. The formulas +A3&B3+C3 and +A3+B3&C3 are invalid. When you enter an invalid formula, Lotus-DM displays an error dialog box. Correcting errors is covered later in this chapter.

In figure 3.10, the names run together in cell A7. Suppose that you want to put a space between the first and last names. You can insert a string directly into a string formula by enclosing the string in quotation marks ("). The formula in cell B8 is +A3&" "&B3. The formula in cell B10 is +D3&" "&E3.

You can write more complex string formulas by using *string functions*. Functions are introduced in this chapter and covered in detail in the Function Reference later in this book.

Reminder:

A string is treated as a value of zero in numeric formulas.

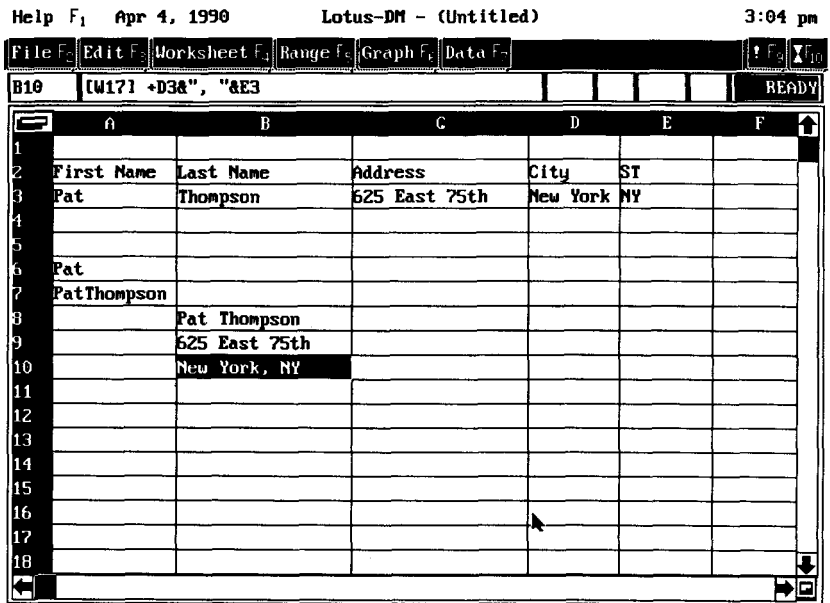
Cue:

You can insert a string directly into a string formula if you enclose it in quotation marks.

Using Operators in Logical Functions

Logical formulas are TRUE/FALSE tests. They compare two values and evaluate to 1 if the test is TRUE and 0 if the test is FALSE. Logical formulas are used mainly in database criterion ranges. Logical functions are covered in detail in the Function Reference later in this book.

Fig. 3.10.
String
formulas
used to
repeat or
concatenate
strings.



The logical operators include the following:

Operator	Meaning
=	Equal
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
<>	Not equal
#NOT#	Reverses the results of a test (changes the result from TRUE to FALSE or from FALSE to TRUE)
#OR#	Logical OR to join two tests; the result is TRUE if either test is TRUE
#AND#	Logical AND to join two tests; the result is TRUE if both tests are TRUE

Figure 3.11 shows examples of logical formulas. For example, the formula in D4 compares A4 (1) to B4 (1) to see whether they are equal. The result of the formula is displayed in E4. In this case, the formula is TRUE (1).

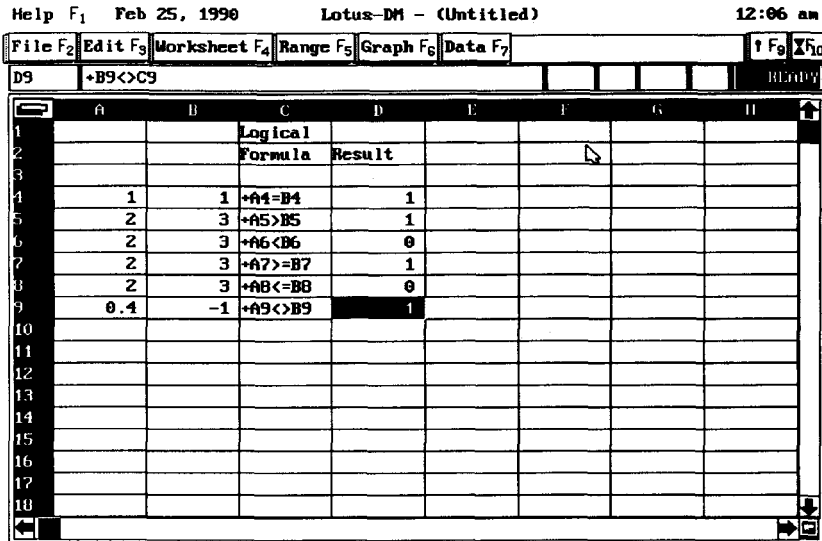


Fig. 3.11.
Logical
formulas
evaluated to 1
if TRUE and 0
if FALSE.

Pointing to Cell References in Formulas

Formulas consist mainly of operators and cell references. The formula in figure 3.9 has four cell references. You can type each address, or you can use a better way. Whenever Lotus-DM expects a cell address, you can use the movement keys to point to the desired cell. As soon as you move the cell pointer, Lotus-DM changes to POINT mode, and the address of the cell pointer appears in the formula in the edit panel.

Cue:

For speed and accuracy, use POINT mode to enter cell references in formulas.

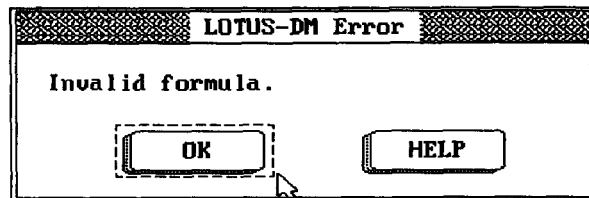
Move the cell pointer until it is on the correct cell for the formula. If this location marks the end of the formula, press Enter. If the formula contains more terms, type the next operator and continue the process until you are finished; then press Enter. If you want, you can type some addresses and point to others.

Because you can easily type an incorrect address in a formula, pointing to cells is more accurate than typing—and also much faster. The only time it is easier to type an address than point to the cell is when the cell reference is far from the current cell and you happen to remember the cell address. For example, if you enter a formula in Z238 and want to refer to cell J23, it may be faster to just type **J23** than point to it. Experienced Lotus-DM users rarely type addresses.

Correcting Errors in Formulas

If you enter a formula that Lotus-DM cannot evaluate, the program displays an error dialog box (see fig. 3.12). If you choose OK, Lotus-DM lets you edit the formula and moves the cursor to the place in the formula where it encountered an error. You cannot enter an invalid formula into a worksheet. For more information about changing a cell, see “Editing Data in the Worksheet” later in this chapter. If you choose Help from the Error dialog box, Lotus-DM displays a help screen with information about why the entry was not acceptable.

Fig. 3.12.
The Error dialog
box activated by
an incorrect
formula.



Common errors that make a formula invalid are missing or extra parentheses and mixing numeric and string operators. Other sources of errors are misspelled function names and incorrect arguments in functions (detailed in the Function Reference later in this book). The following examples show some common simple errors:

<i>Formula</i>	<i>Reason for Error</i>
+A1+A2&A3	Mixing numeric and string operators
+A1/(A2-A3	Missing right parenthesis
@SIM(A1..A3)	Misspelled @SUM function

If you do not know what is wrong or how to fix a formula, select Help from the Error dialog box, select Help Index, and then select @Function Index. From the list of functions displayed, choose the function you want to learn more about.

Cue:
To fix a
formula that
is in error,
temporarily
convert it to
a label.

When you know what is wrong with the formula, follow the procedures in “Editing Data in the Worksheet” later in this chapter. If you do not know how to correct the formula, convert it to a label. Because all labels are valid entries, this technique clears the error and lets you continue working. Follow these steps to convert a formula to a label and return to READY mode:

1. Press Home to move to the beginning of the formula.
2. Type an apostrophe (') as the label prefix. (Lotus-DM accepts anything preceded by an apostrophe as a label.)
3. Press Enter.

You now can use the Help facility or look at another part of the worksheet that has a similar formula. When you find the error, correct the formula and remove the apostrophe.

Addressing Cells in Formulas

A cell address in a formula is known as a *cell reference*. The formula in cell F1 in figure 3.9 has four cell references (+B1+C1+D1+E1). Normally, when you copy a formula from one cell to another cell, the cell references adjust automatically. If you copy the formula in cell F1 of figure 3.9 to cell F2, the cell references change to +B2+C2+D2+E2. This type of cell referencing is called *relative addressing*.

You can use cell references in formulas that are absolute instead of relative. An *absolute address* in a formula does not change when you copy the formula to another cell. You specify an absolute address by preceding the column and row address with a dollar (\$) sign. For example, \$A\$1 is an absolute address. If this address were in cell C9 and you copied it to cell E19, the cell reference would still be \$A\$1. To specify an absolute cell address in POINT mode, press ABS (Alt-F4).

Reminder:

Make an address absolute by inserting a \$ before the row and column designators; the address does not change when you copy it.

In addition to relative and absolute cell addresses, you can specify a *mixed cell* address. In a mixed cell address, part of the address is relative and part is fixed. For example, A\$1 is a mixed address.

Whether a cell reference is relative, absolute, or mixed has no effect on how the formula is calculated. This type of addressing matters only when you copy the formula to another cell. Copying and cell addressing are covered in detail in Chapter 4.

Changing Cell Formats for Formulas

Several commands change the way numbers and formulas display in the worksheet. These commands, Worksheet Format and Range Format, are covered in detail in Chapter 5.

For example, you can specify a fixed number of decimal digits so that the numbers in a column line up; add commas and currency symbols; show numbers as percents; and even hide the contents of the cell.

In addition, Lotus-DM includes special formats and functions to handle dates and times. Functions are introduced in the following section; formats are described in detail in Chapter 5.

Entering Functions

Reminder:
Functions are
prewritten
formulas.

In addition to worksheet formulas you construct, you can take advantage of a variety of preconstructed formulas that Lotus-DM provides. These built-in formulas—called *functions*—are a welcome substitute to constructing your own formulas.

In total, Lotus-DM provides 89 functions that can be broken down roughly into 7 categories:

- ☐ Mathematical
- ☐ Statistical
- ☐ Financial and accounting
- ☐ Logical
- ☐ Special
- ☐ Date and time
- ☐ String

The mathematical functions, which include logarithmic and trigonometric functions, are a necessity for engineering and scientific applications. These functions also provide convenient tools to perform a variety of standard arithmetic operations such as rounding values or calculating square roots.

A set of statistical and database statistical functions allow you to perform standard statistical calculations either on data in a worksheet or in a Lotus-DM database. (The database versions of the statistical functions are described in Chapter 10.)

The financial and accounting functions enable you to perform a series of discounted cash flow, depreciation, and compound-interest calculations for investment analysis, and accounting or budgeting for depreciable assets.

The logical functions let you add standard Boolean logic to a worksheet and use the logic either alone or as part of other worksheet formulas. Each logical function enables you to test whether a condition is TRUE or FALSE.

Lotus-DM also provides a set of special functions for dealing with the worksheet itself. For example, one special function returns information about specific cells. Others count the number of rows or columns in a range.

The date and time functions enable you to convert dates and times to serial numbers and then use these serial numbers to perform date and time arithmetic.

The final set of functions are string functions, which manipulate text. You can use string functions to repeat text characters, convert letters in a string to uppercase or lowercase, and change strings into numbers and numbers into strings. You can even use a string function to produce special characters not found on the standard keyboard.

Entering a Lotus-DM function is a three-step process:

1. Type the @ sign to tell Lotus-DM you want to enter a function.
2. Type the function name.
3. Enter any information, or *arguments*, the function needs to make its calculations.

An example of a function is @AVG. If you type the function @AVG(1,2,3), Lotus-DM returns the calculated result 2, which is the average of 1, 2, and 3.

All functions begin with—and are identified by—the @ character. By typing @, you tell Lotus-DM you are entering a function.

With nearly 90 functions, you probably will not be able to remember every function name. Fortunately, Lotus-DM uses short, three-to-five character abbreviations for functions. These abbreviations enable you to identify and remember those you use most frequently. For example, the function name to calculate the internal rate of return is IRR, and the function name to round numbers is ROUND.

You enter a function's arguments inside the parentheses that immediately follow the function's name. If the function has multiple arguments, you separate them with commas, semicolons, or periods. (Use the Worksheet International command to change the default from commas to semicolons or periods, as described in Chapter 5.)

Functions provide an extremely powerful and timesaving set of tools. Suppose that you want to calculate the average sales of four salespersons: 10,000, 50,000, 60,000, and 80,000. If you remember that the function name to calculate an average is AVG, you easily can write the Lotus-DM function to make the calculation. To perform the calculation, enter the following:

```
@AVG(10000,50000,60000,80000)
```

Lotus-DM returns the result, 50000, which is the average of the numbers entered as arguments. Notice that the function begins with the @ character, followed by the function name AVG. Also notice that the function's arguments are included inside parentheses and are separated by commas.

Reminder:

All functions begin with—and are identified by—the @ character.

Cue:
Use cell
references or
range names
as the
arguments of
functions.

You can use cell addresses and range names as arguments. For example, if you store the sales totals in worksheet cells B1, B2, B3, and B4, you can enter the function as the following:

`@AVG(B1,B2,B3,B4)`

Or, if you name each of the four cells that contain the sales amounts with the salesperson's first name, you can enter the function as follows:

`@AVG(ROBERT,SARAH,EMIL,MARIA)`

A few functions don't require arguments, so you don't use parentheses with those functions. For example, the function to return pi is entered simply as follows:

`@PI`

The function to produce a random number is entered as follows:

`@RAND`

Nevertheless, the first two steps—identify the function with an @ symbol and type the function's name—are the same for each of the 89 functions. In addition, you enter any required arguments inside parentheses. You discover some variations when you use the functions.

The first part of the Function Reference guide that appears later in this book groups the functions by category. The guide then lists descriptions of all the functions in alphabetical order. Refer to the Function Reference guide if you want to use one of the many functions Lotus-DM makes available for use in worksheets. Refer to Chapter 10 to learn more about the database statistical functions.

Editing Data in the Worksheet

After you make an entry in a cell, you may want to change it. You may have misspelled a word in a label or created an incorrect formula. You can change an existing entry in two ways:

- ☐ You can replace the contents of a cell by typing a new entry. The new entry completely replaces the original entry.
- ☐ You can change (edit) the contents of the cell. To edit a cell's contents, move the cell pointer to the cell and press Edit (Ctrl-F2) to go into EDIT mode. Make the correction as described in this section and press Enter.

Remember that when you make an error entering a formula, Lotus-DM forces you to create an acceptable entry (see "Correcting Errors in Formulas" earlier

in this chapter). When you choose OK from the Error dialog box, Lotus-DM puts you in EDIT mode and moves the cursor to the place in the formula where it encountered the error.













When you are in EDIT mode, the contents of the current cell are displayed in the edit panel. If the entry is too long to display completely in the edit panel, you can see the remaining characters by pressing the left-arrow key until the entry scrolls in the panel.

Table 3.2 describes the action of keys in EDIT mode. Use the keys in table 3.2 to move the cursor in the edit panel. As you edit the characters in the edit panel, the contents of the cell in the worksheet do not change. The cell's contents change only when you press Enter to complete the edit.

Cue:

Use ← to see all the characters in an entry that is too long to display in the edit panel.

Table 3.2
Key Actions in EDIT Mode

Key	Action
	Moves the cursor one character to the left
	Moves the cursor one character to the right
 or  	Moves the cursor to the beginning of the entry
 or  	Moves the cursor to the end of the entry
	Deletes the character to the left of the cursor
	Deletes the character at the cursor
	Negates any changes made, returns to READY mode
	Completes the edit

If you press Esc while in EDIT mode, you cancel the edit, and the cell reverts back to the way it was before you pressed Edit (Ctrl-F2).

Chapter Summary

This chapter explained how to move around worksheets and enter and edit data. You also learned how to build different types of formulas. In addition, you learned how to point to cells in formulas and use the various operators.

This chapter provides you with the basic skills you need to use Lotus-DM. In Chapter 4, you learn basic commands that provide the tools to build and use worksheets effectively.

Using Fundamental Lotus-DM Commands

Much of the power of Lotus-DM comes from the use of its commands. You use commands to tell Lotus-DM to perform a specified task or sequence of tasks. Commands can change the operation of the Lotus-DM program itself, or they can operate on a file, a worksheet, or a range. You use commands to change how data displays in the cell, to print reports, to graph data, to save and open files, to copy and move cells, and to perform many other tasks.

Lotus-DM includes over 400 commands. Certain commands are used every time you use the program; others are used rarely, if ever. Some commands perform general tasks that apply to all worksheets; other specialized commands apply only to certain circumstances. This chapter covers using pull-down command menus and the most fundamental Lotus-DM commands. Later chapters cover more specialized commands.

This chapter shows you how to do the following:

- ☐ Use pull-down menus
- ☐ Save files
- ☐ Use ranges and range names
- ☐ Set column widths
- ☐ Clear data from rows, columns, and worksheets
- ☐ Insert rows and columns
- ☐ Protect and hide data
- ☐ Move and copy data
- ☐ Reference cells with relative and absolute addressing
- ☐ Control recalculation
- ☐ Freeze titles on-screen

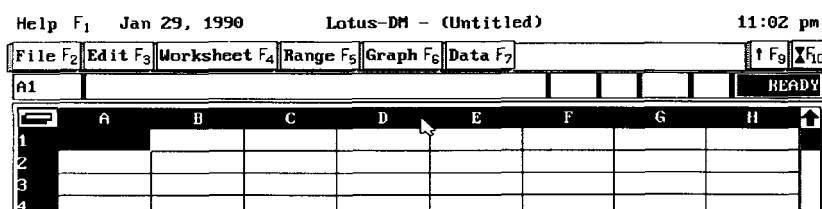
Selecting Commands from Pull-down Menus

Reminder:

You can access the menu bar from READY mode only.

You execute Lotus-DM commands through a series of menus. The main menu bar is always displayed across the top of the screen (see fig. 4.1). Although only six major categories of commands appear on the menu bar, the menu bar ultimately gives you access to over 400 commands. Although you can see the menu bar when dialog boxes are displayed or when you enter data, you can access the menu bar only from READY mode.

Fig. 4.1.
The main menu bar.



You can select commands from the menu bar in three ways:

- ☐ Use the mouse to point to a command (for example, the Range command) and click the left mouse button
- ☐ Press the appropriate function key (for example, press F5 to select the Range command)
- ☐ Press the Alt key and press the first letter of the command (for example, press Alt-R to select the Range command)

Table 4.1 summarizes the commands available on the main menu bar, the keys you can press to access them, and a short description of the kinds of actions you can perform.

Table 4.1
Selecting Pull-down Menus

Command	Function Key	Alt Key Combination	Purpose
File	F2	Alt-F	Open, save, and print files
Edit	F3	Alt-E	Copy and move data, use clip-board
Worksheet	F4	Alt-W	Affect the format or appearance of the entire worksheet

Table 4.1 (continued)

<i>Command</i>	<i>Function Key</i>	<i>Alt Key Combination</i>	<i>Purpose</i>
Range	F5	Alt-R	Affect part of the worksheet
Graph	F6	Alt G	Prepare, View, and print graphs
Data	F7	Alt-D	Manage databases

No matter which command you choose, a pull-down menu with a list of commands appears. To select a command from the pull-down menu, point to the command with the mouse and press the left button twice rapidly (double-click). If you use a keyboard, use the arrow keys to highlight the desired command and then press Enter. In time, you will become proficient at using a mouse to select commands. In a single motion, you can point with the mouse to a command, hold the left button, and when the pull-down menu appears, drag the mouse to point to the desired option, and then release the button.

Cue:

Type the first character of a command name to select the command from a pull-down menu.

A keyboard method you can use to select commands from a pull-down menu is to press the first letter of the option you want to use. The first command in the pull-down menu beginning with that letter is highlighted. If it's the option you want, press Enter. In some menus, several commands begin with the same letter, so keep pressing the same letter key until the option you want is highlighted.

To access some commands on the pull-down menus, you can use yet another method. Next to some commands is a keystroke combination (for example, notice the Ctrl-P combination next to the Print command in fig. 4.2). From READY mode, you can access the Print command directly, bypassing the menu. Simply hold the Ctrl key and press P to go directly to the Print command. Table 4.2 lists the commands you can access from READY mode with a special keystroke combination.

Fig. 4.2.
The File pull-down menu, showing key combinations next to the Save and Print options.

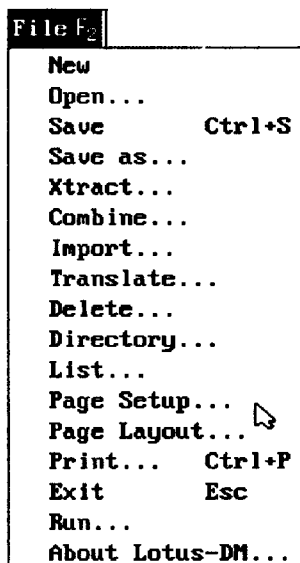


Table 4.2
Key Combinations Used for Commands

<i>Command</i>	<i>Key Combination</i>
File Save	Ctrl-S
File Print	Ctrl-P
File Exit	Esc
Edit Cut	Shift-Del
Edit Copy	Ctrl-Ins
Edit Clear	Del
Edit Paste	Shift-Ins
Edit Copy Range	Ctrl-C
Edit Move Range	Ctrl-M
Worksheet Column	Ctrl-W
Worksheet Zero Suppress	Ctrl-Z
Worksheet Grid	Ctrl-G
Range Format	Ctrl-F

Table 4.2 (continued)

<i>Command</i>	<i>Key Combination</i>
Range Name	Ctrl-N
Graph Type	Ctrl-T
Graph Ranges	Ctrl-R
Graph Name	Ctrl-E
Data Fill	Ctrl-D

Because you have several methods to select commands from the menu bar and the pull-down menus, this book uses terminology that embraces all methods. When you are asked to select a command from the menu bar, a phrase such as *select File (F2)* is used. Notice that the appropriate function key appears in parentheses after the command name. When you are asked to select a command from the menu bar and then immediately select a command from the pull-down menu, a phrase such as *select File Save* is used. Similarly, phrases such as *the Edit (F3) command* and *the Edit Copy Range command* are used. In this way, you can access the indicated command in whatever method is easiest or most appropriate for you.

In figure 4.2, notice that some of the commands in the pull-down menu are followed by a three-dot ellipsis. If you select a command followed by an ellipsis, a dialog box appears. Dialog boxes prompt you to specify ranges, file names, or values; or select items from a list of choices.

Sometimes, you see commands on a pull-down menu that are faintly visible (shadowed); these commands, because of the status of the worksheet or the nature of data, are not available at this time. For example, select Edit (F3), and notice that the Paste option, which allows you to extract data previously moved or copied to a buffer, is shadowed (see fig. 4.3). The Paste command is shadowed unless you had previously used Edit Cut (which moves data to the buffer) or Edit Copy (which makes a copy of data in the buffer). In other words, you cannot extract data from a buffer if you never put anything in the buffer.

If you have begun to select a command, and then decide not to, press Esc to return to READY mode. If a dialog box is on display, select the Cancel button to return to READY mode.

Fig. 4.3.
Edit
commands,
showing Paste
and Clear as
shadowed (not
available).

Edit F ₃	
Cut	Shift+Del
Copy	Ctrl+Ins
Paste	Shift+Ins
Clear	Del
Select all	
Copy Range	Ctrl+C
Move Range	Ctrl+M

Reminder:
 A Worksheet
 command
 may refer to
 an individual
 worksheet or to
 Lotus-DM as a
 whole.

The names of the main menu-bar commands help guide you to the correct command. For example, all the graph commands are accessed through Graph (F6), and all the data-management commands are accessed through Data (F7). Note one important exception: the Worksheet (F4) commands can refer to an individual worksheet or to Lotus-DM as a whole. For example, you use Worksheet Page Setup and Worksheet Update to change the default page settings for all worksheets; you use Worksheet Column, however, to change the column widths for just the current worksheet.

Saving Files

Any worksheet you build exists only in the computer's memory. When you exit Lotus-DM and return to the operating system, you lose your work if you do not first save the file to disk. Fortunately, Lotus-DM warns you to save your work if you attempt to exit without saving. When you save a file, you copy the worksheet in memory to the disk and assign the worksheet a file name. The file remains on disk after you quit Lotus-DM or turn off the computer. When you make changes to a worksheet, the changes are made only to a copy of the worksheet in the computer's memory. You must save the file again with the changes.

More information on file operations is included in Chapter 6. In that chapter, you learn how to read, use, and save files. For now, you learn to save your work by using the File Save or File Save As command.

Suppose that the current worksheet in memory is one you have just begun to create. To save it, you must use the File Save As command (when you access the File pull-down menu, notice that the File Save command is shadowed).

When you select File Save As, the File Save As dialog box appears (see fig. 4.4). Lotus-DM prompts you to enter the name under which you want to save the file; you also can enter a password if you want to password-protect the file. At the bottom of the dialog box is a default path name (the directory location) for the file. Type a meaningful file name, one that gives some clue as to the nature or content of the worksheet, enter a password if desired, and then select OK. Choose Cancel only if you want to escape from the dialog box without naming the worksheet file.

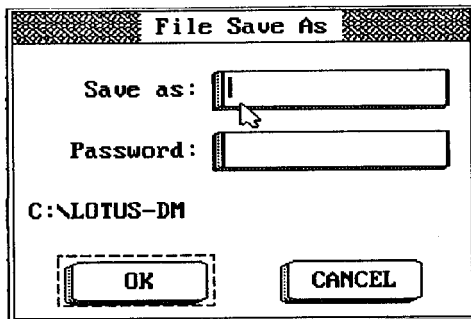


Fig. 4.4.
The File
Save As
dialog box.

If you type the name of an existing file in the File Save As dialog box, Lotus-DM prompts you to decide whether you really want to replace the other file. Choose OK if you want to overwrite the existing file with the worksheet currently in memory. Choose Cancel if you do not want to replace the existing file; then provide a new name for the worksheet you want to save.

Saving a File with a Password

To prevent access to a file by unauthorized users, you can save the file with a password. Without the password, no one can read the file or retrieve any information from the file. If you lose the password, even you cannot access the file. You can find more information on protecting files with passwords in Chapter 6.

Saving a Previously Saved File

If you are working with a file that has been previously saved and want to save the changes made to the file, choose the File Save command. No dialog box appears when you select File Save; the command replaces the old version of the file with the current worksheet in memory. If you want to keep the old version of the file you're updating, you must save the current file under a different name.

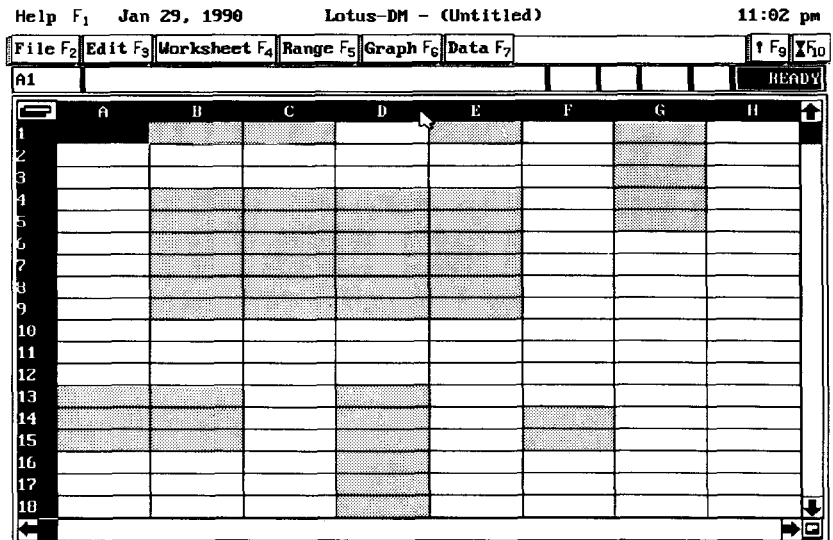
Cue:
Save a previously
named file with
another name to
create a backup
file.

To do this, select File Save As, type a new file name, and choose OK. This process retains the old file and saves the updated version under a new name. If you do this often, you quickly accumulate many versions of the same file, each one slightly different. Most users keep only one or two versions of a significant worksheet. If you're confident that the changes you made are worthwhile and should be kept, update the old file with File Save.

Using Ranges

A *range* is a rectangular group of cells. A range is defined by the cell addresses of the opposite corners of the range, separated by two periods. As shown in figure 4.5, a range can be a single cell (E1..E1), part of a row (A1..C1), part of a column (G1..G5, D13..D18, and F14..F15), or a rectangle that spans multiple rows and columns (B4..E9 and A13..B15).

Fig. 4.5.
A sample of
Lotus-DM
ranges.



Selecting a Range

Although many commands act on ranges, some do not present you with a dialog box that you can use to define the range beforehand. For example, the Range Erase command immediately erases all data in the range selected before you accessed the command.

Selecting a range before using a command is easier; with some commands (as with Range Erase) you *must* select the range first. You can select, or *highlight*, a range with a mouse or with the keyboard. For ranges that include the entire worksheet or a portion of the screen, using the mouse is easier. Move the mouse pointer to a corner of the range you want to select; press and hold the button and drag the mouse across the screen to highlight the desired cells. As you drag the mouse, the POINT indicator appears at the top of the screen. When you release the mouse button, the range remains highlighted.

To select a range using the keyboard, use the arrow keys to move the cell pointer to a corner of the range to be selected. Press Shift-Enter to anchor the range at this cell, and use the arrow keys (and other key combinations such as End-↑, End-→, and the like) to highlight additional cells until you have chosen the complete range. As you expand the highlight, the POINT indicator appears at the top of the screen. Press Enter to finish selecting the range.

Once you select a range, you can use any command you want. If the command is designed to cause changes to a preselected range, the command does exactly that. If the command presents a dialog box with the option to enter a range, notice that the preselected range is supplied in the dialog box already (see fig. 4.6). When you complete the command—whether or not the command has anything to do with specific ranges—the selected range remains highlighted. Pressing an arrow key or moving the mouse “deselects” the range.

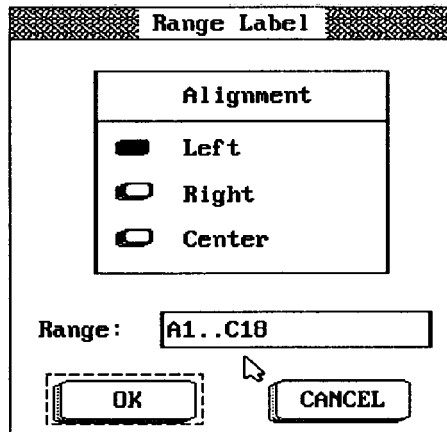


Fig. 4.6.
The Range
Label
dialog box
with a
preselected
range.

Commands with dialog boxes, such as Range Label and Range Format, allow you to define a range beforehand or within the dialog box itself. In these situations, you can respond to a prompt for a range in three different ways. Depending on the situation, you may find a different method more convenient. To specify a range, use any of the following methods in the appropriate part of the dialog box:

- ☐ Type the addresses of the opposite corners of the range
- ☐ Type a range name, if you have assigned one to the range you want to specify
- ☐ Press Name (Ctrl-F3) to display a list of range names and select the appropriate name, if you have assigned one to the range you want to specify

Each of these methods is explained in the following sections.

Typing Range Addresses

The first method, typing the addresses of the range, is used the least because it is most prone to error. With this method, you type the addresses of any two opposite corners of the range.

You specify a range by typing the addresses of its opposite corners; separate the two addresses with one or two periods. Lotus-DM always stores a range with two periods, but you have to type only one period. For example, to specify the range B4..E9 in figure 4.5, you can type **B4..E9**, **B4.E9**, **E9..B4**, or **E9.B4**. You also can type the other two opposite corners: **E4..B9** or **B9..E4**. In all cases, Lotus-DM stores the range that has B4, B9, E4, and E9 as the four corners of the range.

You type cell addresses to specify a range in several situations: when preselecting the range is too cumbersome or involved using the mouse or keyboard, when the dialog box has more than one prompt for a range and only the first prompt uses the preselected range, when the range does not have a range name, and when you happen to know the cell addresses of the range. Experienced Lotus-DM users rarely type cell addresses. Instead, they preselect a range by pointing and highlighting with the mouse or keyboard before issuing the command, or they use range names after issuing the command.

You can point to and highlight a range in formulas and functions just as you can point to a single cell in a formula. Pointing and highlighting in these situations is faster and easier than typing range addresses. Because you can see the range as you specify it, you make fewer errors pointing than you do typing.

Cue:
Use the End
key to
highlight
ranges
quickly.

Use the End key to move quickly to the end of a range of occupied cells when you highlight with the keyboard. To highlight a range from E3..G14, for example, where G14 is the last cell in a range that has data, put the cell pointer at E3, press Shift-Enter, and then press End-↓ and End-→. If you don't use the End key, you have to press the right arrow twice and the down arrow 11 times.

In a highlighted range, the cell opposite the anchored cell is called the *free cell*. You can identify the free cell by observing its address in the edit panel just below the menu bar. In figure 4.7, for example, the free cell is G14. The highlight expands or contracts from the free cell when you use one of the movement keys. If the wrong cell is anchored, you can move the anchor cell and the free cell by pressing the period (.) key. Each time you press the period key in POINT mode (when the POINT indicator appears at the top of the screen), the free cell moves to another corner of the highlighted range.

Reminder:

Press the period key to move the free cell to another corner of the range.

Help F₁ Feb 25, 1990 Lotus-DM - (Untitled) 4:32 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₉ F₁₀

G14 H4..G14 POINT

	C	D	E	F	G	H	I
1	Title	Birth	Service	Sick	Salary	Sales	Quota
2	Journalist	09/24/24	11/01/50	0	28360	6352	9800
3	Inventor	01/23/65	06/30/87	6	28360	8682	9900
4	Driver	12/01/37	08/25/73	7	22220	8400	6200
5	Singer	09/04/46	04/15/79	6	42016	7190	8600
6	Logician	10/04/44	09/10/68	6	22050	7000	9500
7	Composer	07/01/35	11/15/66	2	28360	7410	8400
8	Fugitive	09/27/51	07/29/78	5	27270	6791	7600
9	Quack	04/02/44	08/31/71	5	23432	9800	9600
10	Colonist	05/16/34	04/07/79	7	23423	8765	9700
11	Fugitive	01/01/32	11/29/52	9	49800	9093	8000
12	Backslapper	10/11/41	08/18/70	9	27270	5606	7200
13	Tortist	04/22/49	10/23/71	1	22725	7905	6000
14	Raconteur	01/23/36	03/22/58	0	41490	6032	8300
15	Colonist	02/10/54	08/28/77	2	30986	6796	5700
16	Agent	02/03/25	01/18/65	7	42016	9521	8300
17	Manager	11/22/54	11/07/84	4	33330	4366	6900
18	Sergeant	09/17/61	12/13/85	0	33709	5038	8400

Fig. 4.7.
Highlighting
ranges.

To move the highlight in figure 4.7 to a different range, press the period key twice. The free cell moves from G14 to F4 (observe the address change in the edit panel). Press the arrow keys to highlight a different range.

Dealing with Ranges that Lotus-DM Remembers

When you specify a range with some commands, such as Data, Graph, and File Print, Lotus-DM remembers the range. When you repeat the command, Lotus-DM highlights the previous range.

Reminder:

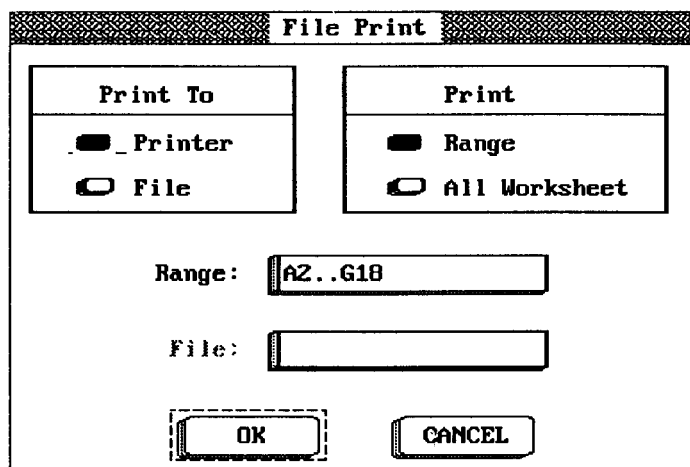
Lotus-DM remembers the previous range with some commands.

If you want to use the previous range, just press Enter. If you want to specify a new range, type its address in the dialog box. With some commands, such as Data Sort, the dialog box contain a Reset button; select Reset to "deselect" the old range; Lotus-DM then inserts the address of the range you selected before you accessed the command.

Reminder:
Press Del to
cancel a
previously
selected range.

Instead of selecting Reset, you also can use Del to cancel a previous range. When you press Del in the dialog-box field that contains the previous range, that range disappears and you can type the new range. Suppose that the last time you used the File Print command, you specified the range A2..G18. Now you have highlighted the range A1..M10 and selected File Print again. The range A2..G18 appears in the File Print dialog box (see fig. 4.8). If you move to the Range Name field and press Del, Lotus-DM erases the range A2..G18 and moves the cursor to the beginning of the field. Type the new range to print.

Fig. 4.8.
*The File Print
dialog box.*



Specifying a Range with Range Names

Two other methods of specifying a range in a dialog box involve range names. *Range names* are descriptive labels for ranges of cells. You can include up to 15 characters in a range name and use them in formulas and commands. When prompted for a range, you can either type the range name if you remember it, or select it from a list of range names that you can call up. The following section, "Creating Range Names," details the process of creating range names.

Using range names has a number of advantages. Range names are easier to remember than addresses. You may find it faster to use a range name than point to a range in another part of the worksheet. Range names also make formulas easier to understand. For example, if you see the range name NOV_SALES_R1 rather than D7..D10 in a formula, you have a better chance of remembering that the entry represents "November Sales for Region 1."

Whenever Lotus-DM expects a cell or range address, you can specify a range name. You can type the range name in the appropriate field in the dialog box, or you can press Name (Ctrl-F3) and select the range name from a list. When you press Name (Ctrl-F3), a list of the first 12 range names in alphabetical order appears. Use the movement keys or the mouse to point to the correct range name and press Enter (see fig. 4.9).

Cue:

You can use the Name (F3) key in commands and functions that require range names.

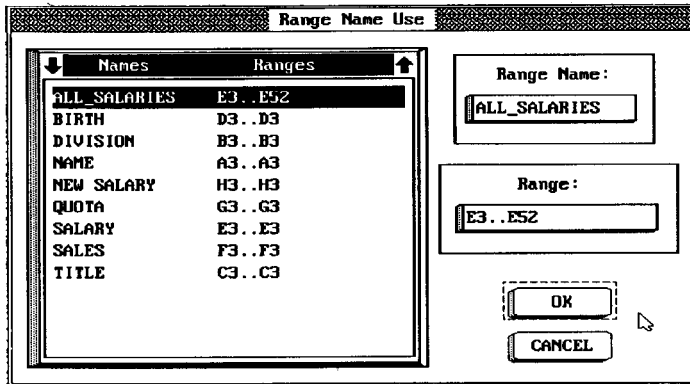


Fig. 4.9.
The Range Name Use dialog box.

If the command calls for a single-cell address, as do Data Sort Primary-Key or GoTo (F5), you can specify an English name or a cell address. If the prompt calls for a single-cell address and you type a range name that applies to a multiple-cell range, Lotus-DM uses the upper left corner of the range. If you type a nonexistent range name, Lotus-DM displays an error dialog box. Select OK to return to the command; press Help (Ctrl-F1) to get a context-sensitive help screen.

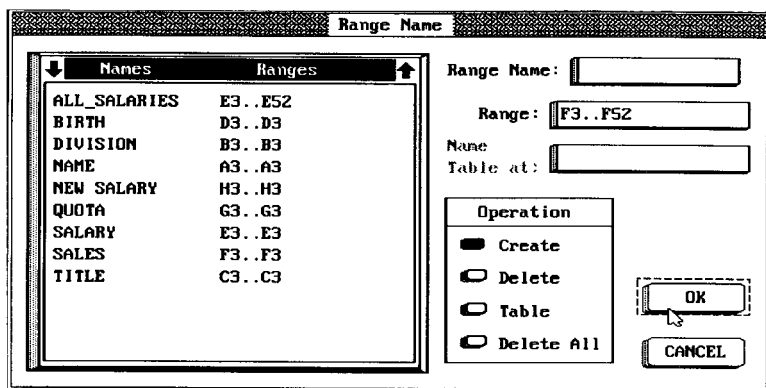
Because a single cell is considered a valid range, you can name a single cell as a range. Whenever Lotus-DM expects a cell address, you can type the address, highlight the cell, or type the single-cell range name.

Creating Range Names

You use the Range Name or Range Name Labels command to assign names to individual cells or ranges. Follow these steps to create range names with the Range Name command:

1. Select, or highlight, the range you want to name.
2. Choose the Range Name command.
3. In the Range Name field, type the name you want to assign to the range. Verify that the range that appears in the Range field is correct and choose OK. Note that Create is selected in the Operation box (see fig. 4.10); the other options listed in the Operation box are used to remove or list range names.

Fig. 4.10.
The Range
Name
dialog box.



Assigning a New Name to a Previously Named Range

To assign a new range name to a range that already has a name, just repeat the steps in "Creating Range Names." When the Range Name dialog box appears, Lotus-DM displays the address of the current range. Type a new name and press Enter. Now you can refer to the range by either of the two range names: the old name or the name you just assigned.

Changing the Address Associated with a Range Name

If you select a range and use the Range Name command to assign an existing range name to that range, the existing range name is now associated with the new range.

You also can create range names with the Range Name Labels command. With this command, you can assign range names to many individual cells at one time. You can use Range Name Labels to assign range names only to single-cell ranges. With this command, you use labels already typed into the worksheet as range names for adjacent cells. In figure 4.11, for example, you can use the labels in cells B5..B8 to name the cells with sales data in C5..C8. Because you want to name the cells to the right of the labels, use the Range Name Labels command and choose the option *Labels name cells to their right*. Now cell C5 has the range name Dept_1. The Range Name Labels dialog box in figure 4.12 shows the labels in row 2 (A2..H2) to be used as names for the cells in row 3 (*Labels name cells below them*).

Cue:

You can specify range names using any combination of uppercase and lowercase letters.

Help F₁ Jan 30, 1990 Lotus-DM - C:\LOTUS-DM\SHORTDB.WK1 12:03 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B2 *Fourth Quarter Sales READY

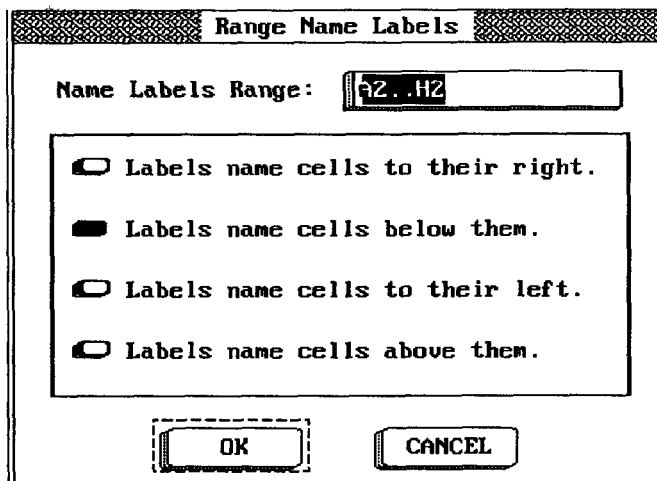
	A	B	C	D	E	F	G
1							
2		Fourth Quarter Sales					
3							
4							
5		Dept_1	355				
6		Dept_2	113				
7		Dept_3	144				
8		Dept_4	233				
9							
10	Totals for Region:	65	845				
11							
12							
13							

Fig. 4.11.
Labels being used as range names.

Guidelines for Naming Ranges

1. Range names can include up to 15 characters and are not case-sensitive. You can type or refer to the name using any combination of uppercase and lowercase letters, but all range names are stored as uppercase letters.
2. Do not use spaces or special characters (except for the underscore character) in range names. If you use special characters, you can confuse Lotus-DM when you use the name in formulas.
3. Do not start a name with a number, although you can use numbers within names. Because of a quirk in Lotus-DM, you cannot type into a formula a range name that starts with a number.
4. Do not use range names that are also cell addresses (such as P2), key names (such as GoTo), or function names (such as @SUM). If you use a cell address as a range name, when you type the range name, Lotus-DM uses the cell address instead.

Fig. 4.12.
The Range Name
Labels dialog
box.



You also can select labels and use them as range names for cells to the left or above. Select these options from the Range Name Labels dialog box:

- ☐ Labels name cells to their left
- ☐ Labels name cells above them

These options assign range names to labels only in the range you specify. If you specified a range of B2..B10 to label cells to the right in figure 4.11, the blank cells in B3, B4, B9, and the number in B10 are ignored. The first 15 characters in the label in B2 become the range name for cell C2. You do no harm if you include cells that are blank or include numbers or formulas in a Range Name Labels range, but do not include other labels. If you do, you end up with unwanted range names.

Listing All Range Names

You can use the Range Name command to create a list of range names and addresses if you choose the **Table** option. Using this command is the only way you can see all the range-name addresses at once (see fig. 4.13). Because the Range Name command provides a two-column listing of names and addresses, be careful when you select the location of the table so that you do not overwrite existing data.

Help F₁ Jan 30, 1990 Lotus-DM - C:\LOTUS-DM\SHORTDB.WK1 12:07 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

A12 [W20] 'DEPT_1' READY

	A	B	C	D	E	F	G
1							
2		Fourth Quarter Sales					
3							
4							
5		Dept_1	355				
6		Dept_2	113				
7		Dept_3	144				
8		Dept_4	233				
9							
10	Totals for Region:	65	845				
11							
12	DEPT_1	C5					
13	DEPT_2	C6					
14	DEPT_3	C7					
15	DEPT_4	C8					
16							
17							
18							
19							

Fig. 4.13.
The result of
using the Range
Name Tables
command.

To delete an unwanted range name, use the Range Name command and select the **Delete** option. To delete all range names, select **Delete All** from the Range Name dialog box. Be careful with this command; it immediately deletes all the range names in the file.

Caution:
The Range
Name Delete
All command
deletes all
range names.

Setting Column Widths

When you start a new worksheet, all columns are 9 characters wide. You can change this default column width and the width of each individual column or a group of columns to accommodate your data. If columns are too narrow, numbers display as asterisks, and labels are truncated if the adjacent cell is full. If columns are too wide, you cannot see as much on-screen or print as much on one page. Figure 4.14 shows a worksheet with a global column width of 5 characters and an individual column width of 13 for column A. The number in cell J8 is too wide for the column and displays as a row of asterisks. The label in A5 is too long for the column width and is truncated.

Whether a number can fit into a cell depends on both the column width and the format. In general, the width of a number must be one character less than the column width. If a negative number displays with parentheses, which take two extra characters, the number width must be even less. If a number displays as a row of asterisks, change either the column width, the format, or both. See Chapter 5 for details about the format of a value—that is, whether a value is to be displayed with a dollar sign, comma, parentheses for negatives, and the like.

Fig. 4.14.
A worksheet with a
global column
width of 5
characters and an
individual column
width of 13 for
column A.

Help F1 Mar 31, 1990 Lotus-DM - C:\LOTUS-DM\1STHALF.WK1 10:10 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

J8 @SUM(B8..G8) READY

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2		JAN	FEB	MAR	APR	MAY	JUN		AUG	TOTAL			
3	Malloy, Tom	1390	1520	1495	1575	1449	1492		1407	8921			
4	Martin, Jo	1688	1522	1380	1449	1442	1384		1478	8865			
5	Hollerith, He	1578	1511	1360	1405	1428	1482		1461	8764			
6	Bush, Paul	1341	1475	1419	1346	1465	1531		1430	8577			
7	Chauvin, Ed	1336	1473	1477	1410	1394	1555		1441	8645			
8	Kimble, Al	1698	1632	1694	1623	1682	1689		1670	*****			
9	Melba, Nell	1402	1385	1536	1415	1555	1419		1452	8712			
10	Starr, Alice	1521	1538	1332	1536	1359	1541		1471	8827			
11	Kane, Chuck	1539	1400	1339	1533	1475	1504		1465	8790			
12	Joplin, Jan	1677	1561	1483	1358	1570	1438		1515	9087			
13	Mork, Robin	1420	1542	1350	1529	1437	1406		1447	8684			
14	Melish, Phil	1502	1486	1541	1470	1446	1526		1495	8971			
15	Hacker, Al	1439	1468	1502	1351	1465	1508		1469	8813			
16	Mantee, Duke	1363	1556	1488	1438	1569	1473		1481	8887			
17	Bates, Norm	1696	1522	1491	1427	1551	1368		1509	9055			
18	Mahler, Gus	1496	1430	1477	1562	1354	1375		1449	8694			

Use the Worksheet Column command to set the width of one or many columns and to change the default column width for the entire worksheet. In the Worksheet Column dialog box, shown in figure 4.15, the **Global** option lets you change the width of all columns not specifically set by using this command with the **Range** option. A column can be from 1 to 240 characters wide.

Fig. 4.15.
The
Worksheet
Column
dialog box.

Worksheet Column

☒ Range ☐ Global

☒ Set-Width ☐ Hide

☐ Reset-Width ☐ Display

Width (1 to 240):

Range:

To set the width of one column, move the cell pointer to the column you want to change and invoke the **Worksheet Column** command. Select the **Range** and **Set-Width** options and type the appropriate column width.

Often, when setting column widths, you may want to set more than one column width—but not all—at a time. You can change multiple column widths in a range at the same time by first highlighting cells in the columns whose widths you want to change (the selected cells constitute a range that does not have to extend across more than one row). Once the row of cells is highlighted, select the **Worksheet Column** command, choose **Range** and **Set-Width**, type the desired column width, and choose **OK**.

In the **Worksheet Column** dialog box, use the **Reset-Width** option to change the width of one column or a range of columns to the global default.

If you use the **Worksheet Column** command to set the width of a single column or a group of columns, these settings override the selection made when you use the **Global** option. If you change the global column width shown in figure 4.14, for example, the width of column A does not change.

Erasing and Deleting Rows and Columns

You can clear parts or all of your work in several ways. Any data you clear is removed from the workspace in memory, but does not affect the files on disk until you use the **File** commands (see Chapter 6). You can use one of three commands to clear part of your work in memory: **Range Erase**, **Edit Clear**, or **Worksheet Insert/Delete** (using the **Delete** option). If you *erase* the work, you remove the contents of the cells. If you *delete* the work, you remove the cells themselves.

Cue:
Erase ranges to leave cells and formats as they are; delete ranges to completely remove the cells from the worksheet.

Erasing Ranges

Use the **Range Erase** or the **Edit Clear** command to erase sections of a worksheet in memory. With the **Edit Clear** command, you can erase only a range larger than one cell; with **Range Erase**, you can erase a single cell or a range of cells. With either command, you erase only the *contents* of the cells. Characteristics such as format, protection status, and column width remain.

Both the **Range Erase** and the **Edit Clear** commands do not use dialog boxes; you must select the range to be erased before starting the command. If you want to erase the contents of the entire worksheet and retain the column-width and format settings, for example, first do one of the following:

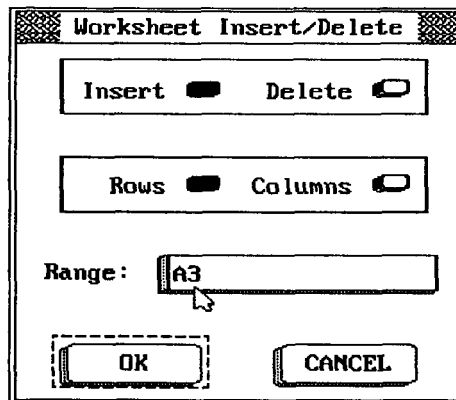
- ☐ If you have a mouse, select the entire worksheet by clicking the entire sheet selection icon (located in the upper left corner at the intersection of the column letters and row numbers).
- ☐ If you use the keyboard, choose the Edit Select All command.

When the range you want to erase is highlighted, select either the Edit Clear or Range Erase command.

Deleting Rows and Columns

If you *erase* a range, the cells remain but are empty. In contrast, if you *delete* rows or columns, Lotus-DM deletes the entire row or column and updates the addresses in the rest of the worksheet. To delete rows, first highlight a range that includes cells in the rows you want to delete (you need to highlight only one cell in each row—not the entire row). Then select Worksheet Insert/Delete and choose the **Delete** and **Rows** options from the Worksheet Insert/Delete dialog box (see fig. 4.16).

Fig. 4.16.
The Worksheet
Insert/Delete
dialog box.



When you select OK, the rows containing highlighted cells are deleted. The rest of the worksheet then moves up (see figs. 4.17 and 4.18). Lotus-DM automatically adjusts all addresses, range names, and formulas. Follow the same procedure to delete columns.

Caution:

When you delete rows and columns, an error can occur if the file contains formulas that refer to deleted cells.

If you delete rows or columns that are part of a range name or a range in a formula, Lotus-DM automatically adjusts the range. If the deleted rows or columns contain data referenced by formulas in other cells, the reference changes to **ERR**, and the formulas become invalid. In figure 4.19, the old row 8 was deleted. Formulas referring to addresses in the deleted row return **ERR**. For example, the formula in C8 was in C9 before row 8 was deleted; the formula originally read **+C8+C7**, but now reads **+ERR+C7**.

Help F₁ Feb 25, 1990 Lotus-DM - (Untitled) 5:19 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

A37 A37..A39 POINT

	A	B	C	D	E	F	G	H	I	J
29										
30										
31	Exam # ----->>>>	1	2	3	4	5	6	Grade		
32	Name of Student	10%	15%	25%	10%	15%	25%			
33										
34	Bates, Norman	72	69	60	65	77	66	67.10	D	
35	Carson, Kit	90	91	56	91	99	89	82.85	B	
36	Chauvin, Nicolas	82	90	99	92	91	83	90.05	A-	
37	Driftwood, Otis P.	78	84	74	76	98	78	80.70	B-	
38	Malloy, Terry	79	81	75	78	86	79	79.25	B-	
39	Fillmore, Millard	88	85	80	74	97	98	88.00	B+	
40	Firefly, Rufus T.	84	84	81	70	88	83	82.20	B-	
41	Hackenbush, Hugo	71	86	81	0	81	76	71.40	C-	
42	Helper, H.	76	75	86	76	76	76	78.35	C+	
43	Hollerith, Herman	90	88	89	52	92	93	86.70	B	
44	Kane, Charles F.	91	99	97	92	96	89	94.05	A	
45	Mahler, Gustav	78	79	91	79	89	77	82.90	B	
46	Martinet, Jean	81	89	88	80	95	82	86.20	B	

Fig. 4.17.
A worksheet
before rows are
deleted.

Help F₁ Feb 25, 1990 Lotus-DM - (Untitled) 5:20 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

A42 [W19] 'Mahler, Gustav' READY

	A	B	C	D	E	F	G	H	I	J
29										
30										
31	Exam # ----->>>>	1	2	3	4	5	6	Grade		
32	Name of Student	10%	15%	25%	10%	15%	25%			
33										
34	Bates, Norman	72	69	60	65	77	66	67.10	D	
35	Carson, Kit	90	91	56	91	99	89	82.85	B	
36	Chauvin, Nicolas	82	90	99	92	91	83	90.05	A-	
37	Firefly, Rufus T.	84	84	81	70	88	83	82.20	B-	
38	Hackenbush, Hugo	71	86	81	0	81	76	71.40	C-	
39	Helper, H.	76	75	86	76	76	76	78.35	C+	
40	Hollerith, Herman	90	88	89	52	92	93	86.70	B	
41	Kane, Charles F.	91	99	97	92	96	89	94.05	A	
42	Mahler, Gustav	78	79	91	79	89	77	82.90	B	
43	Martinet, Jean	81	89	88	80	95	82	86.20	B	
44	McCouginn, Peter I.	81	71	91	55	94	81	81.35	B-	
45	Melish, Fielding	75	84	91	83	94	78	84.75	B	
46	Tetrazzini, Louisa	76	67	93	92	82	78	81.90	B-	

Fig. 4.18.
A worksheet after
rows are deleted.

Invalidating formulas can be a serious consequence of deleting rows and columns. You can affect formulas anywhere in the worksheet; they do not have to be visible on-screen.

To remedy this problem, you must either retype the formula or retrieve from the disk the model before the changes were made. If you have made significant changes to the model since you last saved it, you may find retyping the formula more convenient.

Fig. 4.19.
The resulting
ERR when cells
referred to in a
formula are part
of a range that
has been
deleted.

Help F1 Jan 30, 1990 Lotus-DM - C:\123\CLASS\GRAPHIBM.WK1 1:24 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

CB (F1) +ERR+C7 READY

	A	B	C	D	E	F	G	H	I	J	K
1	Profits -	1986									
2											
3											
4	Region	Jan	Feb	Mar	Apr	May	Jun				
5											
6	USA	5.0	6.0	9.0	7.2	8.0	9.0				
7	European	0.7	1.0	0.7	1.3	3.0	4.0				
8	Non-USA	ERR	ERR	ERR	ERR	ERR	ERR				
9	Average	ERR	ERR	ERR	ERR	ERR	ERR				
10											
11	Totals	ERR	ERR	ERR	ERR	ERR	ERR				
12											
13											
14											
15											
16											
17											
18											

Clearing the Entire Workspace

You can clear a worksheet from memory with the File New command. If you select this command, however, Lotus-DM reminds you that you did not save the current worksheet and gives you the opportunity to do so. The File New command also restores all the default global settings. The effect is the same as if you quit Lotus-DM and restarted it from the operating system.

When you are finished working on a worksheet, you can open another file with the File Open command; this command also warns you about saving your work if you haven't done so.

Inserting Rows and Columns

You can insert rows and columns anywhere in the worksheet by using the Worksheet Insert/Delete command (with the `Insert` option). You can insert one or more rows or columns at one time. To insert a single row, position the cell pointer in a cell in the row immediately *below* where you want the new row

to be inserted. Then select Worksheet Insert/Delete, choose the **Insert** and **Rows** options, and choose OK from the Worksheet Insert/Delete dialog box. If you select the cell A1 and use the preceding process, for example, you create a new row 1 and move all other rows down one row (cell A1 is now cell B1, and so on).

If you want to insert more than one row, select a range two or more cells deep. When you select the Worksheet Insert/Delete command, you create as many new rows as you have rows in the selected range. For example, if you select the range B2..B4 and use Worksheet Insert/Delete to insert rows, you insert three new rows above the previous row 2; the old row 2 is now row 5.

The same principles apply to inserting columns. New columns are inserted to the *left* of the selected range.

When you insert rows, all rows including and below the cell pointer are pushed down. When you insert columns, all columns including and to the right of the cell pointer are pushed to the right. All addresses in formulas and range names adjust automatically. Suppose that you want to insert a column between columns E and F in the worksheet shown in figure 4.20. Place the cell pointer in column F and use the Worksheet Insert/Delete command. Select the **Insert** and **Columns** options. Figure 4.21 shows the result of this operation.

Reminder:

When you insert rows or columns, all addresses in formulas and range names adjust automatically.

Help F₁ Feb 25, 1990 Lotus-DM - (Untitled) 5:27 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

F3 B4 READY

	A	B	C	D	E	F	G	H
1								
2	Department	Number	Budget	BOB	ALICE	DENNIS	Total	Variance
3	Dept 1		144	38	34	84	156	12
4	Dept 2		164	37	33	89	159	-5
5	Dept 3		163	40	30	87	157	-6
6	TOTALS		471	115	97	260	472	1
7								
8								
9								
10								
11								
12								

Fig. 4.20.
The worksheet before inserting a column.

If you insert a row or column in the middle of a range, the range expands to accommodate the new rows or columns. In figure 4.20, the formula in G5 is @SUM(C5..F5). In figure 4.21, the formula is pushed to H5 and becomes @SUM(C5..G5). This range includes the columns in the previous range as well as the inserted column.

Fig. 4.21.
The worksheet
after inserting
a column.

Help F₁ Feb 25, 1990 Lotus-DM - (Untitled) 5:28 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

H3 @SUM(D3..G3)

	A	B	C	D	E	F	G	H
1								
2	Department Number		Budget	BOB	ALICE		DENNIS	Total
3	Dept 1		144	38	34		84	156
4	Dept 2		164	37	33		89	159
5	Dept 3		163	40	30		87	157
6	TOTALS		471	115	97		260	472
7								
8								
9								
10								
11								
12								

Protecting and Hiding Worksheet Data

A typical Lotus-DM worksheet contains numbers, labels, and formulas. When you first build a worksheet, you may lay out the worksheet for an entire year. The budget model in figure 4.22 contains all the labels and formulas for a yearly budget. Once you build this file, you do not want the labels and formulas to change. However, the detailed budget figures may change many times as different versions are submitted for approval or submitted to different departments for revision.

Fig. 4.22.
A typical
large
worksheet.

Help F₁ Jan 30, 1990 Lotus-DM - (Untitled) 1:51 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B7 (.0) [W101 @INT(+B6*@RAND*2)]

	A	B	C	D	E	F	G
1							
2	Regional Report - 1990 Sales by Quarter						
3							
4		Qtr 1	Qtr 2	Qtr 3	Qtr 4	TOTAL	Projected
5	Reg 1	53,555	69,621	90,507	117,659	331,342	340,000
6	Reg 2	29,107	37,839	49,190	63,947	180,083	190,000
7	Reg 3	50,962	66,250	86,125	111,962	315,299	320,000
8	Reg 4	32,098	41,727	54,245	70,518	198,588	200,000
9	Reg 5	54,689	71,095	92,423	120,149	338,356	340,000
10	Reg 6	53,269	69,249	90,023	117,029	329,570	330,000
11	Reg 7	32,693	42,500	55,250	71,825	202,268	210,000
12	Reg 8	28,765	37,394	48,612	63,195	177,966	190,000
13	Reg 9	29,889	38,855	50,511	65,664	184,919	190,000
14	Reg 10	89,432	116,261	151,139	196,400	553,312	550,000
15	Reg 11	78,455	101,991	132,588	172,364	485,398	500,000
16	Reg 12	48,364	62,873	81,734	106,254	299,225	300,000
17	Reg 13	55,678	72,381	94,095	122,323	344,477	350,000
18	Reg 14	46,791	60,828	79,076	102,790	289,493	300,000

Once the budget is approved, you may add actual expense data each month. Each time someone changes the detailed data, you run the risk of accidentally changing a formula or a label. If a formula is changed, all the totals can be wrong.

If different people add data to the file, an individual may want to change a formula that seems incorrect. For example, a model may use factors for inflation, growth, or foreign exchange rates. These factors may be decided by the finance department and should apply equally to all departments. Some department heads, however, may want to use their own factors. Such a change can invalidate the overall budget submitted for approval.

Lotus-DM includes a number of features that protect data from accidental or deliberate change. For example, parts of a file may contain confidential data such as salaries or cost factors. Lotus-DM includes features that let someone use the file but not see certain areas of the file. Unfortunately, none of these features can stop persons from finding this hidden information if they know enough about Lotus-DM.

You also can password-protect a file that contains confidential data when you save it. This process completely prevents access to the file by anyone who does not know the password.

Protecting Cells from Change

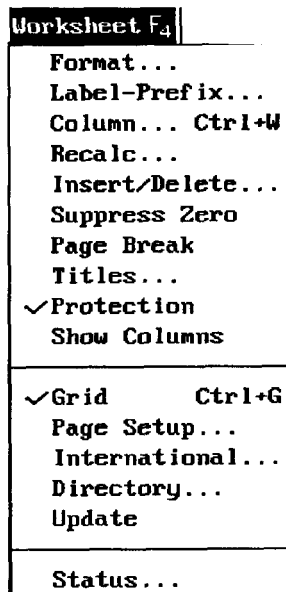
Every worksheet has areas containing formulas and labels that should not change over time. Other areas of the worksheet contain data that can change. You can protect the cells that should not change and still allow changes to other cells by using two related commands: Range Protect/Unprotect marks the cells that allow changes, and Worksheet Protection turns on and off protection for all other cells.

Cue:
Protect the entire worksheet and unprotect the cells into which data is to be entered.

When you start a new worksheet, global protection is off. This means that you have complete access to all cells in the worksheet. To enable the protection feature, use the Worksheet Protection command. This command acts as a toggle switch—every time you use it, it reverses the protection status. If the protection status is on, you see a check mark next to the Protection command on the Worksheet pull-down menu (see fig. 4.23).

When you initially turn on protection with the Worksheet Protection command, all cells in the worksheet are protected. If you try to change a protected cell, Lotus-DM displays an error dialog box and does not make the change. When protection is enabled, the symbol `PR` appears in the edit panel for every protected cell.

Fig. 4.23.
*The Worksheet
 pull-down
 menu, showing
 Protection
 turned on.*



You must unprotect the cells you want to change when worksheet protection is enabled. Use the Range Protect/Unprotect command (also a toggle) to unprotect the selected range. The symbol □ appears in the edit panel for every cell specifically unprotected.

If you unprotect a range of cells, you can protect them again with Range Protect/Unprotect.

Typically, when you build a new worksheet, you leave global protection off. When you finish the worksheet, and you feel that all the formulas and labels are correct, unprotect the data-input areas and turn global protection on.

Caution:
 Protection does not stop anyone from deliberately tampering with a file.

If you need to change a protected cell for any reason, you can unprotect the cell, change it, and then protect it again. You also can turn global protection off, change the cell or cells, and then turn protection on again. As you can see, Lotus-DM's protection features protect only against accidental change, not from deliberate alteration of the worksheet by an unauthorized person.

Hiding Data

Sometimes you want to do more than just stop someone from changing data or formulas; you want to prevent others from even seeing the information. To do this, you can hide cells and ranges of cells.

You can hide data so that the data is not easily visible, but you cannot hide data to prevent someone from seeing it if that person knows how to use Lotus-DM.

To hide a cell or range of cells, use the Range Format command and choose the **Hidden** option. Hidden cells display as blank cells in the worksheet. If you move the cell pointer to a hidden cell, however, you can see the cell contents displayed in the edit panel. To display the cell contents again in the worksheet, apply to the hidden range any other range format as described in Chapter 5. Alternatively, you can use Range Format and select the **Reset** option to reset the cell to the global format.

To hide columns completely, use Worksheet Column with the **Hide** option. If you want to select a range before issuing the command, remember that you need to highlight only one cell in each column. A hidden column does not display in the window but retains its column letter. Figure 4.24 shows a worksheet with some columns about to be hidden. Figure 4.25 shows the worksheet after the columns are hidden. Note that in the column border, the letters D, E, and F are skipped. The columns are still there, but they do not display, and you cannot move the cell pointer to them.

Caution:
You cannot hide data from someone who knows how to use Lotus-DM.

Help F₁ Jan 30, 1990 Lotus-DM - (Untitled) 2:04 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀

F4 [W10] 'Qtr 4

	A	B	C	D	E	F	G	H
1								
2			Regional Report - 1990 Sales by Quarter					
3								
4			Qtr 1	Qtr 2	Qtr 3	Qtr 4	TOTAL	Projected
5		Reg 1	53,555	69,621	90,507	117,659	331,342	340,000
6		Reg 2	81,710	106,223	138,089	179,515	505,537	510,000
7		Reg 3	155,354	201,960	262,548	341,312	961,174	970,000
8		Reg 4	32,098	41,727	54,245	70,518	198,588	210,000
9								

Fig. 4.24.
A worksheet before columns are hidden.

Help F₁ Jan 30, 1990 Lotus-DM - (Untitled) 2:05 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀

G4 [W10] "TOTAL

	A	B	C	G	H	I	J	K	L
1									
2			Regional Report - 1990 Sales by Quarter						
3									
4			Qtr 1	TOTAL	Projected				
5		Reg 1	53,555	331,342	340,000				
6		Reg 2	81,710	505,537	510,000				
7		Reg 3	155,354	961,174	970,000				
8		Reg 4	32,098	198,588	210,000				
9									

Fig. 4.25.
The worksheet after columns are hidden.

When you print a range with hidden columns, the hidden columns do not print. Hiding columns is not really an effective way to hide sensitive information. Whenever you are in POINT mode, Lotus-DM displays the hidden columns so that you can include cells in the hidden columns in the range.

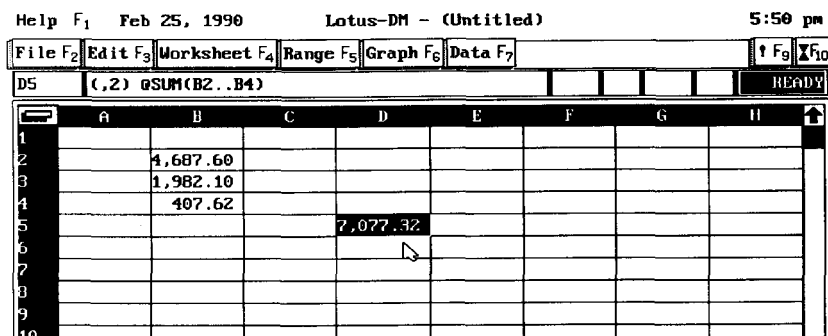


Fig. 4.27.
The
formula
after being
moved.

Moving the Contents of a Range

To move a range, select the range before invoking the Edit commands. Then select Edit Move Range and use the same techniques as described in "Moving the Contents of a Single Cell" to point to the destination range. The cell you point to or the address you type as the destination cell is the upper left corner of the new location. You do not have to highlight the entire destination range.

If the range you want to move has a name, you can preselect the range name from the list of range names. Press Name (Ctrl-F3) to display the list of range names, and then select the appropriate name. Then proceed with the Edit Move Range command as usual; the Move From prompt is filled in with the range name you selected.

Figure 4.28 shows a range of numbers highlighted for a move. Figure 4.29 shows the contents of the cells moved up one row and one column to the right; notice that not only were the contents moved, but also the formats and protection. The original cells in column B are still there, but they no longer contain data, formatting, or the unprotected status.

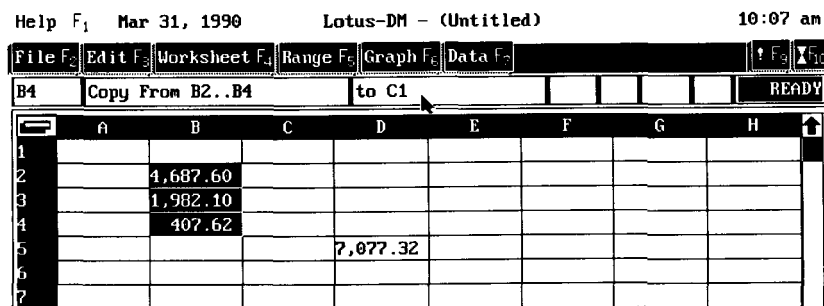


Fig. 4.28.
A range of
numbers
before being
moved.

Fig. 4.29.
The formula
adjusted after the
numbers are
moved.

Help F ₁		Feb 25, 1990		Lotus-DM - (Untitled)		7:26 pm	
File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
D5		(,2) @SUM(C1..C3)				READY	
	A	B	C	D	E	F	G
1			1,687.60				
2			1,982.10				
3			407.62				
4							
5				7,077.32			
6							
7							

As with many Lotus-DM commands, you can use the Edit Move Range command by typing addresses at either or both of the Move From and to prompts.

Note one important feature of Edit Move Range. The formula in D5 of figure 4.29 still shows the sum of the three numbers. When you move data, all formulas that refer to that data adjust their cell references to refer to the new location. The formula in D5 has changed from @SUM(B2..B4) to @SUM(C1..C3).

Caution:
When you move cells, ERR can occur anywhere in the file if there are formulas that refer to the range you moved.

When you move a range, you completely eliminate anything that was in the destination range before the move. You lose the data, the format, and the protection status. If any formulas refer to those cells, the references change to ERR.

Suppose that in figure 4.30 you want to replace the numbers in C1..C3 with the numbers in H1..H3. Figure 4.31 shows the result if you move H1..H3 to C1..C3. The formula in D5 changes from @SUM(C1..C3) to @SUM(ERR).

Fig. 4.30.
The worksheet
before data is
moved into
cells already
used in a
formula.

Help F ₁		Feb 25, 1990		Lotus-DM - (Untitled)		7:27 pm	
File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
D5		(,2) @SUM(C1..C3)				READY	
	A	B	C	D	E	F	G
1			1,687.60				5,372.50
2			1,982.10				2,165.00
3			407.62				376.76
4							
5				7,077.32			
6							
7							

To remedy the problem, you must reenter the formula in D5 manually. If you have hundreds of formulas in the file that refer to the cells C1..C3, you must correct every one. (You don't have to type every formula; instead, you can use the Copy command as explained in the next sections.) Be careful with the Edit Move Range command; you can destroy a worksheet if you use it incorrectly. The correct way to replace the data in C1..C3 with the data in H1..H3 is to copy H1..H3 to C1..C3 and then use Range Erase on H1..H3.

Help F₁ Feb 25, 1990 Lotus-DM - (Untitled) 7:28 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

D5 (,2) @SUM(ERR) READY

	A	B	C	D	E	F	G	H
1			5,372.50					
2			2,165.00					
3			376.76					
4								
5				ERR				
6								
7								
8								

Fig. 4.31.
A formula
changed to **ERR**
when data is
moved into cells
already used in
formulas.

If the source and destination ranges overlap, the Edit Move Range command still works correctly. If you move just one corner of a range used in a formula, the range expands or contracts. Figure 4.32 shows what happens after you move F2..H6 to G2. The overlapping range caused no problems. A common use of Edit Move Range is to make room for a new row or column in a range of data.

The formula in the original cell G3 in figure 4.32 was @SUM(C3..F3). After the move, the formula moved to H3 and is now @SUM(C3..G3). Notice that the @SUM in both formulas starts with cell C3. This cell did not move. But cell F3 moved to G3 in figure 4.32; therefore, the @SUM range expanded to C3..G3.

Help F₁ Jan 30, 1990 Lotus-DM - (Untitled) 2:27 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

H3 @SUM(C3..G3) READY

	B	C	D	E	F	G	H	I
1								
2		Budget	Jan	Feb		Mar	Total	Variance
3		144	38	34		84	300	1,973
4		164	37	33		89	323	2,798
5		163	40	30		87	320	2,760
6		471	115	97		260	943	1,415
7								
8								

Fig. 4.32.
The range
expanded
and formulas
adjusted
automatically
as one corner
of the range
is moved out.

If you move the range G2..I6 in figure 4.32 back to F2, the formulas revert to the original ones (see fig. 4.33). ERR does not display even though part of the range was eliminated. ERR occurs only if you move a range on top of one of the corner cells in a range. In figure 4.31, a new range was moved on top of the corner cells of the range referenced by the formula in D5; therefore, the formulas changed to ERR. In figure 4.33, the range was not moved on top of corner cells; therefore, the formulas do not change to ERR but just contract the range.

Fig. 4.33.
The range and the
formulas adjusted
automatically as
one corner of the
range is moved in.

Help F₁ Jan 30, 1990 Lotus-DW - (Untitled) 2:30 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

G3 @SUM(C3..F3) READY

	B	C	D	E	F	G	H	I
1								
2		Budget	Jan	Feb	Mar	Total	Variance	
3		144	38	34	84	300	1,973	
4		164	37	33	89	323	2,798	
5		163	40	30	87	320	2,760	
6		471	115	97	260	943	1,415	
7								
8								
9								

Copying the Contents of Cells

Cue:
Copy a formula
or a label
instead of
retyping it.

You use Edit Move Range to rearrange data in a file. You use Edit Copy Range to make duplicates of data in a file. In a typical file, formulas are duplicated many times. For example, in figure 4.33, the formula in G3 is duplicated in G4..G6. The same is true for the formulas in column H. If columns G and H were hundreds of rows long, the process of retyping the formulas would be long and tedious. Fortunately, if you use the same number, label, or formula in a number of places in a file, you can enter them once and copy them.

You use Edit Copy Range frequently. Copying can be simple or complicated. This section begins with simple examples and progresses to more complex examples.

You can copy a single cell or a range to another part of the worksheet. When you copy, you can make a single copy or many copies at the same time. When you copy a range, you also copy the format and protection status. You do not, however, copy the column width. The original cells are unchanged after you copy them. When you copy, the duplicate cells overwrite anything that was in the destination range before the copy. When you overwrite existing data, you lose the data as well as the format and protection status.

Copying the Contents of a Single Cell

The simplest example of copying is to copy a label from one cell to another. Figure 4.34 shows the beginning of a budget application. A repeating label in C6 separates the department detail from the totals in row 7. To copy this label from C6 to D6, move the cell pointer to C6 and select the Edit Copy Range command. In the edit panel, the Copy From prompt is followed by the cell address C6..C6; the to prompt is followed by the address C6. To specify the destination address, you can either type D6 and press Enter twice; or press the down arrow key to activate POINT mode, move the cell pointer to D6, and press Enter twice.

The result of the copy is shown in figure 4.35. Notice that the label is *duplicated*, not *moved* as it would have been if you used the Edit Move Range command.

Help F₁ Jan 30, 1990 Lotus-DM - (Untitled) 2:50 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀

C6 ~- READY

	A	B	C	D	E	F	G	H	I
1									
2			Jan	Feb	Mar	Total			
3			144	38	34	216			
4			164	37	33	234			
5			163	40	30	233			
6									
7			471						

Fig. 4.34.
The worksheet before a label is copied.

Help F₁ Jan 30, 1990 Lotus-DM - (Untitled) 2:50 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀

C6 ~- READY

	A	B	C	D	E	F	G	H	I
1									
2			Jan	Feb	Mar	Total			
3			144	38	34	216			
4			164	37	33	234			
5			163	40	30	233			
6									
7			471						

Fig. 4.35.
The worksheet after a label is copied.

Copying a Formula with Relative Addressing

The real power of Edit Copy Range shows up when you copy a formula. The formula in C7 in figure 4.34 is @SUM(C3..C5). When you copy C7 to D7, the formula in D7 is @SUM(D3..D5), as shown in figure 4.36. This concept, called *relative addressing*, is one of the most important concepts in Lotus-DM. When you copy a formula, Lotus-DM adjusts the new formula so that its cell references are in the same relative location as they were in the original formula.

Reminder:
Relative addressing means that cell references are adjusted as the formula containing the references moves around the worksheet.

Help F₁ Jan 30, 1990 Lotus-DM - (Untitled) 2:51 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀

D7 @SUM(D3..D5) READY

	A	B	C	D	E	F	G	H	I
1									
2			Jan	Feb	Mar	Total			
3			144	38	34	216			
4			164	37	33	234			
5			163	40	30	233			
6									
7			471	115					

Fig. 4.36.
The addresses adjusted automatically when a formula is copied.

In most cases, when you copy a formula, you want the addresses to adjust automatically. Sometimes, however, you do not want addresses to adjust, or you want only part of an address to adjust. These situations are examined separately in the following sections.

The formula in C9 in figure 4.37 is +C7/F7. This value represents January's sales as a percent of the total. If you copy this formula to D9, you get +D7/G7. The reference to D7, the sales for February, is correct. The reference to G7, however, is incorrect; G7 is a blank cell. When you copy the formula in C9, you want the address F7 to copy as an *absolute address*, meaning that you do not want that address to change after you copy it.

To specify an absolute address, type a dollar sign (\$) before each part of the address you want to remain “absolutely” the same. The formula in C9 should be `+C7/F7`. When you copy this formula to D9, the formula becomes `+D7/F7`.

[illegible]

Instead of typing the dollar signs, you can type the address and press Abs (Ctrl-F4). The address changes to absolute. When you copy this formula to D9, the formula becomes +D7/\$F\$7 (see fig. 4.37).

You can enter dollar signs while pointing to addresses in a formula. As you type an address in a cell, type the closing parenthesis and then immediately press Abs (Ctrl-F4) to make the address absolute. Do not press Enter before you press Abs. If you make an error and forget to make an address absolute, just press Edit (Ctrl-F2) to go into EDIT mode, move the cursor to the address you want to make absolute, and then press Abs (Ctrl-F4).

If you want to change a reference made absolute with dollar signs back to a relative reference, press Edit (Ctrl-F2), move the cursor to the absolute reference, and press Abs (Ctrl-F4) until both dollar signs disappear. Press Enter to reenter the formula.

Copying a Formula with Mixed Addressing

In some cases, you must use formulas with a mix of both absolute and relative references if you want the formula to copy correctly. The following example shows you how to keep a row reference absolute while letting the column reference change during the copy.

Figure 4.38 shows a price-forecast worksheet where the price-increase percentage differs for each year. When you copy the formula in C3 down column C, you do not want the reference to C1 to change; but when you copy the formula across row 3, you want the reference to change for each column. The mixed reference must be relative for the column and absolute for the row. The formula in C3 is +B3*(1+C\$1). When you copy this formula down one row to C4, the formula becomes +B4*(1+C\$1). The relative address B3 becomes B4, but the mixed address C\$1 is unchanged. When you copy this formula to D3, the formula becomes +C3*(1+D\$1). The relative address B3 becomes C3, and the mixed address becomes D\$1. You can copy the source range C3 to the destination range C3..G8 and create correct formulas throughout the worksheet.

Help F1 Feb 25, 1990 Lotus-DM - (Untitled) 7:44 pm

File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F9	F10
C3	(,2)	+B3*(1+C\$1)					READY
	A	B	C	D	E	F	G
1			8.50%	4.60%	6.70%	7.60%	5.40%
2		1989	1990	1991	1992	1993	1994
3	Product 1	138.60	150.38	157.30	167.84	180.59	190.35
4	Product 2	48.90	53.06	55.50	59.22	63.72	67.16
5	Product 3	487.83	529.30	553.64	590.74	635.63	669.96
6	Product 4	309.30	335.59	351.03	374.55	403.01	424.77
7	Product 5	37.03	40.18	42.03	44.84	48.25	50.85
8	Product 6	59.50	64.56	67.53	72.05	77.53	81.71
9							

Fig. 4.38.
An adjusted
mixed address
in a formula.

To make an address mixed without typing the dollar signs, use Abs (Ctrl-F4). The first time you press Abs, the address becomes absolute. As you continue to press Abs, the address cycles through all the possible mixed addresses and finally returns to a relative address. A complete list of relative, absolute, and mixed addresses is found in table 4.3.

Table 4.3
Using Abs (Ctrl-F4) To Change Address Type

<i>Number of Times To Press Abs (F4)</i>	<i>Result</i>	<i>Explanation</i>
1	\$D\$1	Absolute row and column
2	D\$1	Absolute row
3	\$D1	Absolute column
4	D1	Returned to relative

Copying One Cell's Contents a Number of Times

In figure 4.36, cell C7 was copied to cell D7. The idea, however, is to copy the formula in C7 to D7, E7, and F7. You can do this in one copy operation. The **Copy From** range is still C7..C7, but at the **to** prompt, you want to refer to the range D7..F7. To do this, you can either type the address D7..F7 and press Enter twice; or press the down-arrow key to activate POINT mode, highlight the range D7..F7, and press Enter twice. The formula in C7 is copied to all three cells.

Copying One Cell's Contents to a Range of Cells

You can copy a single cell to a range in the worksheet. Figure 4.39 shows a simple price-forecasting model. The current prices are in column B. The formula in C3 increases the price by the amount in B1. To copy this formula through the table in the worksheet, copy from C3 to C3..G8.

Help F₁ Feb 25, 1990 Lotus-DM - (Untitled) 7:47 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₁₀

C3 (.2) +B3*(1+\$B\$1) READY

	A	B	C	D	E	F	G	H
1		0.085						
2		1989	1990	1991	1992	1993	1994	
3	Product 1	138.60	150.38	163.16	177.03	192.08	208.41	
4	Product 2	48.90	53.06	57.57	62.46	67.77	73.53	
5	Product 3	487.83	529.30	574.29	623.10	676.06	733.53	
6	Product 4	309.30	335.59	364.12	395.07	428.65	465.08	
7	Product 5	37.03	40.18	43.59	47.30	51.32	55.68	
8	Product 6	59.50	64.56	70.04	76.00	82.46	89.47	
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								

Fig. 4.39.
A cell copied to
a number of
rows and
columns in
one copy.

When you copy a single cell, you can include the source cell in the destination range. As a general rule, the first cell in the source range can be the same cell as the first cell in the destination range. In most other cases, overlapping source and destination ranges can destroy data before it is copied.

Caution:
Avoid overlapping
source and
destination ranges.
Unless the
overlapping cell is
the first cell of both
ranges, you can
destroy the data
before you copy it.

Copying the Contents of a Range

In the previous examples, you copied one cell at a time. You also copied a row or a column of cells to a number of locations. Consider figure 4.40. Suppose that you want to copy the label in C6 and the formula in C7 across the columns D, E, and F. Select the range C6..C7 and invoke the Edit Copy Range command. At the **to** prompt, indicate the range D6..F6. Notice that the two-row source range is specified, but only a one-row destination range is given. You only have to select as the destination the top cell where each copy is to go. Lotus-DM remembers the size of each copy and fills in the lower cells of the copy accordingly. The result is displayed in figure 4.41.

Help F₁ Jan 29, 1990 Lotus-DM - (Untitled) 9:41 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

G3 @SUM(D3..F3) READY

	A	B	C	D	E	F	G	H
1								
2	Department	Number	Budget	Jan	Feb	Mar	Total	Variance
3	Dept 1		144	38	34	84	156	12
4	Dept 2		164	37	33	89	159	-5
5	Dept 3		163	40	30	87	157	-6
6	TOTALS		471	115	97	260	472	1
7								
8								

*Fig. 4.43.
The worksheet
after the copy.*

Copying a range a number of times is useful. When you build worksheets, you use this technique often. The technique, however, does have limitations. In general, if the source range is only one cell wide, you can copy it a number of times across both rows and columns. Because a single cell is part of one row and one column, you can copy a single cell across rows and down columns.

Because the source range in figure 4.40 (C6..C7) occupies two rows, you can copy this range across columns. You cannot copy this range down rows. If you specified a destination range in figure 4.40 of D6..F7 or even D6..F100, you get the same result as shown in figure 4.41. The rows are ignored in the destination range because they are fixed in the source range.

You can copy a two-dimensional range only once to a different area of the worksheet. For example, you can copy the range C3..G8 in figure 4.39 anywhere on the worksheet one time. If you highlight more than a single cell as the destination range, Lotus-DM uses the upper left corner of the range you specify and ignores the rest.

Cue:
If the source range is only one cell wide, you can copy it a number of times both down rows and across columns.

Using Range Names with Edit Copy Range

With all commands that prompt for a range, you can use range names for the source range, the destination range, or both. Just type the range name or press Name (Ctrl-F3) and point to the range name. Unfortunately, you cannot use range names with mixed addresses.

To specify an absolute address, you must type the dollar sign before the range name. To use the range name SALES in a formula as an absolute address, you type **\$SALES**. You cannot use Abs (Ctrl-F4) with range names, and you cannot specify a range name and make it a mixed address. You must use the actual cell addresses in these cases.

Using Range Value To Convert Formulas to Values

Cue:
Use Range
Value to
convert
formulas to
numbers.

The Range Value command is a special type of copy command. When you use Range Value on a cell that contains a label or a number, this command works exactly like Edit Copy Range. When you use Range Value on a cell that contains a formula, the current value, *not the formula*, is copied. Use the Range Value command to freeze the value of formulas so that they don't change. Figure 4.44 shows a model that forecasts profits for future years. You update the forecasts each quarter, but you want to keep track of the forecasts from the previous quarter for comparison. You can do this by converting the formula results in row 16 into values in row 18. In this way, next quarter's changes don't affect the values in row 18.

Fig. 4.44.
*A worksheet
before using
Range Value.*

Help F ₁		Jan 30, 1990		Lotus-DM - (Untitled)		4:07 am	
File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
B16		(,0) +B4-B8-B12				READY	
	A	B	C	D	E	F	G
1							
2		Actual	Projected				
3		1988	1989	1990	1991	1992	
4	Sales	37,845	45,641	53,551	64,571	78,622	
5	Growth Rate	13.00%	9.00%	11.00%	14.00%		
6	Inflation Rate	7.60%	8.33%	9.58%	7.76%		
7							
8	Fixed Costs	16,945	18,741	20,690	24,063	26,806	
9	Growth Rate	5.00%	3.00%	8.00%	6.00%		
10	Inflation Rate	5.60%	7.40%	8.30%	5.40%		
11							
12	Variable Costs	17,409	20,995	24,634	29,684	35,846	
13	Growth Rate	13.00%	9.00%	11.00%	13.00%		
14	Inflation Rate	7.60%	8.33%	9.58%	7.76%		
15							
16	Gross Profit	3,491	5,905	8,227	10,825	15,970	
17							
18	Prior Estimate						

The profit figures in row 16 of figure 4.44 are formulas. To copy as values the estimates from row 16 to row 18, select the range B16..F16 and use the Range Value command. Type **B18** in the Range To field of the Range Value dialog box and select OK. The values in row 18 are copies of the gross profit formulas in row 16, converted to numbers (see fig. 4.45). The numbers in row 18 are the current values of the formulas in row 16.

Help F₁ Jan 30, 1990 Lotus-DM - (Untitled) 4:06 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B18 (,0) 3491 READY

	A	B	C	D	E	F	G
1		Actual	Projected				
2		1988	1989	1990	1991	1992	
3							
4	Sales	37,845	45,641	53,551	64,571	78,622	
5	Growth Rate	13.00%	9.00%	11.00%	14.00%		
6	Inflation Rate	7.60%	8.33%	9.58%	7.76%		
7							
8	Fixed Costs	16,945	18,741	20,690	24,063	26,806	
9	Growth Rate	5.00%	3.00%	8.00%	6.00%		
10	Inflation Rate	5.60%	7.40%	8.30%	5.40%		
11							
12	Variable Costs	17,409	20,995	24,634	29,684	35,846	
13	Growth Rate	13.00%	9.00%	11.00%	13.00%		
14	Inflation Rate	7.60%	8.33%	9.50%	7.76%		
15							
16	Gross Profit	3,491	5,905	8,227	10,825	15,970	
17							
18	Prior Estimate	3,491	5,905	8,227	10,825	15,970	

Fig. 4.45.
The worksheet after using Range Value to freeze the previous profit figures.

In figure 4.46, the various rates were updated, and Lotus-DM calculated new gross profits. Because the previous estimates in row 18 did not change, you can compare the newest estimate with the previous one.

Help F₁ Jan 30, 1990 Lotus-DM - (Untitled) 4:18 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

D16 (,0) +D4-D8-D12 READY

	A	B	C	D	E	F	G
1		Actual	Projected				
2		1988	1989	1990	1991	1992	
3							
4	Sales	37,845	45,641	53,551	64,571	78,622	
5	Growth Rate	13.00%	9.00%	11.00%	14.00%		
6	Inflation Rate	7.60%	8.33%	9.58%	7.76%		
7							
8	Fixed Costs	16,945	18,741	20,690	24,270	27,036	
9	Growth Rate	5.00%	3.00%	9.00%	6.00%		
10	Inflation Rate	5.60%	7.40%	8.30%	5.40%		
11							
12	Variable Costs	17,409	20,960	24,488	29,263	34,753	
13	Growth Rate	12.80%	8.50%	10.00%	11.00%		
14	Inflation Rate	7.60%	8.33%	9.50%	7.76%		
15							
16	Gross Profit	3,491	5,939	8,372	11,038	16,833	
17							
18	Prior Estimate	3,491	5,905	8,227	10,825	15,970	

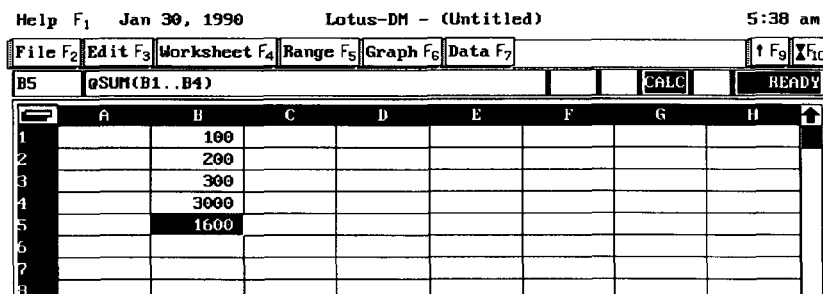
Fig. 4.46.
The worksheet with new profit figures after the rates are updated.

Formulas take more memory than numbers; they also take time to recalculate. To save time and memory, convert to numbers formulas that do not change. For example, the years in row 3 of figure 4.46 are formulas that add 1 to the preceding year (the formula in C3 is $+B3+1$). To convert these formulas to numbers, use the Range Value command to copy the source range C3..F3 to the destination range C3.

Caution:
Don't use
Range Value if
the CALC
indicator is on;
you can freeze
incorrect
values.

You may encounter problems with Range Value if you have recalculation set to Manual. If you use Range Value on a formula that is not current, you freeze an inaccurate value. This problem is even worse if you convert formulas to numbers and the formulas are not current. You lose the formulas, and the resulting numbers are wrong. In figure 4.47, the CALC indicator shows that the worksheet is not current. If you use Range Value on the formula in B5, you freeze an incorrect value. If your worksheet is set to Manual recalculation and the CALC indicator is on, press Calc (Ctrl-F9) before you use Range Value.

Fig. 4.47.
*An incorrect value
frozen if Range
Value is issued
when the CALC
indicator is on.*



Using Range Transpose

Range Transpose is another special type of copy command. This command converts rows to columns, converts columns to rows, and copies formulas relatively. Normally, you select an open area of the worksheet to receive the results. If you don't want the formulas to be copied relatively, you can first use Range Value to copy the range to an open area, and then use Range Transpose on the copied range. In figure 4.48, the range F12..N16 is the result of two operations. First, the Range Value command was used to copy the range A2..E10 to H2, converting the formulas to values. The Range Transpose command was then used to copy the range H2..L10 to F12.

Range Transpose is often used to change data in a database (see Chapter 10 for a discussion of databases). For example, suppose that the information in figure 4.48 is rental information on a VCR movie from a local movie rental store. As the manager of the store, you want to track how many times a particular movie is rented each day of the week to see which days the movie is rented most. Also, you want to determine when rental begins to taper off so that a rental special can be run.

The original database (A2..H10) is not set up properly for Lotus-DM to sort by day or week, because each record of the database must be in a row for sorting. You can use the Range Transpose command to place the data in correct database order for sorting purposes.

Help F₁ Jan 30, 1990 Lotus-DM - (Untitled) 5:49 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀

A1 [W?] READY

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2	Week #	1	2	3	4			Week #	1	2	3	4		
3														
4	Mon	3	4	4	5			Mon	3	4	4	5		
5	Tue	4	6	6	6			Tue	4	6	6	6		
6	Wed	7	7	6	6			Wed	7	7	6	6		
7	Thu	6	8	6	6			Thu	6	8	6	6		
8	Fri	8	7	8	8			Fri	8	7	8	8		
9														
10	TOTALS	28	32	30	31			TOTALS	28	32	30	31		
11														
12						Week #		Mon	Tue	Wed	Thu	Fri		TOTAL
13						1		3	4	7	6	8		28
14						2		4	6	7	8	7		32
15						3		4	6	6	6	8		30
16						4		5	6	6	6	8		31
17														
18														

Fig.4.48.
The results of
using Range
Transpose on a
table.

As with Range Value, you can freeze incorrect values if recalculation is set to Manual. Make sure that the CALC indicator is off before you transpose a range.

Controlling Recalculation

The commands discussed so far have shown you how to clear, protect, copy, and move data in worksheets. This section shows how to control the way Lotus-DM updates the worksheet as you change it.

Whenever a value in a worksheet changes, Lotus-DM recalculates all other cells that depend on the changed value. This is the essence of an electronic worksheet. Lotus-DM provides a number of recalculation options for different circumstances.

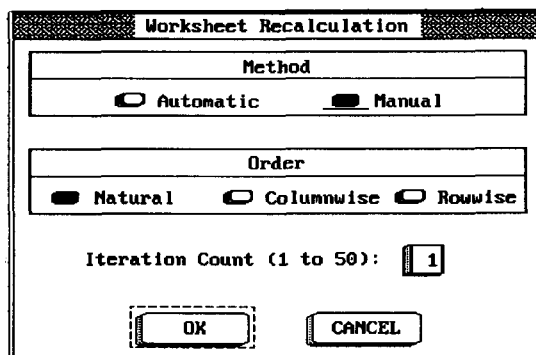
Caution:
Make sure that
the CALC
indicator is off
before you
transpose a
range.

Understanding Recalculation Methods

Normally, Lotus-DM recalculates the file whenever any cell changes. This feature is called *automatic recalculation*. Large worksheets can take a long time to recalculate, slowing work greatly.

Recalculation is best left in the default Automatic mode most of the time. If you want, however, you can tell Lotus-DM not to recalculate the worksheet when you change the worksheet. To do this, select the Worksheet Recalc command and choose **Manual** from the Worksheet Recalculation dialog box (see fig. 4.49). If recalculation is set to Manual and you want to recalculate the worksheet, press **Calc** (Ctrl-F9). As the recalculation is being performed, the mode indicator is set to **WAIT**, and you cannot use Lotus-DM. Setting recalculation to Manual can save time when you work with large worksheets.

Fig. 4.49.
The
Worksheet
Recalculation
dialog box.



During recalculation, Lotus-DM determines which formulas depend on which cells and sets up a recalculation order to ensure the correct answer. This process is called the *natural order of recalculation*. Spreadsheet programs developed in the late 1970s and early 1980s were not able to do this and sometimes required many successive recalculations before they arrived at the right answer in all cells.

These early spreadsheet programs could recalculate only columnwise or rowwise. *Columnwise recalculation* starts in cell A1 and calculates the cells down column A, then down column B, and so on. *Rowwise recalculation* starts in cell A1 and calculates the cells across row 1, then across row 2, and so on. **Columnwise** and **Rowwise** are options in the Worksheet Recalculation dialog box, but unless your model relies on this specific type of calculation, leave the order set to **Natural**.

Using Iteration To Solve Circular References

In the case of circular reference, the natural order of recalculation does not ensure the correct answer for all cells. A *circular reference* is a formula that depends, either directly or indirectly, on its own value. Usually a circular reference is an error, and you should eliminate it immediately. Whenever Lotus-DM performs a recalculation and finds a circular reference, the CIRC indicator appears on the right side of the edit panel. Figure 4.50 shows a typical circular reference in which the @SUM function includes itself.

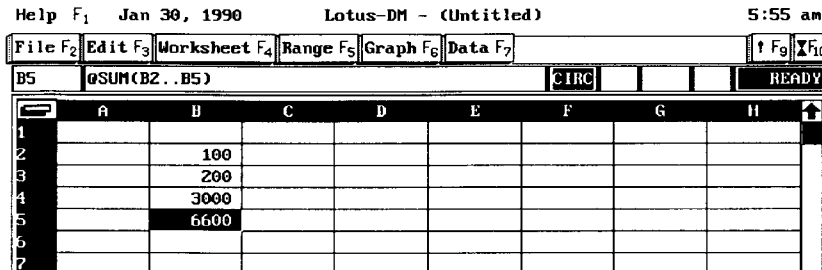


Fig. 4.50.
A circular reference.

If you are not sure why the CIRC indicator appears, use the Worksheet Status command to display a basic status report (see fig. 4.51). This display points out one of the cells that caused the circular reference. (The cell address displayed is always the lowest, rightmost circular reference in the worksheet. When you fix that formula, select Worksheet Status again to see the location of the next circular reference.) In the example shown in figure 4.50, you can fix the error by changing the formula to @SUM(B2..B4). In other cases, the source of the problem may be less obvious, and you may have to check every cell referred to in the cell that contains the formula.

Cue:
Use Worksheet Status to find the location of a circular reference.

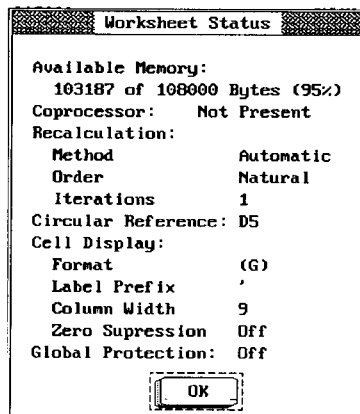


Fig. 4.51.
The circular reference displayed with the Worksheet Status command.



Note: In addition to displaying information about circular references, you can use Worksheet Status to see a mixture of information that includes the memory available, whether your computer has a math coprocessor, the current recalculation method, default formats, label prefix and column width for the current worksheet, and whether global protection is on or off in the current worksheet. The main use of the status display is to check the amount of memory available and to locate circular references.

In some special cases, a circular reference is deliberate. Figure 4.52 shows a worksheet with a deliberate circular reference. In this example, a company sets aside 10 percent of its net profit for employee bonuses. The bonuses themselves, however, represent an expense that reduces net profit. The formula in C5 shows that the amount of bonuses is the net profit in cell D5 times 0.1, or 10 percent. But net profit is equal to the profit before bonuses minus the bonuses (B5–C5). The value of employee bonuses depends on the value of net profit, and the value of net profit depends on the value of employee bonuses. In figure 4.52, C5 depends on D5 and D5 depends on C5. This is a classic circular reference.

Fig. 4.52.
A worksheet
with a
deliberate
circular
reference.

Help F₁ Jan 30, 1990 Lotus-DH - (Untitled) 6:50 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C5 (,0) @ROUND(D5*0.1,0) CIRC READY

	A	B	C	D	E	F	G	H
1								
2		Profit						
3		Before	Employee	Net				
4		Bonuses	Bonuses	Profit				
5		105,648	9,604	96,044				
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								

Each time you recalculate a worksheet with a legitimate circular reference, the answers change by a smaller and smaller amount. Eventually, the changes become insignificant. This is called *convergence*. An erroneous circular reference, on the other hand, never converges; the result of the @SUM function in figure 4.52 gets bigger every time you recalculate.

The worksheet in figure 4.52 needs five recalculations before the changes become less than one dollar. To determine the number of calculations needed for a legitimate circular reference, make an entry in cell B5 and press Enter. If recalculation is set to Automatic, the worksheet calculates one time. Press Calc (Ctrl-F9) until C5 and D5 quit changing. In this example, you must press Calc (Ctrl-F9) four more times; this makes five calculations or *iterations*.

Once you establish this number, you can tell Lotus-DM to recalculate the worksheet five times every time it recalculates. To do this, invoke the Worksheet Recalc command and type **5** in the `Iteration Count (1 to 50)` field.

Locking Titles On-Screen

Most worksheets are much larger than can be displayed on-screen at any one time. As you move the cell pointer, you scroll the display. New data appears at one edge of the display as the data at the other edge scrolls out of sight. This scrolling can be a problem when *titles* (column headings) at the top of the worksheet and *descriptions* (row labels) at the left also scroll off the screen.

To prevent the titles and descriptions from scrolling off the screen, you can use the Worksheet Titles command to *freeze*, or lock, titles on-screen. To lock titles, follow these steps:

1. Position the display so that the titles you want to lock are at the top and left of the display.
2. Move the cell pointer to the first row *below* the column titles and the first column *to the right of* the row descriptions.
3. Choose Worksheet Titles and select `Both` from the Worksheet Titles dialog box to lock both horizontal and vertical titles.

Once you lock titles, the data below and to the right of the titles can scroll off the screen, but the locked titles remain on-screen (see fig. 4.53).

When you lock titles and press Home, the cell pointer moves to the position following the titles (cell B3 in fig. 4.53) rather than to cell A1. You cannot use the mouse or the cursor-movement keys to move into the titles area.

To cancel the locked titles so that you can move freely in the titles area, select Worksheet Titles and choose the `Clear` option. To lock just the rows at the top of the screen, choose the `Horizontal` option in the Worksheet Titles dialog box; to lock just the columns at the left of the screen, choose the `Vertical` option. To change the locked titles, first eliminate the existing files with the `Clear` option and then specify the new locked titles.

Cue:

Use the Worksheet Titles command to prevent titles from scrolling off the screen.

Fig. 4.53.
Locked titles
on-screen.

Help F₁ Feb 25, 1990 Lotus-DM - (Untitled) 8:02 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C8 (,2) +B8*(1+\$B\$1) READY

	A	B	C	D	E	F	G	H
1		0.085						
2		1989	1990	1991	1992	1993	1994	
3	Product 6	59.50	61.56	70.04	76.00	82.46	89.47	
4	Product 7	337.91	366.63	397.80	431.61	468.30	508.10	
5	Product 8	314.34	341.06	370.05	401.51	435.63	472.66	
6	Product 9	332.86	361.15	391.85	425.16	461.30	500.51	
7	Product 10	304.25	330.11	358.17	388.61	421.64	457.48	
8	Product 11	166.66	180.83	196.20	212.88	230.97	250.60	
9	Product 12	282.12	306.10	332.12	360.35	390.98	424.21	
10	Product 13	112.83	122.42	132.82	144.11	156.36	169.65	
11	Product 14	99.35	107.79	116.96	126.90	137.68	149.39	
12	Product 15	171.86	186.46	202.31	219.51	238.17	258.41	
13	Product 16	253.46	275.00	298.38	323.74	351.26	381.12	
14	Product 17	180.84	196.21	212.89	230.99	250.62	271.93	
15	Product 18	167.69	181.94	197.41	214.19	232.39	252.15	
16	Product 19	345.94	375.34	407.24	441.86	479.42	520.17	
17	Product 20	318.32	345.37	374.73	406.58	441.14	478.64	
18								
19								
20								
21								
22								
23								

Chapter Summary

In this chapter, you learn to use fundamental Lotus-DM commands. You learn how to use command menus, how to specify and name ranges, and how to save files. Erasing ranges and inserting and deleting rows and columns are presented as ways to change the layout of a worksheet. In addition, you learn how to protect and hide data. Just as important, you learn the limitations of these techniques and how they can be overridden.

The uses of Edit Move Range and Edit Copy Range, two basic commands used to rearrange data and build worksheets, are explained.

The process of controlling how the worksheet is recalculated and how data is displayed on-screen is discussed, and you see how to lock titles so that row identifiers and column headings can remain on the screen even when the cell pointer is far away from the worksheet borders.

Learning all the commands in Lotus-DM is a formidable task. Fortunately, many commands perform specialized tasks, and you can learn them as needed to perform these tasks. The more specialized commands are covered in the following chapters.

Formatting Cell Contents

Using Lotus-DM to manipulate data is only the first step in using an electronic worksheet. Making the results clear and easy to understand can be as important as calculating the correct answer. In this chapter, you learn to use the tools that control how data within cells is displayed on-screen. Changing how data displays is called *formatting*.

You can use two types of formatting commands. The Range Format command affects the display of individual cells. The Worksheet Format command affects the display of an entire worksheet or file. You use both types of commands to customize the display of data.

When you format data, you change only the way the data displays. You do not change the value of the data itself. Other advanced formatting capabilities that apply only when you print reports are also available. Those printing capabilities are covered in Chapter 7.

This chapter shows you how to do the following:

- ☐ Set range and worksheet formats
- ☐ Use the format commands to change how cells display
- ☐ Change label alignment in the cell
- ☐ Justify long labels across columns
- ☐ Suppress the display of zeros within cells

Lotus-DM includes a number of overall settings that define how Lotus-DM operates and how the overall worksheet looks. You can change these settings. You must select some settings with the Setup accessory (accessed by pressing the F10 key). For example, you use Setup to specify the type of mouse and the printers connected to your computer (Chapter 2 explains how to use the Setup accessory to define these kinds of settings). You can change other settings as you work in Lotus-DM. The main command to change these settings in Lotus-DM is Worksheet (F4).

Reminder:
Use Worksheet
Format to specify
default formats;
use Range Format
to change the
format of
individual ranges.

If you select Worksheet Format, the dialog box in figure 5.1 appears. This dialog box enables you to set the formats to be used throughout the worksheet. If this is the first time you have accessed this dialog box, the General format is selected. The settings specified in this dialog box are the *default* settings.

If you want to format specific ranges in the worksheet differently than what is specified in the Worksheet Format dialog box, use the Range Format command. This command is discussed later in this chapter.

Fig. 5.1.
The Worksheet
Format dialog
box.

Type	
<input type="radio"/>	Fixed
<input type="radio"/>	Scientific
<input type="radio"/>	Currency
<input type="radio"/>	Percent
<input type="radio"/>	, (comma)
<input type="radio"/>	+/-
<input checked="" type="radio"/>	General
<input type="radio"/>	Date
<input type="radio"/>	Time
<input type="radio"/>	Text
<input type="radio"/>	Hidden

Date	
(D1)	<input type="radio"/> DD-MMM-YY
(D2)	<input type="radio"/> DD-MMM
(D3)	<input type="radio"/> MMM-YY
(D4)	<input type="radio"/> MM/DD/YY
(D5)	<input type="radio"/> MM/DD

Time	
(D6)	<input type="radio"/> HH:MM:SS AM/PM
(D7)	<input type="radio"/> HH:MM AM/PM
(D8)	<input type="radio"/> HH:MM:SS 24hr
(D9)	<input type="radio"/> HH:MM 24hr

Decimal Places (0-15):

Caution:
Update the
global defaults;
otherwise, all
changes are lost
when you quit
Lotus-DM.

Any setting changes you make with Worksheet Format are effective only until you quit Lotus-DM. The next time you start Lotus-DM, the settings revert to their original values. To update the changed settings permanently, execute the Worksheet Update command. This command updates a configuration file in the Lotus-DM directory. Lotus-DM uses this file to determine the defaults for the settings.

Cue:
Use the Worksheet
Status command to
see all the global
defaults at one
time.

Use the Worksheet Status command to display global settings, such as the memory available; whether you have a math coprocessor in your computer; the current recalculation method; default formats, label prefix, and column width for the current worksheet; whether global protection is enabled in the current worksheet; and whether zero suppression is currently in effect. The main use of the status display is to check the amount of memory available and to find circular references (see fig. 5.2). See Chapter 4 for more information on circular references.

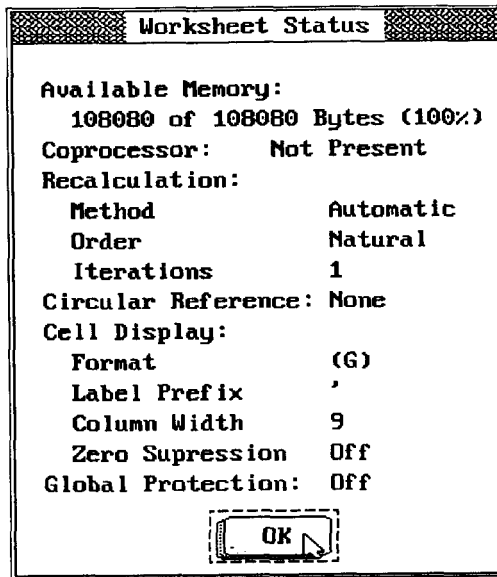


Fig. 5.2.
*The Worksheet
Status display.*

Setting Range and Worksheet Formats

Data in a cell has two characteristics: its contents and how it displays. These two characteristics are related, but they are not the same. The *contents* of the current cell are shown in the edit panel; the *formatted display* of the contents appears in the worksheet (see fig. 5.3). A cell may contain a formula, but the current value of the formula displays in the cell. Other factors, such as the column width, can affect how a cell displays, but the cell format is the most important factor.

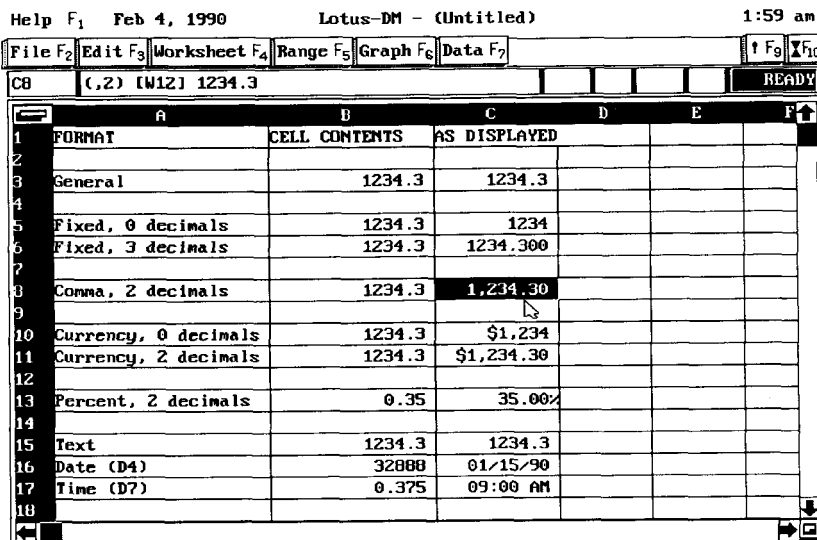


Fig. 5.3.
*A worksheet
demonstrating
various formats.*

The Available Formats

You can display data in a cell in a number of different formats. These formats are listed in table 5.1. You can set any of these options from either the Worksheet Format or the Range Format dialog box. Remember that Worksheet Format affects every cell in the worksheet not specifically formatted with Range Format; Range Format affects only a specified range.

Table 5.1
Available Display Formats

<i>Format</i>	<i>Example</i>	<i>Application</i>
General	1234.5	Numeric data
Fixed	1234.50	Numeric data
comma (,)	1,234.50	Numeric data
Currency	\$1,234.50	Numeric data
Percent	35.4%	Numeric data
Scientific	1.2345E+03	Numeric data
+/-	+++++	Numeric data
Date	10/10/89	Special date serial numbers
Time	06:23 AM	Special time fractions
Text	+C6	All formulas
Hidden	No display	All data

Most formats apply to numeric data (numeric formulas and numbers). If you format a label as Fixed or Currency, for example, the format has no effect on how the label displays. One format, Hidden, can apply to labels and string formulas as well as numeric data. Figure 5.3 shows examples of some of the possible formats.

No matter what the format, numeric data is right-aligned. The rightmost digit always displays in the second position from the right. The extreme right position is reserved for a percent sign or right parenthesis. The result of string (text) formulas is always left-aligned, even if the formula refers to a label with another alignment.

The width of a cell is controlled by the column width setting, as described in Chapter 4. If the column is not wide enough to display a numeric entry, asterisks (*) fill the cell; labels are truncated if the cell is not wide enough and cells to the right are not empty. To display the data, you must either change the format or change the column width.

Cue:
If numeric data displays as asterisks, change the format or the column width.

Because the extreme right position of a cell with a numeric format is reserved for a percent sign or right parenthesis, a number must fit into the cell using one character less than the column width. If the column width is 9, for example, the formatted number must fit into 8 spaces not counting a percent sign or right parenthesis. Negative numbers display with either a minus sign or parentheses. This means that a negative number requires an extra character to display. With a column width of 9, then, a negative number must fit into 7 positions.

The Contents Versus the Format of a Cell

Remember that formatting changes how the data displays, not the data itself. For example, the number 1234 can display as 1,234, \$1,234.00, 123400%, and in many other ways. No matter how the number displays, it remains the same number.

Reminder:
The value of a number does not change when you change its format.

Some formats display a number as if it were rounded. If you format 1234.5 in Fixed format with zero decimal places, the number displays as 1235, but the actual value (1234.5) is used in formulas. In figure 5.4, the sales total in C7 looks as if an addition error has been made. Actually, the formula in C5 is $+B5*1.1$, projecting 10 percent higher sales next year. The value of the formula in C5 is 95.7. The display, however, shows 96 with a Fixed format and zero decimal places. The value of the formula in C6 is 83.6, but the display shows 84. The value of the sum in C7 is 179.3, but the display shows 179. The value appears as $96+84=179$. This is an apparent rounding error produced by rounding the display.

Fig. 5.4.
An apparent rounding error caused by formatting.

Help F1 Feb 4, 1990 Lotus-DM - (Untitled) 2:07 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

C7 (F0) +C5+C6 READY

	A	B	C	D	E	F	G	H
1	Sales in Thousands							
2		This	Next					
3		Year	Year					
4								
5	Dept 1	87	96					
6	Dept 2	76	84					
7	Totals	163	179					

To avoid rounding errors, you need to round the actual value of the formulas, not just the display. To round the value of a formula, use the @ROUND function, as explained in the Function Reference later in this book.

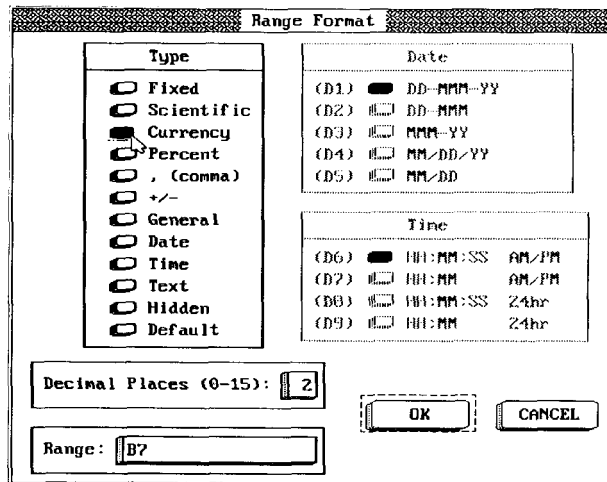
Cue:
Use formats to change how a number displays; use @ROUND to round the value in the cell.

Using the Format Commands

You change the format of an individual cell or a range of cells with the Range Format command (see fig. 5.5). You then pick one of the formats from the Type selection box. For comma format, for example, select the **Comma** option.

If you choose Fixed, Scientific, , (comma), Currency, or Percent, you should fill in the **Decimal Places (0-15)** field in the dialog box. Whenever this prompt appears, Lotus-DM shows a default of 2 decimal places. You can accept the default, or type another number between 0 and 15. The Date and Time formats allow you to make additional selections, as described later in this chapter.

Fig. 5.5.
The Range
Format dialog
box.



If you want to specify a format for a range, preselect the range and then select Range Format. (If you want to specify a format for all cells in the worksheet, you don't have to preselect a range before selecting Worksheet Format.) Figure 5.6 shows the result of using Range Format on the range B5..B11, selecting Fixed format, and specifying 2 decimal places. An abbreviation of the format appears in the edit panel when the current cell has a range format. In figure 5.6, (F2) displayed in the edit panel indicates that B5 has been range formatted as Fixed with 2 decimal places. If the cell has no range format, no format indicator appears in the edit panel. If the formatting was specified with the Worksheet Format command, no abbreviation of the format appears in the edit panel.

Help F₁ Feb 4, 1990 Lotus-DM - (Untitled) 2:25 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B5 (F2) [W12] 975.85 READY

	A	B	C	D	E	F	G
1	Sales in Thousands						
2							
3							
4		Last	Current	Next			
5	Dept 1	975.85	1073.435	1180.7785			
6	Dept 2	960.00	1056	1161.6			
7	Dept 3	880.50	880.55	968.605			
8	Dept 4	1042.46	1146.706	1261.3766			
9	Dept 5	899.00	988.9	1087.79			
10							
11	Totals	4677.81	5145.591	5660.1501			
12							
13							
14							
15							
16							
17							
18							

Fig. 5.6.
A range
formatted as
Fixed with 2
decimal places.

When you start a new file, none of the cells have a range format. For example, in figure 5.6, none of the cells have a range format except for those in the range B5..B11. When a cell does not have a range format, the cell takes the format specified by the Worksheet Format command.

When you start a new file, the worksheet (global) format is General. To change the global format, use the Worksheet Format command (see fig. 5.7). Figure 5.8 shows the worksheet after changing to comma format with 2 decimal places. Notice that the format in B5..B11 did not change. These cells have a range format; the global format affects only the cells with no range format.

Reminder:
A range
format
overrides the
global
format.

Worksheet Format

Type	Date	Time
<input type="radio"/> Fixed	(D1) <input checked="" type="checkbox"/> DD-MMM-YY	(D6) <input checked="" type="checkbox"/> HH:MM:SS AM/PM
<input type="radio"/> Scientific	(D2) <input type="checkbox"/> DD-MMM	(D7) <input type="checkbox"/> HH:MM AM/PM
<input checked="" type="radio"/> Currency	(D3) <input type="checkbox"/> MMM-YY	(D8) <input type="checkbox"/> HH:MM:SS 24hr
<input type="radio"/> Percent	(D4) <input type="checkbox"/> MM/DD/YY	(D9) <input type="checkbox"/> HH:MM 24hr
<input type="radio"/> , (comma)	(D5) <input type="checkbox"/> MM/DD	
<input type="radio"/> +/-		
<input type="radio"/> General		
<input type="radio"/> Date		
<input type="radio"/> Time		
<input type="radio"/> Text		
<input type="radio"/> Hidden		

Decimal Places (0-15):

Fig. 5.7.
The
Worksheet
Format
dialog box.

Fig. 5.8.
The worksheet
with a global
format of
comma (,) with
2 decimal
places.

Help F₁ Feb 4, 1990 Lotus-DM - (Untitled) 2:28 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B5 (F2) (W12) 975.85 READY

	A	B	C	D	E	F	G
1	Sales in Thousands						
2							
3							
4		Last	Current	Next			
5	Dept 1	975.85	1,073.44	1,180.78			
6	Dept 2	960.00	1,056.00	1,161.60			
7	Dept 3	800.50	880.55	968.61			
8	Dept 4	1042.46	1,146.71	1,261.38			
9	Dept 5	899.00	988.90	1,087.79			
10							
11	Totals	4677.81	5,145.59	5,660.15			
12							
13							

If you have applied a range format to a cell or range, and you want that range to have the same format as the global format, remove range formatting by selecting the Range Format command and choosing the Default type. If you want a cell or range with a range format to have a different range format, execute the Range Format command again and choose a different format.

Cue:
Choose the
global format
you will use
most in the
worksheet.

Use worksheet (global) formats for formats you expect to use the most in the worksheet. Then use the Range Format command to format ranges you want to display with other formats. Most worksheets look best if you use a variety of formats to match the data. Figure 5.9 shows a worksheet with a global format of comma (,), as well as Currency, Percent, and Date range formats.

Fig. 5.9.
A worksheet
with a variety
of formats.

Help F₁ Feb 4, 1990 Lotus-DM - (Untitled) 2:33 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

D1 (D4) (W12) @DATE(90,9,13) READY

	A	B	C	D	E	F	G
1	Sales in Thousands			09/13/90			
2							
3							
4		Last	Current	Difference	% Change		
5	Dept 1	\$975.85	\$1,075.03	\$99.18	10.16%		
6	Dept 2	960.00	1,103.78	143.78	14.98%		
7	Dept 3	800.50	845.75	45.25	5.65%		
8	Dept 4	1042.46	1,140.10	97.64	9.37%		
9	Dept 5	899.00	1,001.23	102.23	11.37%		
10							
11	Totals	\$4,677.81	\$5,165.89	\$488.08	10.43%		
12							
13							
14							
15							
16							
17							
18							

The following sections describe each format in detail. You can apply each format with either the Worksheet Format or Range Format command, depending on how you want the format to affect the worksheet. Remember that worksheet formats affect the worksheet globally (all cells not specifically formatted with a Range Format command); range formats override worksheet formats and affect only the specified range. Except for the Hidden format, format commands do not affect the appearance of cells that contain labels.

General Format

General format, the default for all new worksheets, displays only the number, without any dollar signs, commas, or percent signs. If the number is negative, it is preceded by a minus sign. If the number contains decimal digits, it can contain a decimal point. If the number contains too many digits to the right of the decimal point to fit within the column width, the decimal portion that does not fit in the cell is truncated. If the number is too large to display normally, it displays in Scientific format. In a cell with a column width of 9, for example, 123400000 displays as 1.2E+08. In the same cell, a very small number, such as 0.0000000012, is truncated and displays as 0.000000. Negative numbers in Scientific format display with a leading minus sign.

Reminder:

When you start a new file, the global format is General.

(G) appears in the edit panel of cells that have been range formatted as General. Nothing appears in the edit panel if the cells are formatted with Worksheet Format.

Following are several examples of General format in cells that have a column width of 9:

<i>Typed Entry</i>	<i>Displayed Result</i>
123.46	123.46
-123.36	-123.36
1.2345678912	1.234567
150000000	1.5E+08
-.000000002638	-0.00000

Fixed Format

Cue:
Use Fixed
format when
you want a
column of
numbers to line
up on the
decimal point.

Use the Fixed format when you want a column of numbers to line up on the decimal point. Lotus-DM displays numbers with the number of decimal places you specify, from 0 to 15. If the number has more decimal digits than what you specify in the format, the number is rounded in the display, but not in the value used for calculations. In all cases, the full number in the cell is used in calculations. Negative numbers display with a leading minus sign.

(Fn) appears in the edit panel of cells that have been range formatted as Fixed. *n* represents the number of decimal places you specify in the **Decimal Places** (0–15) field in the dialog box. If you format with **Worksheet Format**, no format indicator appears in the edit panel.

Following are examples of Fixed format in cells that have a column width of 9:

<i>Typed Entry</i>	<i>Cell Format</i>	<i>Displayed Result</i>
123.46	(F0)	123
123.46	(F1)	123.5
–123.46	(F2)	–123.46
123.46	(F4)	123.4600
–123.46	(F4)	*****
12345678	(F2)	*****

Comma Format

Cue:
Use comma
format to
make large
numbers
easier to
read.

Like the Fixed format, the comma format (,) displays data with a specified number of decimal places (from 0 to 15). In addition, the comma format separates the thousands, millions, and so on with commas. Positive numbers less than 1,000 display the same way in Fixed format and comma format. Comma format is used most often for financial data.

If the number has more decimal digits than what you specify in the format, the number is rounded in the display. The full value in the cell is used in calculations.

Use comma format instead of Fixed format for large numbers. People can read 12,300,000.00 easier than 12300000.00. With comma format, negative numbers display in parentheses. –1234 displays as (1,234) with 0 decimal places.

(,n) appears in the edit panel of cells that have been range formatted as comma. *n* represents the number of decimal places you specify in the **Decimal Places** (0–15) field in the dialog box. No format indicator appears in the edit panel if you format with **Worksheet Format**.

Following are examples of comma (,) format in cells that have a column width of 9:

<i>Typed Entry</i>	<i>Cell Format</i>	<i>Displayed Result</i>
123.46	(,0)	123
1234.6	(,2)	1,234.60
-1234.6	(,0)	(1,235)
-1234	(,2)	*****

Currency Format

Currency format works much like comma format but includes a leading dollar sign (\$). Because of the dollar sign, an extra position in the column width is needed to display a number in Currency format. Negative numbers are handled the same as with comma format.

You can change the dollar sign, the default currency symbol, if you are using a different currency. Use the **Worksheet International** command to specify a different currency symbol and to specify whether the symbol is a prefix or a suffix (refer to “International Formats” later in this chapter). The currency symbol can be up to 15 characters long—for example, you can specify a currency symbol of \$US or \$CAN—and can include any of the characters in the Lotus International Character Set (LICS). The @CHAR and @CODE @functions, described in the **Function Reference** section at the end of this book, describe the LICS characters in more detail. The currency symbol you specify applies to Lotus-DM as a whole, not to any one worksheet.

Cue:
You can change the default currency symbol.

Suppose that you create a file using Currency format for U.S. dollars and save the file. You later create a file that uses the British pound (£). You can change the currency symbol to the British pound by typing the LICS character for this symbol in the **Worksheet International Settings** dialog box. You do this by pressing **Compose** (Alt-F1) and then typing **L=**. When you later retrieve another file, any cells formatted as Currency display £ as the currency symbol.

Caution:
If you change the currency symbol, the change affects the entire file and all subsequent files you retrieve.

(Cn) appears in the edit panel of cells range formatted as Currency. *n* represents the number of decimal places you specify in the **Decimal Places** (0–15) field in the dialog box. If you format with **Worksheet Format**, no format indicator appears in the edit panel.

Following are examples of Currency format in cells that have a column width of 9:

<i>Typed Entry</i>	<i>Cell Format</i>	<i>Displayed Result</i>
123	(C2)	\$123.00
-123.124	(C2)	(\$123.12)
1234.12	(C0)	\$1,234
1234.12	(C2)	*****

Percent Format

Reminder:
Enter
percentages as
decimal
fractions, not as
whole numbers.

Use the Percent format to display percentages. You specify the number of decimal places from 0 to 15. The number displayed is the value of the cell multiplied by 100, followed by a percent sign. If the number has more decimal digits than what you specify in the format, the number is rounded in the display.

Note that the number of decimal places you specify is for the number as a percent, not as a whole number. For example, only 2 decimal places are needed to display 0.2456 as a percent.

The number *displays* as multiplied by 100, but the *value* of the cell is unchanged. To display 50% in a cell, type .5 and format the cell as Percent. If you type 50 and format the cell as Percent with zero decimal places, 5000% displays.

(Pn) appears in the edit panel of cells range formatted as Percent. *n* represents the number of decimal places you specify in the Decimal Places (0-15) field in the dialog box. If you format with Worksheet Format, no format indicator appears in the edit panel.

Following are examples of Percent format in cells that have a column width of 9:

<i>Typed Entry</i>	<i>Cell Format</i>	<i>Displayed Result</i>
.2	(P2)	20.00%
-1.3528	(P2)	-135.28%
30	(P0)	3000%
30	(P4)	*****

Scientific Format

Use Scientific format to display very large or very small numbers. Very large and very small numbers usually have a few significant digits and many zeros as place holders to tell you how large or how small the number is.

A number in scientific notation has two parts; a mantissa and an exponent. The *mantissa* is a number from 1 to 10 that contains the significant digits. The *exponent* tells you how many places to move the decimal point to get the actual value of the number. You specify the number of decimal places from 0 to 15. If the number has more significant digits than what you specify in the format, the number is rounded in the display.

1230000000000 displays as 1.23E+12 in Scientific format with 2 decimal places. E+12 signifies that you must move the decimal point 12 places to the right to get the actual number. 0.000000000237 displays as 2.4E-10 in Scientific format with 1 decimal place. E-10 means that you must move the decimal point 10 places to the left to get the actual number.

A number too large to display in a cell in General format automatically displays in scientific format.

(S*n*) appears in the edit panel of cells range formatted as Scientific. *n* represents the number of decimal places you specify in the **Decimal Places** (0–15) field in the dialog box. If you format with **Worksheet Format**, no format indicator appears in the edit panel.

Following are examples of Scientific format in cells that have a column width of 9:

<i>Typed Entry</i>	<i>Cell Format</i>	<i>Displayed Result</i>
1632116750000	(S2)	1.63E+12
1632116750000	(S0)	2E+12
-1632116750000	(S1)	-1.6E+12
-1632116750000	(S2)	*****
-.00000000012	(S0)	-1E-10

+/- Format

The +/- format creates a horizontal bar graph based on the number in the cell. A positive number displays as a row of plus (+) signs; a negative number displays as a row of minus (–) signs; a zero displays as a period (.). The number of pluses or minuses can be no wider than the cell.

The +/- format was originally devised to create imitation bar graphs in spreadsheets that had no graphing capability. The format is not widely used today.

Cue:

Use Scientific format to display very large or very small numbers.

Cue:

Use +/- format to create horizontal bar graphs.

(+) appears in the edit panel of cells range formatted as +/- . If you format with Worksheet Format, no format indicator appears in the edit panel.

Following are examples of +/- format in cells that have a column width of 9:

<i>Typed Entry</i>	<i>Cell Format</i>	<i>Displayed Result</i>
6	(+)	++++++
4.9	(+)	++++
-3	(+)	---
0	(+)	.
17.2	(+)	*****

Date and Time Formats

All the formats mentioned so far deal with regular numeric values. Use Date and Time formats when you deal with date and time calculations or functions. Date and time functions are covered in the Function Reference later in this book.

Choose the Range Format Date or Worksheet Format Date command to select from five Date format options. Choose the Range Format Time or Worksheet Format Time command to select from four Time format options.

Date Formats

When you use date functions, Lotus-DM stores the date as a serial number representing the number of days since December 31, 1899. The serial date number for January 1, 1900, is 1. The serial date number for January 15, 1990, is 32888. The latest date that Lotus-DM can handle is December 31, 2099, which has a serial date number of 73050. If a cell is formatted as Date and contains a value that is less than 0 or greater than 73050, the cell displays asterisks (*). Date formats ignore any fraction. 32888.99 with format D4 displays as 01/15/90—the same as 32888 with the format D4. The fraction represents the time, a fractional portion of a 24-hour clock.

Don't be concerned about which serial date number refers to which date. Let Lotus-DM format the serial date number to appear as a textual date.

Caution:
Lotus-DM is one day off in serial-number calculations starting with March 1, 1900.

Actually, all the date serial numbers starting with March 1, 1900, are off by one day. The calendar inside Lotus-DM treats 1900 as a leap year, but it was not. A date serial number of 60 displays as 02/29/00—a date that does not exist. Unless you compare dates before February 28, 1900, to dates after February 28, 1900, this error has no effect on your worksheets. However, be aware that dates may be off by one day if you export data to a database.

When you choose the Range Format command and select Date as the format, the **Date** box becomes active (see fig. 5.10). Table 5.2 lists the five Date format options that appear in the **Date** box. You can change the selections associated with D4 and D5 by using the Worksheet International command and selecting from the formats listed. The default selections associated with D4 and D5 are the formats most common in the United States: MM/DD/YY for D4 (long format) and MM/DD for D5 (short format). You learn to change the default settings for D4 and D5 in “International Formats” later in this chapter.

Cue:
Change the default international Date format with the Worksheet International command.

Table 5.2
Date Formats

<i>Format</i>	<i>Description</i>	<i>Example</i>
(D1) DD-MMM-YY	Day-Month-Year	01-Jan-90
(D2) DD-MMM	Day-Month	01-Jan
(D3) MMM-YY	Month-Year	Jan-90
(D4)	Long International*	
	MM/DD/YY	01/15/90
	DD/MM/YY	15/01/90
	DD.MM.YY	15.01.90
	YY-MM-DD	90-01-15
(D5)	Short International*	
	MM/DD	01/15
	DD/MM	15/01
	DD.MM	15.01
	MM-DD	01-15

* Use the Worksheet International command to select one of the International Date Display formats.

Fig. 5.10.
Range
Format
selections
with Date
options
activated

Range Format

Type

- ☐ Fixed
- ☐ Scientific
- ☐ Currency
- ☐ Percent
- ☐ , (comma)
- ☐ +/-
- ☐ General
- ☒ Date
- ☐ Time
- ☐ Text
- ☐ Hidden
- ☐ Default

Date

(D1) ☐ DD-MMM-YY
 (D2) ☐ DD-MMM
 (D3) ☐ MMM-YY
 (D4) ☒ MM/DD/YY
 (D5) ☐ MM/DD

Time

(D6) ☒ HH:MM:SS AM/PM
 (D7) ☐ HH:MM AM/PM
 (D8) ☐ HH:MM:SS 24hr
 (D9) ☐ HH:MM 24hr

Decimal Places (0-15):

Range:

OK CANCEL

(Dn) appears in the edit panel of cells range formatted as Date. *n* represents the Date format (1 through 5) you selected from the **Date** box in the dialog box. If you format with Worksheet Format, no format indicator appears in the edit panel.

Following are examples of the fourth Date format (D4) in cells that have a column width of 9:

Typed Entry	Cell Format	Displayed Result	Cell Contents
15	(D4)	01/15/00	15
32888	(D4)	01/15/90	32888
32888.4538	(D4)	01/15/90	32888.4538
-32888	any format	*****	-32888

You also can enter dates into a worksheet using one of the date functions: @DATE, @DATEVALUE, or @NOW. You can find explanations of these functions in the Function Reference later in this book.

Time Formats

Lotus-DM maintains times in a special format called *time fractions*. You can format these time fractions so that they look like a time of day. When you enter a time function (described in the Function Reference later in this book), Lotus-DM stores the time as a decimal fraction (from 0 to 1) that represents a fraction of the 24-hour clock. The time fraction for 3 A.M. is 0.125; the time fraction for noon is 0.5; the time fraction for 6 P.M. is 0.75. You do not have to deal with the fractions—just format the cells so that Lotus-DM displays the fraction as a time.

When you choose the Range Format command and select Time as the format, the **Time** box becomes active (see fig. 5.11). Table 5.3 lists the four Time formats that you can select to display fractions as times. You can change the selections associated with the D8 and D9 formats by using the Worksheet International command and selecting from the formats listed. The default selections associated with D8 and D9 are the formats most common in the United States: HH:MM:SS for D8 (long format) and HH:MM for D9 (short format). You learn to change the default settings for D8 and D9 in “International Formats” later in this chapter.

Reminder:

Lotus-DM stores the time as a decimal fraction that represents a fraction of the 24-hour clock.

Range Format

Type
<input type="radio"/> Fixed
<input type="radio"/> Scientific
<input type="radio"/> Currency
<input type="radio"/> Percent
<input type="radio"/> , (comma)
<input type="radio"/> +/-
<input type="radio"/> General
<input type="radio"/> Date
<input checked="" type="radio"/> Time
<input type="radio"/> Text
<input type="radio"/> Hidden
<input type="radio"/> Default

Date
(D1) <input checked="" type="radio"/> DD-MMM-YY
(D2) <input type="radio"/> DD-MMM
(D3) <input type="radio"/> MMM-YY
(D4) <input type="radio"/> MM/DD/YY
(D5) <input type="radio"/> MM/DD

Time
(D6) <input checked="" type="radio"/> HH:MM:SS AM/PM
(D7) <input type="radio"/> HH:MM AM/PM
(D8) <input type="radio"/> HH:MM:SS 24hr
(D9) <input type="radio"/> HH:MM 24hr

Decimal Places (0-15):

Range:

Fig. 5.11.
Range Format
selections with
Time options
activated.

Table 5.3
Time Formats

<i>Format</i>	<i>Description</i>	<i>Example</i>
(D6)	Hour:Minute:Second HH:MM:SS AM/PM	06:23:57 PM
(D7)	Hour:Minute HH:MM AM/PM	06:23 PM
(D8)	Long International*	
	HH:MM:SS	18:23:57
	HH.MM.SS	18.23.57
	HH,MM,SS	18,23,57
	HHhMMmSSs	18h23m57s
(D9)	Short International*	
	HH:MM	18:23
	HH.MM	18.23
	HH,MM	18,23
	HHhMMm	18h23m

* Use the Worksheet International command to select one of the International Time Display formats.

If the number is greater than 1, Time formats ignore the integer portion. 32888.75 with format D7 displays as 06:00 PM. Negative numbers formatted with the D6, D7, D8, or D9 formats are not translated into time and are displayed as asterisks (*).

(Dn) appears in the edit panel of cells range formatted as Time. *n* represents the Time format (6 through 9) you selected from the Time box in the dialog box. If you format with the Worksheet Format command, no format indicator appears in the edit panel.

Following are several examples of the second Time format (D7) in cells that have a column width of 9:

<i>Typed Entry</i>	<i>Cell Format</i>	<i>Displayed Result</i>	<i>Cell Contents</i>
2	(D7)	12:00 AM	2
.25	(D7)	06:00 AM	0.25
-.25	(D7)	*****	-.25

You also can enter times into a worksheet using one of the time functions: @TIME, @TIMEVALUE, or @NOW. You can find explanations of these functions in the Function Reference later in this book.

Text Format

Use the Text format to display in a cell both numeric and string formulas instead of the result of the formula. Numbers formatted as Text appear in General format. If the formula is too long to display in the column width, it is truncated; the formula does not display across blank cells to the right as a long label does. All the entries in figure 5.12 are formatted as Text. Although the labels are unaffected, the numbers in B3..B5 display in General format, and the formula itself—rather than the result of the formula—appears in cell B7.

Help F1 Feb 4, 1990 Lotus-DM - (Untitled) 2:43 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

B7 (T) [W14] @SUM(B3..B5) READY

	A	B	C	D	E	F	G
1	Sales in Thousands			09/13/90			
2		Last	Current	Difference			
3	Dept 1	975.85	1075.03	99.18			
4	Dept 2	960	1103.78	143.78			
5	Dept 3	800.5	845.75	45.25			
6							
7	Totals	@SUM(B3..B5)	3024.56	288.21			
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							

Fig. 5.12.
Samples of
Text format.

Cue:
Use Text
format as an
aid in
debugging
complex
formulas.

One use of Text format is for criterion ranges used with Data Query commands (covered in Chapter 10). You also can use Text format when you enter or debug complex formulas or when you want to see formulas with Data Table. You can change the format of a formula to Text temporarily so that you can see the formula in one cell as you build a similar formula in another cell. (You may have to widen the column temporarily if you do this.)

(T) appears in the edit panel of cells range formatted as Text. If you format with the Worksheet Format command, no format indicator appears in the edit panel.

Hidden Format

Caution:
Don't rely on
the Hidden
format to
hide sensitive
information.

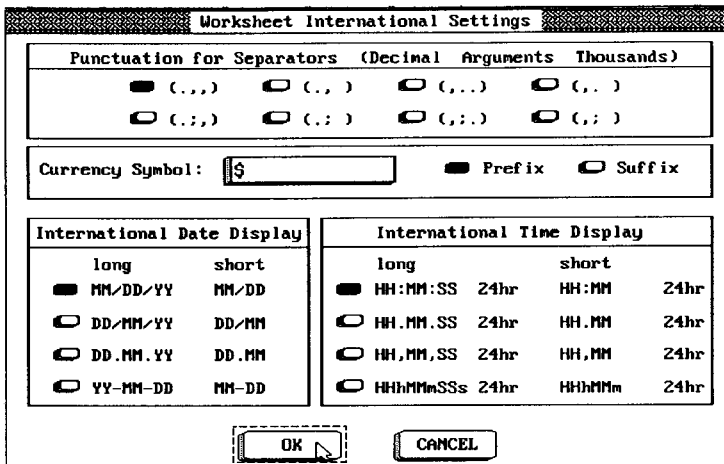
A cell formatted as Hidden displays as blank no matter what the cell contains. Use this format for intermediate calculations you don't want to display or for sensitive formulas you want to hide. Although the cell appears blank in the worksheet, you can see the contents of the cell in the edit panel, so do not rely on this format to prevent someone from discovering sensitive information. The Hidden format is discussed in Chapter 4 also.

(H) appears in the edit panel of cells range formatted as Hidden. If you format with the Worksheet Format command, no format indicator appears in the edit panel.

International Formats

Cue:
Use Worksheet
International to
set conventions
and specify
date and time
conventions
that appear in
the Format
dialog boxes.

You can change some of the default Date and Time formats and characters Lotus-DM uses for currency, the decimal point, and the thousands' separator. When you select Worksheet International, the dialog box shown in figure 5.13 appears. Because different countries have different formatting standards, the settings in this dialog box are called *international formatting options*. If you work with U.S. dollars in the United States, you probably use all the default settings and don't have to worry about resetting these options. If you create worksheets that use different conventions for the display of times, dates, currency symbol, and punctuation separators, however, you will want to know about the Worksheet International Settings dialog box. Remember that any settings you make are good for the current session only; if you want to save the selections you make as the new system defaults, use the Worksheet Update command to make the change permanent.



The dialog box is titled "Worksheet International Settings". It contains several sections for configuring international formatting:

- Punctuation for Separators (Decimal Arguments Thousands):** A grid of radio buttons for selecting combinations of decimal, argument, and thousands separators. The combinations shown are:

<input checked="" type="radio"/> (.,.)	<input type="radio"/> (.,)	<input type="radio"/> (.,.)	<input type="radio"/> (.,)
<input type="radio"/> (.,.)	<input type="radio"/> (.,)	<input type="radio"/> (.,.)	<input type="radio"/> (.,)
- Currency Symbol:** A text box containing "\$" and radio buttons for **Prefix** and **Suffix**.
- International Date Display:** Two columns for "long" and "short" date formats.

<input checked="" type="radio"/> MM/DD/YY	<input type="radio"/> MM/DD
<input type="radio"/> DD/MM/YY	<input type="radio"/> DD/MM
<input type="radio"/> DD.MM.YY	<input type="radio"/> DD.MM
<input type="radio"/> YY-MM-DD	<input type="radio"/> MM-DD
- International Time Display:** Two columns for "long" and "short" time formats.

<input checked="" type="radio"/> HH:MM:SS 24hr	<input type="radio"/> HH:MM 24hr
<input type="radio"/> HH.MM.SS 24hr	<input type="radio"/> HH.MM 24hr
<input type="radio"/> HH,MM,SS 24hr	<input type="radio"/> HH,MM 24hr
<input type="radio"/> HHhMMmSSs 24hr	<input type="radio"/> HHhMMm 24hr

At the bottom are **OK** and **CANCEL** buttons.

Fig. 5.13.
The Worksheet
International
Settings dialog
box.

The first option you can specify in the Worksheet International Settings dialog box is the separator characters. Eight combinations of characters are available. The first character in each combination is the decimal character. Some countries use the comma instead of the decimal point to show a decimal (5.7 is represented as 5,7 in some countries). The second character in each combination is the argument separator used in @functions. You may prefer to use periods or semicolons rather than the default commas to separate the arguments in @functions. For example, if you use the default comma to separate arguments, you write a function as @DATE(year,month,day); if you use the period as the separator, the function is written @DATE(year.month.day); if you use the semicolon, the function is written @DATE(year;month;day). The final character in each combination is the character that separates thousands. The default is the comma (so 1234 appears as 1,234); as alternatives, you can select the period (1.234) or the space (1 234) as the separator. Select the combination that represents the way you want to see Lotus-DM treat these situations.

You can set the currency symbol from the default dollar sign (\$) to another symbol (up to 15 characters long). If you can type the symbol from the keyboard, use the standard keys to enter the desired symbol (such as \$US or \$CANADA). If you cannot type the symbol using standard keys, you can use the Compose (Alt-F1) feature or the @CHAR function and the Lotus International Character Set (LICS) characters. The Compose feature is described later in this chapter. The @CHAR function is described in the Function Reference section at the end of this book. After specifying the symbol, specify whether the symbol is to precede numbers (select Prefix) or is to follow numbers (select Suffix).

Tables 5.2 and 5.3 list the Time and Date formats you can select from the Worksheet Format or Range Format dialog box. The selections D4, D5, D8, and D9, however, can vary depending on selections you make in the Worksheet International Settings dialog box. The *International Date Display* selection box shows four combinations of long and short international formats for dates. If you select the second option, for example, the D4 format on the Worksheet Format or Range Format dialog box becomes DD/MM/YY (rather than the default MM/DD/YY); the D5 format becomes DD/MM. Select the combination that you want to appear as the Short and Long International options in the Format dialog boxes. The *International Time Display* selection box shows four combinations of long and short international formats for times. Select the combination that you want to appear next to the D8 and D9 options in the Format dialog boxes.

Changing Label Prefixes

Most formats apply to numeric data. Almost all numeric data formats have one thing in common: the numbers display right-aligned in the cell. With labels or text entries, however, you can align the text in different ways. Label alignment is based on the *label prefix*. The label prefixes include the following:

<i>Prefix</i>	<i>Alignment</i>
'	Left
"	Right
^	Center
\	Repeating
	Nonprinting

Entering labels and label prefixes is covered in Chapter 3. Remember that you can edit a cell to include or change a label prefix.

You also can change the alignment of labels in a cell or range to left, right, or center with the Range Label command. In addition, you can change the default label prefix that Lotus-DM inserts when you enter a label and do not type a prefix.

To change the label prefix of existing labels, first select a range of cells, and then use the Range Label command to display the Range Label dialog box (see fig. 5.14). Choose *Left*, *Right*, or *Center*. This method is usually faster than typing individual label prefixes as you enter labels. Figure 5.15 shows left-

aligned column headings that do not line up with the data. Figure 5.16 shows the headings after selecting **Right** in the Range Label dialog box. Right alignment starts one position from the extreme right. Right-aligned labels match the alignment of numeric data.

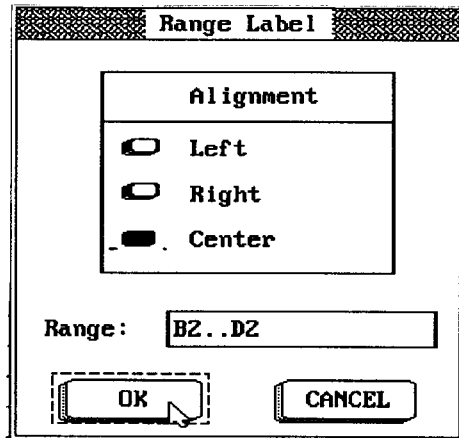


Fig. 5.14.
The Range
Label dialog
box.

Help F₁ Feb 4, 1990 Lotus-DM - (Untitled) 2:50 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀

B2 [W14] 'Last' READY

	A	B	C	D	E	F	G
1	Sales in Thousands			09/13/90			
2		Last	Current	Difference			
3	Dept 1	975.85	1,075.03	99.18			
4	Dept 2	960.00	1,103.78	143.78			
5	Dept 3	800.50	845.75	45.25			
6							
7	Totals	2,736.35	3,024.56	288.21			
8							

Fig. 5.15.
Left-aligned
column
headings that
do not line up
with numeric
data.

Help F₁ Feb 4, 1990 Lotus-DM - (Untitled) 2:51 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀

D2 [W12] "Difference" READY

	A	B	C	D	E	F	G
1	Sales in Thousands			09/13/90			
2		Last	Current	Difference			
3	Dept 1	975.85	1,075.03	99.18			
4	Dept 2	960.00	1,103.78	143.78			
5	Dept 3	800.50	845.75	45.25			
6							
7	Totals	2,736.35	3,024.56	288.21			
8							
9							
10							

Fig. 5.16.
Using the Range
Label Command
with the Right
option to align
headings.

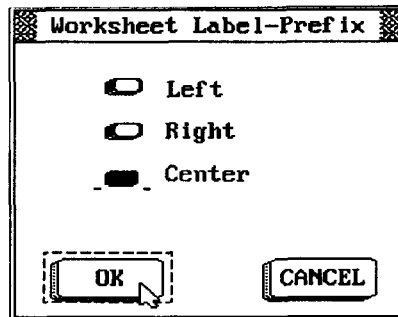
Reminder:

When you enter a label without a label prefix, Lotus-DM automatically enters the default label prefix.

When you enter a label without a label prefix, Lotus-DM automatically uses the default label prefix. The default prefix in new worksheet files is ' (left-aligned). You can change this default by using the Worksheet Label-Prefix command. Changing the default has no effect on existing labels. The way Lotus-DM handles label prefixes is different from the way Lotus-DM handles formats. When you change the worksheet (global) format, you change all cells that have not been range formatted. When you enter a label, Lotus-DM inserts a label prefix; the prefix does not change with the global default.

To change the default label prefix from ' (left-aligned) to " (right-aligned) or ^ (centered), select the Worksheet Label-Prefix command (see the dialog box in fig. 5.17). Select the desired default alignment and choose OK. Now whenever you enter a label without a label prefix, the default alignment you selected supplies a label prefix for you.

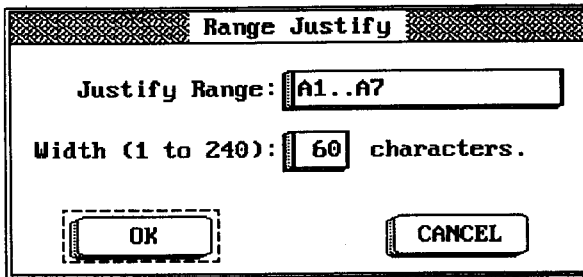
Fig. 5.17.
The Worksheet
Label-Prefix
dialog box.



Justifying Text

At times, you may want to include in a worksheet several lines—or even a paragraph—that explain a table, graph, or report. Lotus-DM does not “word-wrap” like a word processor, but the Range Justify command provides a “wrapping,” or justification, capability that simplifies the alignment of large amounts of text.

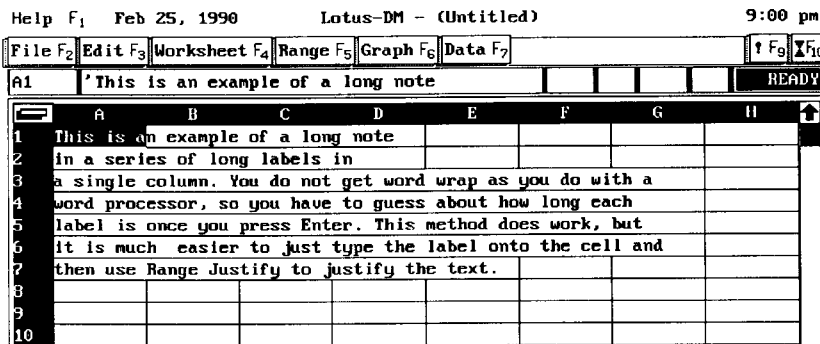
You can type as many as 240 characters in a single cell; if the cells to the right of this cell are empty, the contents of the single cell are displayed across the row (see fig. 5.18). Although the worksheet looks like all the cells in the row contain text, only the cells in column A actually contain information.



*Fig. 5.18.
A column of
long labels.*

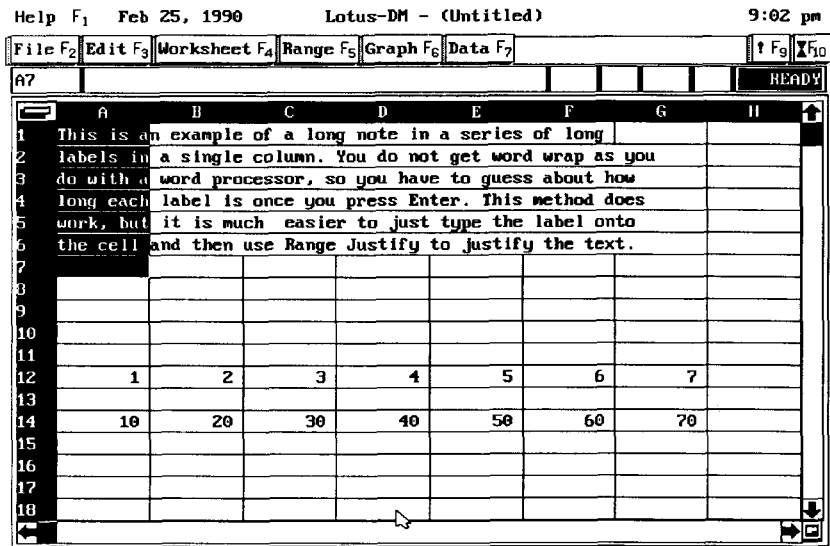
You can use Range Justify to rearrange the text of the long labels. Select the range you want to justify by highlighting the rows that contain the long labels; include in this range any additional rows into which the labels can expand. You need only highlight the leftmost cells in the range (for example, in fig. 5.18 you can highlight the range A1..A7).

Select the Range Justify command to display the dialog box shown in figure 5.19. The range you selected appears in the *Justify Range* field (you can alter this range if you want). In the *Width (1 to 240)* field, type the maximum number of characters you want to display in each row. When you select OK, Lotus-DM rearranges the text to fit the area you selected (see fig. 5.20). Labels are wrapped only at spaces. Where Lotus-DM breaks a label, it eliminates the space. Where Lotus-DM combines all or parts of two labels into one label, it adds a space.



*Fig. 5.19.
The Range
Justify dialog
box.*

Fig. 5.20.
A series of
long labels
after executing
Range Justify.



Caution:
Don't use the
Range Justify
command with a
one-row range if
data is present
below the labels.

If you add text in the middle of existing text, use the Range Justify command again to rejustify the text. If you specify a one-row range, Lotus-DM justifies the entire "paragraph." Figure 5.21 shows the data in figure 5.20 after you change some text and then use Range Justify on the range A1..E1. Realize that the practice of justifying a single row is dangerous. Lotus-DM justifies the labels and uses as many rows as it needs, but it moves any data in column A down to make room. If fewer rows are needed after the rejustification, Lotus-DM moves any data in column A up. In figure 5.21, notice that the numbers in column A no longer line up with the other numbers in rows 12 and 14.

You cannot justify more than one column of labels at a time. When Lotus-DM reaches a blank or numeric cell in the first column, it stops. The labels must all be in the first column of the highlighted range. In figure 5.21, for example, all the labels are in column A. Any labels in column B would be ignored.

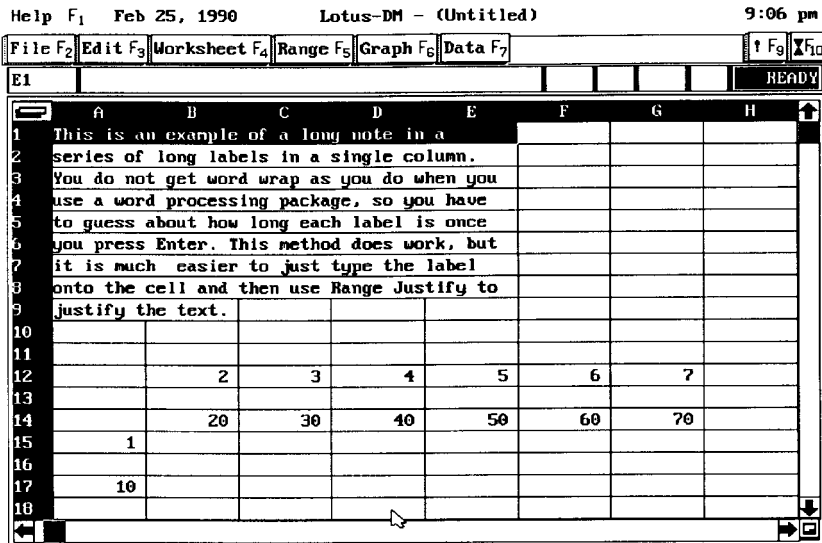


Fig. 5.21.
Using the Range
Justify command
on one row.

Suppressing the Display of Zeros

You can use the Worksheet Suppress Zero command to change the display of cells that contain the number 0 or formulas that evaluate to 0. The command works like a toggle switch; every time you use it, cells evaluating to 0 either are hidden throughout the worksheet or are made to reappear.

This feature is useful with worksheets in which zeros represent missing or meaningless information. Making these cells appear blank can improve the appearance of the worksheet (see fig. 5.22). Blank cells, however, can cause confusion when you or other users are not sure whether the cell is blank because someone forgot to enter data or the cell results equal zero. If you get into the habit of using the Worksheet Status command (described earlier in this chapter), you will know whether zero suppression is in effect (on) or not (off).

Reminder:

Use Worksheet Suppress Zero to hide or display the contents of cells that evaluate to zero.

Fig. 5.22.
A worksheet
with zero values
suppressed.

Help F₁ Feb 4, 1990 Lotus-DM - (Untitled) 3:15 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B3 0 READY

	A	B	C	D	E	F	G	H
1	March Report							
2		Sick	Vacation	Overtime				
3	Dept 1		2					
4	Dept 2	2	3	2				
5	Dept 3	1		1				
6	Dept 4		3					
7	Dept 5	1	4	2				
8								
9								

Typing Special Characters

Reminder:
Use Compose
(Alt-F1) to enter
special
characters.

Some characters that you may want to use are not available on the keyboard. For example, you cannot find the Greek pi symbol (π) on your keyboard. The Lotus International Character Set (LICS) provides many symbols that you can incorporate into your worksheets if you need them. To display one of these characters, you press the Compose (Alt-F1) key and type a series of characters corresponding to the character you want. For example, to display the Greek pi character, press Compose, type **p**, and then type **i**. Most compose sequences use characters that, when superimposed on each other, resemble the character. For example, the compose sequence for the British pound sign (£) is an L followed by an equal sign. Appendix B of the Lotus Spreadsheet for DeskMate manual lists all the compose sequences.

Another way to enter special characters is to use the ASCII values of the characters. To enter the character ñ (an *n* with a tilde over it), hold the Alt key as you type the ASCII value **164**. When you type ASCII values, you must use the numeric keypad; the numbers across the top of the keyboard do not work.

A third way to enter special characters is to use the @CHAR function with an LICS value. Like ASCII values, each character has a unique LICS value. To enter the Greek mu (μ) symbol, type this formula in a cell: **@CHAR(181)**. The LICS values are listed in Appendix B of the Lotus Spreadsheet for DeskMate manual.



Note: Although any character you enter with these methods should display on-screen, it may not print. Your printer may not be able to "understand" the special codes used to create the characters.

Chapter Summary

In this chapter, you learn how to display numeric data in a variety of different formats, to display formulas as text, and to hide the contents of cells. Entering and formatting dates and times and changing the international date and time formats are discussed also. You learn how to change the alignment of labels and justify blocks of text.

By now, you can build and format worksheets. Chapter 6 extends your knowledge of Lotus-DM to manage all the different aspects of files.

Managing Files

The commands available when you select File from the Lotus-DM menu bar provide a wide range of file management, modification, and protection functions. Some commands are similar to operating system commands. Other commands are related to specific Lotus-DM tasks and applications.

By using the File pull-down menu, you can, for example, combine data from several files and extract data from one file to another file. This chapter covers the File commands and the topic of good file management in Lotus-DM.

Specifically, this chapter shows you how to do the following:

- ☐ Manage a file in memory
- ☐ Name files
- ☐ Change directories
- ☐ Save files to disk
- ☐ Use passwords to protect files
- ☐ Open files from disk
- ☐ Extract data and combine data
- ☐ Erase files from disk
- ☐ List different types of files
- ☐ Transfer files between different programs

Lotus-DM's commands for managing worksheet files are accessed from the File pull-down menu. From that menu, you can perform operations such as reading files, combining information into the current file, and creating new files. A brief description of these commands follows. The rest of the chapter covers the File commands in more detail.

When you first start Lotus-DM, a blank worksheet appears. If you want to build a new worksheet, just use the blank one. If you want to start with an existing file, use the File Open command. File Open replaces the blank worksheet or the current file in memory with a new one.

If you want to combine information into the current file, use the File Combine or the File Import command. With File Combine, you can read all or part of a Lotus-DM worksheet file and combine the data into the current file. With File Import, you can read a text file and combine the data into the current file.

To save a new file, use the File Save As command or the File Xtract command. File Save As saves the file in memory on the disk. File Xtract saves part of a file as a new file. To save with the same name a file that has already been saved, use the File Save command.

Usually you work with data files in one directory on your disk. To change the default data directory, use the File Directory command. To see a list of all or some of the files in the current directory, use the File List command. If you want to erase unneeded files on your disk to make room for other files, use the File Delete command. Use File Translate if you want to convert a file to or from Lotus-DM format.

The File Page Setup, File Page Layout, and File Print commands are described in Chapter 7. The File Exit and File Run commands are described in Chapter 2.

Managing a File in Memory

Reminder:

What you see on-screen is only in the computer's memory; save the file to disk to keep a permanent copy.

In Lotus-DM, the word *file* refers to a disk-based file that stores information magnetically for the long term. When you build or change a worksheet in memory, the information is lost unless you save it to a disk-based file.

Reading a file from disk produces in the computer's memory an exact copy of the disk file. The file still exists unchanged on disk.

When you save a file, you store on the disk an exact copy of the file in the computer's memory. The file still exists unchanged in memory. To manage files on disk, you must first understand how to manage a file in memory.

The computer's memory is your work area. When you use the File Exit or File New command, you lose the file in memory. When you use the File Open command, you replace the current file in memory with another file from the disk. If you save a file before removing it from memory, you can read the file again from disk. If you make changes to a file and do not save it to disk, the changes are lost if you erase the file or replace it in memory.

Naming Files

The exact rules for file names depend on the operating system you use. File names consist of name from one to eight characters plus an optional file extension of one to three characters. The extension usually identifies the type of file. An example of a file name is BUDGET.WK1. In most cases, you choose the file name, and Lotus-DM supplies the extension.

Embedded spaces are not allowed in file names. All letters convert automatically to uppercase. A file name should include only letters, numbers, the hyphen (-), and the underscore character (_). Other characters may work now but may not work in later versions of DOS or other operating systems.

The standard extension for Lotus-DM worksheet files is WK1. When you type a file name, simply type the eight-character part of the name. Lotus-DM adds the extension for you. Lotus-DM uses the following extensions:

- WK1 For worksheet files
- PRN For print-image text files
- PIC For files in Lotus graph-image format

You can override these standard extensions and type your own. In addition, Lotus-DM can read worksheets that have the following extensions (as long as these extensions were assigned automatically by the indicated software package):

- WKS For Lotus 1-2-3 Release 1A worksheet files
- WRK For Symphony Releases 1 and 1.01 worksheet files
- WR1 For Symphony Releases 1.1, 1.2, and 2 worksheet files

When you execute most file commands, Lotus-DM expects that you want to see the existing files that have WK1 extensions; the program therefore lists these files, up to five at a time, in a **Files** box on-screen. If you create a file whose extension is not WK1, Lotus-DM does not list that file name as a default.

Changing Directories

A hard disk is logically separated into a number of *directories* (also called *sub-directories*). The set of directories leading from the root to the directory containing a file you want is called the *path*, or *directory path*. When you perform file operations in Lotus-DM, you usually deal with one directory at a time.

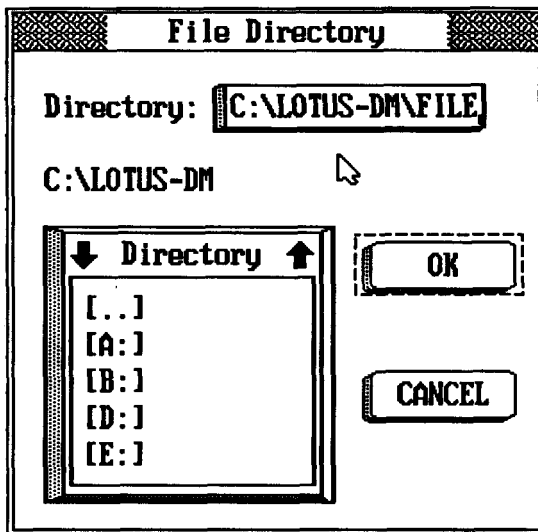
Reminder:

File names consist of an eight-character name, a period, and a three-character extension.

Cue:
Use Worksheet
Directory to
change the
default directory;
use File Directory
to change the
directory for the
current session.

To specify the default directory, use the Worksheet Directory command. Lotus-DM uses this directory whenever you save or list files. Of course, you can change the default directory by typing a different directory name when you issue File commands. To change the default directory, type the path to the directory that contains the files you use most often in the **Directory** field of the Directory at Startup dialog box, press Enter or click with the mouse, and choose OK. (Alternatively, use the arrows or the arrow keys to scroll through the selection box until you highlight the desired directory.) In figure 6.1, the sample path name is C:\LOTUS-DM\FILE. To save the name of the path permanently, use the Worksheet Update command.

Fig. 6.1.
*The Directory at
Startup dialog box.*

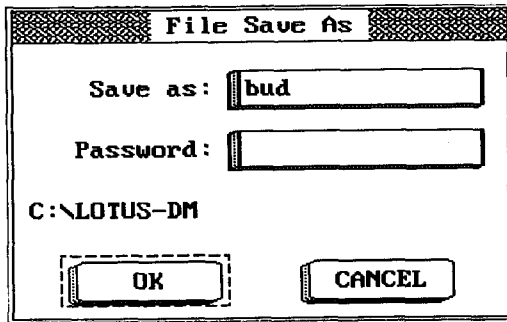


To change the directory for the current session, use the File Directory command. Lotus-DM displays the current directory path in a dialog box similar to the Directory at Startup dialog box shown in figure 6.1. To change the current path, type the directory path you want to use in the **Directory** field, press Enter or click the left mouse button, and select OK. (Alternatively, use the arrows or the arrow keys to scroll through the selection box until you highlight the desired directory.) When you perform any other File commands such as File Open, Lotus-DM assumes that you want to use the current directory and displays the current path.

Saving Files

The File Save and File Save As commands enable you to store on disk a magnetic copy of the file in memory, including all the formats, names, and settings. When you save a file for the first time, use File Save As, provide a file name and, if you wish, a password. Choose a meaningful name for the file.

Figure 6.2 shows the dialog box after you type the letters **bud** as the first three characters of the file name BUDGET. After you type the file name, press Enter. Lotus-DM automatically supplies the WK1 extension.



*Fig. 6.2.
Typing a new
file name.*

When you save a file that has been saved before, you are actually updating the version that you have on disk. Use the File Save command if you want to continue using the old name. Lotus-DM supplies this name as the default; just press Enter or click with the mouse. Use the File Save As command if you want your worksheet to be saved under a new name. (The old version remains on disk until you delete it with the File Delete command or by using the DOS ERASE or DEL command.)

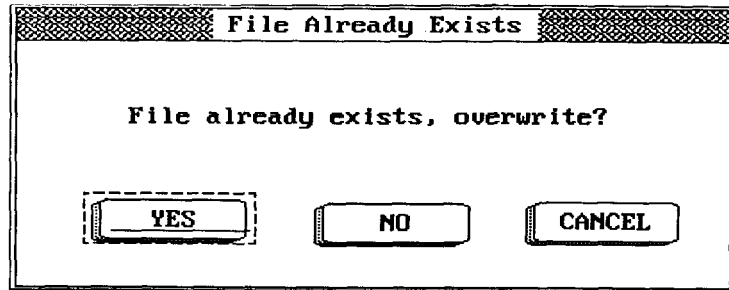
Reminder:
Save a file for the first time with File Save; resave a file with the same name with File Save.

Suppose that you build a worksheet and want to save it for the first time. Choose the File Save As command, type **BUDGET** as the file name, and press Enter or click with the mouse. Later you add to the worksheet and want to save it again, under the name BUDGET1. You don't want to use the default file name BUDGET.WK1; therefore, instead of using File Save, choose the File Save As command, type **BUDGET1** as the new file name and press Enter.

Renaming different versions of the same worksheet is a good way to keep several backup copies accessible as you build a new worksheet. If you make a catastrophic error and don't discover it until after you have saved the file, you have earlier versions you can open.

If a file already exists in the same directory under the same file name you have chosen, Lotus-DM warns you with the message `File already exists, overwrite?` (see fig. 6.3). If you do not want to write over the existing file on disk, choose Cancel to cancel the command. You then can save the file under a different name using File Save As. If you select No in response to the prompt, the File Save As dialog box reappears so that you can type a new, unique name.

Fig. 6.3.
*Saving a file
with the
name of
another file.*



If you want to overwrite the existing file, choose OK. The existing file with the same name is lost permanently. When you choose OK, Lotus-DM first deletes the previous file from the disk. If you get a **Disk full** message while saving a file, you must save the file to another disk or erase some existing files to make room for the file you are saving. If you do not save the file successfully, the existing version of the file on disk is lost. You can save the file still in memory to another disk.

Protecting Files with Passwords

Cue:
Provide a
password to
ensure that
unauthorized
people cannot
access your file.

You can protect worksheet files by using passwords. Once a file is password-protected, no one (including you) can read the file without first issuing the password. This restriction applies to the File Open and File Combine commands.

You password-protect a file when you specify the file name during execution of the File Save As command. Type or select the file name, and, in the **Password** field, type a password of 1 to 15 characters. The password cannot contain spaces.

Passwords are case-sensitive. When you first assign a password, notice how you are typing the letters. If the Caps Lock key is engaged and you are typing in uppercase, you must type the password at all times in uppercase.

When you use File Open or File Combine with a password-protected file, Lotus-DM displays a dialog box to prompt you for the password. Only if you type the password correctly can you access the file.

When you save a file that has already been saved with a password, and you want to save the file with the same password, just press Enter. To delete the password, select File Save As, type the same file name in the **File** field, leave the **Password** field blank, and press Enter or click OK. To change the password, just type over the existing entry in the **Password** field.

Opening Files from Disk

The File Open command enables you to read a file from disk into memory. This command replaces the current file with the new file. If you just started Lotus-DM or if nothing but a blank worksheet is in memory, this command brings a new file into memory. If you have a current file in memory and you have not saved the file since you changed it, Lotus-DM warns you that you will lose the changes if you do not save the file. If you ignore the warning, those changes are lost when the File Open command brings another file into memory. Therefore, be sure to save the current file before opening a new file.

Reminder:
File Open replaces the current file in memory with the file you specify.

When you select File Open, the Open File dialog box appears (see fig. 6.4). Lotus-DM lists in alphabetical order in the selection box all the files in the current directory. You can select from this list using the arrow keys or the mouse, or you can type a file name (including path information) in the `Open File` field. When the name of the file you want to open is displayed in the `Open File` field, select OK.

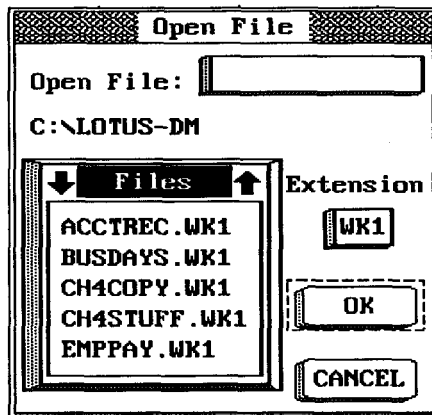


Fig. 6.4.
The Open File
dialog box.

Using Wild Cards for Opening Files

When you use the File Open command, Lotus-DM displays all file names with the extension WK1 in the current directory. You can see a list of files with other extensions by typing in the `Extension` box. Include the asterisk (*) and the question mark (?) as wild cards in the extension. *Wild cards* are characters that enable you to make one file name match a number of files.

Cue:
Use wild cards to list files with other extensions.

The ? matches any one character in the extension (or no character if the ? is the last character of the file name or extension). The * matches any number of characters (or no character).

When you use wild cards, Lotus-DM lists only the files whose names match the wild-card pattern. If you type **WK?** in the **Extension** box, Lotus-DM lists all file names whose extensions start with WK followed by any character.

Opening Files from Subdirectories

When you use the Open File dialog box, Lotus-DM displays the complete path under the **Open File** field (C:\LOTUS-DM\ACCTNG\FY91.WK1, for example). To change the current directory, use the File Directory command. To open or save a file in another directory without changing the current directory, type the complete path and file name in the **Open File** field.

When Lotus-DM lists the files in the current directory, it lists any subdirectories below the current directory in brackets []. To read a file in one of the subdirectories, highlight the subdirectory name and press Enter or click with the mouse. Lotus-DM then lists the files and any subdirectories in that subdirectory. To list the files in the *parent* directory (the directory above the one displayed), return to the root by typing **C:** in the **Open File** field; Lotus-DM then displays subdirectories and files in that directory. You can move up and down the directory structure this way until you find the file you want.

For those who want to learn more about directories, Que Corporation has many books available. New DOS users should try *MS-DOS QuickStart*. Intermediate users who want to learn more about DOS file and directory management should consult *Using DOS*, by David Solomon, and *MS-DOS User's Guide*, Special Edition.

Extracting and Combining Data

You can take some data from one file and use that data to create another, smaller file. For example, you may have a large file that contains budget information from many departments. For each department, you can create a new file that contains only the data for that department.

You also may want to reverse the procedure if you have many departmental files and want to combine them into one file for company-wide analysis and reporting.

Lotus-DM provides the File Xtract command so that you can save a part of the current file as a new file. Lotus-DM also offers the File Combine command so that you can combine data from another file into the current file. The following sections discuss these commands.

Fig. 6.6.
The extracted
range, which
starts in cell
A1 of the new
file.

Help F1 Feb 10, 1990 Lotus-Disk C:\123\DM-TEMP\FIG07_07.WK1 12:16 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

	A	B	C	D	E	F
1		This Year	Last Year	Difference	% Difference	
2	Personnel	459,554	413,476	46,078	11.14%	
3	Premises	154,606	148,783	5,823	3.91%	
4	Travel	92,974	97,322	(4,348)	-4.47%	
5	Supplies	15,643	16,500	(857)	-5.19%	
6	Data Processing	36,815	32,420	4,395	13.56%	
7	Overhead	47,014	51,130	(4,116)	-8.05%	
8	TOTALS	806,606	759,631	46,975	6.18%	

Compare the range-name table in the file SALES (see fig. 6.7) with the range-name table in the file XVALUES (see fig. 6.8). The XVALUES file was created with the File Xtract command and the Values option from the range F1..F9 in the SALES file. A range-name table was added to the extracted file.

Fig. 6.7.
The SALES file.

Help F1 Feb 10, 1990 Lotus-Disk C:\123\DM-TEMP\FIG07_08.WK1 12:17 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

	A	B	C	D	E	F
1		QTR 1	Qtr 2	QTR 3	QTR 4	TOTALS
2						
3	Department 1	367,643	373,150	407,826	463,723	1,612,342
4	Department 2	123,684	126,291	137,569	149,090	536,544
5	Department 3	74,379	79,330	81,245	86,517	321,471
6	Department 4	12,514	12,921	13,830	14,237	53,502
7	Department 5	29,452	29,541	31,223	35,531	125,747
8						
9	TOTALS	607,672	621,233	671,693	749,098	2,649,606
10						
11	Range Name Table					
12	GRAND_TOT	F9				
13	PAGE1	A1..F20				
14	QTR1	B3..B7				
15	QTR2	C3..C7				
16	QTR3	D3..D7				
17	QTR4	E3..E7				
18	TOTALS	F3..F7				

Caution:
When you extract
a range, do not
include
references, range
names, or other
settings outside
the extracted
range.

In the original file, the range name GRAND_TOT refers to F9 (see fig. 6.7). In the new file, GRAND_TOT refers to A9 (see fig. 6.8). All other range names are adjusted as well. Be aware that range names to the left or above the upper left corner of the extract range "wrap" to the end of the worksheet, as shown in the range-name table in figure 6.8. Most of these range names refer to blank cells and really have no meaning in this worksheet. The only meaningful range names are those completely within the extract range—in this case, TOTALS and GRAND_TOT.

Help F1 Feb 10, 1990 Lotus-Disk C:\123\DM-TEMP\FIG07_09.WK1 12:18 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 t F8 X F9

A9 (,0) W101 2649606 READY

	A	B	C	D	E	F	G	H
1	TOTALS							
2								
3	1,612,342							
4	536,544							
5	321,471							
6	53,502							
7	125,747							
8								
9	2,649,606							
10								
11	Range Name Table							
12	GRAND_TOT	A9						
13	PAGE1	IR1..A20						
14	QTR1	IS3..IS7						
15	QTR2	IT3..IT7						
16	QTR3	IU3..IU7						
17	QTR4	IU3..IU7						
18	TOTALS	A3..A7						

Fig. 6.8.
The XVALUES
file.

The extracted file also has all the other settings of the original file, including print, graph, and data ranges. These settings adjust, as do the range names. For example, the print range (called PAGE1) in SALES is A1..F20 (see fig. 6.7). In XVALUES, the print range is IR1..A20 (see fig. 6.8). The Graph x-range (the range that contains the department numbers) is A3..A7 in SALES and IR3..IR7 in XVALUES. As with range names, do not use Graph, Data, or File Print settings in an extracted file unless the entire setting range is within the range extracted. In this example, the Graph and File Print settings are meaningless. Extract formulas only when the formulas in the extract range refer solely to other cells in the extract range. The formulas in figure 6.7 are converted to values in figure 6.8. This fact is important because the formulas in F3..F7 sum a range that was not extracted.

Reminder:
Extract formulas only if those formulas refer solely to cells in the extract range.

Figure 6.9 shows the XFORMULA file created from the range F1..F9 in the SALES file in figure 6.7 with the File Xtract command and the Formulas option. (This range is the same one extracted with the File Xtract command and the Values option in fig. 6.8.) In the SALES file, the formula in F3 is @SUM(E3..B3). In figure 6.9, this formula becomes @SUM(IV3..IS3). Because the cells at the end of the worksheet are blank, all the numbers are zero, and the extracted file is useless. Extracted formulas that refer to cells above or to the left of the extract range are usually incorrect because they "wrap" to the end of the worksheet.

Fig. 6.9.
Meaningless
results
produced by
the File Xtract
command and
the Formulas
option.

Help F₁ Feb 10, 1990 Lotus-D₁ C:\123\DM-TEMP\FIG07_10.WK1 12:19 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

A3 (,0) (W10) @SUM (IV3..IS3) READY

	A	B	C	D	E	F	G	H
1	TOTALS							
2								
3	0							
4	0							
5	0							
6	0							
7	0							
8								
9	0							
10								
11								

At times, you need to extract formulas. Suppose that you want to extract part of the worksheet from the file SALES (see fig. 6.10). (Rows 3 through 9 in fig. 6.10 were "frozen" with the Worksheet Titles command to give the effect of two windows.) To extract the range A21..F30 and place it in a separate file, use the File Xtract command, select the **Formulas** option, and specify the range A21..F30. You might name this extract file XSALES1 to remind yourself that it is an extract file from SALES for Department 1 (see fig. 6.11). Because all formulas refer to cells in the extracted range, the formulas are still valid. The values in figure 6.11 are identical to those in the range A21..F30 in figure 6.10.

Fig. 6.10.
Two separate
parts of the
SALES file
shown in two
windows.

Help F₁ Feb 10, 1990 Lotus-D₁ C:\123\DM-TEMP\FIG07_11.WK1 12:20 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

F30 (,0) (W10) @SUM (F23..F28) READY

	A	B	C	D	E	F	G
3	Department 1	367,643	373,150	407,826	463,723	1,612,342	
4	Department 2	123,684	126,291	137,569	149,000	536,544	
5	Department 3	74,379	79,330	81,245	86,517	321,471	
6	Department 4	12,514	12,921	13,030	14,237	53,502	
7	Department 5	29,452	29,541	31,223	35,531	125,747	
8							
9	TOTALS	607,672	621,233	671,693	749,000	2,649,606	
21	Department 1	QTR 1	Qtr 2	QTR 3	QTR 4	TOTALS	
22							
23	Product 1	64,129	52,294	50,731	88,446	255,600	
24	Product 2	24,665	24,197	17,040	27,883	93,785	
25	Product 3	10,612	14,933	14,724	11,030	51,299	
26	Product 4	3,393	3,795	5,166	5,566	17,920	
27	Product 5	21,728	20,850	12,330	22,773	77,689	
28	Product 6	7,675	11,594	10,014	5,920	35,203	
29							
30	TOTALS	132,202	127,671	110,005	161,618	531,496	
31							

Help F1 Feb 10, 1990 Lotus-Disk C:\123\DM-TEMP\FIG07_12.WK1 12:21 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

F10 (,0) [W10] @SUM(F3..F8) READY

	A	B	C	D	E	F	G
1	Department 1	QTR 1	Qtr 2	QTR 3	QTR 4	TOTALS	
2							
3	Product 1	64,129	52,294	50,731	88,446	255,600	
4	Product 2	24,665	24,197	17,040	27,083	93,785	
5	Product 3	10,612	14,933	14,724	11,030	51,299	
6	Product 4	3,393	3,795	5,166	5,566	17,920	
7	Product 5	21,728	20,858	12,330	22,773	77,689	
8	Product 6	7,675	11,594	10,014	5,920	35,203	
9							
10	TOTALS	132,202	127,671	110,005	161,618	531,496	
11							
12							

Fig. 6.11.
The XSALES1 file,
extracted from
SALES.

When you extract formulas, the formulas adjust even if they are absolute. The resulting formulas are still absolute, but they have new addresses. If the formula in F3 in figure 6.7 read @SUM(\$B\$3..\$E\$3), the formula in A3 in figure 6.9 would be @SUM(\$IV\$3..\$IS\$3).

Reminder:
Even absolute cell references adjust with the File Xtract command.

When you extract with the **Values** option, you get the current value of any formulas in the extract range. If recalculation is set to Manual and the CALC indicator is on, press Calc (Ctrl-F9) to calculate the worksheet before you extract a range; otherwise, you may extract outdated values inadvertently.

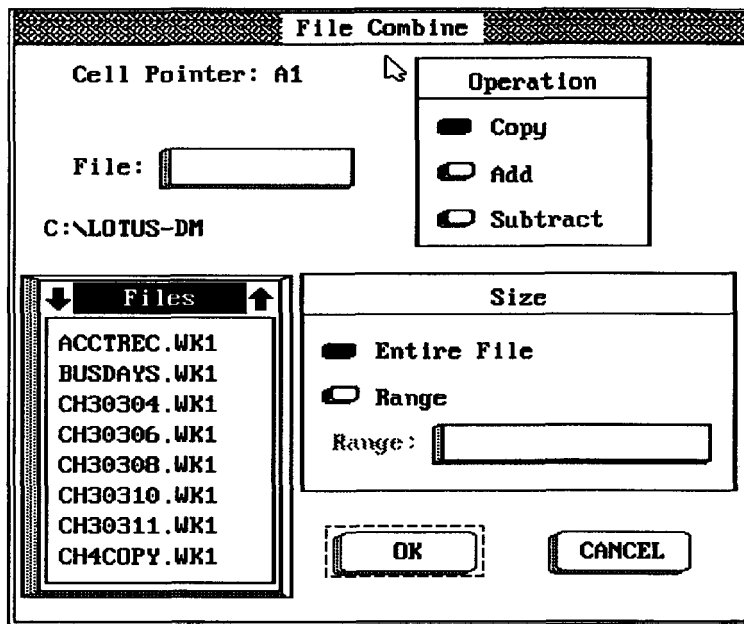
Reminder:
If the CALC indicator is on, press Calc (Ctrl-F9) to calculate the worksheet before you use the File Xtract command with the **Values** option.

Combining Information from Other Files

You can combine information from one or more external files into the current file by using the File Combine command. This command combines the cell contents of all or part of the external file into the current file, starting at the location of the cell pointer.

The File Combine command offers three options: **Copy**, **Add**, and **Subtract** (see fig. 6.12). **Copy** enables you to replace data in the current file with data from an external file. With **Add**, you sum the values of the cells in the external file with the values of the cells in the current file. **Subtract** enables you to subtract the data in the external file from the data in the current file.

Fig. 6.12.
The File
Combine dialog
box.



You can use any of the File Combine options with either an entire file (the **Entire File** option) or a range (the **Named Range** option). The range can be a single cell or a range of cells. You can specify range addresses, but you should use range names if possible. You easily can make an error if you specify range addresses because when you execute the command, you cannot see the external file from which the data is coming.

When you use the File Combine options, blank cells in the external file are ignored. Cells with data in the external file update the corresponding cells in the current file.

Copying Information with the File Combine Command

Reminder:
Start the File
Combine
command from
the worksheet
into which you
want the new
data to appear.

In “Extracting Information,” earlier in this chapter, you learned to use the File Xtract command with a consolidated file to create separate files for individual departments. In this section, the process is reversed. You use the File Combine command with the **Copy** option to update the consolidated file from individual departmental files. These examples are typical of how you use the File Xtract and File Combine commands.

You can use File Combine, for example, if you want to update the SALES file with new data contained in another file—the file XSALES2, for instance (see fig. 6.13). Making sure that you are in the receiving worksheet (in this case, the SALES file, shown in fig. 6.14), move the cell pointer to the upper left corner of the range to receive the combined data—in this case, C34—and execute the File Combine command with the Copy option.

Fig. 6.13.
The XSALES2
file to be
combined into
SALES.

Help F1 Feb 10, 1990 Lotus-DK C:\123\DM-TEMP\FIG07_13.WK1 12:22 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

B7 (,0) (W10) @SUM(B3..B5)

	A	B	C	D	E	F	G
1	Department 2	QTR 1	Qtr 2	QTR 3	QTR 4	TOTALS	
2							
3	Product 1	44,890	36,605	35,511	61,912	178,918	
4	Product 2	17,265	16,937	11,920	19,518	65,648	
5	Product 3	7,428	10,453	10,306	7,721	35,908	
6							
7	TOTALS	69,583	63,995	57,745	89,151	280,474	
8							
9							
10							

Fig. 6.14.
The SALES file
before the
incorporation
of new data.

Help F1 Feb 10, 1990 Lotus-DK C:\123\DM-TEMP\FIG07_14.WK1 12:22 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

C34 (,0) (W10) 14434

	A	B	C	D	E	F	G
31							
32	Department 2	QTR 1	Qtr 2	QTR 3	QTR 4	TOTALS	
33							
34	Product 1	44,890	14,414	42,771	76,283	178,378	
35	Product 2	17,265	24,709	19,345	32,068	93,387	
36	Product 3	7,428	20,017	14,458	11,169	53,072	
37							
38	TOTALS	69,583	59,160	76,574	119,520	324,837	
39							
40							
41							
42							

When the File Combine dialog box appears, you have the choice of combining the whole XSALES2 file or only a range. If you want to include, for example, only the values in the range C3..E5 in XSALES2, choose **Named Range** and type **C3..E5** in the **Range** field. In the **File** field, specify the external file—in this case, **XSALES2**. Figure 6.15 shows how the data in figure 6.14 has been replaced by the data in figure 6.13.

Fig. 6.15.
*The SALES file
after incorporating
new data.*

Help F1 Feb 10, 1990 Lotus-Disk C:\123\DM-TEMP\FIG07_15.WK1 12:23 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

C34 (,0) [W10] 36605 READY

	A	B	C	D	E	F	G
31							
32	Department 2	QTR 1	Qtr 2	QTR 3	QTR 4	TOTALS	
33							
34	Product 1	44,890	36,605	35,511	61,912	178,918	
35	Product 2	17,265	16,937	11,928	19,518	65,648	
36	Product 3	7,428	10,453	10,306	7,721	35,908	
37							
38	TOTALS	69,583	63,995	57,745	89,151	280,474	
39							
40							
41							

In this case, the previous data and the new data had a known format, with no blank cells. Each cell in the external file replaced data in the current file. If there are blank cells in the external file, however, they are ignored, and the corresponding cell in the current file is left unchanged.

Caution:
If there are blank cells in the external file, erase the data in the target range before performing File Combine with the Copy option.

Figure 6.16 is a variation of the input file shown in figure 6.13. In figure 6.16, Product 3 is canceled and the sales data is erased. If you repeat the File Combine command to update the SALES file in figure 6.15 with the range B3..E5 in figure 6.16, you get the results shown in figure 6.17. Notice that the previous sales figures for Product 3 are not erased and that the totals for the department are wrong. To avoid this error, erase the range in the current file before you incorporate the new data. In this case, erase B34..E36 of the SALES file.

Fig. 6.16.
*An external
worksheet with
blank cells to be
incorporated into
the SALES file.*

Help F1 Feb 10, 1990 Lotus-Disk C:\123\DM-TEMP\FIG07_16.WK1 12:24 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

C5 (,0) [W10] READY

	A	B	C	D	E	F	G
1	Department 2	QTR 1	Qtr 2	QTR 3	QTR 4	TOTALS	
2							
3	Product 1	44,890	36,605	35,511	61,912	178,918	
4	Product 2	17,265	16,937	11,928	19,518	65,648	
5	Product 3	cancelled				0	
6							
7	TOTALS	62,155	53,542	47,439	81,430	244,566	
8							
9							
10							

Caution:
Do not use File Combine with the Copy option when you have formulas unless you also incorporate the data referenced by the formulas.

In these examples, only numbers, not formulas, are combined. You can combine formulas if you also combine the data referenced by the formulas. From figures 6.13 and 6.16, for example, you could have incorporated B3..F7 and included the TOTALS formulas in row 7 and column F. Because you also combined the data these formulas reference, the formulas would have been correct in figures 6.15 and 6.17.

Help F₁ Apr 1, 1990 Lotus-DM - C:\LOTUS-DM\DEPT2A.WK1 5:26 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₉ F₁₀

B34 (C,0) [W10] 44890 READY

	A	B	C	D	E	F	G
31							
32	Department 2	QTR 1	Qtr 2	QTR 3	QTR 4	TOTALS	
33							
34	Product 1	44,890	36,605	35,511	61,912	178,918	
35	Product 2	17,265	16,937	11,928	19,518	65,648	
36	Product 3	cancelled	10,453	10,306	7,721	28,480	
37							
38	TOTALS	62,155	63,995	57,745	89,151	273,046	
39							

Fig. 6.17.
Incorrect
results in the
SALES file.

Be careful when you use File Combine with formulas. Formulas—even absolute ones—adjust automatically to their new locations after the execution of the File Combine command. In figure 6.13, for example, the formula for the total for QTR 1 in cell B7 is @SUM(B3..B5). If you combine this formula into the SALES file in figure 6.14, the formula adjusts to @SUM(B34..B36) in cell B38. If the formula in cell B7 of XSALES2 were @SUM(\$B\$3..\$B\$5), the formula would adjust, after the execution of the File Combine command, to @SUM(\$B\$34..\$B\$36) in cell B38 of SALES.

If you simply combine formulas without the data they reference, the formulas are meaningless, and you get incorrect results. Figure 6.18 shows the master consolidation for the SALES file. Because the detail already exists in another worksheet, you might decide to combine only the totals from B7..E7 in figure 6.16 directly into B4..E4. The formula in B7 in figure 6.16 is @SUM(B3..B5). In figure 6.18, the formula adjusts to @SUM(B8192..B2), which is clearly wrong. This formula makes the figures for Department 2 wrong and causes a circular reference. To get what you want in this case, use the File Combine command and select the Add option.

Help F₁ Feb 10, 1990 Lotus-DM - C:\123\DM-TEMP\FIG07_18.WK1 12:25 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₉ F₁₀

B4 (C,0) [W10] @SUM(B8192..B2) CTRL READY

	A	B	C	D	E	F	G
1							
2							
3	Department 1	367,643	373,150	407,826	463,723	1,612,342	
4	Department 2	9,121,396	3,988,260	4,139,912	4,867,756	*****	
5	Department 3	74,379	79,330	81,245	86,517	321,471	
6	Department 4	12,514	12,921	13,830	14,237	53,502	
7	Department 5	29,452	29,541	31,223	35,531	125,747	
8							
9	TOTALS	9,605,384	4,483,202	4,674,036	5,467,764	*****	
10							
11							
12							

Fig. 6.18.
An erroneous
formula in the
SALES file.

Adding and Subtracting Information with the File Combine Command

The **Add** option in the File Combine command is similar to the **Copy** option, but differs in some important ways; the **Subtract** option is similar to **Add** except that you subtract instead of add. With that exception, the following text concerning the **Add** option applies to **Subtract** as well.

Instead of *replacing* the contents of cells in the current file (as the **Copy** option does), the **Add** option *adds* the values of the cells in the external file to the values of cells in the current file that contain numbers or are blank. In other words, this command adds a number or a formula result to a number or a blank cell. If the cell in the current file contains a formula, the formula is unchanged when you use File Combine with the **Add** option.

To update the totals correctly for Department 2 in figure 6.18, move the cell pointer to B4 and use the Range Erase command to erase B4..E4. Then use the File Combine command and select the **Add** and **Named Range** options to add the range B7..E7 from file XSALES2 shown in figure 6.16. The result is shown in figure 6.19.

Fig. 6.19.
The SALES file
after being
updated with the
Add option in
the File Combine
command.

Help F₁ Apr 1, 1990 Lotus-DM - C:\LOTUS-DM\GROUP1.WK1 5:44 pm

File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	! F ₈	F ₉	F ₁₀
B4 (,0) [W10] 62155								
	A	B	C	D	E	F	G	
1		QTR 1	Qtr 2	QTR 3	QTR 4	TOTALS		
2								
3	Department 1	367,643	373,150	407,826	463,723	1,612,342		
4	Department 2	62,155	53,542	47,439	81,430	244,566		
5	Department 3	74,379	79,330	81,245	86,517	321,471		
6	Department 4	12,514	12,921	13,830	14,237	53,502		
7	Department 5	29,452	29,541	31,223	35,531	125,747		
8								
9	TOTALS	546,143	548,484	581,563	681,438	2,357,628		
10								

When you use File Combine with **Add**, cells in the current file increase by the current value of any formulas in the external file. Because you erased the range B4..E4 in SALES in figure 6.18, the blank cells are treated as zeros.

If you had specified an add range of B7..F7 instead of B7..E7, you would have gotten the same result. The total in F7 in figure 6.16 would not be added to the contents of F4 in figure 6.18 because F4 contains the formula **@SUM(E4..B4)**. This formula remains **@SUM(E4..B4)** after File Combine with **Add** because this command has no effect on formulas in the current file.

Be aware that you can add incorrect formula results. Because File Combine with **Add** converts formulas in the external file to their current values before adding them, these values must be current for you to get the correct result. You should make sure that the **CALC** indicator does not appear in the external worksheet.

Another way to use File Combine with the **Add** option command is to sum the values from two or more files into one consolidation. If all you want is the single row of totals in B9..F9 in figure 6.19, you can add the totals from all the input worksheets directly. First, use the Range Erase command to erase A3..F7 (you don't keep department totals in this example). Make sure that F9 contains the formula @SUM(B9..E9). Then move the cell pointer to B9 and use the Range Erase command on B9..E9. Finally, use File Combine with **Add** to combine the totals from each input file (XSALES1, XSALES2, and so on). This process accumulates the totals from each department.

If you have a separate file for credits or returns, you can use the File Combine command and select the **Subtract** option to subtract the returns. If the returns are entered as negative numbers, however, use the **Add** option to add the negative numbers and thereby correctly decrease the sales totals.

Caution:

Make sure that the **CALC** indicator is off before you save a file that might be used with the **Add** or **Subtract** option of the File Combine command.

Deleting Files

Every time you save a file under a different file name, you use some space on your disk. Eventually you will run out of disk space if you do not occasionally erase old, unneeded files from the disk. Even if you still have disk space left, you have a harder time finding the files you want to open if the disk contains many obsolete files. Before you erase files, you may want to save them to a diskette in case you ever need them again. Once you erase a file from disk, you cannot recover it without using a special utility program.

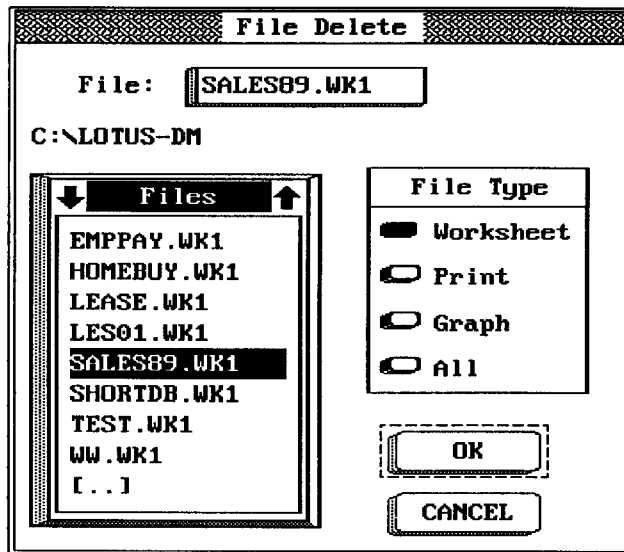
Caution:

Once you erase a file from disk, you cannot recover it without using a special utility program.

To erase an unneeded file from disk, use the File Delete command. This command permanently removes the file from disk and frees the disk space for other files. You also can use the DOS **ERASE** or **DEL** command to erase files on disk. From Lotus-DM, you can erase only one file at a time.

When you choose the File Delete command, the dialog box shown in figure 6.20 appears. Use this dialog box to select the type of file you want to erase. If you choose **Worksheet**, Lotus-DM lists all files in the current directory that have **WK*** extensions (unless you change the default extensions with the File List command, described later in this chapter). If you choose **Print**, Lotus-DM lists all files in the current directory that have **PRN** extensions. Choosing **Graph** produces a list of the files in the current directory that have **PIC** extensions. Choosing **All** produces a list of all files in the current directory.

Fig. 6.20.
The File Delete
dialog box.



When the file names for the indicated type of file appear in the selection box, highlight the file name you want to delete and press Enter or click with the mouse. Choose OK to confirm that you want to erase the file. Lotus-DM erases the file.

Alternatively, you can type the name of the file you want to delete directly in the **File** field of the File Delete dialog box if you know the exact file name and extension.

Viewing a List of Files

Cue:
Use File List
to view the
files in the
current
directory.

Lotus-DM helps you keep track of the files you have on disk. If you work with many files, you may forget the names of certain files.

To see a list of files, use the File List command. The **Worksheet**, **Print**, **Graph**, and **All** options produce the same lists that they provide with the File Delete dialog box described in the preceding section.

Transferring Files

Lotus-DM provides a number of ways to pass data between itself and other programs. The simplest file format is straight text; a *straight text file* also is called an *ASCII file*. Most programs can create and use text files. To create a text file in Lotus-DM that you can use with other programs, use the File Print command (see Chapter 7). To read a text file into a Lotus-DM worksheet, use the File Import command.

To translate a file from a *foreign format* (a format that Lotus-DM cannot use directly) to Lotus-DM format, or from Lotus-DM format into the format of a foreign program, use the File Translate command.

Transferring Files with the File Import Command

The File Import command is a special type of File Combine command. You combine the information into the current worksheet, starting at the position of the cell pointer. Any existing data in these cells is overwritten. When you execute the File Import command, Lotus-DM lists in the selection box of the File Import dialog box the PRN files contained in the current directory (see fig. 6.21). To import a file that has another extension—TXT, for example—type the appropriate file name in the **File** field (for example, type **REPORT.TXT**) and press Enter or click OK with the mouse. You can import two types of data with File Import, as described in the following sections.

Reminder:
File Import brings an external file into the current worksheet, overwriting any existing data.

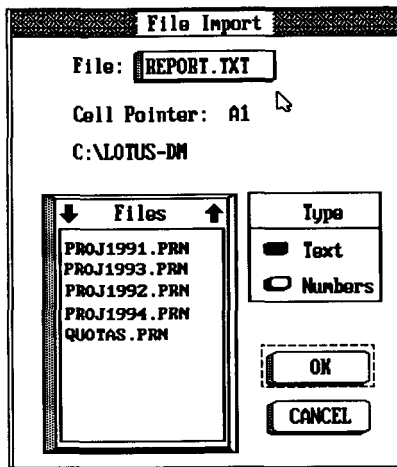


Fig. 6.21.
The File Import
dialog box.

Importing Unstructured Text Files

A typical text file contains lines of data, each line ending with a carriage return. Except for the carriage returns, text files have no structure. You combine them by using the File Import command with the Text option. Figure 6.22 shows the result of importing a typical text file into a worksheet. Each line in the text file becomes a long label in a cell in column A. If you import a list of names or simply want to see the data in the text file, your job is finished. In most cases, however, you want to work with this data in separate cells. And you want numbers to appear as numbers and dates as dates, not as labels. To make the label data you import usable, use the Data Parse command (described in Chapter 10).

Fig. 6.22.
An unstructured
text file imported
with the File Import
command using
the Text option.

Help F1 Feb 10, 1990 Lotus-Disk C:\123\DM-TEMP\FIG07_22.WK1 12:27 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

A4 Whiteside, Sheridan Administration Racon

	A	B	C	D	E	F	G	H
1	Name		Division		Title	Birth	Service	Sick
2						Date	Date	Days
3	Polk, John		Administration		President	08/24/24	01/17/53	9
4	Whiteside, Sheridan		Administration		Raconteur	01/23/36	03/22/58	0
5	McCouginn, Peter T.		Administration		Logician	10/04/44	09/10/68	6
6	Checker C.		Administration		Twister	08/13/34	03/21/70	2
7	Fillmore, Millard		Administration		Vice-Pres	08/01/33	09/27/70	3
8	Smith, John		Administration		Colonist	07/29/25	04/19/71	8
9	Firefly, Rufus T.		Administration		Colonist	05/16/34	04/07/79	7
10	Watson, Thomas		Administration		Diplomat	09/28/48	09/24/81	4
11	Polk, James		Administration		President	01/21/61	01/12/86	3
12	Kemeny, John		Administration		President	09/12/63	03/26/87	7
13	Hollerith, Herman		Administration		Inventor	01/23/65	06/30/87	6
14	Bench, John		Animal Control		Catcher	05/18/25	10/08/67	2
15	Needle P.		Apparel		Tailor	04/14/64	06/13/85	2
16	Morgan, Stanley		Banking		Banker	09/27/49	03/08/76	4
17	Lynch, Merrill		Banking		Assembler	04/19/39	12/13/76	3
18	Hutton, E. F.		Banking		Talker	09/16/65	06/21/86	4

Importing Delimited Files

Some ASCII files are in a special format that enables them to be imported into separate cells without being parsed. This special format is called the *delimited format*. A delimiter appears between each field, and labels are enclosed in quotation marks. A *delimiter* can be a space, comma, colon, or semicolon. If the labels are not enclosed in quotation marks, they are ignored, and only the numbers are imported.

To import a delimited file, use the File Import command with the **Numbers** option. In spite of the name, this command really means "file import delimited." Figure 6.23 is an example of a delimited file. Figure 6.24 shows the results after executing the File Import command with the **Numbers** option and later adjusting column widths.

Fig. 6.23.
A delimited
ASCII file.

```
"Part Name","Part Number","Qty","Cost","Retail"
"Hammer","H0101",12,1.95,3.99
"Wrench","W0998",15,3.25,5.99
"Standard Screw Driver","S0899",30,1.87,1.99
"Phillips Screw Driver","S0101",25,1.27,2.09
"Hack Saw","H0201",5,4.22,6.99
"Jig Saw","J0020",5,22.94,29.99
```


Help F₁ Apr 1, 1990 Lotus-DM - C:\LOTUS-DM\PARTS.WK1 10:34 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ? F₉ F₁₀

C2 [W4] 12 READY

	A	B	C	D	E	F	G
1	Part Name	Part Number	QTY	Cost	Retail		
2	Hammer	H0101	12	1.95	3.99		
3	Wrench	W0998	15	3.25	5.99		
4	Standard Screw Driver	S0099	30	1.87	1.99		
5	Phillips Screw Driver	S0101	25	1.27	2.09		
6	Hack Saw	H0201	5	4.22	6.99		
7	Jig Saw	10020	5	22.94	29.99		
8							
9							

Fig. 6.24.
The delimited ASCII file after executing the File Import command with the Numbers option and adjusting column widths.

Transferring Files with File Translate

The File Translate command provides a method to convert files so that they can be read by a different program. You can convert Lotus-DM files to other formats, and files from other programs into Lotus-DM files. If the files you want to use are already in a form acceptable to Lotus-DM, you may not have to use the File Translate command. You can use the File Open command to read files from the following programs directly into Lotus-DM:

- ☐ Lotus 1-2-3 Releases 2.01 and 2.2
- ☐ Lotus Symphony Releases 1.1, 1.2, and 2.0

You have to use the File Translate command if you want to perform one of the following six types of translation:

- ☐ Lotus-DM to DIF
- ☐ Lotus-DM to dBASE III
- ☐ Lotus-DM to 1-2-3 Release 1A
- ☐ DIF to Lotus-DM
- ☐ dBASE III to Lotus-DM
- ☐ DeskMate (DM) Worksheet to Lotus-DM

The File Translate command cannot perform any other types of translation.

Choose the File (F2) command from the Lotus-DM menu bar, and then select Translate. The screen that appears as shown in figure 6.25 displays four boxes and a single menu-bar selection—File (F2). Select File (F2) to see a pull-down menu of commands, most of which you use to translate files.

Reminder:
Use the File Translate command to translate data from one program to another.

Fig. 6.25.
The File
Translate
screen.

Help F ₁ Jan 29, 1990 Translate - 12:32 pm	
File F ₂	F ₉ F ₁₀
Translation FROM	Translation TO
Source File	Destination File

Choose Translation to see a dialog box that lists the six types of translations you can perform. Use the mouse or the arrow keys to select the type of translations you want. The `Translation FROM` and `Translation TO` boxes on the screen are filled in with the appropriate program types.

Select File Source from the pull-down menu and use the mouse or the arrow keys to select the file you want to translate. The indicators [A:], [B:], and [C:] refer to the A, B, and C drives. The file you want to translate should reside on one of these drives. Select one of these indicators to explore that drive for the desired file name. The indicator [...] is used to look at files in the directory above (that is, the parent directory of) the current directory. After you select the desired file from one of these drives or directories, the `Source File` box is filled in with the name of the selected file.

Select File Destination and provide a name for the file that will receive the results of the translation. If the file name you specify already exists, you are prompted whether you want to overwrite the existing file. If you select No, you can provide a new file name. If you select Yes, the existing file is overwritten with the new translated file. The `Destination File` box is filled in with the file name you specify.

Caution:
You may lose
some
information
when you
translate data
from one
program to
another.

Because no translator, human or automated, is always correct, you may lose some data during translation. Performing the translation a second time may yield better results.

If the information you have provided is not correct, you can select File Clear from the pull-down menu to delete all the selections you made from the boxes so that you can start over. When you are sure that all the translation information is correct, select File Begin to start the actual translation.



Note: Use the File Run command when you want to exit from the Translate program and run a DeskMate application.

Chapter Summary

In this chapter, you learn how to manage files on disk, how to save and read entire files, and how to extract and combine partial files. You see how to combine text files and translate files to and from other formats. Viewing lists of files to help you keep track of your files on disk and in memory is covered also.

The next chapter explains how to obtain paper copies of the data you see on-screen.

Part II

Creating Reports and Graphs

This Part Includes:

Printing Reports
Creating and Displaying Graphs
Printing Graphs

Printing Reports

The Lotus-DM program is a powerful tool for developing information presented in column-and-row format. You can enter and edit your worksheet and database files on-screen as well as store the input on disk. But to make use of your data, you often need it in printed form: as a target production schedule, a summary report to your supervisor, or a detailed reorder list to central stores, for example.

By using Lotus-DM's File Print commands, you can access many levels of print options to meet your printing needs. By using the File Print command, you can elect to write directly from Lotus-DM to the printer or create a print (PRN) file. Later, you can produce a printout of the file from within Lotus-DM or from DOS, or you can incorporate the file into a word processing file.

This chapter shows you how to complete the following tasks:

- ☐ Choose from the three File commands: Page Setup, Page Layout, and Print.
- ☐ Print using default settings
- ☐ Print single or multiple pages
- ☐ Exclude segments within a designated print range
- ☐ Control paper movement
- ☐ Change the default settings with the Worksheet Page Setup command and the Setup accessory.
- ☐ Test the print format of large print ranges
- ☐ Print worksheet contents cell-by-cell
- ☐ Prepare output for acceptance by other programs

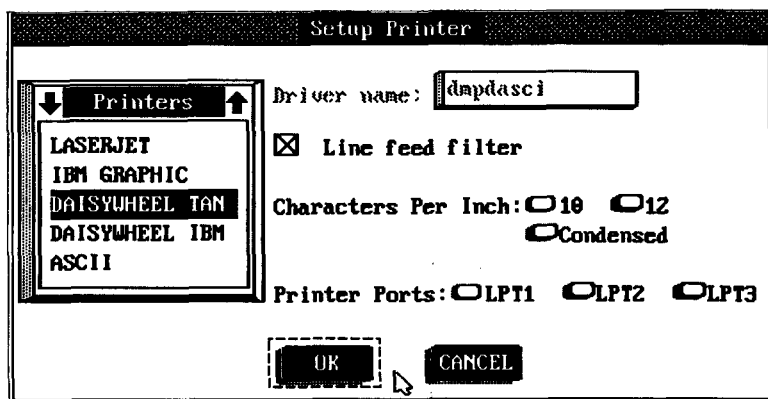
Because you must use the Graph PrintGraph command to print graphs, printing graphs is not covered in this chapter. See Chapter 9 for a complete discussion.

Before You Start

The Setup Accessory, explained in Chapter 2, controls the printer settings, but its primary purpose is confined to three operations: telling Lotus-DM what kind of printer you have, specifying the printer port that your printer is connected to, and indicating the number of characters per inch to use when printing. The first and second operations are used only if you changed printers or ports; the selection of print size is likely to be used more often.

To change the size of print, select Setup (F10) from the main menu, choose Printer Settings, and select the desired Characters Per Inch from the Setup Printer Dialog Box (see fig. 7.1).

*Fig. 7.1.
The Printer
Setup dialog
box.*



Many users of Lotus-DM's print capability may decide to use this setting once and remain with that kind of printing indefinitely. In that case, you would rarely, if ever, need to return to the Setup Accessory.

Standard Print Commands

The remainder of Lotus-DM's print features are found in four commands:

- ☐ Worksheet Page Setup
- ☐ File Page Setup
- ☐ File Page Layout
- ☐ File Print

The first two commands provide you with identical dialog boxes, but Worksheet Page Setup is used for default settings, whereas File Page Setup is used for the current printing task.

The Worksheet Page Setup and File Page Setup commands deal with these printing features:

- ☐ Left Margin setting
- ☐ Line width
- ☐ Lines per Page
- ☐ Printed lines per page
- ☐ Double spacing
- ☐ Pause between pages

The File Page Layout command controls the following print options:

Header	Produces a line that will appear at the top of every page
Footer	Produces a line that will appear at the bottom of every page
Format	Allows you to specify whether to display a print range as formulas or as it appears on the screen, or whether to include header, footer, and page-breaks
Border rows	Allows you to select border rows or columns: rows or columns that appear on all pages

The File Print command presents these choices:

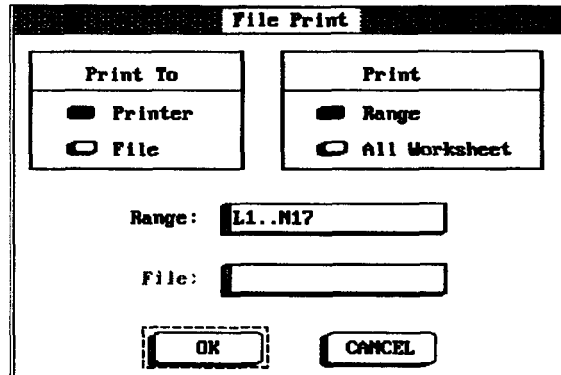
- ☐ Whether to print to the printer or to a file; if you choose to print to a file, prompts you to provide a file name
- ☐ Whether you want to print a range or the entire worksheet

If there is not wide variation in the kinds of printing you are likely to do, most of your usage of the printing commands will center around the File Print command. The next section explains this command in more detail.

Using the File Print Command

This command is concerned with two sets of choices: (1) selecting *where* to print, and (2) selecting *what* to print (see fig. 7.2).

Fig. 7.2.
The File Print dialog box.



Where To Print: Choosing between Printer and File

Cue:
Choose the File option in the File Print command to create a file to be incorporated into a word processing file.

The File Print command allows you to select one of two options. To print to a printer, choose **Printer**. Choose **File** to create a file on disk; later you can print the file from within Lotus-DM or incorporate the file into a word processing file.

When you choose **File**, you are prompted for a file name. Type a name up to eight characters long. You don't need to add a file extension because Lotus-DM automatically assigns the PRN (print file) extension. You can incorporate the file into a Lotus-DM worksheet again by using the File Import command. In this case, the file will not be the same as your original worksheet file; imported PRN files consist of long labels. (File Import is discussed in Chapter 6.) You also can view a PRN file by using the DOS TYPE command, a word processor's print command, or a special printing routine. See the section "Preparing Output for Other Programs" for more information on printing to a file.

To avoid problems of spacing and irregular results in printing to a file, use these other print features:

- ☐ Select **Unformatted** in the **Format** option of the **File Page Layout** command
- ☐ Select **0** as the setting for the **Left Margin** in the **File Page Setup** command

What To Print: Choosing between Range and All Worksheet

If you want to print the entire active area of the worksheet, select the **All Worksheet** button. If you select **Range**, the range panel must be filled with the range address of the cells you want to print.

Using the Worksheet Page Setup Command

To minimize the keystrokes necessary for a print operation, Lotus-DM makes certain assumptions about how you want your copy printed. The usual print operation produces 76 characters per line with a left margin of 4 blank spaces and 55 printed lines per page; total lines per pages is 66, based on using standard 11-inch paper. Neither double spacing nor automatic pausing between every printed page is assumed.

The aforementioned settings are standard and are the original ones used in Lotus-DM if you have never altered them. They all appear on the Worksheet Page Setup dialog box. If you want to change some of these settings just for the current session of Lotus-DM, you may do so. If your purpose is to alter them so that they become the new default settings, follow your usage of these commands with the Worksheet Update command—henceforth, whether in the current session of Lotus-DM or when you access Lotus-DM in the future, these new settings remain the default.

You should check these default settings before you decide to print. To do so, use the Worksheet Page Setup command (see fig. 7.3).

Cue:
Use the Worksheet Page Setup command and the Setup Accessory to check current default print settings.

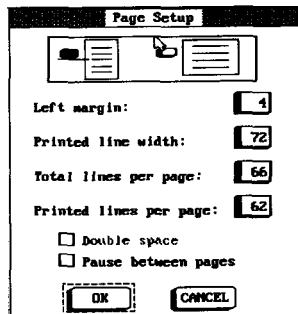


Fig. 7.3.
The Worksheet Page Setup dialog box.

Default Hardware-Specific Options

Remember, if you want to change the printer type or the connector type, use the Worksheet Page Setup accessory, as described earlier in this chapter.



Page Setup Options

For page setup, you must consider the length and width of the printer paper, the number of lines that will print on one page (lines per inch), and the pitch

(characters per inch). Because Lotus-DM initially assumes 8 1/2-by-11-inch paper and a printer output of 6 lines per inch, the default page length is 66 lines. To allow the placement of headers, footers, and automatic top and bottom margins, Lotus-DM does not print on all lines. The default for printed lines per page is 55.

Every printed line contain 10, 12, or 16.7 (condensed) characters per inch, selectable through the Setup accessory.

In both Worksheet Page Setup and File Page Setup, you have the following options:

<i>Option</i>	<i>Setting</i>
	The button next to the depiction of an elongated sheet of paper refers to standard page orientation (also known as Portrait). Default left margin (0..240) is 4.
	The button next to the depiction of a rotated sheet of paper is for Landscape printing, a feature not available unless you are printing graphs with the Graph PrintGraph command.
Left	4 (the number of blank spaces to the left of the leftmost column).
Printed line width	76 (the number of characters to be printed on a single line).
Total lines per page	66 (maximum number of lines that your paper could print if every line were used. It is assumed that you are using 8 1/2-by-11-inch paper with printing occurring at 6 lines per inch).
Printed lines per page	55 (lines to be printed on one page).

Reminder:
Lotus-DM automatically reserves 3 lines each for a header and footer, even if you do not enter any.

To calculate how many lines of your worksheet will actually be printed per page, you need to subtract the lines that Lotus-DM automatically reserves for a header and a footer. If you are using all default settings, for example, the actual number of lines (or rows) from your worksheet that can be printed is 60. Lotus-DM reserves 3 lines each for a header and a footer. The 6 header and footer lines are reserved even if you do not enter a header or footer. Because the default page length is 66, you subtract 6 lines reserved for a header and footer to get 60 printed lines. (To learn how to enter headers and footers, see the section "Creating Headers and Footers" in this chapter.)

Other Default Options

If the `Double space` option is selected, every line printed is followed by an empty line. There is no way to make this feature apply to just part of the print range; printing is either all double-spaced or all single-spaced.

The `Pause Between Pages` setting controls the way paper is fed to the printer. If you are using continuous-feed paper or a laser printer or an automatic sheet feeder that can feed single sheets, leave the selection untouched. If you are using single sheets of paper select this option. Printing will pause at the end of each page so that you can insert a new sheet of paper. After you insert the page, press Enter to continue printing.

Remember that if you use the `Worksheet Page Setup` command to change print settings, the new settings remain in effect for the current work session only. To have the settings remain the default whenever you start Lotus-DM, use the `Worksheet Update` command after you have made the changes you want.

Reminder:

For printing on single sheets of paper, select the `Pause Between Pages` option in the `File Page Setup` command to have the printer pause after printing each sheet.

Printing a Draft-Quality Report

Lotus-DM's Print commands are designed for the simplest to most complex worksheet printing needs. If you want to print a report quickly that requires neither changing any default print settings (such as those for paper size) nor special enhancements (such as headers, footers, or different size and style of type), you can print a report with default settings. If you want to dress up your report or have special requirements for paper size, margins, or page length, you need to use the options available in the `File Page Setup` and `File Page Layout` commands. To illustrate printing techniques, this chapter uses the large worksheet in figure 7.4, which occupies the range A1..T130.

This section shows you how to print draft-quality reports quickly by using a minimum of commands. Later in the chapter, you learn how to use those commands that enhance reports, change type size and style, and automatically repeat border titles. You also learn how to produce printouts of complete formulas rather than their resulting values.

If you don't change any of the default print settings and no other print settings have been entered during the current worksheet session, printing a page or less involves the use of a single command. Using the `File Print` command, choose to print to the printer or file and choose `All Worksheet`.

If another person uses your copy of Lotus-DM and has possibly changed either the default print settings or has entered new settings during the current worksheet session, check the status of two settings—the default settings of the `Worksheet Page Setup` command and the print settings in the `Setup Accessory`.

Fig. 7.4.
Cash Flow
Projector
Worksheet.

[illegible]

If you are certain that all default settings are correct and no other settings have been entered, you can print a report of a page or less easily by simply doing the following:

Cue:

Use Ctrl-Break to stop printing at any time.

1. Check that your printer is on-line.
2. Check that your paper is positioned where you want the data to print.
3. Use the File Print command, selecting either **Range** (followed by filling in the range box with an address), or **All Worksheet**. The results are shown in figure 7.5.

Fig. 7.5.
The result of printing one page with default settings.

BALANCES IN WORKING CAPITAL ACCOUNTS					Dec	Jan
Assets						
Cash					\$17,355	\$31,643
Accounts Receivable					493,151	\$10,780
Inventory					163,833	169,209
Liabilities						
Accounts Payable					125,000	130,754
Line of Credit						0
Net Working Capital					\$549,339	\$580,878
SALES						
					Oct	Nov
Profit Center 1					\$27,832	\$23,864
Profit Center 2					13,469	21,444
Profit Center 3					126,881	124,382
Profit Center 4					94,285	92,447
Profit Center 5						89,010
Total Sales					\$262,487	\$262,137
						\$258,893
						\$277,562
Cash					10%	10%
Percent of 30 Days					20%	20%
Collections 60 Days					50%	50%
90 Days					20%	20%
Cash Collections						\$263,101

To print six columns of data from the working-capital accounts section of the worksheet shown in figure 7.4, first check that your printer is on-line and that your paper is positioned where you want the printing to begin.

Cue:

If your worksheet is more than one page, use the Borders option to repeat the borders on each page.

Because you want the labels in A6 through A17 in figure 7.4 to print on both pages, you must use the **Borders** option. First use the File Page Layout command, selecting the range A6..A17 in the **Column Range** box. (To print a report on two or more pages and repeat labels that are displayed across a row, you select **Row Range** instead.)

Once you have indicated which column or row of labels you want repeated on each page, you do not need to include those labels in your actual print range. Select a range, omitting those border cells, and then use the File Print command, choosing **Range** instead of **All Worksheet**.

Complete the command and Lotus-DM automatically places those labels in the first column or row on every page. To print the January-through-June data for the working-capital accounts section, highlight the range H6..M18. Notice that this range does not include A6..D18, which is the range that contains the labels.

The printed pages of the working-capital accounts section are shown in figures 7.6 and 7.7. Notice that the column descriptions print on both pages.

BALANCES IN WORKING CAPITAL ACCOUNTS	Jan	Feb	Mar
Assets			
Cash	\$31,643	\$34,333	\$36,657
Accounts Receivable	510,780	533,597	551,287
Inventory	169,209	176,671	189,246
Liabilities			
Accounts Payable	130,754	139,851	150,186
Line of Credit	0	0	0
Net Working Capital	\$580,878	\$604,750	\$627,003

Fig. 7.6.
The first page of a report printed on two pages.

BALANCES IN WORKING CAPITAL ACCOUNTS	Apr	May	Jun
Assets			
Cash	\$35,614	\$29,146	\$20,000
Accounts Receivable	577,314	614,997	641,802
Inventory	206,788	228,828	269,990
Liabilities			
Accounts Payable	163,731	180,350	203,669
Line of Credit	0	0	1,834
Net Working Capital	\$655,984	\$692,620	\$726,289

Fig. 7.7.
The second page of a report printed on two pages.

Hiding Segments within the Designated Print Range

Because the Print commands require you to specify a range to print, you can print only rectangular blocks from the worksheet. Nevertheless, you can suppress the display of cell contents within the range. You can eliminate one or more rows, hide one or more columns, or remove from view a segment that spans only part of a row or column. The results of each of the following illustrations print on one page, using the default settings.

Excluding Rows

To exclude rows from printing, you must mark the rows for omission. Do this by typing a double vertical bar (||) in the blank leftmost cell of the print range of each row you want to omit. Only one of these vertical bars appears on-screen and neither appears on the printout. A row marked in this way does not print, but the suppressed data remains in the worksheet and is used in any applicable calculations.

Suppose that you want to print the cash-flow summary line descriptions from the Cash Flow Projector worksheet. When the Print Printer Range command prompts you for a range to print, specify A94..D112. The printout of the contents of rows 94 through 112 is shown in figure 7.8.

Fig. 7.8.
*A printout of
individual cash-
disbursements
rows.*

```
=====
CASH FLOW SUMMARY
=====
Collection of Receivables
Other Cash Receipts

Cash Disbursements
Payment for Purchases on Credit
Operating Expenses
Long-Term Debt Service
Interest Payment on Line of Credit
Interest Rate
Payment
Income Tax Payments
Other

Total Cash Disbursements

Net Cash Generated This Period
```

Now suppose that you don't want the printout to show the cash-disbursements detail (rows 100 through 109). Do not use a worksheet command to delete the rows. Instead, omit the row from printing by typing a double vertical bar in the leftmost cell of each row to be omitted. Because the leftmost cell is not blank, however, you need to make an adjustment. The simplest method is to insert a new column A and narrow it to a one-column width. Then type || in cell A100 and copy that entry to cells A101..A109.

Cue:
If necessary, insert a new column A to provide blank cells for the double vertical bars.

When you use the File Print command, be sure to specify the expanded range A94..E112 (not A94..D112 or B94..E112). Figure 7.9 shows the resulting printout.

```
=====
CASH FLOW SUMMARY
=====
Collection of Receivables
Other Cash Receipts

Total Cash Disbursements

Net Cash Generated This Period
```

Fig. 7.9.
The individual cash-disbursements rows omitted.

To restore the worksheet after you have finished printing, delete the vertical bars from the leftmost cells of the marked rows and delete column A.

Excluding Columns

As you learned from Chapter 4, you can use Lotus-DM's Worksheet Column Command and select **Hide** to mark columns you don't want to display on-screen. If these marked columns are included in a print range, they do not appear on paper when you use the File Print command.

Suppose that you are working with the Cash Flow Projector model and you want to print only the descriptions and the January-through-March sales information contained in the range A21..J40. Issue the Worksheet Column command, choose **Hide** and specify columns E1..G1 to suppress the October-through-December data. The resulting printout is shown in figure 7.10.

Cue:
Use the Worksheet Column command and select **Hide** to hide columns you don't want to print.

Fig. 7.10.
The printout after
hiding columns E,
F, and G.

SALES		Jan	Feb	Mar
Profit Center 1		\$31,336	\$37,954	\$43,879
Profit Center 2		22,572	24,888	25,167
Profit Center 3		131,685	129,044	131,723
Profit Center 4		95,473	98,008	96,986
Profit Center 5				
Total Sales		\$281,066	\$289,894	\$297,755
Percent of Collections	Cash	10%	10%	10%
	30 Days	20%	20%	20%
	60 Days	50%	50%	50%
	90 Days	20%	20%	20%
Cash Collections		\$263,437	\$267,077	\$280,066

To restore the columns, select **Worksheet Column** and choose **Display**. You can specify which column or columns to display and they become visible on the screen; of course, they are printed if included in the print range.

Excluding Ranges

If you want to hide only a partial row, a partial column, or an area that partially spans one or more rows and columns, select a range and use the **Range Format** command and select **Hidden**. The chosen cells appear to be blank.

Perhaps your worksheet includes documentation you want to save on disk but omit from the printout. For example, you may want to omit the copyright message in the third row of the **Cash Flow Projector** worksheet. To omit the message, select the range to be hidden, use the **Range Format** command and specify **Hidden**. (Although the message spans several cells, it is entered in just D3.) Then print the range A1..G7 (see fig. 7.11).

Fig. 7.11.
The printout
after hiding
cell D3.

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Dec

After you finish printing, select the range D3..D3, use the Range Format command and indicate `Reset` to restore the copyright message.

Controlling Paper Movement

Unless you specify otherwise, the top of a page is initially marked by the print head's position when you turn on the printer and load Lotus-DM. If you print a range containing fewer lines than the default page length, the paper advances to the top of the next page. If you print a range containing more lines than the default page length, Lotus-DM automatically inserts page breaks between pages, and the paper advances to the top of the next page after the last page has printed.

If you don't want to accept Lotus-DM's automatic paper-movement controls, you can change the controls manually, if you have a daisywheel or dot-matrix type printer. You can start printing in any paper position, advance the paper by line or by page, and insert page breaks exactly where you want them.

If you are using continuous-feed paper, position the paper so that the print head is at the top of the page; then turn on the printer. Do not advance the paper manually. Because Lotus-DM coordinates a line counter with the current page-length setting, any lines you advance manually are not counted, and page breaks may crop up in strange places.

Setting Page Breaks within the Worksheet

Look again at figure 7.4, which shows the entire Cash Flow Projector worksheet. Suppose that you want to print three months of data (October to December) for the sales and purchases sections of the worksheet. To make sure that the purchases section begins printing on a new page, you can insert a page break into the worksheet by using a command or by typing a special symbol.

To enter a page break using Lotus-DM's commands, first move the cell pointer to column A and then to one row above the row at which you want the page break to occur. Then select the Worksheet Page command; this command automatically inserts a new blank row containing a page-break symbol (|:|).

For example, to insert a page break just above the first separating line in the purchases section, position the cell pointer on A42 and then execute the command. Figure 7.12 shows the inserted row with the double-colon page-break symbol. To remove the inserted row and the page-break symbol after you finish printing, use the Worksheet Delete command and select `Row`.

As an alternative, insert a blank row into your worksheet where you want a page break, and then type a page-break symbol (|:) into a blank cell in the leftmost column of the print range in that row. The contents of cells in any row marked by the page-break symbol do not print.

Caution: Inserting a blank row for a page-break symbol may alter formulas or cause other problems.

Be careful when you alter a worksheet. You may alter formula results by inserting rows, or you may accidentally delete the wrong row after you finish printing. You may be able to avoid these problems by typing the page-break symbol into the leftmost column in the print range of a row that is already blank in your worksheet. First check to be sure that the row is blank; use the End and arrow keys to scan across the row.

Fig. 7.12.
*Inserting a
page-break
symbol in the
worksheet.*

The screenshot shows a Lotus 1-2-3 worksheet with the following data:

	A	B	C	D	E	F	G
26							
27	Total Sales				\$262,487	\$262,137	\$258,893
28							
29							
30			Cash		18%	18%	18%
31	Percent of	30 Days			28%	28%	28%
32	Collections	60 Days			58%	58%	58%
33		90 Days			28%	28%	28%
34							
35	Cash Collections						\$
36							
37							
38							
39	PURCHASES				Oct	Nov	Dec
40							
41	Cost of Goods Sold						
42	Profit Center 1				33%	33%	33%
43					\$9,185	\$7,875	\$8,621

The page break symbol (|:) is visible in cell A37.

Changing the Print Options

Reminder: File Page Setup settings override corresponding Worksheet Page Setup settings.

You can use the Worksheet Page Setup command to change the default print settings. The new default settings remain in effect for all print operations performed in the current work session. If you want the new settings to be in effect whenever you load Lotus-DM, use the Worksheet Update command.

The print settings you use for your worksheet are saved with the file when you use the File Save or File Save As commands. When you open the file, the settings are still in effect.

Creating Headers and Footers

Lotus-DM reserves three lines in a document for a header and an additional three lines for a footer. You can either retain the six lines (regardless of whether you use them) or eliminate all six lines by selecting the *Unformatted* option (explained later in this chapter) in the File Page Layout command (see fig. 7.13).

Technically, the **Header** and **Footer** options let you specify up to 132 characters of text within one line in each of three positions: left, right, and center. But from a practical standpoint, the overall header or footer line cannot exceed the number of characters in the printed line width setting of the File Page Setup command.

The header text, which is printed on the first line of the page, is followed by two blank header lines (for spacing). The footer text line is printed above the bottom of the page below two blank footer lines (for spacing).

Cue:

You can use special characters in your header and footer to enter page numbers, enter the date, and position the text.

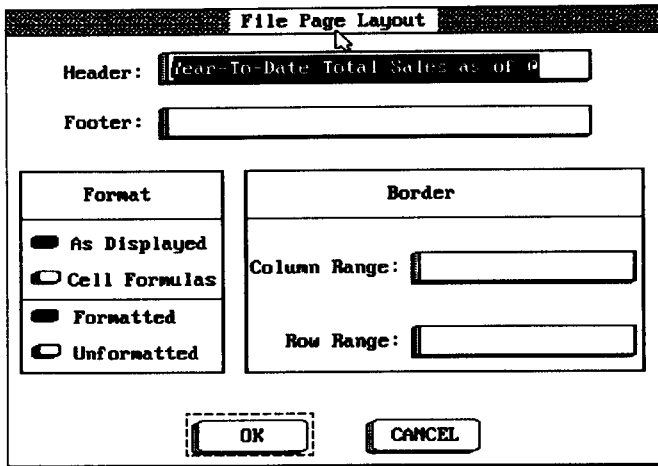


Fig. 7.13.
*The File
Page Layout
dialog box.*

Although you can enter text manually, Lotus-DM provides special characters for controlling page numbers, entering the current date, and positioning text within a header or footer. These special characters include the following:

<i>Character</i>	<i>Function</i>
#	Automatically prints page numbers, starting with 1.
@	Automatically includes (in the form 29-Jun-90) the system date (the one displayed at the top of the screen).
	Automatically separates text: Absence of a mark left-justifies all text. The first mark centers text that follows. The second mark right-justifies remaining text.

For example, reprint the range A1..G18 after adding a header that includes all the preceding special characters. To add the header, select the File Page Layout command and type the following:

@|YOUR FIRM NAME|#

Then, use the File Print command. The resulting printed copy with the header line, as shown in figure 7.14, improves the appearance of the report.

Whenever the print range exceeds a single-page output, the header is printed on each succeeding page and the page number increases by one. If you have used the special page-number character (#) and want to print your report a second time before you leave the Print menu, the page counter is reset when you use the File Print command.

If you have specified a header line, but the centered or right-justified text doesn't print, make sure that the **Printed Line Width** setting is appropriate for the current pitch and paper width. To change the header, simply access the File Page Layout command and type a new header entry.

Fig. 7.14.
*The result of
specifying a
header.*

09-Mar-90	Your Firm Name
=====	
CASH FLOW PROJECTOR	
=====	
BALANCES IN WORKING CAPITAL ACCOUNTS	Dec
=====	
Assets	
Cash	\$17,355
Accounts Receivable	493,151
Inventory	163,833
Liabilities	
Accounts Payable	125,000
Line of Credit	0
Net Working Capital	\$549,339
=====	

Printing a Worksheet Border

A printed report of lines of numbers can be difficult, if not impossible, to interpret if you don't know what those figures represent. You can make your report easy to understand by printing specified columns and rows repeatedly on a multipage printout.

If you use the default print settings to print the Cash Flow Projector worksheet, the report contains all necessary information. But without descriptions of what each line of figures represents, some pages may be difficult to interpret.

To improve the report, you need to add certain column or row headings—what Lotus-DM calls a *border*. Selecting a border is done from the File Page Layout command; you can select a column or row range. Setting borders in a printout is analogous to freezing titles in the worksheet: selecting a column range (such as A1..B1) produces a border like a frozen title display—columns A and B appear on every page; selecting a row range (such as A1..A2) produces a border that freezes rows 1 and 2, displaying them on every page.

Reminder:
Using Borders in printing is analogous to freezing titles on the worksheet.

To illustrate the process of creating borders, you can modify a small portion of the report—the working-capital accounts information in the range A1..S18. Omit the blank columns (E and F) as well as the initial December column (G); then select **Column Range** under **Border** in the File Page Layout command and specify A1..D1. Then use the File Print command to print the range H1..S18.

As you can see from the first two pages of the report, the account names are repeated to coincide with the January-through-December dollar amounts (see figs. 7.15 and 7.16).

CASH FLOW PROJECTOR			
BALANCES IN WORKING CAPITAL ACCOUNTS	Jan	Feb	Mar
Assets			
Cash	\$31,643	\$34,333	\$36,657
Accounts Receivable	510,780	533,597	551,287
Inventory	169,209	176,671	189,246
Liabilities			
Accounts Payable	130,754	139,851	150,186
Line of Credit	0	0	0
Net Working Capital	\$580,878	\$604,750	\$627,003

Fig. 7.15.
Page 1 of a report with a printed column border.

If the designated border includes part of the print range or the print range includes part of the border, the same information prints twice.

If you want to print information with a vertical border on every page, select the **Row Range** option under **Border** in the File Page Layout command. For example, use this option if you want to print only the liabilities information in rows 13 to 15.

If you need to keep existing borders from printing, simply blank out the addresses next to the **Column Range** or **Row Range** options.

Fig. 7.16.
Page 2 of the
report with a
printed column
border.

=====

CASH FLOW PROJECTOR

=====

BALANCES IN WORKING CAPITAL ACCOUNTS

	Apr	May	Jun
Assets			
Cash	\$35,614	\$29,146	\$20,000
Accounts Receivable	577,314	614,997	641,802
Inventory	206,788	228,828	269,990
Liabilities			
Accounts Payable	163,731	180,350	203,669
Line of Credit	0	0	1,834
Net Working Capital	\$655,984	\$692,620	\$726,289

Using the File Page Setup Command

To change the page layout temporarily, use the File Page Setup command shown in figure 7.17 to change any of these selections:

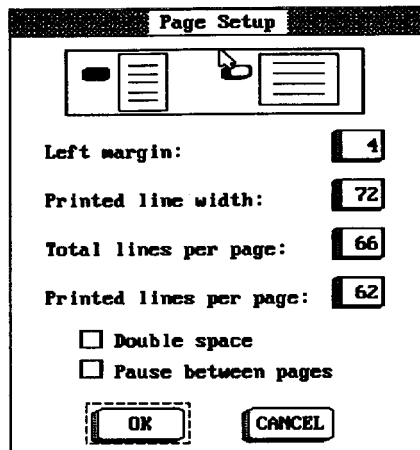
Left margin	Allows you to indicate the number of blank spaces to the left of the first printed character; cannot exceed 131.
Printed line width	Shows the number of characters to be printed on one line; maximum is 132.
Total lines per page	Usually set at 66, in recognition that most paper is 11 inches deep (printing is at 6 lines per inch); cannot exceed 84.
Printed lines per page	Allows you to indicate the number of lines you want to print per page; cannot exceed 84.

When you change these settings, you may need to go through some trial and error to get the results just right. These rules are in effect:

- ☐ Lotus-DM sets aside three rows (only the first header line and last footer line can contain text) for both header and footer, regardless of whether or not you have elected to use them.
- ☐ You don't select top or bottom margins but Lotus-DM calculates their size based on two settings—total lines per page and printed lines per page. If the former is set at 66 and the latter at 50, then the top and bottom

margins are each set at 5. Of the 66 usable rows, three each are needed for the header and footer; at this point, 60 rows remain. Subtracting 50 from 60 leaves 10 — to be split equally between top and bottom margins.

- ❑ If you're not cognizant of the characters-per-inch setting, results are likely to be confusing; remember to check this setting through the Setup accessory under Printer Setup. 10 characters per inch (CPI) results in 80 characters per line maximum; 12 CPI results in a maximum of 96 characters per line; *Condensed* is equivalent to 16.7 CPI, or a line width of 132 maximum. Be sure that your settings are consistent with the width of your paper and the established pitch (characters per inch).



*Fig. 7.17.
The File Page
Setup dialog box.*

Unformatted Printing

The *Unformatted* selection in the File Page Layout command suppresses all formatting. This topic is covered in "Preparing Output for Other Programs."

Printing a Listing of Cell Contents

You can spend hours developing and debugging a model worksheet and much additional time entering and verifying data. You should safeguard your work not only by making backup copies of your important files, but also by printing the cell contents of important worksheets. Be aware, however, that this print job can take a while if you have a large worksheet.

Cue: Choose Cell-Formulas to print a listing of formulas in cells.

You produce printed documentation of cell contents by selecting either **As-Displayed** or **Cell-Formulas** in the **File Page Layout** command. Choosing **Cell-Formulas** produces a listing that shows the width of the cell (if different from the default), the cell format, cell-protection status, and the contents of cells in the print range, with one cell per line. Selecting **As-Displayed** restores the default instructions to print the range as it appears on-screen.

You can produce a cell-by-cell listing of only the first 7 columns and the first 18 rows of the **Cash Flow Projector** worksheet, for example, by selecting **Cell-Formulas** and specifying the range **A1..G18**. Then use the **File Print** command. The resulting one-cell-per-line listing is shown in figure 7.18.

Fig. 7.18.
A listing
produced by
using the
Cell-
Formulas
option.

```

09-Mar-90                                     Your Firm Name

A1: [W9] \=
B1: [W9] \=
C1: [W9] \=
D1: [W9] \=
E1: [W11] \=
F1: [W11] \=
G1: [W12] \=
A3: [W9] 'CASH FLOW PROJECTOR
E3: (H) [W11] 'Copyright (C) 1990 Que Corporation
A5: [W9] \=
B5: [W9] \=
C5: [W9] \=
D5: [W9] \=
E5: [W11] \=
F5: [W11] \=
G5: [W12] \=
A6: [W9] 'BALANCES IN WORKING CAPITAL ACCOUNTS
G6: [W12] 'Dec
A7: [W9] \=
B7: [W9] \=
C7: [W9] \=
D7: [W9] \=
E7: [W11] \=
F7: [W11] \=
G7: [W12] '-----
A8: [W9] 'Assets
A9: [W9] 'Cash
G9: (C0) [W12] 17355
A10: [W9] 'Accounts Receivable
G10: (,0) [W12] 493151
A11: [W9] 'Inventory
G11: (,0) [W12] 163833
A13: [W9] 'Liabilities
A14: [W9] 'Accounts Payable
G14: (,0) [W12] 125000
A15: [W9] 'Line of Credit
G15: (,0) [W12] 0
G16: [W12] '-----
A17: [W9] 'Net Working Capital
G17: (C0) [W12] +G9+G10+G11-G14-G15
G18: [W12] '-----

```

Notice that within the specified print range, the contents of each cell in the first row are listed before the next row is presented. Information enclosed by parentheses indicates a range format established independently of the global format in effect. For example, the (C0) in cell G17 indicates that the cell is formatted (with a Range Format command) as Currency with zero decimal places.

Information enclosed by square brackets indicates a column width set independently of the global column width in effect. For example, the [W11] in cell G17 indicates that column G is set specifically to be 11 characters wide. Cell content is printed after the column-width and format information. The formula in G17 prints as \$549,339 in the printed worksheet.

Preparing Output for Other Programs

Many word processing and other software packages accept ASCII text files. You can maximize your chances of successfully exporting Lotus-DM files to other programs if you use some Print commands to eliminate unwanted specifications for page layout and page breaks.

You can create a printer file through the File Print command by selecting `File` instead of `Printer`; you also need to specify a file name, found in the same File Print dialog box. Output goes to a file with the automatically supplied extension PRN.

Cue:
In most cases, choose `Unformatted` when printing to a file.

If you chose `Unformatted` from the File Page Layout command, all headers, footers, and page breaks are removed prior to creation of the file.

To use the PRN file on disk, exit from Lotus-DM and follow the instructions in your word processing or other software package to import the specially prepared Lotus-DM disk files.

To restore the default printing of headers, footers, and page breaks, use the `Formatted` option in the File Page Layout command. You ordinarily choose `Formatted` when printing to the printer and `Unformatted` when printing to a file.

Chapter Summary

This chapter showed you how to create printed reports from your Lotus-DM worksheets. You learned how to print quickly using the default settings and how to change the defaults. To customize your reports and make them more readable, you can break the worksheet into pages; change the margins and page length; and provide headers, footers, and borders on the printout, as described in this chapter.

Successfully printing large worksheets with a variety of options generally takes practice and some study of your printer manual. Use this chapter as a reference as you continue to experiment.

Creating and Displaying Graphs

Even if Lotus-DM provided only spreadsheet capabilities, the program would be extremely powerful. More information can be quickly assembled and tabulated electronically than possibly could be developed manually. Despite the importance of keeping detailed worksheets that show real or projected data, data can be worthless if it cannot be readily understood.

To help decision-makers who are pressed for time or are unable to draw conclusions from countless rows of numeric data—and who may benefit from seeing key figures displayed graphically—Lotus-DM offers graphics capabilities. The program offers five types of basic business graphs as well as limited options for enhancing the appearance of graphs. Although no match for the capabilities of many stand-alone graphics packages, Lotus-DM's graphic strength lies in its integration with the worksheet.

This chapter shows you how to do the following:

- ☐ Meet minimum requirements for constructing graphs
- ☐ Enhance the appearance of a graph
- ☐ Preserve the graph on disk
- ☐ Edit the current contents of a graph
- ☐ Reset some or all graph settings
- ☐ Select an appropriate graph type
- ☐ Develop all graph types
- ☐ Bypass selected Lotus-DM graph limitations
- ☐ Understand draft-quality and final-quality graphs

When you select Graph (F6) from the menu bar, you begin to get some idea of the variety of options and choices available with this command (see fig.8.1).

You can create graphs that display nothing more than unlabeled data points in bar (or stacked-bar), line (or XY), and pie forms. To do so, select a graph Type;

specify a data range or ranges from choices X, A, B, C, D, E, and F; and View the screen output. The result is a draft-quality graph that depicts relationships between numbers or trends across time.

Fig. 8.1.
The Lotus-DM
Graph (F6)
commands.

Graph F6	
View	Ctrl+F10
Save...	
PrintGraph...	
Type...	Ctrl+T
Ranges...	Ctrl+R
Options...	
Data Labels...	
Legends...	
Titles...	
Grids...	
Scaling...	
X Format...	
Y Format...	
Name...	Ctrl+E
Reset...	

To improve the appearance of your graphs and produce labeled, final-quality output suitable for business presentations, you can select one or more Options. Select **Save** to store a graph for printing. If you plan to recall specifications, use **Name** to store your graph specifications in the current worksheet.

Suppose that you want to make a quick on-screen comparison of specific data in your current worksheet—quarterly sales information (in range N5..Q5) and the associated gross-profit figures (in range N8..Q8). By issuing the following command sequences, you can produce the minimal graph shown in figure 8.2.

In the Graph Type command:

choose **Bar**

In the Graph Range command:

enter **N5..Q5** as the A range

enter **N8..Q8** as the B range

Select Graph View (or press Ctrl-F10) to see the graph on the screen.

In this graph, the four sets of bars represent quarterly data. The bars are graphed in order from left to right, starting with the first quarter. Within each set, the left bar represents Sales data and the right bar represents the corresponding Gross Profit value. This minimal graph shows the upward movement of sales and gross profit for the first three quarters, followed by a downward trend in the fourth.

Help F1 May 3, 1990 Lotus-DM - C:\LOTUS-DM\QTRPROF.WK1 10:51 am
 File Edit Worksheet Range Graph Data

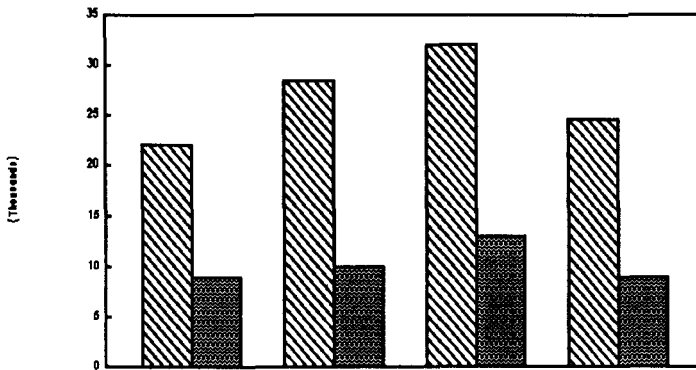


Fig. 8.2.
*A minimal, or
 draft-quality,
 sample graph.*

Suppose that you want to improve the appearance of this quarterly trend analysis before showing it to your colleagues. To produce the final-quality graph shown in figure 8.3, use the following command sequences:

In the Graph Type command:

choose **Bar**

In the Graph Range command:

enter **N5..Q5** (Sales) as the A range

enter **N8..Q8** (Gross Profit) as the B range

enter **N3..Q3** (Quarter headings below x-axis)

In the Graph Titles command:

enter **YOUR FIRM NAME** as the first title

enter **MIDWEST REGION** as the second title

enter **1990 OPERATIONS** as the X-axis title

enter **DOLLARS** as the Y-axis title

In the Graph Legends command:

enter **SALES** for the A range

enter **GROSS PROFIT** for the B range

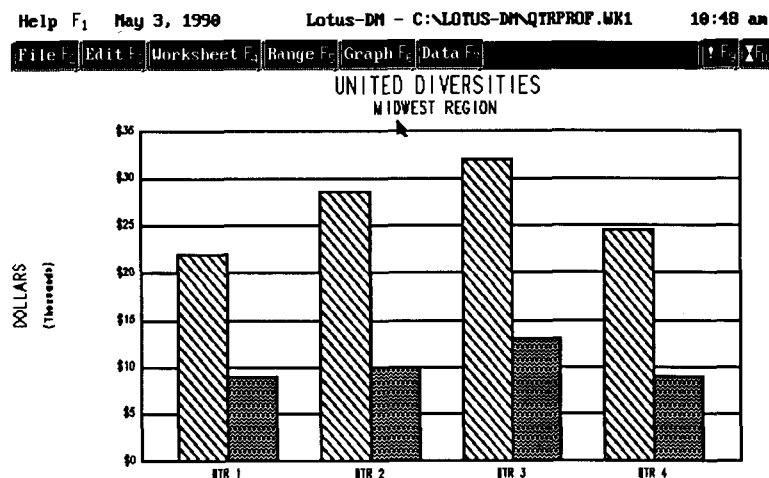
In the Graph Grid command:

select **Horizontal**

In the Graph Y-Format command:

select **Currency** with 0 decimal places

Fig. 8.3.
A presentation-
quality sample
graph.



Even those unfamiliar with the data can understand the contents of an enhanced graph.

In this chapter, you learn how to apply all the options to a single line graph. Then you learn how to construct all the other types of Lotus-DM graphs.

Defining the Basic Requirements for a Graph

Reminder:

The minimum steps for creating a graph involve specifying the type of graph, locating on the worksheet the data to plot, and selecting the Graph View command (or pressing Ctrl-F10).

Before creating your first graph, you must determine whether your hardware supports viewing and printing graphs, whether your Lotus-DM software is correctly installed and loaded, and whether the worksheet on-screen contains data you want to graph. You also should understand which type of graph is best suited for presenting specific numeric data in picture form.

Setting Up Hardware and Software

You use Lotus-DM's graphics feature to create and view a graph, store its specifications for later use and print it. Creating and storing a graph requires only that you have the Lotus system software installed on your equipment and that you correctly select options from the Graph menu.

To print a graph, you need a graphics printer supported by Lotus-DM and a separate set of PrintGraph instructions. (PrintGraph instructions are explained in Chapter 9.)

To create a graph, first load Lotus-DM and retrieve a worksheet file containing the data you want to graph. Suppose, for example, that you want to graph data from the 1990 CASH FLOW DATA spreadsheet, part of which is displayed in figures 8.4 and 8.5.

A	B	C	D	E	F	G	H	I
1	1990 CASH FLOW DATA							
2								
3								
4	WORKING CAPITAL ACCOUNTS	Jan	Feb	Mar	Apr	May	Jun	
5								
6	Assets							
7	Cash	\$31,643	\$34,333	\$36,657	\$35,614	\$29,146	\$20,000	
8	Accounts Receivable	510,780	533,597	551,287	577,314	614,997	641,802	
9	Inventory	169,209	176,671	189,246	206,788	228,828	269,990	
10								
11	Total Current Assets	711,632	744,601	777,189	819,715	872,970	931,792	
12								
13	Current Liabilities							
14	Accounts Payable	130,754	139,851	150,186	163,731	180,350	203,669	
15	Other Short-term Debt	0	0	0	0	0	1,834	
16								
17	Total Current Liabilities	130,754	139,851	150,186	163,731	180,350	205,503	
18								
19	NET WORKING CAPITAL	\$580,878	\$604,750	\$627,003	\$655,984	\$692,620	\$726,289	
20								

Fig. 8.4.
The sample
**WORKING
CAPITAL
ACCOUNTS**
worksheet
(January to June).

A	B	C	J	K	L	M	N	O
1	1990 CASH FLOW DATA							
2								
3								
4	WORKING CAPITAL ACCOUNTS	Jul	Aug	Sep	Oct	Nov	Dec	
5								
6	Assets							
7	Cash	\$20,000	\$20,000	\$76,623	\$186,131	\$337,995	\$582,796	
8	Accounts Receivable	750,544	879,271	989,501	1,097,616	1,270,646	1,218,036	
9	Inventory	296,527	324,230	345,629	352,687	358,926	358,926	
10								
11	Total Current Assets	1,067,071	1,223,501	1,411,753	1,636,434	1,867,567	2,159,759	
12								
13	Current Liabilities							
14	Accounts Payable	225,085	243,320	258,740	267,621	272,747	275,041	
15	Other Short-term Debt	8,327	2,035	0	0	0	0	
16								
17	Total Current Liabilities	233,412	245,355	258,740	267,621	272,747	275,041	
18								
19	NET WORKING CAPITAL	\$833,659	\$978,146	\$1,153,013	\$1,368,812	\$1,594,820	\$1,884,718	
20								

Fig. 8.5.
The sample
**WORKING
CAPITAL
ACCOUNTS**
worksheet (July
to December).

To graph information from this spreadsheet's Working Capital Accounts section, you must know which numeric data you can plot and which data (numeric or label) you can use to enhance the graph.

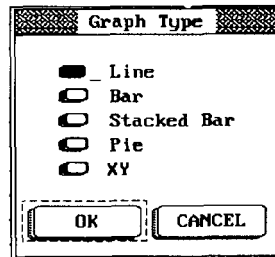
Account names are displayed across columns A, B, and C. Monthly headings and amounts appear in columns D through O. The numeric entries in rows 7, 8, 9, 14, and 15, as well as the formula results in rows 11, 17, and 19, are suitable for graphing as data points.

To develop graphs to view on-screen, select Graph from the menu bar to display the Graph commands. You always use three commands from the main Graph menu: the Type command to indicate the type of graph you want; the Range command to select at least one data series from the choices A, B, C, D, E, F, and X; and the View command to see the graph. (You may also use Ctrl-F10 to see the graph.)

Selecting a Graph Type

Selecting one of the five available graph types is easy. When you select the Graph Type command, five choices are displayed (see fig. 8.6).

Fig. 8.6.
The Graph Type
dialog box.



To understand which type of graph best displays specific numeric data, you must know something about plotting points on a graph. The following paragraphs review the two basic terms *x-axis* and *y-axis*.

All graphs (except pie graphs) have two axes: the *y-axis* (the vertical left edge) and the *x-axis* (the horizontal bottom edge). Lotus-DM automatically provides tick marks for both axes. Lotus-DM also scales the adjacent numbers on the *y-axis*, based on the minimum and maximum figures included in the plotted data range(s).

Every point plotted on a graph has a unique location (*x,y*): *x* represents the time period or the amount measured along the horizontal axis; *y* measures the corresponding amount along the vertical axis. The intersection of the *y-axis* and the *x-axis* is called the *origin*. Notice that the origins of the graphs shown thus far

in the chapter have been zero (0). To minimize misinterpretation of graph results and to make graphs easier to compare, use a zero origin in your graphs. Later in this chapter, you learn how to manually change the upper or lower limits of the scale initially set by Lotus-DM.

Of the five Lotus-DM graph types, all but the pie graph display both the x-axis and y-axis. Line, bar, and stacked-bar graphs display numbers (centered on the tick marks) along the y-axis only. The XY graph displays numbers on both axes. (A general statement about the use of each Lotus-DM graph type precedes the explanation of how to construct that type of graph.)

Specifying a Worksheet Data Range

Lotus-DM does not enable you to type data to be plotted on a graph. Do not confuse the process of *plotting data points* with *typing descriptions* (such as titles). Entering descriptions is described later in this chapter.

To create a graph, you must specify data from the currently displayed worksheet as a *data series* in range form. An example of a data series is D7..O7. In Lotus-DM, you may plot one data series along the x-axis (the X data series) and up to six data series along the y-axis (the A, B, C, D, E, and F data series). To enter a data series, use the Graph Range command (see fig. 8.7) and type the appropriate range next to the letters A, B, C, D, E, F, or X.

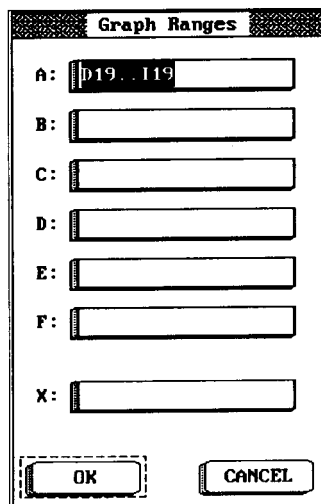


Fig. 8.7.
The Graph
Range dialog
box.

Before you start building a graph, read the following general statements about each graph type:

<i>Graph Type</i>	<i>Comments</i>
Line	Enter as many as six data series after you have accessed the Graph Range command—A, B, C, D, E, and F. You do not have to start with A, nor do you have to select all six data series. The data points in every data series are marked by a unique symbol (see table 8.1 later in this chapter).
Bar	Enter as many as six data series after you have accessed the Graph Range command—A, B, C, D, E, and F. You do not have to start with A, nor do you have to select all six data series. Multiple data ranges appear on the graph from left to right in alphabetical order. Every data series displayed in black and white has unique shading. Every data series displayed in color is assigned a color. (Shading and screen colors are summarized in table 8.1).
XY	Enter the data series being plotted as the independent variable by typing the range address in the box next to X in the Graph Range command. Plot at least one dependent variable (you usually pick A). The unique symbols that mark the data points depend on which A-through-F data series is used with X. The symbols are the same as the Line symbols in table 8.1.
Stacked-Bar	Follow the bar graph instructions. In a stacked-bar graph, multiple data ranges appear from bottom to top in the alphabetical order of the range letter.
Pie	Enter only one data series by entering the range address next to the A range in the Graph Range command. (To shade and “explode” pieces of the pie, indicate a B range also.)

As you build your graphs, refer to the preceding comments (organized by graph type) and to the summary information (organized by data range) in table 8.1. Table 8.1 (found later in this chapter in “Using the Legend Option”) shows each data range with the corresponding default assignments for line symbols, bar shading, and color.

Constructing the Default Line Graph

After you have selected the appropriate graph type for the data to be plotted, producing a graph is easy. Using the Net Working Capital values in row 19 of figures 8.4 and 8.5, you can create a line graph of the January-through-June amounts or the January-through-December amounts.

Because this graph is the first you have created after loading Lotus-DM, and **Line** is the default type, you don't have to make a Type selection.

To enter the first data range, use the Graph Range command and type **D19..I19** in the box for the A range.

By specifying the type of graph and the spreadsheet location of the data to plot, you have completed the minimum requirements for creating a graph. If you use the Graph View command, you see a graph similar to the graph shown in figure 8.8.

You know what this graph represents, but it does not mean much to anyone else. Although the six data points corresponding to the January-through-June figures have been plotted, none of the points has been labeled to indicate what it represents.

Because Lotus-DM sets a scale based on minimum and maximum values in the range, Lotus-DM automatically displays the (Thousands) indicator along the y-axis. Also notice that the origin on this initial Lotus-DM line graph is not zero, making the upward trend seem larger than it really is.

Reminder:
Lotus-DM automatically enters an indicator of units along the y-axis.

Help F1 May 3, 1990 Lotus-DM - C:\LOTUS-DM\BASICGFH.WK1 11:53 am
File Edit Worksheet Range Graph Data

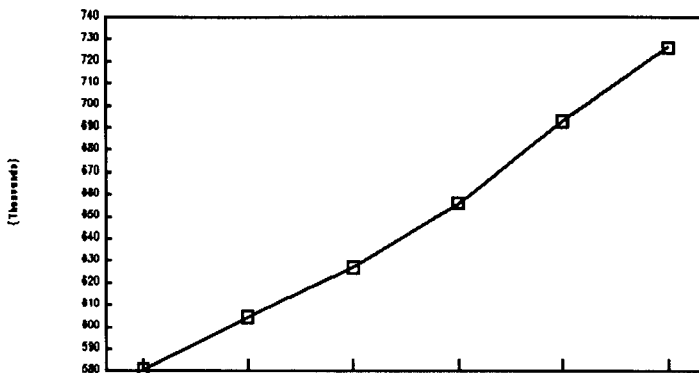


Fig. 8.8.
A default line graph in Lotus-DM.

Before delving into the specific characteristics of each graph type, you should be aware of some of the available methods for improving the appearance of your graphs. These methods apply to all graph types, unless stated otherwise.

Enhancing the Appearance of a Basic Graph

As you know, you can create an on-screen graph by using the Graph Type command to select a graph type, the Graph Range command to define the appropriate data series (A, B, C, D, E, F, or X), and the Graph View command to actually see the graph. If you want to improve the appearance of your graph, select from the many commands found in the Graph menu.

Cue:
Use Graph
(Ctrl-F10) to toggle
between
displaying the
worksheet and
displaying the
graph.

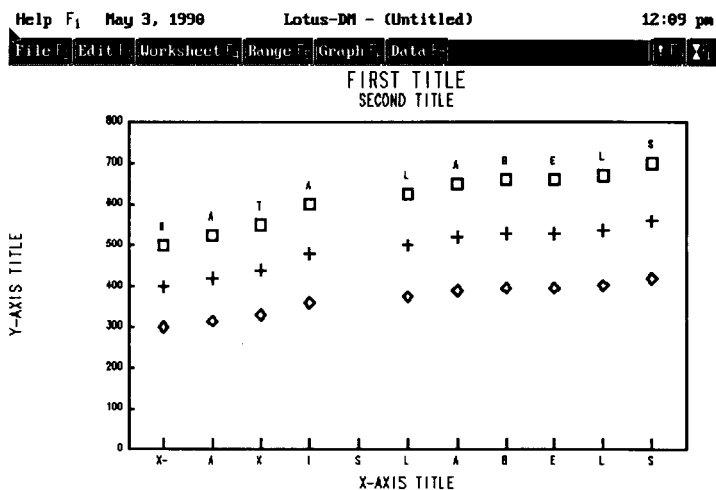
As you add enhancements to your graphs, check the results frequently with the Graph View command or with Ctrl-F10. Either method instantly redraws the graph with any updated information.

Adding Descriptive Labels and Numbers

To add descriptive information to a graph, use the Legend, Titles, and Data-Labels commands from the Graph menu, and the X option from the Range command. Figure 8.9 shows where these additional items appear on your graph.

As shown in figure 8.9, *data labels* appear within the graph. *Descriptions* entered with the X option appear immediately below the x-axis. You can enter as many as four *titles*: two at the top and one to describe each axis. *Legends* describing the shading, color, or symbols assigned to data ranges in line or bar graphs appear across the bottom of the graph. The *legend line* appears in addition to any x-axis title you may have specified.

Fig. 8.9.
Graph
location of
descriptive
information.



Using the Graph Titles Command

When you select the Graph Titles commands, four separate title boxes appear (see fig. 8.10).

You can enter one or two centered titles at the top of your graph. If you enter two titles, both appear the same size on-screen. On the printed graph, however, the title you enter by selecting **First** is twice the size of any other title specified. You can enter titles by typing a new description, specifying a range name, or referencing the cell location of a label or a number already in the worksheet.

Reminder:

The first title you enter with Graph Options Titles is printed twice the size of other titles.

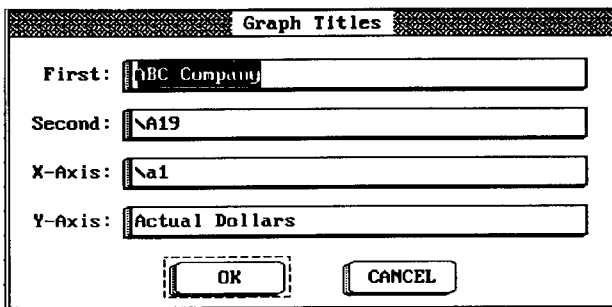


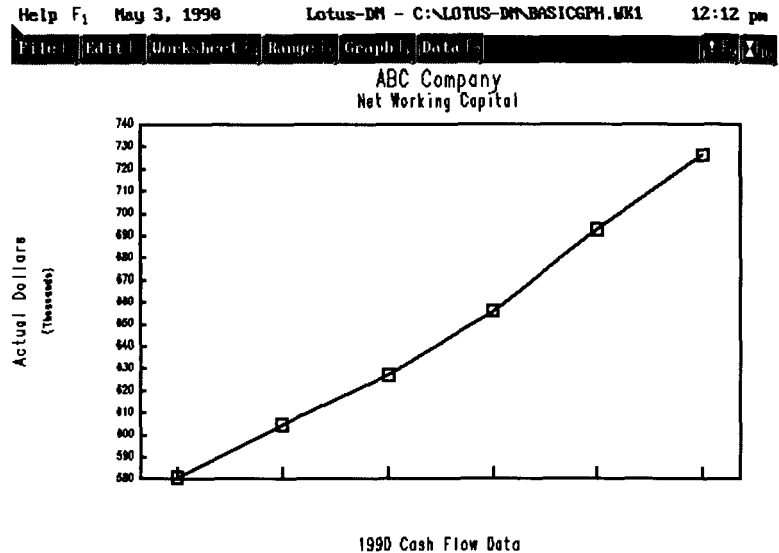
Fig. 8.10.
*The Graph Titles
dialog box.*

Suppose that you want to enhance the basic line graph of the Net Working Capital amounts (refer to fig. 8.8). (Figs. 8.4 and 8.5 contain the worksheet data for this graph.) In the following steps, you enter four titles, using cell references for two of the titles and new descriptions for the others:

1. In the Graph Titles dialog box, type **ABC Company** in the box labeled **First**.
2. Type **\A19** to make Net Working Capital (the contents of cell A19) in the box labeled **Second**.
3. Type **\A1** in the box labeled **X-Axis** to reproduce 1990 CASH FLOW DATA beneath the x-axis.
4. Type **Actual Dollars** in the box labeled **Y-Axis** to have this phrase appear rotated along the y-axis.
5. Choose OK to leave the command.

Now check the appearance of the graph, as shown in figure 8.11, by selecting the Graph View command.

Fig. 8.11.
Titles added to a
line graph.



Cue:
You can
change
print fonts
for the first
title.

Although all titles appear on-screen in the same print style, when you print the graph you can select one font (such as italic) for the top title and another font for other titles and labels. (For a detailed discussion of this topic, see Chapter 9.)

To edit a title, return to the Graph Titles command; each title entry can be edited by moving the cursor to the appropriate box and typing the changes. To eliminate a title, move the cursor to the title and press Del.

The x-axis and y-axis titles have no significance when you construct a pie graph. Because a pie graph has no x-axis or y-axis, titles are not used.

Entering Labels within a Graph

After a data series has been graphed, you can enter values or labels to explain each point plotted on the graph. To do so, use the Graph Data-Labels command and then specify the data series to which the data labels are to apply. Lotus-DM data series include A, B, C, D, E, or F. The X data series is used to assign labels to the tick marks on the x-axis. In the Graph Data Labels dialog box are boxes for each of the six possible ranges (see fig. 8.12). If you want a range to have label information displayed on the graph, use the appropriate box to enter the address of the range (or a range name) containing the data. For line or XY graphs, you can select the relative location of the data: centered on the data points, or to the left, above, to the right, or below the points.

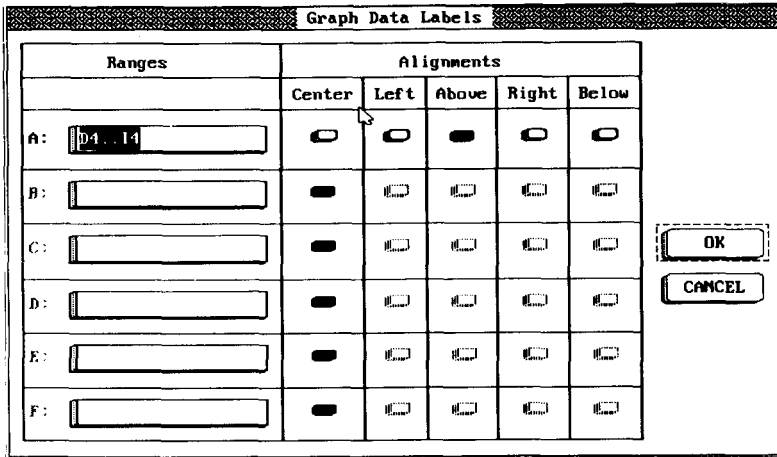


Fig. 8.12.
The Graph
Data Labels
dialog box.

Continue to enhance your sample line graph by entering the January-through-June headings from row 4 of the worksheet shown in figure 8.5. In the Graph Data-Labels command, enter the range address D4..14 in the box labeled A. For now, the only data range currently identified is the Net Working Capital line located in the range D19..119.

From the alignment portion of the Graph Data Labels dialog box, select one option for each data-label range you are identifying. The location applies to the whole range; that is, you cannot position one cell within a data-label range above its associated data point, and another cell in the same data-label range below its associated data point. To continue enhancing your graph, select *Above* and then OK. To check the graph, use the Graph View command. Your graph should resemble the one in shown figure 8.13.

If you graph more than one data series, attach the data labels to the data series with the largest figures. Then select *Above* to position the data labels above the data points plotted. To enter text or numbers as the plotted points, use the *Center* option and use the Graph Options command. In the *Lines* column and *Symbols* column of this dialog box, “deselect” (by using the space bar) lines and symbols for the desired data range (see fig. 8.14). Neither lines nor symbols appear on the graph for this data range; only the data labels appear

To edit either the range or position of the data label, use the same command sequence used to create the data label. Edit the current range or specify a different position.

To eliminate a data label, use one of two methods. If you remember both the data series (A, B, C, D, E, or F) and the position (Center, Left, and so on) you specified when you entered the data label, you can follow the original setup sequence, overriding the existing data-label range by substituting any single blank cell in the worksheet.

Fig. 8.13.
Data-labels
added within a
line graph.

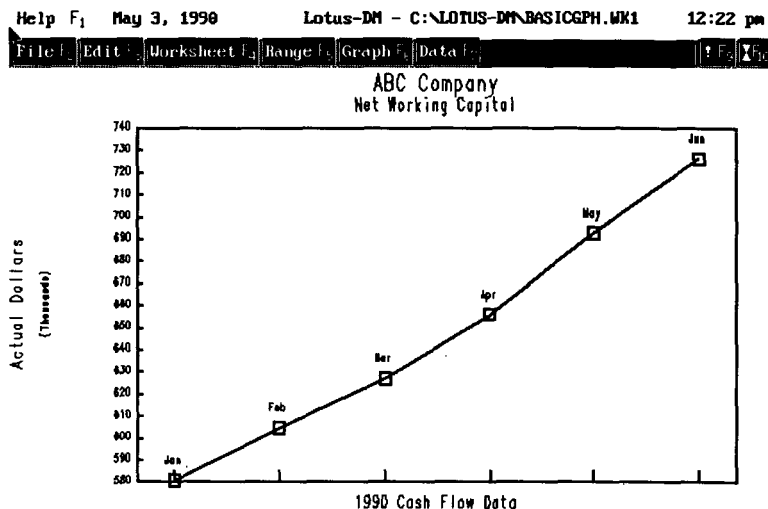


Fig. 8.14.
The Graph
Options dialog
box.

Graph Options

Line and XY Formats		
Range	Lines	Symbols
Entire Graph:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
A:	<input type="checkbox"/>	<input type="checkbox"/>
B:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
C:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
D:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
E:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
F:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Display Mode

☒ Color

☐ Black & White

OK

CANCEL

To remove the January-through-June data labels from the sample Net Working Capital graph, use the Graph Data-Labels command and type **D1**, or the address of any blank cell. Then observe the graph with the Graph View command; it should again resemble the one shown in figure 8.11.

Reminder:
You cannot use
the Data-Labels
option for a pie
graph.

The second method of removing data labels involves resetting the data ranges. Don't use this method when you want to remove only the labels. Because resetting the data ranges destroys associated options (such as data labels) as well as the data ranges, you then must retype them. (To learn more about resetting all or part of the graph settings, read this chapter's "Resetting the Current Graph" section.)



Note: You cannot use the Graph Data-Labels command for a pie graph.

Entering Labels below the X-Axis

Instead of placing descriptive information within a graph, you may prefer to enter label information along the x-axis. The **x** option in the Graph Ranges command has two distinct functions: Use it to position labels below the x-axis in line, bar, and stacked-bar graphs; or to enter a data range in an XY graph. (XY graphs are discussed later in this chapter.) You also can use the **X** option to identify slices of a pie chart.

Suppose that you want to enter the actual January-through-June Net Working Capital figures as labels below your sample graph's x-axis. Select the Graph Ranges command and type **D19..I19** in the box labeled **x**. Use the Graph View command; your graph should look like the one shown in figure 8.15.

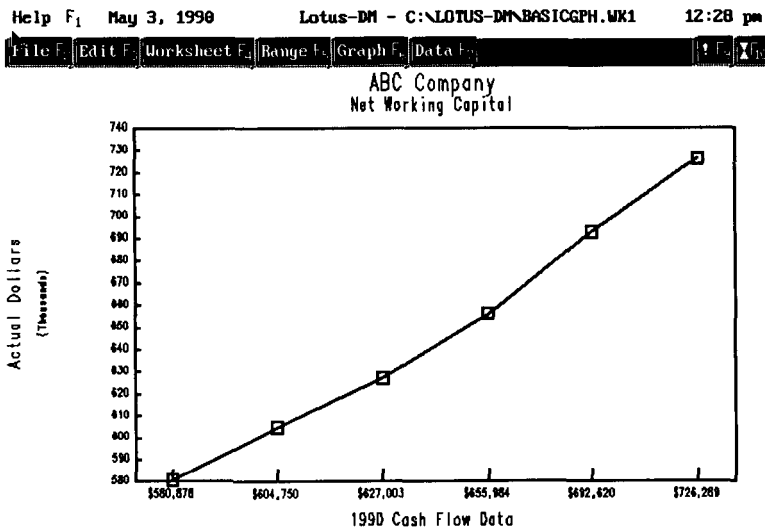


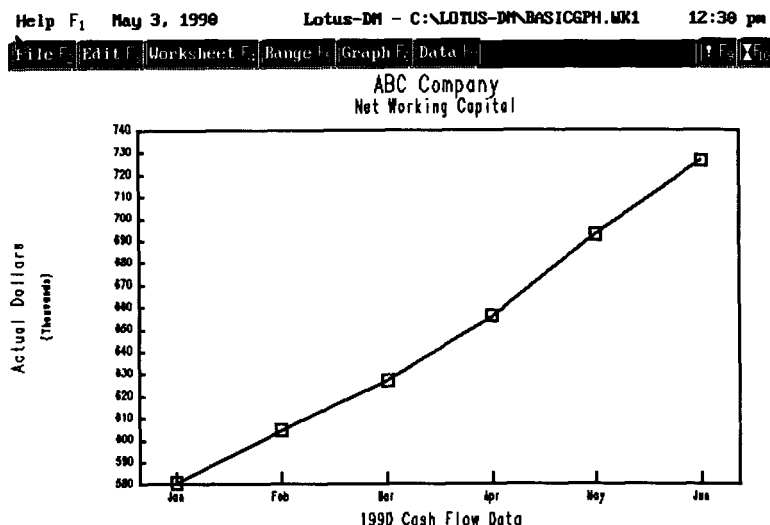
Fig. 8.15.
*Displaying
values below the
x-axis.*

Notice that in the graph shown in figure 8.15, the values used as descriptive labels below the x-axis have the same format shown in the worksheet.

You may remember that entries within the range you specify for descriptions can be either values or labels. To practice entering labels, change the Net Working Capital descriptive amounts to January-through-June headings. To do so, type **D4..I4** in the Graph Ranges dialog box for the **X** range. Your newly altered graph should resemble the one shown in figure 8.16.

You cannot use the **X** option to enter labels below the x-axis when you construct an XY or pie graph. (The x-axis can be used to place labels next to each pie slice in a pie graph, however.)

Fig. 8.16.
*Displaying labels
below the x-axis.*



Using the Legend Option

Whenever a graph contains more than one range of data, you must be able to distinguish between the ranges. If you use a color monitor and select **Color** from the Graph Options menu, Lotus-DM differentiates data series with color. If **Black and White** is in effect, data ranges in line graphs are marked with special symbols; data ranges in bar-type graphs are marked with unique patterns of crosshatches. Table 8.1 summarizes the assignments of each data range.

Table 8.1
Graph Symbols and Shading

<i>Data Range</i>	<i>Line Graph Symbol</i>	<i>Bar Graph B&W Shading</i>	<i>On-Screen Color*</i>
A	□		White
B	+		Red
C	◇		Blue-green
D	△		Lime-green
E	×		Magenta
F	▽		Olive-green

*Colors on your screen may vary, depending on quality and type of monitor.

If you intend to print the graph on a black-and-white printer, even if you have a color monitor, choose **Black and White** before saving the graph. A graph saved under the **Color** option prints on a black-and-white as all black.

You may decide to pick one of the data ranges because you want certain symbols or shadings or, more often, to avoid using certain combinations of symbols or shadings. If you entered only two data items in a line graph and used data ranges D and F, for example, you would have difficulty distinguishing between the two three-sided symbols—one pointing up and the other pointing down. On the other hand, pairing two ranges with widely different patterns on a bar graph produces a distinctly different display. To provide explanatory text for data represented by symbols or shadings, use legends below the x-axis.

The most recent version of the sample Net Working Capital line graph displays the square symbol assigned to the data points entered as the A range (refer to fig. 8.16). Suppose that you want to change the data to reflect two items: Total Current Assets (CA) and Total Current Liabilities (CL), rather than the single item reflecting Net Working Capital.

First, change the second title line to reflect the changed data. Using the Graph Titles command, type **Components of Working Capital** as the new second title. Retain the A range but respecify the data range as **Current Assets**. Enter the cell range containing *Current Liabilities* as the C range. (Because you don't eliminate the A range, you don't use the Reset command.)

Reminder:
Some of the Graph commands do not apply to all graphs.

To enter the Total Current Assets figures for the first six months of the year, select Graph Ranges and type **D11..I11** as the A range and type **D17..I17** as the C range. Use the Graph Legends command (see fig. 8.17) and type **TOTAL CA** in the box labeled A. Then type **TOTAL CL** in the box labeled C. You can type as many as 19 characters for a legend. Select OK; when you use the Graph View command, the modified graph is displayed (see fig. 8.18).

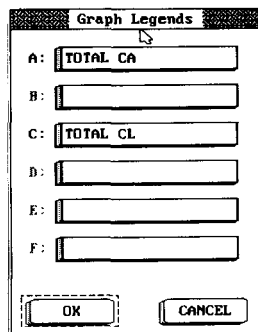
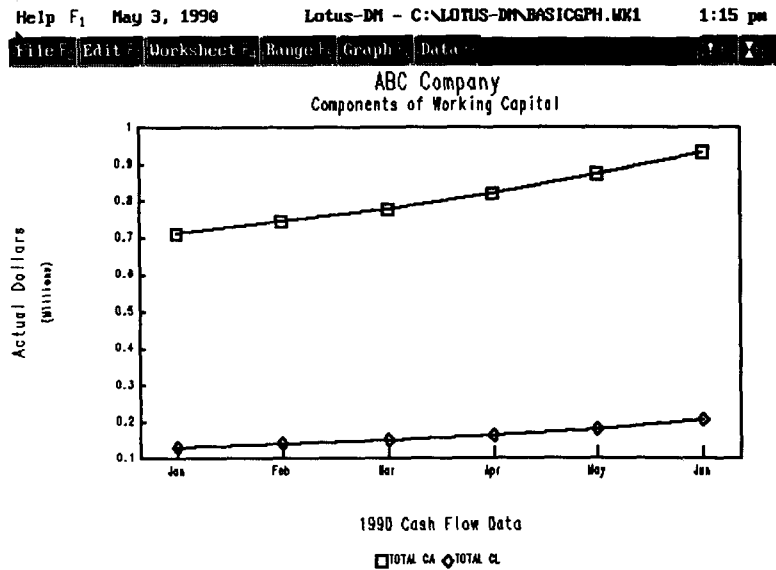


Fig. 8.17.
**The Graph
Legends dialog
box.**

If you want to edit a legend, use the same command sequence you used to create the legend. The existing text, cell reference, or range name appears in a box next to the range letter, ready for you to edit.

Legends are appropriate only for graphs with two or more data ranges. You cannot use the Graph Legends option for pie graphs because pie graphs depict only one range of data.

Fig. 8.18.
Adding legends to
the line graph.



Altering the Default Graph Display

All the previously described enhancements involve adding label or number descriptions to the basic minimal graph. Lotus-DM supplies the additional default display items shown in figures 8.16 and 8.18.

In both of these graphs, for example, the numbers, or *scale*, along the vertical y-axis was set automatically, taking into account the minimum and maximum values in the data ranges plotted. The amounts are displayed in General format. Lotus-DM also determines the parenthetical display of (Thousands) shown in figure 8.16 and (Millions) shown in figure 8.18. Within the graphs, Lotus-DM automatically centers the symbols on the data points plotted; lines are used to connect the symbols, leaving the background clear. All labels included in the x-axis range are displayed below the graphs.

You can change any of these additional default graph display items. To continue enhancing the appearance of a basic graph, change the defaults in the simple line graph. (Additional examples are included in this chapter's explanations of how to develop all graph types.)

Specifying Connecting Lines or Symbols

Some of the Graph commands do not apply to all graphs. You have learned, for example, that the x-axis and y-axis Titles, Legends, and Data-Labels options are not applicable to pie graphs. The Graph Options command, used to display

connecting lines and symbols on a line-type graph, is appropriate for only two types of graphs: line and XY (a form of line graph). Do not confuse this command with the Graph Scaling command.

The Graph Options command allows you to control the lines and symbols for the entire graph or for specific ranges (see fig. 8.19). Use the graph shown in figure 8.11 to learn the mechanics of switching the default setting (where both lines and symbols appear) to *Lines*. (You learn to specify *Neither* or *Symbols* in this chapter's "Line Graphs" section.)

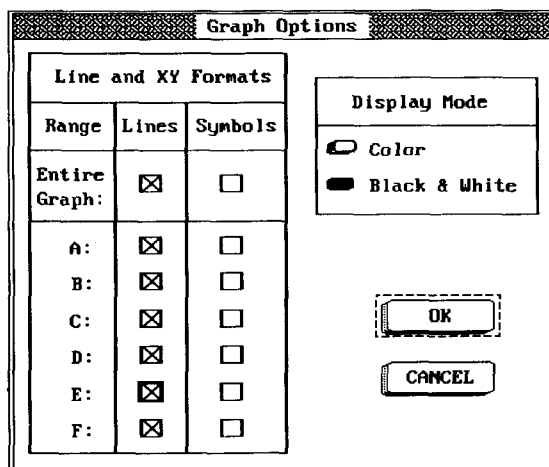


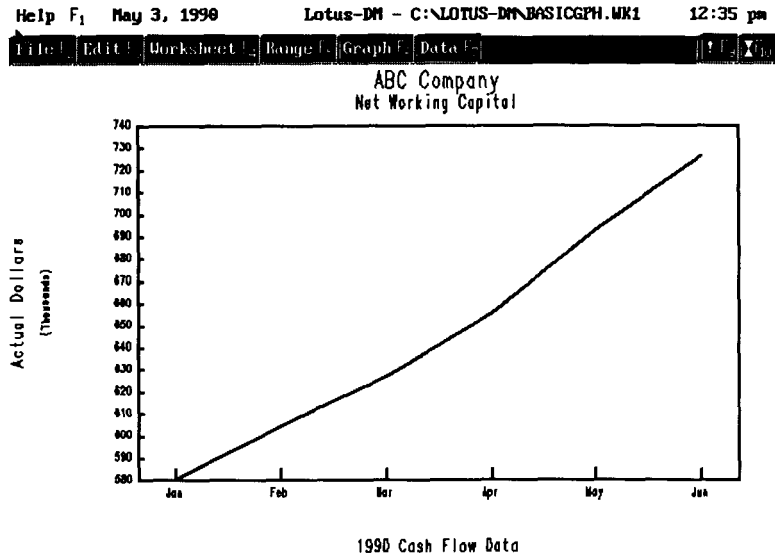
Fig. 8.19.
The Graph
Options dialog
box.

In the Graph Options dialog box, notice the X-filled boxes; each box is at the intersection of a column (labeled either *Lines* or *Symbols*) and a row (signifying the *Entire Graph* or a specific range). With the cursor or pointer at a box, press the space bar to reverse the solution status. An X in the box at the intersection of the *Lines* column and the row labeled A means that the A range is to be displayed using lines. If the box to its right, in the *Symbols* column, does not contain an X, the square symbols for the A-range data points will not appear. Select the A range to be lines only; then select OK and use the Graph View command. As shown in figure 8.20, the square symbols centered on A-range data points are no longer displayed.

Experiment with different format displays by repeating the command sequences, first selecting the data ranges you want to change and then selecting a specific format. To restore the default format setting for the sample line graph, use the Graph Options command and select both *Lines* and *Symbols*. This action will restore the graph to its appearance in figure 8.16.

Reminder:
Choose the *Black and White Display Mode* on the Graph Options command before saving your graph to make sure that the data ranges are shaded correctly.

Fig. 8.20.
*Suppressing
 the display of
 symbols in the
 line graph.*



The Graph Options command can be used for line and XY graphs only. The Display Mode (Color or Black and White) is also selected in this command. For more details, see the section “Viewing a Graph in Color” later in this chapter.

Setting a Background Grid

Ordinarily, you use the default (Clear) background for graphs. You may encounter situations when you want to impose a grid on a graph so that the data-point amounts are easier to read.

The Graph Grid command gives you four mutually exclusive choices (see fig. 8.21).

Horizontal creates a series of horizontal lines across the graph, spaced according to the tick marks on the y-axis. **Vertical** creates a series of vertical lines across the graph, spaced according to the tick marks on the x-axis. **Both** causes both horizontal and vertical lines to appear, and **Clear** clears all grid lines from the graph.

To add horizontal lines to the sample graph, use the Graph Grid command and select **Horizontal**; then OK. The resulting graph should look like the one shown in figure 8.22.

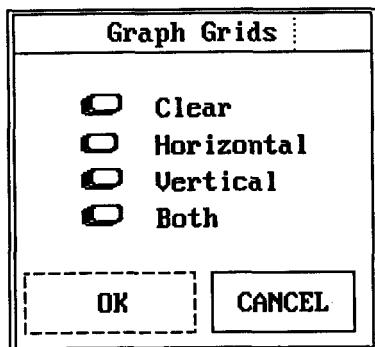


Fig. 8.21.
The Graph
Grids dialog
box.

Help F1 May 3, 1998 Lotus-DM - C:\LOTUS-DM\BASICGPH.WK1 12:38 pm
File F Edit E Worksheet W Range R Graph G Data D

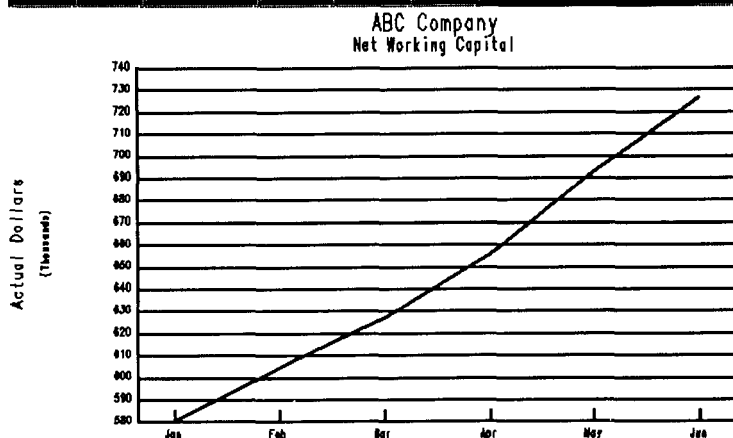


Fig. 8.22.
Adding a
horizontal grid
to the line
graph.

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Experiment with different grids, repeating the command sequence and specifying other options. Whenever you want to eliminate a grid display, select the **Clear** option in the Graph Grid command.



Note: You cannot use the Graph Grid command for a pie graph.

NOTE

Changing Axis Scale Settings

You can use the Graph Scaling command to alter three distinct default settings associated with the values displayed along a graph's x-axis and y-axis.

When a line, XY, bar, or stacked-bar graph is created, Lotus-DM automatically sets scale values displayed on the y-axis, taking into account the smallest and largest numbers in the data ranges plotted. (For XY graphs only, Lotus-DM also establishes x-axis scale values.)

Reminder:
You can change the upper and lower scale values for the y-axis, but you cannot change the degree of increment between values

You can change the upper and lower scale values. You cannot, however, determine the size of the increment between the maximum and minimum values (this increment is indicated by tick marks). For example, you cannot change the incremented scale on the y-axis of the graph shown in figure 8.22 from the default of 10,000 to an increment of 25,000 (575, 600, 625, 650, 675, 700, 725, and 750). As you learn in Chapter 9, increments for scale values on printed graphs are the same as, or more closely spaced than, those displayed on-screen.

Lotus-DM automatically sets the format of the scale values to General—the same default global numeric display you see when you access a blank worksheet. Notice that dollar signs, commas, and decimal points are not displayed along the y-axis shown in figure 8.22. You can change the format to any of the styles available under the Worksheet Format or Range Format commands. Do not confuse the capability of altering the default format of the scale values with bringing in previously formatted worksheet numbers as data labels.

The third automatic scale-related display is the indicators that appear along the y-axis when a line, XY, bar, or stacked-bar graph is created and appears on the x-axis when an XY graph is used. This indicator is (Thousands) on the y-axis of the graph shown in figure 8.22.

Although you cannot change the indicator, you can suppress its display. To understand why you might want to suppress display of the indicator, imagine a worksheet containing data with truncated trailing zeros (for example, a sales budget figure of 5,000,000 entered in the worksheet as 5,000). Graphing the truncated figures produces the y-axis indicator (Thousands) when the graph is really showing millions. You can suppress display of the indicator and type a more appropriate indicator as part of the y-axis title.

To control scaling, use the Graph Scaling command (see fig. 8.23).

The `Automatic` and `Manual` options work as a set. To specify maximum (upper) or minimum (lower) axis values, select `Manual`; select `Automatic` to restore control to Lotus-DM. When you select `Manual`, the box labeled `Manual Limits` is no longer shadowed. Enter values for both upper and lower limits.

If you elect to establish manual limits, remember that you must specify both upper and lower settings because selecting **Manual** resets both upper and lower values to zero. Remember also that the upper limit you specify must be larger than the lower limit. Do not use negative figures for scale values in stacked-bar graphs.

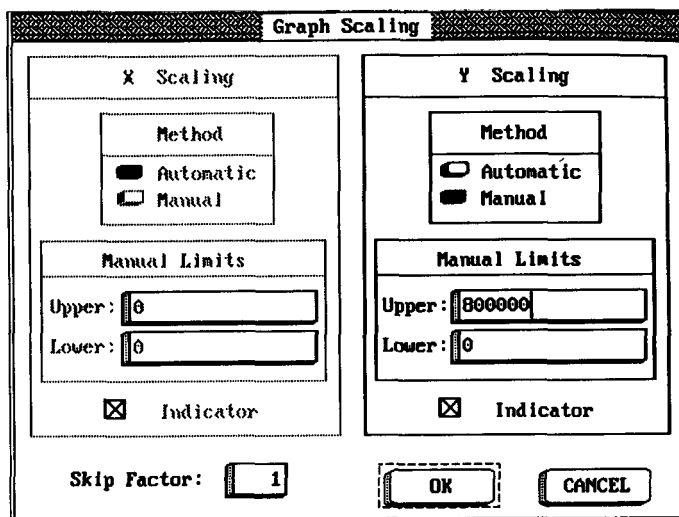


Fig. 8.23.
The Graph
Scaling dialog
box.

Using the sample graph shown in figure 8.24, practice changing y-axis values by setting a lower value of zero and an upper value of \$800,000. In the Graph Scaling command, select **Manual** and enter **800000** (without dollar signs or commas) as the upper limit. Select **OK** to exit the dialog box; use the Graph View command to see the graph; it should resemble the one shown in figure 8.24.

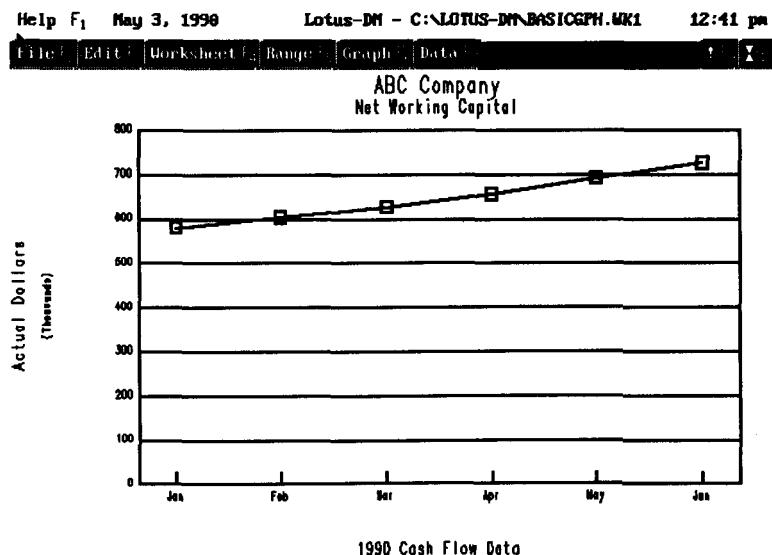


Fig. 8.24.
Changed y-axis
upper and lower
limits.

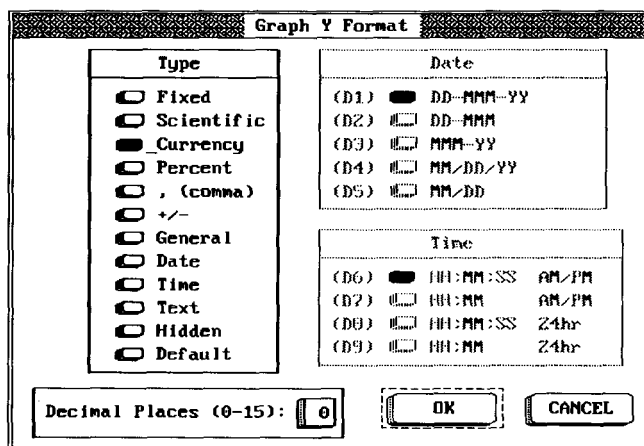
Compare figures 8.22 and 8.24 to see that setting the origin to zero (as is done for most graphs) gives you a different perspective on the magnitude of the increase in working capital. Notice also that Lotus-DM changed the increment between tick marks from \$10,000 in figure 8.22, to \$100,000 in figure 8.24.

Suppose that you want to alter the y-axis title in the graph shown in figure 8.24 to indicate that the y-axis values are in thousands. Also suppose that you want to suppress the automatic scale indicator and change the default General format to Currency format with zero decimal places. At least three different graph commands need to be used.

1. Select the Graph Titles command and alter the existing Y-axis entry to read `Actual Dollars (in thousands)`.
2. Use the Graph Y Format command (see fig. 8.25) to change the display format to Currency and specify 0 decimal places.
3. Use the Graph Scaling command to suppress display of the automatic scale indicator for the Y axis; make sure that the box next to `Indicator for Y Scaling` is empty.

Compare the new graph (see fig. 8.26) with the previous graph in figure 8.24.

Fig. 8.25.
The Graph Y
Format
dialog box.



Using the Graph Scaling command, restore the scale indicator and reset the manual limits to different values. You can restore the automatic scaling by selecting `Automatic`—the manual upper and lower limits become shadowed so that you can't use them when `Automatic` has been chosen.

Change the format in the Graph X Format command; return to the default setting by choosing `General` as the format.

Use the X-Scaling settings in the Graph Scaling command only when the graph type is XY. The `Indicator` and `Manual` scale capabilities are not applicable to pie graphs

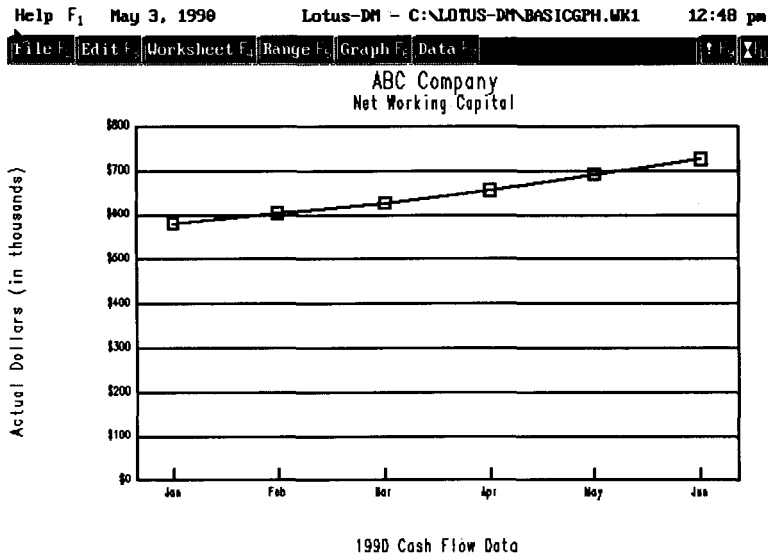


Fig. 8.26.
*Changed scale
format and
suppressed
indicator.*

Spacing Display of X-Axis Labels

Recall that the Graph Scaling command also lets you control the Skip factor, which determines the spacing of displayed labels—whether all labels or only every n th label (entered by selecting X from the Graph Range command)—to appear below the x-axis. The default setting of 1 causes every label to display. If you set the Skip factor to 3, for example, every third label displays.

If the labels are so long that they crowd together or overlap, use the Skip option to improve the display. Technically, you can set a Skip factor of 1 to 8,192, but you seldom need to set the factor higher than 4.

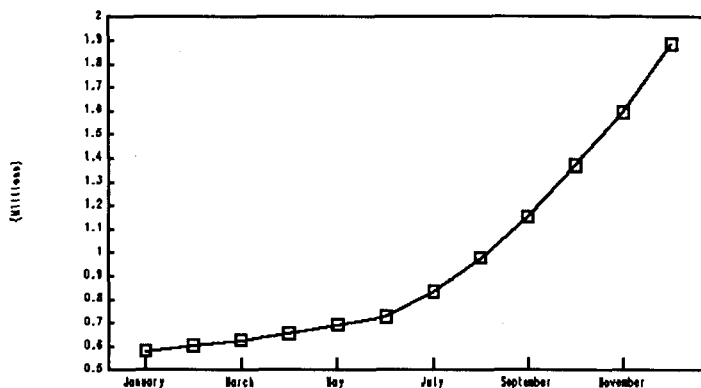
Suppose that the monthly headings below the x-axis were spelled out and encompassed the entire year. The labels would be staggered but would still be crowded. To set a Skip factor other than the default of 1, use the Graph Scaling command and specify a Skip factor of 2. View the graph with the Graph View command. The changed spacing is shown in figure 8.27.

Only the January, March, May, July, September, and November x-axis labels are displayed in figure 8.27. To restore the default setting and display every label in the range, repeat the command sequence, specifying a Skip factor of 1.

The X option of the Graph Ranges command is used to enter labels below the x-axis—only for line, bar, and stacked-bar graphs; the Skip factor option does not apply to XY or pie graphs.

Reminder:
Use the Skip factor in the Graph Scaling command when you cannot correctly display labels for the x-axis.

Fig. 8.27.
Skipped labels
on the x-axis.



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Viewing a Graph in Color

Reminder:

If you print on a black-and-white printer, restore the Black and White setting before you print.

The Graph Options command contains a Display Mode option to choose **Color** or **Black and White**. Setting colors to produce graphs on a color printer or plotter requires command input from the PrintGraph menu (see Chapter 9).

You can select the **Black and White** option even if you have a color monitor installed. The connecting lines in XY or line graphs appear white, amber, or green against a dark background; bar or stacked-bar data ranges display a unique pattern of crosshatches. Refer to table 8.1 for a summary of the crosshatch patterns assigned to each data range. (Pie graphs have unique capabilities for shading portions of the single data range graphed and are explained in this chapter's "Pie Graphs" section.)

To view graphs on-screen in color, you must use a color monitor. The connecting lines and symbols in XY or line graphs appear in the color assigned to the data range(s) in use; bar or stacked-bar segments reflect the color assigned to the data ranges in use. Refer to table 8.1 for a summary of the colors assigned to each data range. (Pie graphs have unique capabilities for coloring the portions of the single data range graphed and are explained in this chapter's "Pie Graphs" section.)

To become familiar with Lotus-DM's shading capabilities, convert the line graph shown in figure 8.28 to a bar graph. Before you convert the line graph, save the settings of the line graph by using the Graph Name command (see fig. 8.29), selecting **Create** and typing a name, say **LINE**, to identify the graph. To produce the graph shown in figure 8.30, use the Graph Type command and select **Bar**.

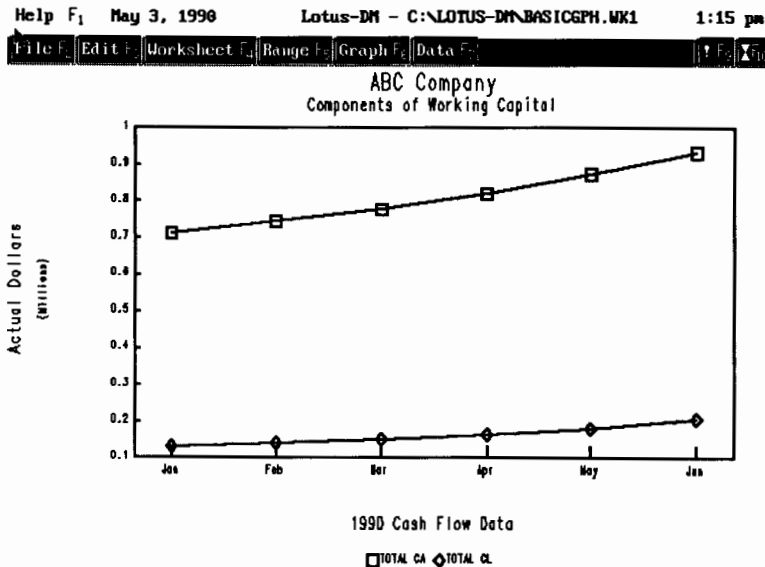


Fig. 8.28
The sample
line graph.

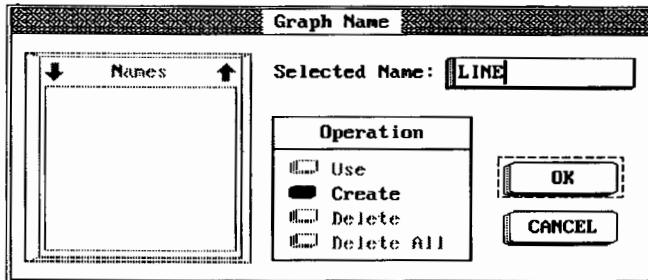


Fig. 8.29.
The Graph Name
dialog box.

Because the left bar in each set represents Total Current Assets in the A data range, the bar is shaded for the A range. The right bar in each set represents Total Current Liabilities, defined as the C data range, and is shaded accordingly. The legends at the bottom of the graph automatically reflect the appropriate black-and-white shading assignments.

If you have a color monitor, you can view this bar graph in color by selecting **Color** in the Graph Options command and then using the Graph View command. The graph shown in figure 8.31 shows solid shading in the bars, indicating that the **Color** option is in use.

In the graphs shown in figures 8.30 and 8.31, the left bar in each set represents Total Current Assets in the A data range. On a color monitor, the entire bar is filled with a color (the color depends on the type of graphics adaptor you have). The right bar in each set represents Total Current Liabilities in the C data range, and is filled in with a different color. The legends at the bottom of the graph reflect the color assignments.

Fig. 8.30.
Comparative bar
graph in color.

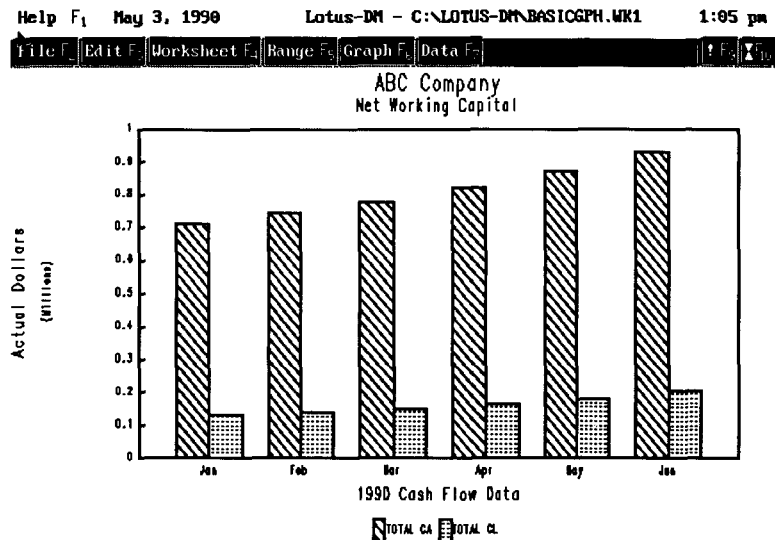
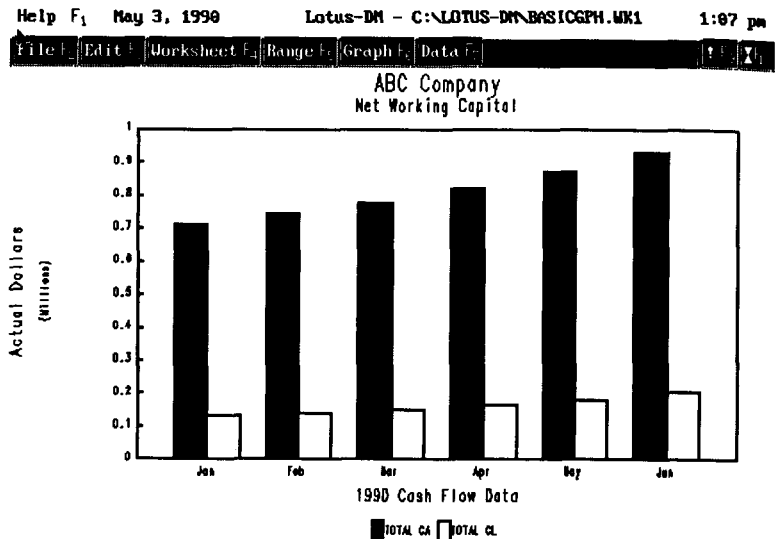


Fig. 8.31.
Comparative
bar graph in
black and
white.



A word of caution: If you can view (but not print) your graphs in color, restore the **Black and White** setting in the Graph Options command before you store your graphs. Otherwise, the graph is printed in all black.

The crosshatch shadings and colors assigned to data ranges A, B, C, D, E, and F do not apply to pie graphs. Pie graphs, unlike other types of graphs, have only one possible data range—A. Coding specified for the B data range determines the color or crosshatch shading assigned to each section of the pie (see “Pie Graphs” later in this chapter).

Preserving the Graph on Disk

You have learned how to create a basic graph and how to use commands to enhance display of that graph. All the Graph commands (except Reset, Save, and Name) have been discussed in detail. This section describes the Save and Name options, which affect preserving the graph for future printing or recalling to the screen. (The Reset command is discussed just before the explanation of how to develop all graph types.)

Although using Lotus-DM to construct a graph from existing data in a worksheet is easy, having to rebuild the graph whenever you want to print or display it on-screen would be unnecessarily tedious.

To create a disk file (with the file extension PIC) that can be used only to print the graph, use the Graph Save command (see fig. 8.32). To save with the underlying worksheet the graph specifications that reflect the changes in the worksheet, use the Graph Name command, select **Create**, and provide the name of the graph; then use File Save or File Save As to save the worksheet.

Reminder:

Use Graph Save to save a graph file for printing; use Graph Name to view a graph later. Always use File Save or File Save As to store the print-and-display settings for future use.

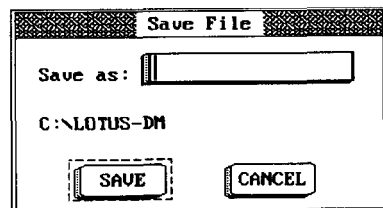


Fig. 8.32.
The File Save
dialog box.

Saving a PIC File for Printing

Suppose that you have constructed a graph you want to store for subsequent printing with the PrintGraph program or other graphics program. (PrintGraph is discussed in Chapter 9.) After verifying that the graph type chosen is appropriate for your presentation needs, that the graph data ranges have been specified accurately, and that all desired enhancements have been added, choose the Graph Save command to create a PIC file on disk. Type a new name as many as eight characters long; Lotus-DM automatically adds the PIC extension.

If a PIC file by the same name already exists in the current directory, you see the File Already Exists dialog box similar to the one that appears when you try to save a worksheet file under an existing name. To overwrite the contents of the existing PIC file, select **Replace**. To abort storage of the current graph as a PIC file with that name, select **Cancel**. To return to the Graph Save command, choose **No**.

If you have set up subdirectories for disk storage, you can store the current graph as a PIC file to other than the current subdirectory without first issuing a File Directory command to change directories. Type the name of the new subdirectory in which you want to store this particular graph, followed by the file name.

Remember the following points:

- ☐ The Graph Save command stores only an *image* of the current graph, locking in all data and enhancements, for the purpose of printing the graph with the PrintGraph program. You also can import the PIC file to another program such as Freelance Plus. You cannot access the print file to make changes such as adding a label or editing an underlying worksheet figure.
- ☐ You cannot recall the graph to screen unless you have named the graph and saved the worksheet, or unless the graph is the last active graph on the current worksheet. Naming graphs is described in the next section.

Creating Graph Specifications for Reuse

If you want to view on-screen a graph created in an earlier graphing session, you must give the graph a name when the graph is originally constructed (and you must save the worksheet, unless the same worksheet is still active). To name a graph, use the Graph Name command (see fig. 8.33).

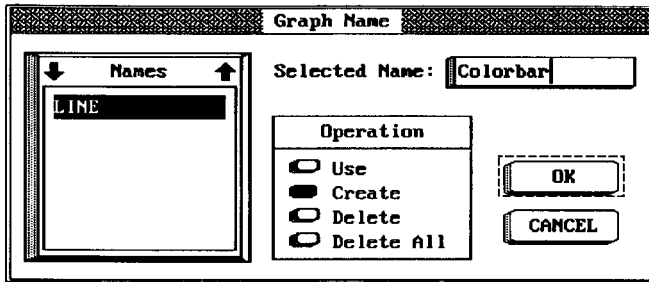


Fig. 8.33.
The Graph
Name dialog
box.

Only one graph at a time can be the current graph. If you want to save a graph you have just completed for subsequent recall to the screen, and you also want to build a new graph, you must first use the Graph Name command with the **Create** option. With this command, Lotus-DM remember the specifications used to define the current graph. If you don't name a graph and then either reset the graph or change the specifications, you cannot restore the original graph without rebuilding it.

The name you create for a graph can be up to 15 characters long. You can use the same name for the PIC file when you save the graph, and even for the worksheet file when you use File Save or File Save As. Remember, however, that PIC file names and WK1 file names are limited to eight characters each.

You can use data from a single worksheet to create and name several different graphs. Be sure to save the worksheet before you retrieve a different worksheet file or before you exit Lotus-DM. Graph specifications are stored with the worksheet file when you issue the File Save or File Save As command.

To recall any named graphs from the active worksheet, use the Graph Name command and select **Use** to see a list of all the graph names stored in the current worksheet. When the names are displayed, select the graph you want to redraw and choose OK.

To delete a single named graph, use the **Delete** option in the Graph Name command. From the list of all the graph names stored in the current worksheet, select the one you want deleted and choose OK.

If you want to delete all the graph names, use the **Delete All** option. Using this option to delete the names of all graphs also deletes the parameters for all the graphs.

Reminder:
Use Graph
Name Use when
you want to
display graphs
stored in the
current
worksheet.

Keep in mind that the Graph Name command is like Range Name: the name is available in a future worksheet only if you follow the Name command with File Save or File Save As. The Graph Name command stores your graph settings in the current worksheet; File Save or File Save As then stores the settings with the worksheet. Forgetting to use either Graph Name or one of the File Save commands may result in extra work later.

Resetting the Current Graph

You may have noticed that, throughout this chapter, instructions for editing or removing options have been given at the end of each new topic. These instructions are important because Lotus-DM continues to use an enhancement in the next version of the same graph—or in a new graph—unless you take specific actions to remove that enhancement. For example, you can build a series of six different bar graphs by specifying the graph Type for only the first one. Recall that you did not have to respecify the titles entered for the graph shown in figure 8.11 when you constructed the graphs shown in figures 8.13, 8.15, and 8.16. Although you changed the second title to better explain the new data ranges shown in figure 8.18, that title was the only one of four that had to be changed.

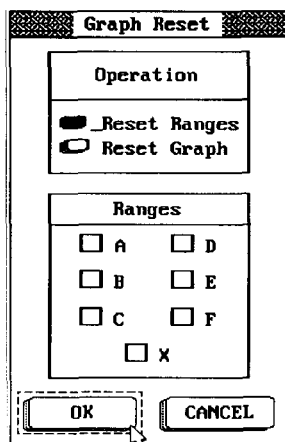
Reminder:

Use the Graph Reset command when the next graph you want to construct is substantially different from the current one.

If you want to enhance only a few items in graph contents, you can respecify or eliminate these items from the Graph commands. If the next graph you construct is substantially different from the current one, however, you may want to use the Graph Reset command (see fig. 8.34).

This command allows you to reset some or all ranges. Select Reset Graphs only if you do not want to use any of the existing specifications in your new graph. This option ensures that no unwanted enhancements from a previous graph carry over into the current one.

Fig. 8.34.
The Graph Reset
dialog box.



As an alternative to a total graph reset, you can remove an individual data range or a group of data ranges. Choose **Reset Ranges** and then put an **X** in boxes next to ranges you want to reset. All data labels assigned to the reset data range or ranges are eliminated also. By resetting **X**, for example, you remove labels displayed below the x-axis, pie-slice labels, or x-axis information for an XY graph.

To illustrate the total graph-reset operation as applied to the bar graph shown in figure 8.31, select the **Reset Graphs** option in the Graph Reset command. If you then select the Graph View command, you hear a beep and see a blank screen. By removing the graph's data ranges, you have eliminated the essential ingredients for graph production.

The following sections discuss how to construct each type of graph.

Developing Alternative Graph Types

You have learned that you can use Lotus-DM to build five types of graphs: line, bar, XY, stacked-bar, and pie.

Because more than one type of graph can accomplish the desired goals, choosing the best graph form may be a matter of personal preference. For example, choosing a line, bar, or pie graph is appropriate if you plan to graph only a single data range. In other situations, only one graph type can do the job. As you work through the remainder of this chapter, take a moment to learn or review the primary uses of each graph type.

Selecting an Appropriate Graph Type

You may want to review the information given earlier in this chapter to refresh your memory about which data ranges are appropriate for each graph type. More information about the use of each graph type is presented in the following chart.

<i>Graph Type</i>	<i>Purpose</i>
Line	To show the trend of numeric data across time. Used, for example, to display monthly working-capital amounts during 1990.
Bar	To show the trend of numeric data across time, often comparing two or more data items. Used, for example, to display total current assets compared to total current liabilities for each month during 1990.

<i>Graph Type</i>	<i>Purpose</i>
XY	To compare one numeric data range to another numeric data series across time to determine whether one set of values appears to depend on the other. Used, for example, to plot monthly Sales and Advertising Expenses to assess whether a direct relationship exists between the amount of sales and the dollars spent for advertising.
Stacked-Bar	To graph two or more data ranges totaling 100% of a specific numeric category. Used, for example, to graph three monthly data ranges—Cash, Accounts Receivable, and Inventory (displayed one above the other)—to depict the proportion each comprises of total current assets throughout the year. (Do not use this type of graph if your data contains negative numbers.)
Pie	To graph only one data range, the components of which total 100% of a specific numeric category. Used, for example, to graph the January Cash, Accounts Receivable, and Inventory amounts to depict the proportion each comprises of the January current assets. (Do not use this type of graph if your data contains negative numbers.)

Building All Graph Types

Although line graphs were used to show Lotus-DM's general graph-enhancement options, most of the options can be used for all graph types. (This chapter has pointed out the options that don't apply to specific types of graphs.)

Next, you focus on each graph type and learn the enhancements that are particularly useful when attached to a specific graph type. To do so, use data in the SALES (by Profit Center) report shown in figures 8.35 and 8.36. The line, bar, and stacked-bar types are all appropriate for graphing the monthly sales-by-profit-center information.

SALES	Jan	Feb	Mar	Apr	May	Jun
Profit Center 1	\$31,336	\$37,954	\$43,879	\$51,471	\$56,953	\$53,145
Profit Center 2	22,572	24,888	25,167	32,588	40,140	37,970
Profit Center 3	131,685	129,044	131,723	139,221	141,879	149,803
Profit Center 4	95,473	98,008	96,986	95,318	103,538	108,146
Total Sales	\$281,066	\$289,894	\$297,755	\$318,598	\$342,510	\$349,064

Fig. 8.35.
Sample sales
data by profit
center (January
to June).

	A	B	I	J	K	L	M	N
1 SALES	Jul	Aug	Sep	Oct	Nov	Dec	Totals	
2								
3								
4 Profit Center 1	\$54,140	\$53,614	\$52,015	\$48,902	\$44,091	\$42,536	\$570,036	
5 Profit Center 2	34,587	33,463	28,939	24,153	27,060	26,701	\$358,228	
6 Profit Center 3	147,108	147,032	153,440	149,990	145,198	150,510	\$1,716,633	
7 Profit Center 4	108,642	106,065	110,401	112,018	111,956	107,522	\$1,254,073	
8								
9 Total Sales	\$344,477	\$340,174	\$344,795	\$335,063	\$328,305	\$327,269	\$3,898,970	
10								

Fig. 8.36.
Sample sales
data by profit
center (July to
December).

Line Graphs

In this section, you use the worksheet data in figures 8.35 and 8.36 to create a line graph. Because you are constructing a new graph, reset the previous graph settings to remove any unwanted options carried over from the most recent graph operations. Enter the four data ranges as the ranges C4..N4, C5..N5, C6..N6, and C7..N7. Although you can choose any four of the six Range options (A, B, C, D, E, or F) in the Graph Range command, enter the data ranges in order (C4..N4 Profit Center 1 values as the A range, C5..N5 Profit Center 2 values as the B range, and so on). Entering the data ranges in order makes the corresponding legend easier to interpret. To produce a graph similar to the one shown in figure 8.37, use the following command sequences:

In the Graph Reset command:

choose `Reset Ranges` and check the box for the A range and the B range

In the Graph Type command:

choose `Line`

In the Graph Range command:

enter **C4..N4** as the A range

enter **C5..N5** as the B range

enter **C6..N6** as the C range

enter **C7..N7** as the D range

In the Graph Titles command:

enter **1990 Sales** as the first title

enter **United Diversities, Inc.** as the second title

enter **SALES BY PROFIT CENTER** as the X-axis title

In the Graph Legends command:

enter **\A4** for the A range

enter **\A5** for the B range

enter **\A6** for the C range

enter **\A7** for the D range

Use the Graph View command.

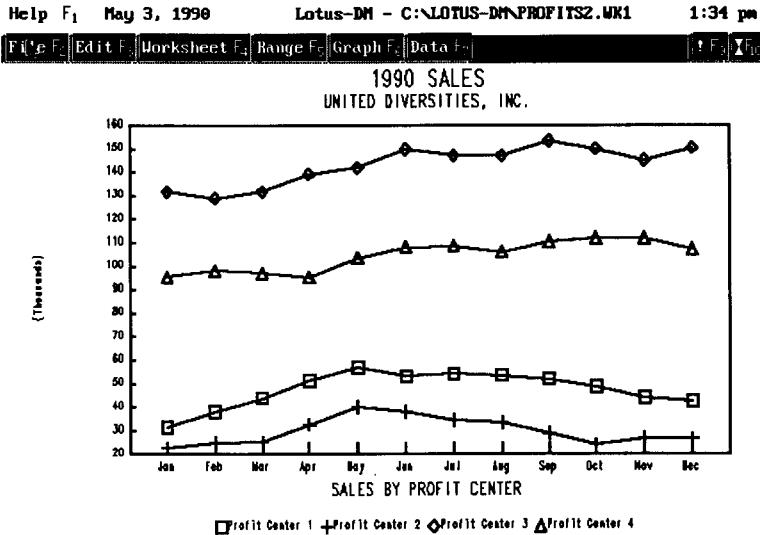


Fig. 8.37.
**An enhanced
multiple-line
graph.**

Notice that the upper limit of the y-axis is set automatically at \$160,000, slightly higher than the highest monthly sales figure (\$153,440—the September sales for Profit Center 3).

Recall that Lotus-DM does not automatically set to zero the lower limit of a line graph's y-axis. To make the graph easier to read, use the Graph Scaling command, select Manual for Y scaling and specify a Lower limit of 0 and an Upper limit of 160000.

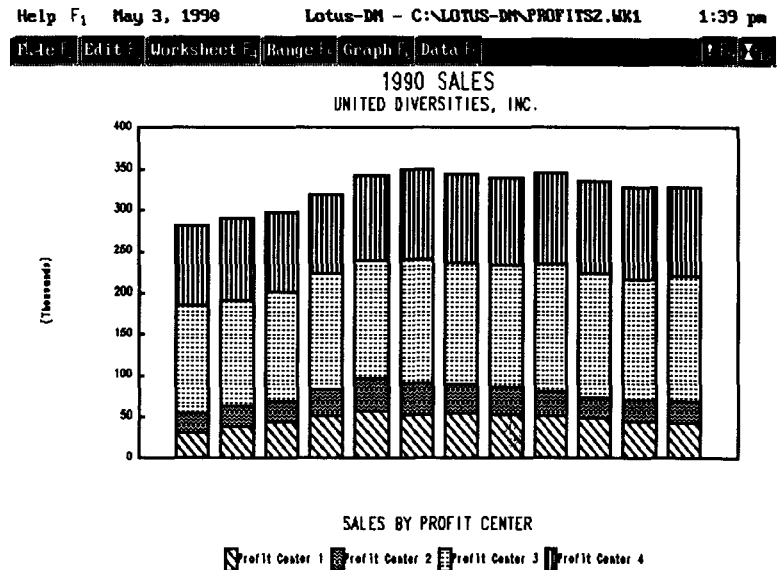
Notice that each of the four legends below the x-axis describes the symbol used for each line in the graph. Always use legends for multiple-line graphs. Without legends, you don't know which line represents which data series (unless you memorize the symbols in table 8.1). If you prefer one symbol to another, pick the data range associated with that symbol when you select a data range or ranges from the Graph Range command. (You see how to select data ranges for the set of graphs discussed in the following section.)

Reminder:
Always use legends for multiple-line graphs.

Stacked-Bar Graphs

You may want to experiment with different graph types when you plot multiple time-series data. If the data-range values combine to produce a meaningful figure (for example, the combined January sales of each profit center equal the total January sales), try using *Stacked-Bar* as a graph type. The data ranges in a stacked-bar graph appear as bars; these bars are plotted in the order A, B, C, D, E, and F, with the A range closest to the x-axis. After entering the command sequences to create figure 8.37, for example, you can create the stacked-bar graph shown in figure 8.38 by selecting *Stacked-Bar* in the Graph Type command.

Fig. 8.38.
The initial
stacked-bar
graph in
Lotus-DM.



Reminder:
In a stacked-bar graph, the lower limit of the y-axis should always be zero.

All the options set to produce the line graph shown in figure 8.37 are carried over to the new stacked-bar graph. The legends (which showed symbol assignments for the line graph) automatically change to display the crosshatches of a black-and-white bar graph. Lotus-DM also automatically adjusts the upper and lower limits of the y-axis. The new \$400,000 upper limit in the current graph exceeds the highest total sales month (\$349,064 in June). In a stacked-bar graph, the lower limit will always be zero if you use *Automatic* scaling. If you use *Manual* scaling, however, you can raise the lower limit above zero even though this violates common usage of stacked-bar graphs.

If you want to view a stacked-bar graph in color, be sure to assign different colors to consecutive bars.

Bar and Comparative Bar Graphs

A bar graph also is appropriate for displaying the worksheet's sales-by-profit-center information (refer to figs 8.35 and 8.36). By plotting more than one data range, you can produce a comparative bar graph in which the bars are displayed in order of data ranges entered, with the A range in the leftmost position.

Assuming that the stacked-bar graph shown in figure 8.38 is the current graph, add monthly headings below the graph. Experiment with the bar graph by entering the following command sequences:

In the Graph Type command:

choose **Bar**

In the Graph Range command:

enter **C2..N2** as the X range

Select Graph View (or press Ctrl-F10) to see the graph on the screen. Your graph should be similar to the one shown in figure 8.39.

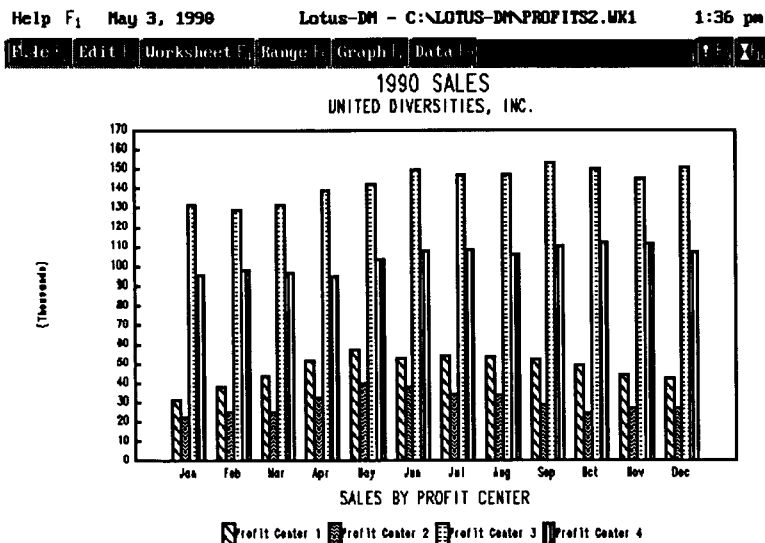


Fig. 8.39.
Four data ranges in a comparative bar graph.

In this graph, each set of four bars clustered together on the x-axis represents sales by profit center. In every set of bars, the left bar represents data range A; the next, data range B; the next, C; and the right bar represents data range D. Monthly headings are centered under each set of bars, and Lotus-DM has automatically revised (to \$170,000) the upper scale of the y-axis.

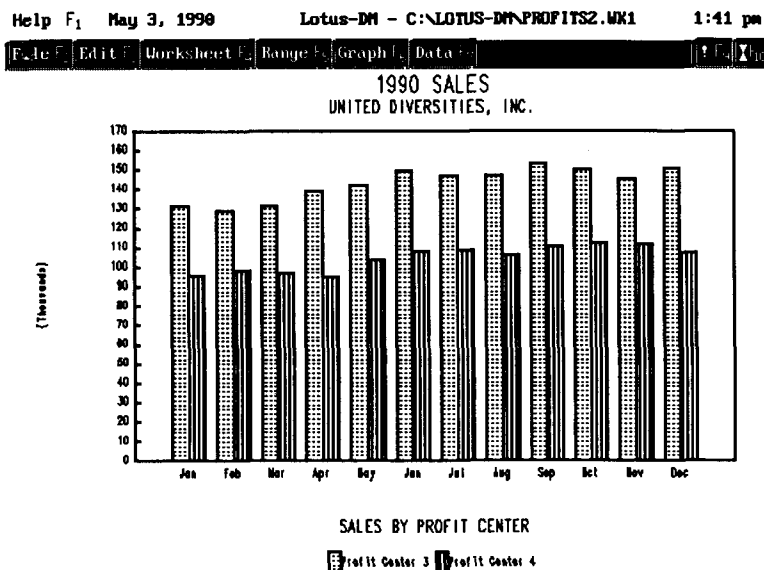
Because the graph display seems crowded when you work with four data ranges, each of which contains 12 numbers, you may prefer to construct additional graphs, each of which compares fewer data series or contains only one data range. To compare only the two top-ranked profit centers according to sales (data ranges C and D), for example, use the following command sequences:

In the Graph Reset command:

choose **Reset Ranges** and check the box for the A range and the B range

Select Graph View (or press Ctrl-F10) to see the graph on the screen. Compare your results to figure 8.40.

Fig. 8.40.
Two data
ranges in a
comparative
bar graph.



Notice that the legends for the deleted data ranges (A and B) are not displayed. Although you may think that the legends have been deleted with the data ranges, the legends are still assigned to the A and B ranges. If you use the A or B range for your next graph (without resetting the total graph), the associated legend reappears. This problem is shown by the next graph.

Ordinarily, you want to graph comparative information (that is, you want to use more than one data series) when the numbers to be plotted are classified by region, division, product line, and the like. By resetting one additional data range in the current example, however, you can produce a simple bar graph of only one profit center.

Suppose that you want to use data in the range O4..O7 to graph each profit center's contribution to total annual sales. To do so, retain the existing bar graph type, x-axis labels, titles, and legends. Before you reestablish data range A as O4..O7, however, reset all the data ranges. Assuming that the graph shown in figure 8.40 is current, use the following command sequences to produce a graph similar to the one shown in figure 8.41:

In the Graph Reset command:

choose **Reset Ranges** and check the box for the C range and the D range

In the Graph Range command:

enter **O4..O7** as the A range

Select Graph View (or press Ctrl-F10) to see the graph on the screen.

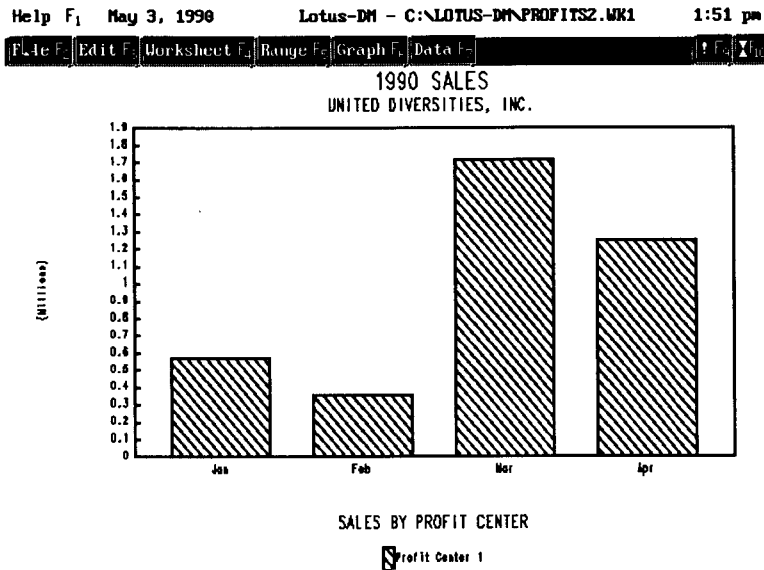


Fig. 8.41.
A bar graph
with an
inappropriate
legend.

Because you have not changed the four legends used in figure 8.39, these legends are still established (as Profit Center 1, 2, 3, and 4) for data ranges A, B, C, and D, respectively. The legend (Profit Center 1) below the graph shown in figure 8.41 is inappropriate for two reasons: first, it no longer applies to the data being graphed; second, a legend is needed only when more than one data series is being graphed. Furthermore, you need to revise the x-axis labels on this graph.

To correct the appearance of the graph shown in figure 8.41 and add a Currency format to the scale numbers on the y-axis, use the following command sequences:

In the Graph Range command:

enter **A4..A7** as the X range

In the Graph Legends command:

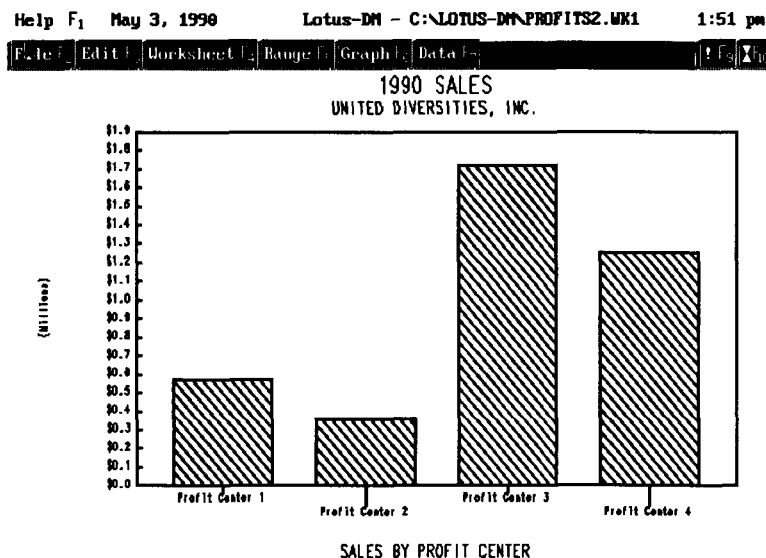
delete the entry for the A range

In the Graph Y Format command:

choose **Currency** with 1 decimal point

Use the Graph View command. The revised bar graph is shown in figure 8.42.

Fig. 8.42.
A corrected
bar graph.



Reminder: Use the Graph Data-Labels command to display specific amounts as data-label descriptions within a graph or as x-labels below the graph.

When you graph summary information, especially when the figures are large, you may want to display specific amounts as data-label descriptions within the graph, or as x-axis labels below the graph. The graph shown in figure 8.42, for example, may be easier to understand if each profit center's specific contribution to total annual sales is shown within the graph, above that center's bar. Recall that you can use the Graph Data-Labels command to enter numbers as well as labels. In this case, raise the upper scale of the y-axis to make room for the data labels and then use the range O4..O7 as a description. Access the main Graph menu and apply the following command sequences to the previous settings to produce an improved graph (see fig. 8.43):

In the Graph Scaling command:

choose **Manual** under Y Scaling

enter **2000000** as the Upper limit

In the Graph Data Labels command:

enter **O4..O7** as the A range

choose **Above** as the Alignment for the A range

Use the Graph View command.

Help F1 May 3, 1990 Lotus-DW - C:\LOTUS-DW\PROFITS2.WK1 1:53 pm

File F Edit F Worksheet F3 Range F6 Graph F7 Data F8

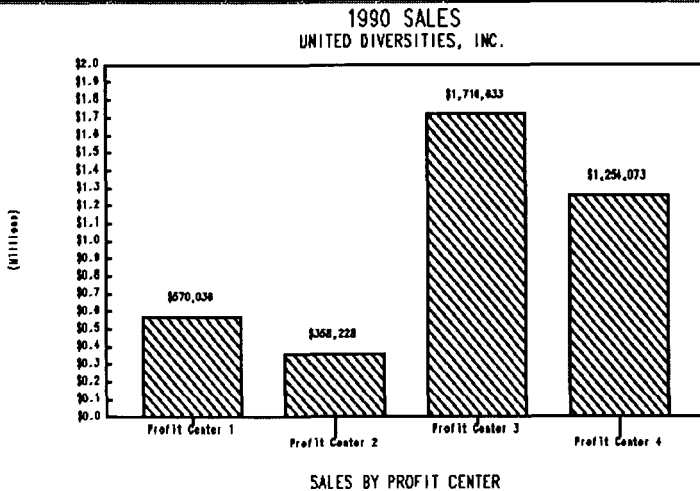


Fig. 8.43.
A bar graph with
numeric data
labels.

Pie Graphs

Use a pie graph only for plotting a single data series in which all numbers are positive. The X and B range options in the Graph Range command, the Range Titles command, and the Display Mode (Color or Black and White) option in the Graph Options command are the only command enhancements that apply to a pie graph.

You construct a pie graph by continuing to plot each profit center's contribution to total sales. If you select **Pie** as the Graph Type, carrying over the improved bar graph settings, the graph shown in figure 8.44 displays.

Reminder:
Graph Ranges,
Graph Titles,
and Graph
Options (just the
display mode)
are the only
commands that
affect a pie
graph.

Help F1 May 3, 1990 Lotus-DW - C:\LOTUS-DW\PROFITS2.WK1 1:54 pm

File F Edit F Worksheet F3 Range F6 Graph F7 Data F8

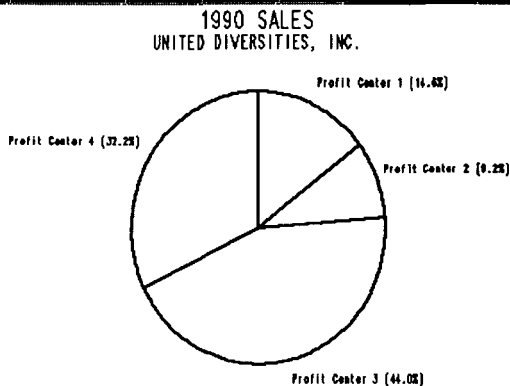
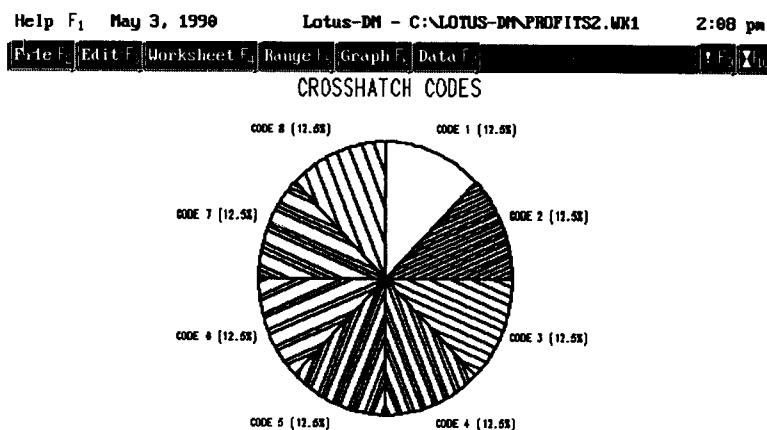


Fig. 8.44.
A basic pie
graph.

Lotus-DM automatically calculates and displays in parentheses the percentage of the whole represented by each pie wedge. (You cannot suppress these percentages.) Notice that the profit center labels, entered by using the main Graph menu's X option, carried over from the previous bar graph.

You can enhance the basic pie graph by adding shading or color. Lotus-DM provides eight different shading patterns for monochrome display, eight different colors for EGA color display, and four colors for CGA color display. Figure 8.45 shows the pie graph shading patterns associated with each of the eight possible code numbers.

Fig. 8.45.
The crosshatch shading codes for pie graphs.



Use the B data range to specify the shadings or colors for each pie wedge. The B range can be any range that is the same size as the A data range in the worksheet you are plotting as a pie graph. To clarify this process, enter codes 1, 2, 4, and 7 in cells P4, P5, P6, and P7 of the Sales by Profit Center worksheet (see fig. 8.46).

Fig. 8.46.
A worksheet containing initial shading codes.

Help F1		Mar 1, 1990		Lotus-DM - C:\LOTUS-DM\PROFITS.WK1		4:38 pm	
File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F8	F9
01	[W11] =						
	U	P	Q	R	S	T	U
1	TOTALS						
2	=====						
3							
4	\$570,036	1					
5	358,228	2					
6	1,716,633	4					
7	1,254,073	7					
8							
9	\$3,898,970						
10	=====						
11							

Assuming that all previous pie-graph settings are still in effect, select the B data range from the Graph Ranges command and specify P4..P7 as the B data range. Select Graph View to see the enhanced pie graph (see fig 8.47).

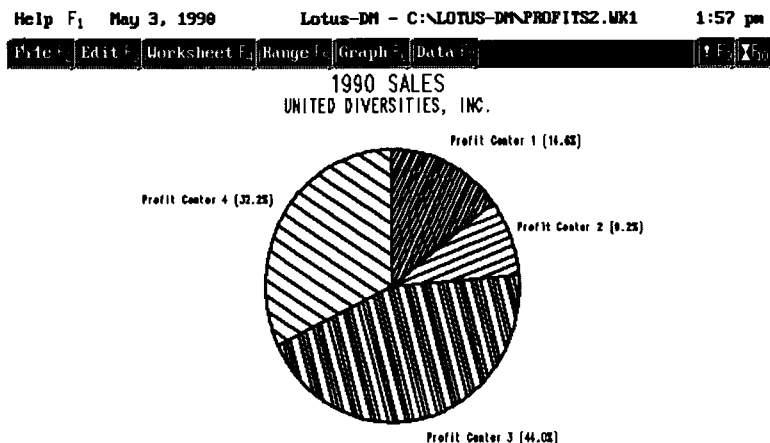


Fig. 8.47.
A shaded pie graph.

You can “explode” any or all of the wedges by adding 100 to the appropriate numeric shading code in the B Range. To illustrate this feature, emphasize Profit Center 3’s top performance by adding 100 to the code number in worksheet cell P6 (see fig. 8.48). When you view the graph, the Profit Center 3 portion of the pie is offset (exploded) from the rest of the graph (see fig. 8.49)

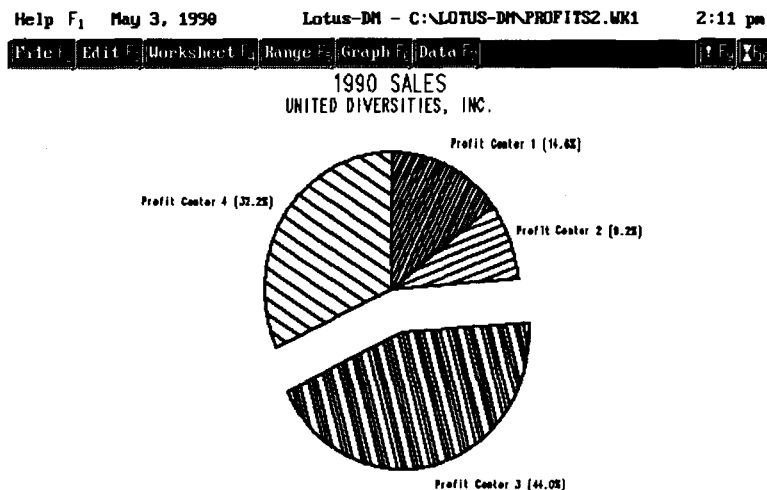
Cue:
Create an exploded pie wedge by adding 100 to the wedge’s shading code in the B Range.

	O	P	Q	R	S	T	U
1	=====						
2	Totals						
3	=====						
4	\$570,036	1					
5	\$358,228	2					
6	\$1,716,633	104					
7	\$1,254,073	7					
8							
9	\$3,898,970						
10	=====						
11							
12							

Fig. 8.48.
A worksheet containing the code to explode a pie wedge.

Marking each segment of the pie with an appropriate label is essential. In this case, you must label each profit center.

Fig. 8.49.
A pie graph
with an
exploded
wedge.



The graph can be even more useful if it displays not only the percentage but also the actual dollar amount of each profit center's sales. If you could join the contents of cell A4 (Profit Center 1) with the contents of cell O4 (displayed as \$570,036), for example, the graph would display both the percentage of sales and the exact dollar amount of sales for each center. You can use Lotus-DM's string functions to join (concatenate) the contents of two such cells. Unfortunately, instead of producing the Currency format (*Profit Center 1 \$570,036*), joining cells A4 and O4 produces the label *Profit Center 1 570036*.

You can change the appearance of each extended label by taking a little extra time. Simply retype the numbers as labels (in a blank section of the worksheet) and then string the newly created cells to the profit-center labels. You can type the contents of cells O4..O7 as labels in the range Q4..Q7, for example, or use Range Value to copy the range O4..O7 to Q4..Q7. Edit each cell by inserting an apostrophe at the beginning of the cell. Your screen should look like the one shown in figure 8.50. Then type the formula `+A4&"' : "&Q4` in cell R4 and copy it to the range R5..R7.

In the Graph Ranges command, type the range **R4..R7** in the box labeled **x** and then view the graph. Figure 8.51 shows the worksheet after the new cell contents have been entered. The labels in the resulting pie graph are displayed in Currency format (see fig. 8.52).

Help F₁ May 31, 1990 Lotus-DM - D:\LOTUS-DM\FIG8-5.WK1 2:51 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₁₀

Q4 (T) (W11) '\$469,119' READY

	O	P	Q	R	S	T
1	=====					
2	Total					
3	=====					
4	\$469,119	1	\$469,119			
5	385,136	2	385,136			
6	1,413,283	104	1,413,283			
7	1,831,654	7	1,831,654			
8	=====					
9	\$3,219,112					
10	=====					
11						
12						
13						
14						
15						
16						
17						
18						

Fig. 8.50.
New cell
contents (in Text
format) for string
labels.

Help F₁ May 31, 1990 Lotus-DM - D:\LOTUS-DM\FIG8-51.WK1 1:48 pm

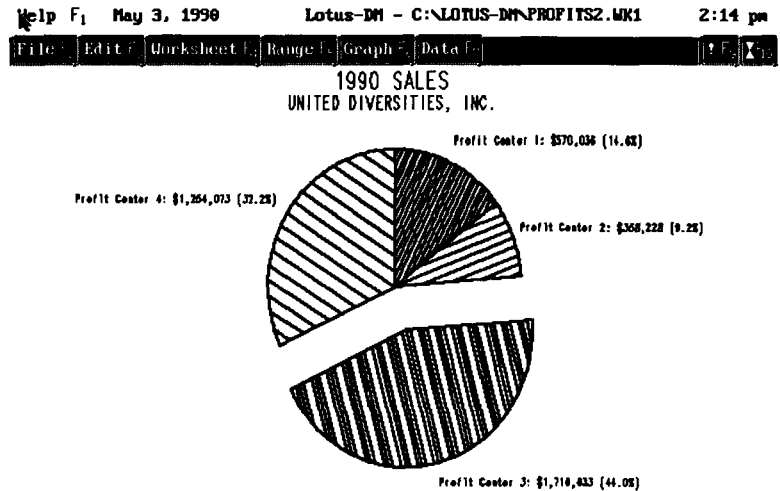
File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₁₀

R4 (W11) +A48": 'RQ4' READY

	O	P	Q	R	S	T
1	=====					
2	Total					
3	=====					
4	\$469,119	1	\$469,119	Profit Center 1: \$469,119		
5	385,136	2	385,136	Profit Center 2: 385,136		
6	1,413,283	104	1,413,283	Profit Center 3: 1,413,283		
7	1,831,654	7	1,831,654	Profit Center 4: 1,831,654		
8	=====					
9	\$3,219,112					
10	=====					
11						
12						
13						
14						
15						
16						
17						
18						

Fig. 8.51.
A worksheet
display of new
cell contents.

Fig. 8.52.
A pie graph with
string labels.



XY Graphs

The XY graph, often called a *scatter plot*, is a unique variation of a line graph. In this type of Lotus-DM graph, two or more different data items from the same data range can share the same x-axis value. Instead of showing time-series data, XY graphs show the relationships between different attributes of data items—age and income, for example, or educational achievements and salary. Think of one data item as the independent variable and consider the other item to be dependent on the first. Use the X data range in the Graph Ranges command to enter the independent variable; use one of the A, B, C, D, E, or F options to enter the other item. If the relationship between the two items is strong, the symbols that represent each item tend to cluster in a straight-line pattern.

Suppose that you want to create a graph showing a correlation between the amount a profit center spends on advertising and the sales generated by that profit center. Imagine that, somewhere in the spreadsheet, information has been tabulated to record each profit center's share of advertising dollars spent. To create an XY graph for Profit Center 1, use the sample % of Advertising Budget data for Profit Center 1 (see fig. 8.53) and the monthly Sales data for Profit Center 1 from the worksheet shown in figures 8.35 and 8.36.

Using the amount of advertising dollars expended as the independent variable, with sales as the dependent variable, construct an XY graph that includes titles and labels. To do so, issue the following command sequences:

In the Graph Reset command:

choose Reset Graph

Help F₁ Mar 1, 1990 Lotus-DM - C:\LOTUS-DM\PROFITS.WK1 11:11 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ X F₁₀

A13 [W9] CALC READY

	A	B	C	D	E	F	G	H
13								
14	% of Advertising Budget							
15								
16	Profit Center 1							
17	Jan	15.00						
18	Feb	20.00						
19	Mar	15.00						
20	Apr	18.00						
21	May	16.20						
22	Jun	20.50						
23	Jul	18.00						
24	Aug	15.00						
25	Sep	19.50						
26	Oct	15.50						
27	Nov	16.00						
28	Dec	18.00						
29								
30								

*Fig. 8.53.
A sales
spreadsheet
containing
advertising
data.*

In the Graph Type command:

choose **XY**

In the Graph Range command:

enter **C4..N4** as the A range

enter **B17..B28** as the X range

In the Graph Titles command:

enter **SALES vs SHARE OF ADVERTISING** as the first title

enter **PROFIT CENTER 1** as the second title

enter **% of Advertising Budget** as the X-axis title

In the Graph Legends command:

enter **\A4** for the A range

enter **\A5** for the B range

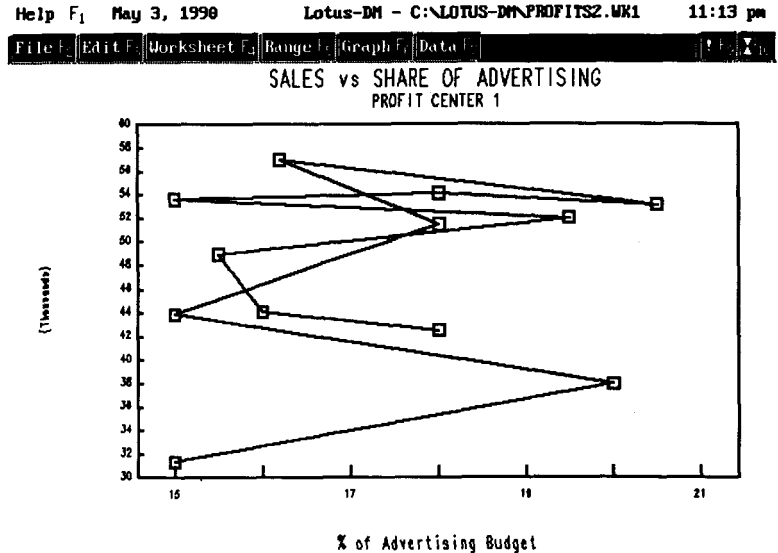
enter **\A6** for the C range

enter **\A7** for the D range

Use the Graph View command.

The initial XY graph should look like the one shown in figure 8.54.

Fig. 8.54.
An initial XY
graph with
connecting
lines.



Because the graph shown in figure 8.54 displays the default lines and symbols typical of line graphs, using the XY graph to determine whether a relationship exists between the two data series plotted is difficult, at best. But by using a setting frequently applied to XY graphs, you can suppress display of the lines and make the graph easier to read. Assuming that the XY graph shown in figure 8.54 is the current graph, issue the following command sequences:

In the Graph Options command:

enter an **X** in the box located in the Symbols column for the Entire Graph and blank out the adjacent box in the Lines column

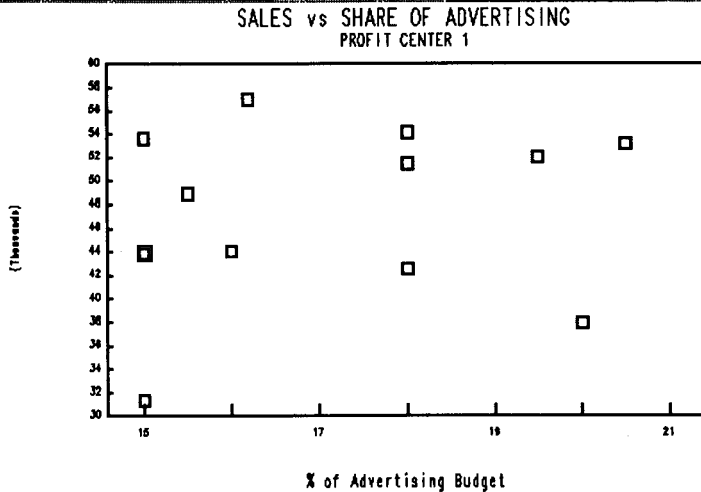
Use the Graph View command. The revised graph should resemble the one shown in figure 8.55.

Cue:
To create a scatter plot, use an XY graph without lines connecting the data points.

An XY graph without lines connecting the data points is called a scatter plot. If the symbols in a scatter plot seem to cluster along a single, imaginary, straight line fitted among the data points, a strong relationship exists.

At first glance, the widely scattered data points shown in figure 8.56 seem to indicate no strong dependency of sales dollars on advertising dollars spent. Before you draw conclusions, however, manually reset the lower scale limits of the y-axis to zero. Set the x-axis to 1. To avoid distortion in the graph caused by scale differences, use the following command sequences and compare the results with figure 8.56:

Help F1 May 3, 1990 Lotus-DW - C:\LOTUS-DW\PROFITS2.WK1 11:12 pm
 File Edit Worksheet Range Graph Data



*Fig. 8.55.
 An XY graph
 that displays
 symbols only.*

In the Graph Scaling command:

under Y Scaling, select **Manual**

enter **60000** as the Upper limit

enter **0** as the Lower limit

under X Scaling, select **Manual**

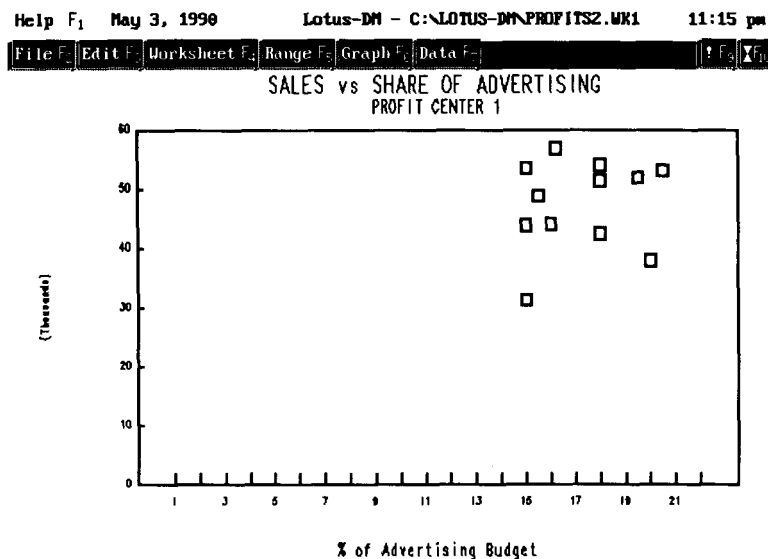
enter **22** as the Upper limit

enter **1** as the Lower limit

Use the Graph View command.

Aren't you glad you didn't jump to conclusions? Figure 8.56 seems to show a significant correlation between the sales generated and the advertising dollars expended for Profit Center 1 during 1990. (If you want to calculate data for a regression line to plot through the scattered symbols, use the Data Regression command.)

Fig. 8.56.
An XY graph
with the origin
set at zero.



Bypassing Selected Lotus-DM Limitations

Now that you have learned when to use and how to construct the five Lotus-DM graph types, and how to use options to enhance them, you should be able to create most of your graphs by accepting the program's graphics defaults and selecting other menu options.

A few common problem areas exist, however. You may find, for example, that the worksheet data you want to graph is not in a continuous range. You may not like the size of a single-range bar graph. Perhaps you like the moveable title capability found in many stand-alone graphics software programs, which is not an option with Lotus-DM. With a little experimentation, you may be able to overcome these apparent limitations.

Graphing Noncontinuous Ranges

Cue:
To graph
noncontinuous
ranges, use blank
areas of the
worksheet.

Although Lotus-DM requires that a graph's data ranges be continuous, you can get around this limitation by creating continuous ranges in a blank area of the worksheet. Suppose that the Sales by Profit Center spreadsheet included not only monthly data but also quarterly summary information (see figs. 8.57 and 8.58).

	A	B	C	D	E	F	G	H	I
1	SALES	Jan	Feb	Mar	Qtr1	Apr	May	Jun	Qtr2
2	Profit Center 1	\$31,336	\$37,954	\$43,879	\$113,169	\$51,471	\$56,953	\$53,145	\$161,5
3	Profit Center 2	22,572	24,888	25,167	72,627	32,588	40,140	37,970	110,6
4	Profit Center 3	131,685	129,044	131,723	392,452	139,221	141,879	149,803	430,9
5	Profit Center 4	95,473	98,008	96,986	290,467	95,318	103,538	108,146	307,0
6	Total Sales	\$281,066	\$289,894	\$297,755	\$868,715	\$318,598	\$342,510	\$349,064	\$1,010,1

Fig. 8.57.
The Sales spreadsheet with quarterly summary data (July to December).

	A	B	K	L	M	N	O	P	Q	R
1	SALES	Jul	Aug	Sep	Qtr3	Oct	Nov	Dec	Qtr4	
2	Profit Center 1	\$54,140	\$53,614	\$52,015	\$159,769	\$48,902	\$44,091	\$42,536	\$135,529	
3	Profit Center 2	34,587	33,463	28,929	96,989	24,153	27,060	26,701	77,914	
4	Profit Center 3	147,108	147,032	153,440	447,580	149,990	145,198	150,510	445,698	
5	Profit Center 4	108,642	106,065	110,401	325,108	112,018	111,956	107,522	331,496	
6	Total Sales	\$344,477	\$340,174	\$344,795	\$1,029,446	\$335,063	\$328,305	\$327,269	\$990,637	

Fig. 8.58.
The Sales spreadsheet with quarterly summary data (January to June).

If you wanted to graph only the monthly sales information for profit center 1, you might be tempted to hide columns F, J, N, and R, and then specify the range C4..R4. Try it! Because the cell entries in hidden columns are graphed, the result is a line, bar, or pie graph with 16 data points plotted, not the 12 data points you need.

You can create separate continuous ranges by pointing to data in noncontinuous ranges. To clarify this procedure, enter the cell contents in the range A12..F16 by typing **+A4** in cell A13 and copying cell A13 to A14..A16, repeating the process as shown in figure 8.59.

Fig. 8.59.
Cell contents
(in Text
format)
for
continuous
ranges.

Help F₁ Mar 1, 1990 Lotus-DH - C:\LOTUS-DH\PROFITS.WK1 11:48 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C13 (T) (W11) +F4 READY

	A	B	C	D	E	F	G
1	=====						
2	SALES		Jan	Feb	Mar	Qtr1	Apr
3	=====						
4	Profit Center 1		\$31,336	\$37,954	\$43,879	113169	\$51
5	Profit Center 2		22,572	24,888	25,167	72627	32
6	Profit Center 3		131,685	129,044	131,723	392452	139
7	Profit Center 4		95,473	98,008	96,986	290467	95
8							
9	Total Sales		\$281,066	\$289,894	\$297,755	868715	\$318
10	=====						
11			Qtr1	Qtr2	Qtr3	Qtr4	
12							
13	+A4		+F4	+J4	+M4	+R4	
14	+A5		+F5	+J5	+M5	+R5	
15	+A6		+F6	+J6	+M6	+R6	
16	+A7		+F7	+J7	+M7	+R7	
17							
18							

To verify that your screen display reflects the quarterly summary figures created in continuous ranges, compare your screen to figure 8.60.

Fig. 8.60.
A cell display
after creating
continuous
ranges.

Help F₁ Mar 1, 1990 Lotus-DH - C:\LOTUS-DH\PROFITS.WK1 11:51 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C12 (W11) ^Qtr1 READY

	A	B	C	D	E	F	G
12			Qtr1	Qtr2	Qtr3	Qtr4	
13	Profit Center 1		113,169	161,569	159,769	135,529	
14	Profit Center 2		72,627	110,698	96,989	77,914	
15	Profit Center 3		392,452	430,903	447,580	445,698	
16	Profit Center 4		290,467	307,002	325,108	331,496	
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							

If you want to create a comparative bar graph of the quarterly sales information, use the following command sequences (refer to fig. 8.61):

In the Graph Reset command:

choose `Reset Graph`

In the Graph Type command:

choose `Bar`

In the Graph Range command:

enter **C13..F13** as the A range

enter **C14..F14** as the B range

enter **C15..F15** as the C range

enter **C16..F16** as the D range

enter **C12..F12** as the X range

In the Graph Titles command:

enter **1990 SALES** as the first title

enter **United Diversities, Inc.** as the second title

enter **SALES BY PROFIT CENTER** as the X-axis title

In the Graph Legends command:

enter **\A13** for the A range

enter **\A14** for the B range

enter **\A15** for the C range

enter **\A16** for the D range

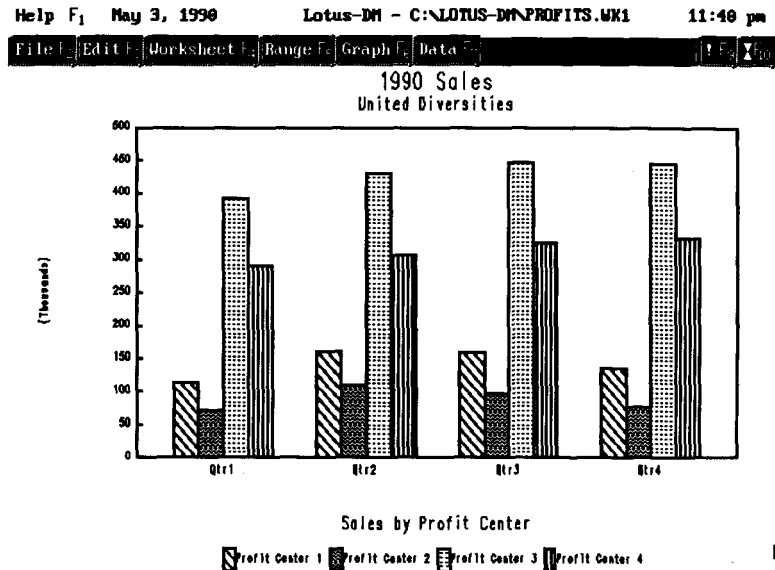
Use the Graph View command.

Using Blank Cells To Alter Spacing

You can use blank cells or ranges to improve the default appearance of many Lotus-DM graphs. Notice that, in figure 8.61, the leftmost and rightmost bars rest close to the left and right sides of the graph. Graphs can be easier to read when each data range is preceded and followed by a blank cell.

To illustrate the concept, use the quarterly summary data from figure 8.60. First, move the range C12..F16 one column to the right (to D12..G16). Expand each data range to include six cells (a blank, four quarterly figures, and another blank). Then apply the following command sequences to the current graph:

Fig. 8.61.
A bar graph that
uses newly
created
continuous
ranges.



In the Graph Range command:

enter **C13..H13** as the A range

enter **C14..H14** as the B range

enter **C15..H15** as the C range

enter **C16..H16** as the D range

enter **C12..H12** as the X range

Use the Graph View command.

The graph displayed on your screen should look like the slightly revised comparative bar graph shown in figure 8.62.

You also can change the display by using totally blank ranges. If you used data from figure 8.60 to graph quarterly data only for Profit Center 1 (adjusting the options accordingly), for example, the resulting graph resembles the one shown in figure 8.63.

Help F1 May 3, 1990 Lotus-DM - C:\LOTUS-DM\PROFITS.WK1 11:44 pm

File F Edit E Worksheet F Range F Graph F Data F ? F10

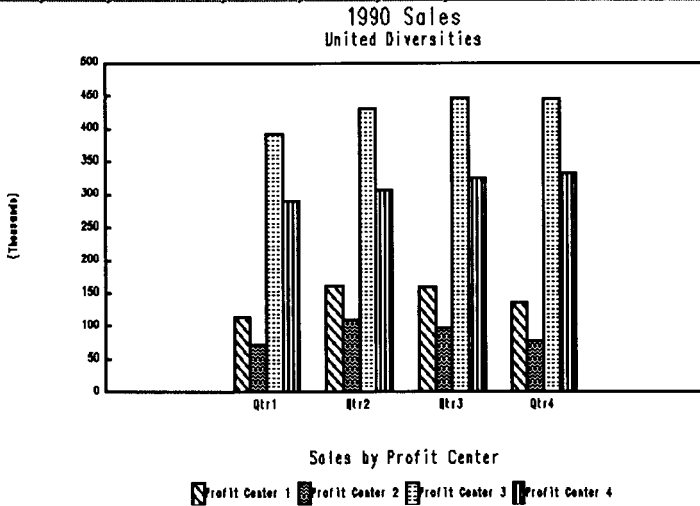


Fig. 8.62.
Using
blank cells
to alter bar
graph
display.

Help F1 May 3, 1990 Lotus-DM - C:\LOTUS-DM\PROFITS.WK1 11:48 pm

File F Edit E Worksheet F Range F Graph F Data F ? F10

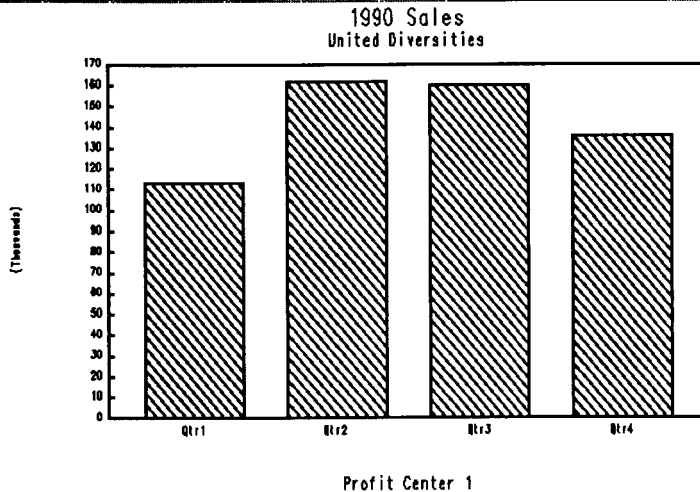
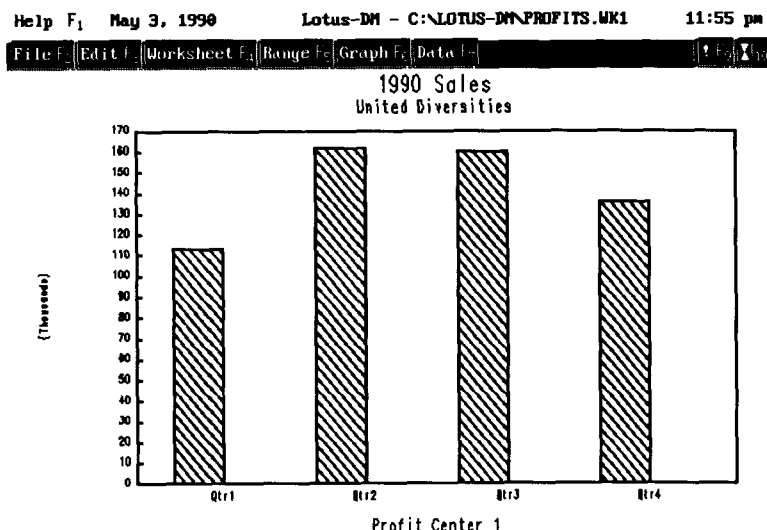


Fig. 8.63.
A bar graph
created by
referencing
noncontinuous
data.

To improve the appearance of the graph, you can narrow the bars by adding additional blank data ranges. If you add a single range of blank cells as the B range (a single blank cell, such as C17 in the current example, will do), the results are less than satisfactory (see fig. 8.64).

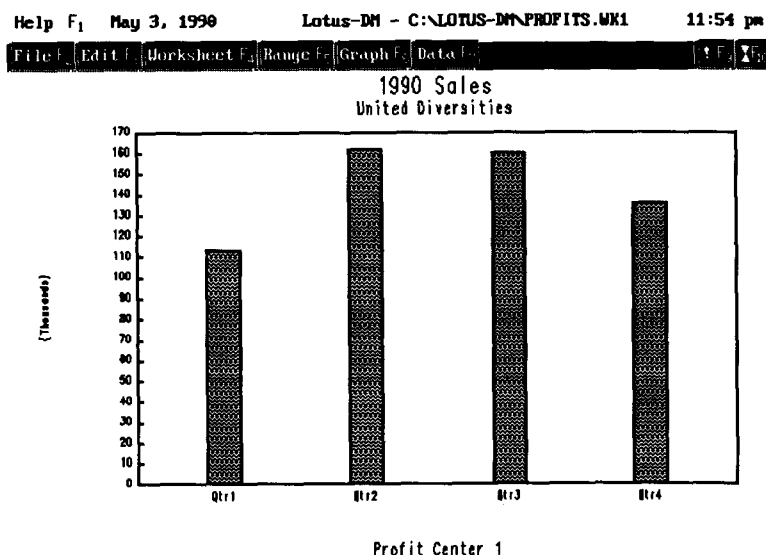
Cue:
To narrow
the bars of a
bar graph,
add blank
data ranges.

Fig. 8.64.
A graph
displaying
the wrong
way to
change bar
width.



Although the bars shown in figure 8.64 are narrower than the original bars, the bars are not centered in the frame of the graph. The location of the bars suggests that data that ought to be graphed is missing. To keep the bars centered, add an equal number of blank ranges on both sides of each data range. For example, use the worksheet, shown in figure 8.60 and subsequently changed, to graph the data range D13..G13 as the B range, enter a blank A range (any blank cell such as C17), and enter a blank C range (any blank cell such as C17). Figure 8.65 reflects the addition of an even number of blank ranges.

Fig. 8.65.
A graph
displaying
bars
positioned
correctly in the
frame of the
graph.



Now compare the default display (shown in fig. 8.62) to the revised display shown in figure 8.65. Both are "correct." Deciding which to use is a matter of individual preference. You should avoid creating bar graphs such as the one shown in figure 8.64, however, because the bars are not centered in the frame of the graph.

Using Blank Cells To Create Moveable Titles

Although some software packages offer a moveable title option for positioning descriptive information anywhere within a graph, Lotus-DM does not. As you have learned, you can use Lotus-DM's options to create only four titles: two centered above the graph, one to the left of the y-axis, and one below the x-axis.

You can use Lotus-DM's Data-Labels option to place text selectively within the graph. Suppose that the reduced fourth-quarter sales for Profit Center 1 (refer to fig. 8.64) were caused by the bad publicity of a product recall. You want to include this explanatory text in the graph, close to the fourth-quarter data. To do so, type the description **PRODUCT RECALL** in a blank area of the worksheet (cell F18, for example). Be sure that the area of the worksheet you choose has three blank cells to the left of it. To produce the moveable title shown in figure 8.66, enter the Data-Labels command sequences that set the B range to position the range C18..F18 above the bars.

Cue:
For more freedom in placing titles, use blank spaces with the Data-Labels option.

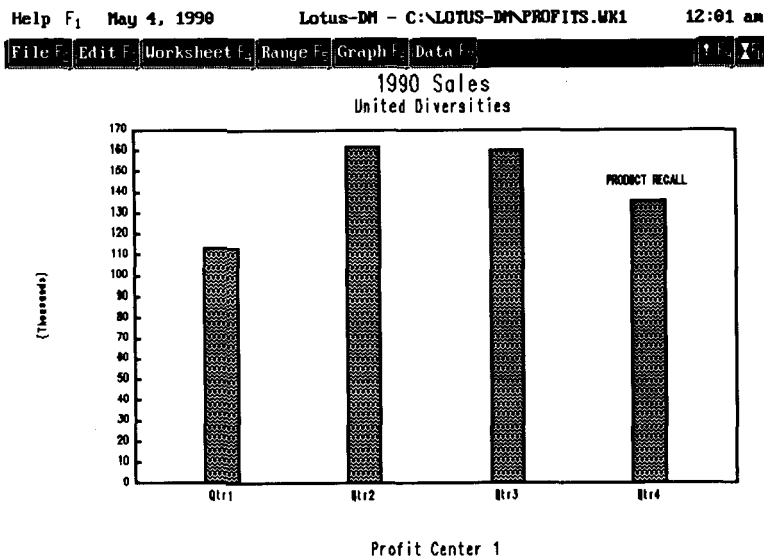


Fig. 8.66.
Setting a moveable title within the graph.

Chapter Summary

You have learned a great deal about Lotus-DM graphs from this chapter: how to create and enhance all five graph types, how to store graphs for printing as well as for subsequent recall to the screen, and how to use your imagination to produce alternative graph displays. The next chapter explains how to print graphs.

Chapter 8 showed you how to use Lotus-DM to create and display graphs. In order to print these graphs, you must call upon PrintGraph, which is actually a separate program. PrintGraph is designed to print those files created with the Graph Save command; such files automatically are given the file extension PIC and are commonly known as *PIC files*.

Because PrintGraph is a separate program, you can activate it not only from Lotus-DM but also from the DOS operating system and from the DeskMate environment.

You can use the PrintGraph program for quick printouts of graphs; you also can choose from a variety of optional print settings for enhancing the appearance of graphs. This chapter shows you how to perform the following tasks:

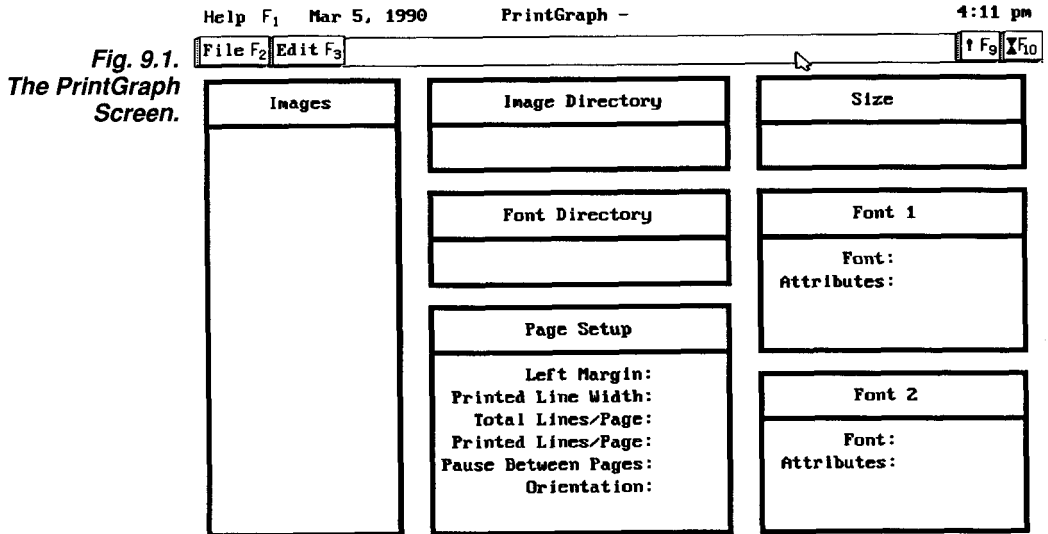
- ☐ Access the PrintGraph program
- ☐ Select or alter hardware-related settings with the Setup accessory
- ☐ Use the PrintGraph screen
- ☐ Print a graph using PrintGraph default settings
- ☐ Change graph size, font, orientation, and paper-placement settings
- ☐ Establish temporary PrintGraph settings
- ☐ Change the PrintGraph default settings

Accessing the PrintGraph Program

To access PrintGraph directly from the operating system, type **pgraph** at the operating system prompt. (The PrintGraph program should reside in the current directory for a hard disk system; for a floppy disk system, the disk that contains the PrintGraph program should be in the active drive.)

To access PrintGraph from DeskMate, activate the Programs list box and select PGRAPH.PDM.

Rather than starting from the operating system or from DeskMate, you are more likely to use PrintGraph immediately after you have created and saved a graph in Lotus-DM. While still using Lotus-DM, select Graph (F6) and select PrintGraph from the list of commands. In a few seconds you see the PrintGraph screen (see fig. 9.1).



When you finish printing graphs, you do not need to reload Lotus-DM; simply exit from PrintGraph and you can return directly to Lotus-DM without any requirement to reopen the worksheet file you were using at the time you activated PrintGraph.

Setting the Type and Name of the Current Printer

Before accessing PrintGraph, you should be sure that your printer can print graphs (daisy-wheel printers, for example, cannot) and that you have used the Setup (F10) accessory to designate which printer you have (see fig. 9.2).

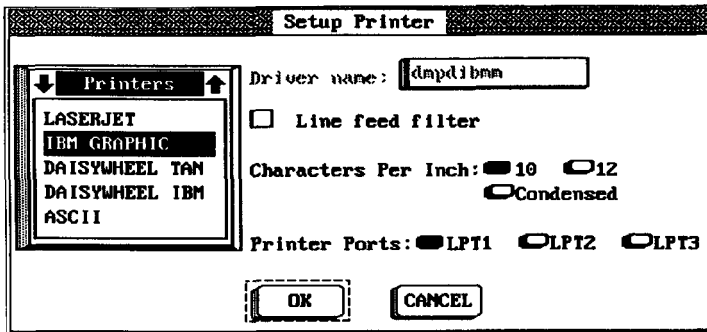


Fig. 9.2.
*The Printer
Settings dialog
box in the Setup
accessory.*

If you've been using Lotus-DM and have had no problems printing text, and your printer is designed to accommodate the printing of graphs, it's likely that you will not need to make any changes in the Setup accessory.

The Characters Per Inch setting in the Setup accessory has an effect on graphs printed in portrait orientation; the setting is irrelevant for landscape orientation. (Learn more about the Orientation option in "Orientation," later in this chapter.)

Producing Basic Printed Graphs

No matter how you access PrintGraph, you see the PrintGraph screen (see fig. 9.1). This screen provides you with most of the relevant information pertaining to graph options, except for the Setup accessory choices mentioned in the previous paragraphs. You can move the cursor on the PrintGraph screen only if you have a mouse or pointing device on your PC; there is no keyboard method to move around the screen to make selections. However, all the PrintGraph selections, and more, are available from File (F2) and Edit (F3) located on the menu bar. Notice the selections when you choose the File commands from the menu bar (see fig. 9.3). Not only are all the choices selectable from the PrintGraph screen available here, but you also have some additional ones—Print, Save, Reset, and Run.

Printing a graph can be a simple procedure if you accept the default PrintGraph settings. If the correct hardware configuration has been specified, you can produce a full-size, Modern font, black-and-white graph in landscape orientation on 8 1/2-by-11-inch continuous-feed paper simply by selecting a graph for printing and then printing it. You choose Image(s) from File (F2) or from PrintGraph to mark a graph for printing; and then choose Print from the File commands to print the graph.

Reminder:
Printing a graph can be as easy as selecting the image to be printed and then choosing Print.

Fig. 9.3.
The File (F2)
commands in
PrintGraph.

File:	
Image(s)...	Ctrl+I
Image Directory...	
Font 1...	Ctrl+F
Font 2...	Ctrl+T
Font Directory...	
Page Setup...	Ctrl+G
Print	Ctrl+P
Save	Ctrl+S
Reset	Ctrl+R
Exit	(ESC)
Run...	
About PGraph...	

Suppose that you want to print the line graph saved in the LINE.PIC file. Make sure that you're using continuous-feed paper and that the printer is on-line and the paper is positioned at the top of a page. Then you can print the default graph by using just two commands:

1. Select Image(s), highlight `LINE` in the Image Files Box, and choose OK (see fig. 9.4).
2. Select Print from the File command.

Figure 9.5 shows the printout of the graph. The top of this graph extends along the lengthier side of an 8 1/2-by-11-inch page and fills the page. The titles are printed in the default Modern font.

If you want to enhance this default graph, you can do so by using any or all of PrintGraph's many special features. These special capabilities (which are not available in the main Lotus-DM program) include the following:

- ☐ Enlargement/reduction based on a simple choice between `Full` and `Half` size.
- ☐ Size change based on the `Characters Per Inch` setting in the Setup accessory (meaningful only in portrait orientation).
- ☐ Size change based on the `Left Margin`, `Printed Line Width`, and `Printed Lines Per Page` settings in the Page Setup command.

- ☐ The use of three different font types: Modern, Gothic, and Roman.
- ☐ The use of four different attributes: Normal, Bold, Underline, and Italic for the chosen fonts.

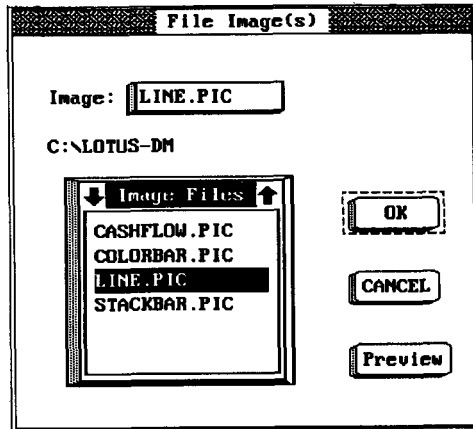


Fig. 9.4.
The File Image(s) command with the LINE file being selected.

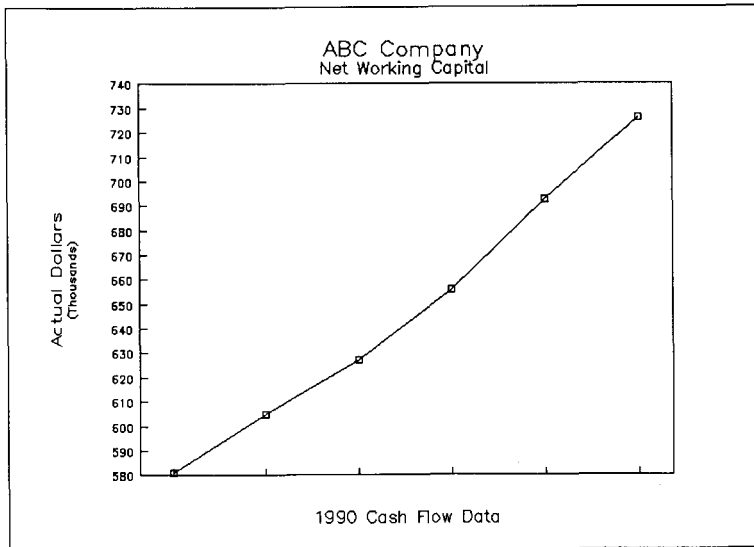


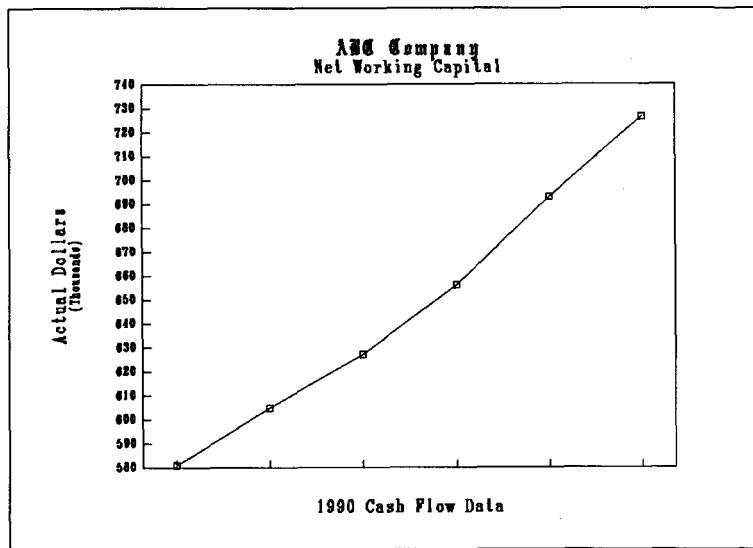
Fig. 9.5.
A sample graph printed with default settings.

To illustrate PrintGraph's size and font options, use the following commands, terminating each one with the selection OK.

1. Select **LINE** from the Image(s) command
2. Select **Full** from the Edit Size command
3. Select **Gothic** from the Font 1 command and choose the **Bold** attribute
4. Select **Roman** from the Font 2 command and choose the **Bold** attribute
5. Select **Portrait Orientation** from the Page Setup command
6. Select the Print command

The resulting graph is printed automatically with the top of the graph across the short side of an 8 1/2-by-11-inch page (see fig. 9.6), occupying about half of the sheet of paper. The top center title is printed in Bold Gothic font; the other text, in Bold Roman font. (These font options, as well as other graph settings, are described in detail later in this chapter.)

Fig. 9.6.
*A sample graph
printed with font
and size
changes.*



Comparing On-Screen Graphs to Printed Graphs

Reminder:
The printed graph will not be exactly the same as the screen display you see with the Graph View command.

As you create and prepare to print graphs, note that a printed graph looks different from its on-screen display. For example, if you compare figure 9.7 (which captures the on-screen display of a stacked-bar graph) with figure 9.8 (which shows the same graph printed), one difference is immediately apparent. You can see at a glance that the shading patterns in the two graphs are considerably different.

Help F₁ May 1, 1990 Lotus-DW - C:\LOTUS-DW\CASHFLOW.WK1 3:17 pm

File Edit Worksheet Range Graph Data

1990 SALES

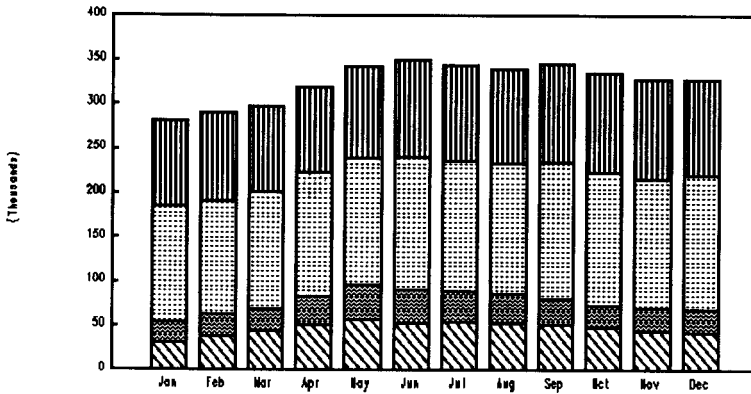


Fig. 9.7.
The screen display of a sample stacked-bar graph.

SALES BY PROFIT CENTER

Profit Center 1 Profit Center 2 Profit Center 3 Profit Center 4

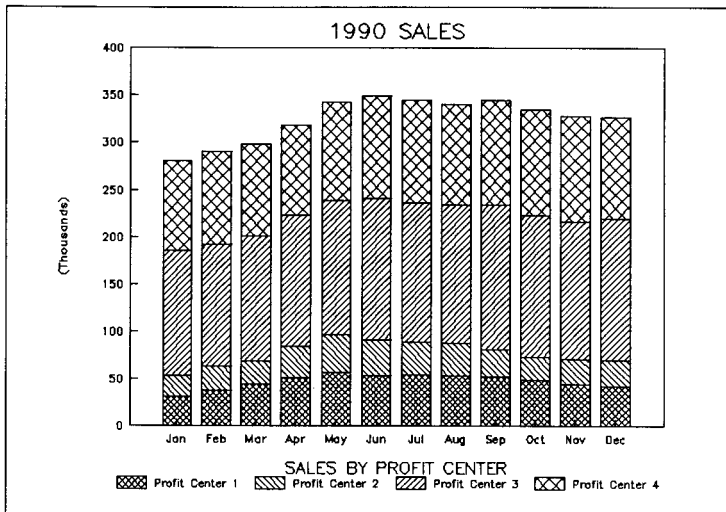


Fig. 9.8.
The printed sample stacked-bar graph.

Using the PrintGraph Screen

The PrintGraph screen serves as a status report; it provides information about current print conditions and the file or files to be printed.

The seven major block areas on the screen represent most of the PrintGraph commands (all but printer selection and Characters Per Inch—both from the Setup accessory—and Print, Save, and Reset, from the File command). These blocks are updated continually as you use commands to make changes.

Cue:
Check the
PrintGraph
screen before
printing any
graphs.

Before you select the Print command to begin printing a graph, get in the habit of checking the PrintGraph screen. As you can see from figure 9.1, the settings displayed in the status report are organized in seven areas:

- ☐ Image(s)
- ☐ Image Directory
- ☐ Font Directory
- ☐ Page Setup
- ☐ Size
- ☐ Font 1
- ☐ Font 2

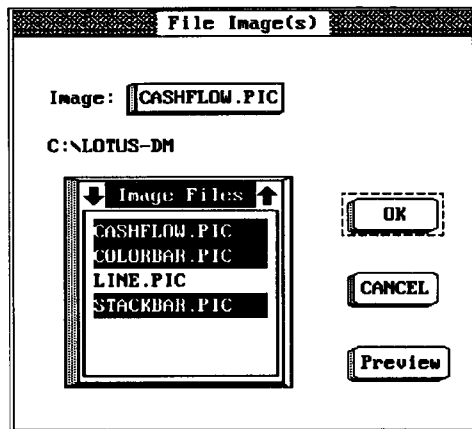
Remember, each of these seven commands can be accessed with a mouse from the screen, or with the keyboard by using the File (F2) or Edit (F3) selections in the menu bar.

Using the Image(s) Command

Use the Image(s) command to get a list of PIC files you may want to print (see fig 9.9). By selecting Preview in the Image(s) dialog box, you get an on-screen preview of the file whose name in the file list is currently highlighted.

You may decide to print more than one graph, so you can highlight a group of consecutive file names by holding down the Shift key and pressing the arrows keys to select other files. After you've selected all the files you want to see printed, release the Shift key and select OK. To get the same results with a mouse, point the mouse to the first or last desired file name, press and hold the mouse button as you drag the mouse up or down to select other files; then release the button and choose OK.

To select nonconsecutive file names, press and hold the Ctrl key while you move the cursor up and down the file list; press the space bar when the file you want to print is underlined. When finished, release the Ctrl key and choose OK. If you're using a mouse, press and hold down the Shift key while moving the mouse up and down the list; click on the file names you want to print. When finished, release the Shift key and choose OK. You cannot use Preview if more than one file name has been selected.



*Fig. 9.9.
The File Image(s)
dialog box with
three files
selected.*

Establishing the Physical Print Environment

The physical print environment includes the following areas:

- ☐ The location of the directory containing files you may want to print (the Image Directory)
- ☐ The location of the directory containing the types of fonts available (the Font Directory)
- ☐ The selection of printer and port types
- ☐ The ability to have the printer pause between pages

The last two items are covered elsewhere. To change the printer type and port, use the Setup (F10) accessory, referred to in detail earlier in this chapter. Printer delay (Pause Between Pages) is covered in the section entitled "Controlling the Appearance of Printed Graphs."

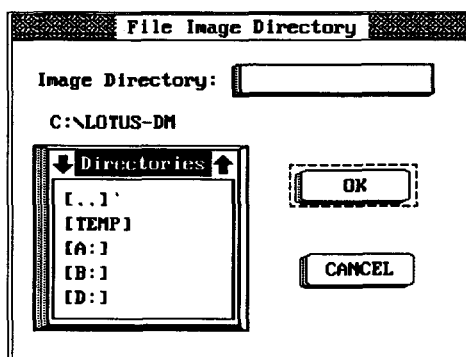
Changing the Image(s) Directory

Reminder:
The graphs you want to print must be located in the current graph's directory.

In figure 9.1, the current graph's directory is C:\LOTUS-DM. This means that you store your PIC files in a directory named Lotus-DM. You can change this directory; for example, you may want to print PIC files from a floppy disk. To do so, insert the floppy disk in drive A and select a different Image Directory by using the File Image Directory command (see fig. 9.10).

Point to the [A:] entry that appears in the Directories box of this command and choose OK. Once you have made your selection, the setting is updated in Image Directory box located near the top of the PrintGraph screen.

Fig. 9.10.
The File Image
Directory dialog
box.



To restore C:\LOTUS-DM as the current graphs directory, select the Image Directory command again and type **C:\LOTUS-DM**.

Changing the Fonts Directory

Reminder:
PrintGraph's font files must be located in the current fonts directory.

Whenever you print a graph, you use PrintGraph's font files, which contain program instructions for font styles. These files are located on the same disk that holds the PrintGraph program. (Available font styles are discussed in this chapter's "Selecting Fonts" section.) As you can see from figure 9.1, the fonts directory is C:\LOTUS-DM.

If you need to change this directory, use the Font Directory command (see fig. 9.11). This command is nearly identical to the Image Directory command. The default location for the Font Directory is C:\LOTUS-DM unless you're using Lotus-DM on a floppy disk based system, where the default location is A. It is unlikely that you would want to change this location, although you might change the directory if you moved the files to another directory or renamed the directory.

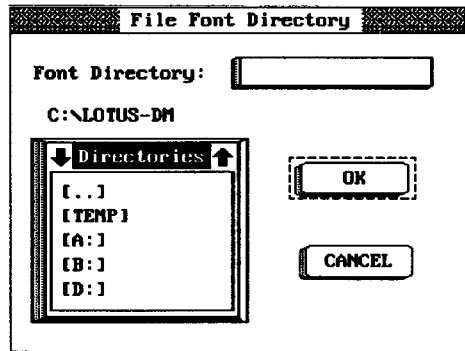


Fig. 9.11.
*The File Font
Directory dialog
box.*

Controlling the Appearance of Printed Graphs

The Page Setup, Size, Font 1, and Font 2 commands, as well as the Setup accessory, affect the overall appearance of the printed graph.

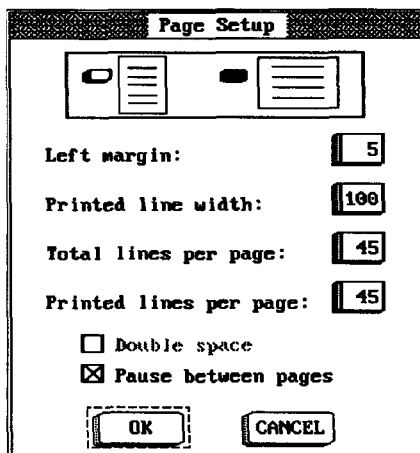
The Lotus-DM Graph commands are used to enter graph enhancements such as titles, legends, and labels; but selecting fonts, positioning the graph on the paper, controlling the orientation, selecting the size of the graph, and deciding whether to pause between pages are all done in PrintGraph. The Page Setup command controls most of these features (see fig. 9.12).

Orientation

In the Page Setup dialog box, the two icons at the top of the box refer to *Portrait* (on the left) and *Landscape* (on the right) orientation. Selecting *Portrait* causes the graph to be printed on the page in the same alignment as text is normally produced. Selecting *Landscape* rotates the graph 90 degrees and accommodates a graph that can fill the page. You have some flexibility in determining the placement and size of the graph by changing the default selections available in the Page Setup command.

The *Left Margin* option refers to the number of blank spaces from the left edge of the paper to the beginning of the graph. This setting is directly related to the *Characters Per Inch* setting that you can make in the Setup (F10) accessory. If you chose *Condensed* in the Setup accessory, the spaces referred to in the *Left Margin* option will be smaller than if you select 10 characters per inch (for a reminder, see the Printer Setup portion of the Setup accessory in fig. 9.2).

Fig. 9.12.
The Page
Setup dialog
box.



Printed Line Width represents the number of characters between the left and right margins; this number cannot exceed 100 for landscape orientation or 70 for portrait orientation.

Total Lines per Page is the maximum printable lines per page; for landscape printing this setting is automatically 45, for portrait, 66.

Printed lines per Page is a number less than or equal to the **Total Lines per Page** setting; it controls the height of your graph. Because PrintGraph always draws a graph in the same proportion, lowering this number decreases both the height and width of the printed graph.

The following default assignments occur with the orientation selected:

<i>Orientation</i>	<i>Portrait</i>	<i>Landscape</i>
Left margin	5	5
Printed line width	70	100
Total lines per page	66	45
Printed lines per page	60	45
Pause between pages	on	on

Because these settings are the default, you don't have to use the `Size` option if you want to print a graph with these dimensions centered upright on a standard-size page.

The `Double Space` option is inoperative in `PrintGraph` but is displayed to retain compatibility with `Page Setup` screens under the `File` and `Worksheet` commands in `Lotus-DM`.

Making the Printer Pause between Graphs

If you have selected more than one PIC file for a single print operation, you can make the printer pause between printing the specified graphs. If you are using a manual sheet-feed printer, for example, you can pause to change the paper.

If you want the printing operation to pause, select the `Pause between Pages` option in the `Page Setup` command. After each graph has been printed, the printer pauses and displays a `Print` message box (see fig. 9.13). Choose `Yes` if you want to print another copy of the graph; choose `Cancel` to stop printing and return to the `PrintGraph` screen; choose `No` to either print the next graph from a group you have chosen to print, or, if there are no more, to stop printing.

If you do not want the paper to pause between printing, deselect this option by pointing to it and pressing the space bar. This is a logical choice if you have numerous graphs to print and don't want to be bothered with reaffirming your desire to continue printing after the completion of each graph.

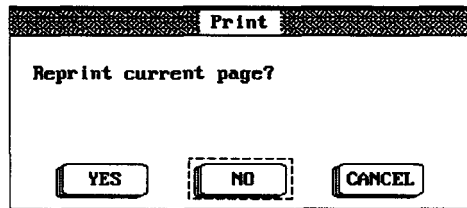
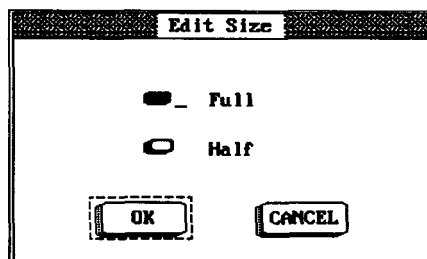


Fig. 9.13.
The Print
Message box.

Adjusting Size

The `Size` option lets you adjust the size of graphs, making them either full-size or half-size. You can get to this command either from the `PrintGraph` screen or from the menu bar by pressing `F3` (see fig. 9.14).

Fig. 9.14.
The Edit Size
dialog box.



Using this command with the *Orientation* option in the *Page Setup* command can be confusing. Here is a list of possibilities when all *Page Setup* options are at their default settings and the *Characters per Inch* setting from the *Setup* accessory is 10.

<i>Orientation</i>	<i>Size</i>	<i>Results</i>
Landscape	Full	The printed graph is rotated 90 degrees and occupies a full page.
Portrait	Full	The graph is printed upright, occupying half of a page, but advances the paper to the next page without allowing another graph to be printed on the same page.
Portrait	Half	The graph is printed upright, although not as large as under Portrait Full. The paper is not advanced; if you have subsequent graphs to print, they could appear on the same page.
Landscape	Half	Inoperative.

The three different settings in the *Setup* accessory for *Characters per Inch* also allow some variation in printing graphs.

The following chart, where each line represents a different combination of settings and produces a different printed result than the settings shown in the previous list, suggests that there are many ways to print a graph.

<i>Orientation</i>	<i>Size</i>	<i>Characters per Inch</i>	<i>Results</i>
Landscape	Full	10, 12, or Condensed	CPI has no effect
Portrait	Full	10	see previous chart
Portrait	Half	10	see previous chart

<i>Orientation</i>	<i>Size</i>	<i>Characters per Inch</i>	<i>Results</i>
Portrait	Full	12	smaller than 10 CPI
Portrait	Half	12	smaller than 10 CPI
Portrait	Full	Condensed	smaller than 12 CPI
Portrait	Half	Condensed	smaller than 12 CPI

If you change some of the other Page Setup entries, such as Left margin, Printed line width, or Printed lines per page, the number of possible ways to print a graph is endless.

Selecting Fonts

You can use different character types, or *fonts*, in a printed graph. For example, you can print a graph's top title in one character type (Font 1) and then select a different font (Font 2) for the remaining titles, data labels, x-labels, and legends.

If you want to change the fonts, first select the Font 1 command from the PrintGraph screen. In the resulting File Font 1 dialog box (see fig. 9.15) there are three font file names displayed—Gothic, Modern, and Roman; there are also four attributes—Normal, Bold, Underline, and Italic.

Of the three available fonts, Modern is the default. Select one of the three, just as you choose a file name in Lotus-DM.

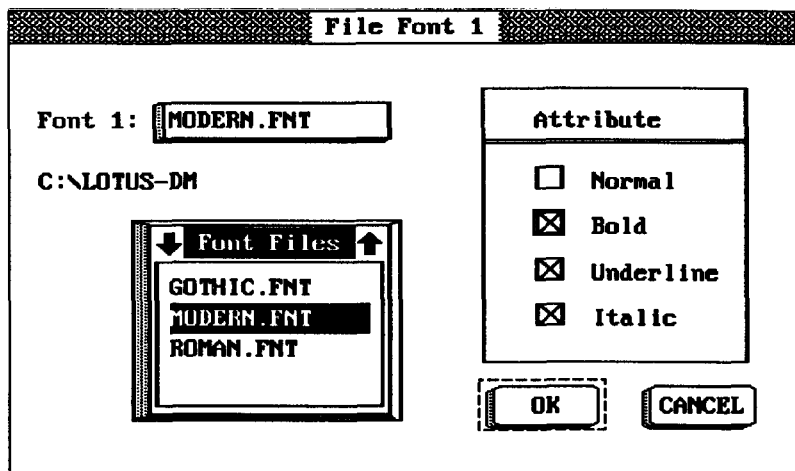
The Attribute box lets you use a combination of choices. If you select *Normal*, none of the others is selectable; selecting a combination of *Bold*, *Underline*, and *Italic* yields up to seven combinations of effects. Use the space bar to select or deselect attributes.

The Gothic type may be difficult to read, especially if you don't have a laser printer. If you want to get some idea of how the printing is going to look, the *Preview* option in the Page Setup command gives an approximation of how Gothic, Modern, or Roman type appears on paper.

The selection for Font 2, which pertains to all printed characters on the graph except for the main title, proceeds in the same manner as for Font 1, using a nearly identical dialog box.

Cue:
Select Font 1 to print the top title in one typeface; then select Font 2 for the remaining text.

Fig. 9.15.
The File
Font 1
Dialog
Box.



Saving and Resetting PrintGraph Settings

After you have established the appropriate Image and Font directories, the desired size, the Font 1 and Font 2 types and attributes, and the Page Setup selections, you may want these settings to constitute the default settings from now on.

The **Save** option, located in the File commands but not on the PrintGraph screen, is used to make the current settings the default settings. When you choose **Save**, the current options are stored in a file named PGRAPH.CNF; this file is read whenever PrintGraph is accessed.

The **Reset** option, also located exclusively in the File commands, is used to restore all the current PrintGraph settings to the default values.

Completing the Print Cycle

After you have accepted the default settings or selected other options, complete the printing operation by selecting **Print** from the File commands.

Printing a graph takes much longer than printing a similar-sized worksheet range. If you want to interrupt the process of printing a graph or series of graphs, use the **Cancel** option presented once printing has begun.

To leave the PrintGraph program, choose Exit from the File commands or press Esc. The next screen to appear depends on the method you used to access PrintGraph. If you entered PrintGraph from Lotus-DM, you return there with the same worksheet file on the screen as when you accessed PrintGraph. If you entered PrintGraph by typing **pgraph** from the operating system prompt, the operating system prompt is restored.

Chapter Summary

The mechanics of printing a graph are simple. The PrintGraph utility program provides a menu-driven approach to mark graphs for printing and to specify settings involving the physical print environment. You also must create and store the graphs within the Lotus-DM program, correctly install hardware, and use PrintGraph to print the results.

Part III

Using Lotus-DM as a Database Manager

This Part Includes:

Managing Data

Managing Data

In addition to electronic worksheet and business graphics, Lotus-DM has a third element: data management. Because the entire Lotus-DM database resides in the worksheet within memory (RAM), Lotus-DM's database feature is fast, easy to access, and easy to use.

Lotus-DM's database is quick because the program reduces the time required to transfer data to and from disks. By doing all the work inside the worksheet, Lotus-DM saves the time required for input and output to disk.

The Lotus-DM database is easily accessed because Lotus Development Corporation has made the entire database visible within the worksheet. You can view the contents of the whole database by using cursor-movement keys to scroll through the database.

The ease of use is a result of integrating data management with the program's worksheet and graphics functions. The commands for adding, modifying, and deleting items in a database are the same ones you have already seen for manipulating cells or groups of cells within a worksheet. And creating graphs from ranges in a database is as easy as creating them in a worksheet.

This chapter shows you how to complete the following:

- ☐ Create a Lotus-DM database
- ☐ Enter, modify, and maintain data records
- ☐ Carry out Sort and Query operations
- ☐ Load data from ASCII files and other programs
- ☐ Apply data with other Data commands
- ☐ Use database statistical functions

Defining a Database

A *database* is a collection of data organized so that you can list, sort, or search its contents. The data can contain any kind of information, from addresses to tax-deductible expenditures.

In Lotus-DM, the word *database* means a range of cells that spans at least one column and more than one row. This definition, however, does not distinguish between a database and any other range of cells. Because a database is actually a list, its manner of organization sets it apart from ordinary cells. Just as a list must be organized to be useful, a database must be organized to permit access to the information it contains.

Remember nonetheless that in Lotus-DM a database is similar to any other group of cells. This knowledge can help you as you learn about the different Data commands covered in this chapter. You can use these database commands in what you might consider “nondatabase” applications in many instances.

The smallest unit in a database is a *field*, or single data item. For example, if you develop an information base of present or potential corporate contributors for a not-for-profit organization, the following might be fields of information:

- ☐ Company Name
- ☐ Company Address
- ☐ Contact Person
- ☐ Phone Number
- ☐ Last Contact Date
- ☐ Contact Representative
- ☐ Last Contribution Date

A database *record* is a collection of associated fields. For example, the accumulation of all contributor data about one company forms one record. In Lotus-DM, a *record* is a row of cells within a database, and a *field* is a single cell.

You must set up a database so that you can access the information it contains. Retrieval of information usually involves key fields. A database *key field* is any field on which you base a list, sort, or search operation. For example, you can use ZIPCODE as a key field to sort the data in the contributor database and assign contact representatives to specific geographic areas. And you can prepare a follow-up contact list by searching the database for the key field LAST CONTACT DATE in which the date is less than one year ago.

The Lotus-DM database resides in the worksheet's row-and-column format. Figure 10.1 shows the general organization of a Lotus-DM database.

Reminder:
The Lotus-DM database resides in the worksheet's row-and-column format.

Help F₁ Apr 4, 1990 Lotus-DM - C:\LOTUS-DM\FIELDS.WK1 2:54 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₉ F₁₀

D6 [W12] 'Field R4F2' READY

	A	B	C	D	E	F	G
1			FIELD	FIELD	FIELD	FIELD	FIELD
2			NAME 1	NAME 2	NAME 3	NAME 4	NAME 5
3	Record#	1		Field R1F2			
4	Record#	2		Field R2F2			
5	Record#	3		Field R3F2			
6	Record#	4	Field R4F1	Field R4F2	Field R4F3	Field R4F4	Field R4F5
7	Record#	5		Field R5F2			
8	Record#	6		Field R6F2			
9	Record#	7		Field R7F2			
10	Record#	8		Field R8F2			
11	Record#	9		Field R9F2			
12	Record#	10		Field R10F2			
13							
14							
15							
16							
17							
18							

Fields (columns)

Fig. 10.1.
The general
organization of
the Lotus-DM
database.

Labels
(field names)

Records
(rows)

Labels (*field names*) describing the data items appear as column headings. Information about each specific data item (*field*) is entered in a cell in the appropriate column. In figure 10.1, the highlighted cell (D6) represents data for the second field name in the database's fourth record.

In the marketing research database shown in figure 10.2, the highlighted row (row 5) contains all fields of information concerning the first record.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1202.WK1 9:13 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₉ F₁₀

A5 [W7] '3' READY

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Marketing Research Database: Test Product X												
2													
3	Survey	Test	Test			Annual	Zip	Rank	Rank	Rank			
4	Area	Rep	Number	Age	Sex	Income	Code	Taste	Pkg	Price	Buy		
5	3	1	218	26	F	19,300	86560	4	2	3	N		
6	b	2	453	21	M	14,700	21204	1	3	2	N		
7	3	1	211	35	M	23,600	71636	1	1	1	N		
8	1	3	721	39	F	30,000	91570	2	3	2	Y		
9	1	3	722	21	M	16,700	43798	1	3	3	Y		
10	5	21	291	45	F	17,500	72756	4	4	1	N		
11	B	12	454	41	F	23,000	52787	5	2	1	Y		
12	5	21	290	76	F	3,600	16968	3	3	2	N		
13	A	B	112	35	M	31,000	57636	2	1	2	Y		
14	A	B	114	28	M	24,600	55947	1	4	1	Y		
15	1	3	723	51	F	8,000	13623	4	2	2	Y		
16	a	B	113	49	M	21,300	17263	3	1	1	N		
17	B	12	455	35	F	0	38566	5	3	2	Y		
18	5	21	289	26	F	25,200	46628	2	1	2	Y		

Fig. 10.2.
A highlighted
record.

Understanding Database Limits

Reminder:

You must load the entire Lotus-DM database into memory before you can perform any data-management operations.

The major disadvantage of Lotus-DM's database capabilities is the limitation the program imposes on the size of the database. With some popular database programs, you can load only portions of your database at once; with Lotus-DM, the entire database must be in memory before you can perform any data-management operations.

Theoretically, the maximum number of records you can have in a Lotus-DM database corresponds to the maximum number of rows in the worksheet (8,192 rows minus 1 row for the field names). Realistically, however, the number of records in a specific database is limited by the amount of available memory: conventional memory (RAM), expanded memory, and disk storage. You also must consider the room needed within the database to hold data extracted by Data Query commands.

A typical computer system with 640K of conventional memory can store in a single Lotus-DM database only about 2,000 records of the type shown in figure 10.2. For large databases, you need to add expanded memory to your computer.

Reminder:

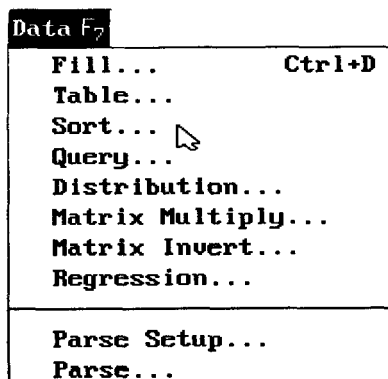
The size of a worksheet in memory is usually different from the amount of space it takes up on a disk.

If you use floppy disks to store database files, you are limited by the capacity of the disk. A 5 1/4-inch disk can hold either 360 kilobytes (low density) or 1.2 megabytes (high density). A 3 1/2-inch disk can hold either 720 kilobytes (low density) or 1.44 megabytes (high density). A hard disk's capacity is much higher than a floppy disk's. The only time you have to worry about whether a database file will fit on your hard disk is when you have so much other information stored on the disk that you are running out of available space. Keep in mind that no direct relationship exists between the size of a worksheet in memory and the amount of space it takes up on a disk.

When you estimate the maximum database size you can use on your computer equipment, be sure to include enough blank rows to accommodate the maximum output you expect from extract operations.

When you select Data from the Lotus-DM menu bar, a list of commands appears on the Data pull-down menu (see fig. 10.3).

The Sort and Query options are true *data-management* operations. Both are described in detail in this chapter. The other commands (Fill, Table, Distribution, Matrix Multiply, Matrix Invert, Regression, Parse Setup, and Parse) are considered, more appropriately, *data-creation* operations. They too are described in this chapter.



*Fig. 10.3.
The Data
pull-down
menu.*

Creating a Database

You can create a database as a new database file or as part of an existing worksheet. If you decide to build a database as part of an existing worksheet, choose a worksheet area you do not need for anything else. This area should be large enough to accommodate the number of records you plan to enter. If you add the database to the side of the worksheet, be careful about inserting or deleting worksheet rows that might also affect the database. If you add a database below an existing worksheet, be careful not to disturb predetermined column widths in the worksheet portion when you adjust the column widths of the database fields.

Reminder:
Place a database where it isn't affected by inserted or deleted columns or rows or by changed column widths in other applications.

After you decide which area of the worksheet to use, you create a database by specifying field names across a row and entering data in cells as you would for any other Lotus-DM application. The mechanics of entering database contents are simple; the most critical step in creating a useful database is choosing your fields accurately.

Determining the Required Output

Lotus-DM's data-retrieval techniques rely on locating data by field names. Before you begin typing the kinds of data items you think you may need, write down the output you expect from the database. Also consider any source documents already in use that provide input to the file. For example, you might use the following information from a sample database:

- ☐ Company Name
- ☐ Company Address
- ☐ Contact Person
- ☐ Phone Number
- ☐ Last Contact Date
- ☐ Contact Representative
- ☐ Last Contribution Date

When you are ready to set up these items in your database, you must specify for each item a field name, the column width, and the type of entry.

You make a common error in setting up a database if you choose a field name (and enter data) without thinking about the output you want from that field. Suppose that you establish GIFTDATE as a field name to describe the last date a contribution was made. Then you enter dates as labels in the general form XX/XX/XX. Although you can search for a GIFTDATE that matches a specific date, you cannot perform a math-based search for all GIFTDATEs within a specified period of time or before a certain date. To get maximum flexibility from Lotus-DM's Data commands, enter dates in the following form:

@DATE(year number,month number,day number)



Note: The Function Reference later in this book details each of the Lotus-DM functions.

Reminder:

The format of the data (date, labels, numbers) affects how you can sort and search the data.

After you decide on the output, choose the level of detail needed for each item of information, select the appropriate column width, and determine whether to enter data as a number or as a label. For example, if you want to sort by area code all records containing telephone numbers, enter telephone numbers as two separate fields: area code (XXX) and the base number XXX-XXXX. If you never want to perform math functions on telephone numbers, enter them as labels.

To save memory and increase data-entry speed and accuracy, use abbreviations as frequently as possible. For example, if you need to query only about workloads, plan to use the first, middle, and last initials of each contact representative in the database instead of printing a list of their full names.

If you enter database information from a standard source document, such as a marketing research survey form, you can increase the speed of data entry by setting up the field names in the same order as the corresponding data items on the form.

Be sure to plan your database carefully before you establish field names, set column widths and range formats, and enter data.

Entering Data

After you plan your database, you can build it. To help you understand how the process works, create a sample marketing research database as a new database in a blank worksheet. After you select the appropriate area of the worksheet for the database, enter the field names across a single row (see fig. 10.4).

The highlighted bar rests on row 4, the field-name row. The field names must be labels, even if they are the numeric labels such as '1', '2', and so on. Although you can use more than one row for field names, Lotus-DM processes only the values that appear in the bottom row. For example, the first field name in the marketing research database (cells A3 and A4) is SURVEY AREA, but only AREA (the portion of the name in row 4) is referenced in sort or query operations.

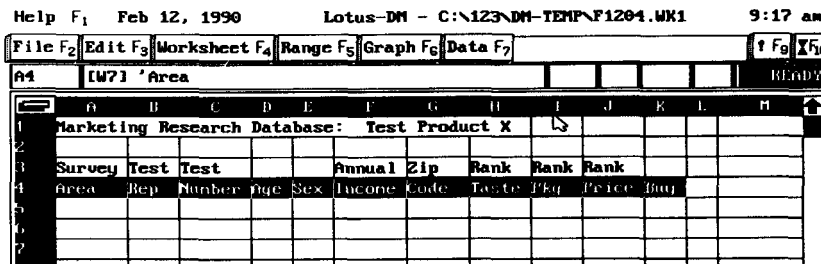


Fig. 10.4.
Creating field names in a database.

Keep in mind that all field names should be unique; any repetition of names confuses Lotus-DM when you search or sort the database. The field names in figure 10.4 are acceptable because, although the words in row 3 are repeated (two TESTS and three RANKS), each key-field name in row 4 is unique.

To control the manner in which cells are displayed on-screen, use Lotus-DM's Range Format and Worksheet Column commands. In figure 10.2, notice that the range format in column F is the comma (,) format with zero decimal places, and that column widths on the worksheet vary from 4 to 7 characters.

Note also that whenever a right-aligned column of numeric data is adjacent to a left-aligned column of label information (AGE and SEX, and INCOME and CODE in fig. 10.2, for example), the data looks crowded. You can insert blank columns to change the spacing between fields, but if you plan to search values in the database, do not leave blank rows.

After you alter the column widths and formats, enter the title and field names, and add columns, you can add records to the database. To enter the first record, move the cell pointer to the row directly below the field-name row; then enter data across the row.

Reminder:
Keep all field names unique; repetition of field names confuses Lotus-DM.

Cue:
Insert blank columns between fields to prevent crowding data.

In the sample marketing research database, the contents of the AREA, REP, NUMBER, SEX, CODE, and BUY fields are entered as labels; the contents of the AGE, INCOME, TASTE, PKG, and PRICE fields are entered as numbers. Figure 10.5 shows the initial data and the column spacing for the database.

Fig. 10.5.
The marketing
research
database.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1205.WK1 9:17 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₉ F₁₀

A1 [W7] Marketing Research Database: Test Pro READY

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Marketing Research Database: Test Product X														
2															
3	Survey	Test	Test				Annual	Zip	Rank	Rank	Rank				
4	Area	Rep	Number	Age	Sex	Income	Code	Taste	Pkg	Price	Buy				
5	a	1	218	26	F	19,300	86560	4	2	3	N				
6	b	2	453	21	M	14,700	21204	1	3	2	N				
7	a	1	211	35	M	23,600	71636	1	1	1	N				
8	1	3	721	39	F	30,000	91570	2	3	2	Y				
9	1	3	722	21	M	16,700	43798	1	3	3	Y				
10	5	21	291	45	F	17,500	72756	4	4	1	N				
11	B	12	454	41	F	23,000	52787	5	2	1	Y				
12	5	21	290	76	F	3,600	16968	3	3	2	N				
13	a	B	112	35	M	31,000	57636	2	1	2	Y				
14	a	B	114	28	M	24,600	55947	1	4	1	Y				
15	1	3	723	51	F	8,000	13623	4	2	2	Y				
16	a	B	113	49	M	21,300	17263	3	1	1	N				
17	B	12	455	35	F	0	38566	5	3	2	Y				
18	5	21	289	26	F	25,200	46628	2	1	2	Y				

This sample marketing research database is used periodically throughout this chapter to explain the results of using Data commands. In this book, the fields are limited to a single screen display. "Real-life" applications, however, track many more columns of data. You can maintain 256 fields (the number of columns available) in a Lotus-DM database.

In the AREA field, letters code shopping-center test locations and numbers indicate locations of college-campus product testing. The entries in the TASTE and PKG fields reflect options 1 through 5 (1 is "most favorable"); the entries in the PRICE field reflect options 1 through 3 (1 is "too high").

Modifying a Database

After you collect the data for a database and decide which field types, widths, and formats to use, creating and maintaining the accuracy of a database is easy.

To add and delete records in a database, use the same Lotus-DM commands for inserting and deleting rows you use for any other application. Because records correspond to rows, you begin inserting a record with the Worksheet Insert/Delete command, selecting the **Insert** and **Row** options. Then fill in the various fields in the inserted row with the appropriate data. Figure 10.6 shows an example of inserting a record in the middle of a database. More common than adding rows to the middle of a database, however, is the technique of entering records at the end of the database and then rearranging the order of database records, as explained in the next section.

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1206.WK1 9:18 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

A10 [W7] READY

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Marketing Research Database: Test Product X														
2															
3	Survey	Test	Test			Annual	Zip	Rank	Rank	Rank					
4	Area	Rep	Number	Age	Sex	Income	Code	Taste	Pkg	Price	Buy				
5	3	1	218	26	F	19,300	86560	4	2	3	N				
6	3	2	453	21	M	14,700	21204	1	3	2	N				
7	3	1	211	35	M	23,600	71636	1	1	1	N				
8	1	3	721	39	F	30,000	91570	2	3	2	Y				
9	1	3	722	21	M	16,700	43798	1	3	3	Y				
10															
11	5	21	291	45	F	17,500	72756	4	4	1	N				
12	3	12	454	41	F	23,000	52707	5	2	1	Y				
13	5	21	290	76	F	3,600	16968	3	3	2	N				
14	A	B	112	35	M	31,000	57636	2	1	2	Y				
15	A	B	114	28	M	24,600	55947	1	4	1	Y				
16	1	3	723	51	F	8,000	13623	4	2	2	Y				
17	A	B	113	49	M	21,300	17263	3	1	1	N				
18	B	12	455	35	F	0	38566	5	3	2	Y				

Fig. 10.6.
*Inserting a
record row in
the database.*

To delete records, first highlight a single cell in the row you want to delete or a contiguous range of cells in the rows you want to delete. Then select **Worksheet Insert/Delete** and choose the **Delete** and **Row** options. If you want to delete the inactive records in a database, consider first using the **Data Query** command and the **Extract** option to store the copies of the inactive records in a separate file before you delete the records.

The process of modifying fields in a database is the same as that for modifying the contents of cells in any other application. As you learned in Chapter 3, you change the cell contents either by retyping the cell entry or by using the **Edit** (Alt-F2) feature (not the **Edit** command) and editing the entry.

Cue:
Archive inactive records by using the **Data Query** command's **Extract** option before you delete them from the main database.

Reminder:

Add new fields to your database or delete existing fields with the Worksheet Insert/Delete Command.

To add a new field (column) to a database, position the cell pointer anywhere in the column that will be to the right of the newly inserted column. Issue the Worksheet Insert/Delete command and choose **Insert** and **Column**. Then fill the field with values for each record. For example, to insert a **DATE** field between the **NUMBER** and **AGE** fields in the marketing research database, position the cell pointer on any cell in the **AGE** column, use the Worksheet Insert/Delete command as just explained, and type the new field name in cells D3 and D4 (see fig. 10.7).

To delete a field, position the cell pointer anywhere in the column you want to remove and then use the Worksheet Insert/Delete command with the **Delete** and **Column** options.

All other commands, such as those for moving cells, formatting cells, displaying the contents of worksheets, and so on, work the same for database applications as they do for worksheet applications.

Fig. 10.7.
Inserting a
column for
a new field.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1207.WK1 9:19 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

D4 'Date' READY

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Marketing Research Database: Test Product X													
2	Survey	Test	Test	Test				Annual		Zip	Rank	Rank	Rank	
3	Area	Rep	Number	Date	Age	Sex	Income	Code	Taste	Pkg	Price			
4	B	1	218		26	F	19,300	86560	4	2	3			
5	B	2	453		21	M	14,700	21204	1	3	2			
6	B	1	211		35	M	23,600	71636	1	1	1			
7	1	3	721		39	F	30,000	91570	2	3	2			
8	1	3	722		21	M	16,700	43798	1	3	3			
9	5	21	291		45	F	17,500	72756	4	4	1			
10	B	12	454		41	F	23,000	52787	5	2	1			
11	5	21	290		76	F	3,600	16968	3	3	2			
12	A	B	112		35	M	31,000	57636	2	1	2			
13	A	B	114		28	M	24,600	55947	1	4	1			
14	1	3	723		51	F	8,000	13623	4	2	2			
15	A	B	113		49	M	21,300	17263	3	1	1			
16	B	12	455		35	F	0	38566	5	3	2			
17	5	21	289		26	F	25,200	46628	2	1	2			

Sorting Database Records

Lotus-DM's data-management capability lets you change the order of records by sorting them according to the contents of the fields. A number of options are provided with the Data Sort command (see fig. 10.8).

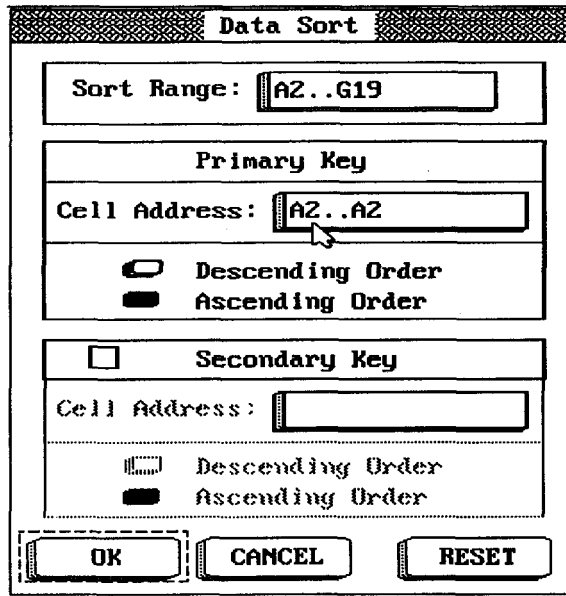


Fig. 10.8.
The Data Sort
dialog box.

To sort the database, start by selecting a sort range. This range must be long enough to include all the records to be sorted and wide enough to include all of the fields in each record. Do not include the field-name row in this range. (If you are unfamiliar with how to designate ranges or how to name them, see Chapter 4.)

The range to sort does not have to include the entire database. If part of the database already has the organization you want or if you don't want to sort all the records, you can sort only a portion of the database.

After choosing the data range, issue the Data Sort command to see the many options on the Data Sort dialog box. The next step is to specify the key(s) for the sort. *Keys* are the fields to which you attach the highest precedence when the database is sorted. The field with the highest precedence is the *primary key*; the field with the next highest precedence is the *secondary key*. You must specify a primary key, but the secondary key is optional.

After you specify the range to sort, the key field(s) on which to base the reordering of the records, and whether the sort order is ascending or descending, select Go to execute the command. If you think you may want to restore the file to its original order, use File Save or File Save As to save the database to disk before you issue a Sort command.

Reminder:

Do not include the field-name row when you designate a sort range.

Cue:

Use File Save or File Save As before sorting a database in case you need to restore the original order.

Sorting on One Key

One of the simplest examples of a database sorted according to a primary key (often called a *single-key database*) is a telephone book. All the records in the telephone book are sorted in ascending alphabetical order using the last name as the primary key. You can use an ascending alphabetical sort to reorder the records in the address database shown in figure 10.9.

Fig. 10.9.
The unsorted
address
database.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1209.WK1 9:28 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

A1 IW111 'LAST' READY

	A	B	C	D	E	F	G
1	LAST	FIRST	STREET ADDRESS	CITY	STATE	ZIP	
2	Menninger	Thalia	566 Tuesday Ct.	Meld	WA	99801	0
3	Hackenbush	Hugo	333 Horse Way	Newport	KY	44567	0
4	Driftwood	Otis P.	1800 Shipping Lane	Victor	CO	80903	0
5	Martinet	Jean	872 Stern Pl.	Sarge	UT	89954	0
6	Whiteside	Sheridan	776 Wooley Ave.	Beardley	RI	05644	0
7	Kimble	Richard	999 Jansen St.	Nomad	DH	78443	0
8	Firefly	Rufus T.	345 Marx Lane	Freedonia	NH	10578	0
9	Tetrazzini	Louisa	45 Opera Blvd.	Spinto	CT	07655	0
10	Mahler	Gustav	544 Erde Ave.	Kinder	NY	09982	0
11	Kane	Charles F.	666 Rosebud Ave.	Herald	NM	89223	0
12	Malloy	Terry	99 Dockside Pl.	Marlon	TN	55784	0
13	Bates	Norman	3334 Toten Lane	Smertz	GA	55567	0
14	Bickle	Travis	3334 Taxi Drive	New York	NY	10019	0
15	Mantee	Duke	334 Bogart Ave.	Sierra	CA	98875	0
16	Babbit	George	1932 Keystone St.	Kenton	OH	43326	0
17	Helish	Fielding	453 San Marcos St.	Allen	DH	67754	0
18	Hollerith	Herman	4666 Punch Ave.	Carden	MO	63856	0

To sort the records alphabetically on the LAST name field, first select the range you want to sort (A2..G19 in this case). Issue the Data Sort command and move the cursor to the **Primary Key** field in the dialog box. Type the address of any cell in the field on which you want to base the sort (in this example, you want to sort on the LAST field, so type any cell address in column A), for example, **A1**. Select a sort order—either ascending or descending. For this example, choose **Ascending Order** and then select **OK** to execute the sort. Figure 10.10 shows the address database sorted in ascending order by last name.

Cue:
Add a new
record to a
sorted database
by entering the
record at
the bottom of the
database and
then resorting
the database.

You can add a record to an alphabetized name-and-address database without having to insert a row manually to place the new record in the proper position. Simply add the new record to the bottom of the current database, expand the range to be sorted, and sort the database again by last name.

Help F₁ Feb 12, 1996 Lotus-DH - C:\123\DM-TEMP\F1210.WK1 9:29 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

A1 [W11] 'LAST' READY

	A	B	C	D	E	F	
1	LAST	FIRST	STREET ADDRESS	CITY	STATE	ZIP	0.
2	Babbitt	George	1932 Keystone St.	Kenton	OH	43326	0.
3	Bates	Norman	3334 Totten Lane	Smertz	GA	55567	0.
4	Bickle	Travis	3334 Taxi Drive	New York	NY	10019	0.
5	Chauvin	Nicolas	1919 Patriots' Way	Paris	KY	47823	0.
6	Driftwood	Otis P.	1800 Shipping Lane	Victor	CO	80903	0.
7	Firefly	Rufus T.	345 Marx Lane	Freedonia	NH	10578	0.
8	Hackenbush	Hugo	333 Horse Way	Newport	KY	44567	0.
9	Hollerith	Herman	4666 Punch Ave.	Carden	MO	69856	0.
10	Kane	Charles F.	666 Rosebud Ave.	Herald	NM	89223	0.
11	Kimble	Richard	999 Jansen St.	Nomad	OH	78443	0.
12	Mahler	Gustav	544 Erde Ave.	Kinder	NY	09982	0.
13	Malloy	Terry	99 Dockside Pl.	Marlon	TN	55784	0.
14	Mantee	Duke	334 Bogart Ave.	Sierra	CA	98875	0.
15	Martinet	Jean	872 Stern Pl.	Sarge	UT	89954	0.
16	Melish	Fielding	453 San Marcos St.	Allen	OH	67754	0.
17	Menninger	Thalia	566 Tuesday Ct.	Weld	WA	99801	0.
18	Tetrazzini	Louisa	45 Opera Blvd.	Spinto	CT	07655	0.

Fig. 10.10.
The address
database
sorted on the
LAST field.

Sorting on Two Keys

A *double-key database* is sorted by both a primary and a secondary key. In a business directory, for example, records are sorted first according to business type (the primary key) and then by business name (the secondary key). This section explains how to reorder the address database first by state and then by city within state.

Preselect the range A2..G19 of the address database and select the Data Sort command. Specify any cell in column E (the STATE field) as the *Primary Key* and choose *Ascending Order* to sort the states alphabetically. Specify any cell in column D (the CITY field) as the *Secondary Key* and choose *Ascending Order* to sort the cities in alphabetical order. Select OK to execute the sort. Figure 10.11 shows the results of the two-key sort.

As you can see, records are now grouped first by state in alphabetical order (California, Colorado, Connecticut, Georgia, Kentucky, and so on) and then by city within state (Newport, KY before Paris, KY). When you determine whether to use a primary or secondary key, be sure to request a reasonable sort. For example, do not try to sort first on city and then on state within city. Also, whenever possible, place the fields you plan to use as sort keys in the left columns of the database. With this placement, you don't have to hunt for the results of the sort.

Fig. 10.11.
The address
database sorted
by CITY within
STATE.

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1211.WK1 9:32 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F8 F9 F10

A1 (W11) LAST READY

	A	B	C	D	E	F
1	LAST	FIRST	STREET ADDRESS	CITY	STATE	ZIP
2	Hantee	Duke	334 Bogart Ave.	Sierra	CA	98875
3	Driftwood	Otis P.	1800 Shipping Lane	Victor	CO	80903
4	Tetrazzini	Louisa	45 Opera Blvd.	Spinto	CT	07655
5	Bates	Morman	3334 Toten Lane	Smertz	GA	55567
6	Hackenbush	Hugo	333 Horse Way	Newport	KY	44567
7	Chauvin	Nicolas	1919 Patriots' Way	Paris	KY	47823
8	Hollerith	Herman	4666 Punch Ave.	Carden	MO	69856
9	Firefly	Rufus T.	345 Marx Lane	Freedonia	NH	10578
10	Kane	Charles F.	666 Rosebud Ave.	Herald	NM	89223
11	Mahler	Gustav	544 Erde Ave.	Kinder	NY	09982
12	Bickle	Travis	3334 Taxi Drive	New York	NY	10019
13	Melish	Fielding	453 San Marcos St.	Allen	OH	67754
14	Babbitt	George	1932 Keystone St.	Kenton	OH	43326
15	Kimble	Richard	999 Jansen St.	Nomad	OH	78443
16	Whiteside	Sheridan	776 Wooley Ave.	Beardley	RI	05644
17	Malloy	Terry	99 Dockside Pl.	Marlon	TN	55784
18	Martinet	Jean	872 Stern Pl.	Sarge	UT	89954

Determining the Collating Sequence

Caution:
Do not include
blank rows past
the end of the
database when
you designate
the data range
for a sort.

The order in which records appear after a sort depends on the ASCII values of the contents of the primary and secondary keys. For this reason, you should not include blank rows past the end of the database when you designate the data range. Because blanks have precedence over all the characters in a sort, the blank rows appear at the top of a sorted database.

Lotus-DM sorts information in the following order if you choose **Ascending Order** from the Data Sort dialog box:

- ☐ Blank cells
- ☐ Labels beginning with numbers
- ☐ Labels beginning with letters
- ☐ Labels beginning with other characters
- ☐ Values

If you have entered numbers as labels ('567', for example), a problem can occur because Lotus-DM sorts from left to right, one character at a time. For example, if you sort the marketing research database shown in figure 10.5 in ascending order according to the representative who administered the test (the REP field in column B), the results resemble those in figure 10.12.

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1212.WK1 9:33 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

B4 [W5] 'Rep READY

Marketing Research Database: Test Product X											
Survey	Test	Test			Annual	Zip	Rank	Rank	Rank		
Area	Rep	Number	Age	Sex	Income	Code	Taste	Pkg	Price	Buy	
3	1	211	35	M	23,600	71636	1	1	1	N	
3	1	218	26	F	19,300	86560	4	2	3	N	
7	12	455	35	F	0	38566	5	3	2	Y	
8	12	454	41	F	23,000	52787	5	2	1	Y	
9	2	453	21	M	14,700	21204	1	3	2	N	
10	5	21	290	76	F	3,600	16968	3	3	2	N
11	5	21	291	45	F	17,500	72756	4	4	1	N
12	5	21	289	26	F	25,200	46628	2	1	2	Y
13	1	3	723	51	F	8,000	13623	4	2	2	Y
14	1	3	721	39	F	30,000	91570	2	3	2	Y
15	1	3	722	21	M	16,700	43798	1	3	3	Y
16	a	8	113	49	M	21,300	17263	3	1	1	N
17	a	8	114	28	M	24,600	55947	1	4	1	Y
18	a	8	112	35	M	31,000	57636	2	1	2	Y

Fig. 10.12.
An erroneous
ascending sort.

Although you may expect the records to be sorted in ascending order on the REP field, notice that the 12 in rows 7 and 8 appears before the 2 in row 9, and that 21 appears before 3. This problem occurs because Lotus-DM sorts the numbers one character at a time when sorting labels. To bypass the problem, enter a zero (0) before each single-character REP field. Figure 10.13 shows the corrected sort.

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1213.WK1 9:33 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

B4 [W5] 'Rep READY

Marketing Research Database: Test Product X											
Survey	Test	Test			Annual	Zip	Rank	Rank	Rank		
Area	Rep	Number	Age	Sex	Income	Code	Taste	Pkg	Price	Buy	
3	01	211	35	M	23,600	71636	1	1	1	N	
3	01	218	26	F	19,300	86560	4	2	3	N	
7	02	453	21	M	14,700	21204	1	3	2	N	
8	03	721	39	F	30,000	91570	2	3	2	Y	
9	03	722	21	M	16,700	43798	1	3	3	Y	
10	03	723	51	F	8,000	13623	4	2	2	Y	
11	08	114	28	M	24,600	55947	1	4	1	Y	
12	08	113	49	M	21,300	17263	3	1	1	N	
13	08	112	35	M	31,000	57636	2	1	2	Y	
14	12	454	41	F	23,000	52787	5	2	1	Y	
15	12	455	35	F	0	38566	5	3	2	Y	
16	5	21	289	26	F	25,200	46628	2	1	2	Y
17	5	21	291	45	F	17,500	72756	4	4	1	N
18	5	21	290	76	F	3,600	16968	3	3	2	N

Fig. 10.13.
The corrected
ascending sort.

Restoring the Presort Order

Cue:
Add a
"counter" field
to your
database in
case you want
to restore
records to their
original order.

If you sort most databases, you cannot restore the records to their original order. If you add a "counter" column to the database before doing any sort, however, you can sort the records on any field and then restore the original order by sorting on the counter field.

Figure 10.14 shows the counter field NUM, which has been added in column A. After you sort the database on a particular column, you can sort again on the NUM field to restore the records to their original order.

Fig. 10.14.
*Inserting a
counter field in
an original
database.*

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1214.WK1 9:34 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F8 F9 F10

A5 [W4] 1 READY

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1		Marketing Research Database: Test Product X														
2		Rec	Survey	Test	Test			Annual	Zip		Rank	Rank	Rank			
3		Num	Area	Rep	Number	Age	Sex	Income	Code	Taste	Pkg	Price	Buy			
4		1	B	1	218	26	F	19,300	B6560	4	2	3	N			
5		2	b	2	453	21	M	14,700	21204	1	3	2	N			
6		3	B	1	211	35	M	23,600	71636	1	1	1	N			
7		4	1	3	721	39	F	30,000	91570	2	3	2	Y			
8		5	1	3	722	21	M	16,700	43798	1	3	3	Y			
9		6	S	21	291	45	F	17,500	72756	4	4	1	N			
10		7	B	12	454	41	F	23,000	52787	5	2	1	Y			
11		8	S	21	290	76	F	3,600	16968	3	3	2	N			
12		9	A	8	112	35	M	31,000	57636	2	1	2	Y			
13		10	A	8	114	28	M	24,600	55947	1	4	1	Y			
14		11	1	3	723	51	F	8,000	13623	4	2	2	Y			
15		12	a	8	113	49	M	21,300	17263	3	1	1	N			
16		13	B	12	455	35	F	0	38566	5	3	2	Y			
17		14	S	21	289	26	F	25,200	46628	2	1	2	Y			

Searching (Querying) for Records

You have learned how to use the Data Sort command to reorganize information from the database by sorting records according to key fields. In this section, you learn how to use Data Query to search for records and then edit, extract, or delete the records you find.

You can use the tools inventory database shown in figure 10.15 to learn the basic concepts of Lotus-DM's query operations.

Looking for records that meet certain conditions is the simplest form of searching a Lotus-DM database. To determine when to reorder items, for example, you can use a search operation to find any records with an ON HAND QUANTITY of less than 4 units.

Once you locate the information you want, you can extract the found records from the database to another section of the worksheet separate from the database. For example, you can extract all records with a specified P.O. DATE (purchase-order date) and print the extracted area as a record of pending purchases.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1215.WK1 9:34 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

A1 [W251 'Physical Inventory: Hand Tool Stores' READY

	A	B	C	D	E	F
1	Physical Inventory: Hand	Tool Stores #3				
2						
3		On Hand	Unit of	Unit	Inventory	P.O.
4	Description	Quantity	Issue	Cost	Value	Date
5	Hammer, Claw	2	EA	6.75	13.50	08/02/87
6	Screwdriver, flat tip set	17	EA	9.95	169.15	
7	Tack Hammer, 3/8"drive	24	EA	4.30	103.20	
8	Air Hammer, magnetized	1	KT	67.32	67.32	08/24/87
9	Phillips screwdriver set	8	EA	8.73	69.84	
10	Hack saw	3	EA	11.89	35.67	09/08/87
11	Counter sink set, 10pc	3	KT	13.44	40.32	09/15/87
12	Drop Light, 100 foot	4	EA	17.99	71.96	
13	Square	0	EA	37.50	0.00	09/15/87
14	Hex Wrench Set	2	KT	14.50	29.00	
15	Wrench, box/open	0	ST	46.70	0.00	08/31/87
16	Pipe wrench, 14 inch	4	EA	56.70	226.80	
17						
18						

Fig. 10.15.
The initial tools
inventory
database.

Using Lotus-DM's query operations, you can look for only the first occurrence of a specified field value. With this feature, you can develop a unique list of field entries. For example, you can search the UNIT OF ISSUE field to extract a list of the different units of issue. Another query option lets you delete all inventory records that meet a specific criterion (for which quantity on-hand equals zero, for example, if you don't want to reorder these items).

Understanding the Minimum Search Requirements

To initiate any search operation, you select the operation from the Data Query dialog box (see fig. 10.16).

For any Data Query operation, you must specify input and criterion ranges, which give the locations of the search area and the search conditions, respectively. You establish an output range only when you select the **Extract** or **Unique** option; both these options copy records or parts of records to an area outside the database.

Fig. 10.16.
The Data
Query
dialog box.

The Reset button removes all previous search-related ranges so that you can specify a different search location and conditions.

The five operations in the Data Query dialog box perform the following search functions:

<i>Operation</i>	<i>Description</i>
Find Previous	Moves up through a database and positions the cursor on the next previous record that matches the given criteria. You can enter or change data in the records.
Find Next	Moves down through a database and positions the cursor on the next record that matches the given criteria. You can enter or change data in the records.
Delete	Deletes from a database all the records that match given criteria and shifts the remaining records to fill in the gaps that remain.

<i>Operation</i>	<i>Description</i>
Extract	Copies in a specified area of the work sheet all or some of the fields in records that match the given criteria.
Unique	Similar to Extract, but recognizes that some of the field contents in the database may be duplicates of other cell entries in the same fields. Eliminates duplicates as entries are copied to the output range.

To perform a Data Query operation, you must specify both an input range and a criterion range and select one of the five search options. (Before issuing a Unique or Extract command, you also must specify an output range.)

Reissuing a Data Query Command

If you issue a Data Query command and then make changes only to the content of the criterion range, you can reissue the last Data Query operation by pressing Query (Ctrl-F7) from READY mode.

Cue:
Reissue a Data Query command by pressing Query (Ctrl-F7).

Determining the Input Range

The *input range* for a Data Query command is the range of records you want to search. The specified area does not have to include the entire database. In the tools inventory database, for example, specifying an input range of A4..F16 defines the area of search as the entire database. Entering A4..B16 as the input range limits the search area to the fields for tool descriptions and on-hand quantities.

Whether you search all or only part of a database, you must include the field-name row in the input range. If the field names occupy space on more than one row, specify only the bottom row in the input range. In the tools inventory database, for example, even though rows 3 and 4 both contain portions of the field names, you enter A4..F16 instead of A3..F16 for the input range.

Reminder:
You must include the field name in the input range whether you search all or only part of a database.

You may find that preselecting a range before using the Data Query command is easier. If you preselect a range, you don't have to type the addresses of the range in the *Input Range* field of the Data Query dialog box.

Determining the Criterion Range

When you want Lotus-DM to search for records that meet certain criteria, you must be able to talk to Lotus-DM in terms the program can understand. Suppose that you want to identify all records in the address database that contain OH in the STATE field. When the database is on-screen and Lotus-DM is in READY mode, type **STATE** in cell H2 and **OH** in cell H3 (see fig. 10.17). Type **Criterion Range** in cell H1 only if you want the documentation this label provides; cell H1 is not directly involved in the search command.

Fig. 10.17.
*Establishing
a single
search
condition.*

Help F₁ Feb 26, 1990 Lotus-DM - C:\LOTUS-DM\17ADDR.WK1 11:46 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀

H2	STATE						READY
	D	E	F	G	H	I	J
1	CITY	STATE	ZIP		Criterion Range		
2	Weld	MA	09801		STATE		
3	Newport	KY	44567		OH		
4	Victor	CO	80903				
5	Sarge	UT	89954				
6	Beardley	RI	05644				
7	Nomad	OH	78443				
8	Freedonia	NH	10578				
9	Spinto	CT	07655				
10	Kinder	NY	09982				
11	Herald	NH	89223				
12	Marlon	TN	55784				
13	Swertz	GA	55567				
14	New York	NY	10019				
15	Sierra	CA	98875				
16	Kenton	OH	43326				
17	Allen	OH	67754				
18	Carden	MO	69856				

Highlight the range A1..F19 as the input range and activate the Data Query command. Specify the range H2..H3 in the **Criterion Range** field.

Reminder:
The criterion range must include the field names in the first row and a criterion or criteria in the second row.

You can use numbers, labels, or formulas as a criterion. A criterion range can be up to 32 columns wide and 2 or more rows long. The first row must contain the field names of the search criteria, such as STATE in row 2. The rows below the unique field names contain the actual criteria, such as OH in row 3. The field names in the input range and the criteria range must match.

By entering the input and criterion ranges, you have completed the minimum requirements for executing all but the Extract or Unique operations. Be sure that the specific field names are above the criteria conditions in the worksheet before you issue the Data Query command.

Issuing the Find Previous and Find Next Commands

If you have never used the **Find Next** option on the database in the current session, the **Find Previous** option is shadowed (you cannot select it) in the **Data Query** dialog box. If you choose **Find Next** and then select **OK**, a highlighted bar rests on the first record in the input range that meets the conditions specified in the criterion range. After one record has been found, you can use either the **Find Previous** or **Find Next** option; depending on your selection, either the last previous record or the next record after the current record to match the selection criterion is highlighted. In figure 10.18, the highlighted bar rests on the first record that includes **OH** in the **STATE** field.

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1218.WK1 9:41 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

A7 [W11] 'Kimble' READY

	A	B	C	D	E	F
	LAST	FIRST	STREET ADDRESS	CITY	STATE	ZIP
1	Penninger	Thalia	566 Tuesday Ct.	Weid	MA	99801
2	Hackenbush	Hugo	333 Horse Way	Newlyt	KY	44567
3	Driftwood	Otis P.	1806 Shipping Lane	Victor	CO	80903
4	Martinet	Jean	872 Stern Pl.	Sarge	UT	89954
5	Whiteside	Sheridan	776 Wooley Ave.	Beardley	RI	05644
6	Kimble	Richard	999 Jansen St.	Nomad	OH	78443
7	Firefly	Rufus T.	345 Marx Lane	Freedonia	NH	10578
8	Tetrazzini	Louisa	45 Opera Blvd.	Spinto	CT	07655
9	Mahler	Gustav	544 Erde Ave.	Kinder	NY	09982
10	Kane	Charles F.	666 Rosebud Ave.	Herald	NM	89223
11	Malloy	Terry	99 Dockside Pl.	Marlon	TN	55784
12	Bates	Norman	3334 Tuten Lane	Smertz	GA	55567
13	Bickle	Travis	3334 Taxi Drive	New York	NY	10019
14	Mantee	Duke	334 Bogart Ave.	Sierra	CA	98875
15	Babbitt	George	1932 Keystone St.	Kenton	OH	43326
16	Melish	Fielding	453 San Marcos St.	Allen	OH	67754
17	Hollerith	Herman	4666 Punch Ave.	Carden	MO	69856

Fig. 10.18.
The first record highlighted in a **Find Next** operation.

Defining the Output Range

Choose a blank area in the worksheet as the output range to receive records copied in an **Extract** or **Unique** operation. Designate the range to the right or below the database. In figure 10.19, for example, both the criterion range and the output range have been placed below the records in the address database.

In the first row of the output range, copy the names of only those fields whose contents you want to extract. You do not have to copy these names in the same order as they appear in the database. (In fig. 10.19, the output-range entry in cell A27 is for documentation purposes only, and all field names in row 28 have been reproduced in the existing order of the database.)

Fig. 10.19.
The criterion
range and
output range.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1219.WK1 9:42 am

File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
A21	[W11]	'Criterion Range					READY
17	Melish	Fielding	453 San Marcos St.	Allen	OH	67754	
18	Hollerith	Herman	4666 Punch Ave.	Carden	MO	69856	
19	Chauvin	Nicolas	1919 Patriots' Way	Parish	KY	47823	
20							
21	Criterion Range						
22	LAST	FIRST	STREET ADDRESS	CITY	STATE	ZIP	
23							
24							
25							
26							
27	Output Range						
28	LAST	FIRST	STREET ADDRESS	CITY	STATE	ZIP	
29							
30							
31							
32							
33							
34							

Reminder:

Field names in the criterion and output ranges must match the corresponding field names in the input range.

The field names in both the criterion and output ranges must match the corresponding field names in the input range. To avoid mismatch errors, use the Edit Copy command to copy the database field names to the criterion and output ranges.

Select Data Query and choose either **Extract** or **Unique**. The **Output Range** field is activated. Type the range location of the output area. You can create an open-ended extract area by entering only the field-name row as the range, or you can set the exact size of the extract area.

Caution:

If you do not allow sufficient room in the output range for extracted records, the Extract operation aborts.

To limit the size of the extract area, enter the upper left and lower right cell coordinates of the entire output range. The first row in the specified range must contain the field names; the remaining rows must accommodate the maximum number of records you expect to receive from the extract operation. Use this method when you want to retain additional data located below the extract area. For example, in figure 10.19, naming A28..F36 as the output range limits incoming records to eight. If you do not allow sufficient room in a fixed-length output area, the Extract operation aborts, and the message **too many records for output range** is displayed in a dialog box. Choose **OK** to return to the command or select **Help** to see a context-sensitive help screen.

To create an open-ended extract area that does not limit the number of incoming records, include in the output range only the row that contains the output field names. For example, by naming A28..F28 as the output range in figure 10.19, you define the output area without limiting the number of records.

An extract operation first removes all existing data from the output range. If you use only the field-name row to specify the output area, all data below that row is destroyed to make room for the unknown number of incoming extracted records.

Caution:
The Extract operation deletes all data from the output range.

Executing an Extract Operation

An Extract operation works much the same as the Find operations. The Data Query Extract command requires an input, criterion, and output range, defined in the preceding sections.

To accelerate what seems to be a time-consuming setup process, establish standard input, criterion, and output areas and then assign range names to these locations. Keeping in mind the limit of 32 criterion fields, you may want to establish a single criterion range (such as the range A22..F23 in fig. 10.19) that encompasses all the fields on which you might search. By establishing such a range, you save the time needed to respecify a criterion range for each extract on different field names. If the criterion range contains many unused field names, however, the price you pay for decreased setup time is some loss in speed of execution.

To explain the extract process using the address database, create a list of all records with OH in the STATE field. Assuming that rows 22 and 28 contain the field names (as shown in fig. 10.19), type **OH** in cell E23. Specify an input range of A1..F19, a criterion range of A22..F23, and an output range of A28..F28. Figure 10.20 shows the results of the extract. The output range contains three records, each of which meets the condition STATE = OH.

Fig. 10.20.
A full-record extract on an "exact match" label condition.

Help F ₁		Feb 12, 1990		Lotus-DH - C:\123\DH-TEMP\F1220.WK1		9:43 am	
File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
E23	OH						READY
	A	B	C	D	E	F	
15	Mantee	Duke	334 Bogart Ave.	Sierra	CA	98875	
16	Babbit	George	1932 18th St.	Kenton	OH	43326	
17	Melish	Fielding	453 San Marcos St.	Allen	OH	67754	
18	Hollerith	Herman	4666 Punch Ave.	Carden	MO	69856	
19	Chauvin	Nicolas	1919 Patriots' Way	Paris	KY	47823	
20							
21	Criterion Range						
22	LAST	FIRST	STREET ADDRESS	CITY	STATE	ZIP	
23					OH		
24							
25							
26							
27	Output Range						
28	LAST	FIRST	STREET ADDRESS	CITY	STATE	ZIP	
29	Kimble	Richard	999 Jansen St.	Nomad	OH	78443	
30	Babbit	George	1932 18th St.	Kenton	OH	43326	
31	Melish	Fielding	453 San Marcos St.	Allen	OH	67754	
32							

Cue:
You can extract
partial records or
scramble the
order of the fields
by altering the
field-name row in
the output range.

You do not have to extract entire records or maintain the order of field names within the extracted records. For example, you can combine the first-name and last-name fields in a new field (NAME) and then extract only the NAME and CITY information from records that have OH in the STATE field. To do this, type **NAME** in cell G1 and then type the string formula **+B2&" "&A2** in cell G2 (see fig. 10.21).

Fig. 10.21.
*Creating the
NAME field in
the address
database.*

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1221.WK1 9:44 am

File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F9	F10
G2		+B2&" "&A2				READY	
	C	D	E	F	G	H	I
1	STREET ADDRESS	CITY	STATE	ZIP	NAME		
2	566 Tuesday Ct.	Weld	WA	99801	Thalia Menninger		
3	333 Horse Way	Newport	KY	44567			
4	1800 Shipping Lane	Victor	CO	80903			
5	872 Stern Pl.	Sarge	UT	89954			
6	776 Wooley Ave.	Beardley	RI	05644			

After you copy the contents of cell G2 to the range G3..G19, use the Range Value command to convert the formulas in G2..G19 to values. Next, use Edit Clear to erase the field names in row 28. Type the new field name **NAME** in cell A28, skip column B (for spacing purposes), and type the second field name **CITY** in cell C28. When you display the Data Query dialog box, specify the output range as A28..C28, and expand both the input and criterion ranges to include the new column G. This operation extracts the name and city information for all records of individuals living in Ohio (see fig. 10.22).

Fig. 10.22.
*A partial-
record
extract on a
single-label
condition.*

Help F1 Feb 26, 1990 Lotus-DM - C:\LOTUS-DM\22ADDR.WK1 11:59 pm

File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F9	F10
E23		"OH				READY	
	A	B	C	D	E	F	
14	Bickle	Travis	3334 Taxi Drive	New York	NY	10019	Tr
15	Mantee	Duke	334 Bogart Ave.	Sierra	CA	90875	Du
16	Babbit	George	1932 Keystone St.	Kynton	OH	43326	Ge
17	Melish	Fielding	453 San Marcos St.	Allen	OH	57754	Fi
18	Hollerith	Herman	4666 Punch Ave.	Carden	MO	59856	He
19	Chauvin	Nicolas	1919 Patriots' Way	Paris	KY	47823	Ni
20							
21	Criterion Range						
22	LAST	FIRST	STREET ADDRESS	CITY	STATE	ZIP	
23					OH		
24							
25							
26							
27	Output Range						
28	NAME		CITY				
29	Richard Kimble		Monad				
30	George Babbit		Kenton				
31	Fielding Melish		Allen				

Creating More Complex Criterion Ranges

In addition to an “exact match” search on a single label field, Lotus-DM permits a wide variety of record searches: on exact matches to numeric fields; on partial matches of field contents; on fields that meet formula conditions; on fields that meet all of several conditions; and on fields that meet either one condition or another. The following section looks at variations of queries on single fields.

Using Wild Cards in Criterion Ranges

You can use Lotus-DM's wild cards to match labels in database operations. The characters ?, *, and ~ have special meaning when used in a criterion range. The ? character instructs Lotus-DM to accept any character in that specific position and can be used only to locate fields of the same length. You can use the * character, which tells Lotus-DM to accept any and all characters that follow, on field contents of unequal length. By placing a tilde (~) symbol at the beginning of a label, you tell Lotus-DM to accept all values *except* those that follow. Table 10.1 shows how you can use wild cards in search operations.

Reminder:

You can use wild cards to match labels in database operations.

Table 10.1
Using Wild Cards in Search Operations

<i>Enter</i>	<i>To Find</i>
N?	NC, NJ, NY, <i>and so on</i>
BO?L?	BOWLE <i>but not</i> BOWL
BO?L*	BOWLE, BOWL, BOLLESON, BOELING, <i>and so on</i>
SAN*	SANTA BARBARA, SAN FRANCISCO
SAN *	SAN FRANCISCO
~N*	<i>Strings in specified fields that do not begin with the letter N</i>

Use the ? and * wild-card characters when you are unsure of the spelling used in field contents. Be sure that the results of any extract operation that uses a wild card are what you need. Be extremely careful when you use wild cards in a Data Query Delete command. If you are not careful, you can remove more records than you intend.

Entering Formulas in Criterion Ranges

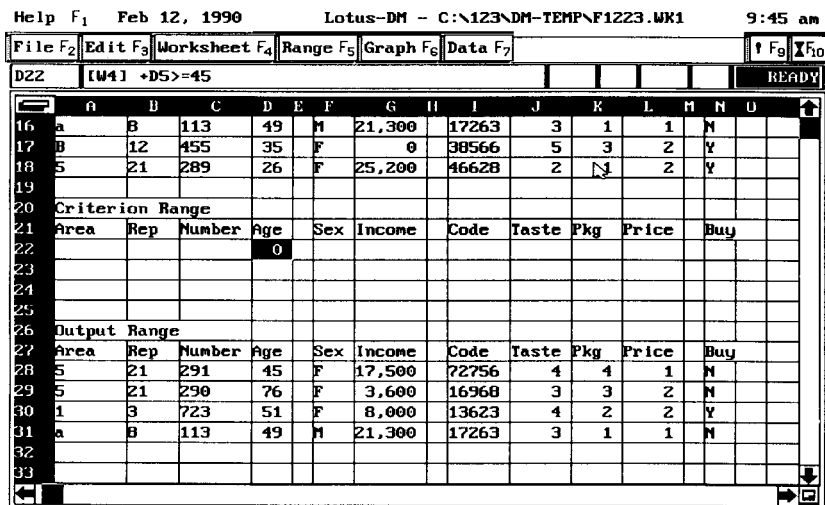
To set up formulas that query numeric fields in the database, you can use the following relational operators:

Operator	Meaning
>	Greater than
>=	Greater than or equal to
<	Less than
<=	Less than or equal to
=	Equal to
<>	Not equal to

Create a formula that references the first field entry in the numeric column you want to search. Lotus-DM tests the formula on each cell in that column until the program reaches the end of the specified input range.

You can place the formula anywhere below the criterion range's field-name row (unlike text criteria, which must appear directly below the associated field name). For example, you can use a formula based on information already in the marketing research database to extract the records of test participants who are at least 45 years old. First, type the formula **+D5>=45** in cell D22 (see fig. 10.23).

Fig. 10.23.
Extracting
records with a
relative-formula
condition.



Notice that the formula is displayed in the control panel and that 0 is displayed in cell D22. The formula checked whether the contents of cell D5 (where the AGE field contains the value 26) was greater than or equal to 45; because 26 was not greater than 45, the formula returned zero to indicate a false condition. (To better understand the search condition as it appears in the criterion range, use the Range Format command and select the Text option to change the display from 0 to the formula `+D5>=45`. The AGE column in this example is so narrow, however, that the full formula is not displayed.)

After you specify the input, criterion, and output ranges correctly, executing Data Query Extract produces four records for which AGE equals or exceeds 45 years. An AGE criterion of `+D5>45` would extract three records; the formula `+D5=45` would extract one record.

To reference cells outside the database, use formulas that include absolute cell addressing. (For addressing information, refer to Chapter 4.) Suppose that immediately after you issue the Data Query Extract command to extract records based on AGE, you want to extract the records of those respondents whose income exceeds the average income of all respondents. To do this, return to READY mode. Then determine the average income by entering `@AVG(G5..G18)` in a blank cell away from all database ranges. (In fig. 10.24, the averaging formula is entered in cell G24.)

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1224.WK1 9:46 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

G22 [W7] +G5>=\$G\$24 READY

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
17	B	12	455	35	F	0	38566	5	3	2	Y				
18	5	21	289	26	F	25,200	46628	2	1	2	Y				
19															
20	Criterion Range														
21	Area	Rep	Number	Age	Sex	Income	Code	Taste	Pkg	Price	Buy				
22						1									
23															
24			Average Income:			19,036									
25															
26	Output Range														
27	Area	Rep	Number	Age	Sex	Income	Code	Taste	Pkg	Price	Buy				
28	9	1	218	26	F	19,300	86560	4	2	3	N				
29	3	1	211	35	M	23,600	71636	1	1	1	M				
30	1	3	721	39	F	38,000	91570	2	3	2	Y				
31	B	12	454	41	F	23,000	52787	5	2	1	Y				
32	A	8	112	35	M	31,000	57636	2	1	2	Y				
33	A	8	114	28	M	24,600	55947	1	4	1	Y				
34	A	8	113	49	M	21,300	17263	3	1	1	M				

Fig. 10.24.
Extracting
records with a
mixed-formula
condition.

With the program still in READY mode, press Query (Ctrl-F7) to repeat the most recent query operation. Use the shortcut method of pressing Query (Ctrl-F7) to reissue a Data Query command only when you do not want to change the locations of the input, criterion, and output ranges. In figure 10.24, the extracted records indicate that eight of the respondents have incomes greater than the average income of all respondents (the eighth respondent is in row 35, off the screen).

Now that you have seen how to base a find or extract operation on only one criterion, you learn how to use multiple criteria for your queries. You can set up multiple criteria as AND conditions (in which all the criteria must be met) or as OR conditions (in which any one criterion must be met). For example, searching a music department's library for sheet music requiring drums AND trumpets is likely to produce fewer selections than searching for music appropriate for drums OR trumpets.

tools database have either KT or ST for a unit of issue.

Fig. 10.25.
An initial two-
field logical AND
search.

[illegible]

When you maintain a criterion range that includes many fields, you quickly can extract records based on an alternative condition. For example, access READY mode, change M to F in cell C24 (under SEX), and press the Query (Ctrl-F7) key. Lotus-DM immediately copies the records of female accounting majors to the extract range (see fig. 10.26).

You can continue to add conditions that must be met. Enter the additional criteria in the row immediately below the field-name row. For example, the extracted records in figure 10.27 are limited to female accounting majors under 30 years old.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1226.WK1 9:48 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₁₀

C24 [WS] 'F' READY

	A	B	C	D	E	F	G	H
19	Part	Marketing	F	33				
20	Part	Administration	F	19				
21								
22	Criterion Range							
23	Status	Major	Sex	Age				
24		Accounting	F					
25								
26								
27	Output Range							
28	Status	Major	Sex	Age				
29	Full	Accounting	F	27				
30	Part	Accounting	F	26				
31	Full	Accounting	F	35				
32	Full	Accounting	F	20				
33	Part	Accounting	F	29				
34	Full	Accounting	F	42				
35								
36								

Fig. 10.26.
A revised
two-field
logical AND
search.

Specifying OR Conditions

Criteria placed on the same row have the effect of a logical AND; they tell Lotus-DM to find or extract on this field condition AND this field condition AND this field condition and so on. Criteria placed on different rows have the effect of a logical OR; they tell Lotus-DM to find or extract on this field condition OR that field condition and so on. You can set up a logical OR search on one or more fields.

Searching a single field for more than one condition is the simplest use of an OR condition. To explain the concept, extract from the tools inventory database those records whose unit of issue is either KT (kit) or ST (set).

Under the ISSUE criterion field, type one condition immediately below the other (see fig. 10.28). Be sure to expand the criterion range to include the additional row. As you can see from the output range in figure 10.28, four records in the

Caution:
Make sure that your criterion range includes all rows that contain the multiple criteria.

Fig. 10.27.
A three-field
logical AND
search.

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1227.WK1 9:48 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

D24 [W5] +D2<30 READY

	A	B	C	D	E	F	G	H
19	Part	Marketing	F	33				
20	Part	Administration	F	19				
21								
22	Criterion Range							
23	Status	Major	Sex	Age				
24		Accounting	F	1				
25								
26								
27	Output Range							
28	Status	Major	Sex	Age				
29	Full	Accounting	F	27				
30	Part	Accounting	F	26				
31	Full	Accounting	F	28				
32	Part	Accounting	F	29				
33								
34								
35								
36								

Fig. 10.28.
A logical OR
search within a
single field.

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1228.WK1 9:49 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

C21 'ST READY

	A	B	C	D	E	F
12	Drop Light, 100 foot	4	EA	17.99	71.96	
13	Square	0	EA	37.50	0.00	09/15/87
14	Hex Wrench Set	2	KT	14.50	29.00	
15	Wrench, box/open	0	ST	46.70	0.00	08/31/87
16	Pipe wrench, 14 inch	4	EA	56.70	226.68	
17						
18	Criterion Range					
19	Description	Quantity	Issue	Cost	Value	Date
20			KT			
21			ST			
22						
23	Output Range					
24	Description	Quantity	Issue	Cost	Value	Date
25	Air Hammer, magnetized	1	KT	67.32	67.32	08/24/87
26	Counter sink set, 10pc	3	KT	13.44	40.32	09/15/87
27	Hex Wrench Set	2	KT	14.50	29.00	
28	Wrench, box/open	0	ST	46.70	0.00	08/31/87
29						

You also can specify a logical OR condition on two or more field conditions. Suppose that you want to search the marketing research database for records in which age is greater than 50 OR in which income exceeds \$25,000. Figure 10.29 shows the setup of the criteria in rows 22 and 23.

Type **+D5>50** in cell D22. In the next row, type **+G5>25000** in cell G23. (Remember that you can type formulas under any field name; you can enter these two formulas in cells A22 and A23, for example.) Adjust the criterion range to include the OR condition by expanding the criterion range down a row.

When you issue the Data Query command and choose the **Extract** option, five records are copied to the output range (see fig. 10.29). Although rows 29 and 31 in figure 10.29 do not reflect **INCOME** contents exceeding \$25,000, they do contain **AGE** contents over 50. Only one condition OR the other had to be met before the extract was made.

Help F1 Feb 12, 1990 Lotus-DH - C:\123\DH-TEMP\F1229.WK1 9:49 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F8 F9 F10

G23 [W7] +G5>25000 READY

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
17	B	12	455	35	F		0	38566	5	3	2	Y			
18	S	21	289	26	F	25,200	46628	2	1	2	Y				
19															
20	Criterion Range														
21	Area	Rep	Number	Age	Sex	Income	Code	Taste	Pkg	Price	Buy				
22				0											
23						0									
24															
25															
26	Output Range														
27	Area	Rep	Number	Age	Sex	Income	Code	Taste	Pkg	Price	Buy				
28	1	3	721	39	F	38,000	91570	2	3	2	Y				
29	5	21	290	76	F	3,600	16968	3	3	2	N				
30	A	8	112	35	M	31,000	57636	2	1	2	Y				
31	1	3	723	51	F	8,000	13623	4	2	2	Y				
32	5	21	289	26	F	25,200	46628	2	1	2	Y				
33															
34															

Fig. 10.29.
A logical OR
search on two
fields.

To add other OR criteria, move to a new row, enter each new condition, and expand the criterion range. If you reduce the number of rows involved in a logical OR search, be sure to contract the criterion range.

Although no technical reason prevents you from mixing AND and OR logical searches, the results of such a mixed query operation may not be of much use. Follow the format of placing each AND condition in the row immediately below the criterion field-name row, and each OR condition in a separate row below.

For example, if you want to search the marketing research database for records in which BUY equals Y (Yes) and INCOME is either less than \$10,000 or greater than \$30,000, erase the AGE search condition in cell D22 of figure 10.29 and then enter the AND and OR conditions in the following cells:

G22	+G5<10000
N22	Y
G23	+G5>30000
N23	Y

By specifying these conditions, you tell Lotus-DM to search for records in which INCOME is less than \$10,000 and the BUY response is Yes (row 22) OR for records in which INCOME is greater than \$30,000 and the BUY response is Yes (row 23). The criterion range (A21..N23) remains unchanged. Repeating the Y in cell N23 is critical (even though you have entered Y in cell N22) because if Lotus-DM finds a blank cell within a criterion range, the program selects all records for the field name above that blank cell.

You should test the logic of your search conditions on a small sample database in which you can verify search results easily by scrolling through all records and noting which of them should be extracted. For example, if the marketing research database contained hundreds of responses, you could test the preceding AND and OR search conditions on a smaller group of about 14 records.

Entering String Searches

Cue:
Use string
functions to
search on the
partial
contents of a
field.

If you want to perform a search on the partial contents of a field, you can use functions in a formula. Suppose that you can remember only the street name *Keystone* for a record you want to extract from the address database. If you safely can assume that all street addresses start with a number and have a space before the street name (*XXX Streetname*), you can use the following formula as the search criterion (see fig. 10.30):

@MID(C2,@FIND(" ",C2,0)+1,8)="keystone"

The double quotation marks (" ") in the formula instruct Lotus-DM to start the search after a blank space is encountered (between the street number and street name). The 1,8 portion of the formula instructs the program to search on the first through the eighth character positions, matching *Keystone* and eliminating the need to know whether *Street*, *Ave.*, *Avenue*, and so on, is part of the field. (Lotus-DM's string functions are not case sensitive; you can enter **Keystone**, **keystone**, or **KeYsToNe** as the text to match.) Issuing the Data Query Extract command produces one record in the output range (row 29). You also can use compound criteria to search on both CITY and part of the STREET ADDRESS field. (The Function Reference later in this book provides in-depth descriptions of the functions.)

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1230.WK1 9:50 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C23 [W20] @MID(C2,@FIND(" ",C2,0)+1,8)="keystone READY

	A	B	C	D	E	F
12	Malloy	Terry	99 Dockside Pl.	Marlon	TN	55784
13	Bates	Norman	3334 Totem Lane	Swertz	GA	55567
14	Bickle	Travis	3334 Taxi Drive	New York	NY	10019
15	Nantee	Duke	334 Bogart Ave.	Sierra	CA	90875
16	Babbit	George	1932 Keystone St.	Kenton	OH	43326
17	Melish	Fielding	453 San Marcos St.	Allen	OH	67754
18	Hollerith	Herman	4666 Punch Ave.	Carden	MO	69856
19	Chauvin	Nicolas	1919 Patriots' Way	Paris	KY	47823
20						
21	Criterion Range					
22	LAST	FIRST	STREET ADDRESS	CITY	STATE	ZIP
23			0			
24						
25						
26						
27	Output Range					
28	LAST	FIRST	STREET ADDRESS	CITY	STATE	ZIP
29	Babbit	George	1932 Keystone St.	Kenton	OH	43326

Fig. 10.30.
Using a
function
condition to
search a
string.

Using Special Operators

To combine search conditions within a single field, use the special operators #AND# and #OR#. Use the special operator #NOT# to negate a search condition.

Use #AND# or #OR# to search for two or more conditions within the same field. Suppose that you want to extract from the tools inventory database all records with an August 1987 purchase-order date (DATE). Establish the criterion by requesting an extract of all dates later than July 31, 1987 AND earlier than September 1, 1987. In figure 10.31, the formula condition has been entered in cell A20. (Keep in mind that you do not have to type a formula under the associated field name—DATE, in this example.) The extracted records are displayed in rows 25 through 27 of figure 10.31. Because the edit panel is not wide enough to display the entire formula, it is given here:

```
+F5>@DATE(87,7,31)#AND#F5.@DATE(87,9,1)
```

You use the #AND#, #OR#, and #NOT# operators to enter (in one field) conditions that can be entered some other way (usually in at least two fields). For example, you can enter +C5="KT"#OR#C5="ST" in a single cell in row 20 (any cell in the criterion range A19..F20) as an alternative criterion entry to select all units of issue as KT or ST in the tools inventory database.

Reminder:
Use #AND#, #OR#, and #NOT# to combine search conditions within a single field.

Fig. 10.31.
Extracting
records with
the special
#AND#
operator.

Help F₁ Feb 27, 1990 Lotus-DM - C:\LOTUS-DM\31TOOLS.WK1 12:23 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₁₀

A20 [IN25] +F5>@DATE(87,7,1)#AND#F5<@DATE(87,9,1) READY

	A	B	C	D	E	F
10	Jack saw	3	EA	11.89	35.67	89/08/87
11	Counter sink set, 10pc	3	KT	13.44	40.32	89/15/87
12	Drop Light, 100 foot	4	EA	17.99	71.96	
13	Square	0	EA	37.50	0.00	89/15/87
14	Hex Wrench Set	2	KT	14.50	29.00	
15	Wrench, box/open	0	ST	46.70	0.00	88/31/87
16	Pipe wrench, 14 inch	4	EA	56.70	226.80	
17						
18	Criterion Range					
19	Description	Quantity	Issue	Cost	Value	Date
20		1				
21						
22						
23	Output Range					
24	Description	Quantity	Issue	Cost	Value	Date
25	Hammer, Claw	2	EA	6.75	13.50	88/02/87
26	Air Hammer, magnetized	1	KT	67.32	67.32	88/24/87
27	Wrench, box/open	0	ST	46.70	0.00	88/31/87

Use #NOT# at the beginning of a condition to negate that condition. For example, if the tools inventory database had only three units of issue—KT, ST, and EA—you could select all KT or ST units of issue by specifying the criterion #NOT#"EA" in cell C20 of the criterion range A19..F20.

Performing Other Types of Searches

In addition to the Find Previous, Find Next, and Extract options, you can use the Unique and Delete options from the Data Query dialog box for searches. By selecting the Unique option, you can produce (in an output range) a copy of only the first occurrence of a record that meets a specified criterion. By selecting the Delete option, you can update the contents of the database by deleting all records that meet a specified criterion. After entering the conditions, you specify only input and criterion ranges before you issue the Data Query Delete command.

Searching for Unique Records

Ordinarily, the **Unique** option is used to copy into the output area only a small portion of each record that meets the criterion. For example, if you want a list of issues used in the tools inventory database, set up an output range that includes only the field name **ISSUE** (see fig. 10.32). To search all records, leave the row blank below the field-name row in the criterion range A19..F20. Then, with the input range defined as A4..F16 and the output range set at A24, select **Data Query Unique** to produce (in rows 25 through 27) a list of the three units of issue.

Reminder:

Use the **Unique** option of the **Data Query** command to copy the first occurrence of a record in the output range.

Fig. 10.32.
The results
of issuing a
Data Query
Unique
command.

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1232.WK1 9:51 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

A24 [W25] 'Issue' READY

	A	B	C	D	E	F
10	Hack saw	3	EA	11.89	35.67	09/08/87
11	Counter sink set, 10pc	3	KT	13.44	40.32	09/15/87
12	Drop Light, 100 foot	4	EA	17.99	71.96	
13	Square	0	EA	37.50	0.00	09/15/87
14	Hex Wrench Set	2	KT	14.50	29.00	
15	Wrench, box/open	0	ST	46.70	0.00	08/31/87
16	Pipe wrench, 14 inch	4	EA	56.70	226.80	
17						
18	Criterion Range					
19	Description	Quantity	Issue	Cost	Value	Date
20						
21						
22						
23	Output Range					
24	Issue					
25	EA					
26	KT					
27	ST					

Using the college database as another example, you can produce a list of the majors selected by current students. To do so, specify in the output range only the field name **MAJOR**, leave the row blank under the field names in the criterion range, and execute the **Data Query Unique** command with the **Unique** option.

Deleting Specified Records

As you know, you can use the Worksheet Insert/Delete command to remove records (rows) from a worksheet. If you want a fast alternative to this "one-by-one" approach, use the Data Query Delete command to remove unwanted records from your database files. Before you select **Delete** from the Data Query dialog box, specify the range of records to be searched (the input range) and the conditions for the deletion (the criterion range).

Suppose that you want to remove from the address database all records with a STATE field beginning with the letter N. To do so, specify an input range of A1..F19, a criterion range of A22..F23, and use the criterion N* in cell E23 (see fig. 10.33). Then issue the Data Query Delete command. The remaining records pack together in rows 2 through 15, and the input range automatically adjusts to A1..F15.

Fig. 10.33.
*The results of
issuing a Data
Query Delete
command.*

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1233.WK1 9:52 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

E23 N* READY

	A	B	C	D	E	F
9	Malloy	Terry	99 Dockside Pl.	Marlon	TN	55784
10	Bates	Norman	3334 Totten Lane	Smertz	GA	55567
11	Mantee	Duke	334 Bogart Ave.	Sierra	TX	98875
12	Babbitt	George	1932 Keystone St.	Kenton	OH	43326
13	Melish	Fielding	453 San Marcos St.	Allen	OH	67754
14	Hollerith	Herman	4666 Punch Ave.	Carden	MO	69856
15	Chauvin	Nicolas	1919 Patriots' Way	Paris	KY	47823
16						
17						
18						
19						
20						
21	Criterion Range					
22	LAST	FIRST	STREET ADDRESS	CITY	STATE	ZIP
23					N*	
24						
25						
26						

Be extremely careful when you issue the Data Query Delete command. So that you can verify that you want to delete records, Lotus-DM displays the Data Query Delete dialog box. Choose **Cancel** to abort the delete operation. Select **OK** to verify that you want to execute the delete operation.

Cue:
Before issuing
Data Query
Delete, save the
file under another
name or extract
the records and
examine them first.

Guard against deleting the wrong records by doing one (or both) of two things. Before you issue a Data Query command, use **File Save As** to save the database using a name such as **TEMP**. Then, if the logic of the delete conditions proves faulty, you can retrieve the backup copy. Alternatively, perform an **Extract** operation using the delete conditions, view the records to verify that they should be removed, and then perform the **Delete** operation.

Loading Data from Other Programs

Lotus-DM provides several means of importing data from other applications. The File Translate command (see Chapter 6) has options for converting data directly to Lotus-DM worksheets from DIF, DeskMate worksheets, and dBASE III files. You then can access the translated data by using the File Open or File Combine command.

Use the File Import command to read into a current worksheet the data stored on disk as a text file. Depending on the format, these files may be read directly to a range of cells or a column of cells. Specially formatted “numeric” data can be read directly to a range of worksheet cells. ASCII text can be stored as long labels in a single column with one line of the report per cell. You then must disassemble these labels into the appropriate data values or fields by using functions or the Data Parse Setup and Data Parse commands.

Using the Data Parse Setup Command

The Data Parse commands provide a flexible and easy method to extract numeric, string, and date data from long labels and place it in separate columns. Suppose that you typed inventory data in a report composed with the Word-Perfect word processing program, and you want to load the print-image file in Lotus-DM. After you load the file by using the File Import command, you must reformat the data by first using the Data Parse Setup command, and then using the Data Parse command.

Reminder:

Use Data Parse Setup and Data Parse to split long labels imported from text files into separate text, number, or date fields.

The File Import command loads the inventory data into the range A1..A16 (see fig. 10.34). Visually, the data is formatted in a typical worksheet range such as A1..G16, but the display is misleading. The current cell-pointer location is A5; the entire contents of the row exist only in that cell.

To break the long label into columns, move the cursor to the first cell to be parsed (in this case, cell A4) and select Data Parse Setup. The Data Parse Setup dialog box appears (see fig. 10.35).

In the Data Parse Setup dialog box, simply reaffirm that this is the first cell in the range that you want to parse and select OK. A format line is created immediately above the line in the data to be parsed. The format line specifies the pattern or patterns for splitting the long labels into numbers, labels, and dates.

Fig. 10.34.
The results of
issuing a File
Import command.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1234.WK1 9:53 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

A5 Hammer, Claw 2 EA READY

	A	B	C	D	E	F	G	H
1	Physical Inventory: Hand Tool Stores #3							
2								
3			On Hand	Unit of	Unit			
4	Description	Quantity	Issue	Cost	Date			
5	Hammer, Claw	2	EA	6.75	08/02/87			
6	Screwdriver, flat tip set	17	EA	9.95				
7	Tack Hammer, 3/8" drive	24	EA	4.30				
8	Air Hammer, magnetized	1	KT	67.32	08/24/87			
9	Phillips screwdriver set	8	EA	8.73				
10	Hack saw	3	EA	11.89	09/08/87			
11	Counter sink set, 10pc	3	KT	13.44	09/15/87			
12	Drop Light, 100 foot	4	EA	17.99				
13	Square	6	EA	37.50	09/15/87			
14	Hex Wrench Set	2	KT	14.50				
15	Wrench, box/open	8	ST	46.70	08/31/87			
16	Pipe wrench, 14 inch	4	EA	56.70				
17								
18								

Fig. 10.35.
The Data
Parse
Setup
dialog box.

Data Parse Setup

Cell Address:

Using the Data Parse Command

After Lotus-DM automatically creates a format line, you can edit it as you would any label: by pressing Edit (Ctrl-F2). Use the format line to mark the column positions and the type of data in those positions. The Data Parse command uses the format line to break down the data and move it to its respective columns in the output range.

To parse the data in figure 10.34, follow these steps:

1. Move the cursor to A4, the first cell that contains data you want to break into columns. (You do not have to parse the title in cell A1.)
2. Parse the column headings in cells A3..A4 using one format line; parse the data in A5..A16, using another format line.

You use two different format lines because all the headings are labels, and because the data is a mixture of label, numeric, and date data. With the cell pointer at A3, issue the Data Parse Setup command. Lotus-DM inserts a suggested format line at A3, and the remaining worksheet content moves down one line.

Combinations of certain letters and special characters comprise format lines. The letters denote the beginning position and the type of data; special symbols define the length of a field and the spacing. The following chart details these letters and symbols.

<i>Symbol</i>	<i>Purpose</i>
D	Marks the beginning of a date field.
L	Marks the beginning of a label field.
S	Marks the beginning of a skip position.
T	Marks the beginning of a time field.
V	Marks the beginning of a value field.
>	Defines the continuation of a field. Use one > for each position in the field (excluding the first position).
•	Defines blank spaces (in the data below the format line) that may be part of the block of data in the following cell.

Use as many format lines as you need in your data. In the inventory example, enter another format line at cell A6 and specify the format criterion for the data records that follow. A suggested format line is shown in figure 10.36.


After setting up two format lines in the inventory database, issue the Data Parse command (see fig. 10.37). Specify the range A4..A18 in the *Input Column* field; this range should include format lines, column headings, and data. Specify A20 in the *Output Range* field; this cell is the upper left corner of a blank range that is to accept the parsed data. Figure 10.38 shows the results of the Data Parse command.

The data displayed in individual cells may not be exactly what you want. You can make a few changes in the format and column width, and you also can add or delete information to make the newly parsed data more usable. These enhancements are not part of the Data Parse command, but they usually are necessary after importing and parsing data.

Fig. 10.36.
**A suggested
format line to
parse an
inventory
database.**

[illegible]

Fig. 10.37.
The Data Parse
dialog box.



Data Parse

Input Column:

Output Range:

OK **CANCEL**

To produce the final inventory database shown in figure 10.39, follow these steps:

1. Delete rows A3..A19 to remove the unparsed data and to move the parsed data up under the title.
2. Expand column A to make it 25 characters wide; contract column C to make it 8 characters wide.
3. Reformat the P.O. DATE range in column E to the Date 4 format.
4. Insert at column E a column for the inventory value.

5. Widen the new column E to 10 characters (the P.O. DATE field should now be column F).
6. Add the INVENTORY and VALUE headings in cells E3 and E4, respectively.
7. Enter in cell E5 the formula that computes the inventory value: +B5*D5.
8. Copy the formula in cell E5 to cells E6..E16.
9. Use Range Format to format D5..E16 to the comma format with two decimal places.

Help F1 Feb 27, 1990 Lotus-DM - C:\LOTUS-DM\35TOOLS.WK1 1:05 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

A32 'Pipe wre READY

	A	B	C	D	E	F	G	H
15	Square			0 EA	37.50	09/15/87		
16	Hex Wrench Set			2 KT	14.50			
17	Wrench, box/open			8 ST	46.70	08/31/87		
18	Pipe wrench, 14 inch			4 EA	56.70			
19								
20	Description	Quantity	Issue	Cost	Date			
21	Hammer, Claw	2	EA	6.75	31991			
22	Screwdriver, flat	17	EA	9.95				
23	Tack Hammer, 3/8"	24	EA	4.3				
24	Air Hammer, mague	1	KT	67.32	32013			
25	Phillips screwdriver	8	EA	8.73				
26	Hack saw	3	EA	11.09	32028			
27	Counter sink set,	3	KT	13.44	32035			
28	Drop Light, 100 f	4	EA	17.99				
29	Square	0	EA	37.5	32035			
30	Hex Wrench Set	2	KT	14.5				
31	Wrench, box/open	8	ST	46.7	32020			
32	Pipe wrench, 14 i	4	EA	56.7				

Fig. 10.38.
The results of a
parse operation.

Guidelines for Using the Data Parse Commands

1. If you are parsing a value that continues past the end of the field, Lotus-DM parses the data until it encounters a blank or until the value runs into the next field in the format line. If you parse labels, make sure that the field widths in the format line are wide enough to avoid losing data because of blanks. If you parse values, field widths are less critical.
2. Experiment on small amounts of data until you are comfortable using the Data Parse commands.

Fig. 10.39.
Improving the
appearance of
parsed data.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1239.WK1 10:03 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

A1 [W25] 'Physical Inventory: Hand Tool Stores' READY

	A	B	C	D	E	F
1	Physical Inventory: Hand	Tool Stores #3				
2						
3		On Hand	Unit of	Unit	Inventory	P.O.
4	Description	Quantity	Issue	Cost	Value	Date
5	Hammer, Claw	2	EA	6.75	13.50	08/02/87
6	Screwdriver, flat tip set	17	EA	9.95	169.15	
7	Jack Hammer, 3/8" drive	24	EA	4.3	103.20	
8	Air Hammer, magnetized	1	KT	67.32	67.32	08/24/87
9	Phillips screwdriver set	8	EA	8.73	69.84	
10	Hack saw	3	EA	11.89	35.67	09/08/87
11	Counter sink set, 10pc	3	KT	13.44	40.32	09/15/87
12	Drop Light, 100 foot	4	EA	17.99	71.96	
13	Square	0	EA	37.5	0.00	09/15/87
14	Hex Wrench Set	2	KT	14.5	29.00	
15	Wrench, box/open	8	ST	46.7	373.60	08/31/87
16	Pipe wrench, 14 inch	4	EA	56.7	226.80	
17						
18						

After you understand how parsing works, you will find many applications for it. Every time you develop a new application, consider whether existing data created with another software program can be imported and changed to Lotus-DM format by using the Data Parse commands.

Using Database Statistical Functions

Reminder:
The database
statistical
functions are
similar to the
worksheet
statistical
functions.

Lotus-DM's database statistical functions are similar to the worksheet statistical functions, described in the Function Reference later in this book. Like the standard statistical functions, the database statistical functions perform in one simple statement calculations that would otherwise require several statements. Efficiency and ease of application make these excellent tools. Lotus-DM's database functions are listed in table 10.2.

Table 10.2
Database Functions

<i>Function</i>	<i>Description</i>
@DCOUNT	Gives the number of items in a list
@DSUM	Sums the values of all the items in a list
@DMIN	Gives the minimum of all the items in a list
@DMAX	Gives the maximum of all the items in a list
@DSTD	Gives the standard deviation of all the items in a list
@DVAR	Gives the variance of all the items in a list
@DAVG	Gives the arithmetic mean of all the items in a list

The general format of the functions is as follows:

@DFUNCTION(*input range*,*offset*,*criterion range*)

The input and criterion ranges are the same as those used by the Data Query command. The *input range* specifies the database or part of a database to be scanned; the *criterion range* specifies which records are to be selected. The *offset* indicates which field to select from the database records; the *offset* value must be either zero or a positive integer. A value of 0 indicates the first column, 1 indicates the second column, and so on.

The following example uses database statistical functions. The example involves computing the mean and standard deviation of the average interest rates offered by money market funds for a given week. If you are unfamiliar with the concepts of mean and standard deviation, you can read more about them in the Function Reference later in this book.

Figure 10.40 shows the money market returns database and the results of the various database functions. The functions and their ranges include the following:

Count	@DCOUNT(A3..B20,1,D13..D14)
Mean	@DAVG(A3..B20,1,D13..D14)
Variance	@DVAR(A3..B29,1,D13..D14)
Std Dev	@DSTD(A3..B20,1,D13..D14)
Maximum	@DMAX(A3..B20,1,D13..D14)
Minimum	@DMIN(A3..B20,1,D13..D14)

Fig. 10.40.
Statistical
functions
used with a
money market
database.

Help F₁ Feb 27, 1990 Lotus-DM - C:\LOTUS-DM\40STOCKS.WK1 1:23 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

E7 (F1) @DMAX(A3..B20,1,D13..D14) READY

	A	B	C	D	E
1	Money Market Database (7 day average yield)			Database Statistics	
2					
3	NAME	Week 1		Count	15
4	Alliance Cash Reserves	7.7		Mean	7.7
5	Bull & Bear Dollar Reserves	7.7		Variance	0.057
6	Carnegie Cash Securities	6.9		Std Dev	0.238
7	Colonial Money Market	7.9		Maximum	8.2
8	Equitable Money Market	7.8		Minimum	7.3
9	Fidelity Cash Reserves	8.0			
10	Kemper Money Market	7.7			
11	Lexington Money Market	8.1			
12	Money Market Management	7.8		Criterion Range	
13	Paine Webber Cash	7.9		Week 1	
14	Prudential Bache	6.8		WEEK 1>7	
15	St. Paul Money Market	7.6			
16	Shearson I-Fund	8.2			
17	Short Term Income Fund	7.9			
18	Summit Cash Reserves	7.3			

Figure 10.40 shows that the week's mean return for 15 different money market funds that have a value over 7 (the criterion specified in cell D14) works out to an annual percentage rate of 7.7 (cell E4). This result means that about 68 percent of the money market funds return between 7.46 and 7.94 percent annually.

One Standard Deviation below mean: $7.7 - 0.238 = 7.46$

One Standard Deviation above mean: $7.7 + 0.238 = 7.94$

The result of the @DMIN function (cell E8) shows that Summit Cash Reserves returns the lowest rate of all funds with a value greater than 7 (the criterion specified in cell D14) at 7.3 percent. This value is almost 2 standard deviations below the mean. That figure (2 standard deviations below the mean) is computed as follows:

Two Standard Deviations below mean: $7.7 - (2 \times 0.238) = 7.22$

Because approximately 95 percent of the population falls within plus or minus 2 standard deviations of the mean, Summit Cash Reserves is close to being in the lowest 2.5 percent of the population of money market funds for that week; 5 percent is divided by 2 because the population is assumed to be normal. (See the Function Reference later in this book for a discussion of how to interpret the statistical functions.)

Conversely, the Shearson T-Fund returns 8.2 percent, the highest rate. The @DMAX function has determined the highest rate to be just over 2 standard deviations above the mean—the highest 2.5 percent of the population.

By setting up the proper criteria, you can analyze any portion of the database you want. How do the statistics change if funds returning less than 7.5 percent are excluded from the statistics? Figure 10.41 gives the answer.

Help F1 Feb 27, 1990 Lotus-DM - C:\LOTUS-DM\40STOCKS.WK1 1:27 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

D14 (T) (W12) +WEEK 1>7.5 READY

	A	B	C	D	E
1	Money Market Database (7 day average yield)		Database Statistics		
2					
3	NAME	Week 1		Count	13
4	Alliance Cash Reserves	7.7		Mean	7.7
5	Bull & Bear Dollar Reserves	7.7		Variance	0.035
6	Carnegie Cash Securities	6.9		Std Dev	0.187
7	Colonial Money Market	7.9		Maximum	8.2
8	Equitable Money Market	7.8		Minimum	7.6
9	Fidelity Cash Reserves	8.0			
10	Kemper Money Market	7.7			
11	Lexington Money Market	8.1			
12	Money Market Management	7.8		Criterion Range	
13	Paine Webber Cash	7.9		Week 1	
14	Prudential Bache	6.8		+WEEK 1>7.5	
15	St. Paul Money Market	7.6			
16	Shearson T-Fund	8.2			
17	Short Term Income Fund	7.9			
18	Summit Cash Reserves	7.3			

Fig. 10.41.
A money fund
analysis with
funds earning
less than 7.5
percent
excluded.

The database statistical functions can tell you a great deal about the database as a whole and about how to interpret the values contained in it. If you add several more weeks' data to the database, as shown in figure 10.42, you can use the database statistical functions to analyze all or part of the larger database.

You can use all the methods described so far to interpret the statistics in figure 10.42. The input, offset, and criterion ranges used for the data from the third week of the example are as follows:

Input range	A3..G20
Offset	3 (for the fourth column)
Criterion range	I13..I14

From this information, you can determine how the formulas have been set up for each week. The criterion range displayed in figure 10.42 shows the condition used to select the values for the third week.

Fig. 10.42.
Additional
money
fund data.

Help F₁ Feb 27, 1990 Lotus-DM - C:\LOTUS-DM\F1242.WK1 1:33 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ X F₁₀

J3 @DCOUNT(A3..G20,3,113..114) READY

	D	E	F	G	H	I	J	K
1							Database Statistics	
2								
3	Week 3	Week 4	Week 5	Week 6		Count	17	
4	7.9	7.8	7.8	7.8		Mean	7.9	
5	7.8	7.9	7.9	7.9		Variance	0.058	
6	7.5	7.4	7.8	7.6		Std Dev	0.240	
7	7.9	7.7	8.0	7.3		Maximum	8.3	
8	7.9	7.7	7.7	7.7		Minimum	7.4	
9	8.1	7.4	8.1	8.0				
10	7.8	7.9	7.9	7.9				
11	8.2	7.8	7.8	7.8				
12	7.9	8.0	8.0	8.0		Criterion Range		
13	8.0	7.7	7.7	7.7		Week 3		
14	7.5	8.1	8.1	8.1		+WEEK 3>7		
15	7.7	7.8	7.8	7.8				
16	8.3	7.9	7.9	7.9				
17	8.1	7.4	7.4	7.4				
18	7.8	7.8	7.8	7.8				

Building Tables

Reminder:
Table building
automates the
"what if" process.

Table building is an extended version of the "what if" process. In fact, you can duplicate the functions performed by the table-building feature by performing repeated "what if" analyses. Doing so takes a prohibitive amount of time, however. Table building automates the "what if" process so that you can make a thorough analysis with a minimal amount of effort. The Data Table command is the host command for the table-building function. Figure 10.43 shows the Data Table dialog box.

When you build a table, Lotus-DM takes sets of values and substitutes them one at a time for existing values in the worksheet. You provide the values for substitution and tell Lotus-DM where to substitute them. The program reports the results.

Although the Data Table command may take some time to learn, you will find it to be one of Lotus-DM's most powerful commands. In fact, the strength of this command rivals similar commands in more sophisticated mainframe decision-support systems.

The purpose of the Data Table command is to structure the "what if" analysis. The command lets you build a table of input values that the program substitutes one at a time into your model. Lotus-DM then records the results in the table next to the input values.

Data Table

☒ **Data Table 1**

Table Range:

Input Cell:

☐ **Data Table 2**

Table Range:

Input Cell 1:

Input Cell 2:

OK **CANCEL** **RESET**

Fig. 10.43.
The Data
Table
dialog box.

To demonstrate a simple example, build a table of interest rates and show their effect on the monthly payments of a 30-year mortgage, as shown in figure 10.44.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1244.WK1 10:08 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

D2 (C2) @PMT(A2,B2/12,C2*12) READY

	A	B	C	D	E	F	G	H
1	Principal	Interest	Term	Payment				
2	\$30,000	10%	30	\$269.22				
3								
4		Interest Monthly						
5		Rate Payments						
6								
7		5%						
8		6%						
9		7%						
10		8%						
11		9%						
12		10%						
13		11%						
14		12%						
15		13%						
16		14%						
17		15%						
18		16%						

Fig. 10.44.
A worksheet
for monthly
payment
analysis.

By using **Data Table 1** (the top option in the **Data Table** dialog box), you can have Lotus-DM substitute in appropriate input cells the interest rates entered in a column. After calculating the results, Lotus-DM lists the monthly payments in the column next to the interest rates.

Before issuing the **Data Table 1** command, type the interest-rate values in a column. (To enter those values easily, use the **Data Fill** command, covered in the next section.) Cells B7..B18 in figure 10.44 hold the interest rates. You also must enter either the appropriate formula to calculate the results or the cell address from which to draw the results. This entry goes next to the column of interest rates and one row above the first entry (in fig. 10.44, the formula goes in cell C6). Cell D2 contains the formula used to calculate the monthly payments.

Because cell C6 was formatted with the **Text** option of the **Range Format** command, the formula rather than the value appears when you enter **+D2** in cell C6 (see fig. 10.45). Instead of a cell reference, you can enter in C6 the formula for computing the payments: **@PMT(A2,B2/12,C2*12)**.

Fig. 10.45.
The
worksheet
before **Data
Table 1** is
issued.

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1245.WK1 10:10 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

C6 (T) (W10) +D2 READY

	A	B	C	D	E	F	G	H
1	Principal	Interest	Term	Payment				
2	\$30,000	10%	30	\$263.27				
3								
4		Interest	Monthly					
5		Rate	Payments					
6			+D2					
7		5%						
8		6%						
9		7%						
10		8%						
11		9%						
12		10%						
13		11%						
14		12%						
15		13%						
16		14%						
17		15%						
18		16%						

Reminder:
Specify a table
range and the
input cell for a
Data Table 1
command.

Select the range B6..C18; the table range must include all the rates, the column of cells where the results are to be displayed, and the payment formula. When you issue the **Data Table** command, the **Data Table** dialog box shows the **Table Range** field filled in with the preselected range. The **Input Cell** field is the cell into which each value in the column of interest rates is substituted. In figure 10.45, the input cell is B2. Figure 10.46 shows the results of a **Data Table 1** command.

Help F₁ Feb 12, 1990 Lotus-D_M - C:\123\DM-TEMP\F1246.WK1 10:11 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C6 (T) [W10] +D2 READY

	A	B	C	D	E	F	G	H
1	Principal	Interest	Term	Payment				
2	\$30,000	10%	30	\$263.27				
3								
4		Interest	Monthly					
5		Rate	Payments					
6		+D2						
7		5%	\$161.05					
8		6%	\$179.07					
9		7%	\$199.59					
10		8%	\$220.13					
11		9%	\$241.39					
12		10%	\$263.27					
13		11%	\$285.70					
14		12%	\$308.50					
15		13%	\$331.86					
16		14%	\$355.46					
17		15%	\$379.33					
18		16%	\$403.43					

Fig. 10.46.
The worksheet
after issuing
Data Table 1.

If you want to try some other input values, change the values in row 2 and then press Table (Ctrl-F8) key to recalculate the table using the specifications used the last time you issued the Data Table command.

A more complicated example, shown in figure 10.47, uses the Data Table 2 command. This command requires two input variables instead of one. Using more variables increases the breadth of the analyses you can perform. This example is designed to show the effects of changes in the order quantity and order point on total cost. You want the combination of order point and order quantity that minimizes cumulative costs-to-date at the end of a 12-month period.

The Data Table 2 command creates a much more extensive table. It shows the effect of varying order points *and* varying order quantities. The result is a more complete analysis—the advantage of the Data Table 2 command.

To use the Data Table 2 command, you enter the values for variable 2 (order quantity, in this example) in the row just above the first entry of variable 1 (order point). In this example, these values begin in cell F21. Notice also that you enter +N13, the address of the formula for cost-to-date, in the row directly above the first entry of variable 1, cell E21. Cell E21 is formatted with the Text option of the Range Format command so that the cell displays the formula rather than the value.

Reminder:
The Data Table 2
command lets
you specify two
variables.

Fig. 10.47.
Mortgage
analysis
with the
Data Table 2
command.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Beginning Inventory	43	18	39	38	10	38	18	46	21	11	39	20
Past Demand for Month	28	16	11	18	12	10	13	24	10	12	19	22
Ending Inventory	15	-1	28	10	-2	18	8	21	11	-1	20	-2
Quantity Ordered	0	40	0	0	40	0	40	0	0	40	0	40
Setup Costs (\$10 per order)	\$0.00	\$10.00	\$0.00	\$0.00	\$10.00	\$0.00	\$10.00	\$0.00	\$0.00	\$10.00	\$0.00	\$10.00
Inventory Costs (\$1.5/unit)	\$2.00	\$0.00	\$8.40	\$2.00	\$0.00	\$3.00	\$1.00	\$6.20	\$2.20	\$0.00	\$4.00	\$0.00
Shortage Costs (\$1/unit)	\$0.00	\$1.00	\$0.00	\$0.00	\$2.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1.00	\$0.00	\$2.00
Total Costs for Month	\$3.00	\$11.00	\$8.40	\$2.00	\$12.00	\$3.00	\$11.00	\$6.20	\$2.20	\$11.00	\$4.00	\$12.00
Cum Cost From Last Month	\$0.00	\$3.00	\$11.40	\$13.40	\$21.60	\$23.60	\$32.70	\$44.20	\$52.40	\$63.40	\$67.40	\$79.40
Cumulative Costs to Date	\$3.00	\$14.00	\$19.40	\$21.60	\$23.60	\$32.70	\$44.20	\$52.40	\$63.40	\$67.40	\$79.40	\$81.40
Order Quantity Input Cell	40											
Order Point Input Cell	8											
DATA TABLE 1 -->	Order Quantity	Cumulative Cost										
	Quant	Cost										
21	40	\$12.00	\$13.40	38	39	40	41	42	43	Average		
22	28	\$104.00		1	\$91.20	\$103.20	\$98.40	\$96.00	\$92.20	\$91.80	\$98.37	
23	26	\$109.60		2	\$91.20	\$103.20	\$98.40	\$93.80	\$93.20	\$91.60	\$96.00	
24	27	\$106.40		3	\$91.20	\$98.40	\$96.00	\$93.80	\$93.20	\$91.60	\$92.10	
25	28	\$98.00		4	\$91.20	\$98.40	\$96.00	\$93.80	\$93.20	\$91.60	\$92.10	
26	28	\$99.60		5	\$90.40	\$98.40	\$91.60	\$93.80	\$94.40	\$91.80	\$98.10	
27	30	\$102.40		6	\$90.40	\$98.40	\$91.60	\$93.80	\$94.40	\$91.80	\$98.10	
28	31	\$99.20		7	\$90.40	\$98.40	\$91.60	\$91.60	\$94.40	\$91.80	\$97.13	
29	38	\$91.60		8	\$93.20	\$99.60	\$91.60	\$91.60	\$94.40	\$91.80	\$97.93	
30	33	\$94.60		9	\$93.20	\$92.80	\$91.60	\$91.60	\$98.20	\$97.00	\$97.03	
31	34	\$95.60		10	\$93.20	\$93.80	\$97.20	\$91.60	\$98.20	\$97.00	\$98.63	
32	38	\$86.80		11	\$93.20	\$93.80	\$94.00	\$98.60	\$98.20	\$95.00	\$97.72	
33	35	\$88.80		12	\$98.80	\$93.80	\$94.00	\$98.60	\$92.80	\$90.00	\$91.43	
34	37	\$84.60		13	\$98.80	\$93.80	\$94.00	\$98.60	\$92.80	\$98.60	\$92.87	
35	38	\$93.20		14	\$98.80	\$93.80	\$94.00	\$98.60	\$93.80	\$98.60	\$98.80	
36	39	\$93.80		15	\$100.40	\$100.20	\$100.80	\$103.80	\$100.80	\$100.00	\$103.67	
37	40	\$81.80		16	\$110.40	\$108.40	\$100.80	\$103.80	\$100.80	\$108.00	\$108.07	
38	41	\$81.80		17	\$110.40	\$108.40	\$100.80	\$103.80	\$100.80	\$108.00	\$108.47	
39	43	\$88.20		18	\$110.40	\$118.40	\$108.80	\$103.80	\$108.20	\$108.00	\$109.10	
40	43	\$87.00		19	\$110.40	\$118.40	\$108.80	\$103.80	\$108.20	\$108.00	\$109.10	
41	44	\$90.00		20	\$110.40	\$118.40	\$114.40	\$112.00	\$108.20	\$114.60	\$111.43	
42	45	\$89.40		21	\$110.40	\$118.40	\$112.40	\$112.00	\$108.20	\$114.60	\$114.17	
43	46	\$88.80		22	\$110.40	\$118.40	\$112.40	\$112.00	\$117.80	\$114.60	\$115.97	
44	47	\$86.40		23	\$110.40	\$118.40	\$112.40	\$112.00	\$117.80	\$114.60	\$115.97	
45	48	\$89.40		24	\$110.40	\$118.40	\$112.40	\$112.40	\$117.80	\$112.20	\$119.73	
46	49	\$90.40		25	\$110.40	\$118.40	\$112.40	\$112.40	\$117.80	\$112.20	\$119.73	
47	50	\$98.00		26	\$118.00	\$116.40	\$112.40	\$112.40	\$117.80	\$112.20	\$121.00	

When you issue the Data Table 2 command, Lotus-DM calls for a table range and input cells for variables 1 and 2. For this example, enter the following information for these parameters:

Table Range E21..K47
Input Cell Variable 1 B16
Input Cell Variable 2 B15

After you enter this information, Lotus-DM builds the table of results. A Data Table 2 command requires more time than a Data Table 1 command, because more variables are involved and more results are calculated.

Because the Data Table Command creates pure values and not formulas, it saves both memory space and recalculation time; in large worksheets, these considerations may be critical.

Filling Ranges with Numbers

To fill ranges, you use the Data Fill command. This command is useful when combined with the other database commands mentioned earlier in this chapter, especially Data Table and Data Sort.

Data Fill fills a range of cells with numbers that increase or decrease by a specified increment or decrement. For an example of the use of Data Fill, look at the year numbers used as titles in the sales forecast shown in figure 10.48.

Cue:
Use the Data Fill command to automate the process of entering a series of numbers or dates that increment at the same value.

The screenshot shows the Lotus-DM spreadsheet interface. The menu bar includes Help, File, Edit, Worksheet, Range, Graph, and Data. The status bar at the top indicates the date is Feb 12, 1990, the file is Lotus-DM - C:\123\DM-TEMP\F1248.WK1, and the time is 10:11 am. The active window is titled 'Sales Forecast' and contains a table with 6 columns (A-F) and 10 rows. The first row (A1) is the title 'Sales Forecast'. The second row (B2) contains the years 1990, 1991, 1992, 1993, and 1994. The subsequent rows (A4-A9) list products 1 through 5 with numerical values in columns B through F.

	A	B	C	D	E	F	G
1	Sales Forecast						
2		1990	1991	1992	1993	1994	
3							
4	Product 1	64	66	91	116	144	
5	Product 2	24	29	35	42	48	
6	Product 3	10	11	13	14	15	
7	Product 4	45	53	59	59	62	
8	Product 5	21	22	27	36	38	
9							
10							

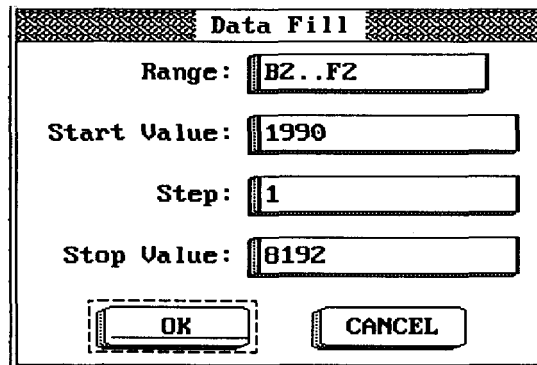
Fig. 10.48.
Entering year numbers with Data Fill.

Before using the Data Fill command, select the range to be filled. When you issue the Data Fill command, the Data Fill dialog box appears, prompting you for four selections (see fig. 10.49). If you preselected a range, it appears in the Range field; specify values for the Start Value, Step, and Stop Value fields. The step value is the value to be added to the previous value.

To enter a sequence of year numbers for a five-year forecast beginning in 1990, start by specifying the range of cells to be filled. For this example, select B2..F2. The start value is 1990. Because you want the years to increment one year at a time, specify a step value of 1. The stop value is 1994 for a five-year forecast. For the stop value, you can let Lotus-DM default to 8192, which is far beyond the ending value actually needed. The Data Fill command fills only the specified range; it does not fill cells beyond the end of the range.

You can use the Data Fill command with Data Sort. Suppose that you want to sort a database, and you want to be able to restore the records to their original order if you make a mistake in sorting them. As you learned earlier in this chapter, add a field to the database and use Data Fill to fill the field with consecutive numbers. Then sort the database however you want. If you find the sort results unacceptable, simply sort the database on the consecutive-number field to return the database to its original order. Figure 10.50 shows a stocks database after it is sorted by number of shares with the Data-Sort command; figure 10.51 shows the database returned to its original order.

Fig. 10.49.
The Data Fill
dialog box.



The Data Fill dialog box is titled "Data Fill". It contains four input fields: "Range:" with the value "B2..F2", "Start Value:" with the value "1990", "Step:" with the value "1", and "Stop Value:" with the value "8192". At the bottom, there are two buttons: "OK" and "CANCEL".

Fig. 10.50.
A stocks
database
sorted by
number of
shares.

Help F1 Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1250.WK1 10:14 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

DZ (C2) 33 READY

	A	B	C	D	E	F	
	COMPANY	GROUP	SHARES	PRICE	SORT FIELD		Pr
1	Boeheed	air	100	\$33.00	13		\$
2	Union Allied	chem	100	\$61.00	15		
3	Mutual of Pawtucket	ins	100	\$56.00	10		
4	Rockerfeller Rail	tran	100	\$44.13	4		
5	Rubberstone	rub	200	\$23.00	9		
6	Bear and Bull, Inc	fin	200	\$30.75	3		
7	TexasGulf	oil	200	\$77.00	16		
8	Cable Corp.	tele	200	\$56.75	5		
9	Petro, Inc.	oil	200	\$61.00	6		
10	Sorghums	llig	300	\$41.38	11		
11	Pan World	trsn	300	\$47.00	14		
12	Cyber Net	tech	400	\$11.50	1		
13	Junkomart	ret	400	\$31.00	8		
14	StakeOut	food	500	\$12.00	7		
15	Zenith & Nadir	tech	500	\$16.25	2		
16	Ebb n' Flow	ret	600	\$19.25	12		
17							
18							

Reminder:
You can use
formulas and
functions for
start, step, and
stop values with
Data Fill.

As you have seen, you can use regular numbers for the start, step, and stop values. You also can use formulas and functions. If you want to fill a range of cells with incrementing dates, specify the range and use the @DATE function to set the start value—for example, @DATE(90,6,1). You also can use a cell formula, such as +E4. If E4 contains the value 7 and is the formula used for the step value, the date values are incremented one week at a time. You can use a function such as @DATE(89,10,1) or a cell address for the stop value. Lotus-DM lets you mix and match functions, formulas, and cell references.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1251.WK1 10:15 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

A1 [W25] COMPANY READY

	A	B	C	D	E	F
	COMPANY	GROUP	SHARES	PRICE	SORT FIELD	
1	Cyber Net	tech	400	\$11.50	1	
2	Zenith & Nadir	tech	500	\$16.25	2	
3	Bear and Bull, Inc	fin	200	\$30.75	3	
4	Rockerfeller Rail	tran	100	\$44.13	4	
5	Cable Corp.	tele	200	\$56.75	5	
6	Petro, Inc.	oil	200	\$61.00	6	
7	StakeOut	food	500	\$12.00	7	
8	Junkomart	ret	400	\$31.00	8	
9	Rubberstone	rub	200	\$23.00	9	
10	Mutual of Pawtucket	ins	100	\$56.00	10	
11	Sorghums	lliq	300	\$41.30	11	
12	Ebb n' Flow	ret	600	\$19.25	12	
13	Bocheed	air	100	\$33.00	13	
14	Pan World	trsn	300	\$47.88	14	
15	Union Allied	chem	100	\$61.00	15	
16	TexasGulf	oil	200	\$77.00	16	
17						
18						

Fig. 10.51.
A stocks
database
returned to
the original
order.

Figuring Frequency Distributions

The command for creating frequency distributions in Lotus-DM is Data Distribution. A *frequency distribution* can describe the relationship between a set of classes and the frequency of occurrence of members of each class. A list of consumers with their product preferences is an example of the use of Data Distribution to produce a frequency distribution (see fig. 10.52).

Before using the Data Distribution command, first set up the range of intervals in what Lotus-DM calls the *bin range*. In figure 10.52, the range of intervals is D3..D7. Make sure that the column to the right of these entries is empty; Lotus-DM places the results of the Data Distribution command in the column to the right of the bin range. If you use evenly spaced intervals, you can use the Data Fill command to enter the values for the bin range. Values in the bin range must be entered in ascending order if you want accurate results.

Issue the Data Distribution command to display the Data Distribution dialog box (see fig. 10.53). Specify the range D3..D7 in the Bin Range field. In the Values Range field, specify the cells containing the actual taste preferences of all of the participants. In figure 10.52, this range is B3..B18.

Fig. 10.52.
Using Data
Distribution to
analyze taste-
preference data.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1252.WK1 10:15 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀

E3 TW111 S READY

	A	B	C	D	E	F
1		Taste				
2	Name	Preference	Preference	Frequency		
3	Thalia Menninger	2	2	5		
4	Hugo Hackenbush	7	4	1		
5	Otis P. Driftwood	8	6	4		
6	Jean Martinet	8	8	5		
7	Sheridan Whiteside	7	10	1		
8	Richard Kimble	2		9		
9	Rufus T. Firefly	6				
10	Louisa Tetravzzini	5				
11	Gustav Mahler	2				
12	Charles F. Kane	3				
13	Terry Malloy	7				
14	Norman Bates	6	2	Poor		
15	Travis Bickle	9	4	Fair		
16	Duke Mantee	1	6	Good		
17	Herman Hollerith	6	8	Very Good		
18	Fielding Melish	1	10	Excellent		

Fig. 10.53.
The Data
Distribution
dialog box.

Data Distribution	
Values Range:	<input type="text" value="B3..B18"/>
Bin Range:	<input type="text" value="D3..D7"/>
<input type="button" value="OK"/>	<input type="button" value="CANCEL"/>

Reminder:
The Data
Distribution
command
always places
the results in the
column to the
right of the bin
range.

When you select OK in the Data Distribution dialog box, Lotus-DM fills the results column (E3..E8) to the right of the bin range (D3..D7). The results column, which shows the frequency distribution, is always in the column to the right of the bin range and extends one row farther down.

The values in the results column represent the frequency of distribution of the numbers in the values range for each interval. In figure 10.52, the first interval in the bin range is for values greater than 0 and less than or equal to 2; the second interval is for values greater than 2 and less than or equal to 4; and so on. The last value in the results column, in cell E8, shows the frequency of leftover numbers (that is, the frequency of numbers that don't fit into an interval classification).

Using the Data Regression Command

The Data Regression command gives you a free multiple-regression analysis package within Lotus-DM. Most people may never use this advanced feature, but if you need it, Lotus-DM saves you the cost and inconvenience of buying a stand-alone statistical package for performing regression analysis.

Use Data Regression when you want to determine the relationship between one set of values (the dependent variable) and one or more other sets of values (the independent variables). Regression analysis has a number of uses in a business setting, including relating sales to price, promotions, and other market factors; relating stock prices to earnings and interest rates; and relating production costs to production levels.

Think of linear regression as a way to determine the "best" line through a series of data points. Multiple regression does this for several variables simultaneously, determining the "best" line relating the dependent variable to the set of independent variables. As an example, consider a data sample showing annual earnings versus age. Figure 10.54 shows the data; figure 10.55 shows the data plotted as an XY graph.

Reminder:

Use Data Regression to determine the relationship between one set of values and one or more other sets of values.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1256.WK1 10:23 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

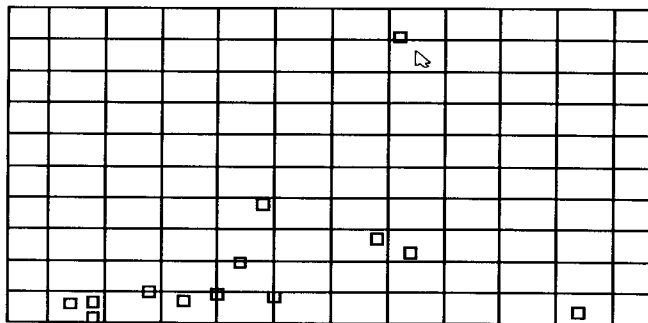
A1 [W9] 'Annual Earnings vs Age' READY

	A	B	C	D	E	F
1	Annual Earnings vs Age					
2	Sample Data					
3						
4			Annual			
5		Age	Earnings			
6						
7		24	\$20,000			
8		17	\$16,100			
9		47	\$32,600			
10		19	\$11,400			
11		62	\$13,940			
12		34	\$47,900			
13		19	\$16,540			
14		27	\$17,200			
15		32	\$29,400			
16		30	\$19,300			
17		46	\$100,875			
18		35	\$18,400			

Fig. 10.54.
Annual
earnings
versus age
data.

Fig. 10.55.
The XY graph
of annual
earnings
versus age.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1256.WK1 10:24 am
File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀



The Data Regression command can simultaneously determine how to draw a line through these data points and how well the line fits the data. When you invoke the command, the Data Regression dialog box appears (see fig. 10.56).

Fig. 10.56.
The Data
Regression
dialog box.

Data Regression

X Range:

Y Range:

Output Range:

Zero Intercept

☒ Compute

☐ Force to zero

OK

CANCEL

Use the **X Range** field to specify one or more independent variables for the regression. The Data Regression command can use as many as 16 independent variables. The variables in the regression are columns of values. (Remember that you can transpose data in rows to columns with Range Transpose.) In figure 10.54, the x-range is A7..A20.

Use the **Y Range** field to specify the dependent variable. The y-range must be a single column. In figure 10.54, the y-range is C7..C20.

Use the **Output Range** option to specify the upper left corner of the results range. This should be an unused section of the worksheet; the output overwrites any existing cell contents and occupies a range that is a minimum of nine rows deep and four columns wide. Add an additional column for each independent variable beyond two.

The **Zero Intercept** options let you specify whether you want the regression to compute the y-axis intercept or to use zero. The default is **Compute**; if you have to exclude a constant in an application, select **Force to zero**.

Figure 10.57 shows the results of the Data Regression command on the annual earnings versus age example in figure 10.54. The results include the value of the constant and the coefficient of the single independent variable you specified with the **X Range** option. The results also include a number of regression statistics that describe how well the regression line fits the data. In this case, the R-squared value and the standard errors of the constant and the regression coefficient all indicate that the regression line does not explain much of the variation in the dependent variable.



Note: The R-squared value becomes more meaningful as it approaches the value of 1. Both the Std Err results are meaningful if they are less than half the constant (the Std Err of Y Est) and less than half the X coefficient (the Std Err of Coeff).

The new data in column D is the computed regression line. These values consist of the constant plus the coefficient of the independent variable times its value in each row of the data. This line can be plotted against the original data, as shown in figure 10.58.

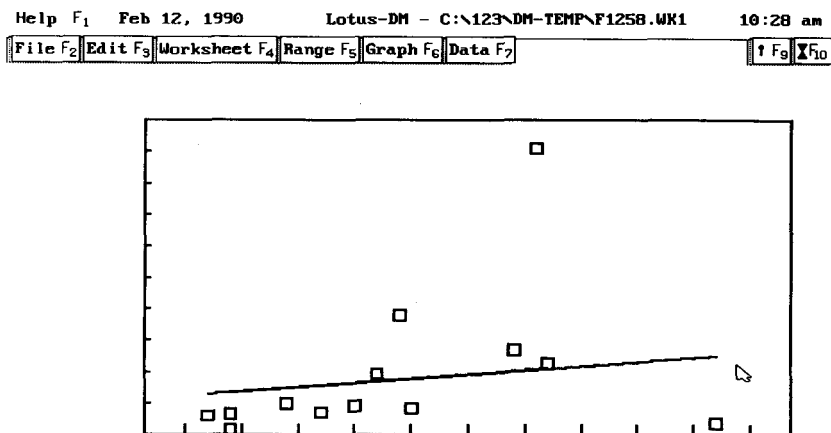
Looking at the annual earnings versus age plot, you notice that income appears to rise with age until about age 50; then income begins to decline.

Fig. 10.57.
The results of
Data Regression
on annual
earnings versus
age.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\DM-TEMP\F1258.WK1 10:26 am

File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
D7 (C0) [W9] +\$H\$6+\$G\$12=A7 READY							
	A	B	C	D	E	F	G
1	Annual Earnings vs Age						
2	Sample Data						
3							
4			Annual Regression				
5	Age	Earnings	Line	Constant	Regression Output:		
6							
7	24	\$20,000	\$24,001	Std Err of Y Est	18395.19		
8	17	\$16,100	\$22,989	R Squared	0.034248		
9	47	\$32,600	\$31,097	No. of Observations	14		
10	19	\$11,400	\$23,530	Degrees of Freedom	12		
11	62	\$13,940	\$35,150				
12	34	\$47,900	\$27,584	X Coefficient(s)	270.2456		
13	19	\$16,540	\$23,530	Std Err of Coef.	114.2673		
14	27	\$17,200	\$25,692				
15	32	\$29,400	\$27,043				
16	30	\$19,300	\$26,503				
17	46	\$100,875	\$30,826				
18	35	\$18,400	\$27,854				

Fig. 10.58.
The graph of
annual earnings
versus age data,
with regression
line.



Using the Data Matrix Multiply Command

The Data Matrix Multiply command is a specialized mathematical command that lets you solve systems of simultaneous linear equations and manipulate the resulting solutions. This command is powerful but has limited application in a business setting. If you use Lotus-DM for certain types of economic analysis or for scientific or engineering calculations, you may find this command valuable.

Data Matrix Multiply allows you to multiply two rectangular matrices together in accordance with the rules of matrix algebra. The number of columns in the first matrix must equal the number of rows in the second matrix. The resulting matrix has the same number of rows as the first matrix and the same number of columns as the second.

Reminder:
Use Data Matrix Multiply to multiply the contents of two matrices.

Figure 10.59 shows a database of names and grades where formulas were written in column H to calculate an average grade. A portion of the formula for cell H34 is exposed on the edit line; entries in row 34 and downward are multiplied by percentages in row 32.

Help F₁ Feb 12, 1990 Lotus-DM - C:\123\CLASS\GRADES.WK1 10:41 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

H34 (F1) (B\$32*B34)+(C\$32*C34)+(D\$32*D34)+(E\$32*

	A	B	C	D	E	F	G	H	I	J	K	L
32	Name of Student	10%	15%	25%	10%	15%	25%					
33												
34	Menninger	72	69	60	65	77	66	67.1	D			
35	Hackenbush	90	91	56	91	99	89	82.9	B			
36	Driftwood	82	90	99	92	91	83	90.1	A-			
37	Martinet	61	71	70	70	83	82	74.2	C			
38	Whiteside	73	69	62	65	82	79	71.7	C-			
39	Kimble	71	81	71	92	82	82	79.0	B-			
40	Firefly	86	66	79	46	82	74	73.7	C			
41	Tetrazzini	78	84	74	76	98	78	80.7	B-			
42	Mahler	79	81	75	78	86	79	79.3	B-			
43	Kane	88	85	80	74	97	98	88.0	B+			
44	Malloy	84	84	81	70	88	83	82.2	B-			
45	Bates	71	86	81	0	81	76	71.4	C-			
46	Bickle	76	75	86	76	76	76	78.4	C+			
47	Nantee	90	88	89	52	92	93	86.7	B			
48	Babbitt	91	99	97	92	96	89	94.1	A			
49	Melish	78	79	91	79	89	77	82.9	B			

Fig. 10.59.
A complicated formula to calculate an average.

If you transpose the entries in the range B32..G32 to the range K34..K39 (see fig. 10.60), the two ranges B34..G51 (an 18-row by 6-column matrix) and K34..K39 (a 6-row by 1-column matrix) can be multiplied with matrix multiplication. To do this, issue the Data Matrix Multiply command to display the dialog box shown in figure 10.61. Specify the two matrix ranges and set the output range to be at cell J34. When you select OK in the Data Matrix Multiply dialog box, the results occupy cells J34..J51 (see fig. 10.60). If the matrices you choose are large, you must wait a few minutes for the operation to complete.

Fig. 10.60.
The results of
a Matrix
Multiply
operation.

Help F1 Feb 27, 1990 Lotus-DM - C:\LOTUS-DM\MATRIX.WK1 2:17 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

J34 (F2) [W6] 67.1

	A	B	C	D	E	F	G	H	I	J	K	L
32	Name of Student	10%	15%	25%	10%	15%	25%					
33												
34	Menninger	72	69	60	65	77	66	67.1	D	67.10	10%	
35	Hackenbush	90	91	56	91	99	89	82.9	B	82.05	15%	
36	Driftwood	82	90	99	92	91	83	90.1	A	90.05	25%	
37	Martinet	61	71	70	70	83	82	74.2	C	74.20	10%	
38	Whiteside	73	69	62	65	82	79	71.7	C	71.70	15%	
39	Kinble	71	81	71	92	82	82	79.0	B	79.00	25%	
40	Firefly	86	66	79	46	82	74	73.7	C	73.65		
41	Tetrazzini	78	84	74	76	98	78	80.7	B	80.70		
42	Mahler	79	81	75	78	86	79	79.3	B	79.25		
43	Kane	88	85	80	74	97	98	88.0	B	88.00		
44	Mallory	84	84	81	70	88	83	82.2	B	82.20		
45	Bates	71	86	81	0	81	76	71.4	C	71.40		
46	Bickle	76	75	86	76	76	76	78.4	C	78.35		
47	Plantee	90	88	89	52	92	93	86.7	B	86.70		
48	Babbitt	91	99	97	92	96	89	94.1	A	94.05		
49	Melish	78	79	91	79	89	77	82.9	B	82.90		

Fig. 10.61.
The Data
Matrix
Multiply
dialog box.

Data Matrix Multiply

Matrix A Range:

Matrix B Range:

Output Range:

The results, as shown in figure 10.60, are the same as they were when formulas were used, but now the absence of formulas creates a two-fold advantage: the worksheet occupies less space in memory, and when changes occur in the worksheet, the cells that now contain values are not recalculated, which saves valuable time. With large matrices, such time savings can be measured in minutes, not seconds.

Using the Data Matrix Invert Command

Data Matrix Invert lets you invert a square matrix of up to 90 rows and columns. A *square matrix* is one that has as many columns as it does rows. The Data Matrix Invert command requires a range to invert and an output range to hold the inverted matrix. You can place the output range anywhere in the worksheet, including on top of the matrix you are inverting.

Reminder:

Use Data Matrix Invert to invert a square matrix of up to 90 rows and columns.

The time required to invert a matrix is proportional to the cube of the number of rows and columns. If you frequently use Lotus-DM to invert matrices, consider investing in an 8087, 80287, or 80387 math coprocessor for your computer to speed up the inversion process.

Chapter Summary

This chapter addresses all the options on the Data menu. The Sort and Query options are true data-management commands. The other options (Parse Setup, Parse, Table, Fill, Distribution, Regression, Matrix Multiply, and Matrix Invert) create data; you can use these eight commands in database or worksheet applications.

Part IV

Quick Reference

This Part Includes:

Function Reference

Function Reference

Chapter 3 introduced you to functions. This Function Reference guide presents the main categories of functions and lists the functions in each category. Descriptions of each function are organized in alphabetical order for easy reference.

Mathematical Functions

Lotus-DM provides 17 mathematical functions that enable you to perform most of the common—and some specialized—mathematical operations. The operations you can perform include general, logarithmic, and trigonometric calculations. Tables FR.1, FR.2, and FR.3 list the general, logarithmic, and trigonometric functions with brief descriptions.

Table FR.1
General Mathematical Functions

<i>Function</i>	<i>Description</i>
@ABS(<i>number or cell reference</i>)	Computes the absolute value of the number
@INT(<i>number or cell reference</i>)	Computes the integer portion of a number
@MOD(<i>number,divisor</i>)	Computes the remainder, or <i>modulus</i> , of a division operation
@RAND	Generates a random number
@ROUND(<i>number or cell reference,precision</i>)	Rounds a number to a specified precision
@SQRT(<i>number or cell reference</i>)	Computes the square root of a number

Table FR.2
Logarithmic Functions

<i>Function</i>	<i>Description</i>
@EXP(<i>value or cell reference</i>)	Computes the number <i>e</i> raised to power of the argument
@LN(<i>value or cell reference</i>)	Calculates the natural logarithm of a specified number
@LOG(<i>value or cell reference</i>)	Calculates the common, or base 10, logarithm of a specified number

Table FR.3
Trigonometric Functions

<i>Function</i>	<i>Description</i>
@ACOS(<i>angle</i>)	Calculates the arccosine given an angle in radians
@ASIN(<i>angle</i>)	Calculates the arcsine given an angle in radians
@ATAN(<i>angle</i>)	Calculates the arctangent given an angle in radians
@ATAN2(<i>number1,number2</i>)	Calculates the four-quadrant arctangent
@COS(<i>angle</i>)	Calculates the cosine given an angle in radians
@PI	Calculates the value of pi
@SIN(<i>angle</i>)	Calculates the sine given an angle in radians
@TAN(<i>angle</i>)	Calculates the tangent given an angle in radians

Statistical Functions

Lotus-DM provides 7 statistical functions. (Additional statistical functions, specifically for databases, are described in Chapter 10.) Table FR.4 lists the functions, their arguments, and the statistical operations they perform.

Table FR.4
Statistical Functions

<i>Function</i>	<i>Description</i>
@AVG(<i>list</i>)	Calculates the arithmetic mean of a list of values
@COUNT(<i>list</i>)	Counts the number of cells that contain entries
@MAX(<i>list</i>)	Returns the maximum value in a list of values
@MIN(<i>list</i>)	Returns the minimum value in a list of values
@STD(<i>list</i>)	Calculates the population standard deviation of a list of values
@SUM(<i>list</i>)	Sums a list of values
@VAR(<i>list</i>)	Calculates the population variance of a list of values

Each statistical function uses the argument *list*. *list* can be either individually specified values or cell addresses, a range of cells, or multiple ranges of cells. For example, each of the following formats (or any combination) is valid:

@SUM(1,2,3,4)

@SUM(B1,B2,B3,B4)

@SUM(B1..B4)

@SUM(B1..B2,B3..B4)

@SUM(A1,A3..A10,B11,C13..C20)

Although the preceding examples use the @SUM function (which totals the values included as arguments), the principles apply equally to each of the statistical functions.

Some statistical functions perform differently when you specify cells individually than when you specify ranges. The functions that perform differently in this case include @AVG, @MAX, @MIN, @STD, and @VAR. When you specify a range of cells, Lotus-DM ignores empty cells within the specified range. When you specify cells individually, however, Lotus-DM takes empty cells into consideration for the particular functions mentioned.

Suppose that you are looking for the minimum value in a range that includes an empty cell and cells that contain the entries 1, 2, and 3. In this case, Lotus-DM returns the value 1 as the minimum value. Suppose, however, that you instead specify individually an empty cell along with cells containing the entries 1, 2, and 3. In this case, Lotus-DM returns the value 0 as the minimum.

The reason is that empty cells actually contain invisible zeros. Accordingly, Lotus-DM assumes that if you specify an individual cell—even if it is empty—you must want it included in the statistical calculation.

When you specify cells, keep in mind also that Lotus-DM treats cells holding labels as zeros. This is the case both when you include the cell as part of a range and when you specify the cell individually.

Financial and Accounting Functions

Lotus-DM provides 11 financial and accounting functions that perform discounted cash flow, loan amortization, and asset depreciation calculations. Table FR.5 summarizes the financial and accounting functions available with Lotus-DM.

Table FR.5
Financial and Accounting Functions

<i>Investment Function</i>	<i>Description</i>
@CTERM (<i>interest, future value, present value</i>)	Calculates the number of periods for present value to grow to future value
@FV (<i>payment, interest, term</i>)	Calculates the future value of a stream of periodic cash flows
@IRR (<i>guess, cashflows</i>)	Calculates the internal rate of return on an investment
@NPV (<i>interest, cashflows</i>)	Calculates the present value of a stream of periodic cash flows—even if the cash flows are not even
@PMT (<i>principal, interest, term</i>)	Calculates the loan payment amount

Table FR.5 (continued)

<i>Investment Function</i>	<i>Description</i>
@PV (<i>payment, interest, term</i>)	Calculates the present value of a stream of periodic cash flows if the cash flows are even
@RATE (<i>future value, present value, term</i>)	Calculates the return on an investment given the present value and the future value
@TERM (<i>payment, interest, future value</i>)	Calculates the number of times a loan payment is made
@DDB (<i>cost, salvage, life, period</i>)	Calculates 200% declining balance depreciation
@SLN (<i>cost, salvage, life</i>)	Calculates straight-line depreciation
@SYD (<i>cost, salvage, life, period</i>)	Calculates sum-of-the-years'-digits depreciation

Logical Functions

The logical functions allow you to add standard Boolean logic to your worksheet and use the logic either alone or as part of other worksheet formulas. Essentially, each of the logical functions allows you to test whether a *condition* is TRUE or FALSE.

For some of the logical functions, you describe the test and what the function should do based on the test. For example, the @IF function tests any condition you include as an argument and then returns one value or label if the test is TRUE, and another value or label if the test is FALSE. For other logical functions, both the test and what the function returns based on the test are built into the function itself. For example, @ISSTRING simply tests whether the argument is a string and returns 1 if the test is TRUE and 0 if the test is FALSE.

The 7 logical functions that Lotus-DM provides are summarized in table FR.6.

Table FR.6
Logical Functions

<i>Function</i>	<i>Description</i>
@FALSE	Equals 0, the logical value for FALSE
@IF(<i>test</i> , <i>TRUE</i> , <i>FALSE</i>)	Tests the condition and returns one result if the condition is TRUE and another if the condition is FALSE
@ISERR(<i>cell reference</i>)	Tests whether the argument equals ERR
@ISNA(<i>cell reference</i>)	Tests whether the argument equals NA
@ISNUMBER(<i>cell reference</i>)	Tests whether the argument is a number
@ISSTRING(<i>cell reference</i>)	Tests whether the argument is a string
@TRUE	Equals 1, the logical value for TRUE

Special Functions

The special functions are listed in a separate category because they provide information about cell or range content or worksheet location. Table FR.7 lists Lotus-DM's special functions.

Table FR.7
Special Functions

<i>Function</i>	<i>Description</i>
@@(<i>cell address</i>)	Returns the contents of the cell referenced by the cell address in the argument
@CELL(<i>string</i> , <i>range</i>)	Returns the attribute designated by the string for the cell in the upper left corner of the range
@CELLPOINTER(<i>string</i>)	Returns the attribute designated by the string for the current cell
@CHOOSE(<i>offset</i> , <i>list</i>)	Locates the specified entry in a list

Table FR.7 (continued)

<i>Function</i>	<i>Description</i>
@COLS(<i>range</i>)	Computes the number of columns in a range
@ERR	Displays ERR in the cell
@HLOOKUP(<i>key,table,offset</i>)	Locates the specified key in a look-up table and returns a value from that row of the look-up table
@INDEX(<i>range, column-offset, row-offset, worksheet-offset</i>)	Locates an entry in the specified address in a range
@NA	Displays NA in the cell
@ROWS(<i>range</i>)	Computes the number of rows in a range
@VLOOKUP(<i>key,table,offset</i>)	Locates a specified key in a look-up table and returns a value from that column of the look-up table

Date and Time Functions

Lotus-DM's date and time functions enable you to convert dates and times to serial numbers and then use these serial numbers in date arithmetic and time arithmetic—a valuable aid when dates and times affect worksheet calculations and logic. The date and time functions available with Lotus-DM are summarized in table FR.8.

Table FR.8
Date and Time Functions

<i>Function</i>	<i>Description</i>
@DATE(<i>y,m,d</i>)	Calculates the serial number that represents the described date
@DATEVALUE(<i>datestring</i>)	Converts a date expressed as a string into a serial number
@DAY(<i>date</i>)	Extracts the day number from a serial number

Table FR.8 (continued)

<i>Function</i>	<i>Description</i>
@HOUR(<i>time</i>)	Extracts the hour number from a serial number
@MINUTE(<i>time</i>)	Extracts the minute number from a serial number
@MONTH(<i>date</i>)	Extracts the month number from a serial number
@NOW	Calculates the serial date and time from the current system date and time
@SECOND(<i>time</i>)	Extracts the second number from a serial number
@TIME(<i>h,m,s</i>)	Calculates the serial number that represents the described time
@TIMEVALUE(<i>timestring</i>)	Converts a time expressed as a string into a serial number
@YEAR(<i>date</i>)	Extracts the year number from a serial number

String Functions

Lotus-DM has a variety of functions that give you significant power to manipulate strings. *Strings* are labels or portions of labels. More specifically, strings are units of data consisting of connected characters (alphabetic, numeric, blank, and special) delimited by quotation marks (" "). The functions specifically designated as string functions are not the only Lotus-DM functions that take advantage of the power and flexibility of strings. For example, logical, error-trapping, and special functions use strings as well as values. The string functions, however, are specifically designed to manipulate strings. Table FR.9 summarizes the string functions available with Lotus-DM.

Table FR.9
String Functions

<i>Function</i>	<i>Description</i>
@CHAR(<i>number</i>)	Converts a code number into an ASCII/LICS character
@CODE(<i>string</i>)	Converts the first character in the string into an ASCII/LICS code
@EXACT(<i>string1</i> , <i>string2</i>)	Returns TRUE if <i>string1</i> and <i>string2</i> are exact matches; otherwise, returns FALSE
@FIND(<i>search string</i> , <i>overall string</i> , <i>start number</i>)	Locates the start position of one string within another string
@LEFT(<i>string</i> , <i>length</i>)	Extracts the leftmost specified number of characters from the string
@LENGTH(<i>string</i>)	Displays the number of characters in the string
@LOWER(<i>string</i>)	Converts all characters in the string to lowercase
@MID(<i>string</i> , <i>start position</i> , <i>length</i>)	Extracts the specified number of characters from a string, beginning with the character in the start position
@N(<i>range</i>)	Returns the value contained in the cell in the upper left corner of the range
@PROPER(<i>string</i>)	Converts the first character in each word in the string to uppercase, and the remaining characters to lowercase
@REPEAT(<i>string</i> , <i>number</i>)	Copies the string the specified number of times in a cell

Table FR.9 (continued)

<i>Function</i>	<i>Description</i>
@REPLACE (<i>original string, start number, length, replacement string</i>)	Substitutes the specified number of characters from the original string with the replacement string at the character start number
@RIGHT (<i>string, length</i>)	Extracts the rightmost specified number of characters from the string
@S (<i>range</i>)	Returns the string value of the cell in the upper left corner of the range
@STRING (<i>number to convert, decimal places</i>)	Converts a value to a string showing the specified number of decimal places
@TRIM (<i>string</i>)	Extracts blank spaces from the string
@UPPER (<i>string</i>)	Converts all characters in the string to uppercase
@VALUE (<i>string</i>)	Converts a string to a value

You can link strings to other strings by using the concatenation operator (&). The descriptions of the string functions show several examples of the use of the concatenation operator. Keep in mind that you cannot link strings to cells that contain numeric values or to cells that are empty. If you try, Lotus-DM returns an ERR value.

Avoid mixing data types in string functions. For instance, some functions produce strings, and others produce numeric (value) results. You cannot concatenate strings with values until you convert the values to strings. Nearly all the string functions are designed to operate on labels, not values. You can use the **@STRING** function to change values into labels before you do string manipulation on cells containing values.

The numbering scheme for positioning characters in a label is also something to watch for when using string functions. These positions are numbered beginning with zero and continuing to a number corresponding to the last character in the label. The following example shows the position numbers (0 to 24) for a long label:


```
111111111122222
0123456789012345678901234
'two chickens in every pot
```

The prefix (') before the label does not have a number because the prefix is not considered part of the label. Nor are negative position numbers allowed. The importance of position numbers is critical in the functions @FIND, @MID, and @REPLACE.

Lotus-DM offers two functions you can use to interface with the Lotus International Character Set (LICS). (Be aware that the ASCII code number for a given character may not correspond to its LICS code number.) LICS is a character set that allows you to display foreign-language characters and mathematical symbols.

The complete set of LICS characters, listed in the Lotus Spreadsheet for Desk-Mate manual, includes everything from the copyright sign (©) to the lowercase *e* with the grave accent (è).

Function Descriptions

Following in alphabetical order are descriptions of each of the functions you can use with Lotus-DM.

@@

The @@ function provides a way of indirectly referencing one cell by way of another cell. The format of the @@ function is as follows:

@@(cell reference)

For example, if cell A1 contains the label 'A2, and cell A2 contains the number 5, the function @@(A1) returns the value 5.

The argument of the @@ function must be a reference to the cell that contains the indirect address. Similarly, the cell referenced by the argument of the @@ function must contain a string value that evaluates to a cell reference. This cell can contain a label, a string formula, or a reference to another cell, as long as the resulting string value is a cell reference.

The @@ function is useful primarily in situations where several formulas each have the same argument, and the argument must be changed from time to time during the course of the application. Lotus-DM lets you specify the arguments of each formula through a common indirect address, as shown in the example in figure FR.1.

Fig. FR.1.
An example of
the @@
function in a
series of
formulas.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F638.WK1 10:56 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B11 (C2) [W11] @PMT(40000,@@(D6)/12,20*12) READY

	A	B	C	D	E	F	G
1							
2							
3		Functions		Reference Cell		Interest Rates	
4							
5							
6		\$13,692.82		F6		0.09	
7		\$76,740.18				0.10	
8		\$26.72				0.11	
9		\$18.68				0.12	
10		\$4,381.86				0.13	
11		\$359.89				0.14	
12							

In figure FR.1, column B contains a variety of financial functions, all of which use the @@ function to reference one of seven interest rates in column F indirectly through cell D6. When you are ready to change the cell being referenced, you have to change only the label in cell D6 instead of editing all six formulas in column B. Figure FR.2 shows the results of the same formulas after the indirect address has been changed from 'F6 to 'F7.

Fig. FR.2.
Formulas
using @@
after changing
an indirect
reference.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F639.WK1 10:56 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B11 (C2) [W11] @PMT(40000,@@(D6)/12,20*12) READY

	A	B	C	D	E	F	G
1							
2							
3		Functions		Reference Cell		Interest Rates	
4							
5							
6		\$13,692.82		F7		0.09	
7		\$76,740.18				0.10	
8		\$26.72				0.11	
9		\$18.68				0.12	
10		\$4,381.86				0.13	
11		\$386.01				0.14	
12							
13							

@ABS

The @ABS function calculates the absolute value of a number, using the following format:

@ABS(number or cell reference)

The function has one argument, which can be either a numeric value or a cell reference to a numeric value. @ABS converts a negative value into its equivalent positive value. @ABS has no effect on positive values. Some examples using @ABS are shown in figure FR.3.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F601.WK1 10:35 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ ↑ F₉ ↓ F₁₀

B3 @ABS(A3) READY

	A	B	C	D	E	F	G	H
1	Value	@ABS Result						
2								
3	-11.13	11.13						
4	-3	3						
5	0	0						
6	12	12						
7	101.5	101.5						
8								
9								

Fig. FR.3.
The results of
using @ABS with
positive and
negative
numbers.

@ACOS

The @ACOS, @ASIN, @ATAN, and @ATAN2 functions calculate the arccosine, the arcsine, the arctangent, and the four-quadrant arctangent, respectively. @ACOS computes the inverse of cosine; @ASIN computes the inverse of sine; and @ATAN computes the inverse of tangent. @ATAN2 calculates the four-quadrant arctangent using the ratio of its two arguments. Given a number, the @ASIN function calculates a radian angle that would produce that number from the @SIN function. In other words, @ACOS(x) gives the angle in radians whose cosine is x ; to get the cosine of x , use @COS(@ACOS(x)).

Both @ACOS and @ASIN are called with one argument:

@ACOS(*value or cell reference*)

@ASIN(*value or cell reference*)

Because all cosine and sine values lie between -1 and 1 , you can use @ACOS and @ASIN only with values between -1 and 1 . Each function returns ERR if you use a value outside this range. @ASIN returns angles between $-\pi/2$ and $+\pi/2$; @ACOS returns angles between 0 and $\pi/2$. Figure FR.4 shows examples of the @ACOS, @ASIN, and @ATAN functions.

For the @ATAN function, you again use one argument. You can call @ATAN with any number; this function returns a value between $-\pi/2$ and $+\pi/2$. The format of the @ATAN function is as follows:

@ATAN(*value or cell reference*)

@ATAN2 computes the angle whose tangent is specified by the ratio *number2/number1*, the two arguments. At least one of the arguments must be other than zero.

@ATAN2 returns angles between $-\pi$ and $+\pi$. The format of the @ATAN2 function is as follows:

@ATAN2(*number1,number2*)

Fig. FR.4.
Examples of the
@ACOS, @ASIN,
and @ATAN
functions

Help F1 Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F611.WK1 10:40 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

B3 [W18] @ACOS(A3) READY

	A	B	C	D	E
1	Value	@ACOS	@ASIN	@ATAN	
2					
3	1	0	1.5707963268	0.7853981634	
4	0.70711	0.7853936113	0.7854027155	0.6154818545	
5	0	1.5707963268	0	0	
6	-0.70711	2.3561990423	-0.7854027155	-0.6154818545	
7	-1	3.1415926536	-1.5707963268	-0.7853981634	
8	10	ERR	ERR	1.4711276743	
9					
10					

Figure FR.5 gives examples of the @ATAN function.

Fig. FR.5.
Examples of the
@ATAN2
function.

Help F1 Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F612.WK1 10:41 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

C3 [W18] @ATAN2(A3,B3) READY

	A	B	C	D	E	F
1			@ATAN2			
2						
3	1.570796	0	0			
4	1.047198	0.523599	0.463647609			
5	0	1.5707963268	1.5707963268			
6	2.094395	-0.5236	-0.2449792249			
7	3.141592	-1.5708	-0.4636485444			
8	0	-1	-1.5707963268			
9	1	0	0			
10	0	0	ERR			
11						

@ASIN

Refer to the discussion of the @ACOS function.

@ATAN

Refer to the discussion of the @ACOS function.

@ATAN2

Refer to the discussion of the @ACOS function.

@AVG

To calculate the average of a set of values, you add all the values and then divide by the number of values. The @AVG function is a helpful tool for calculating the *arithmetic mean*—a commonly used measure of a set of values' average. Use the following format with the @AVG function:

@AVG(*list*)



Note: The *list* argument can be values, cell addresses, cell names, cell ranges, range names, or combinations of these.

Figure FR.6 shows the *list* argument as B3..B11. As long as cells B8 and B9 are empty and are included in the *list* argument only as part of a range, the values of these cells—actually zero—are ignored in the calculation.

Help F1 Feb 5, 1990 Lotus-DH - C:\123\DH-TEMP\F613.WK1 10:41 am

File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F8	F9	F10
F3	@AVG(B3..B11)							
	A	B	C	D	E	F	G	
1	Day	Price			Statistics			
2								
3	Monday	\$11.50			Average	\$11.54		
4	Tuesday	\$11.25						
5	Wednesday	\$11.00						
6	Thursday	\$11.50						
7	Friday	\$11.75						
8	Saturday							
9	Sunday							
10	Monday	\$12.00						
11	Tuesday	\$11.75						
12								

Fig. FR.6.
The @AVG function used to calculate the mean price per share.

@CELL and @CELLPOINTER

The @CELL and @CELLPOINTER functions provide an efficient way to determine the nature of a cell because these functions return up to nine different characteristics of a cell.

The formats of the @CELL and @CELLPOINTER functions are as follows:

@CELL(*string*,*range*)

@CELLPOINTER(*string*)

Both functions have a *string* argument, which is the *aspect* of the cell you want to examine. The @CELL function, however, also requires the specification of a *range*; the @CELLPOINTER function works with the current cell.

The *string* argument can be one of the following aspects (notice that you must include the quotation marks surrounding each word):

"row"	"col"	"contents"
"type"	"protect"	"address"
"prefix"	"format"	"width"

The following examples show how you can use the @CELL function to examine some cell attributes. Notice that you can use a range name for the second argument, a single-cell address in range format (for example C195..C195), or a single-cell address (for example, C195). If you type a single-cell address, notice that Lotus-DM automatically changes the cell address to range format when you press Enter.

@CELL("address",SALES)

If the range named SALES is C187..E187, Lotus-DM returns the absolute address \$C\$187. This function is a convenient way to list the upper left corner of a range's address in the worksheet. To list all the range names and their addresses in the worksheet, move the cell pointer to the upper left corner of a two-column range that is empty; then select the Range Name command and choose the Table option.

@CELL("prefix",C195..C195)

If the cell C195 contains the label 'Chicago, Lotus-DM returns ' (indicating left alignment). If cell C195 is blank, Lotus-DM returns nothing; in other words, the current cell appears blank.

@CELL("format",A10)

Lotus-DM changes the single-cell address in the second argument to rangeformat (A10..A10) and returns the format of cell A10.

@CELL("width",B12..B12)

Lotus-DM returns the width of column B as viewed in the current window, regardless of whether the width was set using the Worksheet Column command with the Global or Range option.

The difference between @CELL and @CELLPOINTER is important. The @CELL function examines the string attribute of a cell you designate in a range format, such as A1..A1. If you use a single-cell format, such as A1, Lotus-DM changes to the range format (A1..A1) and returns the attribute of the single-cell range. If you define a range larger than a single cell, Lotus-DM evaluates the cell in the upper left corner of the range.

On the other hand, the @CELLPOINTER function operates on the current cell—the cell where the cell pointer was positioned when the worksheet was last recalculated. The result remains the same until you enter a value or press the Calc (Ctrl-F9) key—whether the worksheet is in Automatic Recalculation or Manual Recalculation mode.

For example, to determine the address of the current cell, enter @CELLPOINTER("address") in cell B22. If recalculation is set to Automatic, the value displayed in that cell is displayed as the absolute address \$B\$22. This same address remains displayed until you recalculate the worksheet by making an entry elsewhere in the worksheet or by pressing the Calc (Ctrl-F9) key. The address that appears in cell B22 changes to reflect the position of the cell pointer when the worksheet was recalculated. If recalculation is Manual, you can change the address only by pressing the Calc (Ctrl-F9) key. Figure FR.7 shows the use of the @CELLPOINTER function with all the attributes that can be examined by both the @CELLPOINTER and @CELL functions.

Help F₁ Feb 5, 1990 Lotus-DH - C:\123\DH-TEMP\F640.WK1 10:57 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₉ F₁₀

E2 123 READY

	A	B	C	D	E	F
1						
2	Formula		RESULT		123	
3						
4	@CELLPOINTER("address")		\$E\$2			
5						
6	@CELLPOINTER("row")		2			
7						
8	@CELLPOINTER("col")		5			
9						
10	@CELLPOINTER("contents")		123			
11						
12	@CELLPOINTER("type")		v			
13						
14	@CELLPOINTER("prefix")					
15	@CELLPOINTER("protect")		1			
16	@CELLPOINTER("width")		9			
17	@CELLPOINTER("format")		G			
18						

Fig. FR.7.
The
@CELLPOINTER
function used to
examine cell
attributes.

@CHAR

The @CHAR function displays the ASCII/LICS equivalent of a number between 1 and 255. The format of the @CHAR function is as follows:

@CHAR(*number*)

For example, Lotus-DM represents a ™ sign on-screen with a T. To display the trademark sign on-screen, enter **@CHAR(184)** in a cell. You can use a string formula to concatenate the trademark sign to a product name. For instance, enter the following formula to produce the string 8080T:

+“8080”&@CHAR(184)

When you print the screen display, this string prints as 8080™. Figure FR.8 shows several other examples of the use of the @CHAR function.

Fig. FR.8.
LICS
characters
displayed with
the @CHAR
function.

Help F1 Feb 28, 1990 Lotus-DM - C:\LOTUS-DM\CHAR.WK1 2:43 pm

File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F9	F10
E3 @CHAR(C3) READY							
	A	B	C	D	E	F	G
1	Function		Number		Result		
2							
3	@CHAR(C7)		239		™		
4	@CHAR(C5)		162		¢		
5							
6	@CHAR(C7)		124		l		
7							
8	@CHAR(C9)		173		■		
9							
10							
11							

Keep in mind two simple rules when using @CHAR. First, if the numeric argument you are using is not between 1 and 255, Lotus-DM returns an ERR message. Second, Lotus-DM disregards any noninteger portion of the argument.

Some special characters also can be displayed by pressing Compose (Alt-F1) and typing a compose sequence.



Note: An appendix in the Lotus Spreadsheet for DeskMate manual includes a list of characters and the LICS codes you can use with the @CHAR function to display those characters. The appendix also lists the compose sequence you type to display the characters.

@CHOOSE

The @CHOOSE function selects an item from a list based on the item's position in the list. The format of the @CHOOSE function is as follows:

@CHOOSE(*offset*,*list*)

The function selects the item in the specified position, or *offset*, in the specified *list*. Keep in mind that positions are numbered starting with 0. For example, the first position is 0, the second is 1, the third is 2, and so on.

Figure FR.9 shows examples of the @CHOOSE function. The key, or *offset*, is the specified position. The actual formulas are shown in column B. The lists of items, which can be either values or strings, are shown in columns C through F. The results of the @CHOOSE function are shown in column H.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F641.WK1 10:58 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

H7 [W11] @CHOOSE(A7,C7,D7,E7,F7) READY

	A	B	C	D	E	F	G	H
1								Calculated
2		Offset Formula	1	2	3	4		Result
3								
4		0 @CHOOSE(A4,C4,D4,E4,F4)	1	2	3	4		1
5		1 @CHOOSE(A5,C5,D5,E5,F5)	Bob	Sue	Tom	Liz		Sue
6		2 @CHOOSE(A6,C6,D6,E6,F6)	25	50	75	100		75
7		3 @CHOOSE(A7,C7,D7,E7,F7)	-1	-2	-3	-4		4

Fig. FR.9.
The @CHOOSE function used to select an item from a list.

@CODE

@CODE examines an ASCII/LICS character and returns a number between 1 and 255. The format of the @CODE function is as follows:

@CODE(string)

Suppose that you want to find the ASCII/LICS code number for the letter *a*. Type @CODE("a") in a cell, and Lotus-DM returns the number 97. If you enter @CODE("aardvark"), Lotus-DM still returns 97, the code of the first character in the string. Figure FR.10 shows several other examples of the use of the @CODE function.

Help F₁ Feb 28, 1990 Lotus-DM - C:\LOTUS-DM\CODE.WK1 2:43 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

E4 @CODE(C4) READY

	A	B	C	D	E	F	G
1			LICS				
2		Function	Code		Result		
3							
4		@CODE(C4)	a		64		
5							
6		@CODE(C6)	\$		36		
7							
8		@CODE(C8)	@		38		
9							
10		@CODE(C10)	=		61		
11							
12							
13							

Fig. FR.10.
The @CODE function used to find LICS numbers.



Note: If you specify a number as the argument for @CODE (expressed as a number and not as a string), Lotus-DM returns an ERR message.

@COLS

The @COLS and @ROWS functions are used to describe the dimensions of ranges, using the following formats:

@COLS(*range*)

@ROWS(*range*)

Suppose that you want to determine the number of columns in a range called RANDOM, which has the cell coordinates D4..G9, and you want to display that value in the current cell. To do so, enter **@COLS(RANDOM)**. Similarly, you can enter **@ROWS(RANDOM)** to display the number of rows in the range. Figure FR.11 shows the results of entering @ROWS(RANDOM) in cell B5 and @COLS(RANDOM) in cell B7.

Fig. FR.11.
The @COLS
and @ROWS
functions used
to show range
dimensions.

Help F ₁		Feb 28, 1990		Lotus-DM - C:\LOTUS-DM\ROWS.WK1		3:45 pm	
File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
B5	(G) @ROWS(RANDOM)						READY
	A	B	C	D	E	F	G
1							
2	Formula	Result	The Range RANDOM				
3							
4				0.973444	0.693856	0.740001	0.677185
5	@ROWS(D4..G9)	6		0.201287	0.722128	0.566287	0.085451
6				0.616824	0.313609	0.480985	0.176696
7	@COLS(RANDOM)	4		0.825949	0.604962	0.819124	0.232887
8				0.105465	0.761743	0.569163	0.239453
9				0.854902	0.077560	0.187321	0.446952
10							
11							
12							
13							

If you specify a single cell (such as C3) as the argument for the @COLS or @ROWS function, Lotus-DM changes the argument to range format (C3..C3) and returns the value 1.

@COS

The @COS, @SIN, and @TAN functions calculate the cosine, sine, and tangent, respectively, of an angle. Each function is called with one argument—an angle calibrated in radians:

@COS(*angle in radians*)

@SIN(*angle in radians*)

@TAN(*angle in radians*)

Be sure to convert angle measurements into radians before using these functions.

Figure FR.12 shows these three functions. Notice that in cells C5, C9, D7, and D11, the numbers returned are small, but not exactly zero, which they should be. These small values cause large numbers to be displayed in cells E5 and E9, which should show ERR (division by zero), and small numbers in cells E7 and E11, which should also show zero. These errors occur because of problems with Lotus-DM's floating-point driver.

Use the @ROUND function to ensure that results are rounded to a specified number of decimal places. Using @ROUND does more than change the numbers visually (as is the case when you format cells to a specific number of decimal places); @ROUND actually changes the values.

Help F1 Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F610.WK1 10:40 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F8 F9 F10

C1 [W10] ^ @COS READY

	A	B	C	D	E
	Degrees	Radians	@COS	@SIN	@TAN
1					
2	0	0	1	0	0
3					
4	45	0.785398	0.7071067812	0.7071067812	1
5	90	1.570796	6.1650800600E-17	1	1.6220389521E+16
6	135	2.356194	-0.7071067812	0.7071067812	-1
7	180	3.141592	-1	1.2262037688E-16	-1.2262037688E-16
8	-45	-0.78539	0.7071067812	-0.7071067812	-1
9	-90	-1.57079	6.1257422745E-17	-1	-1.6324552278E+16
10	-135	-2.35619	-0.7071067812	-0.7071067812	1
11	-180	-3.14159	-1	1.2262037688E-16	1.2262037688E-16
12					
13					

Fig. FR.12.
Examples of
the @COS,
@SIN, and
@TAN
functions.

@COUNT

The @COUNT function totals the number of cells that contain entries by using the following format:

@COUNT(*list*)



Note: The *list* argument can be values, cell addresses, cell names, cell ranges, range names, or combinations of these.

You can use the @COUNT function to show the number of prices included in a column, as shown in figure FR.13.

Fig. FR.13.
The **@COUNT**
function used to
calculate the
number of
prices in a
column.

Help F1 Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F614.WK1 10:41 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F8 F9 F10

F4 (F0) @COUNT(B3..B11) READY

	A	B	C	D	E	F	G
1	Day	Price			Statistics		
2							
3	Monday	\$11.50			Average	\$11.51	
4	Tuesday	\$11.25			Days	?	
5	Wednesday	\$11.00					
6	Thursday	\$11.50					
7	Friday	\$11.75					
8	Saturday						
9	Sunday						
10	Monday	\$12.00					
11	Tuesday	\$11.75					
12							
13							

You should include only ranges as the *list* argument for the @COUNT function. If you specify an individual cell, Lotus-DM counts that cell regardless of whether or not the cell is empty. If you must specify an individual cell but want to count it only if it actually contains an entry, use the @@ function.

@CTERM

The @CTERM (compound term of investment) function calculates the number of periods required for an initial investment earning a specified interest rate to grow to a specified future value. The @TERM function calculates the number of periods needed for a series of payments to grow to a future value at a specified interest rate; @CTERM function calculates the required number of periods based on the specified present value, future value, and interest rate. The format of the @CTERM function is as follows:

@CTERM(*interest, future value, present value*)

This equation is used to calculate @CTERM:

$$\text{Term} = \frac{\text{@LN}(\text{future value}/\text{present value})}{\text{@LN}(1 + \text{interest})}$$

The @CTERM function is useful for determining the term of an investment necessary to achieve a specific future value. Suppose that you want to determine how many years it will take for \$2,000 invested in an IRA account at 10 percent interest to grow to \$10,000. Figure FR.14 shows how to use the @CTERM function to determine the answer: just over 16 years and 10 months.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F629.WK1 10:49 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B5 (W6) @CTERM(B1,B2,B3) READY

	A	B	C	D	E	F	G
1	Interest Rate	10.00%					
2	Future Value	\$10,000					
3	Present Value	\$2,000					
4							
5	Compound Term	16.8863					
6							

Fig. FR.14.
The @CTERM function used to calculate the number of years for \$2,000 to grow to \$10,000 at 10 percent.

@DATE

The first step in using dates in arithmetic operations is to convert them to actual numbers, or *serial numbers*, you can then use in arithmetic operations. The most frequently used date function is @DATE, which converts any date into a number you can use in arithmetic operations—and, as importantly, that Lotus-DM can view as a date. The @DATE function uses this format:

@DATE(year,month,day)

You identify the *year*, *month*, and *day* with numbers. For example, you enter the date November 26, 1989, into the @DATE function as follows:

@DATE(89,11,26)

Enter the *year* argument as an integer from 0 (1900) to 199 (2099). For example, for the year 1999, use 99; for the year 2000, use 100; for the year 2001, use 101.

The numbers you enter to represent the year, month, and day must make up a valid date, or Lotus-DM returns an ERR. For example, you can specify the *day* argument in February as 29 only during leap years, and never as 30 or 31. When you specify the month as 1 (which represents January), 30 or 31 are valid *day* arguments because January has 31 days.

Help F₁ Feb 28, 1990 Lotus-DM - C:\LOTUS-DM\LOANS.WK1 2:46 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B2 (D1) (W11) @DATE(90,12,15) READY

	A	B	C	D	E	F
1	Loan origination date	15-May-90				
2	Loan payoff date	15-Dec-90				
3						
4	Days loan outstanding	214				
5						
6						
7						
8						
9						

Fig. FR.15.
The @DATE function expressing dates as serial numbers.

Guidelines for Using the @DATE Function

1. The internal Lotus-DM calendar starts with the serial number 1—the first date that Lotus-DM recognizes—which represents January 1, 1900. Each day is incremented by 1. The last serial date that Lotus-DM recognizes is 73050—December 31, 2099.
2. Although 1900 wasn't a leap year, Lotus-DM erroneously assigns the serial number 60 to February 29, 1900. To adjust for this error, subtract 1 from serial numbers that represent dates between January 1, 1900 and March 1, 1900.

Note that the serial dates used in figure FR. 15 appear as dates even though they are actually just numbers. Using the Range Format command and selecting **Date**, you can format serial numbers that represent dates to appear as recognizable dates. When you format the dates, Lotus-DM still works with the dates as serial numbers, but you see the dates in reports and on-screen in formats you recognize. (The various date and time formats available are discussed in detail in Chapter 5.)

@DATEVALUE

@DATEVALUE computes the serial number for a string that looks like one of the Lotus-DM date formats you may have set using the Range Format command. The @DATEVALUE function uses this format:

@DATEVALUE(*"datestring"*)

Construct the *datestring* by including one of the five Lotus-DM date formats or by referencing a cell that contains one of the valid date formats. If the string doesn't look like a formatted date, Lotus-DM returns ERR; if it does, Lotus-DM returns the appropriate serial number.



Note: If you have reset the default date format for Lotus-DM using the Worksheet International command, you must use the International Date display you set as the default when you enter the *datestring* for the @DATEVALUE function. For example, if you reset the default date format to MM/DD/YY, enter the date December 27, 1990, as the following:

@DATEVALUE("12/27/90")

Figure FR.16 shows the @DATEVALUE function converting into serial numbers the date strings that mirror each of the five standard date formats. Column A shows the Lotus-DM date format name; column B shows the date string; column C, the format of the @DATEVALUE function; column D, the unformatted results of the @DATEVALUE function; and column E, the results of the @DATEVALUE function formatted to look like the corresponding date string in column B.

Because no year is included in the *datestring* for the second and fifth date formats, Lotus-DM assumes that the year is the same as the system date year—in these cases, 1989. Because no day is included in the *datestring* for the third format, Lotus-DM assumes that the day is the first day of the month. Keep these assumptions in mind for your specific application.

Help F₁ Feb 28, 1990 Lotus-DM - C:\LOTUS-DM\DATEVALU.WK1 2:45 pm

File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
D9 (G) [W11] @DATEVALUE(B9) READY							
	A	B	C	D	E	F	G
1	Date	Example	@DATEVALUE	@DATEVALUEs	@DATEVALUEs		
2	Format	Date	Function	displayed	Formatted		
3	Name	String	displayed	as numbers	as dates		
4							
5	Date 1	24-Feb-90	@DATEVALUE(B5)	32928	24-Feb-90		
6	Date 2	24-Feb	@DATEVALUE(B6)	32928	24-Feb		
7	Date 3	Feb-90	@DATEVALUE(B7)	32905	Feb-90		
8	Date 4	02/24/90	@DATEVALUE(B8)	32928	02/24/90		
9	Date 5	02/24	@DATEVALUE(B9)	32928	02/24		

Fig. FR.16.
The
@DATEVALUE
function used
to convert
date strings to
serial
numbers.

@DAVG

Refer to Chapter 10 for a discussion of the database statistical functions.

@DAY

The @DAY, @MONTH, and @YEAR functions convert serial numbers to dates. These functions use the following formats:

@DAY(*date*)

@MONTH(*date*)

@YEAR(*date*)

The @DAY function accepts a valid date serial number as its single argument and returns the day of the month—which is a number from 1 to 31. The @MONTH function accepts a valid date serial number as its single argument and returns the month of the year—which is a number from 1 to 12. The @YEAR function accepts a valid date serial number as its single argument and returns the number of the year—which is a number from 0 (1900) to 199 (2099).

Figure FR.17 shows the mechanics of these three date functions. With these functions, you can extract just the component of a date—year, month, or day—you want to manipulate.

Fig. FR.17.
The @YEAR,
@MONTH, and
@DAY functions
used to extract
parts of a date.

Help F ₁		Feb 28, 1990		Lotus-DM - C:\LOTUS-DM\DATES.WK1		2:44 pm	
File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
C3		(D1) [W10] @DATE(90,3,15)					READY
	A	B	C	D	E	F	G
1		Function	Result				
2							
3	Date:	@DATE(90,3,15)	15 Mar 90				
4							
5	Year:	@YEAR(C3)	90				
6							
7	Month:	@MONTH(C3)	3				
8							
9	Day:	@DAY(C3)	15				
10							

@DCOUNT

Refer to Chapter 10 for a discussion of the database statistical functions.

@DDB

The @DDB (double-declining balance depreciation) function calculates depreciation using the double-declining balance method, with depreciation ceasing when the book value reaches the salvage value. Double-declining balance depreciation is a method of accelerating depreciation so that greater depreciation expense occurs early rather than late in the life of the item. *Book value* in any period is the purchase price less the total depreciation in all previous periods.

The format of the @DDB function is as follows:

@DDB(*cost,salvage,life,period*)

In general, the double-declining balance depreciation formula used in any period is the following:

book value*2/n

In this formula, *book value* is the book value in the period, and *n* is the depreciable life of the asset. Lotus-DM adjusts the results of this formula in later periods to ensure that total depreciation does not exceed the purchase price less the salvage value.

Figure FR.18 shows how the @DDB function can calculate depreciation on an asset purchased for \$1,000, with a depreciable life of 3 years, and an estimated salvage value of \$100.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F631.WK1 10:50 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C11 (C0) @DDB(\$B\$1,\$B\$2,\$B\$3,C9) READY

	A	B	C	D	E	F
1	Cost of Asset	\$1,000				
2	Salvage value	\$100				
3	Life	3				
4						
5						
6						
7						
8						
9	Depreciation		1	2	3	4
10						
11	Double-declining balance		\$667	\$222	\$11	ERR
12						
13						
14						

*Fig. FR.18.
The @DDB
function used
to calculate a
200% declining
balance
depreciation.*



Note: When you use the double-declining balance depreciation method for an asset with a small salvage value, the asset is not fully depreciated in the final year. The ERR in cell F11 reflects this situation.

@DMAX

Refer to Chapter 10 for a discussion of the database statistical functions.

@DMIN

Refer to Chapter 10 for a discussion of the database statistical functions.

@DSTD

Refer to Chapter 10 for a discussion of the database statistical functions.

@DSUM

Refer to Chapter 10 for a discussion of the database statistical functions.

@DVAR

Refer to Chapter 10 for a discussion of the database statistical functions.

@ERR and @NA

If you find yourself in a situation in which you simply don't know what number to enter for a value, but you don't want to leave the cell blank, you can enter @NA (for "Not Available"). Lotus-DM then displays NA in that cell and in any other cell that depends on that cell.

Another condition you may encounter is that of screening out unacceptable values for cells. For example, suppose that you are developing a checkbook-balancing formula in which checks with values less than or equal to zero are unacceptable. One way to indicate this unacceptability is to use ERR to signal that fact. You may use the following version of the @IF function:

`@IF(B9<=0,@ERR,B9)`

This statement says: "if the amount in cell B9 is less than or equal to zero, display ERR on-screen; otherwise, use the amount."

Lotus-DM also uses ERR as a signal for unacceptable numbers—for example, a division by zero or mistakenly deleted cells. ERR often shows up temporarily when you are reorganizing the cells in a worksheet. If the ERR message persists, however, you may have to do some careful analysis to figure out why.

As it does for NA, Lotus-DM displays ERR in any cells that depend on a cell with an ERR value. Sometimes, many cells display ERR after you delete rows or columns that contain cells on which other formulas depend. To correct the errors, trace back through the chain of references to find the root of the problem.

@EXACT

The @EXACT function compares two strings, returning a value of 1 for strings that are alike and 0 for strings that are unlike. Following is the format of the @EXACT function:

`@EXACT(string1,string2)`

@EXACT's method of comparison is like the = operator in formulas except that the = operator checks for an *approximate* match, and the @EXACT function checks for an *exact* match. For example, if cell A2 holds the string `Marketing Function` and cell B2 holds the string `marketing function`, the numeric value of `A2=B2` is 1 because the two strings are an approximate match. The numeric value of `@EXACT(A2,B2)` is 0 because the two strings are not an exact match.

The examples in figure FR.19 demonstrate the use of @EXACT. Notice in the third example that @EXACT cannot compare nonstring arguments. If you try to compare the entry in cell A6 with the blank in cell C6, the value of @EXACT(A6,C6) is ERR. In fact, if either argument is a nonstring value, Lotus-DM returns the ERR value.



Note: You can use the @S function to ensure that the arguments used with @EXACT have string values.

Help F₁ Feb 28, 1990 Lotus-DM - C:\LOTUS-DM\EXACT.WK1 2:46 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C14 (G) (W91 @EXACT(A6,C6)) READY

	A	B	C	D	E	F	G
1							
2	STRING		string				
3							
4	STRING		STRING				
5							
6	STRING						
7							
8	Formula		Result				
9							
10	@EXACT(A2,C2)		0		False		
11							
12	@EXACT(A4,C4)		1		True		
13							
14	@EXACT(A6,C6)		ERR				
15							
16							
17							
18							

Fig. FR.19.
Strings
compared with
the @EXACT
function.

@EXP

The @EXP function computes the power of *e*, using this format:

@EXP(*value or cell reference*)

With @EXP, you quickly can create large numbers. If the function's resulting value is too large to be displayed, asterisks are displayed instead. Figure FR.20 shows the use of the @EXP function (and the @LN and @LOG functions) with a series of numbers.

Fig. FR.20.
Examples of
Lotus-DM's
logarithmic
functions—
@LN, @LOG,
and @EXP.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F608.WK1 10:39 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B8 [W20] @LN(A8) READY

	A	B	C	D
	Value	@LN	@LOG	@EXP
1				
2				
3	-1	ERR	ERR	0.3678794412
4	0	ERR	ERR	1
5	1	0	0	2.7182818285
6	10	2.302585093	1	22026.465795
7	100	4.605170186	2	2.6881171418E+43
8	500	6.2146080984	2.6989700043	*****
9				

@FALSE

You use the @TRUE and @FALSE functions to check for errors. Neither function requires an argument. These functions are useful to help document formulas. The @TRUE function returns the value 1, the Boolean logical value for TRUE. The @FALSE function returns the value 0, the Boolean logical value for FALSE.

Figure FR.21 uses an undocumented feature of Lotus-DM—its capability to perform Boolean logic—along with @TRUE and @FALSE statements to provide easy-to-read @IF functions. The Boolean formulas shown as text in cells B3 and B5 perform logical tests just like the @IF statement does. However, rather than returning a user-specified value based on the results of the test, these formulas return the logical values for TRUE and FALSE shown in cells C3 and C5: 1 and 0.

Fig. FR.21.
The @TRUE
and @FALSE
functions used
with Boolean
logic in @IF
statements.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F637.WK1 10:55 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C4 [WB1] READY

	A	B	C	D	E	F
	Name	Formula	Value	300	300	200
1						
2						
3	TEST1	(D1=E1)	1			
4						
5	TEST2	(E1<F1)	0			
6						
7	TRUE	@TRUE	1			
8						
9	FALSE	@FALSE	0			
10						
11	IF 1	@IF(TEST1=@TRUE,100,0)	100			
12						
13	IF 2	@IF(TEST2=@FALSE,-100,0)	-100			
14						
15						
16						
17						
18						

Cells B7 and B9 show the @TRUE and @FALSE functions; cells C7 and C9 show the logical values these two functions produce. The @IF function in cell B11 compares the results of the Boolean logic in TEST1 to @TRUE; cell B13 compares TEST2 to @FALSE. Both @IF statements return values based on the outcome of these tests. Boolean logic enables you to construct logical tests using any of the logical operators—without using the @IF statement. As shown in figure FR.21, you also can create a “nested IF statement” using only one @IF function.

@FIND

@FIND, one of the simplest string functions, is the best function for showing how position numbers are used in strings. The @FIND function locates the starting position of one string within another string. For instance, you can use this function to find at what position the string *every* occurs within the string *two chickens in every pot*. The format of the @FIND function is as follows:

@FIND(search string,overall string,start number)

The *search string* is the string you want to locate. In this example, the *search string* is *every*. The *overall string* is the target string to be searched. In this example, *two chickens in every pot* is the *overall string*. The *start number* is the position number in the *overall string* where you want to start the search. If you want to start at position 6, and you are using the *overall string* located in cell A2 of figure FR.22, use the following function:

@FIND("every",A2,6)

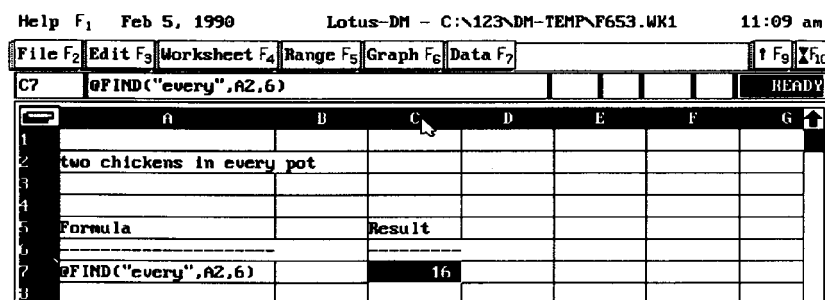


Fig. FR.22.
An example of
the @FIND
function.

Your result is the number 16—the position of the first (and only) occurrence of *every* in the *overall string*. If the *search string* *every* is not found in the *overall string*, the ERR message is displayed.

In the example, notice that specifying a *start number* of 6 has no bearing on the outcome of the function. You can just as easily choose 0 (or any other number less than or equal to 16) for the starting position. If every appeared more than once in the overall string, however, the start number can locate its occurrence elsewhere. Suppose that the following overall string appears in cell A2:

'two chickens in every pot, two cars in every garage

Now suppose that you want to locate all occurrences of *every* in the overall string. The following function returns a value of 16, as before:

`@FIND("every",A2,6)`

Try changing the start number by adding 1 to the result of the original function. The appropriate function is now this:

`@FIND("every",A2,17)`

This new function returns the number 39, the starting location of the second occurrence of *every*. Next, add 1 to the second result and use this function:

`@FIND("every",A2,40)`

The resulting ERR message tells you that you have found all the occurrences of the search string.

Guidelines for Using the @FIND Function

1. @FIND (like string functions in general) limits a string to 240 characters.
2. The *search string* must be surrounded by quotation marks.
3. Any decimals in the *start number* argument are ignored.
4. @FIND is case sensitive. Enter the *search string* argument exactly as you want to find it. In the preceding example, if you use a search string of *Every* instead of *every*, you get the ERR message instead of a numeric value.

@FV

The @FV (future value) function calculates to what amount a stated amount will grow based on a specified interest rate and number of years. The function is helpful for estimating the future balances into which current savings and investments will grow. The @FV function uses the following format:

`@FV(payment,interest,term)`

The function is based on the following formula:

$$\text{Future value} = \text{payment} * \frac{(1 + \text{interest})^{\text{term}} - 1}{\text{interest}}$$

You can use @FV to calculate the estimated value of an individual retirement account 25 years from now. Figure FR.23 shows such a calculation, assuming annual contributions of \$2,000 and annual interest rates of 9 percent.

Help F1 Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F626.WK1 10:48 am

File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F9	F10
B5 (C2) (W12) @FV(B1,B2,B3)							
	A	B	C	D	E	F	G
1	Payments	\$2,000					
2	Interest Rate	9.00%					
3	Term	25					
4							
5	Present Value	\$169,401.79					

Fig. FR.23.
The @FV function used to calculate a future IRA balance.

In addition to calculating the future value of a stream of periodic cash-flow payments (using the @FV function), you also may want to calculate the future value of amounts already set aside. To calculate the future value of a present value, the following formula is used:

$$\text{Future value} = \text{present value} * (1 + \text{interest})^{\text{term}}$$

Suppose that, in addition to planning to make \$2,000 annual individual retirement account contributions over the next 25 years, you also already have accumulated \$5,000. You want to know the future value of this amount. Figure FR.24 shows an example using these assumptions.

Help F1 Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F627.WK1 10:48 am

File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F9	F10
B13 (C2) (W12) +B9*(1+B10)^B11							
	A	B	C	D	E	F	G
1	Payments	\$2,000					
2	Interest Rate	9.00%					
3	Term	25					
4							
5	Present Value	\$169,401.79					
6							
7							
8							
9	Present Value	\$5,000					
10	Interest Rate	9.00%					
11	Term	25					
12							
13	Future Value	\$43,115.40					
14							

Fig. FR.24.
A formula used to calculate the future value of a present value amount.

@HLOOKUP

The @HLOOKUP and @VLOOKUP functions retrieve a string or value from a table based on a specified key. The operation and format of the two functions are essentially the same, except that the @HLOOKUP function looks through horizontal tables, and the @VLOOKUP function looks through vertical tables. The functions use the following formats:

@HLOOKUP(*key,range,row-offset*)

@VLOOKUP(*key,range,column-offset*)

Keys are values in labels that the LOOKUP function uses to search through the list. Lotus-DM compares the key specified with the contents of each cell in the first row or column of the table, looking for a cell whose contents match the key.

When you use numeric keys, make sure that the values in the leftmost column (when using @VLOOKUP) or in the topmost row (when using @HLOOKUP) are in ascending order. If they are not in order, you may get an ERR or an incorrect result. (If the keys are strings, you can list the keys in any order.) When you use numeric keys, the LOOKUP function actually searches for the largest value that is less than or equal to the key. If it cannot find a value equal to the key, the function picks the largest value less than the key.

The *range* argument is the area making up the entire look-up table. The *offset* argument specifies the number of columns to move to the right (with @VLOOKUP) or the number of rows to move down (with @HLOOKUP) to locate the resulting data. The *offset* argument is always a number, in ascending order, ranging from 1 to the highest number of columns or rows in the look-up table. An offset of 1 refers to the first column to the right of the column that contains key data or the first row below the row that contains key data. When you specify an offset number, it cannot be negative or exceed the correct number of columns or rows. Figure FR.25 shows one @HLOOKUP and two @VLOOKUP functions.

The first @HLOOKUP function looks for the key *E* in the first row of the range D2..H3. If the LOOKUP is successful, the function retrieves the contents of the cell one row below the cell containing the key (the offset row 1). In this case, the function returns the value 4.

The first @VLOOKUP looks for the numeric value 2 in the first column of the vertical table located in the worksheet range D7..E11. If the LOOKUP is successful, the function returns the string from the cell one column to the right of the cell containing the key (the offset column 1). In this case, the function returns the string *banana*.

Help F₁ Feb 5, 1990 Lotus-DH - C:\123\DH-TEMP\F643.WK1 10:59 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₉ F₁₀

B16 [W27] @VLOOKUP(B14,D14..G18,3) READY

	A	B	C	D	E	F	G	H	I
1									
2	Key:	E		1	2	3	4	5	
3	Lookup:	@HLOOKUP(B2,D2..H3,1)							
4	Result:	4							
5									
6									
7	Key:	2		1	apple				
8	Lookup:	@VLOOKUP(B7,D7..E11,1)		2	banana				
9	Result:	banana		3	grape				
10				4	orange				
11				5	pear				
12									
13									
14	Key:	6		1	a	u	Bob		
15	Lookup:	@VLOOKUP(B14,D14..G18,3)		2	b	w	Emil		
16	Result:	Russell		3	c	x	Maria		
17				5.5	d	y	Russell		
18				6.5	e	z	Susan		

Fig. FR.25.
The @HLOOKUP
and @VLOOKUP
functions used to
retrieve strings and
values from tables.

The second @VLOOKUP function, shown in cell B15, looks through the first column of the vertical table located in the worksheet range D14..G18 for an entry with a numeric key value of 6. In figure FR.25, no entries have a value of 6. In this case, the LOOKUP function picks the table entry with the largest key value that doesn't exceed the argument key. The LOOKUP function "matches" the search key of 6 with the entry 5.5, and returns the contents of the cell offset three columns to the right. The function returns the value *Russell*.

Watch for three common errors when you construct @HLOOKUP and @VLOOKUP functions. First, when you use a string as the *key* argument, the LOOKUP function returns ERR if it cannot find the string in the table. If a LOOKUP function with a string key returns ERR, first check that you haven't misspelled the string either in the function or in the table.

A second common error is omitting from the *range* argument the columns or rows that contain the key and value or string you want returned; this situation also generates an ERR condition. The examples in figure FR.25 use cell addresses to specify the table so that the example is easy to understand. However, you probably will assign range names to look-up tables, which can make spotting missing rows or columns tricky.

When you use named ranges for the *range* argument, make sure that the named range includes both the key column or row and the offset column or row. Accordingly, if you use an @HLOOKUP function with the *row-offset* argument set to 6, the *range* should include at least seven rows. Similarly, if you use a @VLOOKUP function with the *column-offset* argument set to 3, the *range* should include at least four columns.

When you construct a look-up table, remember that the *key* strings or values for which you will search should go in the first column or row. Column and row numbering starts at 0. Accordingly, the first offset is 0 (the row or column containing the key), the second is 1, the third is 2, and so on.

@HOUR

The @SECOND, @MINUTE, and @HOUR functions enable you to extract different units of time from a numeric time fraction. These functions use the following formats:

@SECOND(*time*)

@MINUTE(*time*)

@HOUR(*time*)

Figure FR.26 shows that these three functions are the reverse of the @TIME function, just as the @DAY, @MONTH, and @YEAR functions are the reverse of the @DATE function.

Fig. FR.26.
The @SECOND,
@MINUTE, and
@HOUR
functions used
to extract parts
of a time.

Help F ₁		Feb 28, 1990		Lotus-DH - C:\LOTUS-DH\TIMES.WK1		4:27 pm	
File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
D9	@SECOND(D3)						READY
	A	B	C	D	E	F	G
1		Function		Result			
2							
3		@TIME(2,37,33)		0.109409			
4		@HOUR(D3)		2			
5							
6							
7		@MINUTE(D3)		37			
8							
9		@SECOND(D3)		33			
10							
11		@SECOND(33438.109409)		33			
12							
13							

Notice that the *time* argument includes both an integer and a decimal portion. Although the integer portion is important for date functions, it is disregarded for time functions, as shown by the last example in the figure. You can use these functions for various time-related chores, such as developing a time schedule.

@IF

The @IF function represents a powerful tool—one you can use both to manipulate text within your worksheets and to affect calculations. For example, you can use the @IF statement to test the condition “Is the inventory on-hand below 1,000 units?” and then return one value or string if the answer is TRUE, and another if the answer is FALSE. The @IF function uses the following format:

@IF(test, TRUE, FALSE)

Figure FR.27 shows several examples of the @IF function. To show clearly the functions, their arguments, and their results, the first column displays the function (formatted as Text so that you can read it), and the second column shows the calculated results of the function.

The first @IF function checks whether the content of a cell is the same as a specified string and produces one of two strings based on whether the test is TRUE or FALSE. Notice that when you include a string in the @IF statement test, you include it in quotation marks. You use the equal sign (=) to compare the two strings.

The second @IF function tests whether the content of the cell named BOBS_SALES exceed 10,000 and returns one string if the test is TRUE and another if the test is FALSE. The third @IF function again tests whether the content of BOBS_SALES exceed 10,000 and then calculates the commission that the Bob is entitled to if sales exceed 10,000. To test whether BOBS_SALES exceeds 10,000, the function uses the greater-than sign (>).

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F633.WK1 10:51 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₈ F₉ F₁₀

B12 (F8) (W5) @IF(BOBS_SALES>10000,0.1*BOBS_SALE READY

	A	B	C	D	E
1	TEST_STRING	Steve			
2					
3	BOBS_SALES	8000			
4					
5					
6					
7					
8	@IF(B1="STEVE", "YES", "NO")	YES			
9					
10	@IF(B3>10000, "YES", "NO")	NO			
11					
12	@IF(B3>10000, 0.1*B3, 0)	0			
13					
14					

Fig. FR.27.
Examples
of the @IF
function
using
strings and
values.

The @IF function can perform six logical tests, summarized in table FR.10.

Table FR.10
Logical Test Symbols

<i>Symbol</i>	<i>Description</i>
<	Less than
<=	Less than or equal to
=	Equal to
>=	Greater than or equal to
>	Greater than
<>	Not equal to

If you think about the conditions you test in your worksheet formulas, probably many are made up of two or more individual tests. For example, the following statement uses compound condition:

IF
 (test 1) Company revenues increase **and**
 (test 2) Company expenses decrease
 THEN
 TRUE Company profits will increase

You will find occasion to use the three complex operators summarized in table FR.11 in your worksheets.

Table FR.11
Complex Logical Operators

<i>Operator</i>	<i>Description</i>
#AND#	Used to test two conditions that both must be TRUE for the entire test to be TRUE
#NOT#	Used to test that a condition is <i>not</i> TRUE
#OR#	Used to test two conditions; if either condition is TRUE, the entire test condition is TRUE

Figure FR.28 shows how you can use these three complex operators. In the figure, REVS90 is the name of the cell that contains the 1990 gross revenues; REVS89 is the cell that contains the 1989 gross revenues. MARG90 is the cell that contains the 1990 gross margin; MARG89 is the cell that contains the 1989 gross margin.

The first complex @IF condition tests whether *both* the conditions REVS90>REVS89 *and* MARG90>=MARG89 are TRUE. If *both* tests are TRUE, the function returns the string GOOD; otherwise, the function returns the string BAD.

The second complex @IF function tests whether either *one* of the two conditions REVS90>REVS89 *or* MARG90>=MARG89 is TRUE. If *either* test is TRUE, the function returns the string GOOD; if *both* are FALSE, the function returns the string BAD.

Help F₁ Feb 28, 1990 Lotus-D₁ - C:\LOTUS-D₁\ACCTNG.WK1 2:42 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B5 [W11] @IF(REVS90>REVS89#AND#NOT#MARG90>=MARG89,"GOOD","BAD") READY

	A	B
1	@IF(REVS90>REVS89#AND#MARG90>=MARG89,"GOOD","BAD")	GOOD
2	@IF(REVS90>REVS89#OR#MARG90>=MARG89,"GOOD","BAD")	GOOD
3	@IF(REVS90>REVS89#AND#NOT#MARG90>=MARG90,"GOOD","BAD")	GOOD
4		
5		
6		
7	REVS89	\$1,000,000
8	REVS90	\$1,500,000
9	MARG89	\$100,000
10	MARG90	\$125,000

Fig. FR.28.
Compound @IF
conditions being
tested using
complex logical
operators.

The third complex @IF condition tests whether the condition REVS90>REVS89 is TRUE and the condition MARG89>=MARG90 is FALSE. When *both* tests pass, the function returns the string GOOD; when *either* of the two tests is FALSE, the function returns the string BAD.

You also can specify the TRUE or the FALSE argument within an @IF function as another @IF function. Putting @IF functions inside other @IF functions is a common and powerful logical tool. This technique, called *nesting*, gives you the ability to construct sophisticated logical tests and operations in your worksheets.

@INDEX

@INDEX, a data-management function, is similar to the @HLOOKUP and @VLOOKUP functions. However, @INDEX has some unique features. The format of the @INDEX function is as follows:

@INDEX(range,column-offset,row-offset)

The @INDEX function works with a table (specified by the range argument) of values. When you use the @INDEX function, you indicate the column-offset and row-offset of the cell that contains the data you want to retrieve. For example, the following function, shown in figure FR.29, returns the value 2625:

@INDEX(L142..S145,3,2)

Notice that the offset number 0 corresponds to the first column, 1 corresponds to the second column, and so on. The same numbering scheme applies to rows. Using 3 for the *column-offset* and 2 for the *row-offset* indicates that you want an item from the fourth column, third row.

With the @INDEX function, you cannot use column or row numbers that fall outside the specified range. Using either negative numbers or numbers too large for the range causes Lotus-DM to return an ERR message.

Fig. FR.29.
An example of
the @INDEX
function.

Help F1 Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F644.WK1 10:59 am

File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F8	F9	F10
L141	@INDEX(L142..S145,3,2)							READY
	L	M	N	O	P	Q	R	S
139								
140								
141	2625							
142	1996	8204	7539	4468	6534	6342	8718	4399
143	6165	5291	3588	5479	2734	6870	4127	7878
144	8137	8189	1301	2625	5890	2098	8978	5799
145	3409	7587	6816	3433	8354	8271	2620	2169
146								
147								

@INT

The @INT function is used to convert a decimal number into an integer or whole number by truncating the decimal portion of a number. The function follows this format:

@INT(*number or cell reference*)

The function has one argument, which can be either a numerical value or a cell reference to a numerical value. The result of applying @INT to the value 3.1 yields an integer value of 3.

@INT is useful for computations where the decimal portion of a number is irrelevant or insignificant. Suppose that you have \$1,000 to invest in XYZ company, and that shares of XYZ sell for \$17 each. You divide 1,000 by 17 to compute the number of shares you can purchase. Because you cannot purchase a fractional share, you can use @INT to truncate the decimal portion as shown in figure FR.30.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F602.WK1 10:36 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B3 (C0) @INT(B1/B2) READY

	A	B	C	D	E
1	Amount for Purchase	\$1,000			
2	Amount per share of XYZ	\$17			
3	Total shares that may be purchased	\$58			
4					
5					

Fig. FR.30.
The @INT
function used to
calculate the
number of
shares that can
be purchased.

@IRR

The @IRR (internal rate of return) function measures the percentage return on an investment. The format for the @IRR function is as follows:

@IRR(guess,cashflows)

The *guess* argument typically should be a percent between 0 and 1 (0% and 100%), and the first cell in the *cashflows* range is usually a negative amount (signifying the initial investment). The *cashflows* range is the list of cash outflows (negative numbers) and cash inflows (positive numbers). Lotus-DM uses the *guess* argument as the interest rate in the following formula and tests whether the result equals 0:

$$0 = \sum_{n=0}^N \frac{C_n}{(1+IRR)^n}$$

If the result does not equal 0, Lotus-DM tries different interest rates in an attempt to make the equation TRUE—that is, to make the left side of the equation, 0, equal the right side of the equation. (Notice that the right side of the equation is the formula for calculating the profit measure called the *net present value*.) Lotus-DM attempts to converge to a correct interest, or discount rate, with .0000001 precision within 30 attempts or iterations. If the program cannot do so, the @IRR function returns an ERR value.

You may need to try several different *guess* arguments to get one close enough for Lotus-DM to converge on the correct internal rate of return. Because the @IRR function can find an internal rate of return below the initial *guess* easier than one above the initial *guess*, guessing high is the best practice.

Figure FR.31 shows the @IRR function calculating the internal rate of return on a certificate of deposit. The purchase amount, a negative cash flow, is made at time 0. Other cash flows occur at the end of equally spaced periods. Notice that the monthly internal rate of return is converted to an annual rate by multiplying the monthly amount by 12.

Fig. FR.31.
The internal rate of return calculated with the @IRR function.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F619.WK1 10:44 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ t F₉ X F₁₀

B14 (P2) (W12) @IRR(0.1,B6..B12)*12 READY

	A	B	C	D	E	F	G
1	Six-Month CD - IRR Calculation						
2	Cash flow	Monthly					
3	Description	Amount					
4							
5							
6	Purchase	(\$1,000.00)					
7	January	\$0.00					
8	February	\$0.00					
9	March	\$20.00					
10	April	\$0.00					
11	May	\$0.00					
12	Jun	\$1,020.00					
13							
14	CD's IRR:	7.95%					



Note: Although the internal rate of return profit measure is widely used, the formula is currently being disputed. The problem is with the internal rate of return formula itself, not with the @IRR function, which simply makes using the formula easier.

@ISERR

The @ISERR function tests whether the argument you specify equals ERR. If the test is TRUE, the function returns the value 1; if the test is FALSE, the function returns the value 0. The format for the @ISERR function is as follows:

@ISERR(*cell reference*)

You can use the @ISERR function to trap errors so that the errors don't cause other, dependent formulas and functions to return ERR values also. Figure FR.32 shows the mechanics of the @ISERR function and the returned values both when the test condition is TRUE and when the test condition is FALSE.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F636.WK1 10:55 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C9 [W14] @ISNA(A9) READY

	A	B	C	D	E	F	G
1	Tested Value	Formula	Returned Value				
2							
3	ERR	@ISERR(A3)	1				
4							
5	250	@ISERR(A5)	0				
6							
7	NA	@ISNA(A7)	1				
8							
9	text string	@ISNA(A9)	0				
10							

Fig. FR.32.
The @ISERR
and @ISNA
functions used
to test
arguments.

@ISNA

The @ISNA function tests whether the argument you specify is equal to NA. If the test is TRUE, the function returns the value 1; if the test is FALSE, the function returns the value 0. The format for the @ISNA function is as follows:

@ISNA(*cell reference*)

Refer to the description of the @ISERR function earlier in this reference section for an example of the use of @ISNA.

You use the @ISNA function to trap NA values in worksheets that use the @NA function. Refer to the description of the @NA function later in this reference section for more information.

@ISNUMBER

Before using the contents of a cell, you may want to test the cell's *aspect*—what type of cell it is, whether the cell contains a number or a label, or whether the cell is empty. A cell's aspect also includes the cell's address, the row and column the cell resides in, the cell's label prefix (if any), the width of the cell, and the cell's format. Depending on the characteristics of a cell's aspect, you may want to use different cell-processing methods.

Two functions that help you determine the type of value stored in a cell are @ISSTRING and @ISNUMBER. Although these functions are used most often with the @IF function, you can use them with other types of functions as well. The @ISNUMBER function helps to verify whether a cell entry is a number. The format of the @ISNUMBER function is as follows:

@ISNUMBER(*cell reference*)

If the argument is a number, the numeric value of the function is 1 (TRUE). If the argument is a string, including the null string (" "), the numeric value of the function is 0 (FALSE).

Suppose that you want to test whether the value entered in cell B3 is a number. If the value is a number, you want to show the label `number` in the current cell; otherwise, you want to show the label `string`. To do so, use the following formula:

```
@IF(@ISNUMBER(B3),"number","string")
```

With this statement, you can be fairly certain that the appropriate label will appear in the current cell. The `@ISNUMBER` function, however, gives the numeric value of 1 to empty cells as well as to numbers, because blank cells actually contain invisible zeros. Obviously, the preceding formula is incomplete because the function assigns the label `number` to the current cell if cell B3 is empty. For complete reliability, you must modify the function to handle empty cells.

You can distinguish between a number and an empty cell by using the formula that follows. Note that cell AA3 must contain the range B3..B3.

```
@IF(@ISNUMBER(B3),@IF(@COUNT(@@ (AA3)),"number","blank"),"string")
```

This function first tests whether the cell contains a number or a blank. If it does, the function then uses the `@COUNT` function to test whether the range B3..B3 contains an entry. (Recall that `@COUNT` assigns a value of 0 to blank cells and a value of 1 to cells with an entry when the argument used is a range rather than a cell reference. Refer to the description of the `@COUNT` function for a detailed explanation.)

If the cell contains an entry, the label `number` is displayed. Otherwise, the label `blank` is displayed. If the cell does not contain a number or a blank, the cell must contain a string, and the `string` label is displayed.

As an alternative, consider using the `@ISSTRING` function. `@ISSTRING` works in nearly the same way as `@ISNUMBER`. `@ISSTRING`, however, determines whether a cell entry is a string value. The format of the `@ISSTRING` function is as follows:

```
@ISSTRING(cell reference)
```

If the argument for the `@ISSTRING` function is a string, the value of the function is 1 (TRUE). If the argument is a number or blank, however, the value of the function is 0 (FALSE). You can use this function to stop what Lotus calls the "ripple-through" effect of NA and ERR in cells that should have a string value. Lotus-DM considers both NA and ERR to be numeric values.

Returning to the earlier example about distinguishing between a number and an empty cell, you also can complete the function with @ISSTRING by using the following formula. Note that cell AA3 must contain the range B3..B3.

```
@IF(@ISSTRING(B3),"string",@IF(@COUNT(@@ (AA3))>0,"number","blank"))
```

This function first tests whether string data is present. If it is, the function assigns the label *string*. Otherwise, the @COUNT function is used to determine whether the range B3..B3 contains a number or is empty. If the data is a number, the label *number* is assigned. Otherwise, the label *blank* is assigned.

@ISNUMBER provides the capability to test for a number, although the function's inability to distinguish between numbers and blank cells is its principal weakness. In many applications, however, @ISNUMBER provides sufficient testing of values, especially when you can be certain that a cell is not blank. @ISSTRING provides the capability to test for a string. When used with the @COUNT function, @ISSTRING can distinguish blank cells from strings. The @COUNT function combined with both @ISNUMBER and @ISSTRING can help you distinguish between blank cells and numbers.

@ISSTRING

Refer to the discussion of the @ISNUMBER function.

@LEFT

@LEFT and @RIGHT are special variations of the @MID function and are used to extract one string of characters from another, beginning at the leftmost and rightmost positions in the underlying string. The functions use these formats:

```
@LEFT(string,length)
```

```
@RIGHT(string,length)
```

The *length* argument is the number of character positions to be extracted from *string*. For example, if you want to extract the ZIP code from the string *Cincinnati, Ohio 45243*, use the following formula:

```
@RIGHT("Cincinnati, Ohio 45243",5)
```

@LEFT works the same way as @RIGHT except that @LEFT extracts from the beginning of a string. For instance, use the following function statement to extract the city in the preceding example:

```
@LEFT("Cincinnati, Ohio 45243",10)
```

In most cases, you can replace the *length* argument (10 in this case) with a @FIND function such as the following:

@FIND(";", "Cincinnati, Ohio 45243", 0)

You can use @FIND here because you don't need to count the number of characters beforehand. Figure FR.33 shows the results of using @LEFT and @RIGHT with varying length arguments.

Fig. FR.33.
The length argument changed for the @LEFT and @RIGHT functions.

Help F1 Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F657.WK1 11:10 am

File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F9	F10
E13	[W17]	@RIGHT(\$A\$2,A13)					READY
	A	B	C	D	E	F	
1							
2	Left-and-right						
3							
4							
5							
6	Length	@LEFT(A2,Length)		@RIGHT(A2,Length)			
7							
8	0						
9	1	L		t			
10	2	Le		ht			
11	3	Lef		ght			
12	4	Left		ight			
13	5	Left-		right			
14							

@LENGTH

The @LENGTH function indicates the length of a string. The format of the @LENGTH function is as follows:

@LENGTH(string)

Figure FR.34 shows how you can use @LENGTH to find the length of a string. Notice that the function returns the value ERR as the length of numeric values or formulas, empty cells, and null strings.

Fig. FR.34.
The @LENGTH function used to find the length of a string.

Help F1 Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F659.WK1 11:11 am

File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F9	F10
D11		@LENGTH(A2)					READY
	A	B	C	D	E	F	G
1							
2	The @LENGTH function in cell D11 calculates the length of this string.						
3							
4	\$12,387.99						
5							
6							
7							
8	Formula			Result			
9							
10							
11	@LENGTH(A2)			70			
12							
13	@LENGTH(A4)			ERR			

@LN

The @LN function computes the natural, or base *e*, logarithm, using this format:

@LN(*value or cell reference*)

If @LN is called with a negative *value* argument, ERR is returned. Refer to the description of the @EXP function for examples of the @LN function.

@LOG

The @LOG function computes the base 10 logarithm, using this format:

@LOG(*value or cell reference*)

If @LOG is called with a negative *value* argument, ERR is returned. Refer to the description of the @EXP function for examples of the @LOG function.

@LOWER

Lotus-DM offers three functions for converting the case of a string value. @LOWER converts all letters in a string to lowercase letters. @UPPER converts all the letters in a string to uppercase letters. @PROPER capitalizes the first letter in each word of a label. (*Words* are defined as groups of characters separated by blank spaces.) @PROPER then converts the remaining letters in each word to lowercase.

The functions have the following formats:

@LOWER(*string*)

@UPPER(*string*)

@PROPER(*string*)

Figure FR.35 shows an example of the use of each function.

None of these three functions works with nonstring values. For instance, if cell E9 contains a number or a null string (" "), Lotus-DM returns ERR for each of these functions.



Note: You can use the @S function to ensure that the arguments of these functions have string values.

Fig. FR.35.
Functions used
to convert the
case of
alphanumeric
strings.

Help F ₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F661.WK1 11:12 am	
File F ₂	Edit F ₃ Worksheet F ₄ Range F ₅ Graph F ₆ Data F ₇
B8	[W59] @LOWER(A2)
	READY
1	
2	This is an example of @LOWER, @UPPER, and @PROPER functions
3	
4	
5	
6	Function Result
7	
8	@LOWER(A2) this is an example of @lower, @upper, and @proper functions
9	
10	@UPPER(A2) THIS IS AN EXAMPLE OF @LOWER, @UPPER, AND @PROPER FUNCTIONS
11	
12	@PROPER(A2) This Is An Example Of @Lower, @Upper, And @Proper Functions
13	

@MAX

The @MAX function finds the largest value included in the *list* argument; the @MIN function finds the smallest value. The formats for these functions are as follows:

@MAX(*list*)

@MIN(*list*)



Note: The *list* argument can be values, cell addresses, cell names, cell ranges, range names, or combinations of these.

Figure FR.36 shows information concerning prices per share of an imaginary company. Using the @MAX and @MIN functions can help you easily find the lowest and the highest prices. You can see the *list* argument of the @MAX function in the edit panel as B3..B11. Although the example shows only seven values, the true power of these functions is most evident when the *list* argument consists of several dozen or several hundred items.

If you are familiar with statistics, you recognize that these two functions also provide the two pieces of data you need to calculate a range. A *range*, which is one measure of variability in a list of values, is the difference between the highest value and the lowest value in a list of values. (This is not the same as a *worksheet range*, which is a rectangular block of cells.)

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F615.WK1 10:42 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

F6 @MAX(B3..B11) READY

	A	B	C	D	E	F	G
1	Day	Price	Shares		Statistics		
2							
3	Monday	\$11.50	100		Average	\$11.54	
4	Tuesday	\$11.25	200		Days	7	
5	Wednesday	\$11.00	300		Minimum Price	\$11.00	
6	Thursday	\$11.50	100		Maximum Price	\$12.00	
7	Friday	\$11.75	100				
8	Saturday						
9	Sunday						
10	Monday	\$12.00	100				
11	Tuesday	\$11.75	100				
12							

Fig. FR.36.
The @MIN and @MAX functions used to show low and high prices per share.

@MID

The @MID function lets you extract one string from another. This operation is called *substringing*. The format of the @MID function is as follows:

@MID(*string*,*start position*,*length*)

The *string* argument is the original string from which you want to extract a substring. The *start position* is a number representing the character position in the string where you want to begin extracting characters. The *length* argument indicates the number of characters to extract. For example, to extract the first name from the label `Page Davidson`, use this function:

@MID("Page Davidson",0,4)

This function extracts the string starting in position 0 (the first character) and continuing for a length of 4 characters—the string `Page`.

Suppose that you want to extract the first and last names from a column list of full names, and you want to put those two names in a separate column. To accomplish this, use the @MID and @FIND functions together. Because you know that a blank space always separates the first and last names, @FIND can locate the position of the blank in each full name. Using this value, you then can set up the functions to extract the first and last names.

If cell A4 contains the full name `Ivan Anderson`, as shown in figure FR.37, place the following function in cell B4:

@MID(A4,0,@FIND(" ",A4,0))

Fig. FR.37.
The @MID and
@FIND functions
used to locate
and extract a first
name.

Help F1 Feb 28, 1990 Lotus-DM - C:\LOTUS-DM\LOCATOR.WK1 2:47 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

B4 @MID(A4,0,@FIND(" ",A4,0)) READY

	A	B	C	D	E	F	G
1	Name	Result					
2							
3	Ivan Anderson	Ivan					
4							
5							
6							
7							
8							
9							
10							

The result of this function is *Ivan* because @FIND(" ",A4,0) works as the *length* argument, returning a value of 4.

Place the following function in cell C4 to extract the last name, as shown in figure FR.38:

@MID(A4,@FIND(" ",A4,0)+1,99)

Fig. FR.38.
The @MID
and @FIND
functions
used to locate
and extract a
last name.

Help F1 Feb 28, 1990 Lotus-DM - C:\LOTUS-DM\NAMES.WK1 2:47 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

C4 @MID(A4,@FIND(" ",A4,0)+1,99) READY

	A	B	C	D	E	F	G
1	Name	Result #1	Result #2				
2							
3							
4	Ivan Anderson	Ivan	Anderson				
5							
6							
7							

The @FIND(" ",A4,0)+1 function indicates that the *start position* argument is one character beyond the blank space. Notice that the *length* argument is given as 99 characters. Although a length of 99 is greater than you need, you pay no penalty to ensure that you extract all the required characters. The string that Lotus-DM extracts is *Anderson*.

@MIN

Refer to the discussion of the @MAX function.

@MINUTE

Refer to the discussion of the @HOUR function.

@MOD

The @MOD function computes the remainder, or *modulus*, when the dividend is divided by the divisor. The function is called with two arguments that can be either numerical values or cell references. The function syntax of @MOD is as follows:

@MOD(*number,divisor*)

Because you cannot divide by zero, the *divisor* argument must be something other than a zero value. The result of @MOD is a value greater than or equal to zero, and less than the *divisor*.

Although you can use the @INT function to calculate the number of shares of XYZ, you also can use the @MOD function to make the same calculation, as shown in figure FR.39. Using @MOD, the result also determines the amount left over after the purchase.

You also can use the @MOD function in combination with some of the date functions to determine the day of the week for a given date.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F603.WK1 10:37 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B9 (C0) @MOD(B1,B2) READY

	A	B	C	D	E
1	Amount for Purchase	\$1,000			
2	Amount per share of XYZ	\$17			
3	Total shares that may be purchased	\$58			
4					
5	Total purchase price (\$17 *58)	\$986			
6					
7	Leftover calculated as (\$1000 -\$986)	\$14			
8					
9	Leftover calculated using @MOD	\$14			
10					

Fig. FR.39.
The @MOD function used to return the remainder, or modulus, from a division.

@MONTH

Refer to the discussion of the @DAY function.

@N

The @N and @S functions provide a way to test for the presence of strings or values. @N returns the value of a number or formula found in a cell. If the cell is blank or contains a label, @N returns the value 0. @N always has a numeric value.

The @S function returns the string value of a cell. If the cell contains a string—or a formula that evaluates to a string—@S returns the string. If the cell contains a number or is empty, @S returns the null string (" "). @S always has a string value.

The @N and the @S functions use these formats:

@N(range)

@S(range)

The *range* argument must be a range or a single-cell reference. If you use a single-cell reference, Lotus-DM adjusts the argument to range format and returns the numeric or string value of the single cell. If the argument is a multicell range, @N and @S return the numeric or string value of the upper left corner of the range. Figure FR.40 shows the results of using the @N and @S functions.

Fig. FR.40.
String
functions used
for string and
numeric
values.

Help F ₁		Feb 5, 1990		Lotus-DM - C:\123\DM-TEMP\F664.WK1		11:13 am	
File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
C10		{W91 @S(E2..E2)}					READY
	A	B	C	D	E	F	G
1							
2	Formula		Result	Lotus	123		
3							
4	@N(D2..D2)		0				
5							
6	@N(E2..E2)		123				
7							
8	@S(D2..D2)		Lotus				
9							
10	@S(E2..E2)						
11							
12							

@NA

Refer to the discussion of the @ERR function.

@NOW

The @NOW function retrieves both the current system date and current system time as a serial number. The decimal places to the left of the decimal point specify the date; the decimal places to the right of the decimal point specify the time.

Assuming either that you enter the current date and time when you boot your computer or that you have an internal clock that keeps the date and time for you, the @NOW function provides a convenient tool for recording the dates and times on which worksheets are modified or printed. @NOW does not require an argument:

@NOW

Figure FR.41 shows the result of using @NOW. Column B shows the serial number, which represents the system date and time. Column C shows the serial number formatted as a date. Column D shows the result of the function, formatted to show the current system time.

Help F1 Feb 28, 1990 Lotus-DM - C:\LOTUS-DM\RECORD.WK1 3:44 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F8 F9 F10

B4 [W24] @NOW READY

	A	B	C	D	E
1	Function		Formatted	Formatted	
2	Name	Serial Number Returned	Date	Time	
3					
4	@NOW	32302.655949	28-Feb-90	03:44 PM	
5					
6					
7					

Fig. FR.41.
The @NOW function used to insert the date and time in a worksheet.

@NPV

The @NPV (net present value) function closely resembles the @PV function, except that @NPV can calculate the present value of a varying, or changing, stream of cash flows. The format of the @NPV function is as follows:

@NPV(*interest*,*cashflows*)

The function calculates the following formula:

$$NPV = \sum_{n=1}^N \frac{C_n}{(1+i)^n}$$

Figure FR.42 shows how you can use the @NPV function to calculate the present value of a stream of varying cash flows.

Fig. FR.42.
The @NPV
function used
to calculate
the present
value of
varying cash
flows.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F623.WK1 10:46 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C14 (C2) @NPV(C3,B8..B12) READY

	A	B	C	D	E	F	G	H
1	Present Value of varying cash flows							
2								
3	Interest Rate		10.00%					
4								
5	Year	Cash						
6		flow						
7								
8	1	150						
9	2	200						
10	3	250						
11	4	200						
12	5	150						
13								
14	Present Value		\$719.22					
15								



NOTE

Note: What Lotus-DM calls the *net present value* function is not what accountants and financial analysts define as the *net present value profit measure*. The @NPV functions assumes that the first cash flow occurs at the end of the first period; therefore, the function actually is only a flexible present value function. In any situation where you can use the @PV function, therefore, you also can use the @NPV function to obtain the same result.

@PI

The @PI function computes the value of π . The function is called with no arguments:

@PI

@PI returns the value 3.141592653589794. You use π to calculate the area of circles and the volume of spheres. In addition, you use π to convert from angle measurements in degrees to angle measurements in radians. Because the number of radians in 180 degrees is equal to π , you can multiply the number of degrees by @PI/180, and the result represents radians, as shown in figure FR.43.

Help F₁ Feb 5, 1990 Lotus-DH - C:\123\DH-TEMP\F609.WK1 10:40 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B6 [W25] +A6*@PI/180 READY

	A	B	C	D	E	F
1	@PI =	3.141592653589794				
2						
3						
4	Degrees	Radians				
5						
6	0	0				
7	45	0.7853981634				
8	90	1.5707963268				
9	180	3.1415926536				
10	270	4.7123889804				
11	360	6.2831853072				
12						

Fig. FR.43.
The @PI
function used
to convert
angles from
degrees to
radians.

@PMT

You can use the @PMT function to calculate the periodic payments necessary to pay the entire principal on an amortizing loan. All you need to know is the loan amount (or the *principal*), the periodic *interest* rate, and the *term* (or the number of payment periods). You enter three arguments with the @PMT function:

@PMT(*principal, interest, term*)

The @PMT function assumes that payments are to be made at the end of each period; such payments are called *payments in arrears*. The function uses the following formula to make the payment calculation:

$$\text{PMT} = \text{principal} * \frac{\text{interest}}{1 - (1 + \text{interest})^{-n}}$$

Figure FR.44 shows the @PMT function used to calculate the monthly payment on a \$12,000 car loan. The loan is repaid over 60 months and accrues interest at the monthly rate of 1 percent.

Fig. FR.44.
The **@PMT**
function used
to calculate
loan payments

Help F ₁		Feb 5, 1990		Lotus-DH - C:\123\DH-TEMP\F622.WK1		10:46 am	
File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
B5		(C2) @PMT(B1,B2,B3)					READY
	A	B	C	D	E	F	G
1	Loan Principal	\$12,000					
2	Interest Rate	1.00%					
3	Term in Months	60					
4							
5	Payment in arrears	\$266.93					

You can modify the calculated result of the **@PMT** function if payments are to be made at the beginning of the period; these payments are called *payments in advance*. To calculate this type of payment structure, use the following modified format for the **@PMT** function:

@PMT(principal,interest,term)/(1+interest)

Whether you are calculating payments for payments in arrears or payments in advance, you need to keep two important guidelines in mind. First, you calibrate the interest rate as the rate per payment period. Second, you express the loan term in payment periods. Accordingly, if you make monthly payments, you should enter the *interest* argument as the monthly interest rate and the *term* as the number of months you make payments.

@PROPER

Refer to the discussion of the **@LOWER** function.

@PV

The **@PV** (present value) function closely resembles the **@NPV** function in that **@PV** calculates the present value of a stream of cash flows. The difference is that the **@PV** function calculates the present value of a stream of equal cash flows occurring at the end of the period. The stream of equal cash flows is called an *ordinary annuity*, or *payments in arrears*. The **@PV** function uses the following format:

@PV(payments,interest,term)

The formula used in the function is as follows:

$$PV = \text{payment} * \frac{1 - (1 + \text{interest})^{-\text{term}}}{\text{interest}}$$

Figure FR.45 shows the result of using the @PV function to calculate the present value of ten \$1,000 payments.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F625.WK1 10:47 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

A1 [W19] 'Payments' READY

	A	B	C	D	E	F	G
1	Payments	\$1,000					
2	Interest Rate	10.00%					
3	Term in Months	10					
4							
5	Present Value	\$6,144.57					
6							

Fig. FR.45.
The @PV
function used
to calculate
the present
value of ten
\$1,000
payments.

Keep in mind that the @PV function assumes that the equal-amount cash flows, or *payments*, occur at the end of the period. If the cash flows occur at the beginning of the period—called an *annuity due* or *payments in advance*, use the following variation of the function:

$$PV(\text{payments}, \text{interest}, \text{term}) * (1 + \text{interest})$$

@RAND

@RAND generates random numbers and uses no arguments:

@RAND

@RAND returns a randomly generated number between 0 and 1, using 15 digits to the right of the decimal each time the worksheet is recalculated. Figure FR.46 shows @RAND generating 5 random numbers in cells A5 through A9. Notice that new random numbers are generated each time you recalculate.

Fig. FR.46.
The **@RAND**
function used to
produce random
numbers.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F604.WK1 10:38 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B9 (W20) @INT(100*@RAND) READY

	A	B	C	D	E	F
1	Randomly	Randomly generated				
2	generated	numbers between				
3	numbers	0 and 99:				
4						
5	0.358794226311147	72				
6	0.855501231271774	45				
7	0.951704693958163	1				
8	0.642850908916444	90				
9	0.850453761406243	47				
10						
11						

@RAND is helpful for modeling problems that involve random occurrences. Generally, to simulate random occurrences in these sorts of models, you use random numbers as model inputs.

@RATE

The @RATE function calculates the compound growth rate for an initial investment that grows to a specified future value over a specified number of periods. The rate is the periodic interest rate and not necessarily an annual rate. The format of the @RATE function, where *term* equals the number of periods, is as follows:

@RATE(future value,present value,term)

This function's basic formula calculates the future value of an initial investment given the interest rate and the number of periods. For the @RATE calculation, the formula is rearranged to compute the interest rate in terms of the initial investment, the future value, and the number of periods:

$$\text{Interest rate} = (\text{future value}/\text{present value})^{1/\text{term}} - 1$$

You can use the @RATE function, for example, to determine the yield of a zero-coupon bond sold at a discount from its face value. Suppose that for \$350 you can purchase a zero-coupon bond with a \$1,000 face value, maturing in 10 years. The implied annual interest rate, as shown in figure FR.47, is 11.07 percent.

The @RATE function is also useful in forecasting applications to calculate the compound growth rate between current and projected future revenues, earnings, and so on.

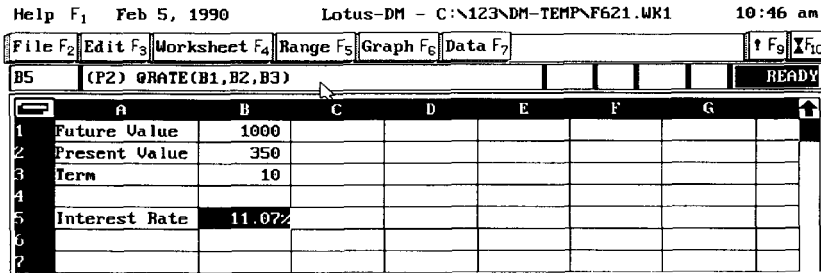


Fig. FR.47.
The @RATE
function used
to calculate a
zero-coupon
bond yield.

@REPEAT

The @REPEAT function repeats strings within a cell much as the backslash (\) repeats characters. But @REPEAT has some distinct advantages over the backslash. @REPEAT lets you repeat the character the precise number of times you want—which may be different than the column width in characters. The format of the @REPEAT function is as follows:

@REPEAT(string,number)

The *number* argument indicates the number of times you want to repeat *string* in a cell. For example, if you want to repeat the string 1234567890 three times, you can enter this function:

@REPEAT("1234567890",3)

The resulting string is 123456789012345678901234567890

This string follows Lotus-DM's rule for long labels. That is, the string displays beyond the right boundary of the column, provided that no entry is in the cell to the right. When you use the backslash to repeat a string, however, Lotus-DM fills the column to the exact column width. If the string doesn't fit within the column width, Lotus-DM truncates it.

The @REPEAT function in figure FR.48 shows how to generate a dashed line that is one character less than the column width of the current cell. You can enter the formula shown in the figure in one cell and then use the Edit Copy Range command to copy it to any other appropriate cell in the worksheet. If you use this technique, do not reference in the @CELL function a cell that contains a formula; otherwise, a circular reference may result.

Fig. FR.48.
The @REPEAT
function used
to generate
dashed lines.

Help F₁ Feb 28, 1990 Lotus-DM - C:\LOTUS-DM\SALES1Q.WK1 3:46 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C7 @REPEAT("-",@CELL("width",C6..C6)-1) READY

	A	B	C	D	E	F	G	H
1				First Quarter Sales				
2								
3				NORTH	SOUTH	EAST	WEST	TOTAL
4	Dept 1		114	254	384	309	1061	
5	Dept 2		279	275	116	189	859	
6	Dept 3		179	232	274	245	930	
7								
8			572	761	774	743	2850	

@REPLACE

The @REPLACE function removes a group of characters from a string and replaces them with another string. The @REPLACE function is valuable for correcting a text entry without having to retype the entire string. @REPLACE numbers the character positions in a string, starting with zero and continuing to the end of the string (up to a maximum of 239). The format of the @REPLACE function is as follows:

@REPLACE(*original string*,*start number*,*length*,*replacement string*)

The *start number* argument indicates the position where Lotus-DM is to begin removing characters from the *original string*. The *length* shows how many characters to remove, and the *replacement string* contains the new characters to replace the removed ones.

Suppose, for example, that the string *This is the original string* appears in cell A2. Figure FR.49 shows several examples of how to use @REPLACE to change words in the string. Notice in the third example in the figure that you can use the @FIND function to locate the string you want to replace instead of starting at 0 and counting the 12 positions to find the start number.

Fig. FR.49.
The @REPLACE
function used to
alter a string.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F658.WK1 11:11 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B11 {W26} @REPLACE(A2,@FIND("original",A2,0),8,"" READY

	A	B
1		
2	This is the original string	
3		
4		
5	Formula	Result
6	@REPLACE(A2,12,8,"new")	This is the new string
7		
8	@REPLACE(A2,8,12,"another new")	This is another new string
9		
10		
11	@REPLACE(A2,@FIND("original",A2,0),8,"final")	This is the final string
12		

@RIGHT

Refer to the discussion of the @LEFT function.

@ROUND

The @ROUND function performs a rounding function using two arguments: the value you want to round, and the precision you want to use in the rounding. The function format of @ROUND is as follows

@ROUND(number or cell reference,precision)

The *precision* argument determines the number of decimal places and can be a numeric value between -15 and +15. You use positive precision values to specify places to the right of the decimal place and negative values to specify places to the left of the decimal. A precision value of 0 rounds decimal values to the nearest integer. Figure FR.50 demonstrates the use of @ROUND.



Note: The @ROUND function and the Range Format command perform differently. @ROUND actually changes the contents of a cell; Range Format only alters how the cell's content is displayed.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F605.WK1 10:38 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C3 [W16] @ROUND(A3,B3) READY

	A	B	C	D	E	F	G
1	Value	Precision	Result of @Round				
2							
3	123.456	2	123.46				
4	123.456	1	123.5				
5	123.456	0	123				
6	123.456	-1	120				
7	123.456	-2	100				
8	123.456	-3	0				
9							

Fig. FR.50.
The @ROUND
function used to
round values.

In Lotus-DM, the formatted number you see on-screen or in print may not be the number used in calculations. This difference can cause errors. To prevent such errors, use the @ROUND function to round formula results to match the display.

If the number to be rounded is less than 0.5, @ROUND rounds down to 0; if the number is 0.5 or more, @ROUND rounds up to 1. Sometimes, you want to round down to the nearest integer. Then again, at times, you want to round up to nearest integer.

If you need to round up to the nearest integer, you can do so by adding 0.5 to the number you need to round. Figure FR.51 shows this technique.

Fig. FR.51.
A result
"rounded up" by
adding 0.5 to the
rounded
number.

Help F1 Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F606.WK1 10:39 am

File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F8	F9	F10
B5 @ROUND(B1+B2+0.5,0) READY								
	A	B	C	D	E			
1	Number of people	9						
2	Amount of computer time per person	0.25						
3	Precise amount of time required	2.25						
4	Round calculation of time needed	2						
5	Rounded up" computer time needed	3						
6								
7								

@ROWS

Refer to the discussion of the @COLS function.

@S

Refer to the discussion of the @N function.

@SECOND

Refer to the discussion of the @HOUR function.

@SIN

Refer to the discussion of the @COS function.

@SLN

The @SLN function calculates straight-line depreciation given an asset's cost, salvage value, and depreciable life. The format of the @SLN function is as follows:

@SLN(cost, salvage value, life)

This formula is used to calculate @SLN:

$$\text{SLN} = \frac{(\text{cost} - \text{salvage value})}{\text{life}}$$

The @SLN function conveniently calculates straight-line depreciation for an asset. Suppose that you have purchased a machine for \$1,000 that has a useful life of 3 years and a salvage value estimated to be 10 percent of the purchase price (\$100) at the end of its useful life. Figure FR.52 uses the @SLN function to calculate the straight-line depreciation for the machine: \$300 per year.

Help F1 Feb 28, 1990 Lotus-DM - C:\LOTUS-DM\DEPREC.WK1 2:45 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

C7 (C0) @SLN(\$B\$1,\$B\$2,\$B\$3) READY

	A	B	C	D	E	F	G
1	Cost of Asset	\$1,000					
2	Salvage value	\$100					
3	Life	3					
4							
5	Depreciation		1	2	3		
6							
7	Straight-line		\$300	\$300	\$300		

Fig. FR.52.
The @SLN function used to calculate straight-line depreciation.

@SQRT

The @SQRT function calculates the square root of a positive number with an accuracy of 15 digits to the right of the decimal point. The function uses a single argument, the number whose square root you want to find, and the following format:

@SQRT(*value or cell reference*)

The *value* argument must be a non-negative numeric value or a cell reference to such a value. If @SQRT is called with a negative value, the function returns ERR. Figure FR.53 shows examples of @SQRT. Notice that the value of the displayed square root is calculated to 10 decimal places when the default General format is used (and the width of the column is expanded to accommodate the number). If you want to display the value to 15 decimal places, change the format of the cell to Fixed with 15 places and expand the width of the column to accommodate the number.

Help F1 Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F607.WK1 10:39 am

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

B9 (W16) @SQRT(A9) READY

	A	B	C	D	E	F	G
1	Value	Result of @SQRT					
2							
3	-1	ERR					
4	0	0					
5	1	1					
6	25	5					
7	50	7.0710678119					
8	75	8.6602540378					
9	100	10					
10							
11							
12							

Fig. FR.53.
The @SQRT function used to find the square root of numbers.

@STD

The @STD function calculates the standard deviation of a population. The format for the @STD function is as follows:

@STD(*list*)



Note: The *list* argument can be values, cell addresses, cell names, cell ranges, range names, or combinations of these.

The standard deviation is a measure of dispersion about or around an average. A smaller standard deviation indicates less dispersion, and a larger standard deviation indicates greater dispersion. A standard deviation of 0 indicates no dispersion—meaning that every value in the list of values is the same.

The precise definition of the standard deviation formula is best shown by the formula Lotus-DM uses to calculate it. This formula is as follows:

$$\text{STD} = \sqrt{\frac{\sum_{n=1}^N (X_n - \text{avg})^2}{N}}$$

Notice the standard deviation shown in figure FR.54. The standard deviation is small, only 0.3113 from the average of 11.54, because there is only a small variation from the minimum and maximum values of \$11.00 and \$12.00. If the values were greater—for example, if the minimum and maximum values were \$110.00 and \$120.00—the standard deviation would be larger (3.113 to be exact!).

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F616.WK1 10:42 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

F7 (F4) @STD(B3..B11) READY

	A	B	C	D	E	F	G
1	Day	Price	Shares		Statistics		
2							
3	Monday	\$11.50	100		Average	\$11.54	
4	Tuesday	\$11.25	200		Days	7	
5	Wednesday	\$11.00	300		Minimum Price	\$11.00	
6	Thursday	\$11.50	100		Maximum Price	\$12.00	
7	Friday	\$11.75	100		Std. Deviation	0.3113	
8	Saturday						
9	Sunday						
10	Monday	\$12.00	100				
11	Tuesday	\$11.75	100				
12							
13	Total Shares		1000				

Fig. FR.54.
The @STD
function used
to calculate
standard
deviation.

@STRING

The @STRING function lets you convert a number to a string so that the number can be used with Lotus-DM's string functions. For example, @STRING can override Lotus-DM's automatic right-alignment of numbers and display a left-aligned number. The format of the @STRING function is as follows:

@STRING(*number to convert*,*decimal places*)

Lotus-DM uses the fixed-decimal format for the @STRING function. The *decimal places* argument represents the number of places to be included in the string. For example, if the *number to convert* argument in cell A2 is 22.5, and you enter **@STRING(A2,2)** in cell C10, the string 22.50 is displayed with the default left-alignment (see fig. FR.55).

Notice that in the first example in the figure, Lotus-DM rounds the number upward to 23, just as Lotus-DM rounds any number displayed in fixed-decimal format. The third example shows how to use the @STRING function and the concatenation sign (&) to display a number as a percentage. The formula **@STRING(A2,2)&"%"** produces the string 22.50%.



Note: To create a string from a number in any format other than fixed decimal, you must add the additional format characters.

Fig. FR.55.
A number
converted to
a string.

Help F ₁		Feb 5, 1990		Lotus-DH - C:\123\DM-TEMP\F665.WK1		11:14 am	
File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
C12		@STRING(A2,2)&"%"					READY
	A	B	C	D	E	F	G
1							
2		22.5					
3							
4							
5	Function		Result				
6							
7							
8	@STRING(A2,0)		23				
9							
10	@STRING(A2,2)		22.50				
11							
12	@STRING(A2,2)&"%"		22.50%				
13							

@SUM

The @SUM function provides a convenient way to add a list of values that you specify as the *list* argument in the following format:

@SUM(*list*)



NOTE

Note: The *list* argument can be values, cell addresses, cell names, cell ranges, range names, or combinations of these.

Consider figure FR.56 and assume that you have purchased the shares of stock recorded in column C. You could create a formula that adds the values in column C with this equation:

+C3+C4+C5+C6+C7+C10+C11

Or you could use @SUM(C2..C12) as shown in figure FR.56.

Of all the statistical functions, @SUM is the one you probably use most because it provides a shorthand way of constructing formulas. Because labels are included in statistical functions as zeros, you can include a cell at both ends of range you are summing with the @SUM function. That way, if rows or columns are inserted in the range, the range included as the function's *list* argument expands as part of the insertion. For instance, if you insert a row at rows 3 and 11 in figure FR.56, the *list* argument included in the @SUM function expands to become @SUM(C2..C14). If you do not include text "placeholders" at either end of the @SUM range, you can accidentally insert a value that appears to be in the total, when it is not.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F617.WK1 10:43 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C13 (F0) [W11] @SUM(C2..C12) READY

	A	B	C	D	E	F	G
1	Day	Price	Shares		Statistics		
2							
3	Monday	\$11.50	100		Average	\$11.54	
4	Tuesday	\$11.25	200		Days	?	
5	Wednesday	\$11.00	300		Minimum Price	\$11.00	
6	Thursday	\$11.50	100		Maximum Price	\$12.00	
7	Friday	\$11.75	100		Std. Deviation	0.3113	
8	Saturday						
9	Sunday						
10	Monday	\$12.00	100				
11	Tuesday	\$11.75	100				
12							
13	Total Shares		1000				

Fig. FR.56.
The @SUM
function used
to calculate
the total
shares
purchased.

@SYD

The @SYD function calculates depreciation by the sum-of-the-years'-digits method. This method accelerates depreciation so that earlier periods of the item's life reflect greater depreciation than later periods. The @SYD function uses the following format:

@SYD(cost,salvage,life,period)

The *cost* is the purchase cost of the asset. The *salvage* is the estimated value of the asset at the end of the depreciable life. The *life* is the depreciable life of the asset. The *period* is the period for which depreciation is to be computed.

@SYD calculates depreciation with the following formula:

$$\text{SYD} = \frac{(\text{cost} - \text{salvage}) * (\text{life period} + 1)}{\text{life} * (\text{life} + 1) / 2}$$

The expression *life-period+1* in the numerator shows the life of the depreciation in the first period, increased by 1 in each subsequent period. This expression reflects the declining pattern of depreciation over time. The expression *life*(life+1)/2* in the denominator is equal to the sum of the digits, as follows:

$$1 + 2 + \dots + \text{life}$$

The name *sum-of-the-years'-digits* originates from this expression.

Figure FR.57 shows how the @SYD function can calculate depreciation for an asset costing \$1,000 with a depreciable life of 3 years and an estimated salvage value of \$100.

Fig. FR.57.
The @SYD
function used
to calculate
sum-of-the-
years'-digits
depreciation.

Help F ₁		Feb 5, 1990		Lotus-DM - C:\123\DM-TEMP\F632.WK1		10:50 am	
File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇	F ₉	F ₁₀
A1		[W24] 'Cost of Asset					READY
	A	B	C	D	E	F	
1	Cost of Asset	\$1,000					
2	Salvage value	\$100					
3	Life	3					
4							
5							
6							
7							
8							
9	Depreciation		1	2	3		
10							
11	Sum-of-the-years-digits		\$450	\$300	\$150		

@TAN

Refer to the discussion of the @COS function.

@TERM

The @TERM function calculates the number of periods required to accumulate a specified future value by making equal payments into an interest-bearing account at the end of each period. The format of the @TERM function is as follows:

@TERM(payment, interest, future value)

The @TERM function is similar to the @FV function except that instead of finding the future value of a stream of payments over a specified period, the @TERM function finds the number of periods required to reach the given future value. The equation for calculating the number of periods is as follows:

$$\text{Term} = \frac{\text{@LN}(1 + (\text{interest} * \text{future value}) / \text{payment})}{\text{@LN}(1 + \text{interest})}$$

Suppose that you want to determine the number of months required to accumulate \$5,000 by making a monthly payment of \$50 into an account paying 6 percent annual interest compounded monthly (0.5 percent per month). Figure FR.58 shows the answer: slightly more than 81 months for an *ordinary annuity*, but slightly less than 81 months for an *annuity due*. For this account, making the deposit at the beginning of the month makes only a little difference.

Help F₁ Feb 5, 1990 Lotus-DM - C:\123\DM-TEMP\F628.WK1 10:49 am

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

B7 [W13] @TERM(B1,B2,B3) READY

	A	B	C	D	E	F
1	Payment	\$50				
2	Interest Rate	0.50%				
3	Future Value	\$5,000.00				
4						
5	Term(months)					
6						
7	Ordinary Annuity	01.295585653				
8						
9	Annuity due	00.962806183				
10						
11						

Fig. FR.58.
The @TERM function used to calculate the number of months to reach a specified future value.

The following formula is used to calculate the term for the *annuity due* in figure FR.58:

Term for an annuity due = @TERM(payment, interest, future value/(1+interest))

@TIME

Lotus-DM expresses time in fractions of serial numbers between 0 and 1. For example, 0.5 is equal to 12 hours (or 12:00 P.M.). In addition, Lotus-DM works in military time; 10:00 P.M. is 22:00 in military time. Lotus-DM's time-keeping system may seem a little awkward at first. Use the following general guidelines to help you understand the system:

<i>Time Increment</i>	<i>Numeric Equivalent</i>
1 hour	0.041666667
1 minute	0.0006944444
1 second	0.0000115741

The @TIME function produces a serial number for a specified time of day. The format of the @TIME function is as follows:

@TIME(hour number, minute number, second number)

The arguments have some restrictions. The *hour number* argument must be a number between 0 and 23. Both the *minute number* and *second number* arguments must be between 0 and 59. Although Lotus-DM accepts numeric arguments that contain integers and decimals, only the decimal portion of such numbers is used.

After Lotus-DM interprets a time as a fraction of a serial number, use the Range Format command to display the time in a more recognizable way.

You can use the @TIME function to produce a range of times just as you use the @DATE function to generate a range of dates. One way to produce a range of times is to use the Data Fill command. For example, to produce a range of times from 8:00 A.M. to 5:00 P.M. in 15-minute increments, use the following steps:

1. Select Data Fill to display the Data Fill dialog box.
2. Type the range where you want the times to appear.
3. Type @TIME(8,0,0) as the Start value.
4. Type @TIME(0,15,0) as the Step value.
5. Type @TIME(17,0,0) as the Stop value.
6. Use the Range Format command to display the range in whatever time format you choose. Remember to expand the column widths as necessary.

In figure FR.59, B4..D17 is selected as the range for the times to appear; the results are formatted with Range Format Time with the (D6) HH:MM:SS AM:PM option selected.

Fig. FR.59.
An example of
the @TIME
function.

Help F1 Feb 28, 1990 Lotus-DM - C:\LOTUS-DM\TIMEFILL.MK1 3:47 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7

B4 (D6) [W14] 0.3333333333

READY

	A	B	C	D	E	F
1						
2		Using @TIME with Data Fill command to generate times				
3						
4		08:00:00 AM	11:30:00 AM	03:00:00 PM		
5		08:15:00 AM	11:45:00 AM	03:15:00 PM		
6		08:30:00 AM	12:00:00 PM	03:30:00 PM		
7		08:45:00 AM	12:15:00 PM	03:45:00 PM		
8		09:00:00 AM	12:30:00 PM	04:00:00 PM		
9		09:15:00 AM	12:45:00 PM	04:15:00 PM		
10		09:30:00 AM	01:00:00 PM	04:30:00 PM		
11		09:45:00 AM	01:15:00 PM	04:45:00 PM		
12		10:00:00 AM	01:30:00 PM	05:00:00 PM		
13		10:15:00 AM	01:45:00 PM			
14		10:30:00 AM	02:00:00 PM			
15		10:45:00 AM	02:15:00 PM			
16		11:00:00 AM	02:30:00 PM			
17		11:15:00 AM	02:45:00 PM			
18						

@TIMEVALUE

@TIMEVALUE is a variation of the @TIME function. Like @TIME, @TIMEVALUE produces a serial number from the hour, minute, and second information you supply to the function. Unlike @TIME, however, @TIMEVALUE uses string arguments rather than numeric arguments. The format of the @TIMEVALUE function is as follows:

@TIMEVALUE(*timestring*)

The *timestring* must appear in one of the following four time formats:

- D6 HH:MM:SS AM:PM
- D7 HH:MM AM:PM
- D8 HH:MM:SS AM:PM (default International Long format)
- D9 HH:MM AM:PM (default International Short format)

If *timestring* conforms to one of the time formats, Lotus-DM displays the appropriate serial number fraction. If you then format the cell, Lotus-DM displays the appropriate time of day. Figure FR.60 shows the results of using the @TIMEVALUE function with the four different acceptable time strings.

Help F₁ Feb 28, 1996 Lotus-DM - C:\LOTUS-DM\TIMEVALU.WK1 4:27 pm

File F₂ Edit F₃ Worksheet F₄ Range F₅ Graph F₆ Data F₇ F₉ F₁₀

C10 @TIMEVALUE("9:20") READY

	A	B	C	D	E	F
1		Time	Function	Formatted		
2	Function	Format	Result	Result		
3	@TIMEVALUE("9:20:25 AM")	D6	0.389178	09:20:25 AM		
4						
5	@TIMEVALUE("9:20 AM")	D7	0.388888	09:20 AM		
6						
7	@TIMEVALUE("9:20:25")	D8	0.389178	09:20:25		
8						
9	@TIMEVALUE("9:20")	D9	0.388888	09:20		
10						
11						

Fig. FR.60.
An example
of the
@TIMEVALUE
function.

The first two time formats, D6 and D7, accept times from 12:00 A.M. to 11:59 A.M., and from 12:00 P.M. to 11:59 P.M. The last two time formats, D8 and D9, which Lotus calls *international time formats*, accept military time from 00:00 (12 A.M.) to 23:59 (11:59 P.M.). The separator character for the international time formats defaults to a colon (:), but you can change this by using the Worksheet International command.

@TRIM

The @TRIM function deletes blank spaces from the beginning, end, or middle of a string. The format for the @TRIM function is as follows:

@TRIM(string)

If more than one space occurs consecutively in the middle of a string, Lotus-DM removes all but one of the blank spaces. For example, the @TRIM function in figure FR.61 removes extra spaces between the words of a sentence.

Fig. FR.61.
Unwanted
spaces
removed with
the @TRIM
function.

Help F ₁ Feb 5, 1990		Lotus-DM - C:\123\DM-TEMP\F663.WK1		11:13 am	
File F ₂	Edit F ₃	Worksheet F ₄	Range F ₅	Graph F ₆	Data F ₇
C7		[W41] @TRIM(A2)		READY	
	A	B	C		
1					
2	This	is	an	example	of the @TRIM function.
3					
4					
5	Function			Result	
6					
7	@TRIM(A2)			This is an example of the @TRIM function.	
8					
9	@LENGTH(A2)				69
10					
11	@LENGTH(@TRIM(A2))				41

Notice that the value of @LENGTH(A2) is 69, but the value of @LENGTH(@TRIM(A2)) is 41.

@TRUE

Refer to the discussion of the @FALSE function.

@UPPER

Refer to the discussion of the @LOWER function.

@VALUE

If you have been entering string data but need to use the data as numbers, use the @VALUE function. Suppose that you enter model numbers and their quantities as labels. The information on model numbers works fine as strings, but you want to change the format of the quantity data so that you can add quantities together. The format of the @VALUE function, which handles this kind of task, is as follows:

@VALUE(string)

Figure FR.62 shows a number of examples of converting labels to numeric values with the @VALUE function. Aside from converting strings in the standard number format (as in the first example in the figure), @VALUE also can convert strings with decimal fractions as well as numbers displayed in scientific format. In the second example, the string 22 1/2 is converted to the number 22.5. If cell C6 contained the string 22 3/2, @VALUE would convert the string to the number 23.5. The final two examples in figure FR.62 show how @VALUE converts strings in percentage and in scientific format.

Help F1 Feb 28, 1998 Lotus-DM - C:\LOTUS-DM\VALUCONU.MK1 4:28 pm

File F2 Edit F3 Worksheet F4 Range F5 Graph F6 Data F7 F9 F10

E10 @VALUE(C10) READY

	A	B	C	D	E	F	G
1	Function		Label		Result		
2							
3							
4	@VALUE(C4)		22.5		22.5		
5							
6	@VALUE(C6)		22 1/2		22.5		
7							
8	@VALUE(C8)		22.5%		0.225		
9							
10	@VALUE(C14)		2.25E+1		22.5		
11							
12							

Fig. FR.62.
Labels
converted to
numbers.

Guidelines for Using the @VALUE Function

1. Although Lotus-DM usually does not object to extra spaces left in a string, the program has trouble with some extra characters, such as trailing percent (%) signs. Currency signs (such as \$) that precede the string are acceptable, however. Try experimenting with different characters to see how @VALUE reacts.
2. A numeric value supplied as an argument for @VALUE simply returns the original numeric value.

@VAR

The variance, like the standard deviation (@STD), is a measure of dispersion about, or around, an average. The @VAR function calculates the variance of a population. The format for the @VAR function is as follows:

@VAR(list)



Note: The *list* argument can be values, cell addresses, cell names, cell ranges, range names, or combinations of these.

Actually, calculating a statistical variance is an intermediate step in calculating the standard deviation described in the discussion of the @STD function. The standard deviation is simply the square root of the variance.

$$\text{VAR} = \frac{\sum_{n=1}^N (X_n - \text{avg})^2}{N}$$

Figure FR.63 shows the use of the @VAR function to measure the price-per-share variability over the specified period.

Fig. FR.63
@VAR
function

Help F1		Feb 5, 1990		Lotus-DM - C:\123\DM-TEMP\F618.WK1		10:43 am	
File F2	Edit F3	Worksheet F4	Range F5	Graph F6	Data F7	F8	F10
F8		(F4) @VAR(B3..B11)		READY			
1	A	B	C	D	E	F	G
2	Day	Price	Shares		Statistics		
3	Monday	\$11.50	100		Average	\$11.54	
4	Tuesday	\$11.25	200		Days	7	
5	Wednesday	\$11.00	300		Minimum Price	\$11.00	
6	Thursday	\$11.50	100		Maximum Price	\$12.00	
7	Friday	\$11.75	100		Std. Deviation	0.3113	
8	Saturday				Variance	0.0964	
9	Sunday						
10	Monday	\$12.00	100				
11	Tuesday	\$11.75	100				
12							
13	Total Shares		1000				
14							

@VLOOKUP

Refer to the discussion of the @HLOOKUP function.

@YEAR

Refer to the discussion of the @DAY function.

Installing Lotus-DM

Whether or not your PC has a hard disk, you have to install Lotus-DM before you can use it. Installation is performed only once; its purpose is to record your name and the name of your company on the software. Every time the software is used, this information is displayed on-screen. You cannot use Lotus-DM at all until you complete installation.

The file named INSTALL.EXE on the Lotus-DM disks leads you through the necessary steps to complete installation. The procedure for installing Lotus-DM can vary, depending not only on whether or not you have a hard disk, but also on whether you have the full version of DeskMate on your PC or simply the run-time version.

In any case, you run the INSTALL program to record your name and company name on the Lotus-DM System disk. If you have a hard disk, the installation program automatically copies the Lotus-DM disks onto your hard disk. If you don't have a hard disk, you should make working copies of the original Lotus-DM disks.

Noting System Requirements

Before you install Lotus-DM, make sure that your system meets the following hardware and software requirements:

- ☐ Is a Tandy PC or any personal computer supported by DeskMate.
- ☐ Has one floppy-disk drive and a hard disk, or two double-sided floppy-disk drives (double-density or high-density). The drives can be 5 1/4 inches or 3 1/2 inches in size.
- ☐ Has a monochrome or color monitor and an EGA, VGA, CGA, or Hercules standard display adaptor for graphics.
- ☐ Has a keyboard. A mouse or pointing device is desirable, but optional.

- ☐ Has at least 512K of RAM.
- ☐ Uses DOS V3.2 or higher.

Examining the Lotus-DM Disks

To accommodate the two standard sizes of floppy-disk drives, Lotus packages Lotus-DM with two different sets of disks: four 5 1/4-inch disks, and two 3 1/2-inch disks. The files contained on the two sets of disks are exactly the same, but the files are divided among the disks differently.

Lotus-DM Disks for 5 1/4-Inch Drives

The Lotus-DM package includes four 5 1/4-inch disks. Make sure that you have the following disks before proceeding with the installation:

- ☐ Runtime disk
- ☐ System disk
- ☐ PrintGraph and Translate disk
- ☐ Help and Sample Files disk

The Runtime disk contains the INSTALL.EXE program, essential for completing installation. This disk holds all the hardware drivers used to set up Lotus-DM for your system. *Drivers* are programs that Lotus-DM uses to control the hardware. Different drivers, for example, are used to control a color monitor and a monochrome monitor. Driver files are necessary when you use the Setup accessory (described in Chapter 2) to indicate to Lotus-DM what kinds of hardware you have on your computer.

The System disk contains most of the Lotus-DM operations except the commands for printing graphs and the on-line help system.

If you want to print graphs or translate files (convert data to and from Lotus-DM and other software programs), you need the PrintGraph and Translate disk.

The Help and Samples Files disk contains Lotus-DM's extensive context-sensitive help system as well as some sample files.

Lotus-DM Disks for 3 1/2-Inch Drives

The Lotus-DM package includes two 3 1/2-inch disks. Make sure that you have these disks before proceeding with the installation:

- ☐ System disk
- ☐ PrintGraph, Translate, and Help disk

The System disk contains the INSTALL.EXE program you use to tailor Lotus-DM to your computer system. This disk also holds the library of drivers you use with the INSTALL.EXE program to set up Lotus-DM for your system. As mentioned in the preceding section, *drivers* are programs that Lotus-DM uses to control your hardware. Different drivers, for example, are used to control a color monitor and a monochrome monitor.

The PrintGraph, Translate, and Help disk contains the PrintGraph program (used to print graphs), the Translate program (used to convert data to and from Lotus-DM and other software programs), and the on-line help facility.

Understanding Installation Options

Once you confirm that you have all the necessary disks, you can begin the installation. Installation falls into one of two major categories:

1. Installing Lotus-DM from DeskMate.

This method assumes that you have DeskMate *and* the run-time version of Lotus-DM and have either a floppy-disk-based system or a hard-disk system.

2. Installing the run-time version of Lotus-DM.

This method assumes that you have only the run-time version of Lotus-DM and have either a floppy-disk-based system or a hard-disk system.

Each of these methods is described in the following sections.

The INSTALL program can be run to completion only once. You cannot change your name and company name again. Although the installation program's operation is simple, review your entries for errors before you answer the confirmation prompts. If you are installing the program for your company, you may want to establish the appropriate name and company name with a supervisor before proceeding. The name and company name are displayed as part of the start-up banner.

You can stop the installation program without completing it by pressing Esc. If you stop the installation program, you can run it again. You can start and stop the program any number of times. Once the program runs to completion, however, you cannot run it again.

Installing Lotus-DM from DeskMate

Start DeskMate before you proceed with the following instructions:

1. Make sure that the System Disk is in drive A:.



Note: The System disk must not be write-protected; make sure that the write-protect notch on the 5 1/4-inch disk is not covered or that the plastic shutter does cover the write-protect opening on the 3 1/2-inch disk.

2. From the Desktop (F7) menu, choose Install.
3. The Display Menu box shows four sizes; select the size you want for the Lotus-DM list box.
4. Select a location for the Lotus-DM list box on the desktop and press Enter.
5. Read the Lotus-DM Install information, press Enter, read the next information screen, and press Enter again.
6. In the Licensee Information dialog box, type your name, using up to 30 characters.
7. Use the cursor-movement keys to move to the `Company name` field and type the name of your company, using up to 30 characters. Type your own name again if you have no company name.
8. Press Enter to affirm that your entries are correct; press Esc to exit from the installation process.
9. When confronted with the Final Confirmation box, which displays your entries, press Enter if you want the name and company to be permanently copied to the System disk. If you press Esc, the Install program terminates; you must choose Install from the Desktop (F7) menu to start the process over.

Your name and your company name are written to the System disk and become permanent. If you have a floppy-disk-based computer, installation is now complete. Whenever you start Lotus-DM, use the System disk; continue your reading in this appendix with "Backing Up the Lotus-DM Disks with DeskMate."

If your PC has a hard disk, you are now ready to copy the files from the Lotus-DM disks to the hard disk. Follow these steps to continue the installation process:

1. After you complete the confirmation of name and company in step 9 of the preceding instructions, the Specify Directory dialog box appears. The default directory setting is C:\LOTUS-DM.

Press Enter if you want the Lotus-DM files copied to that directory; alternatively, type the path of the desired directory. For example, type **C:\LOTUS\DM** if you want the Lotus-DM files to be copied to DM, a subdirectory of a directory named LOTUS.

The Install program displays prompts for you to insert disks so that all files can be copied to the hard disk.

2. When you see an information screen that indicates the completion of installation, press Enter to bring back the DeskMate desktop.
3. Select Redefine from the Desktop (F7) menu; then select Lotus-DM and press Enter.
4. Use the cursor-movement keys to highlight the *Start-up Directory* field; type the name of the directory in which you chose to store the Lotus-DM files and press Enter.

Installing Lotus-DM Run-Time

Follow these steps to install Lotus-DM if you do not have a copy of the DeskMate program on your computer. These steps install Lotus-DM with a run-time version of DeskMate:



Note: The instructions for these steps assume that you will be using drive A to initialize the System disk. If you will be using another drive (such as drive B), then be sure to substitute that drive's letter where the instructions use A.

1. Make sure that the System Disk (3 1/2-inch size) or the Runtime Disk (5 1/2-inch size) is in the A: drive.
2. If the DOS prompt is not **A>** type **A:** and press Enter.
3. From the DOS prompt, type **INSTALL**.

If you're using 5 1/4-inch disks, use the System disk when asked to insert the disk containing the INSTALL.PDM file.

4. Read the Lotus-DM Install information, press Enter, read the next information screen, and press Enter again.
5. In the Licensee Information dialog box, type your name, using up to 30 characters.
6. Use the cursor-movement keys to move to the *Company name* field and type the name of your company, using up to 30 characters. Type your own name again if you have no company name.

7. Press Enter to affirm that your entries are correct; press Esc to exit from the installation process.
8. When confronted with the Final Confirmation box, which displays your entries, press Enter if you want the name and company to be permanently copied to the System disk. If you press Esc, the Install program terminates; you must choose Install from the Desktop (F7) menu to start the process over.

Your name and company name are written to the System disk and become permanent. If you have a floppy-disk-based computer, installation is now complete; whenever you start Lotus-DM, use the System disk. Continue your reading in this chapter with “Backing Up the Lotus-DM Disks with DOS.”

If your PC has a hard disk, you are now ready to copy the files from the Lotus-DM disks to the hard disk. Follow these steps to continue the installation process:

1. After you complete the confirmation of name and company in step 8 of the preceding instructions, the Specify Directory dialog box appears. The default directory setting is C:\LOTUS-DM.

Press Enter if you want the Lotus-DM files copied to that directory; alternatively, type the path of the desired directory. For example, type **C:\LOTUS\DM** if you want the Lotus-DM files to be copied to DM, a subdirectory of a directory named LOTUS.

The Install program displays prompts for you to insert disks so that all files can be copied to the hard disk.

2. When you see an information screen that indicates the completion of installation, press Enter to return to the DOS prompt.

If you cancel the Installation program *after* you record your name and company name but *before* you copy the Lotus-DM disks to the hard disk, you must copy the disks manually—using the DOS COPY command.

Backing up the Lotus-DM Disks

If you have a floppy-disk-based computer system, you should make a copy of the Lotus-DM disks. Use the copies and store the original disks in a safe place. The following sections explain how to make copies of the original Lotus-DM disks using DeskMate and using DOS.

Backing Up the Lotus-DM Disks with DeskMate

Before you begin making backup copies of the Lotus-DM disks, make sure that you have the two 3 1/2-inch or four 5 1/4-inch original Lotus-DM disks available. You also need two 3 1/2-inch or four 5 1/4-inch blank disks for backup purposes. The blank disks can be unformatted; if they are formatted, they should contain no files.

Follow these steps to back up the original Lotus-DM disks with DeskMate:

1. Label the blank disks as follows:

<i>5 1/4-inch</i>	<i>3 1/2-inch</i>
System disk	System disk
Runtime disk	PrintGraph, Translate, and Help disk
PrintGraph and Translate disk	
Help and Sample Files disk	

2. Turn on your computer and start DeskMate; see your DeskMate manual if you are unsure how to start DeskMate.
3. From the menu, choose Disk (F4) and select Diskcopy.
4. In the Copy Disk dialog box, make two entries:
 - A. Type the name of the drive that will contain the Lotus-DM original disks in the FROM field; use the Tab key to move to the TO field.
 - B. Type the name of the drive that will contain the backup disks in the TO field.
5. Select OK to begin copying; you see a prompt to insert the source disk in the drive you designated for the original disks (the FROM location in step 3A). You see another prompt to insert the target disk in the drive you designated for the backup disks (the TO location in step 3B).
6. Place the System disk in the drive for source disks and a blank disk in the drive for target disks and press Enter. Copying usually takes about a minute and is complete when you see the message `Copy another diskette (Y/N)`.
7. Select Y, and respond to the prompts to insert the source and target disks. Repeat this process until both (if you have 3 1/2-inch disks) or all four (if you have 5 1/2-inch disks) disks are copied.
8. Store the original disks in a safe place. Whenever you need to use a Lotus-DM disk, use a backup copy, not the original.

Backing Up the Lotus-DM Disks with DOS

Before making backup copies, you should become familiar with your computer's disk operating system. For specific explanations of formatting disks and copying files, refer to your system manual or to *Using DOS*, published by Que Corporation.

Use the following steps to use DOS to create backup copies of the Lotus-DM disks:

1. Format four blank 5 1/4-inch disks or two 3 1/2-inch disks, using the DOS **FORMAT** command.

2. Label the blank disks as follows:

<i>5 1/4-inch</i>	<i>3 1/2-inch</i>
System disk	System disk
Runtime disk	PrintGraph, Translate, and Help disk
PrintGraph and Translate disk	
Help and Sample Files disk	

3. Copy each original Lotus-DM disk onto the appropriate formatted blank disk as follows:
 - A. Place, in turn, each original Lotus-DM disk into drive A and the formatted disk labeled with the same name into drive B.
 - B. At the **A>** prompt, type **COPY A:*.* B:** and press Enter.
 - C. After all files have been copied from the original disk to the formatted disk, remove the original disk from drive A and the backup copy from drive B.
 - D. Follow steps 3A through 3C for each original disk.
4. Store the original disks in a safe place. Whenever you need to use a Lotus-DM disk, use a backup copy, not the original.

Once you have installed Lotus-DM and copied the files to your hard disk, you can load Lotus-DM and create and save spreadsheets. You cannot, however, display graphs or print anything until you run the Setup accessory. Because this feature is accessed from the Lotus-DM worksheet environment, details on its use are found in Chapter 2.

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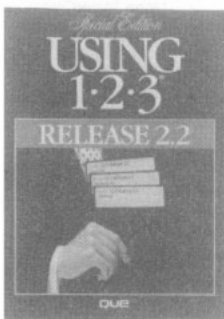
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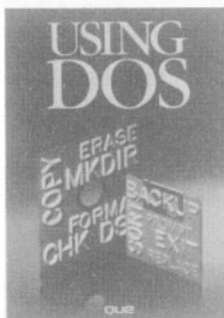


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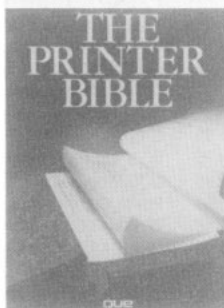


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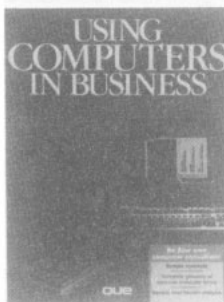


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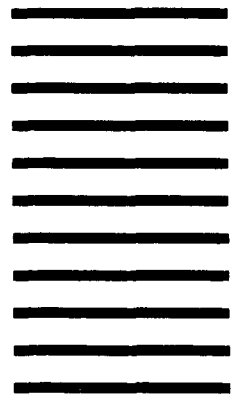
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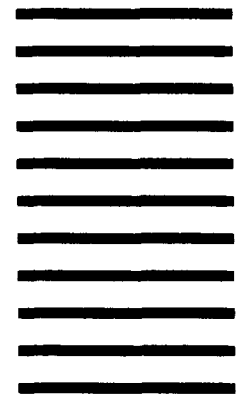
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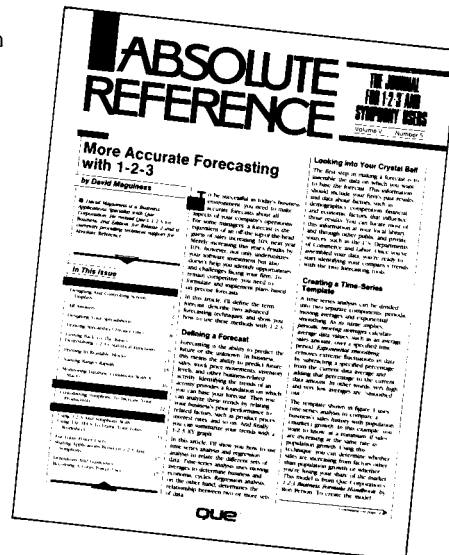
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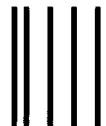
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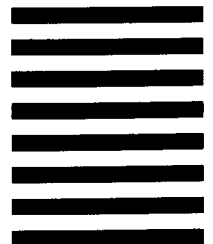


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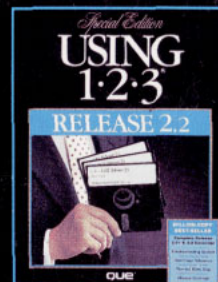
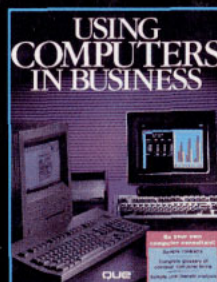
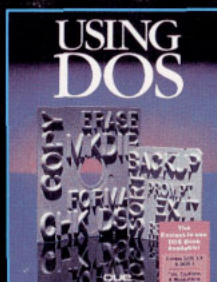
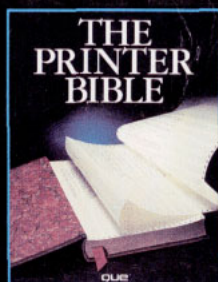
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