Have you ever wanted just to sit down with someone who knows what a computer program is all about, and talk with them in such a way that you will understand that program easily and well? We're going to do that with you right now.

This book is not written for an audience, or for any market. It is written to one person: to you who hold it in your hands; to you who are depending on its accuracy, its clarity and its thoroughness to ensure that you are receiving full value.

If we are successful, you will come to know all of the almost infinite capabilities and variations possible in using this program. We have worked hard to make it rather special for you.

If we have done it right, your learning will be a gentle adventure, and comfort will come to you quickly. You may even become a bit excited by all you can do.

And that is the very best we could ask.

TIMBERLINE SOFTWARE

Welcome to the world of Timberline Software!

Not so many years ago, a small group of people with great dreams entered the world of computer software. Their dreams were not much different from those of other men: their hopes were based solely on the premise that success was a proper consequence of product excellence.

Today, Timberline Systems is still a small group of people who are concerned with excellence. Yes, we have grown a lot since those early years; and, yes, success has proven to be the consequence of allowing only the very best products to bear our name.

Within the computer world, we are considered old-timers. We've been here long enough to remember a time when there were no micro-computers; and we are still here, and still young enough, to know the excitement of watching a new revolution.

We know that micro-computers are not just for micro-businesses. We're watching executives at every level of management adopt small computers, using them in new ways that provide an incredibly thorough understanding of the manner in which businesses really operate.

We're using that knowledge to develop software that enhances the process of understanding the business world and brings to that process the sureness and clarity that are the companions of excellence.

Welcome to our world; and thank you for letting us join yours.

What hardware will the Spreadsheet run on?

The SPREADSHEET runs on a wide array of computers by means of the UCSD-PASCAL® or p-SYSTEM® operating system. The great advantage of this operating system is that it is transportable without modification from one computer to another; and the program will not become obsolete as new hardware becomes available.

For further information, please see the note on Page 14.

The Timberline

SPREADSHEET

CALCULATOR
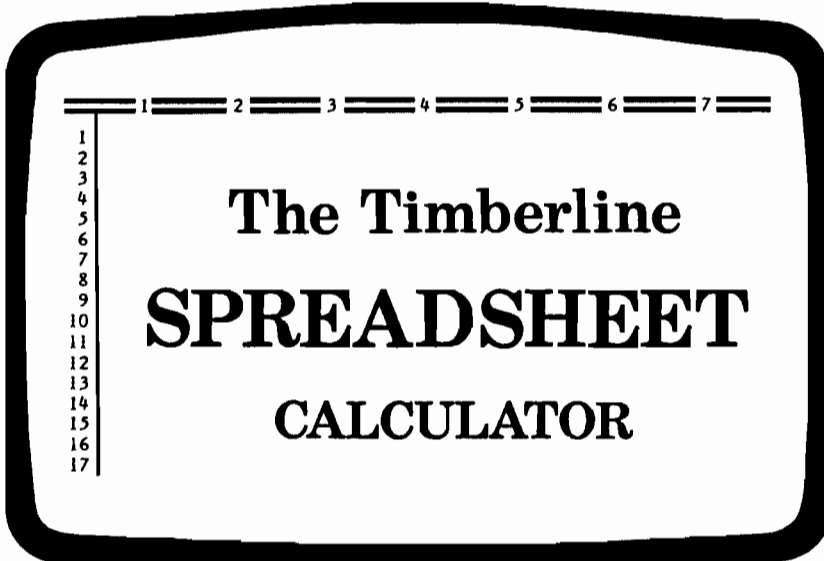
TIMBERLINE
SOFTWARE

NOTICE

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TIMBERLINE SYSTEMS, INC. assumes no responsibility for any errors which may appear in the publication.

Timberline Software

We'll have you up and running–
...in about half an hour!

Anyone who has ever bought a brand new, bright red Mighty-Widget wants to use it now! — without first having to wade through pages and pages of technical whoopdeedoo.

You've paid your money; and you want to see it work — right? You'll read all that other stuff later, when you have time. What's important right now is to get started, and you shouldn't have to read or memorize a whole book in order to get going.

Everyone hates instruction sheets...

The trouble with computer programs is that you just can't tell anything about them by looking at a dumb disk — so you <u>do</u> have to look at what computer-people call the "documentation", to see if any of it makes sense.

You are holding a rather different kind of "documentation" in your hands: It has been written in the belief that learning ought to be enjoyable — that you should be able to start using this or any other good program right from the beginning!

You are going to learn a great deal about the Spreadsheet very quickly. Then you'll be able to play around with it, create your own custom worksheets, or follow along with our examples, as you wish.

The program you are holding is an incredibly powerful creative tool for analyzing, comparing and predicting the consequences of any situation that can be quantified. If you can assign values or formulas to that situation, and arrange them in any logical pattern, no matter how many variables are present, the Spreadsheet will make it possible for you to control the interaction of those variables with each other, in as many different ways as you can create.

What's more, if you apply one set of possibilities, and don't like the results of that set of assumptions — then, by altering any of the variables, you can direct the Spreadsheet to recalculate that entire situation over again, in as many variations as you wish, observing and learning from each stage of the continuing process.

Make yourself comfortable in front of your computer. Start at the beginning, and go through the first several sections of this book. Before long, you'll be creating your own Spreadsheet magic!

Timberline Software

```
  ========1========2===3====4====5====6====7==
 1    SALE PRICE  per unit         5.95     6.95     7.95     8.95
 2  -----------------------------  -------  -------  -------  -------
 3    UNIT SALES per month        1,800    1,620    1,458    1,312
 4  -----------------------------  -------  -------  -------  -------
 5  Materials ...      0.94 per unit   0.94     0.94     0.94     0.94
 6  Labor .......      0.46 per unit   0.46     0.46     0.46     0.46
 7  Rent ........  2,500.00 per mo.    1.39     1.54     1.71     1.91
 8  Office ......  1,800.00 per mo.    1.00     1.11     1.23     1.37
 9  Utilities ...   750.00 per mo.     0.42     0.46     0.51     0.57
10  Advertising..   700.00 per mo.     0.39     0.43     0.48     0.53
11  Insurance ...   225.00 per qtr.    0.04     0.05     0.05     0.06
12  -----------------------------------------------------------------
13  UNIT PROFIT per month...........   1.31     1.95     2.55     3.11
14  GROSS PROFIT per month.......... 2,365.00 3,166.00 3,724.90 4,082.11
15
16  PerCent Return on Sales.........   22.1     28.1     32.1     34.8
17
```

... A tool for financial analysis, dynamic business management
detailed investment projections ... and a great deal more!

```
    =======1========2=======3====4====5====6==
 1
 2        In the beginning of your career you are going to invest increasing
 3    amounts of money each year for the first few years.  At what rate of
 4    return must you invest to have desired amounts at the end of year 5?
 5
 6  Year 1   Investment          500      750    1,000    1,250
 7  Year 2   Investment        1,000    1,500    2,000    2,500
 8  Year 3   Investment        1,500    2,250    3,000    3,750
 9  Year 4   Investment        2,000    3,000    4,000    5,000
10                            -------  -------  -------  -------
11  Year 5   Desired Yield     6,000    9,000   12,000   15,000
12      Required Rate of Return %  9.3      9.3      9.3      9.3
13                            -------  -------  -------  -------
14  Year 5   Desired Yield     6,500   10,000   13,000   17,000
15      Required Rate of Return % 13.5     14.9     13.5     16.0
16
17
```

Timberline Software

What is a Spreadsheet Calculator?

You can think of the Spreadsheet Calculator program as a huge, liquid, magic ledger that flows down and across space, changing its width, depth, and the form of its rows and columns at your command.

When you put numbers and category names inside it, it behaves like an enormous, intelligent yellow-pad, combined with a statistical analysis system that is almost automatic, and a fully programable calculator that can perform nearly every function you can think of.

And Still It Is More Than That ....

Think of building a very sophisticated structure on paper, made up of all kinds of numbers and formulas that are nothing but rough data that have no form and seemingly don't fit together in any pattern.

Now think of building a house: all you have to build with is a big pile of rough lumber, none of which fits the plans you have drawn, or the space you have available.

Someone comes along, and hands you a magic tool − a lightning fast saw that never needs to be sharpened. You set it down on that pile of rough boards, dial in a few numbers, and watch in amazement as it goes to work, shaping, changing, refining and fitting each board in different ways until the finished pieces precisely fit the space and the need you have for them, and together they form a finished home.

The Spreadsheet is just such a tool − used for taking rough piles of data and shaping them into organized structures on paper, in such a way that patterns and interrelationships do reveal themselves, and thus allow you to analyze and predict their behavior under any set of conditions that you specify.

How often, just before dropping off to sleep, have you caught yourself wondering, "...but what if it happens THAT way?...what do I do THEN?" In all likelihood, you didn't have time the next day to sit down and really work the problem through. Besides, there were dozens of possibilities, and you couldn't analyze every one. Right?

Now you can. Enter the rough data; find the patterns by which that data is affecting some part of your world; and watch, as your Spreadsheet Calculator works its magic on your world of numbers.

Timberline Software

	1	2	3	4	5	6		8	9	10	11	12	13	14
1	THE MORE CREDIT CO.	INTEREST RATE	INTEREST RATE	INTEREST RATE	INTEREST RATE	INTEREST RATE		INTEREST RATE	INTEREST RATE	INTEREST RATE	INTEREST RATE	INTEREST RATE	INTEREST RATE	INTEREST RATE
2	CONSOLIDATED	10	10.5	11	11.5	12		13	13.5	14	14.5	15	15.5	16
3	LOAN													
4	ANALYSIS	InerAnnum	InerAnnum	InerAnnum	InerAnnum	InerAnnum		InerAnnum	InerAnnum	InerAnnum	InerAnnum	InerAnnum	InerAnnum	InerAnnum
5														
6														
7	LOAN AMOUNT.........	20,000	20,000	20,000	20,000	20,000		20,000	20,000	20,000	20,000	20,000	20,000	20,000
8														
9	No.Periods: 8 Yr..	96	96	96	96	96		96	96	96	96	96	96	96
10	10 Yr....	120	120	120	120	120		120	120	120	120	120	120	120
11	12 Yr....	144	144	144	144	144		144	144	144	144	144	144	144
12	15 Yr....	180	180	180	180	180		180	180	180	180	180	180	180
13														
14	No.PAYMENT: 8 Yr....	303.48	308.80	314.17	319.59	325.06		336.15	341.76	347.43	353.15	358.91	364.72	370.58
15	10 Yr....	264.30	269.87	275.50	281.19	286.94		298.62	304.55	310.53	316.57	322.67	328.82	335.03
16	12 Yr....	239.02	244.83	250.71	256.66	262.68		274.93	281.14	287.43	293.77	300.18	306.64	313.17
17	15 Yr....	214.92	221.08	227.32	233.64	240.03		253.05	259.66	266.35	273.10	279.92	286.80	293.74
18								32,269.93	32,809.27	33,353.28	33,901.93	34,455.18	35,012.97	35,575.27
19								35,834.58	36,545.83	37,263.94	37,988.83	38,720.39	39,458.53	40,203.15
21	12 YR..	34,418.25	35,255.25	36,102.39	36,959.52	37,826.47	38,703.09	39,589.21	40,484.65	41,389.26	42,302.85	43,225.25	44,156.28	45,095.77
22	15 YR..	38,685.78	39,794.36	40,917.49	42,054.83	43,206.05	44,370.79	45,548.72	46,739.47	47,942.69	49,158.03	50,385.14	51,623.65	52,873.23
23														
24														
25	LOAN AMOUNT.........	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
26														
27	No.Periods: 8 Yr..	96	96	96	96	96	96	96	96	96	96	96	96	96
28	10 Yr....	120	120	120	120	120	120	120	120	120	120	120	120	120
29	12 Yr....	144	144	144	144	144	144	144	144	144	144	144	144	144
30	15 Yr....	180	180	180	180	180	180	180	180	180	180	180	180	180
31														
32	No.PAYMENT: 8 Yr....	303.48	308.80	314.17	319.59	325.06	330.58	336.15	341.76	347.43	353.15	358.91	364.72	370.58
33	10 Yr....	264.30	269.87	275.50	281.19	286.94	292.75	298.62	304.55	310.53	316.57	322.67	328.82	335.03
34	12 Yr....	239.02	244.83	250.71	256.66	262.68	268.77	274.93	281.14	287.43	293.77	300.18	306.64	313.17
35	15 Yr....	214.92	221.08	227.32	233.64	240.03	246.50	253.05	259.66	266.35	273.10	279.92	286.80	293.74
36														
37	Total Payment: 8 Yr..	29,134.40	29,644.83	30,160.18	30,680.40	31,205.46	31,735.31	32,269.93	32,809.27	33,353.28	33,901.93	34,455.18	35,012.97	35,575.27
38	10 YR..	31,716.18	32,384.40	33,060.00	33,742.91	34,433.03	35,130.28	35,834.58	36,545.83	37,263.94	37,988.83	38,720.39	39,458.53	40,203.15
39	12 YR..	34,418.25	35,255.25	36,102.39	36,959.52	37,826.47	38,703.09	39,589.21	40,484.65	41,389.26	42,302.85	43,225.25	44,156.28	45,095.77
40	15 YR..	38,685.78	39,794.36	40,917.49	42,054.83	43,206.05	44,370.79	45,548.72	46,739.47	47,942.69	49,158.03	50,385.14	51,623.65	52,873.23
41														
42														
43	LOAN AMOUNT.........	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
44														
45	No.Periods: 8 Yr..	96	96	96	96	96	96	96	96	96	96	96	96	96
46	10 Yr....	120	120	120	120	120	120	120	120	120	120	120	120	120
47	12 Yr....	144	144	144	144	144	144	144	144	144	144	144	144	144
48	15 Yr....	180	180	180	180	180	180	180	180	180	180	180	180	180
49														
50	No.PAYMENT: 8 Yr....	303.48	308.80	314.17	319.59	325.06	330.58	336.15	341.76	347.43	353.15	358.91	364.72	370.58
51	10 Yr....	264.30	269.87	275.50	281.19	286.94	292.75	298.62	304.55	310.53	316.57	322.67	328.82	335.03
52	12 Yr....	239.02	244.83	250.71	256.66	262.68	268.77	274.93	281.14	287.43	293.77	300.18	306.64	313.17
53	15 Yr....	214.92	221.08	227.32	233.64	240.03	246.50	253.05	259.66	266.35	273.10	279.92	286.80	293.74
54														
55	Total Payment: 8 Yr..	29,134.40	29,644.83	30,160.18	30,680.40	31,205.46	31,735.31	32,269.93	32,809.27	33,353.28	33,901.93	34,455.18	35,012.97	35,575.27
56	10 YR..	31,716.18	32,384.40	33,060.00	33,742.91	34,433.03	35,130.28	35,834.58	36,545.83	37,263.94	37,988.83	38,720.39	39,458.53	40,203.15
57	12 YR..	34,418.25	35,255.25	36,102.39	36,959.52	37,826.47	38,703.09	39,589.21	40,484.65	41,389.26	42,302.85	43,225.25	44,156.28	45,095.77
58	15 YR..	38,685.78	39,794.36	40,917.49	42,054.83	43,206.05	44,370.79	45,548.72	46,739.47	47,942.69	49,158.03	50,385.14	51,623.65	52,873.23
59														
60														
61	LOAN AMOUNT.........	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
62														
63	No.Periods: 8 Yr..	96	96	96	96	96	96	96	96	96	96	96	96	96
64	10 Yr....	120	120	120	120	120	120	120	120	120	120	120	120	120
65	12 Yr....	144	144	144	144	144	144	144	144	144	144	144	144	144
66	15 Yr....	180	180	180	180	180	180	180	180	180	180	180	180	180
67														
68	No.PAYMENT: 8 Yr....	303.48	308.80	314.17	319.59	325.06	330.58	336.15	341.76	347.43	353.15	358.91	364.72	370.58
69	10 Yr....	264.30	269.87	275.50	281.19	286.94	292.75	298.62	304.55	310.53	316.57	322.67	328.82	335.03
70	12 Yr....	239.02	244.83	250.71	256.66	262.68	268.77	274.93	281.14	287.43	293.77	300.18	306.64	313.17
71	15 Yr....	214.92	221.08	227.32	233.64	240.03	246.50	253.05	259.66	266.35	273.10	279.92	286.80	293.74
72														
73	Total Payment: 8 Yr..	29,134.40	29,644.83	30,160.18	30,680.40	31,205.46	31,735.31	32,269.93	32,809.27	33,353.28	33,901.93	34,455.18	35,012.97	35,575.27
74	10 YR..	31,716.18	32,384.40	33,060.00	33,742.91	34,433.03	35,130.28	35,834.58	36,545.83	37,263.94	37,988.83	38,720.39	39,458.53	40,203.15
75	12 YR..	34,418.25	35,255.25	36,102.39	36,959.52	37,826.47	38,703.09	39,589.21	40,484.65	41,389.26	42,302.85	43,225.25	44,156.28	45,095.77
76	15 YR..	38,685.78	39,794.36	40,917.49	42,054.83	43,206.05	44,370.79	45,548.72	46,739.47	47,942.69	49,158.03	50,385.14	51,623.65	52,873.23

One of the many possible variations of the Spreadsheet, used to its full capacity, showing the approximate portion of the worksheet that can be viewed at any given time.

Timberline Software

WHATIF ?

Throughout this manual, we're going to pretend that there are two very special keys on your computer keyboard that aren't actually there. They are both rather strange looking. Yet they are two of the most important terms in today's world of financial survival.

We are not living in an orderly and predictable world, in either our private lives or in business, where prudent decisions and desired results are the natural outcome of good hard work and self-discipline. We are surrounded by a rapidly fluctuating economy, prohibitive costs, a financial future that is almost impossible to plan, and so many other factors that change without warning and drastically alter our financial perceptions and operating realities.

WHATHEN ?

We need to ask WHAT IF ? We need to apply that very special reasoning process to as many possibilities as we can imagine — and then we need to ask WHATHEN ? — in order that we can have some idea of the way in which each of those possibilities might affect our livelihood should any one or more of them take place.

The Spreadsheet is one of the most powerful tools ever developed to perform that kind of analysis. It is a superb way of analyzing and forecasting your personal or professional financial world.

It is equally useful in purchasing, production scheduling, inventory control, sales forecasting, real estate management and stock market analysis. And its frequent use will suggest more ways of using it.

The Spreadsheet is a totally new method of organizing and testing quantitative information, both existing and imagined, in a manner that will provide you with a better informed perspective when the moment comes for making real life decisions.

TABLE OF CONTENTS

Before you begin: some first thoughts

As you follow along, REMEMBER! The Spreadsheet will take just about any form that you want it to. While it does start you out with a pre-set form of display when you first enter a new worksheet, from that point on the design, format, size and capabilities of that worksheet are always directed by you, rather than by the program.

Since each worksheet begins, in effect, as a huge blank liquid ledger, its columns and rows are able to be given almost any shape and to flow in any direction. The program allows you to generate hundreds of entries and compile them into an organized grid of nearly any form that you choose. You can make half a dozen entries along with their appropriate headings, for instance, then calculate their relationships to each other in more than a hundred different ways within that single worksheet; or you can make a highly detailed model, using seventy or eighty separate factors, then calculate the ways in which each of them relates to the others, in a dozen different situations at the same time; or you can even create two separate worksheets, then merge them.

Power, Speed, Capacity for Change

As you will learn in the pages that follow, the most awesome characteristic of the Spreadsheet is its ability to answer [WHATIF]. When you create a worksheet whose initial entries, taken together, form a composite of one situation, and then alter one or more elements of the composite, the Spreadsheet will re-examine all of the elements, recalculate everything affected by that change, and return end results that reflect all the current data that has been influenced in any way.

Whenever a worksheet's entries or calculations appear to yield a significant result, you can store and/or print any part of the worksheet at that point, and then continue introducing new data or changes.

You can direct the Spreadsheet to display its entries and results of calculations in numerical form, or as a display of the formulas you have used in creating the worksheet, or as a graphic display. And you can instruct the Spreadsheet to display different parts of a worksheet in any one of those forms, thus combining all three forms of display within the same worksheet, if you wish.

It's worth saying again: You can do almost anything you want to do, by using the power and the flexibility inherent in the Spreadsheet.

━━━━━━━━━Timberline Software ━━━━━━━

Put Your Calculator Back In The Drawer!

There is a stand-alone full function mathematical calculator included in the Spreadsheet. You don't ever have to keep a scratch pad or calculator handy to pre-figure a desired entry from other data.

The Spreadsheet will do that for you, separately, and then let you decide whether or not you wish to enter the result. You can use every function and capability of the entire program within your calculations, even compound them or perform them in cumulative sequence, without affecting the worksheet in any way. It is rather as if you have two very powerful computers in front of you, one nested inside the other.

And Still There Is More...and More!

When you have made all of your entries and inserted all of the appropriate formulas, instructed the Spreadsheet to complete all of its calculations, designed a worksheet format that you like, and done just about everything else with it that you can think of — including the display and printout of the results in graphic form, to provide a visual comparison of its data — you can then sort all of that information in either alphabetical or numerical order, according to any pattern that you choose.

Don't worry! We won't confuse you. We're going to take you through it one step at a time, and you'll find that you will learn very quickly. We just want you to have the feeling, right from the start, that the Spreadsheet can do almost anything. And it can!

The examples that follow are shorter and generally a bit more simplified than most of those that you will set up on your own; that is part of the process necessary to make you comfortable with the Spreadsheet as quickly as possible.

In normal usage, a typical worksheet would be greatly expanded, and would contain far greater detail, and be able to treat many more variables, than those you will be working with at first. Before long, however, you'll be able to create your own unique worksheet formats as easily as the sample worksheets we'll guide you through here.

Now we're going to take you right into the program. Just make yourself comfortable and follow along. You're going to like it!

Instructions for Starting the Spreadsheet Calculator

To start up the Spreadsheet Calculator, please load the p-System, which will display the following message:

Command: E(dit, R(un, F(ile, C(omp, L(ink, X(ecute, A(ssem, D(ebug,?

Press: **X**

Execute what file?

Key in: T S : S S and press [RETURN]

This manual documents the use of the Timberline Spreadsheet Calculator, which is written utilizing the UCSD p-System operating system. Operations such as diskette storage backup, diskette copying, setting the date and time, etc., are performed by the p-System. The company which supplied your p-System provides instructions for using the system.

Creating A Worksheet

Beginning at the Beginning...

```
Spreadsheet Calculator
─────────────────────────────────────────
MAIN MENU

        Select the Option you want to use
Enter the appropriate abbreviation and press RETURN

        E W -   Enter Worksheet Information
        C W -   Clear Worksheet
        S W -   Save Worksheet in File
        L W -   Load Worksheet from File
        P W -   Print Worksheet

        END -   Done with Spreadsheet Calculator
```

As soon as you have loaded the Spreadsheet program into your computer, the MAIN MENU will come up on your screen, as you see in the illustration above. It directs you to:

───
Select the option you want to use:
Enter the appropriate abbreviation and press RETURN
───

Throughout your use of the Spreadsheet, each series of keystrokes must be followed by pressing the [RETURN] key on your keyboard in order to be entered into the worksheet or acted upon by the program.

Don't worry! If you make a mistake, and then enter it by pressing [RETURN], you can delete or correct the entry easily. You'll learn how in just a few moments. Now, follow the keying instructions, which will always be in the form you see below. You're on your way!

───
To enter the worksheet   Key: E W
To activate your keystrokes   Key: [RETURN]
───

Timberline Software

```
┌──────────────────────────────────────────────────────────────┐
│ [1] Row  1  Column  1  Label: [2]          [4] Avail: 948      │
│ [3] Edit Line: All data appears here before entry into worksheet│
│ ═══════════1═══2═══3═══4═══5═══6═══7═══                        │
│        1 ■                                                      │
│        2                                                        │
│        3                                                        │
│        4                                                        │
│        5                                                        │
│        6                                                        │
│        7                                                        │
│        8                                                        │
│        9                                                        │
│       10                                                        │
│       11                                                        │
│       12                                                        │
│       13                                                        │
│       14                                                        │
│       15                                                        │
│       16                                                        │
│       17                                                        │
│ [5] F1 Move Cursor   F3 Done       F5 Change Format  F7 Move Fields │
│     F2 Edit Field    F4 Recalculate F6 Insert/Delete F8 Copy Fields │
│    [6] 0.000                                                    │
└──────────────────────────────────────────────────────────────┘
```
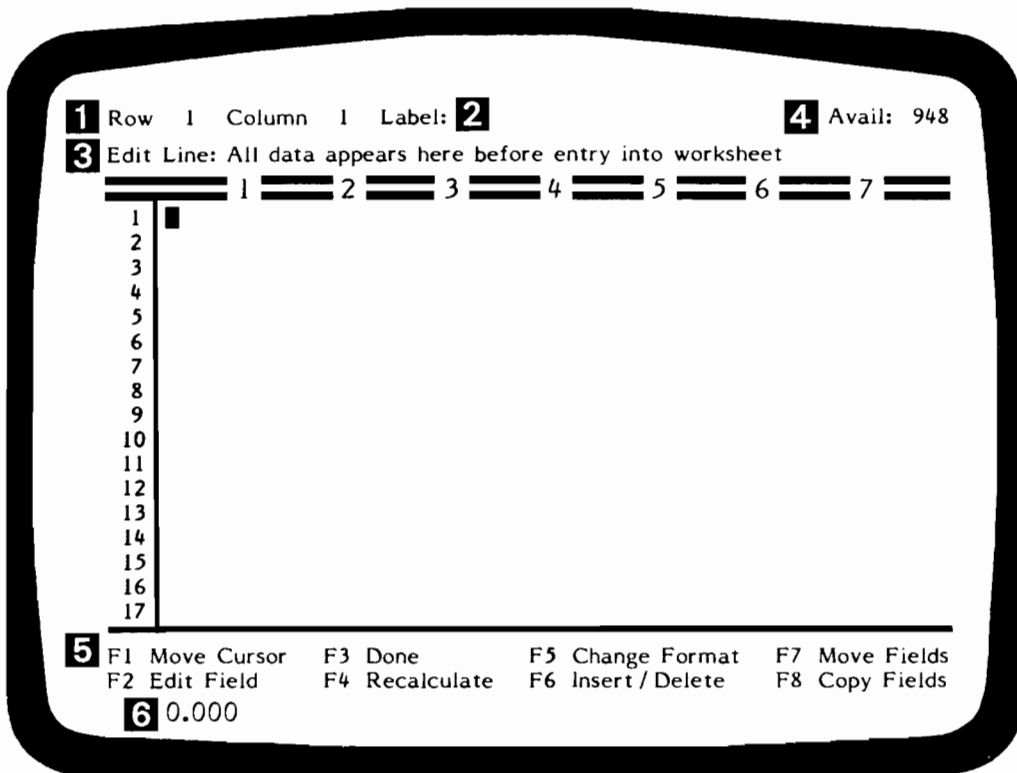
[1] ROW #, COLUMN # : Will always display the present location of the cursor, and is referred to as the Active or Current Field.

[2] LABEL or VALUE: Tells you whether an entry will be handled by the program as a Label (word) or as a Value (number or formula).

[3] EDIT LINE: Displays data keyed in, before entry into worksheet, or a prior entry being edited; display capacity is 80 characters.

[4] AVAILABLE MEMORY: Gives approximate number of additional entries that can be made within the limits of current worksheet.

[5] FUNCTION KEYS: Displays the available options that you may utilize in creating or modifying your worksheet; display changes according to the options available at any point in the program.

[6] CALCULATOR ANSWERS: Displays calculated result, if desired, of data keyed into Edit Line before entry into the worksheet.

```
┌─────────────────────────────────────────────────────────────┐
│ Row  1 Column  1                                 Avail: 989   │
│ ═══════ 1 ═══════ 2 ═══════ 3 ═══════ 4 ═══════ 5 ═══════ 6 ═══════ 7 ═══════ │
│  1                                                            │
│  2                                                            │
│  3                                                            │
│  4                                                            │
│  5                                                            │
│  6                                                            │
│  7                                                            │
│  8                                                            │
│  9                                                            │
│ 10                                                            │
│ 11                                                            │
│ 12                                                            │
│ 13                                                            │
│ 14                                                            │
│ 15                                                            │
│ 16                                                            │
│ 17                                                            │
│                                                               │
│ F1 Move cursor    F3 Done        F5 Change format  F7 Move fields │
│ F2 Edit field     F4 Recalculate F6 Insert/delete  F8 Copy fields │
└─────────────────────────────────────────────────────────────┘
```
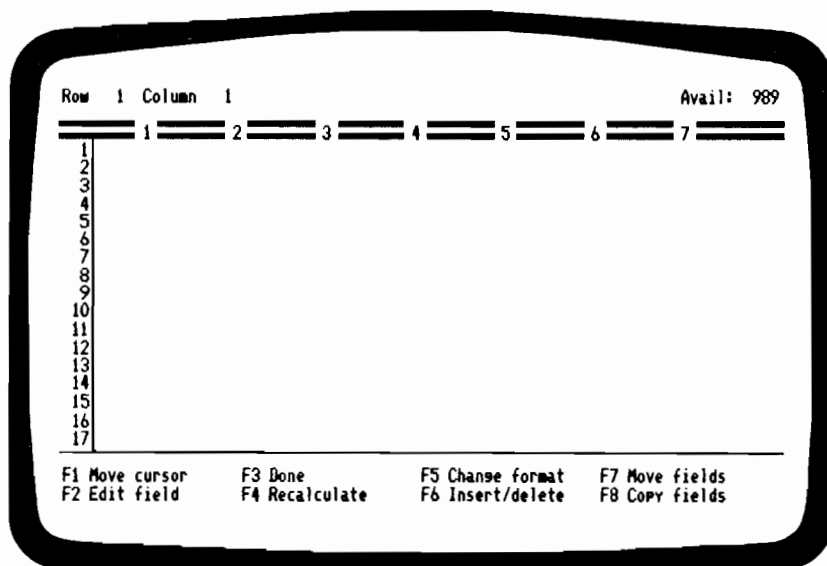
There you are, the first 17 Rows and 7 Columns of the Spreadsheet. Each new worksheet is displayed in this manner, with all its Columns preset 10 characters wide. There are 200 Rows and 100 Columns available within each worksheet.

The initial display, illustrated above and on the preceeding page, appears empty. Yet there is some vital information displayed there that will guide you in everything you do from this point on:

1 The top left-hand corner of the screen will always display the present location of the cursor by its COORDINATES of ROW and COLUMN. The location that is described is the FIELD in which you are operating at this instant, and is distinguished from all the other FIELDS of the worksheet by referring to it as the CURRENT FIELD. Any entry that you make right now will go into the CURRENT FIELD when you key in [RETURN].

2 The next piece of information displayed will tell you what kind of an entry you are making, or have made, into the CURRENT FIELD. Any entry that begins with the numbers 0 thru 9, or with a plus, minus, decimal-point or left-parenthesis [0-9, +, -, . , ( ] is considered to be a VALUE. An entry beginning with anything else is a LABEL.

It is extremely important that you know whether your entries are VALUES or LABELS. If you were to label a column of figures with the heading "1982" to designate a year, you would not want that year included as a VALUE when adding the rest of the numbers in that column. The same would be true of a parts serial number in a list created for inventory control; the number is actually the name of a particular part, and must be designated as a LABEL. (You can turn numbers into LABELS by typing a quotation mark as the beginning character in an entry — more about this later).

Similarly, you would not want a mathematical formula to be taken as a LABEL, even if it began with an alphabetical character. When adding a column of figures, you might use the formula for the SUM of a series of numbers. In this case, beginning your entry with "SUM" would designate the entry as a LABEL. Since it is a mathematical operation, you want it designated as a VALUE. You must, therefore, key in a VALUE designator as the first character, such as +SUM....

3 Now, go ahead and key in a word, any word you like: How about SHAZAM, just for fun? Key in the word, but don't press [RETURN].

Notice that, as soon as you begin to key in an entry, the cursor moves from the CURRENT FIELD up to the EDIT LINE, located just above the top of the worksheet, and displays your entry there.

Why did it do that? Because you might not want to enter what you just typed. The Spreadsheet is giving you a first look at your entry: at this point you can correct it, change it, erase it, or even compute it, before you enter it into the worksheet.

Now press your left arrow key twice [◄] [◄]. The cursor should now be located at the last A in SHAZAM. Now key in ZAM, which should make the EDIT LINE read SHAZZAM.

This time, press your left arrow key three times [◄] [◄] [◄]. Now press your [DELETE CHARACTER] key. Your screen should now display the original word, SHAZAM. Next, look at the bottom of your screen: you'll see displayed a single prompt saying, "F4 Void". Find the corresponding FUNCTION KEY for [F4] and press it. Your entry disappears, and the cursor returns to Row 1 Column 1.

The EDIT LINE has a maximum capacity of 80 characters. The Spreadsheet program will retain internally any entry of that length or less, even if the column width of the display is too narrow to allow the full entry to be displayed or printed.

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4 There is one other critical bit of information displayed on your empty worksheet: In the upper-right-hand corner your screen will say, "AVAIL: xxxx". The number displayed is the approximate remaining capacity within this worksheet, in FIELDS, or number of entries:

IMPORTANT! The "AVAIL: xxxx" is an estimate only!

Yes, that number will change and become smaller every time that you make an entry. Please be sure to keep your eye on that number as you develop and expand your worksheets.

Now why would you want to do that? For two very good reasons: First, as you approach the utilization of your worksheet's full capacity, and the display of "AVAIL: xxxx" has been reduced to about 100, the program will slow down as it nears the limit of that capacity.

Second, the number displayed as "AVAIL: xxxx" is nothing more than an approximation. It does NOT represent precisely that number of entries still available. Why not? Brief entries may not reduce the number displayed at all; long or complex entries, and particularly very complex Formulas, may reduce that number by more than one unit for a single entry. And when the available capacity reaches "0", or quite close to it:

THE SPREADSHEET WILL LOCK UP!

At that point, your worksheet will not abort, but you will then be unable to make additional entries within that worksheet, unless you erase other entries to provide more room. Don't let that happen to you!

5 The eight items displayed near the bottom of your screen denote the options available to you, through the use of the FUNCTION KEYS. Most of the operations involving these keys assist you in modifying or customizing your worksheets.

A complete description of each of the FUNCTION KEYS and the options available with their use will be found in the first part of the Technical Reference Section of this manual.

Remember, we want to enable you to use the Spreadsheet just as quickly as possible. Rather than discuss these options at length now, we're going to go right on ahead. You'll be using several of them in the next few moments; and as you become familiar with them, a good many of these options will become self-explanatory.

6 The EDIT LINE performs another vital function: It is your own personal STAND ALONE CALCULATOR. Suppose you wanted to enter into your worksheet a VALUE that was equal to, say, 13% of $23,000 divided by 17. You want to enter only the result of that calculation, not each one of those items.

Key into Edit Line	Key:	.13
Sign for multiplication		*
Dollar amount		23000
Sign for division (slant)		╱
Divided by		17

Look at the bottom of your screen: you'll find a prompt there saying, "F3 Calculate". It appears on your screen as soon as you key in any beginning character that designates the contents of the EDIT LINE as a VALUE. Now you are going to calculate the result of what you have just keyed in, without entering anything into the worksheet.

Calculate	Key:	[F3]

Look at the bottom left-hand corner of your screen. The result of that calculation is displayed there: "175.8823529412". The cursor has moved to the bottom right-hand corner of your screen, and is sort of waiting, while you evaluate the result. What do you do now?

Return Cursor to Edit Line	Key:	[RETURN]
Do you want to enter that result? You can make changes now just by keying in other data, or by deleting or writing-over anything on the Edit Line.		
To enter the result now	Key:	[RETURN]

Eight digits of the calculated result, plus the decimal-point, are now displayed in Row 1 Column 1. Except that, after all that work, we really don't want you to keep that entry. Please hit your [ERASE] key.

Good! You are back to a blank worksheet.

Onward!

Bear with us for a few moments. You need to experiment with several more of the basic features of the Spreadsheet; then you will be able to begin building whole worksheets.

Using your arrow keys [▼▲] which direct the movement of the cursor, move the cursor down two rows, to Row 3 Column 1.

Move Cursor to R3 C1	Key:	▼ ▼
Key in this word:	Key:	TRANSPORTATION
Enter into worksheet		[RETURN]

Two things have happened on your worksheet: part of the word you keyed in is now displayed; and, just to the right of the Row and Column display at the top of the worksheet, new information has now appeared, telling you that you've just entered a LABEL (as opposed to a Value), and displaying the full contents of your entry.

But it doesn't fit. Do you remember, a moment ago, when only eight digits of your calculated numerical entry (175.8823529412) were displayed in Column 1 ? This is the same problem: when you first enter a new worksheet, all the columns are preset at ten characters of width. Each column will at that point display NINE characters of a number, counting commas and decimal point (thus leaving a buffer space of one character so that numbers don't run into each other from column to column); or the columns will display TEN characters of a LABEL or FORMULA.

Since you can do almost anything you wish in creating your own worksheet, however, you can alter that. You simply need to change the basic format of the worksheet to widen Column 1.

From this point on, you're going to have a bit more fun with the Spreadsheet. Right now, you are going to begin designing a custom worksheet by using the function key [F5 Change Format]. This one key offers the broadest series of options of any single element in the Spreadsheet program, and you'll be using it often. To widen Column 1:

Change Format	Key:	[F5]
Select "Column" from Edit Line		C
Activate Selection		[RETURN]

When you keyed [F5], you were met by a long list of terms displayed across the Edit Line:

"Field, row, column, global, window, titles, or sort?"

From this list, you were then directed to select "Column" and key in the first letter of that selection, C . Don't pay any attention to the rest of those choices right now.

When you then pressed the [RETURN] key, the Edit Line cleared for just an instant, and is now displaying "Column Width", with the cursor displayed just following. You may change the width of any one or more columns, or for all the columns of your worksheet together, at any time you wish; or you may make each column a different width, varying from 2 to 76 characters wide.

In this case, our cursor was in Column 1 when we keyed in [F5]; and since we selected "Column", only Column 1 will be affected by a change in width at this time.

Select "Column Width" of 14	Key: 14
Exit the entire list of options at this point by pressing Function key [F3 Done]	Key: [F3]

As soon as you keyed [F3 Done], Column 1 widened to display the full width of the LABEL TRANSPORTATION. The rest of the worksheet is left unchanged. Had you wanted the entire worksheet to have all of its columns set at a width of 14 characters, you simply would have selected "Global" (meaning the entire worksheet) from that list of terms on the Edit Line, instead of "Column".

Had you selected "Global", all columns on the worksheet would have assumed a width of 14 characters, EXCEPT those columns which you had individually set to some other width at an earlier time, or would choose to individually set to another width later on.

Why wouldn't all the columns of your worksheet assume a width of 14 characters at any time you select "Global"? The question brings up a most important rule of the Spreadsheet program:

All format changes have an order of priority, that affects all of your entries. In order of the highest to the lowest priority, they are:

FIELD, ROW, COLUMN, GLOBAL

FIELD has the highest priority; GLOBAL, the lowest. In other words, if you change the format of the entire worksheet by using the "Global" option, you can still change any individual Field, Row, or Column by itself. But if you change the format of a single Column, by using the "Column" option, further "Global" changes with regard to that option will not affect that Column. You will have to go to that Column and change it individually if you wish to alter it further.

Do your best to remember that order of priority; it will be very useful to you as you gain experience with the Spreadsheet.

Now you are going to begin working with other format changes, dollar amounts and notation options, formulas, and some results of extending those formulas into other Fields. Let's begin:

Move Cursor to Row 3 Column 2	Key:	➡
Key in Value (dollar amount)		1000
Enter in Worksheet		[RETURN]

You have entered 1000 as a whole number. If that number, and others like it, are to represent dollars, you will probably want to have those numbers displayed with commas and dollars-and-cents-decimal-point, just for clarity. You don't have to key them in each time you enter an amount; you simply need another change in the worksheet's format, one that will give that same kind of display to all the dollar amounts you may wish to enter at any place in the worksheet. Now, you need a "Global" change:

Change Format	Key:	[F5]
Select "Global"		G
Activate Selection		[RETURN]

You're going to bypass all those options in the [F5 Change Format] series that you are not concerned with at this moment. You do this by pressing [RETURN] to continue past any option in the series that you wish to leave unchanged.

Follow the keying instructions on the next page very closely, as you move through many of the [F5 Change Format] options:

Bypass "Column Width"	Key:	[RETURN]
Bypass "Numeric Display"		[RETURN]
"Number of Decimal Places"	Key:	2
Activate Selection		[RETURN]
Bypass "Label Justification"	Key:	[RETURN]
Bypass "Value Justification"		[RETURN]
"Insert Commas In Values?" Yes	Key:	Y
Exit list of options		[F3]

You have formatted your worksheet so that all numerical entries will appear as dollar amounts with commas and decimal point in the appropriate places. It is not necessary that you display dollar figures in this manner; but doing so will usually add clarity to any financial worksheet.

What if you wanted to make other numerical entries within this same worksheet that did not represent dollars-and-cents? Remember, with the program's order of priority, you can go back through any of the options offered by the [F5 Change Format] key and amend the worksheet to display whole numbers for any FIELD, ROW or COLUMN without affecting any other part of the worksheet.

You've started with 1,000.00 in Row 3 Column 2. Why don't you make the stakes in this game a bit higher? No one can do much with a thousand dollars anymore; and it's time for you to learn two ways of overwriting a LABEL or VALUE already entered in a FIELD:

Key in this new Value	Key:	23000
To replace prior entry, press		[RETURN]

You see here that any entry in any FIELD can be replaced just by keying in new data and pressing [RETURN]. Later on, you will learn that there are a couple of ways that you can PROTECT one or more FIELDS, or TITLE-LOCK parts of your worksheet whenever you don't want certain entries to be able to be changed, or when you want to hold the display of titles and headings no matter where you roam on your worksheet.

With the exception of those options, you can alter any prior data entered in the worksheet by moving the cursor to the respective FIELD, and then entering a new LABEL or VALUE.

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Another way of overwriting the contents of a FIELD is to use the function key [F2 Edit Field]. This function allows you to work over the previous entry in a FIELD without having to key in the original information again. Why don't you try this out with the dollar amount entry you've made in Row 3 Column 1:

Edit Field	Key:	[F2]
Move through first 2 digits of 23000		➡ ➡
Change Value to 23175		1 7 5
Move Cursor back to head of Edit Line		[HOME]
Move through first 2 digits again		➡ ➡
Change Value back to 23000		0 0 0
Enter Value into worksheet		[RETURN]

It would not have been terribly inconvenient for you to just re-key 23175 and then 23000 in the example above. Had the original entry in that FIELD been a complicated statistical formula of forty-or-so characters, however, using [F2 Edit Field] to add, change or correct a character somewhere within the formula would have been much easier than re-keying the entire entry. There would also be less chance of introducing some new typographical error.

Whenever you can, always edit existing data by utilizing what has already been entered, rather than reproducing the entire entry.

There is one occasion on which you would not want to alter a prior entry by using [F2 Edit Field]: When you wish to change the type of entry you have made, from a VALUE to a LABEL, for instance, you must key in an entirely new entry, containing the appropriate beginning character, in order for the Spreadsheet to know that you are changing entry type.

You have two entries on your worksheet. Now you're going to begin utilizing the real power of the Spreadsheet by working with the formulas and extensions of data that make your worksheets into such a marvelous tool for analysis and planning.

Save Often! SEE PAGE 44

The first Formula

You're going to introduce the first FORMULA into your worksheet. At this point, the only information on the worksheet tells us that the category of TRANSPORTATION is either worth, or has cost, 23,000.00.

In the next Column over, at Row 3 Column 3, you want a dollar amount to be displayed that is equal to 110% of the amount entered in Row 3 Column 2, no matter what amount is entered in that FIELD.

Right now, 23,000.00 is the amount entered in Row 3 Column 2. You do not want merely to calculate 110% of 23,000.00 and enter that fixed amount in the next Column forever. You want the worksheet to do the calculation for you; and more important, you want to be able to change the amount entered in Row 3 Column 2 at any time and have your worksheet automatically recalculate and enter the corresponding 110% of that amount in Row 3 Column 3.

How do you accomplish such a feat? You use a formula:

Move Cursor to Row 3 Column 3	Key: ➡
Key in the Formula for 110% of any amount entered in Row 3 Col 2	1.1 * C2
Enter the Formula by pressing	[RETURN]

Remember the Asterisk! * means "multiplied by"

You've just entered your first operating Formula, and life with your Spreadsheet will never be quite the same. You have instructed your worksheet to enter into Row 3 Column 3 an amount that will always be 1.1 times whatever amount is entered into the same row of Column 2.

The worksheet has done exactly as you have instructed: Notice that at the top of the worksheet, the Coordinates of the Current Field are displayed, Row 3 Column 3, and are followed by the notation that you have entered a VALUE (Formulas are Values) of 1.1 * C2, which is exactly the way you keyed it in.

In making that entry into the Current Field, however, you see that the worksheet has calculated the result of the Formula and entered the result into R3 C3, which is now displayed as 25,300.00.

The Spreadsheet will always internally calculate Formulas and then enter the result, unless you instruct it to display the Formulas instead.

When you keyed in that first Formula, why did you use only the Column Coordinate in the Formula to designate Row 3 Column 2 ? The Formula 1.1 * C2 looks as if it would translate to 1.1 times everything in Column 2. Is that what it means? No, it does not.

Now this is important ! You could just as correctly have keyed in a Formula giving both Coordinates of Row 3 Column 2 as you see done in the example below:

Alternate Formula, keying in both Coordinates of Row and Column Key:	1.1 * R3C2
Enter the Formula	[RETURN]

The Coordinates of the Field containing the Value that you want multiplied are in fact R3 C2, clearly designating Row 3 Column 2, and that is the correct way to enter them in the worksheet.

There is one exception: A Field may be referred to by one of its Coordinates, so long as its other Coordinate can be assumed to be the same as that of the Field in which the cursor is located.

Where is the cursor right now? In Row 3 Column 3, R3 C3. And where is the Field whose contents you want multiplied by a factor of 1.1 ? In Row 3 Column 2, R3 C2.

Since the Spreadsheet will always assume that any Field described by only one Coordinate is in the Same Row or the Same Column as the Current Field containing the cursor, you need key in only that single Coordinate of the Row or Column that is different from that of the Current Field containing the cursor.

In the example you are working with now, therefore, R3 C2 can be designated in this case simply as C2 since it shares the same Row as the Current Field into which you are entering the Formula.

It may seem unimportant to you now that such a fuss is being made over a couple of keystrokes and one Coordinate. In a moment, however, when we introduce the second Formula and show you how to use Relative Coordinates , you will see the importance of your understanding this concept.

Copying Fields

Stay where you are! Don't move the cursor, which should be in the Field displaying 25,300.00, Row 3 Column 3. You are going to assume that for some perfectly good reason, you want your first Formula to also apply to Row 3 of Columns 4, 5, 6 and 7. Yes, you could key in the same Formula in each of those Fields by moving the cursor one Field at a time and entering the Formula as you go along.

There is a faster and better way, in which you instruct the work-sheet to copy that Formula into whatever areas of the worksheet you choose, through the use of the function key [F8 Copy Fields].

Until you become familiar with this function, it may seem a bit difficult to understand; therefore, you must be careful to follow the keying order precisely:

Key Exactly As Instructed

Copy Fields:		Key:	[F8]
Copy FROM:	Row		[RETURN]
	Column		[RETURN]
thru:	Row		[RETURN]
	Column		[RETURN]
Copy TO:	Row		[RETURN]
	Column		4
			[RETURN]
thru:	Row		[RETURN]
	Column		7
			[RETURN]

Are you sure you keyed those steps correctly? After keying in [F8], you should have pressed [RETURN] 5 times, then keyed in the number 4, pressed [RETURN] twice, keyed in the number 7, and finally pressed [RETURN] once.

This sequence has to be done correctly in order for you to follow the operations described on the next several pages. If you have keyed the sequence accurately, your screen will display all seven Columns of Row 3 exactly as the illustration shows on the next page.

If for any reason your screen display and the illustration on page 30 do not perfectly agree, Go Back! Repeat all of the keying directions until they do match.

```
═══  ══1══  ══2══  ══3══  ══4══  ══5══  ══6══  ══7══
 1
 2
 3 TRANSPORTATION 23,000.00 25,300.00 25,300.00 25,300.00 25,300.00 25,300.00
 4
 5
 6
 7
 8
 9
10
11
12
13
14
15
16
17
```

Your own screen display now matches that of the illustration above. What have you just done? You have copied one Field of the worksheet to several other Fields. Since the several Fields are all adjacent to one-another, they are called a Range of Fields. You have thus Copied from a Field to a Range.

You have not copied just the displayed Value of that Field. You have copied the Formula entered in that Field; and as you will see, that is an important distinction in learning how the Spreadsheet works.

Let's go through each part of the keying instructions on and look closely at the process of Copying Fields:

As soon as you key in [F8 Copy Fields], the Edit Line display asks you the Coordinates of the Field or the Range of Fields that you wish to Copy From: The Coordinates already displayed are those of the Current Field containing the cursor.

If, as in our example, the Current Field is the only Field that you wish to be copied, you simply move through the four selections on the Edit Line by keying [RETURN] four times.

The fourth time you key in [RETURN], another series of Row and Column selections appears:

The Edit Line display now asks you the Coordinates of the Field or the Range of Fields that you wish to Copy To: The Coordinates already displayed are, as in the last instance, the Coordinates of the Current Field, which should still be Row 3 Column 3.

Now you don't want to copy from where you're at to where you're at — that wouldn't make much sense. You do, however, want to do all of your copying within the same Row. The only change you must make to these selections, therefore, is to instruct the worksheet to Copy From: the Current Field and Copy To: Columns 4 thru 7, all in Row 3.

More information on Copying Fields, together with examples of each type of copying, is given in the Technical Reference Section. You should become thoroughly familiar with each of the three types of Copying Fields, as they are among the most valuable capabilities of your Spreadsheet program.

What have you done so far? You've entered one arbitrary Value into the worksheet, 23,000.00, instructed the worksheet to take the calculated result of a Formula and enter it into an adjacent Field, and finally to copy that Formula and display the result into four additional Fields.

What has doing that accomplished? Now you can begin to use the ability of the Spreadsheet to calculate and extend any initial Value you choose to enter as the first dollar-amount of cost or worth under the category of TRANSPORTATION:

Move Cursor back to Row 3 Col 2 Key:	⬅
Key in a different dollar-amount	2 6 4 0 0
Enter the new Value	[RETURN]

As soon as you pressed [RETURN] this time, notice that not only was the new Value, 26,400.00, entered; what is more, you watched your Spreadsheet automatically recalculate the results displayed in each of the other Fields according to the Formula you had entered in those Fields.

This is a very simple demonstration of the Spreadsheet's ability to act upon changes in data. As you build this sample worksheet, you are going to discover that the number of ways in which you will be able to analyze data with your Spreadsheet are almost unlimited.

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The second Formula

You are going to use a <u>different kind</u> of Formula now, which at first glance will appear to you to be almost like the first Formula. You will find, however, that there is a very substantial difference in the way the two Formulas operate upon your worksheet.

This Formula is going to utilize a new way to designate Fields, by using what are called <u>Relative Coordinates</u>. And rather than just copying a Formula yielding the <u>same</u> result across several Fields, you are going to instruct the worksheet to compute and display a correct Value for each succeeding Field by calculating according to the <u>result entered in each previous Field</u>!

You're going to create a new Row of entries now, in such a way that you will be able to directly compare the way in which this second Formula operates on the same basic data used with the first Formula:

Move Cursor to Row 1 Col 1	Key:	[HOME]
Move Cursor down to Row 5 Col 1		▼▼▼
Key in and Enter the Label		HOUSING [RETURN]
Move Cursor to Row 5 Col 2		➡
Key in same Value as Row 3 Col 2 Enter the Value		26400 [RETURN]
Move Cursor to Row 5 Col 3		➡
Key in the Formula for 110% of any Value entered into the <u>previous Column</u> of the <u>same Row</u>.		
The Entry is: <u>1.1 times C minus one</u>		1.1 * C-1
Enter the Formula		[RETURN]

Since the <u>result</u> displayed in Row 5 Column 3 is the same Value displayed in Row 3 Column 3 above, it might appear that you are doing the same operation in two different ways. <u>You are not.</u> What you have done in Row 5 Column 3 is to introduce a Formula stated in Relative Coordinates. In a moment, you will observe a vastly different result than that obtained by the use of the first Formula.

How? You have instructed the worksheet to calculate a Value (and display it in R5 C3) that is 1.1 times something called <u>C minus one</u>.

What exactly is $\underline{C \text{ minus one}}$? It is a $\underline{\text{Relative Coordinate}}$, and when keyed in to describe a Field as $\underline{C-1}$, it designates a specific Field $\underline{\text{in the same Row of one Column less than the Current Column.}}$

This is important! Let's go through it again:

Your $\underline{\text{Current Field}}$ is Row 5 Column 3. That is the Field which presently contains the cursor. Therefore, the Current $\underline{\text{Column}}$ must be Column 3. The single Coordinate $\underline{C-1}$ is a $\underline{\text{Relative Coordinate}}$ that designates $\underline{\text{one Column less than Column 3.}}$ Since there is no Row Coordinate given, $\underline{\text{Row 5}}$, $\underline{\text{the Current Row}}$, is assumed.

Now, given that information, the appropriate $\underline{\text{Field}}$ designated by the single Relative Coordinate $\underline{C-1}$ must be Row 5 Column 2.

Remember: the Spreadsheet will always assume that any Field designated by only $\underline{\text{one}}$ Coordinate, whether an Absolute Coordinate as in $\underline{C2}$, or a Relative Coordinate as in $\underline{C-1}$, is in the same Row or the same Column as the Current Field.

Why have you gone through all of this when you still have the same result displayed that you obtained in Row 3 above? Because from here on the results will change — just watch.

You are going to Copy Fields now, exactly as you did in Row 3. Keep in mind, though, that you are copying a Formula employing a $\underline{\text{Relative Coordinate}}$, $\underline{C-1}$, which will designate a different Column with respect to any Column to which it is copied!

Key Exactly As Instructed

Copy Fields:		Key:	[F8]
Copy FROM:	Row		[RETURN]
	Column		[RETURN]
thru:	Row		[RETURN]
	Column		[RETURN]
Copy TO:	Row		[RETURN]
	Column		4
			[RETURN]
thru:	Row		[RETURN]
	Column		7
			[RETURN]

```
 ═══ 1 ══════ 2 ════ 3 ════ 4 ══ 5 ══ 6 ══ 7 ══
 1│
 2│
 3│TRANSPORTATION 26,400.00 29,040.00 29,040.00 29,040.00 29,040.00 29,040.00
 4│
 5│HOUSING       26,400.00 29,040.00 31,944.00 35,138.40 38,652.24 42,517.46
 6│
 7│
 8│
 9│
10│
11│
12│
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15│
16│
17│
```

Compare each of the entries in Row 5 with the corresponding entry in Row 3. You'll see that the Values displayed in Row 5, in Columns 4, 5, 6 and 7 are different from those in the same Columns of Row 3.

Remember that for the entries in Row 3, you copied a Formula yielding a percentage of one Absolute Field, R3 C2, across several Columns. The Formula was based on the Value displayed in R3 C2 regardless of the location of the Current Field.

In Row 5, however, you copied a Formula which, for each Field of entry, calculated 110% of the Value displayed in the previous Column of the same Row. It is somewhat like taking half-of-a-half-of-a-half of an apple; each successive Field in Row 5 backed up one Column, took 110% of that Value, entered it in the Current Field, went forward to the next Field, backed up, and went through that process again.

It will be worth your going back over these pages several times until you become comfortable with both ways of describing a Field. Using Relative Coordinates offers you one of the most powerful options of the Spreadsheet: if, for instance, you want to examine the results of a number of periods of inflation on a given dollar amount, the use of Relative Coordinates would make that analysis an easy task indeed.

You now have two rows of figures displayed beside the words TRANSPORTATION and HOUSING. Assume that, for the worksheet you are creating, the figures represent operating expenses in certain time periods.

You are going to instruct your worksheet to keep totals of each of the Columns, and a grand total of those Column totals. Let's say that each Column represents operating expense for one month, and the grand total represents expense for the year to date:

Move Cursor to Row 5 Col 1	Key: ← ←
Move Cursor to Row 9 Col 1	↓↓↓↓
Key in Label using upper and lower case letters; also, add one period at the end of Label	Monthly Totals.
Enter into worksheet	[RETURN]
Move Cursor to Row 9 Col 2	→
Key in Formula for the Sum (total) of all Values displayed in Rows 3 thru 7 that are in the same Column	+ SUM (R3 . . R7)
Enter the Formula	[RETURN]

The cursor should still be in Row 9 Column 2, and that Field should display the Value 52,800.00 opposite the Label Monthly Totals. (Don't forget to put in the period).

Go back to page 33 : Use [F8 Copy Fields] exactly as you did there, except that this time you will be Copying To: Columns 3 thru 7. From this point on, the keying instructions for Copying Fields will be given in the form of a reference to the keying block on page 33:

[F8] Copy Fields in Progress: Refer to Page 33

You have used a Formula for the Addition of a Range of Fields. The symbol + at the beginning of the Formula tells the Spreadsheet that what follows is a Value. Keying in SUM instructs the worksheet to add whatever List or Range of Values follows in parentheses.

A Range is always designated by keying in the Coordinate(s) of the first Field in the Range, followed by two periods, followed by the Coordinate(s) of the last Field in the Range.

In this case, it was necessary for you to use only the Coordinates for the Row of the first and last Fields in the Range, since all of the Fields in the Range are in the same Column as the Current Field.

Since the worksheet you are creating involves a small number of Fields, you could have keyed in the Formula using the Coordinates of the individual Fields, or a List of Fields , as well as a Range of Fields. You will find illustrated below each of the possible ways of expressing the same Formula. All are correct in this particular case.

Individual Coordinates for each Field:	+R3 +R4 +R5 +R6 +R7
List of Fields:	+ SUM (R3, R4, R5, R6, R7)
Range of Fields:	+ SUM (R3 .. R7)

Had you described the Fields to be added together by both Row and Column, then you would not have been able to copy the Formula across your worksheet to other Columns. You see here that your ability to use a Single Coordinate enabled you to key in one Formula and extend it to as many other Fields of the worksheet as appropriate.

If you are adding together the Values from a great many Fields, you can see that it is much easier to key in a Range of Fields, if you are including all of the Fields within a section of your worksheet; or to key in a List of Fields if you are selecting a number of Fields that are not joined together.

You should also know that a List of Fields can include one or more Ranges of Fields. For instance, suppose that you had created a large worksheet and wanted to add all of the first thirty Rows of Column 2 except Rows 2, 15 and 24. You do not have an unbroken Range of Fields; you must, therefore, use a List of Fields, although you will be able to shorten your List by grouping Fields wherever possible. The Formula in this case will be:

+ SUM (R1, R3 .. R14, R16 .. R23, R25 .. R30)

Getting used to the mechanics of such things as Ranges, Lists and Copying Fields is not nearly as difficult as it might first appear.

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It may take some time for you to become completely comfortable with all of these concepts. Yet as you use the Spreadsheet, you will find that comfort will come to you far more easily than you might imagine. Follow these pages all the way through; then let your own imagination take over and just play around with it for a while, using whatever ideas come to mind to create worksheets at random, which you can then change and refine. That is the very best way to learn.

For now, stick with the example: you're going to add two more items to this first worksheet. Then you are going to see how quickly what you have done can be turned into a first-rate presentation.

You must now instruct the worksheet to calculate a year-to-date total based on the monthly totals of Columns 2 through 7:

Move Cursor to Row 9 Col 1	Key: ←
Move Cursor to Row 12 Col 1	↓ ↓ ↓
Key in Label, <u>with period at end</u>	YEAR TO DATE.
Enter into worksheet	[RETURN]
Move Cursor to Row 12 Col 2	→
Key in the Formula	+ SUM (R9 C2 .. R9 C7)
Enter the Formula	[RETURN]

Oops! The row of asterisks now displayed at Row 12 Column 2 was not what you had in mind, right? And as a YEAR-TO-DATE total, it gives you the impression that either you've keyed in an incorrect Formula, or the worksheet couldn't bear to add up all those expenses.

You've done everything just right. The Spreadsheet is holding out on you: It knows that the result of calculating the Formula that you keyed in is <u>375,292.10</u>. Do you want to check that? Good.

Key in [F2 Edit Field]	Key: [F2]
Key in [F3 Calculate]	[F3]
Examine Calculation Result at Bottom of Screen	
Return Cursor to Edit Line	[RETURN]
Re-Enter Formula	[RETURN]

Nevertheless, as the illustration on the next page shows, your screen is still displaying asterisks as an entry rather than a Value.

```
 ═══════1═════2═══3═══4═══5═══6═══7═══
 1│
 2│
 3│TRANSPORTATION 26,400.00 29,040.00 29,040.00 29,040.00 29,040.00 29,040.00
 4│
 5│HOUSING        26,400.00 29,040.00 31,944.00 35,138.40 38,652.24 42,517.46
 6│
 7│
 8│
 9│Monthly Totals 52,800.00 58,080.00 60,984.00 64,178.40 67,692.24 71,557.46
10│
11│
12│YEAR TO DATE.  *********
13│
14│
15│
16│
17│
```

If you add up all of the monthly totals on Row 9, you will find that the calculated amount is correct; therefore the Formula must also be correct. Then why won't your worksheet display the result?

Because you haven't given it enough room! The result is more than 9 characters wide; thus it will not fit into Column 2, which like all the Columns of your worksheet (except Column 1) is preset at a width of 10 characters. Remember the 1-character buffer, to prevent Values from running into each other. Labels will display full Column width, but Values will display 1-character-less-than Column width. Since Column 2 is not wide enough, the worksheet signifies that by displaying a row of asterisks.

The correction needed is simple. Increase the width of Column 2:

Change Format	Key:	[F5]
Select Column		C
Activate Selection		[RETURN]
Key in Column Width		12
Exit List of Selections		[F3]

The row of asterisks in R12 C2 has been replaced by the correct year to date total of 375,292.10. You will need to further widen Column 2 only at such time as your year to date total is equal to or greater than 1,000,000.00.

The Formula you entered in R12 C2 for the year to date totals (page 37) required the keying in of both Coordinates, Row and Column, of the Fields described in the Formula. Since all but one of those Fields were located in both a different Row and a different Column than the Current Field in which the Formula was being entered, you could not use a single Coordinate to designate any one of those Fields.

You need to add one additional Row of data: Assume that you have found through experience that the category Utilities has a steady proportional relationship to HOUSING , and requires 1/12 of whatever expenditure is made on HOUSING in any one period:

Move Cursor to Row 1 Col 1	Key: [HOME]
Move Cursor to Row 6 Col 1	↓ 5 times
Key in Label, with period at end	Utilities.
Enter into worksheet	[RETURN]
Move Cursor to Row 6 Col 2	➡
Key in Formula for $\frac{1}{12}$ of the current period housing expense	+ R-1 / 12
Enter the Formula	[RETURN]

Back on page 32, you first used Relative Coordinates that described a prior Column, C-1, across each Field of a given Row. In the Formula above, you are again using Relative Coordinates that describe a prior Row, R-1, and assume the same Column. You'll see on your screen that the worksheet has calculated the Formula, and entered the result, 2,200.00, in Row 6 Column 2.

Furthermore, both the monthly total for Column 2 and the year to date total have been recalculated to reflect the addition of that new entry. That is why you were instructed on page 35 to include Rows 3 thru 7 in the Formula for monthly total, even though at that time Rows 4, 6 and 7 were blank. By including the blank Rows in the Formula, you were allowing for future entries, without the necessity of revising the Formula for monthly totals.

You have one additional series of keystrokes to make now. That's right: you are going to Copy Fields across Row 6 to extend Utilities.

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The cursor should be in Row 6 Column 2. Now, just as you did with the Formula for monthly totals on page 35, you are going to extend the Formula for Utilities expense across Row 6.

Copy From: the Current Field and Copy To: Columns 3 thru 7 of the same Row.

[F8] Copy Fields in Progress: Refer to Page 33

The respective amounts for Utilities expense are now displayed across Columns 2 thru 7 of Row 6. Is there anything wrong with your worksheet at this point?

Yes! Your worksheet automatically recalculated all of the totals when you made the first entry for Utilities in Column 2. When you then copied that Formula across the 5 adjacent Columns of Row 6, the worksheet displayed the results of the Formula, but did not go on to recalculate the rest of the Fields of the worksheet.

It is vital for you to remember this about Copying Fields. Very often when Copying Fields, the entries that you are copying are Labels, underlines, or Ranges of data that do not require recalculation of the entire worksheet. In order to make the Spreadsheet operate as rapidly as possible, therefore, the program does not automatically recalculate the worksheet after Copying Fields.

At this point, your year to date total and all but one of your monthly totals are incorrect. If you now just press [F4 Recalculate], the worksheet will then go through every Field in which you've made an entry and recalculate all of the data.

[F4] Recalculation in Progress

Now all of your totals have been recalculated and are correct. You've keyed in all of the basic data for your first worksheet, and the information itself is complete. Your worksheet should match the one illustrated on the next page.

There is one more important principle to remember with regard to the way the Spreadsheet does its calculating: Whenever you make an entry, the Spreadsheet will calculate only down and to the right of the Field in which the entry is made, unless you give it some help.

```
 ═══1═══  ═══2═══ ═══3═══ ═══4═══ ═══5═══ ═══6═══ ═══7═══
 1
 2
 3│TRANSPORTATION    26,400.00 29,040.00 29,040.00 29,040.00 29,040.00 29,040.00
 4
 5│HOUSING           26,400.00 29,040.00 31,944.00 35,138.40 38,652.24 42,517.46
 6│Utilities.         2,200.00  2,420.00  2,662.00  2,928.20  3,221.02  3,543.12
 7
 8
 9│Monthly Totals    55,000.00 60,500.00 63,646.00 67,106.60 70,913.26 75,100.59
10
11
12│YEAR TO DATE.     392,266.45
13
14
15
16
17
```

What if you were to change or erase the entry in Row 3 Column 2 ? The Spreadsheet's automatic recalculation feature would correct all the worksheet's Fields, as you are altering the upper-left-most Field of data.

What if you were then to change or erase the entry displayed in Row 3 Column 3 ? The Monthly Totals entry in Column 3 would be recalculated correctly, because it is directly below the Field that you are altering. The Year to Date total would not be recalculated by the worksheet, because it is below and to the left of the Field that you are altering. You would have to key [F4 Recalculate] in order to correct the Year to Date total.

Whenever you are in any doubt that the entries on a worksheet are recalculating, press [F4 Recalculate]. The entire worksheet will be recalculated; and while this operation may take a couple of minutes if your worksheet is very large, it will reassure you that all of those many entries are up to date and correct.

There's your first "complete" worksheet. Even though it occupies only one screen-area of the Spreadsheet, you've already learned a great deal about the program. What you have now may not be beautiful, but the information is all there, and in order. Now you're going to take it through the next lesson in Spreadsheet magic !

— Don't Go Away!

Formatting

Making the numbers make sense!

Save Often!

To "save" means to store the format and the data you've entered, even as you are creating it, so that power failures, hardware problems and, most of all, human error won't cause you to lose all the work you've done in building a large, highly detailed worksheet.

The strategy behind Save Often! is that the minute-or-so it takes to preserve your work, as you go along, is incredibly cheap insurance. When you've experienced the feeling of frustrated disbelief that comes from spending hours building a worksheet, only to see it inexplicably blown away, you'll better understand the wisdom of such a strategy.

Don't wait until you've completed a long and detailed worksheet. Save as you build, and save again as each major block of data is entered, "replacing" prior partial worksheets with gradually-more-complete ones. That way, you can lose no more than a few minutes' effort should some electronic gremlin decide to go berserk.

You'll find below the basic steps needed to save a worksheet and then re-enter it. There is a more thorough description of the entire Save Worksheet process in the Technical Reference Section.

SAVE WORKSHEET (Refer to Technical Reference Section)

Exit your worksheet temporarily	Key:	[F3]
Main Menu: Save Worksheet		S W
		[RETURN]
Data Volume Name (as an example)		DATA
		[RETURN]
Worksheet File Name (max. 10 char.)		BUDGET
		[RETURN]
Password (optional: you don't need one)		[RETURN]
Replace Existing File? (probably "Yes")		Y
		[RETURN]
Save Entire Worksheet? (probably "Yes")		Y
		[RETURN]
(After saving, will return to Main Menu)		
To re-enter your worksheet		E W
Activate your Selection		[RETURN]

```
 ══════1═════════2═══3═══════4══════5═══════6═══════7═══
 1
 2
 3│TRANSPORTATION     26,400.00 29,040.00 29,040.00 29,040.00 29,040.00 29,040.00
 4
 5│HOUSING            26,400.00 29,040.00 31,944.00 35,138.40 38,652.24 42,517.46
 6│Utilities.          2,200.00  2,420.00  2,662.00  2,928.20  3,221.02  3,543.12
 7
 8
 9│Monthly Totals     55,000.00 60,500.00 63,646.00 67,106.60 70,913.26 75,100.59
10
11
12│YEAR TO DATE.     392,266.45
13
14
15
16
17
```

Do you know what?   YOUR WORKSHEET IS UGLY!

The numbers are crowded against each other. The totals don't stand out from the rest of the data. And if you had entered a great many rows and columns of information, the whole worksheet would be nearly incomprehensible.

Entering data and making calculations are only half of what the Spreadsheet program is all about. Formatting your worksheets into distinctive, professional, well organized presentations is the other side of the power that the Spreadsheet makes available to you.

You can Format your worksheets before you begin making entries, or as you create data groups, or after all your data is entered and the calculations are completed. Generally, you will want to create some kind of format when you first begin a worksheet. Very often, however, you will find yourself changing the format substantially as you build and expand your worksheet.

Either way, creating a clear, attractive worksheet that has all of the appearance of a custom designed report will take you only a few moments ... remember, with the Spreadsheet, you can do almost anything you can visualize.

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Uncrowd It !

Since you are working with only a few columns of data in this first worksheet, it will be a simple matter for you to UNCROWD IT !

Uncrowding-it isn't a true high-tech computer term. Yet you'll see it used often through these pages. Worksheets and most other forms that come from computers are so often all crowded up and difficult to follow: it doesn't have to be that way. And once you get used to formatting really clear and impressive worksheets, you won't have it any other way.

Why don't you begin by spreading out the columns of your first worksheet, so that the data reads more easily:

Cursor at Row 6 Column 2		
Change Format	Key:	[F5]
Select Global		G
Activate Selection		[RETURN]
Column Width		1 3
Exit List of Selections		[F3]

You've uncluttered the columns by widening them; but now you have lost Columns 6 and 7 ... no you haven't. You have just moved them over to the right of your screen. You can bring them back into view by repeatedly pressing your [➡] key to scroll the columns of your worksheet. There is also a very fast way to take a look at them:

Move Cursor to Row 6 Col 3	Key:	➡
Press your [TAB] key		[TAB]
Move Cursor back to R6 C2 by pressing Left Arrow Key once and the [TAB] key again		⬅ [TAB]

Now you should be back to the prior screen display, with your cursor in Row 6 Column 2. The [TAB] key will always move your display one full screen at a time , in whatever direction the cursor was last moved. It is by far the fastest way to scan a large worksheet.

Notice that when you selected "Global" to widen the columns of the worksheet, Columns 1 and 2 were not affected, since they had previous been altered by a higher priority "Column" change in format.

You're not using all of your screen's display capacity on those first five columns. For even greater clarity (you'll see why in just a moment), why don't you further expand Column 1:

Move Cursor to Row 1 Col 1	Key: [HOME]
Change Format	[F5]
Select Column	C
Activate Selection	[RETURN]
Column Width	19
Exit List of Selections	[F3]

Now then, what do the dollar amounts entered in the columns of your worksheet represent? Assume they represent periods of one month, for the first six months of the year, and comprise some of the expense items of a budget. You need to insert some Labels as headings for your columns. To key in headings as quickly as possible, you are also going to utilize the automatic-cursor-advance feature:

Change Format	Key: [F5]
Select Global	G
Activate & Locate the Auto-Cursor-Advance	[RETURN] **8** times
Key in "Yes"	Y
Exit List of Selections	[F3]
Key in first Label	EXPENSE
Enter into worksheet	[RETURN]
Move Cursor to R1 C2	➡
Key in Label	JANUARY
Enter into worksheet	[RETURN]
Key in Label	FEBRUARY
Enter into worksheet	[RETURN]
Key in Label	MARCH
Enter into worksheet	[RETURN]
Key in Label	APRIL
Enter into worksheet	[RETURN]
Key in Label	MAY
Enter into worksheet	[RETURN]
Key in Label	JUNE
Enter into worksheet	[RETURN]
Move Cursor to R1 C1	[HOME]

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You have all the columns Labeled in Row 1. And notice that the Automatic Cursor Advance provision works very much like the [TAB] key. You must key in one movement of the cursor with the [→] key; from that point on, the cursor will advance one Field in that direction each time you make an entry. To change the direction the cursor advances, just use the appropriate arrow key.

Now you need to insert a second Row of Labels. For this series of entries, you do not want the cursor to advance automatically:

Change Format	Key: [F5]
Select Global	G
Activate & Locate the Auto-Cursor-Advance	[RETURN] **8** times
Key in "No"	N
Exit List of Selections	[F3]
Move Cursor to R2 C1	↓
Key in first Label Enter into worksheet	ITEM [RETURN]
Move Cursor to R2 C2	→
Key in the Year	1982
Enter into worksheet	[RETURN]

Oops! You want 1982 to be a Label, not a Value! Entering it in the form of a dollar amount, 1,982.00, could ruin the whole worksheet — especially if it accidentally got added into the monthly expense totals.

When is a number not a number?

When you want it to be a LABEL! You've been told that any data keyed into the Edit Line beginning with 0 thru 9 will be entered as a Value. Yet you don't want to key in something like Year 1982, just to turn it into a Label; that would look dumb.

Use quotation marks. If you begin an entry with quotation marks (either single or double), it will always be treated as a Label; and the quotation marks themselves will not be entered. Now, simply key in the year again: this time, though, begin with quotation marks.

Overwrite previous entry by keying in quotation marks, followed by the year	Key: " 1982
Enter into worksheet	[RETURN]

```
        ═══1══════2══════3══════4══════5═══
     1 EXPENSE         JANUARY    FEBRUARY    MARCH       APRIL
     2 ITEM          → 1,982.00
     3 TRANSPORTATION   26,400.00   29,040.00   29,040.00   29,040.00
     4
     5 HOUSING          26,400.00   29,040.00   31,944.00   35,138.40
     6 Utilities.        2,200.00    2,420.00    2,662.00    2,928.20
     7
     8
     9 Monthly Totals.  55,000.00   60,500.00   63,646.00   67,106.60
    10
    11
    12 YEAR TO DATE.   392,266.45
    13
    14
    15
    16
    17
```

The illustration above shows the worksheet display as it was before you corrected the entry for 1982. Be sure that your worksheet is not now displaying the year as a dollar amount.

It is time to once again use one of your favorite series of keystrokes, right? You're going to Copy Fields, so that the Label 1982 can be extended across Columns 3 thru 7 in Row 2.

One more hint about Copying Fields: it really doesn't matter where on the worksheet the cursor is when you Copy Fields. By filling in all of the appropriate Coordinates in both Copy From: and Copy To: sequences, you can copy from any part of the worksheet to any other area without moving the cursor.

The advantage of having the cursor in the Field that you are going to Copy From: is simply that you can move through the copying sequence faster that way, because the Current Field Coordinates will already be displayed within the Copy Fields format, thus requiring only that you move through the sequence by pressing [RETURN] four times.

Go ahead and Copy Fields to extend the Label for the current year to all the columns of data on your worksheet:

_____

[F8] Copy Fields in Progress: Refer to Page 33

_____

You have each of the columns Labeled, although your headings don't seem to be quite in the right place. That is because each new worksheet is pre-set to place all Labels at the left of the Column, unless it is instructed to do otherwise.

You need to do otherwise. If you make a Global change in format now, both the Column headings and the itemized categories listed in Column 1 will be changed, since they are all Labels. What you want is to center the Column headings, while leaving the Labels for the itemized categories lined up to the left as they are now. Since you want to change only the Column headings, change the format only of the first two Rows:

Move Cursor to R1 C1	Key:	[HOME]
Change Format		[F5]
Select: "Row"		R
Activate, and Locate "Label Justification"		[RETURN] **3** times
Select: "Center"		C
Exit List of Selections		[F3]

You're half way there; now move down to Row 2 and do the same process one more time:

Move Cursor to R2 C1	Key:	↓
Change Format		[F5]
Select: "Row"		R
Activate, and Locate "Label Justification"		[RETURN] **3** times
Select: "Center"		C
Exit List of Selections		[F3]

Good. Your worksheet is gaining clarity. The top of it is still much too crowded, and it doesn't look as though you have any room there to spread it out.

Oh yes you do! You always have the option of inserting, or deleting, additional rows and columns at any location within your worksheet. In that way, if you have misjudged the space needed for making entries, you can adjust the worksheet to fit your requirements.

Uncrowd It!

Move your cursor down one Row to Row 3, and insert one new Row to separate your Column headings from the rows of data:

Move Cursor to R3 C1	Key: ↓
Press [F6 Insert/Delete]	[F6]
Select: "Insert" Activate Selection	I [RETURN]
Select: "Row" Activate Selection	R [RETURN]

"How Many?"
  "1" is already keyed in, so
  just activate preset selection
	[RETURN]

Can you see what a wonderful option that is? You see, you never have to worry about setting up a worksheet to exactly fit any given amount of information. The principle here is that you always change the worksheet to fit whatever you decide it should become.

Wait a minute! When you inserted that extra Row, all the other Rows of data moved down one Row. Hasn't that change destroyed the operation of all the Formulas you entered earlier?

For example, the Formula you entered for the Year to Date Total was keyed in as +SUM (R9 C2 .. R9 C7). But now there is nothing at all on Row 9! Haven't you upset your whole worksheet?

Nope. The Spreadsheet is smarter than that! When you inserted that new Row, and all of your entries moved down one Row, the Spreadsheet automatically changed every single Formula to fit your new format!

Move your cursor down and over, to Row 13 Column 2. There you see a new Formula displayed at the top of your worksheet; it has been revised to + SUM (R10 C2 .. R10 C7) so that it can follow the calculations that you intended.

No matter how complex your use of Formulas, Relative Coordinates, or references to other Fields: whenever you insert, delete or move Rows or Columns of data, the Spreadsheet will automatically adjust to perform the operations that you have already instructed it to perform. Here again, you begin to see the incredible power and flexibility that you have available to you.

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Underlining and Filling

You are going to begin to work with underlines now, in order to give your worksheets even greater clarity. It is much more difficult to explain underlining than it is to do it. There are a number of ways to create different kinds of underlines, each of which makes quite a bit of difference in the appearance of the worksheet.

You have both an underline and a minus-sign on your keyboard, as well as an equals sign. Any of these may be used in underlining, so long as you always remember to key them in as Labels.

Using the underline character will create an underline along the bottom of a Row; using the minus-sign or the equals-sign will give you an underline along the middle of a Row.

You are going to key in an underline now, in what may seem to be a rather strange manner. You are going to enter into your worksheet only a single character of underline:

Cursor must be at R3 C1		
Key in 2 blank spaces	Key:	[space]
		[space]
Key in a single minus sign		—
Enter into worksheet		[RETURN]

That doesn't look right. Why couldn't you have keyed in a series of underlines that would have run all the way across the Column? You could have; and it would have been perfectly correct to do so. In a moment, though, you'll see why one underline keystroke is often better than 20.

You're going to fill R3 C1 with an underline; but you're going to do it with one of the [F5 Change Format] options, rather than doing it manually by repeatedly hitting the underline key:

Change Format	Key:	[F5]
Select: "Field"		F
Activate, and Locate "Label Justification"		[RETURN] **3** times
Select: "Fill"		F
Exit List of Selections		[F3]

```
 ═══════ 1 ═══════ 2 ═══════ 3 ═══════ 4 ═══════ 5 ═══════
 1│    EXPENSE         JANUARY      FEBRUARY     MARCH        APRIL
 2│     ITEM            1982         1982         1982         1982
 3│ ─────────────────
 4│TRANSPORTATION     26,400.00    29,040.00    29,040.00    29,040.00
 5│
 6│HOUSING            26,400.00    29,040.00    31,944.00    35,138.40
 7│Utilities.          2,200.00     2,420.00     2,662.00     2,928.20
 8│
 9│
10│Monthly Totals.    55,000.00    60,500.00    63,646.00    67,106.60
11│
12│
13│YEAR TO DATE.     392,266.45
14│
15│
16│
17│
```

Now the first Column of Row 3 is filled with underline, and your worksheet should look precisely like the one above. You see, it really is getting better and better.

You're going to Copy Fields now, and extend that underline across all 7 Columns of Row 3. Then you are going to Copy Fields once again and extend the same underline across all 7 Columns of Row 9.

First, make sure your cursor is still at Row 3 Column 1. Then go through the Copy Fields sequence, and Copy To Columns 2 through 7 of Row 3:

[F8] Copy Fields in Progress: Refer to Page 33

The underline now extends, in broken sections, all the way across the Columns of Row 3. Don't move the cursor ! You're going to do the same thing again, but this time you are going to key in a full set of Coordinates when you Copy To: Row 9 Column 1 thru Row 9 Column 7:

[F8] Copy Fields in Progress: Refer to Page 33

You have two additional areas to underline. The first area falls between Monthly Totals and Year to Date Total. The second area is a final double underline below the Field containing Year to Date Total.

In the previous two examples, you have created what are called discrete underlines, which means that they are broken between columns in order to strengthen the vertical appearance of the columns. That's why your first keystrokes in Row 3 Column 1 were [space][space].

When you underline now, in Row 12, you might want to create a solid underline that is more appropriate to indicate what is in effect a row of sub-totals. First, though, you must move down to R12 C2.

The cursor can be moved down to that part of the worksheet by repeatedly pressing the arrow keys. There is another way to move the cursor that is much faster if you are working with a large worksheet, or have a long move to make: you then use the [F1 Move Cursor] option of the Spreadsheet:

Move Cursor	Key: [F1]
Select: "Coordinate"	C
Activate Selection	[RETURN]
Select: Row "12"	1 2
Activate Selection	[RETURN]
Select: Column "2"	2
Activate Selection	[RETURN]

The cursor should now be in Row 12 Column 2. It isn't always faster to do it that way. Just as with the many other options of the Spreadsheet program, however, the more often you utilize the options, the more quickly they will operate for you.

Be careful now: you want a solid underline; but if you begin your underline entry with a minus-sign, you are designating your entry as a Value ... and if you attempt to enter it by itself, your screen will then display an error message.

How do you change a Value to a Label? Remember, that you just begin your entry with a quotation mark, which will always designate a Label, but will not display as part of the entry.

You can also use the underline-character itself, which will be understood by the program as a Label. The only difference between the two characters is in the position of the underline within the Row.

Key in and fill Row 12 Column 2 with a solid underline, which you will then extend across all the Columns of Monthly Totals in Row 12:

Key in quotation-marks, and a single minus-sign	Key: " —
Enter into worksheet	[RETURN]
Change Format	[F5]
Select: "Field"	F
Activate, and Locate "Label Justification"	[RETURN] **3** times
Select: "Fill"	F
Exit List of Selections	[F3]

Now Copy Fields, to extend your solid underline across Row 12 as you Copy To: Columns 3 thru 7:

[F8] Copy Fields in Progress: Refer to Page 33

You have only the final double underline below your Year To Date total to make now, using the equals-sign and filling that one Field:

Move Cursor to R14 C2 Key:	↓ ↓
Key in a single equals-sign	=
Enter into worksheet	[RETURN]
Change Format	[F5]
Select: "Field"	F
Activate, and Locate "Label Justification"	[RETURN] **3** times
Select: "Fill"	F
Exit List of Selections	[F3]

No, you do not have to Copy Fields this time! You see, there are occasionally rewards for those of you of courage and spirit, who have followed these pages in good faith.

Are you all through? Can you start playing around with your own worksheets now, and do it any way you like? No, not quite yet. You have another trick or two to learn ... just relax and enjoy.

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	1	2	3	4	5
1	EXPENSE	JANUARY	FEBRUARY	MARCH	APRIL
2	ITEM	1982	1982	1982	1982
3	-----------------	---------	---------	---------	---------
4	TRANSPORTATION	26,400.00	29,040.00	29,040.00	29,040.00
5					
6	HOUSING	26,400.00	29,040.00	31,944.00	35,138.40
7	Utilities. .	2,200.00	2,420.00	2,662.00	2,928.20
8					
9	-----------------	---------	---------	---------	---------
10	Monthly Totals.	55,000.00	60,500.00	63,646.00	67,106.60
11					
12					
13	YEAR TO DATE.	392,266.45			
14					
15					
16					
17					

Does your worksheet match the illustration above? It better! If for any reason your worksheet does not match the illustrations as you follow along, please go back over the keying instructions until you do get a match. Each stage of this worksheet leads to the next, and a great many features of the Spreadsheet program have been designed into this first example, so that you will learn as much as possible about the program right at the beginning.

If you have made any errors, in most cases you can correct them by overwriting them: just key in the data again, according to the instructions given; if you have entered data in a Field that one of the illustrations shows should be blank, you can move your cursor to that Field and erase the entry.

This is a good place to explain the reason for filling Fields, as you have been doing upon first using each kind of underlining. Why wouldn't it have been just as convenient to create that first Field of underline by repeatedly striking one of the underline keys until the Field was full, and then copy that entry across the other Columns?

In this case, that would have worked, but only because Column 1 is the widest Column on your worksheet. Column 1 is 19 characters wide now, and a series of underline keystrokes sufficient to span the

width of Column 1 will be more than enough to fill any of the other Columns of your worksheet when copied across.

What would happen if you then decided to use [F5 Change Format] and widen Column 2 to 25 characters ? You would then have only the maximum of 19 characters of underline available that you keyed into Column 1. Since that would no longer span Column 2, you would have to key in additional underline characters in each Row of Column 2 that you have used as an underline.

On the other hand, when you key in a single character of one of the underline keys, and then use [F5 Change Format] to fill that Field, the Spreadsheet will fill that Field, and any Field to which it is copied, no matter what the width of the Field or how often it is changed.

Your underlining is complete now, and the worksheet is looking rather professional ... except for the category Labels in Column 1. They need help. And this is a perfect opportunity for you to learn about one other characteristic of [F5 Change Format] to fill a Field.

Move Cursor to R1 C1 Key:	[HOME]
Change Format	[F5]
Select: "Column"	C
Activate, and Locate "Label Justification"	[RETURN] **4** times
Select: "Fill"	F
Exit List of Selections	[F3]

Oops! Does your worksheet look like the one pictured at the top of the next page? You don't mind if Rows 4 and 6 display the Labels

TRANSPORTATIONNNNNN and HOUSINGGGGGGGGG

do you? What sort of dirty trick has been played on you now? Everything was looking pretty decent a moment ago. Then you just did what you were told to do, and your worksheet went slightly berserk.

No it didn't ! It just followed your instructions. You instructed it to fill all the Fields of Column 1. The fill option always uses the last character entered in a Field to fill that Field. Where you had typed a period as the last character in an entry, the worksheet filled that Field with a row of periods; where you had keyed in an N as the last character in an entry, the Field was filled with NNNNNNNs. Now you know why you were asked to end some entries with a period.

```
   ┌──────1══════2══════3══════4══════5══════┐
  1│   EXPENSE       JANUARY    FEBRUARY    MARCH      APRIL
  2│    ITEM          1982        1982       1982       1982
  3│ ──────────────  ─────────   ─────────  ─────────  ─────────
  4│TRANSPORTATIONNNNNN  26,400.00   29,040.00  29,040.00  29,040.00
  5│
  6│HOUSINGGGGGGGGGGGGGG  26,400.00   29,040.00  31,944.00  35,138.40
  7│Utilities..........   2,200.00    2,420.00   2,662.00   2,928.20
  8│
  9│ ──────────────  ─────────   ─────────  ─────────  ─────────
 10│Monthly Totals.....  55,000.00   60,500.00  63,646.00  67,106.60
 11│
 12│                 ─────────────────────────────────────
 13│YEAR TO DATE.......  392,266.45
 14│                 ═════════════
 15│
 16│
 17│
```

Most lists of Labels running down a Column will look much more attractive if flushed out to the right by a row of periods. When you end each of the Labels in such a list with a period, then it is only necessary to direct the entire Column to utilize the fill option at some point in formatting the worksheet.

You can correct those two entries in Column 1 very easily. At the same time, why don't you take Row 5 out of your worksheet, so that your expense entries will be consolidated into a single block:

Move Cursor to Row 4 Col 1 Key:	↓ ↓ ↓
Key in Label, with period at end	Transportation.
Enter into worksheet	[RETURN]
Move Cursor to Row 5 Col 1	↓
Press [F6 Insert/Delete]	[F6]
Select: "Delete"	D
Activate Selection	[RETURN]
Select: "Row"	R
Activate Selection	[RETURN]
"How Many?" "1" is keyed in, so just activate preset selection	[RETURN]
Key in Label, with period at end	Housing.
Enter into worksheet	[RETURN]

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```
 ═══════ 1 ═══════ 2 ═══════ 3 ═══════ 4 ═══════ 5 ═══════
 1│   EXPENSE        JANUARY      FEBRUARY       MARCH        APRIL
 2│    ITEM           1982          1982          1982         1982
 3│ ─────────────   ─────────    ─────────    ─────────    ─────────
 4│Transportation.....  26,400.00    29,040.00    29,040.00    29,040.00
 5│Housing...........   26,400.00    29,040.00    31,944.00    35,138.40
 6│Utilities.........    2,200.00     2,420.00     2,662.00     2,928.20
 7│
 8│ ─────────────   ─────────    ─────────    ─────────    ─────────
 9│Monthly Totals.....  55,000.00    60,500.00    63,646.00    67,106.60
10│
11│                 ───────────────────────────────────────────────────
12│YEAR TO DATE.......  392,266.45
13│                 ════════════
14│
15│
16│
17│
```

That's better! The illustration above is your finished worksheet. All of the entries have been made, and the worksheet has been made to look organized and efficient. You are almost through with your first worksheet (you've heard that before, right?).

Take a moment to move your cursor around and beyond the area of the worksheet that is being used: use the [──►] arrow key to scroll the worksheet over to Column 10. Then move your cursor back to Row 1 Column 1 by pressing the [HOME] key. Finally, use your [▼] arrow key to scroll the worksheet down to Row 20.

Did you notice that, as you scrolled the worksheet to Column 10, the list of expense Labels disappeared from the display? And as you scrolled the worksheet down to Row 20, the Column headings also disappeared from the display.

That might not cause much trouble on a small worksheet like the one you are working with now. What if you had 40 categories in your expense list, and were entering the dollar-amounts for 20 months? Without being able to see the Labels and Column headings, it would be extremely difficult to remember where to make new entries.

You can lock your titles onto the screen, retaining all vertical Labels, all horizontal Labels or both.

Simply use the Title-Lock provision of the Spreadsheet, which you'll find among the selections offered by [F5 Change Format].

Move Cursor to Row 1 Col 1	Key:	[HOME]
Move Cursor to Row 3 Col 1		↓ ↓
Change Format		[F5]
Select: "Titles"		T
Activate the Selection		[RETURN]
Select: "Both"		B
Activate the Selection		[RETURN]

The only visible change to your worksheet is that your cursor has mysteriously moved by itself from Row 3 Column 1 down and over to Row 4 Column 2.

Why did it want to do that? First of all, you placed your cursor at Row 3 Column 1 to indicate that you wanted the first three Rows and first Column of entries (which include the underlining) to be the Title-Locked area. Had you left the cursor in Row 1 Column 1, only the first Row and first Column would have been locked in.

As soon as you locked the titles in, your cursor moved down and over to its new HOME position. You'll find now that you cannot move your cursor any farther up or to the left with either the [HOME] key or any of the arrow keys.

You should know one thing more about Title-Lock: while all of the Fields you have chosen are locked into the screen display, those Fields are not protected (which means unable to be changed). Should you want to go into the title-locked area for any reason, you can unlock those Fields by using [F5 Change Format], selecting "Titles", and then keying in N for "None". Or you may leave the titles locked and use [F1 Move Cursor] to get into that area to make changes.

Go ahead and move your cursor around just as you did a moment ago. You see that now, the appropriate Labels remain displayed on your screen no matter how far you scroll down or to the right.

If you move your cursor over to Row 4 Column 8, you will find a perfect example of a situation in which you might want to go into the title-locked area: if you now wanted to enter JULY and 1982 in Column 8, you could use [F1 Move Cursor] to get into Rows 1 and 2 and make those entries, which would then be title-locked like the rest.

Moving Fields and Looking through Windows

	1	4	5	6	7
1	EXPENSE	MARCH	APRIL	MAY	JUNE
2	ITEM	1982	1982	1982	1982
3	------------	---------	---------	---------	---------
4	Transportation.....	29,040.00	29,040.00	29,040.00	29,040.00
5	Housing............	31,944.00	35,138.40	38,652.24	42,517.46
6	Utilities..........	2,662.00	2,928.20	3,221.02	3,543.12
7					
8	------------	---------	---------	---------	---------
9	Monthly Totals.....	63,646.00	67,106.60	70,913.26	75,100.59
10					
11		---
12	YEAR TO DATE.......				
13					
14					
15					
16					
17					

Now your titles are locked onto the screen. Wait a minute! The Spreadsheet is supposed to be able to do almost anything, right? Well, what if you want to look at the expense figures for JANUARY and for JUNE at the same time?

The way your worksheet is set up now, that is not possible. As you can see, in the illustration above, as soon as you scroll across your worksheet to display the JUNE figures in Column 7, you lose both the JANUARY and FEBRUARY figures in Columns 2 and 3.

Isn't there any way to solve this dilemma? Yes there is. In fact there are at least two ways, and you're going to learn both right now. Sometimes one way will be better, sometimes the other. You decide.

First, you can move JUNE over next to JANUARY by using the Function Key [F7 Move Fields]. This is a simple exercise in Moving Fields, and can be accomplished with a few keystrokes.

You are only going to move one Column now. When you move a lot of data around on your worksheet, Moving Fields can sometimes be a bit complicated. For a more thorough understanding of this function, refer to the information in the Reference Section beginning on page T-83.

```
 ╺━━━━━ 1 ━━━━━━ 2 ━━━━ 3 ━━━━ 4 ━━━━ 5 ━━
 1│     EXPENSE      JANUARY     JUNE    FEBRUARY    MARCH
 2│      ITEM         1982       1982      1982      1982
 3│   ─────────────  ─────────  ─────────  ─────────  ─────────
 4│Transportation.....  26,400.00  29,040.00  29,040.00  29,040.00
 5│Housing...........   26,400.00  42,517.46  29,040.00  31,944.00
 6│Utilities..........   2,200.00   3,543.12   2,420.00   2,662.00
 7│
 8│   ─────────────  ─────────  ─────────  ─────────  ─────────
 9│Monthly Totals.....  55,000.00  75,100.59  60,500.00  63,646.00
10│
11│                    ──────────────────────────────────────
12│YEAR TO DATE.......  392,266.45
13│                    ═══════════
14│
15│
16│
17│
```

You are going to move Column 7 to Column 3. You're not really moving the Columns; you're moving <u>what's in them</u>:

Your cursor must be in some Row of Column 7.	
Press [F7 Move Fields]	Key: [F7]
"Move Rows or Columns?" Select Column Activate Selection	C [RETURN]
"Move from Column _7_ " (yes)	[RETURN]
"Thru Column _7_ " (yes)	[RETURN]
"To Column __ " (key in 3)	3
Activate Selection	[RETURN]
Move Cursor to Row 4 Column 2	[HOME]

Look at the top of the page, and you'll see <u>JUNE</u> in Column 3, right next to <u>JANUARY</u>. The other Columns (that is, what was in them) have just moved over to the right to make room for <u>JUNE</u>.

Moving Fields is one way that you can relocate information when you want to make side-by-side comparisons on a worksheet.

```
    ═══════1═══════2═════3═════════4═════════5═══════
  1 │     EXPENSE      JANUARY   FEBRUARY    MARCH      APRIL
  2 │      ITEM         1982       1982       1982       1982
  3 │ ─────────────── ───────── ───────── ───────── ─────────
  4 │Transportation.....  26,400.00  29,040.00  29,040.00  29,040.00
  5 │Housing............  26,400.00  29,040.00  31,944.00  35,138.40
  6 │Utilities..........   2,200.00   2,420.00   2,662.00   2,928.20
  7 │
  8 │ ─────────────── ───────── ───────── ───────── ─────────
  9 │Monthly Totals.....  55,000.00  60,500.00  63,646.00  67,106.60
 10 │
 11 │                   ─────────
 12 │YEAR TO DATE.......  392,266.45
 13 │                   ═════════
 14 │
 15 │
 16 │
 17 │
```

When you're through comparing JUNE with JANUARY, you are
probably going to want all the months back in their regular order so
that they follow the natural passage of time. That's easy, too:

Move Cursor to Column 3	Key: ➡
Press [F7 Move Fields]	[F7]
"Move Rows or Columns?" Select Column Activate Selection	C [RETURN]
"Move from Column _3_ " (yes)	[RETURN]
"Thru Column _3_ " (yes)	[RETURN]
"To Column __ " (key in 7)	7
Activate Selection	[RETURN]

Your worksheet should now be back in its original form, and be
displayed on your screen just as it appears in the illustration above.

One important note about Moving Fields: whenever you move a
Row or Column (or more than one) by using [F7 Move Fields], the
Spreadsheet will automatically adjust all of the Formulas and other
references to those Fields that are moved so that the results of all
the worksheet calculations will remain the same.

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There is another way to display two widely separated parts of a worksheet on your screen at the same time. It's called creating a WINDOW within your worksheet.

You can create either a vertical window or a horizontal window wherever you wish on a worksheet. And you can then scroll back and forth, up and down, within each window, almost as though you had two copies of the same worksheet to look at, one above or beside the other, at the same time.

Right now, move your cursor over to Column 5 and follow along with the keying instructions. You're about to create a magic window!

Move Cursor to Row 4 Col. 2 Key:	[HOME]
Move Cursor to Row 4 Col. 5	➡ ➡ ➡
Press [F5 Change Format]	[F5]
Select Window Activate Selection	W [RETURN]
Select Vertical Activate Selection	V [RETURN]
"Synchronized Scrolling?" Selection pre-set to NO	[RETURN]

You've got a vertical window at Column 5, your cursor is now at Row 4 Column 4, and your worksheet looks a whole lot like the one shown at the top of the next page — except for one small detail: You have JANUARY, FEBRUARY, and MARCH displayed in the first, or left, window; and you have April displayed in the right-hand window.

If you scroll your cursor around now, you'll experience the same problem you had before: as soon as you scroll over to JUNE, you lose JANUARY again.

What you want is JANUARY in one window, and JUNE in the other window. You just have to know the secret of how to do it:

Move Cursor to Row 4 Column 2 Key:	[HOME]
Press [F1 Move Cursor]	[F1]
Select Other Window	W
Activate Selection	[RETURN]
Scroll Right Window to Column 7	➡ ➡

```
 ┌──────1══════2══════3══════4═══════7═══┐
 │1│  EXPENSE    JANUARY   FEBRUARY   MARCH    1│   JUNE    │
 │2│   ITEM       1982       1982     1982     2│   1982    │
 │3│ ─────────── ───────── ───────── ───────── 3│ ───────── │
 │4│Transportation.....  26,400.00  29,040.00  29,040.00  4│  29,040.00 │
 │5│Housing............  26,400.00  29,040.00  31,944.00  5│  42,517.46 │
 │6│Utilities..........   2,200.00   2,420.00   2,662.00  6│   3,543.12 │
 │7│                                                      7│           │
 │8│ ─────────── ───────── ───────── ───────── 8│ ───────── │
 │9│Monthly Totals.....  55,000.00  60,500.00  63,646.00  9│  75,100.59 │
 │10│                                                    10│           │
 │11│ ───────────────────────────────────────── 11│ ───────── │
 │12│YEAR TO DATE.......  392,266.45                      12│           │
 │13│                    ═══════════                      13│           │
 │14│                                                    14│           │
 │15│                                                    15│           │
 │16│                                                    16│           │
 │17│                                                    17│           │
 └──────────────────────────────────────────────────┘
```

Now you do have JANUARY and JUNE displayed on the very same screen. You can scroll the cursor around while it is in the right-hand window, to any other part of the worksheet, including the same part that is displayed in the left-hand window.

When you want to move the cursor back to the left-hand window, just press [F1 Move Cursor], key in W and press [RETURN], each time you want to move from one window to the other.

When you are ready to turn off the windowing feature, you can do so with just five keystrokes:

Press [F5 Change Format]	Key: [F5]
Select Window	W
Activate Selection	[RETURN]
Select None	N
Activate Selection	[RETURN]

Notice that the window which is turned off will always be the one which does not contain the cursor.

There is more for you to know about windows; you'll find all of that discussed in the Technical Reference Section, starting at page T-73.

```
         1          2            3           4           5
    1    EXPENSE     JANUARY      FEBRUARY    MARCH       APRIL
    2    ITEM        1982         1982        1982        1982
    3    ----------  -----------  ----------  ----------  ----------
    4   Transportation..    26400     1.1 * C2    1.1 * C2    1.1 * C2
    5   Housing........     26400     1.1 * C-1   1.1 * C-1   1.1 * C-1
    6   Utilities.......  + R-1 / 12  + R-1 / 12  + R-1 / 12  + R-1 / 12
    7
    8   ----------  -----------  ----------  ----------  ----------
    9   Monthly Totals..  +SUM (R4..R7)  +SUM (R4..R7)  +SUM (R4..R7)  +SUM (R4..R7)
   10
   11              -------------------------------------------------
   12   YEAR TO DATE....+SUM (R9C2..R9C7)
   13              ================
   14
   15
   16
   17
```

There is one more version of your worksheet for you to look at. You've entered some Formulas (and copied some of them over to other Fields). Your worksheet is displaying Values in the form of numbers, but internally those Fields contain the Formulas that make everything work. Whenever you wish, you may look at a worksheet in that form:

Press [F5 Change Format]	Key: [F5]
Select Global	G
Activate Selection	[RETURN]
Bypass "Column Width"	[RETURN]
"Numeric Display..."	
Select Formulas	F
Exit List of Selections: Press	[F3]

If you now widen Columns 2, 3, 4 and 5 to 15 characters, and then narrow Column 1 to 16 characters, your worksheet will be displayed very much like the one above. And it shows what's really going on within your worksheet. (Use the same keystrokes as above, but with V rather than F to return your display to its original form.)

Finally, take your worksheet and play around with those two entries of 26400. Enter anything! Just have fun, and watch it work!

Graphics, Sorting, and all that Stuff

No matter how beautifully organized a worksheet may be, there will come a time when some way of dramatizing the results of your numerical calculations would add a great deal of impact and clarity to the situation you are analyzing with the Spreadsheet.

Glad you asked! That is where the Spreadsheet's ability to convert tabulated data into a Graphic Display shines through.

Assume that you are going to create a very basic Sales Report for a single period; then you are going to analyze how each of your salesmen compares to the others and to both the goals you have set for them as well as the total sales for the company.

You are looking for a way of making that analysis that will give you a good opportunity to utilize the results as part of an important sales meeting you have scheduled to review the performance of your sales staff.

You'll find below a summary of the steps required to create the basic format of such a worksheet. When you have entered all of the data, your worksheet should look like the illustration at the top of the next page.

The information you have to start with is the sales goal that you have set for your salesmen, and their individual performance figures for the current period:

		Sales Goal	$ 30,000
Edgar's sales	$ 12,000	Craig's sales	28,750
Mark's sales	7,000	Steven's sales	21,750
Jeffrey's sales	17,250	Lindsay's sales	25,500

Widen Column 1 to 14 and Column 3 to 52

Center Titles in Rows 1 and 2

Underline-Fill-Copy across Row 3

End all Labels in Column 1 with a period

Formula for Total Sales in Row 12 is + SUM (R5..R10)

Insert Commas in Column 2

Change Format to Fill Column 1

Formula for Row 5 Column 3 is +C2

Copy From: R5C3 thru R5C3 Copy To: R6C3 thru R10C3

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```
     ═══════ 1 ═══════ 2 ═══════════════════ 3 ═══════
  1               CURRENT              SALES
  2   SALESMAN     SALES               ANALYSIS
  3   ─────────── ──────   ──────────────────────────
  4
  5 Edgar......... 12,000                           12000
  6 Mark.......... 7,000                             7000
  7 Jeffrey....... 17,250                           17250
  8 Craig......... 28,750                           28750
  9 Steven........ 21,750                           21750
 10 Lindsay....... 25,500                           25500
 11               ──────
 12 TOTAL SALES... 112,250
 13               ══════
 14
 15 SALES GOAL.... 30,000
 16
 17
```

　　　You can create a single underline in Row 11 Column 2 and a double underline in Row 13 Column 2 for greater clarity, if you wish, as we have done in the illustration.

　　　Do not copy Total Sales, Row 12, or Sales Goal, Row 15, over to Column 3 yet. You do not want either of those Values to influence your worksheet at this point. You will want them to a bit later.

　　　When your worksheet matches the illustration, you're ready to convert the worksheet to a Graphic Display with a few keystrokes:

Move Cursor to any Row in Column 3	
Change Format	Key:　[F5]
Select: "Column"	C
Activate Selection	· [RETURN]
Bypass "Column Width"	[RETURN]
Numeric Display: Select "Graphic"	G
Exit List of Selections	[F3]

　　　Now, how do you like that? You've got the first of a series of Graphic Displays of your sales department's performance to take with you to your sales meeting. In a moment, you'll have the others.

```
 ═══════1 ═══════2 ═════════════════3 ═══════════
 1|              CURRENT            SALES
 2|  SALESMAN     SALES            ANALYSIS
 3|  ─────────   ───────   ──────────────────────────
 4|
 5|Edgar.........  12,000  ══════════════════
 6|Mark..........   7,000  ══════════
 7|Jeffrey.......  17,250  ══════════════════════════
 8|Craig.........  28,750  ═══════════════════════════════════════
 9|Steven........  21,750  ══════════════════════════════
10|Lindsay.......  25,500  ══════════════════════════════════
11|             ───────
12|TOTAL SALES...  112,250
13|             ═══════
14|
15|SALES GOAL....  30,000
16|
17|
```

Your worksheet, like the illustration above, now gives you a far more vivid comparison than any mere column of figures could present. The Values by themselves are sterile and impersonal compared to your Sales Analysis Chart.

At this point you have an absolute comparison of the results of each man's effort with respect to their peers. You have taken the best man's performance as "100%", without regard to any quotas or sales goals.

Can you add greater impact to this worksheet? Yes, it will probably be even more effective if you rank your salesmen's working product in consecutive order.

You need to SORT! . . . and you can rest assured that sorting out things with the Spreadsheet is a lot easier than sorting out Life. The latter is beyond the scope of this program; the former you can master with a few jabs at your keyboard.

The Spreadsheet sorts by Columns; that is, it will take any one Column that you designate, and sort the entire worksheet by ranking the data in that Column, either from smallest to largest, or the other way around. With Values, it sorts by order of magnitude; with Labels the sorting is done alphabetically.

```
        1          2                    3
 1             CURRENT              SALES
 2  SALESMAN    SALES                ANALYSIS
 3  ————————    ————————    —————————————————————————
 4
 5 Crais........    28,750 ═══════════════════════════════════
 6 Lindsay.......   25,500 ══════════════════════════════
 7 Steven........   21,750 ═════════════════════
 8 Jeffrey.......   17,250 ════════════════
 9 Edgar.........   12,000 ═══════════
10 Mark..........    7,000 ══════
11                   ————————
12 TOTAL SALES...  112,250
13                  ════════
14
15 SALES GOAL....   30,000
16
17
```

Change Format	Key: [F5]
Select: "Sort"	S
Activate Selection	[RETURN]
"Sort Row"	5
Activate Selection	[RETURN]
"thru Row"	10
Activate Selection	[RETURN]
"by Column"	3
Activate Selection	[RETURN]
"Ascending or Descending Order?"	
Select "Descending"	D
Activate Selection	[RETURN]

Now you have a pecking order for your sales force. What the chart above does not tell you, however, is how the men's relative performance stacks up against the goals that you have set for them in order to ensure the company's profitability.

If you now extend the entry for Sales Goal, 30,000, over to the chart area of Column 3, the Spreadsheet will re-rank everyone, using the Value for Sales Goal as the "100%" Value.

```
 ══════ 1 ══════ 2 ══════════════════════ 3 ══════════
 1│              CURRENT                     SALES
 2│   SALESMAN    SALES                      ANALYSIS
 3│ ───────────   ──────                     ────────────
 4│
 5│Craig........  28,750 ═══════════════════════════════════
 6│Lindsay......  25,500 ═════════════════════════════════
 7│Steven.......  21,750 ═══════════════════════════
 8│Jeffrey......  17,250 ══════════════════════
 9│Edgar........  12,000 ═══════════════
10│Mark.........   7,000 ═════════
11│                      ───────
12│TOTAL SALES... 112,250
13│                      ════════
14│
15│SALES GOAL....  30,000 ══════════════════════════════════════
16│
17│
```

Move Cursor to Row 15 Column 3

Key in same Formula as before	Key:	+ C2
Enter Formula into worksheet		[RETURN]
Key in [F4 Recalculate] in order to re-scale graph		[F4]

That oughta' show 'em! Now you've got a real-world visual representation with regard to your best people, and your worst, as each of them relates to your stated expectations from them.

In the example above, you can utilize a large printout of this display at your sales meeting to point out that only half of your sales force comes anywhere close to meeting your sales goal. And you can see some rather convincing arguments for making several decisions here, the first of which will most probably be to send old Mark to a sales training seminar, and perhaps take a closer look at his expense account.

There are a couple of other rather creative things you can do with sorting and graphics. First, there are two technical principles of the Graphic Display feature that you must be aware of.

AUTO-SCALE FEATURE:

Notice that the Spreadsheet always fills the entire Column used for Graphic Display with the largest Value in that Column, and then scales all of the other Values in proportion.

No matter what width you assign to the Graphic Display Column, or how great the range of Values, the largest Value will occupy the full width of the Column.

There is one element of the AutoScale feature that you must activate yourself, however: Any time that you change the largest Value, the AutoScale feature will reportion the entire Graphic Display providing you instruct it to recalculate by using the [F4 Recalculate] function. If you do not follow up a change in the largest Value in the Graphic Display Column by keying in [F4], the elements of the chart that you have not altered with not adjust themselves to the new entry.

At this point, why don't you create an additional chart that will show each salesman's performance as a component of the Total Sales for the company as a whole:

Move Cursor to Row 12 Column 3		
Key in same Formula as before	Key:	+ C2
Enter Formula into worksheet		[RETURN]
Activate AutoScale to recalculate		[F4]

The resulting display should look remarkably like the one at the top of the next page. Now you have a fairly comprehensive set of charts to present at your next meeting, to back up your own seasoned observations about current sales efforts.

Can you do anything else ? Just about anything you can think of. Suppose that you want to insert an additional Column of figures, and compare current sales to some past period . . . or calculate and create a Graphic Display of the increase in sales required from each person in order to meet your sales goals.

On the next page you'll find the keying instructions for inserting another Column, while maintaining the Graphic Display on your screen, and below that a summary of steps for utilizing the new Column.

```
┌═══════1═══════2═══════════════════════3═══════
│ 1              CURRENT                  SALES
│ 2  SALESMAN    SALES                    ANALYSIS
│ 3  ─────────   ────────                 ──────────────
│ 4
│ 5│Craig........  28,750 ==============
│ 6│Lindsay....... 25,500 ============
│ 7│Steven........ 21,750 ==========
│ 8│Jeffrey....... 17,250 ========
│ 9│Edgar......... 12,000 =====
│10│Mark.........   7,000 ==
│11
│12│TOTAL SALES... 112,250 ===========================================
│13             ==========
│14
│15│SALES GOAL....  30,000 =============
│16
│17
```

The keying instructions below will create a new Column between the Current Sales Column and the Graphic Display. In this example, you will create that Column in such a way that your entire worksheet will be retained within the display area of one screen:

Move Cursor to Row 1 Column 3		
Change Format	Key:	[F5]
Select: "Column" Activate Selection		C [RETURN]
"Column Width"		42
Exit List of Selections		[F3]
Insert/Delete	Key:	[F6]
Select: "Insert" Activate Selection		I [RETURN]
Select: "Column" Activate Selection		C [RETURN]
Activate Preset Selection "1"		[RETURN]

Why don't you use the new Column you've just inserted to take a look at the increase in sales that would be required of each of your salesmen for all of them to meet your sales goal.

You should be familiar enough now with the Spreadsheet so that you can fill that Column and produce a Graphic Display with only a few guidelines:

Enter Column headings as shown on next page

Underline Row 3 Column 3

Use [F5] to set Column 3 at "0" decimal places

Formula for Row 5 Column 3 is: +R15C2/C2 −1 * 100

Copy Formula from Row 5 to Rows 6 thru 10

Change Formula for Column 4 to +C3 in Rows 5 thru 10

Erase Entries in R12C4 and R15C4

Remember! Key [F4 Recalculate] to AutoScale

You now have one additional chart, hopefully looking like the one pictured on the next page, showing the range of needed improvement on the part of your salesmen.

In actual practice, it is more likely that you would create various data columns to occupy the first screen's area, and devote an entire screen area to the right of that for the Graphic Display.

In that way, you could present both past and current sales figures using 5 or 6 Columns across the first screen, and a Graphic Display of 76 characters' width which would occupy all of a second screen area.

Whenever you make a change that affects the Graphic Display portion of a worksheet, check to see that each line on the bar chart has adjusted correctly. If you're at all in doubt, key [F4 Recalculate].

Occasionally, you will even find that a change in an entry made in the lower part of a worksheet, that also affects a Graphic Display, will require you to key [F4 Recalculate] twice before that part of your worksheet readjusts completely.

Remember, the automatic recalculation feature of the program operates only down and to the right of any new entry, in order to be able to scan the worksheet as quickly as possible. That is the reason you may once in a while need to hit [F4] once to recalculate the whole worksheet, and hit [F4] again to re-scale the Graphic Display.

```
   ╔═══ 1 ═══ 2 ═══ 3 ══════════════ 4 ═══════════
  1│            CURRENT % INCREASE              SALES
  2│  SALESMAN    SALES  REQUIRED             ANALYSIS
  3│ ----------  ------  --------  ------------------------
  4│
  5│Craig........  28,750      4 =
  6│Lindsay......  25,500     18 ==
  7│Steven.......  21,750     38 ====
  8│Jeffrey......  17,250     74 ========
  9│Edgar........  12,000    150 ================
 10│Mark.........   7,000    329 =================================
 11│             --------
 12│TOTAL SALES...112,250
 13│             ========
 14│
 15│SALES GOAL.... 30,000
 16│
 17│
```

In the worksheet that you have created above, the only numerical entries are the five figures keyed in as the actual sales for each of your people, and the amount of the sales goal.

Everything else on the worksheet has been entered as a Formula. If you now experiment with different <u>potential</u> sales figures for any of the salesmen, or explore the effects of setting various sales goals, all the rest of the entries on your worksheet will adjust according to any changes you have made.

[WHAT IF] and [WHATHEN]!

Spend a few moments with either this last version or one of the prior variations. Substitute different Values, thinking in terms like, "What-would-happen-if-old-Mark-did-so-and-so?" or perhaps, "Suppose-every-one-of-my-salesmen-were-able-to-sell-twice-as-much... what-in-the-dickens-would-I-do-with-all-the-money-then?"

Enjoy all that you can do with the Spreadsheet. Remember, there are almost no limits to what you can create; and as you gain mastery of its many functions and abilities, you will also gain greater insight into the countless variations that can be applied to most real life processes that involve Values, in order to make the goals you seek more likely to become realities.

━━━━━━━━━━ Timberline Software ━━━━━━━━━━

Have fun with a COMPUTER PROGRAM ?

That would be absolutely horrible!

The potential of the Spreadsheet program is staggering

... and matters of staggering potential

should be accorded deep and solemn respect.

Good Heavens!

You can't just have FUN with it!

... or can you ?

Spreadsheet
Examples

Some things to grow with . . .

LIST of EXAMPLES

Every application of the Spreadsheet program may be unique in some way — and every person who utilizes the Spreadsheet may have different uses and different needs for it. How can a few examples even begin to cover what you need to know?

Yet there are some common threads that run through virtually all of the applications of such a program — and they are always the same. To achieve the greatest benefit and power from any worksheet that you create, that worksheet must be:

Well organized, clear in its presentation of data and conclusions, and visually attractive (which will add to its credibility).

Formatted to allow as many alternatives as possible to be examined simultaneously, and other alternatives also to be created with a minimum of alteration of the worksheet.

Formulated in such a way that the Spreadsheet itself does most of the work — requiring only that you make a few basic alterations as you examine the variables, while the program performs the task of recalculating everything else.

In one of the examples that follow, you will see that by altering a single Value, you will cause 179 other Fields to be recalculated and in that process yield new information that might be critical to your decision-making. The perspective you gain by being able to analyze a large number of alternatives almost instantly is an awesome experience.

As is true in the development of any real skill, the more you use the Spreadsheet, the more you learn about the ways in which it can chew and digest information, the more it will free you to go faster, reach higher, and just possibly "get there" half an hour before all the other guys.

1

JEFFERSON and JOHNSON ACRYLIC MFG. CO.

Consolidated Balance Sheet

A S S E T S

```
Cash on Hand ...........        4,800.00
Accounts Receivable ....       12,600.00
Inventory ..............       24,125.00
Work in Process ........        8,500.00
Raw Materials ..........        3,400.00
Supplies ...............          900.00
Trade Fixtures .........       13,250.00
Prepaid Expenses .......        1,175.00
Land and Buildings .....       84,500.00
Investments ............       42,750.00

TOTAL ASSETS    .......        196,000.00
```

L I A B I L I T I E S

```
Accounts Payable .......                 9,600.00
Notes Payable ..........                 7,200.00
Interest Payable .......                 1,750.00
Wages Payable ..........                10,400.00
Emp.Benefits Payable ...                 2,150.00
Income Taxes Payable ...                 3,575.00
Sales Taxes Payable ....                 1,875.00
Insurance Payable ......                   325.00

    Net Worth ..........               159,125.00

TOTAL LIABILITIES and NET WORTH        196,000.00
```

Timberline Software

Retrieving Data from Other Files:

The first example is a balance sheet. Its format seems almost too straightforward to learn much from; yet there are some valuable principles that this worksheet can demonstrate.

First you should format the worksheet so that it is clear, clean and uncrowded. You'll find listed below some guidelines you can use in creating a format like the one illustrated at the left:

Formatting:

1. There are three Columns spread across the screen. Column 1 is 24 characters wide, Columns 2 and 3 are 26 characters wide, which fills out the total available width of 76 characters.

2. The Global format is set for 2-decimal-places, to insert commas, and to calculate manually rather than automatically. You'll see why in a moment.

3. Column 1 Label Justification is set to the Fill option, so that rows of periods will automatically be entered with all of the headings in the Rows of Column 1 (see pages 57-58).

4. Column 2 Label Justification is set to the Center option, so that the headings ASSETS and LIABILITIES will be centered.

5. ASSETS begins in Row 2, and LIABILITIES begins in Row 19. This places them exactly one screen apart, and makes it convenient to move rapidly from one section to the other simply by pressing the appropriate arrow key once and hitting the [TAB] key (see page 46).

6. TOTAL ASSETS are calculated by entering a Formula in Row 15 Column 2: +SUM(R4..R13).

7. Net Worth is calculated by entering +R15C2 − SUM(R21..R28) in Row 30 Column 3.

8. TOTAL LIABILITIES and NET WORTH is calculated by entering the Formula +SUM(R21..R30) in Row 32 Column 3.

9. The underlines in Rows 3, 14, 20 and 31 are created by entering a quotation mark, single minus-sign, setting the Field to Fill, and then copying over to Columns 2 and 3 (see page 52).

Now you have formatted an empty balance sheet — and it is time to learn about a very special and powerful feature of the Spreadsheet: its ability to draw information from other worksheets that you have previously created and stored.

Store this empty balance sheet by performing the Save Worksheet procedure, which is explained on page 44, and in the Reference Section beginning on page T-9.

This next step will take some time to complete; it will also show you how to utilize the special FILE function of the Spreadsheet, which offers you the opportunity to collect data from other worksheets and consolidate it within your current worksheet.

You are going to create nine worksheets, each of which will have only one entry, and then store each of them in the permanent memory of your computer. These micro-worksheets should be created following the list below:

#1   Worksheet File Name: INVEN   Enter 24125 in Row 18 Column 4.

#2   Worksheet File Name: TR-FIX   Enter 13250 in Row 16 Column 7.

#3   Worksheet File Name: PPD-EX   Enter 1175 in Row 14 Column 4.

#4   Worksheet File Name: LD-BGS   Enter 84500 in Row 23 Column 3.

#5   Worksheet File Name: INVEST Enter 42750 in Row 30 Column 2.

#6   Worksheet File Name: NOTE-P   Enter 7200 in Row 8 Column 3.

#7   Worksheet File Name: EM-BEN   Enter 2150 in Row 16 Column 8.

#8   Worksheet File Name: INC-TX   Enter 3575 in Row 40 Column 2.

#9   Worksheet File Name: INSURE   Enter 325 in Row 10 Column 2.

Store each of these worksheets. Then load your empty balance sheet from memory, using the Load Worksheet procedure (see page T-13).

You're going to create a typical balance sheet, using current data which you will enter as Values, together with FILE references to the nine worksheets you have just created and stored.

When you have completed the first half of your balance sheet, ASSETS, you will have keyed in each of the entries very much as you

```
 ══════════ 1 ══════════ 2 ══════════ 3 ═══
 1
 2                        A S S E T S
 3 ─────────────────────────────────────────────────
 4 Cash on Hand ...........                4800
 5 Accounts Receivable ....               12600
 6 Inventory ..............   +FILE (DATA,INVEN,,18,4)
 7 Work in Process ........                8500
 8 Raw Materials ..........                3400
 9 Supplies ...............                 900
10 Trade Fixtures .........   +FILE (DATA,TR-FIX,,16,7)
11 Prepaid Expenses .......   +FILE (DATA,PPD-EX,,14,4)
12 Land and Buildings .....   +FILE (DATA,LD-BGS,,23,3)
13 Investments ............   +FILE (DATA,INVEST,,30,2)
14 ─────────────────────────────────────────────────
15 TOTAL ASSETS    .......      +SUM (R4..R13)
16
17
```

see them illustrated above. There are five FILE references to other worksheets in the ASSETS section, together with five other Values you have presumably drawn from current data not available elsewhere.

To understand exactly how the FILE function operates, and the required order for keying in the references, read the material which you will find on pages T-129-130 in the Technical Reference Section.

SPECIAL NOTE:

In the illustration above, the Label DATA is shown keyed in as the Volume Name under which the other worksheets are stored. Your computer undoubtedly uses some other identification for the Volume Name; therefore, disregard that part of the FILE entries shown in the illustration — the Volume Name DATA is used only as an example.

The illustration also shows the worksheet as it would be displayed if you set the Numeric Display function to Formulas (see page T-51). Set in its normal mode, the worksheet would actually display the Values referenced by the FILE formulas, and would appear more like the completed balance sheet shown on page 80.

```
        ═══════ 1 ═══════════ 2 ═══════════ 3 ═══════
     18│
     19│                    L I A B I L I T I E S
     20│----------------------------------------------------------------
     21│Accounts Payable .......                              9600
     22│Notes Payable ..........            +FILE (DATA,NOTE-P,,8,3)
     23│Interest Payable .......                              1750
     24│Wages Payable ..........                             10400
     25│Emp.Benefits Payable ...           +FILE (DATA,EM-BEN,,16,8)
     26│Income Taxes Payable ...           +FILE (DATA,INC-TX,,40,2)
     27│Sales Taxes Payable ....                             1875
     28│Insurance Payable ......           +FILE (DATA,INSURE,,10,2)
     29│                                   ------------------------
     30│    Net Worth ..........           +R15C2 - SUM (R21..R28)
     31│----------------------------------------------------------------
     32│TOTAL LIABILITIES and NET WORTH              +SUM (R21..R30)
     33│
     34│
```

Now enter the data for the LIABILITIES portion of your balance sheet. Remember that, because of the way you have positioned the two sections of the balance sheet, pressing either the up or the down arrow key and then pressing the [TAB] key will allow you to skip back and forth between the two sections, each of which will occupy the same exact position on your screen.

When the balance sheet is complete as shown, you are ready to examine the effects of your good friend [WHAT IF].

Any new Value that you now enter in any Row of Column 2 in the ASSETS portion, or in Column 3 of the LIABILITIES portion, will cause the entire balance sheet to be recalculated. What's more, you will be in balance no matter what entry you make, since the balance sheet is formulated to do exactly that: stay in balance !

Oops! You've just discovered that when you enter a new Value in the balance sheet, it does not recalculate! That's right. Remember when you set the worksheet for manual calculation on page 81 ? You did that so you could enter all the data without waiting for the entire worksheet to recalculate each time you made an entry. Now you will want to reset it for automatic calculation (see page T-71). Then you can play [WHAT IF] and watch the figures dance to your own music.

================ **Timberline Software** ================

THE GREAT NORTHERN PACIFIC COMPANY **2**

Unit Pricing and Volume Analysis

SALE PRICE per unit		5.95	6.95	7.95	8.95	9.95	10.95
UNIT SALES per month		1,800	1,620	1,458	1,312	1,181	1,063
Materials.....	0.94 per unit	0.94	0.94	0.94	0.94	0.94	0.94
Labor.........	0.46 per unit	0.46	0.46	0.46	0.46	0.46	0.46
Rent..........	2,500.00 per mo.	1.39	1.54	1.71	1.91	2.12	2.35
Office........	1,800.00 per mo.	1.00	1.11	1.23	1.37	1.52	1.69
Utilities.....	750.00 per mo.	0.42	0.46	0.51	0.57	0.64	0.71
Advertising...	700.00 per mo.	0.39	0.43	0.48	0.53	0.59	0.66
Insurance.....	225.00 per qtr.	0.03	0.03	0.04	0.04	0.05	0.05
UNIT PROFIT per month............		1.32	1.95	2.55	3.11	3.62	4.07
GROSS PROFIT per month...........		2,383.75	3,166.00	3,724.90	4,082.11	4,272.38	4,325.52
PerCent Return on Sales..........		22.3	28.1	32.1	34.8	36.4	37.2

The Great Northern Pacific Company is trying to determine what unit price it should set for a particular product. Some of the pro-rated costs are fixed; other costs vary seasonally, or with volume.

The most important relationship that appears to exist, according to management's past experience, is between sales price and volume. The company isn't sure what the new product's price should be; but there does seem to be about a 10% decrease in sales volume for each dollar increase in unit price.

The worksheet above looks like a simple collection of data that could just as easily be worked out, for each price, on a pad of paper. What isn't apparent, is that only two of the entries in all six of the right-hand Columns are numbers. Everything else is a Formula!

If you enter a trial unit price other than 5.95 in that space of the SALE PRICE row, or enter a trial volume figure other than 1800 in that space of the UNIT SALES row, the entire worksheet will at once calculate and display different figures for every single entry in those six Columns of the worksheet.

At the top of the next page, you'll find the first five Columns of this worksheet expanded and displayed in Formulas rather than Values.

```
     ═══1═══════2═══════3════════════4═══════════5═══
  1│    SALE PRICE    per unit                5.95         +C-1+1
  2│ --------------   --------   -------  ----------   ----------
  3│    UNIT SALES    per month               1800         .9*C-1
  4│ --------------   --------   -------  ----------   ----------
  5│Materials.....    .94        per unit      +C2          +C2
  6│Labor........     .46        per unit      +C2          +C2
  7│Rent.........     2500       per mo.     +C2/R3       +C2/R3
  8│Office.......     1800       per mo.     +C2/R3       +C2/R3
  9│Utilities.....    750        per mo.     +C2/R3       +C2/R3
 10│Advertising...    700        per mo.     +C2/R3       +C2/R3
 11│Insurance.....    225        per qtr.   +C2/R3/4     +C2/R3/4
 12│
 13│UNIT PROFIT per month.................. +R1-SUM(R5..R11) +R1-SUM(R5..R11)
 14│GROSS PROFIT per month...  .........       +R13*R3      +R13*R3
 15│
 16│PerCent Return  on Sales.  ......... +R14/(R1*R3)*100 +R14/(R1*R3)*100
 17│
```

For this example, you're going to be left somewhat more on your own. Just as before, however, there follows a list of guidelines that will assist you in formatting this worksheet:

Formatting: (These guidelines apply to the screen on the next page).

1. Column 1 is 14 characters wide; Column 3 is 9 characters wide. All the other Columns remain pre-set to 10 characters in width.

2. The Global format is set for 2-decimal-places, Row 3 is set for zero-decimal-places, and Row 16 is set for one.

3. A sort of trick was used in Columns 2 and 3: the program won't accept the entry of a Value such as 750 per mo. ; when you need that type of entry, place the numerical Value in one Column and its word reference in the adjacent Column.

4. To automatically display price increases of one dollar in each of the Columns of Row 1, use a Value only in Column 4. Then in Column 5 enter + C-1 + 1 and copy that Formula across to all of the other Columns. Whenever you change the Value in R1 C4 , the other Columns of Row 1 will recalculate and increase a dollar over and above the price calculated in the preceding Column.

		1	2	3	4	5	6	7
1	SALE PRICE per unit				5.95	6.95	7.95	8.95
2	------------------------				--------	--------	--------	--------
3	UNIT SALES per month				1,800	1,620	1,458	1,312
4	------------------------				--------	--------	--------	--------
5	Materials.....	0.94	per unit		0.94	0.94	0.94	0.94
6	Labor.........	0.46	per unit		0.46	0.46	0.46	0.46
7	Rent..........	2,500.00	per mo.		1.39	1.54	1.71	1.91
8	Office........	1,800.00	per mo.		1.00	1.11	1.23	1.37
9	Utilities.....	750.00	per mo.		0.42	0.46	0.51	0.57
10	Advertising...	700.00	per mo.		0.39	0.43	0.48	0.53
11	Insurance.....	225.00	per qtr.		0.03	0.03	0.04	0.04
12								
13	UNIT PROFIT per month............				1.32	1.95	2.55	3.11
14	GROSS PROFIT per month...........				2,383.75	3,166.00	3,724.90	4,082.11
15								
16	PerCent Return on Sales.........				22.3	28.1	32.1	34.8
17								

5. The same process applies to UNIT SALES in Row 3. Enter a Value only in Column 4. Enter .9 * C-1 in R3 C5 and copy across. Each Column will then calculate a Value of 90% of the Column before.

6. The entries for all costs are Formulas that relate to the Value you have entered in Column 2. Once again, the Formula is keyed in only once, in Column 4, then copied across. Any change in a cost that you enter in Column 2 will be recalculated for all the other Columns of the worksheet.

7. Note that monthly costs are divided by whatever sale volume is entered in Row 3, and Gross Profit multiplied by Row 3's Value.

8. You are not copying Values across. You are copying Formulas!

The worksheet you are creating will appear on your screen like the one illustrated above (the version shown on the last page had to be expanded to display the Formulas used).

As you will see when you begin wondering [WHAT IF], the Values you enter don't matter. What does matter is that, for the first time, you've created a worksheet that does nearly all the work! You need only change the Value in R1C4 or R3C4 and IT will do the rest!

3

```
━━━━━━━━ 1 ━━━━━━━━━━━━━━━━━━━━ 2 ━━━━━━━━━━
 1
 2  NET PROFIT:                        34,750.00
 3 ----------------------------------------------------
 4
 5  TAX BRACKET
 6  ----------------------------------------------------
 7  Tax on 50,000 or More                 .40 * R2
 8  Tax on 30,000 to 49,999               .28 * R2
 9  Tax on 15,000 to 29,999               .17 * R2
10  Tax on    0   to 14,999               .12 * R2
11  ----------------------------------------------------
12
13    "TAX DUE" FORMULA:  +IF(R2>49999,R7,IF(R2>29999,R8,IF(R2>14999,R9,R10)))
14
15    AMOUNT OF TAX DUE:                 9,730.00
16
17
```

This example really isn't a worksheet at all. It has only a single Value, four tiny formulas, and ONE HUGE FORMULA. Yet it is so important that you be aware of the application involved, no selection of examples would be complete without it.

There are several pages in the Technical Reference Section that deal with a group of functions called Conditional Statements (see T-95). These "IF..." functions are among the most important tools that are offered to you by the Spreadsheet, and the job they perform within the program is absolutely unique.

Read through the material that begins on page T-95. Then come back to this example. It is not a simple example — and it was not meant to be. It is shown here solely to demonstrate the power that is available to you if you wish to master its use.

The worksheet above shows the calculation of only a single Value, the AMOUNT OF TAX DUE, based on the Value entered in Column 2 as Net Profit, and the "Tax Table" displayed in Rows 7, 8, 9 and 10.

How do you get all of those entries together to arrive at one true Value? You can do it, but only by combining all of that data in the form of a Conditional Statement.

+IF (R2 > 49999 , R7, IF (R2 > 29999 , R8, IF (R2 > 14999 , R9, R10)))

Well, there it is, and it's a monster of a Formula. Now watch the translation closely, and follow along in the Formula itself as it is translated into English.

Since the Formula is entered in Column 2, all of the references to other coordinates by Row also refer to Column 2. Thus, a list of those references would read:

> R2 is the Value for Net Profit in Column 2.
>
> R7 is the Value in R7C2, which is 40% of R2.
>
> R8 is the Value in R8C2, which is 28% of R2.
>
> R9 is the Value in R9C2, which is 17% of R2.
>
> R10 is the Value in R10C2, which is 12% of R2.

The Formula for the AMOUNT OF TAX DUE reads:

" IF the Value of R2 is greater than 49,999 return the Value of R7, otherwise,

IF the Value of R2 is greater than 29,999 return the Value of R8, otherwise,

IF the Value of R2 is greater than 14,999 return the Value of R9 otherwise,

return the Value of R10 ".

In the example above, since R2 presently has a Value of 34,750 , the Conditional Statement will choose R8 as the TRUE argument and return a Value of 28% of 34,750, which is 9,730.00 . The Formula in Row 13 of the example has been copied to Row 15 also, but there is displayed as a Value rather than as a Formula.

The versatility of Conditional Statements is limited only by your own inventiveness and imagination. The IF functions lend yet another level of power and control; you can now almost program the program!

4

THE MORE CREDIT CO. CONSOLIDATED LOAN ANALYSIS	INTEREST RATE 10 %perAnnum	INTEREST RATE 10.5 %perAnnum	INTEREST RATE 11 %perAnnum	INTEREST RATE 11.5 %perAnnum	INTEREST RATE 12 %perAnnum	INTEREST RATE 12.5 %perAnnum	INTEREST RATE 13 %perAnnum
LOAN AMOUNT....	20,000	20,000	20,000	20,000	20,000	20,000	20,000
No.Periods: 8 Yr....	96	96	96	96	96	96	96
10 Yr....	120	120	120	120	120	120	120
12 Yr....	144	144	144	144	144	144	144
15 Yr....	180	180	180	180	180	180	180
Mo.PAYMENT: 8 Yr....	303.48	308.80	314.17	319.59	325.06	330.58	336.15
10 Yr....	264.30	269.87	275.50	281.19	286.94	292.75	298.62
12 Yr....	239.02	244.83	250.71	256.66	262.68	268.77	274.93
15 Yr....	214.92	221.08	227.32	233.64	240.03	246.50	253.05
Total Payout: 8 Yr..	29,134.40	29,644.83	30,160.18	30,680.40	31,205.46	31,735.31	32,269.93
10 YR..	31,716.18	32,384.40	33,060.00	33,742.91	34,433.03	35,130.28	35,834.58
12 YR..	34,418.25	35,255.25	36,102.39	36,959.52	37,826.47	38,703.09	39,589.21
15 YR..	38,685.78	39,794.36	40,917.49	42,054.83	43,206.05	44,370.79	45,548.72

You're looking at a worksheet that contains 360 entries, yet can be created in less than 20 minutes, with very little effort. Given an additional 5 minutes, a worksheet twice as big can be completed.

More than that, once you have created this worksheet, the only Value that you will probably ever alter is the entry in Row 7 Column 2 which is the first Loan Amount.

Why alter only that Value? Because by altering that one Value, you will cause more than 160 other entries to change their Values as well — and that will give you just about all the analytical information about the cash flows of a particular loan that you will need in order to know what your loan costs really are.

Formatting and Entries:

1. Column 1 is 20 characters wide. Set the Global Column width for all the rest of the Columns at 11 characters.

2. Key in the Labels in Column 1. Don't be concerned about the position of any of the Labels within the Column right now.

3. Set the Label Justification for Column 1 to Fill. Again, don't concern yourself about how any of the entries appear.

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INTEREST RATE 13.5 %PerAnnum	INTEREST RATE 14 %PerAnnum	INTEREST RATE 14.5 %PerAnnum	INTEREST RATE 15 %PerAnnum	INTEREST RATE 15.5 %PerAnnum	INTEREST RATE 16 %PerAnnum	INTEREST RATE 16.5 %PerAnnum	INTEREST RATE 17 %PerAnnum	INTEREST RATE 17.5 %PerAnnum	INTEREST RATE 18 %PerAnnum
20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
96	96	96	96	96	96	96	96	96	96
120	120	120	120	120	120	120	120	120	120
144	144	144	144	144	144	144	144	144	144
180	180	180	180	180	180	180	180	180	180
341.76	347.43	353.15	358.91	364.72	370.58	376.48	382.43	388.42	394.46
304.55	310.53	316.57	322.67	328.82	335.03	341.28	347.60	353.96	360.37
281.14	287.43	293.77	300.18	306.64	313.17	319.75	326.38	333.08	339.82
259.66	266.35	273.10	279.92	286.80	293.74	300.74	307.80	314.92	322.08
32,809.27	33,353.28	33,901.93	34,455.18	35,012.97	35,575.27	36,142.02	36,713.19	37,288.72	37,868.57
36,545.83	37,263.94	37,988.83	38,720.39	39,458.53	40,203.15	40,954.15	41,711.44	42,474.90	43,244.45
40,484.65	41,389.26	42,302.85	43,225.25	44,156.28	45,095.77	46,043.53	46,999.38	47,963.15	48,934.64
46,739.47	47,942.69	49,158.03	50,385.14	51,623.65	52,873.23	54,133.51	55,404.15	56,684.82	57,975.16

Would you believe it if you were told that the whole worksheet is already one-third complete? It's true. And it would still be true even if you want this worksheet to be 30 Columns wide and cover a dozen different time periods.

All the rest of your work will be done in Column 2. Let's go!

4. Set Label Justification for Row 1 to Center. Key in INTEREST.

5. Set Label Justification for Row 2 to Center. Key in RATE.

6. Set Value Justification for Row 3 to Center. Then key in your first Formula, at Row 3 Column 2: +C-1 + 0.5 which will display in that Field the Value 0.5. Finally set Label Just. to Center.

As you go through these steps, turn to the illustrations at the top of the next two pages. They are your guides to matching your own worksheet to the example. Your screen will at first display what you see on the next page. Don't worry: that will soon correct itself.

Remember also that you can always review a Formula that you have entered, even though it is displayed as a calculated Value, by moving the cursor to that Field and reading the display of that Formula at the top of the screen just above the Edit Line.

```
      =====1=======2====3 ====4 ===5 ===6 =
   1| THE MORE CREDIT CO.  INTEREST
   2|    CONSOLIDATED       RATE
   3|       LOAN            0.5
   4|      ANALYSIS        %perAnnum
   5| -----------------   ---------
   6|
   7|LOAN AMOUNT ........     0
   8|
   9|No.Periods:  8 Yr...     0
  10|            10 Yr...     0
  11|            12 Yr...     0
  12|            15 Yr...     0
  13| -----------------   ---------
  14|No.PAYMENT:  8 Yr...   ERROR
  15|            10 Yr...   ERROR
  16|            12 Yr...   ERROR
  17|            15 Yr...   ERROR
```

Are you still in <u>Column 2</u>? Good. Let's continue:

7. Set Label Justification for Row 4 to <u>Center</u>. Key in <u>%per Annum</u>.

8. Row 5: Key in a [space], followed by 1 minus-sign, for this entry. Then press function key [F5 Change Format], select <u>F</u>, then set Label Justification to <u>Fill</u> the Field (see pages 52-55).

9. In Rows 7, 9, 10, 11 and 12, enter the Formula <u>+C2</u>, which will display in those Fields as <u>0</u>.

10. Repeat for Row 13 the keying instructions used in Row 5.

11. Row 14: Key in the Formula <u>+PMT (R7, 0, R3/100/12, R9).</u>

12. Row 15: Key in the Formula <u>+PMT (R7, 0, R3/100/12, R10).</u>

13. Row 16: Key in the Formula <u>+PMT (R7, 0, R3/100/12, R11).</u>

14. Row 17: Key in the Formula <u>+PMT (R7, 0, R3/100/12, R12).</u>

You're not through yet, although your screen should now match the illustration above. Don't worry about the ERROR displays. The Fields displaying them have insufficient data with which to calculate, but that will be corrected shortly.

	1	2	3	4
1	THE MORE CREDIT CO.	INTEREST	INTEREST	INTEREST
2	CONSOLIDATED	RATE	RATE	RATE
3	LOAN	10	+C-1 +0.5	+C-1 +0.5
4	ANALYSIS	%perAnnum	%perAnnum	%perAnnum
5				
6				
7	LOAN AMOUNT........	20000	+C2	+C2
8				
9	No.Periods: 8 Yr...	96	+C2	+C2
10	10 Yr...	120	+C2	+C2
11	12 Yr...	144	+C2	+C2
12	15 Yr...	180	+C2	+C2
13				
14	Mo.PAYMENT: 8 Yr...	+PMT (R7,0,R3/100/12,R9)	+PMT (R7,0,R3/100/12,R9)	+PMT (R7,0,R3/100/12,R9)
15	10 Yr...	+PMT (R7,0,R3/100/12,R10)	+PMT (R7,0,R3/100/12,R10)	+PMT (R7,0,R3/100/12,R10)
16	12 Yr...	+PMT (R7,0,R3/100/12,R11)	+PMT (R7,0,R3/100/12,R11)	+PMT (R7,0,R3/100/12,R11)
17	15 Yr...	+PMT (R7,0,R3/100/12,R12)	+PMT (R7,0,R3/100/12,R12)	+PMT (R7,0,R3/100/12,R12)
18				
19	Total Payout: 8 Yr.	+R9 * R14	+R9 * R14	+R9 * R14
20	10 YR.	+R10 * R15	+R10 * R15	+R10 * R15
21	12 YR.	+R11 * R16	+R11 * R16	+R11 * R16
22	15 YR.	+R12 * R17	+R12 * R17	+R12 * R17
23				

You have only five more entries to make:

15. Row 18: Repeat the keying instructions used in Row 5.

16. Row 19: Key in the Formula +R9 * R14 .

17. Row 20: Key in the Formula +R10 * R15 .

18. Row 21: Key in the Formula +R11 * R16 .

19. Row 22: Key in the Formula +R12 * R17 .

20. Row 23: If you wish, underline just as in Row 5.

How long did that take? You're within about one minute of completing the whole worksheet.

Now how can you believe that when you are looking at a Column that contains 3 Labels, one Value of 0.5, five zeros, and 8 ERRORS ?

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Well, it's time for you to work some Spreadsheet magic. You are going to copy Column 2, just as it is, across as many Columns of your worksheet as you wish. This example has a total of 18 Columns, but you may utilize as many as you choose with the same amount of effort.

Copying Columns:

There has been a great deal of material in this manual concerned with Copying Fields. The first discussion is on page 29; and there is further information in the Technical Reference Section, pages T-87-90.

There is an additional copying function of the Spreadsheet that provides the ability to copy a Range of Fields (such as all of the entries in a Column) to a number of other positions (other Columns).

That what you're going to do now. Follow closely the keying in the Copy Fields grid below:

Copy Fields			Key	[F8]	
Copy FROM:	Row	Key	1	[RETURN]
	Column		2	[RETURN]
thru:	Row		23	[RETURN]
	Column		2	[RETURN]
Copy TO:	Row	Key	1	[RETURN]
	Column		3	[RETURN]
thru:	Row		1	[RETURN]
	Column		18	[RETURN]

21. You're almost there! Set the Global format to insert commas. Then set only Rows 14 thru 22 to display to 2-decimal-places.

22. Go back to Row 3 of Column 2: Key in 10 .

23. Go to Row 9: Key in 96 .

24. Go to Row 10: Key in 120 .

25. Go to Row 11: Key in 144 .

26. Go to Row 12: Key in 180 .

Now all the Fields that displayed ERROR are displaying zeros. That's because the most dramatic entry hasn't been made yet. You see, you have no loan amount entered so there are no payments.

The best has been saved until last: Are you ready for what you are about to see? Your next six keystrokes may amaze you.

(A small number of drums and bugles seem appropriate).

Move your cursor to Row 7 Column 2. Key in 2 0 0 0 0, press your [RETURN] key, stand back, and watch the Spreadsheet go to work!

EPILOG:

Can you enter a different Interest Rate in Row 3 Column 2 ? Yes. Will it again automatically increase by half-a-percent in succeeding Columns ? Yes. Will everything else be automatically recalculated ? Absolutely. It might also be just as easy to add more Columns to display a wider range of Interest Rates.

Can you enter a different number of time periods, and have the worksheet adjust all the payments and payouts automatically ? Yes. You could also add more Rows to display a wider range of payout periods — just about as many as you wish.

For the most part, though, the critical Field of this worksheet is Row 7 Column 2, the first entry for LOAN AMOUNT.

Every time you enter a new Value in R7C2, all of the payments, and all of the total payouts, are recalculated at all of the listed Interest Rates.

Do you want to borrow $ 20,000 and pay back no more than a total of $ 30,000 over 8 years, including interest ? Then you'll have to borrow it at somewhere around 11% (Row 19 Column 4).

The Spreadsheet, like anything else, will be as powerful a tool as the skill you bring to it, or learn from it. The enjoyment of it will be found in the adventure that comes with learning that is gentle and steady, and strong.

Technical Reference Section

SPREADSHEET

CALCULATOR

```
Spreadsheet Calculator
MAIN MENU

        Select the Option you want to use
Enter the appropriate abbreviation and press RETURN

        E W -   Enter Worksheet Information
        C W -   Clear Worksheet
        S W -   Save Worksheet in File
        L W -   Load Worksheet from File
        P W -   Print Worksheet

        END -   Done with Spreadsheet Calculator
```

The Main Menu

Program Function: THE MAIN MENU

ENTER WORKSHEET INFORMATION

Notation: Select this Option from the Spreadsheet Main Menu

Press E W [RETURN] to display the Worksheet

Description: ENTERING THE WORKSHEET ENVIRONMENT

This is pretty much where everything begins. And if you're by chance just learning to use your first computer, it may be rather frightening to hold an inch-thick book in your hands and wonder, "How am I going to learn all of this Stuff ? ! "

Start at the front of the book. PLEASE. Then, when you have a specific question, you can use the Index to locate that particular information both in the front section and this Reference Section.

When you have loaded the Spreadsheet Calculator program into your computer, and wish to begin creating a worksheet, executing this option will get you into the actual worksheet environment, displaying the upper-left-hand portion of the worksheet area.

As soon as you press E W and then press the [RETURN] key, the first 17 Rows and 7 Columns of the worksheet will be displayed. A new, blank worksheet will have the characteristics that are pre-set by the program for all new worksheets (these are listed on page T-31).

Whenever you enter the worksheet environment, which is possible only from the Main Menu, by pressing E W [RETURN], information can be entered into any Field of the worksheet, even if that Field has had data previously entered into it, unless that Field's contents have been protected against alteration at some earlier time.

You may always exit from the worksheet environment back to the Main Menu simply by pressing Function Key [F3]. If you do so, the current worksheet will _not_ be erased unless you so instruct.

You may always re-enter the current worksheet by once again pressing E W [RETURN]. The display will return to the same area that it last occupied; and the cursor will be located in the same Field in which you placed it when you exited from the worksheet.

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Program Function:　　　　THE MAIN MENU

CLEAR WORKSHEET

Notation:　　　Select this Option from the Spreadsheet Main Menu

Press C W [RETURN] and your screen will display

Are You Sure?　Press Y or N [RETURN]

Description:　　　CLEARING A WORKSHEET

Whenever you execute the Clear Worksheet option, you will be erasing all of the current worksheet from the active work area (or what is sometimes called the active memory) of your computer.

This is important enough to say again: If you are at the Main Menu, and you execute Clear Worksheet, and you have not stored the current worksheet, you will then destroy the current worksheet. Forever!

For that reason, whenever you do choose to clear a worksheet, you are given an additional opportunity to reverse that decision. When you begin the process of clearing a worksheet by:

Pressing C W [RETURN]

your display screen will then give you a chance to reconsider, asking:

Are You Sure ?

You can at that point key in YES or NO. If you key in YES and press the [RETURN] key, the worksheet will be erased from the active work area.

If, however, you answer NO, and press the [RETURN] key, your screen will return to the Main Menu, where you may elect to save, print, load another worksheet, or re-enter the current worksheet.

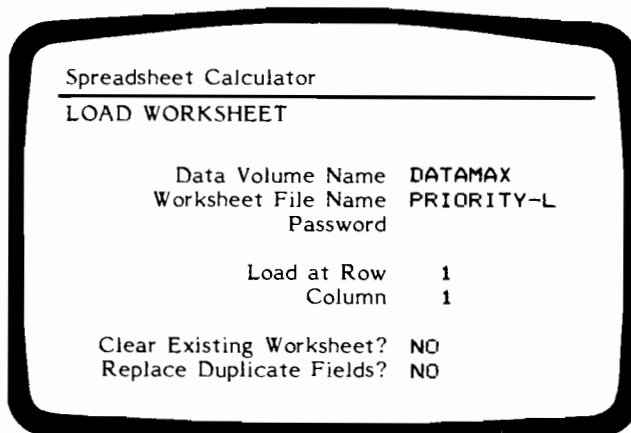**Program Function:**   THE MAIN MENU

                              SAVE·WORKSHEET IN FILE

Notation: Select this Option from the Spreadsheet Main Menu

                 Press S W [RETURN] and your screen will display:

Description:

```
Spreadsheet Calculator
─────────────────────────────────────
SAVE WORKSHEET

              Data Volume Name    DATAMAX
              Worksheet File Name ENERGY-78N
                       Password   SecretWord

              Replace Existing File?  YES
                   Old Password   Hideout

          Save Entire Worksheet?  NO

          Save Row  4  Column   1
          thru Row 12  Column   8
```
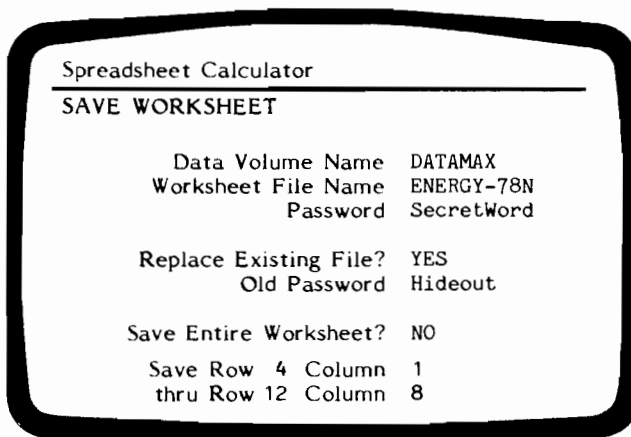
SAVING A WORKSHEET IN A FILE

You may store all or any portion of a worksheet, at any time, by executing the Save Worksheet option of the Spreadsheet program.

Throughout this manual, you have been advised time and again to save your worksheet often! Save it in stages, during the process of creating it, so that your work cannot be lost through error of any kind. Making it a habit to save parts of large worksheets, as they are built, is one of the best lessons you can learn about computers.

At any point in the program, you may elect to save all or part of your current worksheet by exiting from the worksheet environment back to the Main Menu. This is always accomplished by:

Pressing Function Key [F3 DONE]

even if you're not "done" with that worksheet, and wish to save only the portion that you've created so far.

Once you're back to the Main Menu, you can instruct the Spreadsheet to display the Save Worksheet Menu by:

Pressing S W [RETURN]

DATA VOLUME NAME: Key in Volume Name and [RETURN]

This Label is limited to 8 characters. Somewhere in your system, you have already initialized a storage volume, and assigned it a Volume Name. It is here that your storage volume name should be entered so that the computer will know where you wish this worksheet to be stored.

WORKSHEET FILE NAME: Key in Worksheet Name and [RETURN]

This Label is limited to 10 characters. Each worksheet that is stored must have a unique file name assigned to it so that your computer can locate and retrieve it at a later time.

PASSWORD: A Password is optional. Key in and/or press [RETURN]

You need not use a password. When you do use a password, you will then be unable to retrieve that worksheet from storage at a future date unless the password is re-entered in its exact form. Upper and lower case do matter (and length limit is 10 characters).

REPLACE EXISTING FILE?: Press Y or N [RETURN]

If you are at this point saving a worksheet to which you have assigned the same Worksheet File Name as some other work-sheet already stored, this question will be displayed.

If you do not wish to replace the previously-stored worksheet of the same name (in other words, erase it completely), then:

Press N [RETURN]

and the cursor will return to the top of the menu, so that you can assign the current worksheet that you are saving now some different Data Volume Name or a different Worksheet File Name. You cannot ever save two worksheets having the same name on the same Volume, since the computer would have no way to know which of the two to retrieve from storage at a later time.

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What do you do when you have retrieved a previously-stored worksheet, amended or expanded it, and have no further use for the earlier version, but wish to save the current version under the same Volume and Worksheet File Name ?

Press Y [RETURN]

The computer will then completely erase the previously-stored worksheet and now be ready to save the current worksheet to which you have assigned the same name.

This is the process you would normally follow in saving each part of a large worksheet as you build it. Save the first portion under whatever name you choose; add another segment to the worksheet; then save both parts together, replacing the prior portion each time with the current, more complete worksheet. Using this sequence, you can always use the same File Name.

OLD PASSWORD: Key in exact form of prior password, [RETURN]

This selection will only be displayed on your screen when you are saving a worksheet under the same name as a previously-stored worksheet that was assigned a password different from the password you are assigning to it now.

You must at this point enter the old password in the exact form in which it was originally keyed in. Otherwise, you will be given an error message, and be unable to save the current worksheet under the same File Name. When you do enter the old password the entry will be invisible (so that no spies can look over your shoulder and see what you're doing).

SAVE ENTIRE WORKSHEET?: Press Y or N [RETURN]

If you answer "YES" here, your entire current worksheet will be saved. No other entries are necessary.

If you answer "NO", your screen will then display two sets of worksheet coordinates: The first set is the Row and Column designating the upper-left-corner Field of the portion of your current worksheet that you do wish to store. The second set is the Row and Column designating the lower-right-corner Field of the portion of the worksheet that you wish to store.

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If at any time you wish to abort the Save Worksheet process and instead go back into the active work area of the worksheet,

Press Function Key [F4 VOID]

and the Spreadsheet will return immediately to the Main Menu, without executing any of the instructions you have entered within the selections of the Save Worksheet Menu.

When you have saved all or any part of a worksheet into your computer's permanent memory, the Save Worksheet process does not clear that worksheet from the active work area of the Spreadsheet.

It is this feature that makes it so convenient to save parts of a worksheet as you build it. At each stage of completion, you can save what you've done to that point, and still retain it within the active work area of the program, which will allow you to continue entering data right where you left off.

When the Save Worksheet process has been executed, your display will automatically return to the Main Menu. To re-enter the current worksheet,

Press E W [RETURN]

and your display will return to the current worksheet, displaying the same portion of the worksheet that it last displayed, and returning the cursor to the exact position in which you last placed it.

LW

Program Function: THE MAIN MENU

LOAD WORKSHEET FROM FILE

Notation: Select this Option from the Spreadsheet Main Menu

Press L W [RETURN] and your screen will display:

Description:

```
Spreadsheet Calculator
LOAD WORKSHEET

              Data Volume Name   DATAMAX
              Worksheet File Name  PRIORITY-L
                     Password

                   Load at Row      1
                       Column       1

        Clear Existing Worksheet?   NO
        Replace Duplicate Fields?   NO
```

LOADING A WORKSHEET FROM A FILE

This is one of the most powerful and most creative options of the Spreadsheet program. It is also one of the most difficult options to describe thoroughly with respect to all of its variations.

At first glance, executing the Load Worksheet option appears to be the straightforward process of retrieving a previously-stored worksheet from a File in the computer's permanent memory.

That is the very simplest way of utilizing this option. The real power of this provision is that it also allows you to load one worksheet (or any part of one) onto another, to superimpose two or more worksheets together, and to create an entirely new worksheet by combining or reworking parts of the data from other worksheets into a new form.

In addition, the flexibility of the Load Worksheet option gives you the ability to retrieve a stored worksheet in its original form, but in doing so, direct the program to place the stored worksheet at some different location within the current worksheet format.

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In the next several pages, you will see how the flexibility of the Load Worksheet option is applied, by creating special examples. First, though, read through the description of each feature of the Load Worksheet Menu. The examples following will make the various features clearer as you work with them.

Whenever your screen is displaying the Main Menu, you can direct the Spreadsheet program to go to the Load Worksheet Menu by:

Pressing L W [RETURN]

DATA VOLUME NAME: Key in Volume Name and [RETURN]

This Label is limited to 8 characters. The Volume Name must be keyed in exactly as it was assigned when the worksheet you are now loading was stored in a memory File.

WORKSHEET FILE NAME: Key in Worksheet Name and [RETURN]

This Label is limited to 10 characters. Each worksheet has been stored by assigning to it a unique File Name (see the preceding Save Worksheet section). That name must be keyed in using the exact form under which the worksheet was stored.

PASSWORD: Key in Password, if any, and/or [RETURN]

If the worksheet you are loading from storage was assigned a password at the time of being stored, you must key in that exact password. This entry will be invisible when keyed in.

If no password was used at the time of storing the worksheet, you need only press [RETURN] and go on to the next line.

LOAD AT ROW :   Key in Row Number and [RETURN]
COLUMN: Key in Column Number and [RETURN]

It is here that you key in the position on the current worksheet that you wish the upper-left corner of the stored worksheet to begin. It is not as confusing as it may sound; and the examples will show you how to use this provision.

If you are retrieving a worksheet from storage to review it, or to make changes or update its data, you will almost always want to load it onto the screen just as it was originally created.

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In other words, you will want Row 1 Column 1 of the stored
worksheet to be loaded at Row 1 Column 1 on the display of the
current worksheet. Well, certainly you will. Why would you want
it any other way?

Suppose you want to retrieve a stored worksheet, but now you
want 5 new Rows and 2 new Columns at the beginning, so that
you can add new data or Labels in-front-of and on-top-of the
entire original worksheet. Just load the stored worksheet at
Row 6 Column 3; you'll have a new worksheet that is an exact
duplicate of the stored one, except that it will begin with some
new blank Rows and Columns.

Going one step further, you have just created a current work-
sheet that is 10 Rows deep and 10 Columns wide. Now you also
want to take a previously-stored worksheet and combine it with
the worksheet you've just created. Can you do that? Yes!

Load the stored worksheet at Row 12 Column 1. You will now
have placed it on your current worksheet, below all of your
other entries, with a blank Row between them for separation.
You have both worksheets together, one under the other.

If instead you load the stored worksheet at Row 1 Column 11,
you'll now have placed it just to the right of all the other data
on your current worksheet; and you'll have both worksheets
together, side by side.

What's more, you can now insert, delete, change or expand the
entries in both worksheets (since they are both now the current
worksheet), without those changes having any effect whatever
on the previously-stored worksheet. It is still stored in permanent
memory! You are only working with an exact copy of it.

CLEAR EXISTING WORKSHEET? : Press Y or N [RETURN]

If you elect to answer YES, this one is easy. Whatever you
have been working with as a current worksheet will now be
erased, and the previously-stored worksheet will be loaded
into the active work area and will become the current worksheet.

Keying in YES here is just a shortcut way of clearing off your
current worksheet, and then loading a different worksheet from
a storage File.

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If you elect to answer NO, then you still have a very simple situation provided that, as in the examples above, you are just adding one worksheet below or beside another. In that case, the two worksheets will simply combine as one. You are saying, when you answer NO, "Hold onto the current worksheet while I add another one from storage alongside it."

The problem, and the great power of this option occurs when you are bringing together two different worksheets, each of which occupies some of the same Fields as the other. In other words, they overlap each other.

If you answer NO in this situation, and really do want the two worksheets to overlap, you must decide which one of the two overlapping areas will survive. Since you cannot have more than one entry in any one Field, the overlapping area of one of your worksheets must be given a higher priority than the other.

REPLACE DUPLICATE FIELDS?: Press Y or N [RETURN]

This is where you make the decision of which of the two worksheets has priority:

If you answer NO here, then the current worksheet (or the one first retrieved from storage if there was no current worksheet) will remain with all of its entries intact; and the overlapping area of the second worksheet will not be copied over into the current worksheet.

If you answer YES here, the situation will be reversed. Now the second worksheet has priority, and its data will replace the entries of the first worksheet in any overlapping area.

Remember, this is one of the most difficult parts of the program to thoroughly understand. Yet it offers you some incredibly creative possibilities in merging parts of other worksheets into an entirely new form and allowing one worksheet to interact with one or more others.
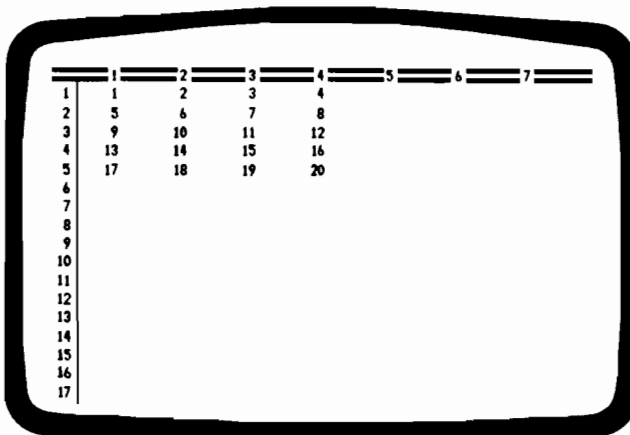
Can you combine more than two worksheets together? Of course. Can you store part of a current worksheet in a dummy File, then load another worksheet from storage in its place, and finally retrieve the dummy-File data and reload it beside the other two? Absolutely.

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This is one of the few times when, in order to understand some function of the Spreadsheet program, you must create a worksheet (in this case two small ones) and just play around with it until you do become comfortable with the many variations of its use.

It may take some time, and require some experimentation, for you to learn all that you can do with this option. It's worth it!
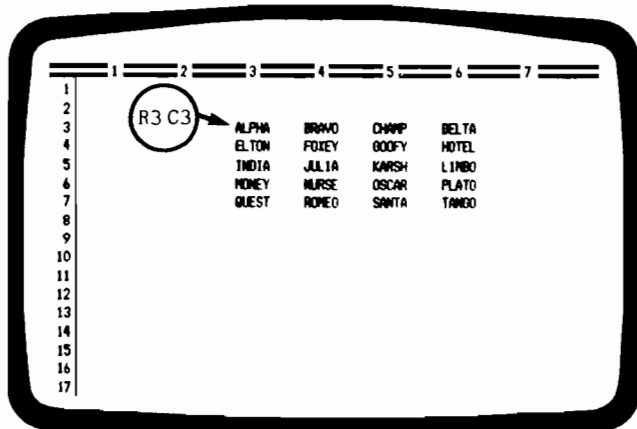
Please create and store, with the Save Worksheet option, both of the worksheets illustrated below, exactly as they appear.

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

Worksheet File Name:

WKSHT-1

Worksheet File Name:

WKSHT-2

	1	2	3	4	5	6	7
1							
2							
3	R3 C3 → ALPHA	BRAVO	CHAMP	DELTA			
4	ELTON	FOXEY	GOOFY	HOTEL			
5	INDIA	JULIA	KARSH	LIMBO			
6	MONEY	NURSE	OSCAR	PLATO			
7	QUEST	ROMEO	SANTA	TANGO			
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							

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Now you have both of those worksheets saved in the permanent memory of your computer, right? It doesn't matter what order you saved them in (as long as you gave them the File Names correctly), and it doesn't matter what is on your current worksheet now.

First, retrieve WKSHT-1 by going to the Main Menu and Keying:

Load Worksheet from File	Key: L W
Go to Load Worksheet Menu	[RETURN]
Data Volume Name	(your vol. name) [RETURN]
Worksheet File Name	WKSHT-1 [RETURN]
Password (none)	[RETURN]
Load at Row 1 (Yes)	[RETURN]
Load at Column 1 (Yes)	[RETURN]
Clear Existing Worksheet? (Yes)	[RETURN]

Whatever was in the current worksheet area has been erased, and WKSHT-1 is now loaded as the current worksheet. Enter the worksheet if you wish, to make sure that WKSHT-1 is correctly displayed.

Good. Now exit back to the Main Menu to load WKSHT-2 right on top of WKSHT-1. This time, however, you are not going to clear the existing worksheet, and you are not going to replace duplicate Fields. You are going to give priority to the data in WKSHT-1.

Load Worksheet from File	Key: L W
Go to Load Worksheet Menu	[RETURN]
Data Volume Name	(your vol. name) [RETURN]
Worksheet File Name	WKSHT-2 [RETURN]
Password (none)	[RETURN]
Load at Row 1 (Yes)	[RETURN]
Load at Column 1 (Yes)	[RETURN]
Clear Existing Worksheet?	NO [RETURN]
Replace Duplicate Fields?	NO [RETURN]

```
    ═══1═══2═══3═══4═══5═══6═══7═══
 1 │  1      2      3      4
 2 │  5      6      7      8
 3 │  9     10     11     12    CHAMP   DELTA
 4 │ 13     14     15     16    GOOFY   HOTEL
 5 │ 17     18     19     20    KARSH   LIMBO
 6 │              MONEY   NURSE  OSCAR   PLATO
 7 │              QUEST   ROMEO  SANTA   TANGO
 8 │
 9 │
10 │
11 │
12 │
13 │
14 │
15 │
16 │
17 │
```

When you re-enter the worksheet area, your display should match the illustration above. If it doesn't, please go back and do it over.

What has happened? You have merged two worksheets, and have merged them in their original positions on the current worksheet, so that one partially overlapped the other.

You have also given WKSHT-1 priority: you have said, in effect, that the data in WKSHT-1 is more important than the overlapping data in WKSHT-2, and by instructing the program not to replace duplicate Fields when loading WKSHT-2 you have made sure that all the data in WKSHT-1 will remain intact, no matter what is contained in WKSHT-2.

What if you want to reverse that situation? Exit from the current worksheet back to the Main Menu. Repeat exactly the keying at the top of the last page, which will erase all of the current worksheet, and load WKSHT-1 , by itself, as the current worksheet.

As soon as you have done that, repeat all but the last of the keying instructions for loading WKSHT-2. This time, when you are asked:

Replace Duplicate Fields? key in YES [RETURN]

You have done everything just as before, except that you have given WKSHT-2 priority this time. At any Field where WKSHT-2 overlapped WKSHT-1, you have instructed the program to erase the data in that Field and replace it with the data from WKSHT-2.

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```
━━━1━━━2━━━3━━━4━━━5━━━6━━━7━━
 1│  1     2     3     4
 2│  5     6     7     8
 3│  9    10   ALPHA  BRAVO  CHAMP  DELTA
 4│ 13    14   ELTON  FOXEY  GOOFY  HOTEL
 5│ 17    18   INDIA  JULIA  KARSH  LIMBO
 6│             MONEY  NURSE  OSCAR  PLATO
 7│             GUEST  ROMEO  SANTA  TANGO
 8│
 9│
10│
11│
12│
13│
14│
15│
16│
17│
```

As you can see from the illustration above, you have exactly the opposite result that you obtained in the prior example.

What if you want to retain all the data in both worksheets? That's simple. Look at the above illustration again: Do you see that, if you erase everything and then load WKSHT-1 just as you have twice before, you can load WKSHT-2 under it or beside it and retain all of both of them.

If you move WKSHT-2 down 3 Rows when you load it, you can begin it in any Column without overlapping WKSHT-1.

Or, if you move WKSHT-2 to the right 2 Columns when you load it, you can begin it in any Row without overlapping WKSHT-1.

Just go back once again to the Main Menu. Load WKSHT-1 as you have before, following the keying instructions at the top of page T-18. When you load WKSHT-2 this time, repeat the keying at the bottom of the same page, except for the beginning Row and Column:

Load at Row 4 [RETURN] Column 2 [RETURN]

In this case, you have many other choices of position; but the instruction above will merge the two worksheets to match the current worksheet that will result as shown at the top of the next page.

```
       1      2      3      4      5      6      7
  1    1      2      3      4
  2    5      6      7      8
  3    9     10     11     12
  4   13     14     15     16
  5   17     18     19     20
  6                        ALPHA  BRAVO  CHAMP  DELTA
  7                        ELTON  FOXEY  GOOFY  HOTEL
  8                        INDIA  JULIA  KARSH  LIMBO
  9                        MONEY  NURSE  OSCAR  PLATO
 10                        QUEST  ROMEO  SANTA  TANGO
 11
 12
 13
 14
 15
 16
 17
```

The number of variations in the loading and merging of multiple worksheets is unlimited. It is at this point that you will learn about those variations in the most productive way if you will take the time to experiment with combining different parts of many worksheets in a number of different ways.

Remember that each time you load a worksheet from storage, you are only retrieving a copy of it. The original is till stored intact. You can, therefore, experiment as much as you wish without fear of losing any part of a previously-stored worksheet.

There is one other similar provision in the Spreadsheet program for bringing data from two different worksheets together. When you want to bring out only a few Fields of data from a stored worksheet to include in a current worksheet (as an entry, or part of a formula), you can use the FILE function of the Spreadsheet, which you will find described in the Functions and Capabilities portion of this Reference Section, listed under FILE.

Program Function:　　　THE MAIN MENU

PRINT WORKSHEET

Notation:　　Select this Option from the Spreadsheet Main Menu

Press P W [RETURN] and your screen will display:

Description:

```
Spreadsheet Calculator
PRINT WORKSHEET
              Printer or Print File Name   PRINTER:

                          Page Width   132
                        Line Spacing   1
               Additional Left Margin

                          Main Title   WORKSHEET
                           Sub Title   SAMPLE

        Print Titles on Every Page?   YES
              Print Page Numbers?   YES
             Print Date in Heading?   YES
                List Field Contents?   NO
           Print Entire Worksheet?   NO

               Print Row  4 Column   2
              thru Row 20 Column   8
```
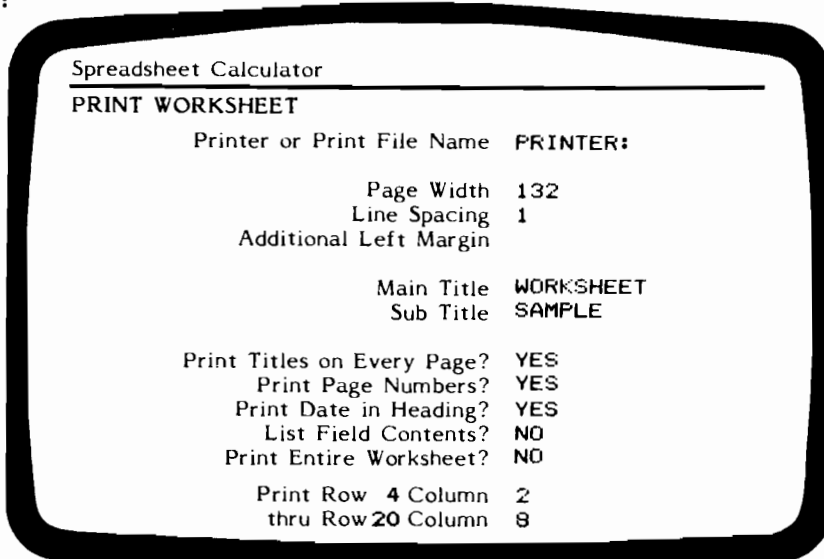
PRINTING A WORKSHEET

The Print Worksheet option of the Spreadsheet will allow you to produce an exact image of all the data contained in a worksheet, in whatever mode of display you have chosen (Values, Formulas, Graphics) or in the form of a listing of the contents of each Field.

This option will also allow you to control the width of the printed information, its spacing, and its position on the page with respect to the left margin.

Titles, sub-titles, page numbers and dates can be inserted at the time of printing the worksheet. The only parts of the worksheet that do not print exactly as displayed are the Row and Column numbers.

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The Print Worksheet option always refers to the current worksheet, which is the worksheet that would be displayed (at least in part) if you were to enter the active work area of the Spreadsheet by keying E W and pressing [RETURN].

If you wish to print a previously-stored worksheet, you must first retrieve that worksheet from storage using the Load Worksheet option of the program, which will return you to the Main Menu when finished.

If you wish to print a worksheet that you have just created, one that is still retained as the current worksheet in the active work area, you must return to the Spreadsheet's Main Menu by use of the function key [F3 Done].

As soon as you are back at the Main Menu, you can then direct the program to display the Print Worksheet Menu by:

Pressing P W [RETURN]

After each entry is keyed into the Print Worksheet Menu, press [RETURN] to move the cursor down to the next entry. Where you see an entry preset, and do not wish to change it, just press [RETURN] to move on to the next entry line.

PRINTER or PRINT FILE NAME:

Refer to the Guide to Operations for your printing unit and your operating system, for the correct entry to key in here. There may be a special Label designation (such as Printer) that is used by your computer to specify a particular printing unit that you wish to use.

PAGE WIDTH:

The page width is pre-set to a standard 132-character line width. In some cases, this specification may be controlled by your own printing hardware. Otherwise, you can specify the width of the printed image so that you can control the split of Columns in the same way that you control the printing of a Row to advance to the top of a new page. Controlling the width, and thus the number of Columns that will be printed on a given page, ensure that the final printout will be as attractive and effective as possible.

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LINE SPACING:

The line spacing is pre-set to a single-space format. Should you wish the printout to space lines farther apart, you can specify any degree of separation from 1-to-9.

ADDITIONAL LEFT MARGIN:

Your printing unit will have a standard setting for the position of the left margin of the printout. If you want to add more width to the left margin, you can shift the left margin to the right in one-character increments up to 99 characters.

MAIN TITLE:

No main title is required to print a worksheet. If you do not want a main title, just bypass this option by pressing [RETURN]. When you do wish a main title, you can key in up to 40 characters here.

SUB-TITLE:

The sub-title option works in the same way as the main title. If you want to include a sub-title in the printout, you can key in up to 40 characters. Or bypass the option by pressing [RETURN].

PRINT TITLES on EVERY PAGE:

This option is pre-set to NO. If you want main and sub-titles to be printed at the top of each page, key in Y and press [RETURN].

PRINT PAGE NUMBERS?:

This option is pre-set to NO. If you want page numbers to be printed on each page, key in Y and press [RETURN].

PRINT DATE in HEADING?:

This option is also pre-set to NO. If you want the current date to print in the top right corner of your printout, key in Y and press [RETURN]. In order for this option to be executed, there must be some provision within your computer system to provide for date entry and retrieval.

LIST FIELD CONTENTS? :

This is a very special option. Keying in YES here will change the entire printout: instead of reproducing the worksheet just as you created it, this option provides a listing of the contents of each Field by Row and Column number. Where you have entered some particular number as a Value in a Field, it will print that number; but wherever you have entered a formula as a Value, the listing will print only the formula, rather than any result that the screen displayed.

The illustration below shows a part of the printout of the worksheet that you created on page 59 of the first section of this manual. If you compare the listing below with the illustration on page 59, you will better understand how this option works.

One of the most important uses of this option is to provide an exact record of the way in which a particular worksheet has been created. Should you wish to erase a worksheet from storage in order to conserve the storage capacity of your computer system, a printout in this form will enable you to recreate the worksheet at some later time with minimum effort.

```
Row  1  Column  1  Label: EXPENSE           Row   6  Column  1  Label: HOUSING
Row  1  Column  2  Label: JANUARY           Row   6  Column  2  Value: 26400
Row  1  Column  3  Label: FEBRUARY          Row   6  Column  3  Value: 1.1 * C-1
Row  1  Column  4  Label: MARCH             Row   6  Column  4  Value: 1.1 * C-1
Row  1  Column  5  Label: APRIL             Row   6  Column  5  Value: 1.1 * C-1
Row  1  Column  6  Label: MAY               Row   6  Column  6  Value: 1.1 * C-1
Row  1  Column  7  Label: JUNE              Row   6  Column  7  Value: 1.1 * C-1
Row  2  Column  1  Label: ITEM              Row   7  Column  1  Label: Utilities.
Row  2  Column  2  Label: 1982              Row   7  Column  2  Value: +R-1 / 12
Row  2  Column  3  Label: 1982              Row   7  Column  3  Value: +R-1 / 12
Row  2  Column  4  Label: 1982              Row   7  Column  4  Value: +R-1 / 12
Row  2  Column  5  Label: 1982              Row   7  Column  5  Value: +R-1 / 12
Row  2  Column  6  Label: 1982              Row   7  Column  6  Value: +R-1 / 12
Row  2  Column  7  Label: 1982              Row   7  Column  7  Value: +R-1 / 12
Row  3  Column  1  Label:  -                Row   9  Column  1  Label:  -
Row  3  Column  2  Label:  -                Row   9  Column  2  Label:  -
Row  3  Column  3  Label:  -                Row   9  Column  3  Label:  -
Row  3  Column  4  Label:  -                Row   9  Column  4  Label:  -
Row  3  Column  5  Label:  -                Row   9  Column  5  Label:  -
Row  3  Column  6  Label:  -                Row   9  Column  6  Label:  -
Row  3  Column  7  Label:  -                Row   9  Column  7  Label:  -
Row  4  Column  1  Label: TRANSPORTATION    Row  10  Column  1  Label: Monthly Totals
Row  4  Column  2  Value: 26400             Row  10  Column  2  Value: +SUM (R4..R8)
Row  4  Column  3  Value: 1.1 * C2          Row  10  Column  3  Value: +SUM (R4..R8)
Row  4  Column  4  Value: 1.1 * C2          Row  10  Column  4  Value: +SUM (R4..R8)
Row  4  Column  5  Value: 1.1 * C2          Row  10  Column  5  Value: +SUM (R4..R8)
Row  4  Column  6  Value: 1.1 * C2          Row  10  Column  6  Value: +SUM (R4..R8)
Row  4  Column  7  Value: 1.1 * C2          Row  10  Column  7  Value: +SUM (R4..R8)
```

PRINT ENTIRE WORKSHEET?:

> This option, unlike the four above it, is pre-set to YES , since it is assumed that in most cases you will want to print the entire worksheet. If you do want the whole worksheet to be printed, this will be the final option your screen will display. When you accept the YES that is already keyed in, and press [RETURN], the printout will begin.

> If you do not want a printout of the entire worksheet, key in NO and press [RETURN]. Two additional lines will appear on your screen which will allow you to key in two sets of coordinates from your worksheet.

> The first set is the Row and Column designating the location of the upper-left-corner Field of that portion of the worksheet that you wish to begin the printout. The second set is the Row and Column designating the lower-right-corner-Field of that portion of the worksheet that you wish to end the printout.

> In either case, as soon as the actual printout of the worksheet begins, the cursor will move to the bottom of your screen, and you will see displayed in the lower left corner the message:

> Worksheet Printout in Progress

If at any time you wish to abort the Print Worksheet process and instead go back into the active work area of the worksheet,

Press Function Key [F4 VOID]

and the Spreadsheet will return you to the Main Menu, without causing any printout of the current worksheet. You may then re-enter your worksheet, or select any other option from the Main Menu.

Printing your current worksheet will not erase it from the active work area. When the Print Worksheet process has been completed, your display will automatically return to the Main Menu, where you can re-enter the worksheet by:

Pressing E W [RETURN]

Your display will return now to the same portion of the worksheet that was last displayed, with the cursor in the position in which you last placed it.   The relative position of the display, and the location of the cursor, at the time you exit from the worksheet to actuate the printout have no effect whatever on the printout.

The printout of a worksheet will always begin at Row 1 Column 1, unless you specifically instruct the program to do otherwise.

Remember, you can execute the printout of your worksheet in any mode you wish, through the use of the [F5 Change Format] function of the program.   You can print a worksheet with Values, with Formulas, with Graphics, or with any combination of those that you create in a worksheet, as it is displayed at the time of the printout.

Then, if you wish, you can re-enter the worksheet, change the mode of display of all or part of the worksheet, and print it out again as a different version.

SPECIAL NOTE:

When you wish to have the printout of a worksheet end a page with a particular Row of data, and begin the next page of the printout with the next Row, you can provide for that at the time you create the worksheet through the use of the [F5 Change Format] function:

Press Function Key [F5] , select Row: press R and [RETURN]

With the cursor placed anywhere along the Row with which you wish to begin a page, move through the selections offered on the Edit Line until you come to the last selection:

Advance to New Page when Printing Row?

Key in YES and press [RETURN].   When that worksheet is printed at some later time, the printout will end the printing of the current page with the data in the previous Row, and begin the next page with the designated Row.

END

Program Function: THE MAIN MENU

DONE WITH SPREADSHEET CALCULATOR

Notation: Select this Option from the Spreadsheet Main Menu

Press E N D [RETURN] and your screen will display:

Warning - Worksheet Not Saved:

Save Worksheet or Re-Enter END

Description:

This is the place where your use of the Spreadsheet program ends. When you are through with the Spreadsheet Calculator, and have exited from the worksheet to the Main Menu, you end the program by:

Pressing E N D and [RETURN]

Ending the program will not affect any worksheets that you have previously stored using the Save Worksheet option. They will remain in the permanent memory of your computer.

Ending the program will erase, however, all data that is in the current work area. If you have just created a worksheet, and have not saved it, ending the program will erase that worksheet.

For that reason, if you are not saving the Current Worksheet, the first time you key in E N D and then press [RETURN], the program wants you to be sure that you are not erasing valuable data that you really do want preserved. Rather than ending the program at this point, therefore, the cursor will move to the lower-right-hand corner of your screen, and the bottom of the screen will then display:

Warning - Worksheet Not Saved:

Save Worksheet or Re-Enter E N D

When you now press [RETURN] the cursor moves back into the Main Menu. You may now still save, print or re-enter the worksheet. If you do wish to end the Spreadsheet program at this point:

Press E N D and [RETURN] once again.

Program Function: SPREADSHEET TERMINOLOGY

Defining the Basic Terms of the Program

Description:

An ENTRY is a VALUE when it <u>begins</u>: with the numbers 0 thru 9
with a plus or minus sign
with a left parenthesis
with a decimal-point.

An ENTRY is a LABEL when it begins with anything else.

A VALUE is any: Number, Coordinate, Formula, Label Reference or
any expression that <u>evaluates</u> to a Value.

<u>Examples:</u>   2175
R3 C7
SUM (R2 C3 .. R8 C3 , R9 C6)
R4 C6 + 'GROSS INCOME'
– 2163
ABS (R2 C5)
2 * SUM (R2 .. R6) + 750 / 12

A RANGE is any: Range of Coordinates or Label References.

<u>Examples:</u>   R2 .. R8
R3 C3 .. R6 C5
'JANUARY' .. 'DECEMBER'
C5 .. C9
'NET INCOME' .. 'EXPENSE'

A LIST is any: Listing in Series of Values and/or Ranges in any of
the above forms; <u>must be separated by commas.</u>

<u>Examples:</u>   10, 20, 30, 40
R3, R4, R7 .. R9, R18 .. R21, R32
R3C7, SUM(R4 .. R6), R9 .. R22
R4, R6 + R8, GROW (R3C3 .. R7C3)

It is important to remember that a List can include
one or more Ranges as items within the List.

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COORDINATES: A shorthand way of finding your way around all the positions of the worksheet in which entries can be made. The fifth Row down and second Column over is not always Row 5 Column 2.

But Row 5 Column 2 can always be called R5 C2.

There are Absolute Coordinates : R5 C2 absolutely gives you the Coordinates of Row 5 Column 2.

There are Relative Coordinates : They always refer to a Row or Column, not by its own Coordinates, but by Coordinates that are relative to the Row or the Column that the Coordinates are referenced to.

C-1 is a Relative Coordinate that refers to a Field in a Column that is one-Column-less-than the actual Column where the entry has been made.

R-1 is a Relative Coordinate that refers to a Field in a Row that is one-Row-less-than the actual Row where the entry has been made.

There are, finally, Single Coordinates : They are used to designate one Coordinate, while the second of the Coordinates is assumed.

R 3 , if used by itself, designates the position of the Field in Row 3 that is in the same Column as that where the entry has been made.

C 4, if used by itself, designates the position of the Field in Column 4 that is in the same Row as that where the entry has been made.

CURRENT
FIELD: The one you are working in right now. There are hundreds of Fields within a worksheet — yet only one, the one you are working in right now, is the Current Field. It also is always the Field where your cursor is displayed, and therefore the only Field within the worksheet where you are able to operate right now.

Program Function: PRESET CONDITIONS or DEFAULT SETTINGS

Notation: These are the standard Spreadsheet settings that are put into effect automatically each time you begin a new worksheet. Any of these settings can be altered by utilization of the [F5 Change Format] function.

Description:

Column Width.. 10 Characters.

Numeric Display .... 9 Characters.

                    (Values exceeding 9 characters display as *******).

Display Mode (Values, Formulas or Graphics) .... Values.

Text Display .... 10 Characters.

                    (Labels exceeding 10 characters display first 10 characters).

Number of Decimal Places .... Floating Decimal Point.

Value Justification .... Right Justified.

Label Justification .... Left Justified.

Automatic or Manual Calculations .... Automatic.

Calculation Order (Row or Column) .... Row.

Automatic Cursor Advance.................................. No.

Insert Commas in Values.................................. No.

Protect Field Contents .... No.

Supress Row Print .... No.

Supress Field Print..................................... No.

Supress Column Print.................................... No.

Advance to New Page when Printing Row .... No.

Program Function: MATHEMATICAL OPERATIONS

and

ORDER of CALCULATION

Description:

ADDITION: The addition process is always signified by keying in a plus-sign, + , as in $2+3$.

SUBTRACTION: The process of subtraction is signified by keying in a minus-sign, − , as in $16-9$.

MULTIPLICATION: To signify multiplication, an asterisk, * , is keyed in between the multiplier and the multiplicand:

4 times 5 is keyed in as $4*5$.

DIVISION: The symbol that signifies division is a slant, / .

18 divided by 3 is keyed in as $18/3$.

POWER - y^x :   Exponentiation: Raising A Number To A Power:

To raise y to the x power:

Key in y followed by a carat, followed by x.

2^3 is keyed in as $2\wedge 3$.

The order of calculation within an expression or formula is always from left to right. This process will occasionally conflict with traditional mathematical convention, yet is necessitated by the program operating system.

Examples: $7+5 * 3+1$ returns a result of 37.

$(7+5)* 3+1$ returns a result of 37.

$7+5 *(3+1)$ returns a result of 48.

$7+(5*3)+1$ returns a result of 23.

$(7+5)*(3+1)$ returns a result of 48.

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Program Function: LABEL REFERENCES

```
    ══════1══════════════2══════════════3══════4═════5════
  1│                  1982           1983            DOLLAR INCREASE
  2│                ------------------- ------------------- -------------------
  3│
  4│GROSS SALES      76,500.00       86,800.00          10,300.00
  5│
  6│Net Profit       18,650.00       31,500.00          12,850.00
  7│
  8│                ---------------------------------------
  9│
 10│Promotion:       11,475.00       15,624.00           4,149.00
 11│
 12│Taxes Due:        3,730.00        7,560.00           3,830.00
 13│
 14│
 15│
 16│
 17│
```

You can utilize Label References in your worksheet, in the same way that you refer to Fields by their coordinates of Row and Column.

1. If the Label is located in Column 1 of Row n , then the Value in the Current Column of Row n will be returned.

2. If the Label is located anywhere else, say in Column x Row n , then the Value in the Current Row of Column x will be returned.

The Label Reference must be entered with quotation marks: When the Label Net Profit is referenced, it must be keyed in as 'Net Profit' . Otherwise the entry will be considered an invalid expression.

In the illustration above, Label References were used as formulas in eight of the Fields shown. A list of those formulas showing the Fields in which they were entered should help familiarize you with the use of Label References as an alternate way of description.

Row 10 Column 2:   .15 * 'GROSS SALES'
Row 12 Column 2:   .20 * 'Net Profit'
Row 10 Column 3:   .18 * 'GROSS SALES'
Row 12 Column 3:   .24 * 'Net Profit'
Rows 4, 6, 10, 12 of Column 5:   + '1983' − '1982'

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Function Keys

F1	MOVE CURSOR	**F5**	CHANGE FORMAT
F2	EDIT FIELD	**F6**	INSERT / DELETE
F3	DONE – CALCULATE	**F7**	MOVE FIELDS
F4	RECALCULATE – VOID	**F8**	COPY FIELDS

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Program Function: [F1]   MOVE CURSOR

Notation: Pressing [F1] will display on the Edit Line:

Move to Coordinate, Label or Other Window ? (C, L, or W)

Description: MOVING THE CURSOR

When you want to move the cursor to a Coordinate:

Press C and then [RETURN]

The Edit Line will then direct you to key in the Row number and Column number of the Field in which you want the cursor.

You may also use this option to enter an area of the worksheet that you have Title-Locked. This is the only method of gaining access to Fields that are Title-Locked to change the contents of the entries in those Fields.

When you want to move the cursor to a Label:

Press L and then [RETURN]

The Edit Line will then direct you to key in the exact Label of the Field in which you want to place the cursor.

As explained above, this option will allow you to enter an area that is Title-Locked, either by Coordinate or Label.

If there are two or more identical Labels in your worksheet, the cursor will move to the Label located in the lowest-numbered Row (following the order of Row then Column).

A bit of experimentation on a sample worksheet will help here.

When you want to move the cursor to the Other Window:

Press W and then [RETURN]

The cursor will then move to the other window of the worksheet, to the Field it previously occupied in that window. The process of keying [F1] W [RETURN] is repeated each time you want to move the cursor from one window to the other.

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Program Function: [F2] EDIT FIELD

Notation: Press [F2]

All data previously entered in the Current Field will now be displayed full-length on the Edit Line.

Description: EDITING FIELDS

When you wish to alter or review the contents of a Field, but do not wish to replace the entire entry in that Field, the [F2 Edit Field] option can be used to place the entry on the Edit Line, where it can be revised to any degree desired and then re-entered.

Often it is desirable to review an entry that is too long to be fully displayed in its Field because of the Column Width of that Field. Keying [F2] will display the entry, to a maximum of 80 characters, on the Edit Line. If no revision is desired, pressing either [F4 Void] or [RETURN] will remove the entry from the Edit Line and return the cursor to that Field.

When [F2 Edit Field] is used for editing an entry, the edited data may be compared to the original form of the entry, which will remain displayed (to a maximum of 40 characters) at the top of your screen until you press [RETURN] and enter the edited data into the Current Field.

During editing, characters may be inserted and deleted, and any part or all of the entry can be overwritten. The cursor may be moved through the entry by use of the arrow [➞] keys, and editing can be done by keying in new data over the original entry.

Program Function: [F3]   DONE

                          [F3]   CALCULATE

Notation: [F3] is a <u>Dual-Purpose</u> Function Key.

                    Its function at a particular time is controlled
                    by the operating mode of the Spreadsheet program.

Description:

THE [F3] DONE FUNCTION

The primary purpose of [F3 Done] is to exit from the active work area of the Spreadsheet to the Main Menu of the program.

When your screen is displaying a worksheet, and you wish to return to the Main Menu in order to:

> Clear the Worksheet
> Save Worksheet in File
> Load Worksheet from File
> Print the Worksheet
> End Spreadsheet Program

pressing [F3 Done] will move your display from the worksheet to the Main Menu. The worksheet will not be disturbed in any way by this operation. Should you then wish to re-enter the Current Worksheet from the Main Menu, pressing <u>E</u> <u>W</u> [RETURN] will return the display to the same portion of the worksheet that was displayed at the time of exiting, with the cursor located in the same Field in which you last placed it.

There is an additional use that can be made of [F3 Done]. If you are moving through the long series of formatting options that is offered by the [F5 Change Format] function key, and you are making use of only a few options at the beginning of the series, you can use [F3 Done] <u>to exit from the series at any time,</u> rather than having to key on through the end of the series.

[F3 Calculate] is described on the following page.

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THE [F3] CALCULATE FUNCTION

There is a stand-alone full function mathematical calculator included in the Spreadsheet program, which uses all of the power and flexibility that are inherent in the program itself.

[F3 Calculate] is the function key that activates the calculator. It can operate as an entity completely separate from the worksheet; or it can be used to pre-figure or test data to be entered into the worksheet.

To use it as a stand-alone calculator, simply key in any data you wish to calculate, just as you would if you were keying in an entry on the worksheet itself. You may make Label References or refer to any Field of the worksheet by its Coordinates, include Formulas, and use all the Spreadsheet functions as part of your data. You can key in up to 80 characters for any single calculation.

When you have keyed in all the data, and see it correctly displayed on the Edit Line, press [F3 Calculate], which will appear at the bottom of your screen as soon as you key in any beginning character which designates the data following on the Edit Line as a Value.

Shortly after you press [F3 Calculate], the result of calculating the data displayed on the Edit Line will be displayed in the bottom-left-hand corner of your screen. The cursor will move to the lower-right corner of the screen, and remain there.

Now what? When you press [RETURN] the cursor will move back to the first-character position on the Edit Line. You can now do any one of three things: Enter that result on the worksheet, by pressing [RETURN] once more. Alter the existing data or key in new data on the Edit Line. Remove the data and the calculated result completely by pressing [F4 Void].

If you wish to use only the result of a calculation, as part of an additional series of data, you simply return the cursor to the start of the Edit Line as soon as the calculated result is displayed at the very bottom of the screen (by pressing the [RETURN] key), then key in the result of the calculation at the beginning of the Edit Line, and follow that with the rest of the data you wish to add.

[F3 Calculate] is thus both separate, and a part of, the program.

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Program Function: [F4] RECALCULATE

[F4] VOID

Notation: [F4] is a <u>Dual-Purpose</u> Function Key.

Its function at a particular time is controlled by
the operating mode of the Spreadsheet program.

Description:

THE [F4] RECALCULATE FUNCTION

When the Spreadsheet program is set to automatically calculate
(which is one of its normal pre-set conditions), each new entry you make
will cause <u>most of the worksheet</u> to be recalculated. As a new entry
is made, the worksheet will be automatically recalculated, <u>but only</u>
<u>down-and-to-the-right</u> of the Field in which the entry is placed.

Several conditions can occur in which the automatic recalculation
feature of the Spreadsheet may, therefore, be neither desirable nor
sufficient. It is those conditions for which the [F4 Recalculate]
function provides the solution:

1   Whenever you make an entry in a worksheet that affects some
portion of the worksheet <u>above and/or to-the-left</u> of the Field in which
that entry is made, the Spreadsheet <u>will not automatically recalculate</u>
the affected part of the worksheet that is above and/or to-the-left.

If, however, after making that entry, you press [F4 Recalculate],
then the <u>entire worksheet</u> will be recalculated, and all the Fields
affected by that entry will be correctly altered.

2   When you are Copying Fields, and are using the [F8 Copy Fields]
function of the Spreadsheet to extend Formulas or other Values from
one area of the worksheet to another, the copying process may affect
other areas of the worksheet. The Spreadsheet <u>does not automatically</u>
<u>recalculate a worksheet after Copying Fields</u>.

Just as in the situation above, if you press [F4 Recalculate]
after Copying Fields, the entire worksheet will be recalculated, and
all affected Fields will have their entries corrected.

3 When you are creating a large worksheet with a great deal of data, or re-entering new data into many Fields of a prior worksheet, you will find that making new entries often becomes a frustratingly slow process. Each time you make an entry, you must wait until the program completes its automatic recalculation of the worksheet before you can make the next entry.   There must be a faster way.

Unless you need to see the way in which each new entry affects the rest of the worksheet, use the [F5 Change Format] function of the Spreadsheet to set the calculation option from automatic over to manual.

This will allow you to make any number of entries you wish, one right after the other, without any calculations being made within the worksheet.   You are simply entering data.   You will find that the process of entering data will be tremendously speeded-up by not having to wait for the program to recalculate between entries.

At any time you wish, though, you can cause the worksheet to be recalculated up to the present point of data entry, simply by pressing [F4 Recalculate].   This allows you to see how your data affects the rest of the worksheet whenever you choose, yet offers the quickest way of working with the program the rest of the time.

4 Once in a while, in order to correctly recalculate all the Fields of a worksheet, it will be necessary for you to press [F4 Recalculate] one time, and then a second time directly following.

If you make an entry that affects a Field above it, and the data in the upper Field likewise affects a Field above it, then you will have to press [F4 Recalculate] once to correct the data in the first Field above your new entry, and press [F4 Recalculate] again to correct the data in the second Field above your entry.

If you are ever in the slightest doubt that all of the Fields of a worksheet have been correctly recalculated, simply repeat the process [F4 Recalculate] to ensure that recalculation is current and complete.

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Program Function: [F4] VOID

                                [F4] RECALCULATE

Notation: [F4] is a Dual-Purpose Function Key

Its function at a particular time is controlled by
the operating mode of the Spreadsheet program.

Description:

THE [F4] VOID FUNCTION

The purpose of the [F4 Void] function is to allow you to abort
all or part of a number of operations within the Spreadsheet program.

If you have keyed in data on the Edit Line of the worksheet, and
wish to cancel all of that data, rather than enter it, and at the same
time return the cursor to the Current Field of the worksheet, simply
press [F4 Void].

If you have utilized any of the Function Keys, and wish to cancel
whatever selections you have made among the options offered by the
Function Keys, pressing [F4 Void] will return you to the active work
area without executing any of those selections.

If you are in the process of moving through the selections on the
Save Worksheet Menu, the Load Worksheet Menu, or the Print Worksheet
Menu, you can exit from those menus back to the Main Menu of the
Spreadsheet program without activating any of your selections just by
pressing [F4 Void].

One notable use of this function: If you have begun the process
to Clear Worksheet (in other words, erase it), and have already keyed
in YES when your screen displays Are You Sure?, you can still abort
the erasure process, should you suddenly discover you are about to
make a big mistake, so long as you have not pressed [RETURN], by
instead pressing [F4 Void].

Whenever the [F4 Void] function is available to you, you will
see it displayed at the bottom of your screen.

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Program Function: [F5]   CHANGE   FORMAT

Notation: Press   [F5]   The Edit Line will display:

Field, Row, Column, Global, Window, Titles, or Sort?

Select Area of the Worksheet to be Affected:

Description:

FIELD: Press   F   [RETURN]

The Current Field, in which the cursor is positioned at the time of keying [F5], is the only Field of the worksheet that will be affected by changes made under this option.

ROW: Press   R   [RETURN]

The entire Row in which the cursor is positioned will be affected by format changes made under this option.

EXCEPT: Prior or subsequent format changes made to a specific Field will not be affected by Row alterations.

COLUMN: Press   C   [RETURN]

Format changes made under the Column option will affect all Rows of the Column in which the cursor is positioned.

EXCEPT: Prior or subsequent format changes made to a specific Field or Row will not be affected by Column alterations.

GLOBAL: Press   G   [RETURN]

Changes in format made under the Global option will affect the entire worksheet, regardless of the cursor's location.

EXCEPT: Prior or subsequent format changes made to a specific Field, Row or Column will not be affected by Global alterations.

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Program Function: COLUMN WIDTH

Press [F5 Change Format]

Notation: This option is available for:

Column, Global

Press: C or G [RETURN]

Description:

CHANGING COLUMN WIDTH

Range: from 2 to 76 characters wide

Whenever you first enter an empty worksheet, all of the Columns will be pre-set to a width of 10 characters. Any Columns into which data is entered will retain that width unless one or more Columns are altered by use of the [F5 Change Format] function.

A Column will display Labels to its full width, but will display Values to one character less than its full width. This provision allows titles and other text to run all the way across a Column; yet it also provides a one-character buffer between Columns so that numerical entries do not run into each other.

By pressing [F5] and selecting Global, all of the worksheet's Columns can be set simultaneously to any width desired, with a minimum of 2 characters and a maximum of 76 characters. When altering Column width Globally, it does not matter in which Field the cursor is located.

By pressing [F5] and selecting Column, only the width of the Current Column, containing the cursor, will be affected. Altering the width of any single Column will take priority over Global settings; and further changes in Column width made Globally will not affect the width of a Column set individually.

Program Function: NUMERIC DISPLAY

Press [F5 Change Format]

Notation: This option is available for:

Field, Row, Column, Global

Press: F , R , C , or G and [RETURN]

Description:

NUMERIC DISPLAY - Values, Formulas, or Graphic

V [RETURN] Data entered in the form of numbers, coordinates, formulas, label references, or any expression that evaluates to a Value will be displayed numerically.

Example: If a single Column contained the entries:

Row	Entry keyed in as:	Entry will display as:
1	10	10
2	4 * 5	20
3	3 * R1C2	30
4	+ R1C2 + R3C2	40
5	+ SUM (R2 .. R4,– 40)	50

F [RETURN] Data entered in the form of numbers, coordinates, formulas, label references, or any expression that evaluates to a Value will be displayed in the exact form in which they were entered.

Row	Entry keyed in as:	Entry will display as:
1	10	10
2	4 * 5	4 * 5
3	3 * R1C2	3 * R1C2
4	+ R1C2 + R3C2	+ R1C2 + R3C2
5	+ SUM (R2 .. R4,– 40)	+ SUM (R2 .. R4,– 40)

Please turn to the next page for a description of Graphic Display.

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GRAPHIC DISPLAY: Press [F5 Change Format]

Press: F , R , C , or G and [RETURN]

Numeric Display - Values, Formulas, or Graphic

G [RETURN]   You can select Graphic Display for either Field, Row, Column, or Global (the whole worksheet) by pressing G and then [RETURN].

When you elect Graphic Display, entries that evaluate to a Value will be displayed in the form of a bar-graph that is comprised of a row of equals-signs.

The magnitude of the Graphic Display in each Field will be in proportion to the largest number that is displayed in graphic form within that one Column of the worksheet.

In the example below, the same entries that were used on the preceding page are shown as they would be displayed graphically, depending on which Fields in the Column were formatted for Graphic Display.

The Auto-Scale feature of the Spreadsheet program ensures that the largest number graphically displayed will always span the entire width of the Column, with other Graphic Values displayed in proportion.

The Auto-Scale feature is described in more detail on page 72 of the first section of this manual.

Row	Entry keyed in as:	1	2	3	4	5	6
1	10	10	10	10	===	10	==
2	4 * 5	20	=========	=====	======	20	====
3	3 * R1C2	30	30	30	========	=====	=====
4	+ R1C2 + R3C2	40	40	========	40	======	=======
5	+ SUM (R2 .. R4,– 40)	50	50	50	50	========	=========

Program Function: NUMBER of DECIMAL PLACES

Press [F5 Change Format]

Notation: This option is available for:

Field, Row, Column, Global

Press: F , R , C , or G and [RETURN]

Description:

NUMBER of DECIMAL PLACES

Range: from 0 to 9 Decimal Places

When you first enter an empty worksheet, the entire worksheet is pre-set to enter data with a floating decimal point, which will display Values throughout the worksheet as they are illustrated in Column 2 below.

The Spreadsheet program calculates all data internally to an accuracy of 12 decimal places; and the worksheet will display up to 12 decimal places, depending on Column width. Comparing each of the Columns below will give you an understanding of this option:

	1	2	3	4	5	6	7
		Column Not Set	Column Set for 0	Column Set for 1	Column Set for 2	Column Set for 3	Column Set for 4
	ENTRY	(Floating)	Decimal Places	Decimal Places	Decimal Places	Decimal Places	Decimal Places
	40 / 10	4	4	4.0	4.00	4.000	4.0000
	40 / 80	0.5	1	0.5	0.50	0.500	0.5000
	40 / 64	0.625	1	0.6	0.63	0.625	0.6250
	40 / 88	0.4545454	0	0.5	0.45	0.455	0.4545
	40 / 13	3.0769230	3	3.1	3.08	3.077	3.0769

Program Function: LABEL JUSTIFICATION

Press [F5 Change Format]

Notation: This option is available for:

Field, Row, Column, Global

Press: F , R , C , or G and [RETURN]

Description:

LABEL JUSTIFICATION - Left, Right, Center, or Fill

Label Justification is pre-set by the Spreadsheet program so that all entries recognized as Labels are placed at the left edge of their respective Fields.

You can, however, change that placement for the Labels in any Field, Row, Column, or for the entire worksheet. Changing the Label Justification will not in any way affect the placement of entries that are recognized as Values.

L [RETURN]   Since the worksheet is pre-set to enter all Labels at the left edge of a Field, you will usually utilize this option to re-set the Label Justification of a portion of the worksheet that has been previously changed to a different form of justification.

R [RETURN]   Use of this option will enter a Label against the right edge of its Field. One example in which you might choose this option is in the entering of a date within the active work area of the worksheet, since it is common practice to place dates to the right on a page.

C [RETURN]   This option is most frequently used to center Column headings at the top of a worksheet. If, for instance, you had 3-line headings at the top of the Columns of your worksheet, applying this option to Rows 1, 2, and 3 would center all the Column headings, including new headings placed at a later time in Columns you have not yet made use of.

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Note on Centering Labels:

Very often, when you are entering Column headings into a worksheet, you will want to include a calendar date as part of a heading.

Remember that keying in 1 9 8 2 as a date, by itself, will be recognized as a Value, rather than a Label, and will be place to the right edge of the Field as if it is the number 1982 or 1982.00 or something like that.

To enter a year, by itself, as a Label, you must begin the entry with a quotation mark. The quotation mark will not become part of the entry; it will just let the Spreadsheet know that what follows is a Label.

To enter the year, then, key in "1 9 8 2 .

F [RETURN]   The Fill option is one of the most creative functions of the Spreadsheet. When you instruct any part of a worksheet, say a single Field, to Fill the Field, you will repeat the last character of any entry across the Field in which the entry is made until it fills all of that Field.

Row headings, and underlines, are two very common types of entries where this option is used. Several examples, shown below, will show you how to use (and how not to use) the Fill option:

Entry Keyed In As:	Will Display w/ Fill Option:
"_	-----------------------------
" _	----------------------------
Balance Due	Balance Dueeeeeeeeeeeeee
Balance Due.	Balance Due..............
=	========================

Be sure to read the discussion on using the Fill option, which includes an excellent example, on pages 52-59 of the first section of this manual.

Program Function: VALUE JUSTIFICATION

Press [F5 Change Format]

Notation: This option is available for:

Field, Row, Column, Global

Press: F , R , C , or G and [RETURN]

Description:

VALUE JUSTIFICATION - Left, Right, or Center

Value Justification is pre-set by the Spreadsheet program so that all entries recognized as Values are placed at the right edge of their respective Fields.

You can alter the position in which Values are placed within any Field, Row, Column or within the entire worksheet. Changing the Value Justification will not in any way affect the placement of Labels.

L [RETURN]   Use of this option will enter a Value against the left edge of its Field. The one-character-buffer that lies ordinarily along the left side of each Column is now along the right side of any Columns affected by this option.

The buffer prevents Values (usually numbers) from running into each other across Rows. For instance, a Value will normally display only 9 characters in any Column 10 characters wide.

R [RETURN]   The worksheet is already pre-set to enter all Values to the right. Use of this option, therefore, will most often be made to restore the normal display of Values following a prior change in Value Justification.

C [RETURN]   Occasionally it is desirable to center a Row of Values, if they are used as some form of Column heading or otherwise define a category (such as a group of items listed by common price). You might also center one Column of Values, containing equal digits, for clarity.

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Program Function: INSERT COMMAS IN VALUES?

Press [F5 Change Format]

Notation: This option is available for:

Field, Row, Column, Global

Press: F , R , C , or G and [RETURN]

Description:

INSERTING COMMAS IN VALUES

The Spreadsheet program is pre-set to enter all Values in their pure digital form, without commas separating groups of integers.

The program does not allow you to key in Values using commas within the Value itself. If you want Values to be displayed and/or printed with commas, you must format the worksheet to insert the commas into the Values in those portions of the worksheet where you wish them to appear.

If you key in a Value by pressing: 1 0 , 6 8 4 , 5 9 2 . 2 6 you will see the Value displayed on the Edit Line exactly as you keyed it in, along with its commas. When you attempt to enter that Value by pressing [RETURN], you will find an error message displayed at the bottom left corner of your screen, proclaiming:

Invalid Expression

When you again press the [RETURN] key to move the cursor back to the Edit Line, the cursor will position itself at the first comma that was keyed into the Value.

If you key in the same Value by pressing: 1 0 6 8 4 5 9 2 . 2 6 you will see that Value displayed just like that on the Edit Line; now you can press [RETURN] and the Value will be entered in the Current Field of your worksheet.

The entry will normally be displayed as: 10684592.26 . When you do want commas to be inserted, simply select the portion of the work-sheet in which you wish commas to be displayed, key in YES to this option, and the entry will then display as: 10,684,592.26 .

Timberline Software

Program Function: PROTECT FIELD CONTENTS?

Press [F5 Change Format]

Notation: This option is available for:

Field, Row, Column, Global

Press: F , R , C , or G and [RETURN]

Description:

PROTECTING FIELDS

What is a Protected Field ? And why would you ever want one ?
A Protected Field is any Field in which the existing contents cannot
be altered. Protected Fields may have data entered, or be absolutely
blank — in any case, no new entry of any kind can be made into such
Fields so long as they are protected.

It is not uncommon for a worksheet to contain vital data that, if
altered or erased, may be difficult or impossible to reproduce at some
later time. The preservation of the data itself may be critical in the
same way that it is important to store the worksheet in the permanent
memory of the computer — if a valuable worksheet is not saved, the
loss of that worksheet through erasure may be an expensive mistake!

The data entered in certain Fields may also be the result of long
hours of effort: compiling or formulating that data may represent an
enormous investment of research and energy.

In any of these situations, those vital entries can be safeguarded
against alteration by protecting the Fields in which they are entered.

Any individual Field, Row, Column, or the whole worksheet may
be protected by utilization of this option. Once you have selected
the portion of the worksheet you wish protected, and have pressed
YES when this option appears in the list offered by the function key
[F5 Change Format], no new data or alteration of an existing entry
can be made to any Field within that portion of the worksheet.

When you do wish to enter new data in a protected Field, you
must use [F5 Change Format] for the same portion of the worksheet
that you earlier protected, and key in NO when this option appears.
Those Fields will then become unprotected and data can be entered.

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Program Function: SUPPRESS PRINT ?

Press [F5 Change Format]

Notation: This option is available for:

Field, Row, or Column

Press: F , R , or C and [RETURN]

Description:

SUPPRESSING FIELD, ROW or COLUMN PRINT

Use of the Suppress Print option will not in any way affect the display of a worksheet on your screen; it will affect only the printed version of the worksheet.

In any large worksheet, there may be many Rows or Columns of data that are vital to the data base of the worksheet, and necessary to the calculation of functions or formulas whose results appear in other Rows and Columns of the worksheet.

It may be only those Fields where the results appear, however, that are relevant to a printout of the worksheet in terms of its being used as a presentation of the results. The Suppress Print option allows you to compress a worksheet in almost any manner you wish, so that extraneous data can be eliminated from the printed form.

You can suppress the printing of any number of individual Fields, Rows, or Columns. When you suppress the printing of either Rows or Columns, the printed version of the worksheet will appear as though the suppressed Rows and/or Columns never existed.

You may also wish to use the Suppress Print option to protect the privacy of certain data. Here again, a suppressed Row or Column will appear to have never existed, while a suppressed Field will appear as a blank Field on the printout.

For other information about printing a worksheet, see the Print Worksheet portion of the Reference Section, beginning on page T-23.

The examples on the following page show a worksheet 17 Rows deep and 7 Columns wide. The boxes drawn in on the illustration of the screen show that the Suppress Print option was applied to Row 3, to Column 3, and Fields R8C5, R9C5 and R10C5 of the worksheet.

─────────── **Timberline Software** ───────────

	1	2	3	4	5	6	7
1	1	2	3	4	5	6	7
2	8	9	10	11	12	13	14
3	15	16	17	18	19	20	21
4	22	23	24	25	26	27	28
5	29	30	31	32	33	34	35
6	36	37	38	39	40	41	42
7	43	44	45	46	47	48	49
8	50	51	52	53	54	55	56
9	57	58	59	60	61	62	63
10	64	65	66	67	68	69	70
11	71	72	73	74	75	76	77
12	78	79	80	81	82	83	84
13	85	86	87	88	89	90	91
14	92	93	94	95	96	97	98
15	99	100	101	102	103	104	105
16	106	107	108	109	110	111	112
17	113	114	115	116	117	118	119

1	2	4	5	6	7
8	9	11	12	13	14
22	23	25	26	27	28
29	30	32	33	34	35
36	37	39	40	41	42
43	44	46	47	48	49
50	51	53		55	56
57	58	60		62	63
64	65	67		69	70
71	72	74	75	76	77
78	79	81	82	83	84
85	86	88	89	90	91
92	93	95	96	97	98
99	100	102	103	104	105
106	107	109	110	111	112
113	114	116	117	118	119

The printout of that worksheet is reproduced above. As you can see, Row 3 and Column 3 are absent, and the suppressed Fields appear as blank spaces.

By selectively using the Suppress Print option on different portions of the worksheet at different times, you could print special versions of the worksheet for distribution to different people or departments.

Timberline Software

Program Function: ADVANCE TO NEW PAGE ?

Press [F5 Change Format]

Notation: This option is available for:

Row only

Press: R and [RETURN]

Description:

ADVANCE TO NEW PAGE BEFORE PRINTING ROW?

When you are designing a large worksheet that is a great many Rows in depth, there may be several places within that worksheet that constitute logical points at which to break the printout of the worksheet and carry the next portion of data over to another page.

You might want to control the particular portions of any given worksheet that appear on a single page for clarity, for that portion's differing content, or just for a more pleasing appearance on the page.

At any time before printing the worksheet, you can format the breaks between pages of the printout:

Move cursor to the Row which you want to print as the First Row at the top of the next page.	
Press [F5 Change Format]	Key: [F5]
Select: Row	R
Move through the options until you see displayed: "Advance to New Page ..."	[RETURN] 8 times
Answer: YES	Y
Activate Selection	[RETURN]

By repeating the same keystrokes and answering NO , you can remove this option at any time you wish. The program will then print all the Rows of a worksheet in a continuous format.

Timberline Software

Program Function: AUTOMATIC CURSOR ADVANCE ?

Press [F5 Change Format]

Notation: This option is available for:

Global only

Press: G and [RETURN]

Description:

AUTOMATIC CURSOR ADVANCE

You will have to experiment with this option; the choice as to whether or not the cursor is automatically advanced to the "next" Field, after an entry is made, is largely a matter of taste.

The Spreadsheet program is pre-set not to advance the cursor automatically. Thus, in its normal mode, each time you enter data into a Field, you must move the cursor manually to the next Field in which you want to make an entry, by using the appropriate key-strokes.

If you are just beginning a new worksheet, with the cursor in Row 1 Column 1, and you want to utilize Automatic Cursor Advance, you would make the following keystrokes:

Press [F5 Change Format]	Key: [F5]
Select: Global	G
Move through the options until you see displayed: "Automatic Cursor Advance?"	[RETURN] 8 times
Answer: YES	Y
Exit List of Options	[F3]

If you now make an entry in Row 1 Column 1, the cursor will not move. But as soon as you move it manually the first time, the cursor will move automatically to the next Field in the same direction each time you make an additional entry.

If you want to change direction, you must do so manually. The cursor will then continue to advance one Field in the new direction each time you make an entry, until you manually shift direction again.

Timberline Software

Program Function: CALCULATION ORDER - ROW or COLUMN

Press [F5 Change Format]

Notation: This option is available for:

Global only

Press: G and [RETURN]

Description:

CALCULATION ORDER - ROW or COLUMN

The Spreadsheet is pre-set to Calculate by Row. That means the program will perform its calculations across all of the Fields of a Row before it returns to Column 1 of the next Row down and begins the calculation of all of the Fields of that Row.

In most cases, this pattern is as efficient as any other would be. There is, however, at least one typical arrangement of data in which Calculation by Row would be undesirable:

Assume that the entry in Row 40 Column 1 is a Formula for the total of all the Values entered in the first 39 Rows of Column 1. The Formula would be + SUM (R1 .. R39). Now you want to bring the result of that calculation up to Row 1 Column 2 and enter it there also. The Formula entered in Row 1 Column 2 would be + R40 C1.

If the program is set to Calculate by Row, and you change the Value entered in one of those first 39 Rows of Column 1, the result of that change will be calculated and correctly entered in R40 C1, but the new result will not be entered over in Row 1 of Column 2, because all of that Row had been calculated before the program made its way down to Row 40.

To display the correct answer now in Row 1 Column 2, you will have to recalculate the whole worksheet by keying [F4 Recalculate]. This second time around, the program will pick up the new result in R40 C1 and apply it to the Formula over and up in Row 1 Column 2.

Instead, press [F5 Change Format], key in G and then press the [RETURN] key 9 times. Set the program to Calculate by Column, and now you will find that in the example above, since the program will calculate all of Column 1 before beginning on Column 2, the correct result from calculating R40 C1 will be entered in R1 C2 the first time.

Program Function: AUTOMATIC or MANUAL CALCULATIONS

Press [F5 Change Format]

Notation: This option is available for:

Global _only_

Press: <u>G</u> and [RETURN]

Description:

AUTOMATIC or MANUAL CALCULATIONS

No matter what the size of the worksheet you are creating, each time you make an entry in a Field, the Spreadsheet program will then automatically recalculate all that portion of your worksheet that lies below-and-to-the-right of the Field in which the entry was made.

The Automatic Calculation feature is one of the pre-set operating conditions of the program. It is of great benefit to the analysis of most worksheets, as it allows constant updating of data and results as new entries are made.

There are occasions, however, when this feature will slow the process of entering data. When you make an entry on a worksheet, you must wait until recalculation of the worksheet is complete before you can make the next entry — and there are times when that wait between entries becomes frustratingly long.

When you are altering entries in the lower-numbered Fields of very large worksheets (those Fields in the upper left work area), or are simply building a data base which involves making many entries that do not yet require calculation, you can save time and increase the speed of the program by directing the Spreadsheet to calculate only when you ask it to.

Setting the program for Manual Calculations allows you to make as many entries as you wish, one right after the other. Whenever you do want that data to be calculated, you need only press the function key [F4 Recalculate]. You can instruct the worksheet to recalculate as often as you choose, while taking advantage of a faster data-entry process the rest of the time.

Note: When you re-set the program to Automatic Calculations, it will <u>not</u> recalculate automatically until the next entry is made.

Timberline Software

Program Function: HORIZONTAL WINDOW

        To create a Second Viewing Area within the Worksheet

Notation: Press [F5] W [RETURN]

              Horizontal, Vertical, or None? Press H [RETURN]

              Synchronized Scrolling? Press N or Y [RETURN]

Description: HORIZONTAL WINDOW

      This option will insert a window, or second viewing area, across the screen, beginning in that Row in which the cursor was positioned. The cursor will then move up one Row, to the last Row now displayed in the original viewing area (which is now the upper window).

      The illustration on the next page displays the lower part of your screen (the lower window) beginning with Row 30. Remember, though, that either window may be scrolled to any desired worksheet area.

      Both windows will retain the same format characteristics that you have assigned for Field, Row and Column. Each window does have its own Global attributes. As such, the newly created window will initially follow whatever Global format you have designed, until you alter that window's Global format, at which time each window will respond to its separately assigned Global characteristics.

      SYNCHRONIZED SCROLLING: The two windows can scan up, down, and across the worksheet independently of each other; or they can be synchronized to move in parallel Columns across the worksheet if the Synchronized Scrolling? option is selected by pressing Y for Yes.

      To move the cursor from one display window to the other:

              Press [F1] W [RETURN]

      To turn off the window from your display, and restore a single viewing area to your screen:

         Press [F5] W [RETURN] N [RETURN]

      Important: When you turn off the window option from the worksheet display, the window turned off will be the one that does not contain the cursor. And the Global format of the entire screen will now have those characteristics assigned to the window which is retained.

Timberline Software

```
Row  8 Column  1                                          Avail: 1053
═══1 ═══2 ═══3 ═══4 ═══5 ═══6 ═══7 ═══
 1
 2
 3
 4
 5
 6
 7
 8
═══1 ═══2 ═══3 ═══4 ═══5 ═══6 ═══7 ═══
30
31
32
33
34
35
36
37

F1 Move cursor      F3 Done          F5 Change format   F7 Move fields
F2 Edit field       F4 Recalculate   F6 Insert/delete   F8 Copy fields
```
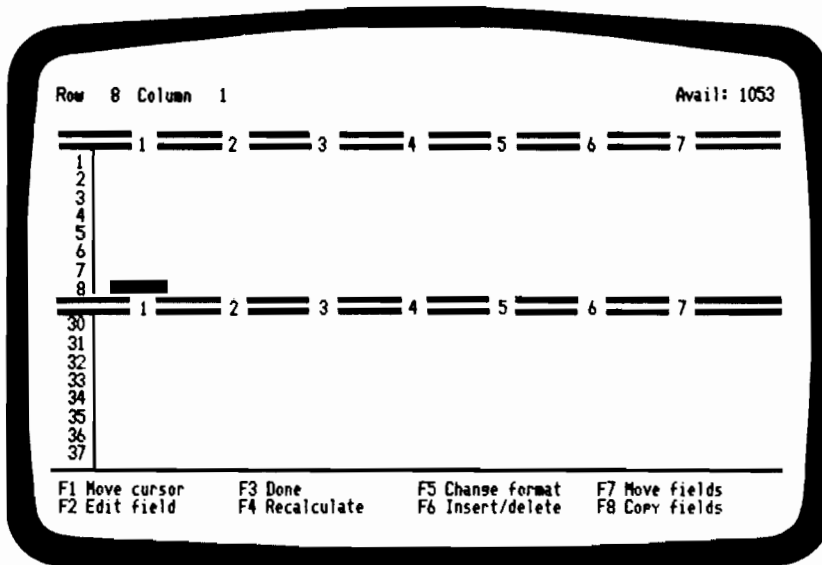
CREATING A HORIZONTAL WINDOW

Move Cursor to Row 9 (any Column)

Press [F5] W [RETURN]

Horizontal, Vertical, or None?   Press H [RETURN]

Synchronized Scrolling? Press N or Y [RETURN]

Window is now created at Row 9

Cursor moves up to Row 8

Program Function: VERTICAL WINDOW

To create a Second Viewing Area within the Worksheet

Notation: Press [F5] W [RETURN]

Horizontal, Vertical, or None? Press V [RETURN]

Synchronized Scrolling? Press N or Y [RETURN]

Description: VERTICAL WINDOW

This option will insert a window, or second viewing area, down the screen, beginning in the Column in which the cursor was positioned. The cursor will then move to the left one Column, to the last Column now displayed in the original viewing area (the left window).

The illustration shown on the next page displays the farthest-right part of the screen (the right-hand window) beginning with Column 20, although either window may be scrolled to any Column you choose.

Both windows will retain the same format characteristics that you have assigned for Field, Row and Column. Each window does have its own Global attributes.   As such, the newly created window will initially follow whatever Global format you have previously designed, until you alter that window's Global format, at which time each of the windows will respond to its separately assigned Global characteristics.

SYNCHRONIZED SCROLLING: The two windows can scan up, down, and across the worksheet independently of each other; or they can be synchronized to move in parallel Rows up or down the worksheet if the Synchronized Scrolling? option is selected by pressing Y for Yes.

To move the cursor from one display window to the other:

Press [F1] W [RETURN]

To turn off the window from your display, and restore a single viewing area to your screen:

Press [F5] W [RETURN] N [RETURN]

Important: When you turn off the window option from the worksheet display, the window turned off will be the one that does not contain the cursor. And the Global format of the entire screen will now have those characteristics assigned to the window which is retained.

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```
┌────────────────────────────────────────────────────┐
│ Row   2  Column   4                      Avail: 1051 │
│ ═══════ 1 ═══════ 2 ═══════ 3 ═══════ 4 ═══════ 20 ═══════ 21 ═══════ 22 ═══ │
│ 1                          1                         │
│ 2            ▆▆▆▆▆▆        2                          │
│ 3                          3                         │
│ 4                          4                         │
│ 5                          5                         │
│ 6                          6                         │
│ 7                          7                         │
│ 8                          8                         │
│ 9                          9                         │
│ 10                        10                         │
│ 11                        11                         │
│ 12                        12                         │
│ 13                        13                         │
│ 14                        14                         │
│ 15                        15                         │
│ 16                        16                         │
│ 17                        17                         │
│ F1 Move cursor    F3 Done         F5 Change format   F7 Move fields │
│ F2 Edit field     F4 Recalculate  F6 Insert/delete   F8 Copy fields │
└────────────────────────────────────────────────────┘
```
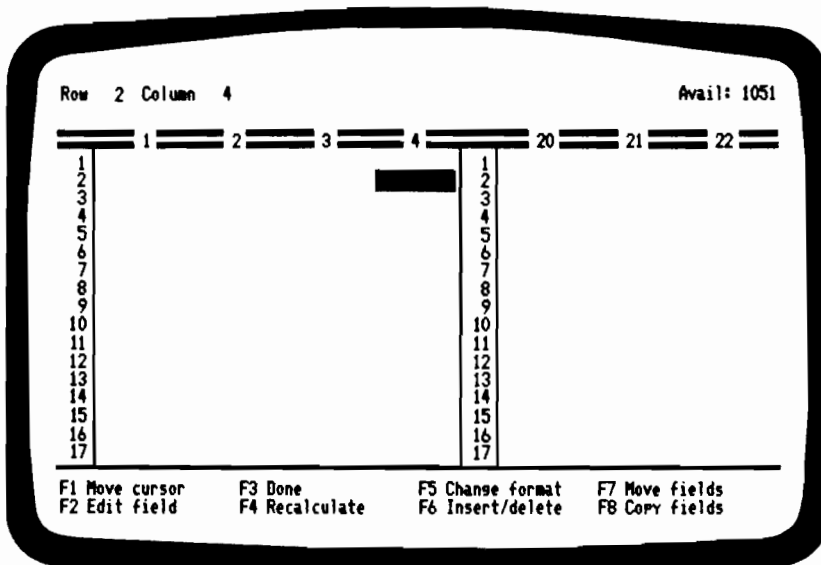
CREATING A VERTICAL WINDOW

Move Cursor to Column 5 (any Row)

Press [F5] W [RETURN]

Horizontal, Vertical, or None? Press V [RETURN]

Synchronized Scrolling? Press N or Y [RETURN]

Window is now created at Column 5

Cursor moves left to Column 4

Program Function: TITLE-LOCK

Notation:
Press [F5]   The Edit Line will display:

Field, Row, Column, Global, Window, Titles, or Sort?

Select <u>Titles</u>: Press <u>T</u> [RETURN]

Horizontal, Vertical, Both, or None?

Description: MAINTAINING THE DISPLAY OF TITLES

The <u>Title-Lock</u> option provides a means of retaining either Row Labels, Column headings, or both, on your screen display even when you move around to other areas of the worksheet. The advantage that <u>Title-Lock</u> offers is simple: when you are entering data, for instance, in <u>Row 23 of Column 36</u> , the item designation for Row 23 (which is in Column 1) and the Column heading for Column 36 (which is in Row 1) will remain displayed as references for your new entry, if you have locked those entries onto your screen with this option.

HORIZONTAL: Press <u>H</u> [RETURN]

This will <u>Title-Lock</u> horizontal Labels (and Values) running across your screen, such as Column headings. You can lock onto your display as many Rows as you wish, by placing the cursor in the bottom-most Row you wish to retain. That Row, and all the Rows above it, will now be <u>Title-Locked</u>.

VERTICAL: Press <u>V</u> [RETURN]

This will <u>Title-Lock</u> vertical Labels (and Values) running down your screen, such as Row designations or narrow buffer Columns (for visual separation). You can lock onto your display as many Columns as you wish, by positioning the cursor in the farthest right-hand Column you wish to retain, just as with Rows, above.

BOTH: Press <u>B</u> [RETURN]

Should you want to <u>Title-Lock</u> both the <u>top 3 Rows</u> and the <u>first 2 Columns</u> of the worksheet, for example, position the cursor in Row 3 Column 2 and select <u>Both</u>. This will typically lock in a double-row of Column headings along with a third Row of underline, and 2 Columns of titles and sub-titles on the left side of the worksheet.

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NONE : Press N [RETURN]

> Selecting this option will unlock all Title-Locked areas of the
> worksheet. You can also use this provision as one of the two
> ways to enter a Title-Locked area of the worksheet to make
> changes or enter additional data, and then re-lock that area.

NEW HOME POSITION OF THE CURSOR:

> As soon as you have Title-Locked any area of the worksheet,
> the cursor will move out of that area, and a new HOME position
> of the cursor will be established just outside of the Title-Locked
> area.
>
> In the example on the previous page, where Both was selected
> to Title-Lock the top 3 Rows and the first 2 Columns of the
> worksheet, the cursor will move to Row 4 Column 3, which will
> then become the new HOME position for the worksheet.
>
> The cursor cannot then be moved back into the Title-Locked
> area of the worksheet, unless that area is unlocked, or unless
> the [F1] Move Cursor function is used.

MOVING THE CURSOR INTO A TITLE-LOCKED AREA:

> Should you wish an area of the worksheet to remain Title-Locked
> yet still be able to edit or add data within the locked Fields,
> you can enter that area of the worksheet and make additional
> entries by pressing [F1] Move Cursor and then keying in either
> the Label or Coordinates of the locked Field you wish to enter.
>
> As soon as you have made the desired entries, and have moved
> the cursor out of the Title-Locked area, the cursor will again
> be unable to enter the locked Fields unless [F1] is utilized or
> those Fields are unlocked.
>
> Title-Locked Fields are not protected Fields. Alteration is
> possible using the [F1] function.
>
> Protected Fields cannot be altered by any method so long as
> the provision for protecting those Fields is in force.

Program Function: SORT

Notation: Press [F5 Change Format] <u>S</u> [RETURN]

Sort Row ___ thru Row ___ by Column ___

Ascending or Descending Order ? (A or D)

Description: SORTING A WORKSHEET

The ability to Sort is one of the most powerful tools offered by the Spreadsheet program. It is one of the vital controls that you can use in organizing and evaluating information in a worksheet.

Read over the example of Sorting that appears on pages 69-75 of the first section of this manual. There you will find that information is taken from a practical situation and that same data is Sorted using four different criteria to arrive at four different sets of results.

You can Sort <u>vertically</u> any portion of the worksheet, according to the alphabetical order, or numerical magnitude, of the data entered in any one Column of that portion.

Sorting part of a worksheet will not disturb any other part of that worksheet. Further, any portion of a worksheet that you have Sorted can be re-Sorted by the order of data in some other Column as many times in as many different ways as you wish.

To make clear the way in which Sorting by different Columns affects the Sorting process, the example illustrated on the next page utilizes both alphabetical and numerical data in a representation of the scores attained on an examination by a group of students.

The original data is entered at random. Then, as you can see in the second and third illustrations, the worksheet is Sorted, first by test score in order of highest to lowest (descending order), and then by the student's name beginning with <u>A</u> and going through <u>Z</u> (which is ascending order).

The first Sort is accomplished by Sorting <u>Row 3 thru Row 11 by Column 2</u> in <u>Descending Order</u>. The second Sort is accomplished by Sorting <u>Row 3 thru Row 11 by Column 1</u> in <u>Ascending Order</u>.

Graphic Display has been added, just to show its effectiveness!

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```
        1              2           3
   1    STUDENT        SCORE       GRAPHIC
   2 ─────────────────────────────────────
   3  Sanderson, Mark ........  44              44
   4  Packer, Sara ...........  96              96
   5  Trevor, Bob ............  73              73
   6  Hansen, Sheila .........  90              90
   7  Buster, Boyd ...........  79              79
   8  Starks, Mickey .........  63              63
   9  Oglesby, Robin .........  51              51
  10  Stevens, Pogo ..........  85              85
  11  Lindsay, Pickle ........  89              89
  12
  13
  14
```

```
             1             2          3
   1         STUDENT       SCORE      GRAPHIC
   2 ──────────────────────────────────────────────
   3  Packer, Sara ...........  96   ======================
   4  Hansen, Sheila .........  90   ====================
   5  Lindsay, Pickle ........  89   ===================
   6  Stevens, Pogo ..........  85   ==================
   7  Buster, Boyd ...........  79   ================
   8  Trevor, Bob ............  73   ===============
   9  Starks, Mickey .........  63   ============
  10  Oglesby, Robin .........  51   ==========
  11  Sanderson, Mark ........  44   ========
  12
  13
  14
```

```
        1              2           3
   1    STUDENT        SCORE       GRAPHIC
   2 ─────────────────────────────────────
   3  Buster, Boyd ...........  79   ================
   4  Hansen, Sheila .........  90   ====================
   5  Lindsay, Pickle ........  89   ===================
   6  Oglesby, Robin .........  51   ==========
   7  Packer, Sara ...........  96   ======================
   8  Sanderson, Mark ........  44   ========
   9  Starks, Mickey .........  63   ============
  10  Stevens, Pogo ..........  85   ==================
  11  Trevor, Bob ............  73   ===============
  12
  13
  14
```

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Program Function: [F6] INSERT / DELETE

Notation: Pressing [F6] will display on the Edit Line;

Insert or Delete? ___ Rows or Columns? ___ How Many? _1_

Description: INSERTING or DELETING ROWS or COLUMNS

The [F6 Insert/Delete] option allows you to add Rows and/or Columns to any portion of the worksheet; it also allows you to remove Rows and/or Columns from any portion of the worksheet.

The quickest way to gain an understanding of this option is for you to create a sample worksheet, or retrieve a worksheet from storage, and experiment with it on your display screen, adding Rows and then removing other Rows — and doing the same thing with Columns.

Please take a look at the first example of Inserting a Row, which you'll find on page 51 of the first section of this manual.

The most important thing to remember about this option is that it frees you from ever being locked into any particular format that you may have set up for a worksheet when you began that worksheet. No matter what you have started out with in the way of a design or format for your worksheet, you can always change it to fit what you may later decide should be the format that you want the final product to comprise.

What happens to Formulas? Assume that in Row 10 Column 3 you have entered a Formula such as 3 * R3 C2 . You have instructed the program to enter in Row 10 Column 3 a Value equal to 3 times whatever Value is entered in Row 3 Column 2 .

Now, move the cursor to Row 3 Column 2 . Enter the Value _40_ . R10 C3 should now display the Value _120_ . Right? Don't move the cursor (which is still at R3 C2).

Make use of [F6 Insert/Delete] to Insert one new Row. Then use [F6] again to Insert one new Column. Look at what's really happened!

First of all, your Value of _40_ has moved all the way over and down to Row 4 Column 3 . and the Value _120_ has moved to R11 C4.

When you Inserted a Row, all of your entries moved down one Row.   When you Inserted a Column, all of your entries moved over one Column.   Now everything's in a different place.

Yes, but all your Values and Formulas have adjusted to take care of that movement.   Move the cursor over to the Field where the Value 120 is displayed: Row 11 Column 4.   Remember when you entered the Formula 3 * R3 C2 ?   If you look above the Edit Line at the top of your screen, you'll see that the Formula now reads 3 * R4 C3 .

How could that be?   You see, the program adjusted the Formula to follow the movement of data on the worksheet when you Inserted the new Row and Column.

No matter how often you have entered complex Formulas, Field Coordinates, or Label References in your worksheet, the Spreadsheet will automatically adjust them whenever you Insert, Delete, or Move Rows or Columns of data.

That is part of the power that the Spreadsheet places right at your fingertips, to create and mold data into almost any form that you can imagine.

You can Insert and Delete Rows and Columns to allow entry of additional data, or to remove data that is no longer of value.   You can use this option just to create space, to open up a worksheet that has become too crowded with data, to give that worksheet greater clarity and better appearance by separating your data into logical or more visually effective blocks.

Like so many functions of this program, the more you use this option, the more use you will find for it.

Program Function: [F7] MOVE FIELDS

Notation: Pressing [F7] will display on the Edit Line:

Move Rows or Columns? (R or C)

Press <u>R</u> or <u>C</u> and [RETURN]

Description: MOVING FIELDS

Moving Rows and/or Columns from one part of a worksheet to another is a difficult process to explain. It is much easier to teach the concept of this function by the examples which are illlustrated on the pages that follow.

The [F7 Move Fields] function is easily executed. The difficulty lies with understanding the related movements that take place when this function is used.

If you move the data in Rows 1, 2, and 3 down to Rows 8, 9, and 10, what happens to the data that was entered in Rows 8, 9, and 10? Does it just exchange places with the data in the first 3 Rows?

No. It does not. If Rows 1 thru 3 are moved "to Row 10", all of the entries in Rows 1, 2, and 3 will be transferred to Rows 8, 9, and 10. Rows 4 thru 10 (that is, the data in those Rows) will then <u>move upward</u> to occupy Rows 1 thru 7.

It sounds complicated. It's easier to see how it works on your screen; and as with so many parts of this program, it will be better understood if you experiment by using it in as many ways as you can.

Before you look at the examples, there is a provision within the program that is important to remember with regard to Moving Fields. Whenever you move an entry from one Field to a different Field by using [F6] or [F7], the Spreadsheet will automatically adjust all of the Formulas, Field Coordinates, or Label References used throughout the worksheet so that the results of calculations will remain the same.

Refer to the discussion of this provision that you'll find in the first section of this manual, on page 51, and to additional information on pages T-81 and T-82 of this Reference Section.

Then turn to the examples of Moving Fields that follow:

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The illustration below is the original position of all the Fields in Rows 1, 2, 3 and 10. You then Move From Row 1 thru Row 3 to Row 10.

```
ORIGINAL POSITION
======1======2======3======4======5======6======7======
  1    R1 C1    R1 C2    R1 C3    R1 C4    R1 C5    R1 C6    R1 C7
  2    R2 C1    R2 C2    R2 C3    R2 C4    R2 C5    R2 C6    R2 C7
  3    R3 C1    R3 C2    R3 C3    R3 C4    R3 C5    R3 C6    R3 C7
  4
  5
  6
  7
  8
  9
 10    R10 C1   R10 C2   R10 C3   R10 C4   R10 C5   R10 C6   R10 C7
 11
 12
 13
 14
 15
 16
 17
```

The result of Moving Rows is displayed in the illustration below.

```
MOVE FROM  ROW 1  THRU  ROW 3  TO  ROW 10
======1======2======3======4======5======6======7======
  1
  2
  3
  4
  5
  6
  7    R10 C1   R10 C2   R10 C3   R10 C4   R10 C5   R10 C6   R10 C7
  8    R1 C1    R1 C2    R1 C3    R1 C4    R1 C5    R1 C6    R1 C7
  9    R2 C1    R2 C2    R2 C3    R2 C4    R2 C5    R2 C6    R2 C7
 10    R3 C1    R3 C2    R3 C3    R3 C4    R3 C5    R3 C6    R3 C7
 11
 12
 13
 14
 15
 16
 17
```

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Now do the same thing with Moving Columns. Create the display of data shown below: then <u>Move From Column 1 thru Column 2 to Column 6.</u>

```
ORIGINAL POSITION
═══1═══════2═══3═══════4═══5═══════6═══════7═══
 1│  R1 C1    R1 C2                      R1 C6
 2│  R2 C1    R2 C2                      R2 C6
 3│  R3 C1    R3 C2                      R3 C6
 4│  R4 C1    R4 C2                      R4 C6
 5│  R5 C1    R5 C2                      R5 C6
 6│  R6 C1    R6 C2                      R6 C6
 7│  R7 C1    R7 C2                      R7 C6
 8│  R8 C1    R8 C2                      R8 C6
 9│  R9 C1    R9 C2                      R9 C6
10│  R10 C3   R10 C2                     R10 C6
11│
12│
13│
14│
15│
16│
17│
```

And you see the result of Moving Columns illustrated below.

```
Move From Column 1 Thru Column 2 To Column 6
═══1═══════2═══3═══════4═══════5═══════6═══════7═══
 1│                        R1 C6    R1 C1    R1 C2
 2│                        R2 C6    R2 C1    R2 C2
 3│                        R3 C6    R3 C1    R3 C2
 4│                        R4 C6    R4 C1    R4 C2
 5│                        R5 C6    R5 C1    R5 C2
 6│                        R6 C6    R6 C1    R6 C2
 7│                        R7 C6    R7 C1    R7 C2
 8│                        R8 C6    R8 C1    R8 C2
 9│                        R9 C6    R9 C1    R9 C2
10│                        R10 C6   R10 C3   R10 C2
11│
12│
13│
14│
15│
16│
17│
```

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Notice that when you are Moving Fields down or to the right, as you did in both of the preceding examples, the Row or Column that you are moving to is the last portion of the worksheet that you are displacing, not the first.

In other words, when you moved Rows 1, 2 and 3 to Row 10, you did not move to Rows 10, 11 and 12. Row 10 was not the starting Row, but rather the ending Row. And your movement was in fact to Rows 8, 9 and 10.

What do you do when you want to reverse those moves, and place the Rows and Columns back in their original positions?

For the first example, on page T-84, you would reverse the whole process when you Move From Row 8 thru Row 10 to Row 1. You will then see all of the Rows move back to their original positions.

For the second example, on page T-85, you would reverse that process by executing Move From Column 5 thru Column 6 to Column 1. Now all of the Columns would be restored to their original positions.

The logic involved in Moving Fields up or to the left again follows the pattern of designating the farthest away point of movement as the Row or Column that you move to.

Program Function: [F8] COPY FIELDS

Pressing [F8] will display on the Edit Line:

Notation: Copy from: Row ___ Column ___ thru Row ___ Column ___

Copy to: Row ___ Column ___ thru Row ___ Column ___

Description: COPYING FIELDS

The [F8 Copy Fields] function of the Spreadsheet allows you to take the Labels and Values in any one or more Fields of the worksheet and repeat those entries in any other part of the worksheet.

The keying pattern may seem a bit confusing at first, because the [F8 Copy Fields] function can be used to perform several different patterns of copying data over to other parts of the worksheet. With a little practice, however, this option can be easily mastered, which is important, since it is one of the most often used options of the whole program.

The **3** Patterns of Copying Fields:

1. Copying from a Field to a Field. Here, you are copying the entry in a single Field over to one other Field.

2. Copy from a Field to a Range of Fields. In this case, you are copying the entry in a single Field over to a number of other Fields (as few or as many as you wish).

3. Copying from a Range of Fields to a Range of Fields. This is the procedure for copying an entire block of entries as a unit over to a different part of the worksheet.

The keying pattern used to instruct the program is different for each of these three situations, and that pattern is very specific. You will find, on the next three pages, illustrations of each one of these procedures, and a description of each that concentrates its attention on the differences between them.

In addition to copying data, this function is also very useful in removing data or "blanking" areas of the worksheet: Simply erase the entry in one Field, and copy that Field to the Fields you wish cleared.

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```
  ═══1═══2═══3═══4═══5═══6═══7═══
 1 │
 2 │    ┌─────┐  125   150
 3 │    │ 100 │  200   225
 4 │    └─────┘  275   300
 5 │     325    350   375
 6 │     400    425   450
 7 │
 8 │
 9 │
10 │              ┌─────┐
11 │              │ 100 │
12 │              └─────┘
13 │
14 │
15 │
16 │
17 │
```

Set up a worksheet with different entries in each of the Fields of Rows 2, 3, 4, 5, 6 in Columns 2, 3 and 4, just as at the top of the screen shown above. Now copy the entry in Field R2C2 over to Field R10C5.

Copy Fields		Key	[F8]	
Copy FROM:	Row	Key	2	[RETURN]
	Column		2	[RETURN]
thru:	Row		2	[RETURN]
	Column		2	[RETURN]
Copy TO:	Row	Key	10	[RETURN]
	Column		5	[RETURN]
thru:	Row		10	[RETURN]
	Column		5	[RETURN]

In this case, you are copying from one Field thru itself over to one other Field thru itself. It does not matter how many entries are in your worksheet; you are restricting the pattern to those 2 Fields.

As you are working through these examples, please read through the other examples of Copying Fields, that begin on page 29, in the first section of this manual.

Now you are going to copy from one Field thru itself over to an area of the worksheet comprising 15 other Fields. You must describe the area containing that group of Fields by keying in the first Field of the group (upper-left) and the last Field of the group (lower-right).

Copy Fields		Key	[F8]	
Copy FROM:	Row	Key	2	[RETURN]
	Column		2	[RETURN]
thru:	Row		2	[RETURN]
	Column		2	[RETURN]
Copy TO:	Row	Key	10	[RETURN]
	Column		5	[RETURN]
thru:	Row		14	[RETURN]
	Column		7	[RETURN]

For clarity, the illustrations show dotted lines forming a frame around a group of Fields that you are copying to or from, and a solid frame around those single Fields that you must key into the Edit Line by their Coordinates in order to accomplish the copying process. When you have practiced the process a few times, and see it in operation on your screen, you'll become comfortable with the way in which it works.

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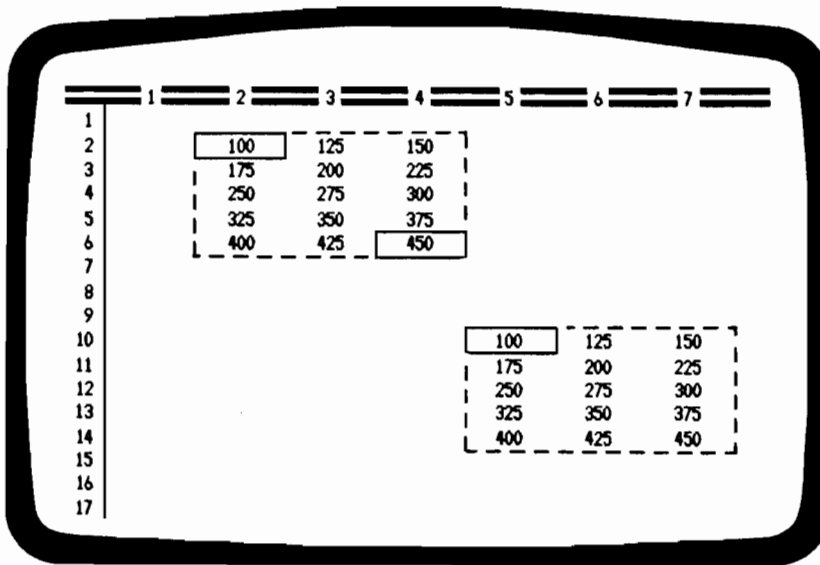
This is the third situation: When you are copying an entire group of Fields (a Range of Fields) over to another area of the worksheet, you describe the group of Fields you are copying from by keying in the first Field of the group (upper-left) and the last Field of that group; but describe the area you are copying to only by its first Field.

Copy Fields		Key	[F8]	
Copy from:	Row	Key	2	[RETURN]
	Column		2	[RETURN]
thru:	Row		6	[RETURN]
	Column		4	[RETURN]
Copy to:	Row	Key	10	[RETURN]
	Column		5	[RETURN]
thru:	Row		10	[RETURN]
	Column		5	[RETURN]

It may seem that you're trying to copy a group of Fields into a single Field (which would create an error message). You aren't doing that at all. What you are doing is defining the Range of Fields that you want copied, and then defining the starting point of the area that you wish the copied Fields to occupy. Try it; you'll see that it works!

Program Functions

and

Operating Formulas

CONDITIONAL STATEMENTS

If . . . . IF

Or . . . . OR

Not . . . . NOT

And . . . . AND

True . . . . TRUE

False . . . . FALSE

FINANCIAL APPLICATIONS

Present Value . . . . PVAL

Future Value . . . . FVAL

Rate . . . . RATE

Period . . . . PERIOD

Payment . . . . PMT

Net Present Value . . . . NPV

Internal Rate of Return . . . . IRR

STATISTICAL APPLICATIONS
and LINEAR REGRESSION

Correlation Coefficient . . . . CORR

Dependent Variable . . . . DEPD

Independent Variable . . . . INDEPD

Slope . . . . SLOPE

Standard Deviation . . . . SDEV

Variance . . . . VAR

Absolute Value . . . . ABS

Average and Mean . . . . AVG

Ceiling Value . . . . CEIL

Count of Values . . . . COUNT

e (mathematical constant) . . . . E

Error function . . . . ERROR

Exponent (to the base e) . . . . EXP

File function . . . . FILE

Floor Value . . . . FLOOR

Growth Rate . . . . GROW

Integer portion of a Value . . . . INT

Logarithm (to the base e) . . . . LN

Logarithm (to the base 10) . . . . LOG

Maximum Value . . . . MAX

Median Value . . . . MEDIAN

Minimum Value . . . . MIN

N/A (Not Available) . . . . NA

Pi (constant) . . . . PI

Random Number . . . . RAND

Rounding of Value . . . . ROUND

Square of Value . . . . SQR

Square Root . . . . SQRT

Sum . . . . SUM

Trend Line . . . . TREND

TRIGONOMETRIC FUNCTIONS

    Sin . . . . SIN

    Cosine . . . . COS

    Tangent . . . . TAN

    Arc Tangent . . . . ARCTAN

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Program Function: CONDITIONAL STATEMENTS

These are the **IF** statements. The Spreadsheet's ability to use Conditional Statements gives you an incredibly powerful tool that is almost equivalent to being able to program the program!

There are so many variations possible in using Conditional Statements that describing them all would require a separate manual. The particular way in which you formulate a Conditional Statement allows almost any set of conditions to be used as an argument, and almost any expression of a Value to be returned as a result of the argument.

The language of Conditional Statements is comprised of some key words, and a fixed order of entering arguments and results. The basic language consists of:

IF (argument, first Value, second Value)

> IF the "argument" is TRUE, return the first Value; otherwise return the second Value. As you'll see by example on the next several pages, the "argument" can have almost any conditions specified within it that you can set to be TRUE or FALSE.

IF (NOT (argument), first Value, second Value)

> IF the "argument" is NOT TRUE, return the first Value; otherwise return the second Value. This is just the reverse of the first case.

IF (OR (argument, argument, argument), first Value, second Value)

> IF any of the "arguments" are TRUE, return the first Value; otherwise return the second Value. There can be just as many "arguments" as you wish. You can also use these key words in combination with each other, such as IF (NOT (OR(...)) ...).

IF (AND (argument, argument, argument), first Value, second Value)

> IF all of the "arguments" are TRUE, then return the first Value; otherwise return the second Value (or formula or expression).

TRUE, FALSE: These are not Labels, they are Values. They are most often used in testing each part of an "argument" as you create the argument. These special functions are described on page T-164.

```
  ══1══2══3════════════4═══════════5══
 1│GROSS SALES ............ 3482.55
 2│NET PROFIT  ............ 123.99
 3│            7    6789   TRUE ◄──keyed in: 7 * 6 = 42
 4│            7    6789   TRUE ◄────keyed in: + C3 > C2
 5│            7    6789   FALSE ◄──────keyed in: + R1 < ( 2 * R2 )
 6│            7    6789   1
 7│            7    6789   100
 8│─────────────────────────────────────────
 9│            7    6789   +IF(R3,,C3)                      0
10│            7    6789   +IF(R3,C2,C3)                    7
11│            7    6789   +IF(R6>50,C2,C3)              6789
12│            7    6789   +IF(NOT(R6>50),C2,C3)            7
13│            7    6789   +IF(OR(R3,R4,R5),C2,C3)          7
14│            7    6789   +IF(AND(R3,R4,R5),C2,C3)      6789
15│            7    6789   +IF(R6<50,'GROSS SALES',C3)   3482.55
16│            7    6789   +IF(R6>R7,'GROSS SALES','NET PROFIT')   123.99
17│            7    6789   +IF(R6>FILE(JIM,LOAN-F2,,7,2),C2,C3)    6789
```

Like so many functions of the Spreadsheet, it is easier to explain Conditional Statements by example than by description alone. And the worksheet illustrated above will offer you an opportunity to try out as many forms of Conditional Statements as you wish.

Set up the worksheet as follows:

Column 1:   Set to 12 characters wide. Enter only the two Labels.

Column 2:   Set to 3 characters wide. Enter the Value 7 in Rows 3-17.

Column 3:   Set to 10 characters wide. Enter the Value 6789 also in Rows 3 thru 17. Don't prepare Column 4 yet.

Column 5:   Set to 12 characters wide. Don't enter any of the Values that you see displayed in the illustration. Instead, simply enter the Formula + C4 in Rows 9 thru 17.

Column 4:   This is where you will enter everything else. Set a width of 38 characters. Set Value Justification to Left. And set Numeric Display to display Formulas.

For clarity, you might also enter underlines across Row 8. Now you have formatted the worksheet, and are ready to learn IF statements.

Make the following entries in Column 4:

Row 1: Enter the Value 3482.55 .

Row 2: Enter the Value 123.99.

Row 3: Key in 7 * 6 = 42 . When you enter that expression, it will
         be displayed as the Value TRUE .

Row 4: Key in + C3 > C2 . Since the Value entered in Row 4 of
         Column 3 is indeed greater than the Value entered in Row 4
         of Column 2, this expression will also be displayed as TRUE .

Row 5: Key in + R1 < (2 * R2) . Nope. The Value entered in Row 1
         of Column 4 is not less than twice the Value entered in Row 2.
         Therefore, this expression will be displayed as FALSE .

Row 6: Enter the Value 1 .

Row 7: Enter the Value 100 .

Now you are going to begin keying in Conditional Statements, as
they appear in the lower part of the illustration. The exact form of
each statement is listed below, along with its translation into plain
language. As you enter each of the statements into Column 4, it will
remain displayed as a Formula. Since Column 5 has been formatted
to reproduce each entry in Column 4, the calculated Values of each of
the Conditional Statements will be displayed in Column 5.

+ IF (R3, , C3)

    IF the Value entered in Row 3 is TRUE, return 0. Otherwise,
    return the Value entered in Column 3. The Row 3 entry, 7*6 = 42
    is indeed TRUE, thus 0 is returned.

+IF (R3, C2, C3)

    IF the Value entered in Row 3 is TRUE, return the Value entered
    in Column 2. Otherwise, return the Value entered in Column 3.

Remember, you have set up your worksheet in such a way that you can
use Single Coordinates which assume current Row or current Column.

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+IF (R6 > 50, C2, C3)

> IF the Value entered in Row 6 is greater than 50, return the Value entered in Column 2. Otherwise, return Column 3 Value.

+IF (NOT (R6 > 50), C2, C3)

> IF it is NOT TRUE that the Value in Row 6 is greater than 50, return Column 2 Value. Otherwise, return Column 3 Value.

+IF (OR (R3, R4, R5), C2, C3)

> IF either R3 or R4 or R5 is TRUE, return the Value in Column 2. Otherwise (if none are TRUE), return the Value in Column 3.

+IF (AND (R3, R4, R5), C2, C3)

> IF R3 and R4 and R5 are all TRUE, return the Value in Column 2. Otherwise (if any one is NOT TRUE), return Column 3 Value.

+IF (R6 < 50, "GROSS SALES", C3)

> IF the Value entered in Row 6 is less than 50, return the Value for GROSS SALES in the same Column (Column 4). Otherwise, return the Value entered in Column 3.

+IF (R6 > R7, "GROSS SALES", "NET PROFIT")

> IF the Value of R6 is greater than the Value of R7, return the Value for GROSS SALES in the same Column. Otherwise, return the Value for NET PROFIT in the same Column.

+IF (R6 > FILE (JIM, LOAN-F2, , 7, 2), C2, C3)   (Note: See page T-130)

> The FILE expression refers to a Value in Row 7 Column 2 of a different worksheet stored under the File Name: LOAN-F2. Thus, IF the Value of R6 is greater than that Value in R7C2 of the other worksheet, return Column 2 Value; otherwise, return Value in C3.

Note: There are a great many other useful word combinations; among them such expressions as +NOT (R7 > 100), which means the Value in R7 as less-than-or-equal-to 100. To test expressions, see page T-164.

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Finance

Program Function: FINANCIAL APPLICATIONS

The Spreadsheet makes available all of the traditional functions associated with financial applications, including Net Present Value and Internal Rate of Return calculations.

The financial applications of the program involve five elements, which are <u>always entered in the same order of entry</u>, regardless of the particular Formula being used, or the function being solved:

(PVAL, FVAL, RATE, PERIOD, PMT)

Present Value: . . . . **PVAL**(FVAL, RATE, PERIOD, PMT)

Future Value: . . . . **FVAL**(PVAL, RATE, PERIOD, PMT)

Interest Rate: . . . . **RATE**(PVAL, FVAL, PERIOD, PMT)

Number of Periods: . . . **PERIOD**(PVAL, FVAL, RATE, PMT)

Payment: . . . . **PMT**(PVAL, FVAL, RATE, PERIOD)

ONE of the VALUES in PARENTHESIS MUST BE ENTERED AS 0.

Each function requires that the other <u>four</u> Values be entered, in order to perform the calculation; however, one of those four Values must be entered as zero, since the calculations will allow only three Values to be considered.

The chart on the next page takes three of the five possible Values for each situation (and pretends the other two are not known), and shows the exact Formula that would be keyed-in to solve for either of the other two Values.

At the bottom of the page, a rather complicated Formula is used to introduce the concept of combining several of the program's many functions so that the program itself analyzes a number of possibilities and finally returns a single Value based on the logic and priorities you have programed into your worksheet.

PVAL	FVAL	RATE	PERIOD	PMT	FORMULA					RESULT
?	9900	0.01	120	—	+PVAL	(9900,	.01 ,	120,	0)	3,000
?	—	0.01	120	43.04	+PVAL	(0 ,	.01 ,	120,	43.04)	3,000
3000	?	0.01	120	—	+FVAL	(3000,	.01 ,	120,	0)	9,901
—	?	0.01	120	43.04	+FVAL	(0 ,	.01 ,	120,	43.04)	9,901
3000	9900	?	120	—	+RATE	(3000,	9900,	120,	0)	0.01
—	9900	?	120	43.04	+RATE	(0 ,	9900,	120,	43.04)	0.01
3000	—	?	120	43.04	+RATE	(3000,	0 ,	120,	43.04)	0.01
3000	9900	0.01	?	—	+PERIOD	(3000,	9900,	.01,	0)	120
3000	—	0.01	?	43.04	+PERIOD	(3000,	0 ,	.01,	43.04)	120
—	9900	0.01	?	43.04	+PERIOD	(0 ,	9900,	.01,	43.04)	120
3000	—	0.01	120	?	+PMT	(3000,	0 ,	.01,	120)	43.04
—	9900	0.01	120	?	+PMT	(0 ,	9900,	.01,	120)	43.04

The chart above illustrates all of the possible ways of solving for each of the functions when 3 of the 4 other Values are known. Note that the <u>order</u> in which those Values are entered is always the same, and there is always one Value entered as 0 .

A great part of the power of the Spreadsheet lies in its ability to use all of these functions in combination with other functions, almost to the point of giving you the ability to program the program.

As an example, you can combine Conditional Statements with the financial functions to create some sophistocated worksheets that have the ability to compare many alternative decisions:

Suppose that you are examining a production facility that needs a new piece of equipment. You don't know whether to buy or lease, but you do want the lowest cash flow possible. Should you borrow all the cost of the new equipment, pay cash for part of it, or lease it?

Example: "If the payment on a loan of the amount entered in R3 at 12% for 5 years is less than the lease payment entered in R4, then return the Value of the loan payment; otherwise, return the Value of the lease payment." Can you combine that all in one Formula? Yes!

+IF (PMT (R3, 0, .01, 60) > R4, PMT (R3, 0, .01, 60), R4)

Program Function: NET PRESENT VALUE

Formula: NPV (Initial outlay, rate, list of cash flows)

Notation: NPV (6000, .12 , 750, 750, 750, 8000)

NPV (R2, .15 , R4..R7, R8+R9)

Description: THE ANALYSIS of CASH FLOWS

One of the most incisive ways to examine investment alternatives is to look at the present-day equivalents of the cash flows from those investments, over the projected life of that investment, to determine whether or not the investment is likely to meet a required minimum rate of return in today's dollars.

This procedure is most often referred to as Discounted Cash Flow Analysis. By requiring a certain minimum rate of return, and then estimating the cash flows for each period, the discounted cash flows can be added (together with the eventual sale price of the investment, if applicable) to see if the investment is worthwhile when examined on the basis of its present-dollar-worth.

The analysis is performed by calculating the Net Present Value of all of the cash flows. The NPV function of the Spreadsheet allows a very large number of cash flows to be examined, since the list of cash flows keyed into the Formula can be either individual Values, or else a range of Values as one of the items within the list.

The initial outlay for the investment (the first Value entered in the Formula) is keyed in as a positive number. The reason for this is that, even though the initial outlay is a negative cash flow, it would be considered an asset on a balance sheet, and therefore a positive Value. The program does treat it internally as a negative cash flow; if you were to key in, for example, +NPV (6000, .12 , 0), to represent a six-thousand-dollar investment, with a required rate of return of at least 12%, and calculate it with no return, as shown, the NPV function would return a Value of − 6000 .

The second Value entered in the Formula is the required rate of return, expressed as a decimal: 12% would be keyed in as .12 . Then all of the cash flows are entered, including any final lump-sum cash flow that would result from disposing of the investment.

```
====== 1 ========= 2 ==== 3 ==== 4 ==== 5 ==== 6 ==
 1|
 2| INITIAL OUTLAY            33750    35750    37750    39750    41750
 3|
 4|    YEAR 1                  -200     -200     -200     -200     -200
 5|    YEAR 2                  2800     2800     2800     2800     2800
 6|    YEAR 3                  3400     3400     3400     3400     3400
 7|    YEAR 4                  4100     4100     4100     4100     4100
 8|    YEAR 5   Formula must-> 4800     4800     4800     4800     4800
 9| SALE PRICE  combine these> 50000    50000    50000    50000    50000
10| ----------------------- -------- -------- -------- -------- --------
11| NET PRESENT VALUE
12|    Assuming 15% Return
13|
14| +NPV(R2,.15,R4..R7,R8+R9)  18.32 -1981.68 -3981.68 -5981.68 -7981.68
15| -----------------------
16| INTERNAL RATE of RETURN    0.15     0.14     0.12     0.11     0.10
17|
```

The illustration above examines the maximum purchase price allowable on a five-year investment, if it is to yield no less than a 15% return throughout its life. The data entered in all Columns is the same, except in Row 2, where different potential purchase prices are entered. The range of purchase prices can be varied very quickly by entering 2000 + C-1 in all Columns of Row 2 except Column 2. Then any change in the Value entered in R2C2 will automatically cause the other Columns to change their Row 2 Values accordingly.

One important note about the last entry in your list of cash flows: If you sell the investment in the same year as your last operating cash flow, you must combine those two figures to obtain a correct NPV. If you do not combine them into one Value, the NPV function will assume that the sale was made the following year, with no other cash flow.

The Formula entered in each Column of Row 14 to calculate NPV is:

$$+NPV(R2, .15, R4..R7, R8+R9)$$

The last cash flow in the list is a single Value for R8+R9, since this example assumes the asset was sold during the 5th year of holding it. As you can see from the results displayed in Row 14, all the purchase prices above $33,750 fail to meet the required 15% return.

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IRR

Program Function: INTERNAL RATE of RETURN

Formula: IRR (Initial outlay, list of cash flows)

Notation: IRR (6000, 750, 750, 750, 8000)

IRR (R2, R4..R12)

IRR (R2, R4..R7, R8+R9)

Description: THE ANALYSIS of CASH FLOWS

Calculating the Internal Rate of Return of an investment is very similar to determining the Net Present Value of that investment. The difference is that the IRR function of the Spreadsheet takes all of the cash flows of an investment and tests them until the actual return based on discounted cash flows is found that would, at that rate of return, yield a Net Present Value of 0 .

Remember that if you apply any given required rate of return to the NPV function, and it calculates to 0 , that means the investment has just exactly met your required rate of return, no more and no less.

If you will go back to the Net Present Value example illustrated on page 102, you will find that on Row 16 the Internal Rate of Return calculations have also been included for each of the Columns by using the Formula:

$$+IRR (R2, R4..R7, R8+R9)$$

In the example, the Internal Rates of Return correlate exactly to the calculations of Net Present Value. Where the required rate of return entered into the NPV Formula was set as 15%, the negative NPV that is displayed in all the Columns except Column 2 shows that investment fails to yield the required return other than at the purchase price in Column 2. The subsequent calculation of IRR shows why.

The example at the top of the next page shows a similar type of investment. The real power offered to you by setting up this kind of worksheet is that, once you have the format, any changes you enter in purchase price, interim cash flows, or selling price, will immediately be recalculated by the IRR function to show the yield. You can learn, therefore, a great deal about a proposed investment, simply by playing around with the Values on the worksheet.

A different kind of IRR calculation appears below on that page.

```
━━━━━━━━━1━━━━━━━━━━━━2━━━━━━━3━
 1
 2  PURCHASE PRICE:
 3      Even though this is a cash outlay, it would be listed
 4      as an Asset - and must be entered as a Positive Value.    25,000.00
 5
 6  Cash Flow 1st year        Lost Money: Negative Cash Flow    -1,500.00
 7  Cash Flow 2nd year        Made Money: Positive Cash Flow       250.00
 8  Cash Flow 3rd year        Made Money: Positive Cash Flow     1,750.00
 9  Cash Flow 4th year                                          2,450.00
10      Must be combined with Sales Price in the Formula, as the
11      total net cash flow for the 4th year must be a single Value.
12      Thus the 4th cash flow in the list must be R9+R14.
13
14  SALES PRICE (Sold in 4th year)                             27,250.00
15
16     INTERNAL RATE of RETURN      +IRR (R4,R6..R8,R9+R14)        0.05
17
```

```
━━━━━━━━━1━━━━━━━━━━━━2━━━━━━━3━
 1
 2  INCOME FROM ROYALTIES:        Cash Flow 1st year        -10,000.00
 3
 4      Even though this is a cash INFLOW, it would be listed as
 5      as a Liability - and must be entered as a NEGATIVE Value.
 6
 7  Residual Income:              Cash Flow 2nd year          3,500.00
 8     Royalties are smaller      Cash Flow 3rd year          2,500.00
 9     each succeeding year.      Cash Flow 4th year          1,500.00
10                                Cash flow 5th year          1,000.00
11
12      At what interest rate would you have to invest your royalties
13      during that time to have 25,000 at the end of the 5th year?
14         NOTE: 25,000 would be entered as a NEGATIVE Value.   -25,000.00
15
16     INTERNAL RATE of RETURN      +IRR (R2,R7..R9,R10+R14)       0.10
17
```

The second example calculates the rate of return required in order for several cash flows to amount to a set future value, such as would occur when receiving royalties, stock dividends, or annuity income.

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Program Function: STATISTICAL APPLICATIONS

LINEAR REGRESSION

Correlation Coefficient: **CORR**

>   CORR (range of x Values, range of y Values)

Dependent Variable: **DEPD**

>   DEPD (range of x Values, range of y Values, x Value)

Independent Variable: **INDEPD**

>   INDEPD (range of x Values, range of y Values, y Value)

Slope (of the line of regression):   **SLOPE**

>   SLOPE (range of x Values, range of y Values)

STANDARD DEVIATION: **SDEV**

>   SDEV (list or range of x Values)
>   SDEV (list or range of y Values)

VARIANCE: **VAR**

>   VAR (list or range of x Values)
>   VAR (list or range of y Values)

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Linear Regression is a statistical method for finding a straight line that is the "best fit" along a set of irregular data points. The purpose of Linear Regression is to provide, as nearly as possible, some linear relationship between those data points that will allow you to draw some reasonable conclusions about that data and other data that may bear the same relationship.

The language of Linear Regression makes it sound very mysterious and difficult to someone who has had no prior experience in statistics. It is not difficult, once you understand what it allows you to do. And its inherent power to find relationships between data and organize the relationships in a useful way offer you a wonderful tool in both finance and statistical analysis.

A single example involving the potential purchase of a parcel of real estate will not only illustrate the various functions by which you can apply Linear Regression; the example will also show you what the useful purpose of those functions is in the real world, and some reasons why you might want to make use of them.

THE EXAMPLE:

You are looking for just the right piece of real estate to purchase. At this point, you've investigated five different properties, all fairly close to each other. You're not sure any of them is the right one, but you do want to learn something about the prevailing market in this one area, and these five properties should give you a basis for a general understanding of property values within this locale.

All five properties have the same depth from the street; that is their only common feature. Each has a different amount of frontage on the street; and each has a different asking price.

Is there any relationship that you can find between these five properties that will give you real insight into their price structure, whether or not they are pretty much "in line" with each other, and what you could reasonably expect to pay for a sixth property that followed the same general pattern of the market?

Parcel Number:	1	2	3	4	5
Frontage (ft):	150	130	170	190	115
Asking Price:	75,000	77,500	83,000	89,950	68,500

Please create a worksheet like the one illustrated at the top of the next page. Although most of the worksheet is easily formatted, you will find below some general guidelines to assist you.

1: Column 1: Column Width 6 characters.

2: Column 2: Column Width 35 characters.
Numeric Display set for Formulas.
Value Justification set for Left.

3: Row 1: Label Justification set for Center.

4: Fields R3C2, R4C2, R5C2, R6C2, R7C2:
Value Justification set for Center.

5: Column 3: set for 2 decimal places and commas.

6: Column 3: This is important: The Formula +C2 is entered in Rows 9 thru 17, which means that each of those Rows in Column 3 will display the numeric Value of the corresponding Formula displayed in Column 2.

7: Column 4: Column Width 24 characters.
All entries have been indented by typing 3 [spaces] when beginning each entry, to separate from Col.3.

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```
═══1═══════════════2═══════════════3═══════════════4═══════
 1│PARCEL            FEET (x)          PRICE (y)
 2│──────  ─────────────────────────── ─────────
 3│No. 1              150              75,000.00
 4│No. 2              130              77,500.00
 5│No. 3              170              83,000.00
 6│No. 4              190              89,950.00
 7│No. 5              115              68,500.00
 8│──────────────────────────────────────────────────────
 9│      +DEPD   (R3..R7,R3C3..R7C3,0)    40,558.22   Value of Y when X=0
10│      +SLOPE  (R3..R7,R3C3..R7C3)         253.19   Slope in dollars/foot
11│      +CORR   (R3..R7,R3C3..R7C3)           0.94   Good Fit: 1.0 perfect
12│      +SDEV   (R3..R7)                      30.08   Stand.Dev. of Footage
13│      +SDEV   (R3C3..R7C3)               8,126.84   Stand.Dev. of Price
14│
15│      +DEPD   (R3..R7,R3C3..R7C3,165)   82,334.67   Est.Price of 165 feet
16│      +INDEPD (R3..R7,R3C3..R7C3,70000)    116.28   What $70,000 will buy
17│      +VAR    (R3..R7)                     905.00   Square of Stand.Dev.
```

The completed worksheet is shown above. You need not enter the Formulas in the lower part of the worksheet yet; start with the first Formula, in Row 9 Column 2, and take them one at a time.

What do you do first? You find out how much no feet of land costs! That's right. You see, none of these properties is in a perfect dollars-to-footage relationship. Therefore your "best fit" straight line is not going to begin at 0-feet-for-0-dollars. It will begin somewhere else, and you need to know where.

First, calculate the Dependent Value (y), Dollars, when the Value of the Independent Value (x) is equal to 0.

Key in the first Formula at Row 9 Column 2, which will appear as +DEPD(R3..R7, R3C3..R7C3, 0) and which will return a Value that says you will pay $40,558.22 for no feet of property.

Don't give up yet: it is not all as crazy as it may seem to you. This is simply the first step in building a logical relationship from the data we have on these five properties, although it doesn't appear too terribly logical at the moment. Keep going.

There is some kind of a "best fit" straight line out there, and you need to know its SLOPE, which is a technical way of calculating how far the line moves in dollars for each extra front foot, starting from 0 front feet.

Now move to Row 10 Column 2 and key in the Formula for the SLOPE of the line: +SLOPE(R3..R7, R3C3..R7C3) which will now display as a Formula in Column 2 and return a Value in Column 3 of 253.19.

What does THAT mean? It means that you now have a complete description of the straight line that makes the "best fit" possible with your five sets of data. What's more, that line says that the closest you can come to a single equation for the asking price of any property in that locale, based on your five sample properties, is:

$40,558.22 plus $253.19 per foot of frontage!

At the top of the next page, you will see a graph illustrating all of the data points and the straight line of "best fit" that starts out at $40,558.22 and climbs $253.19 for each foot of frontage that it moves to the right. It's important for you to realize, however, that you don't ever have to have a graph drawn to understand how the relationships work. We're doing it here just to make the example more effective.
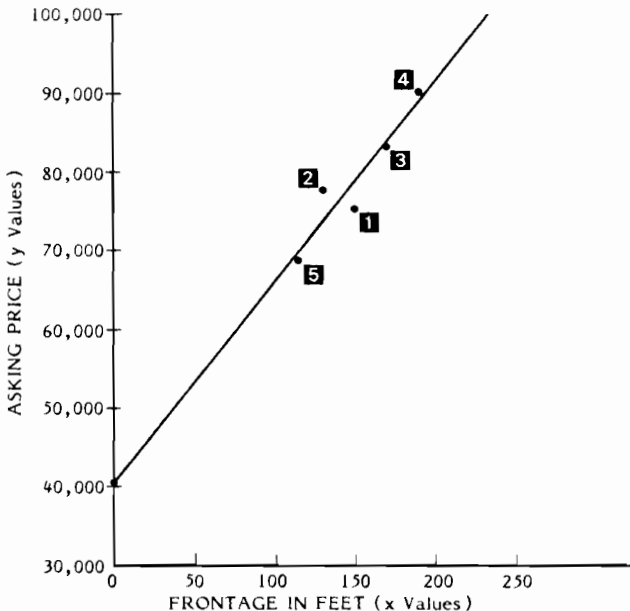
And, as you can see it <u>is</u> a good fit. Well, you know that it is statistically the best straight line possible, but is there a measure of how good the "best fit" really is ?

Yes. It is called the <u>Correlation Coefficient</u>, and it is a measure of how closely that line correlates to a theoretically perfect fit for all the data points. Move to Row 10 Column 2 and key in the Formula for the <u>Correlation Coefficient</u>: <u>+CORR (R3..R7, R3C3..R7C3)</u> and note that when reproduced as a Value in Column 3, it returns <u>0.94</u> . Since a Value of <u>1.00</u> would be a <u>perfect</u> fit, the figure tells you that your line is a very good fit indeed, which you could see by looking.

If the <u>Correlation Coefficient</u> was around 0.8 for your line, it

would be only a so-so fit, and if that Value was 0.6 it wouldn't be a very good fit at all, which would not mean that you had calculated anything incorrectly. It would mean only that your data-points did not in fact have much of a linear relationship of any kind.

Standard Deviation:

In the example, Standard Deviation for both the (x) Values and the (y) Values is easy to obtain: +SDEV (R3..R7) gives you the Standard Deviation for the footage Values, while +SDEV (R3C3..R7C3) gives you the same thing for the dollar Values.

Now what does that mean? Well, statisticians discovered a long time ago that any very large number of natural or coincidental things that happen, and can be measured, will distribute themselves along a predictable route or pattern.

In almost every instance, about 2/3 of those items will occur within plus-or-minus one Standard Deviation of their overall average. What's more, about 95% will occur within 2 times that amount, and almost all (99.7%) within 3 times that amount.

That isn't critical to this example, as we have only five items. The average, or mean, footage of the five is 151 feet; and you have calculated the Standard Deviation for footage at 30.08 . Yet what is amazing, is that if you now go out and find 100 other properties, the odds are overwhelming that two-thirds of them will be between 121 and 181 feet wide, 95% of them will be from 91 to 211 feet wide, virtually all will be from 60 to 240 feet wide, in that same locale.

That is not altogether a bad thing to know, in researching other properties. And it works! There is sometimes magic in numbers.

The same is true for Prices: The mean of your five prices is just about $78,800. The Standard Deviation is around $8,100.00. And you will find (barring foolishness on the part of some seller) that the same 99.7% of all similar properties (qualitatively) in that locale will have asking prices between $54,500 and $103,000, 95% will be priced from $62,600 to $95,000, and two-thirds from $70,700 to $86,900.

Have you noticed that the five samples you are working with here follow those patterns almost perfectly?

At the very beginning of the example, you used +DEPD to find the "beginning" point of your straight line. +DEPD will give you the Value of (y) when (x) is equal to 0. And +INDEPD will give you the Value, in the same mannner, of (x) when (y) is equal to 0. You can, however, reference them to points other than 0, and in so doing, use them to predict how much frontage you can buy for a given amount of money, or how much a given amount of frontage is likely to cost. The screen example shows those operations on Rows 15 and 16.

Is there any chance of error in using Linear Regression in your research with properties, or any other application? Certainly there is. You are working with estimates, projections and probabilities. You have not considered whether you are calculating Standard Deviation, for instance, on the basis of your data being a sample or a population (when you have 30 or more data-points there isn't much difference between the two). There is some room for error.

What is important, though, is that you _are_ using several rather sophisticated mathematical procedures and applying them in a very practical way to real life problems.

There is one additional function of Linear Regression that you are offered: the ability to calculate the Variance of your data, should you wish to do so.

Variance is the square of Standard Deviation. It is an important function to a statistician, since the actual placement of that straight line on the graph is determined by a "least squares linear regression" that minimizes the sum of the squares of the deviation of (y) Values from the straight line of best fit.

Will you ever use Variance in the practical application of Linear Regression? Probably not. Yet if you do want to utilize Variance, it is available as a Spreadsheet function, and its use is illustrated on Row 17 of the worksheet, keyed in as +VAR (R3..R7) in Column 2 (where it displays as a Formula) and reproduced in Column 3 where it returns the Value of 905. That just happens to be the square of the Standard Deviation of R3..R7, which you see as 30.08 in Row 12.

If you are interested in using Linear Regression, read through the material in this manual on Trend Line Analysis and Growth Rate, in which alternative ways of examining similar data are described.

ABS

Program Function: ABSOLUTE VALUE

Formula: ABS (value)

Notation: ABS (R9 C2)
ABS (SUM (R2 .. R6))
ABS (R2 + R3 + R4 - R3C2)

Description:

The Absolute Value of an entry is the Value itself without regard to sign. If the calculation of a Formula you have entered might result in a negative Value, but you want that Value in terms of its magnitude only, not whether it is positive or negative, you would instruct the worksheet to enter its Absolute Value.

The Absolute Value of +1,000 is 1,000.
The Absolute Value of −1,000 is 1,000.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

Program Function: ARITHMETIC AVERAGE and MEAN

Formula: AVG (list) and MEAN (list)

Notation: AVG (R3, R4, R8, R17)

AVG (R2, R4 .. R7, R9)

AVG (SUM(R2 .. R4) , R6, R9-R8)

Description:

The Arithmetic Average or Arithmetic Mean will calculate the mathematical mid-point of any list of Values.   The list can include Coordinates, Sums, Ranges, Formulas and Values themselves.

The Arithmetic Average of 2 and 4 is 3.

The Arithmetic Mean of 2 and 4 is 3.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

CEIL

Program Function: CEILING

Formula: CEIL (value)

Notation: CEIL (3.8495)

CEIL (coordinate)

CEIL (formula)

Description:

The term CEILING refers to the next whole integer equal to or greater than the referenced Value.

Example:	Row	Entry
	1	2.172635
	2	2.6384
	3	+CEIL (R1+R2) would return a result of 5.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

COUNT

Program Function: COUNT of VALUES

Formula: COUNT (list)

Notation: COUNT (R2, R7..R23, R2C3..R10C3)

Description:

This function makes a numerical count of the non-blank Fields that contain <u>Values</u>. Blank Fields, and Fields containing entries in the form of Labels are not counted.

Example:	Row	Entry
	1	1
	2	
	3	2
	4	expense
	5	3
	6	4
	7	0
	8	+COUNT (R1 .. R7) would return result: <u>5</u>

In the example shown, neither Row 2, which is blank, or Row 4, which has a Label entered, would be counted. Row 7, which has a Value of 0, <u>would</u> be counted, along with Rows 1, 3, 5 and 6, yielding a COUNT of <u>5</u>.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

Program Function: THE CONSTANT: **e**

Formula: Entered as: E

Notation: To enter into a Field in place of a Value: +E

The program gives E the Value of: 2.718281828

Description:

Expressions and formulas utilizing the Constant **e** are generally found only in differential equations.

There is an occasion, however, when the Constant **e** arises very naturally.   This occurs in the theoretical study of compound interest. While a discussion of the theory is beyond the scope of this Technical Reference Section, an example will illustrate the way in which financial calculations relate to the Constant **e** .

Example: **e** is the number of dollars to which one dollar will grow in one year, at 100% interest per annum, compounded continuously.

Practical examples of this relationship can be found under the reference EXP in this section, which deals with Exponents to the base e , or the calculation of e to a power.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

ERROR

Program Function: ERROR FUNCTION

Formula: Entered as: ERROR

Notation: To enter into a Field in place of a Value: +ERROR

Description:

The function ERROR is entered into a Field to indicate that the appropriate Value for that Field has been designated <u>as an error</u>.

It is important to note that, whenever a reference is made to a Field, list of Fields or range of Fields that contains an ERROR entry, the reference will also return a result of ERROR.

ERROR may also be returned as the equivalent of a Value if designated as the result of one of the logical arguments in one of the Condiditonal Statements allowed by the program.

Example: +IF (R6 > R7, R6, ERROR)

The above expression translates:

> If the Value in Row 6 is greater than the Value in Row 7, return the Value in Row 6. Otherwise return ERROR (as a Value, not a Label).

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

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Program Function: EXPONENT to the base e

Formula: EXP (value)

Notation: To enter e^2: $+EXP(2)$

(The Value in parentheses is the power to which the base e is raised; e has the Value 2.718281828)

Description:

Expressions and formulas raising the Constant e to a power are found predominantly in the calculus of differential equations.

This constant occurs naturally, however, in the area of finance when interest is computed as the limit of interests attained by your allowing the compounding interval (or period) to approach zero.

When interest is compounded over a nearly infinite number of microscopically small periods, it is termed compounding continuously.

The result yields, to any desired degree of accuracy, the very largest sum to which interest can grow in a given period of time, no matter how often it is compounded.

Example: One dollar, compounded continuously at an interest rate of r, will amount in one year to e^r dollars. If r were equal to 6%, then:

$+EXP(.06)$ would return $ 1.0618365 dollars.

In p years it will amount to e^{pr} dollars.

If $p = 10$: $+EXP(10*.06)$ yields $ 1.8221188 dollars.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

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Program Function: RETRIEVING DATA from a FILE

Formula: FILE (volume name, file name, password, row #, column #)

Notation: FILE (DISC, BUDGET, , 8, 2)

FILE (DATA, INVENTORY, Secretword, 12, 3)

Description:

RETRIEVING DATA from a STORED WORKSHEET FILE

The FILE function provides you with the very powerful option of being able to utilize data from one worksheet as part of your data base in creating another worksheet.

The program has the ability to look into any worksheet that you have saved in the computer's permanent memory. It can scan all of the Fields in the stored worksheet, bring out a Value from a specific Field of that worksheet, and make it available for you to use in your Current Worksheet.

You may retrieve a Value using the FILE function, and enter that Value directly into your Current Worksheet, as in the example:

+FILE (DATA, FINANCE,   , 14, 4)

---

in which case the Spreadsheet would:

Go to the Storage Volume named DATA
Find the worksheet you have stored named FINANCE
Enter it, as directed, providing there is no password
Retrieve the Value entered there in Row 14 Column 4
Enter it in the Current Field of the worksheet that
   you are creating at the present time.

Don't forget the password !

Look at the two examples under "Notation" at the top of the page. If the worksheet from which you wish to retrieve the data was stored using a password, you must use that password in its exact form or you

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will be unable to access that worksheet. Even if there is no password, you must acknowledge the space for it by keying in 2 commas, as in the first example under "Notation".

You can also retrieve a Value using the FILE function, and utilize it as part of an expression that you are keying in on the Edit Line. For example, one of the formulas used in calculating the Future Value of an investment is:

FVAL (Present Value, Interest Rate, Period)

If the interest rate structure of your investment portfolio was stored in another worksheet, you might want to draw out one particular rate from that worksheet rather than derive it again from raw data, and use that Value in determining the Future Value of one investment:

+FVAL (R4C3, FILE (DISC, INTEREST, , 22, 4), 48)

You have instructed the Spreadsheet to:

> Use the Value at R4 C3 as the Present Value
> The Value at R22 C4 of your INTEREST file as the Rate
> And the Value 48 as the number of Periods.

If the entry you are retrieving from the stored worksheet is actually an expression that evaluates to a Value (a formula, for instance), the FILE function will only retrieve its numerical Value, not the expression itself. A formula referenced to Values on the stored worksheet by their coordinates, for example, would be utterly useless to you, since those same coordinates (or more properly, the Fields described by them) on your Current Worksheet contain completely different Values.

Because the FILE function requires a great deal of scanning in the permanent memory of your computer, calculation and entry of data may be considerably slower when you make use of this option during the creation of a worksheet, especially if you use the FILE function in a number of entries within one worksheet.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

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FLOOR

Program Function:　　　　　FLOOR

Formula:　　　FLOOR (value)

Notation:　　　FLOOR (3.8495)

　　　　　　　FLOOR (coordinate)

　　　　　　　FLOOR (formula)

Description:

The term FLOOR refers to the next whole integer equal to or less than the referenced value.

Example:	Row	Entry
	1	2.172635
	2	2.6384
	3	+FLOOR (R1+R2) would return
		a result of 4.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

GROW

Program Function: GROWTH RATE

Formula: GROW (list of Values)

Notation: GROW (10, 12, 14, 19, 15, 23)

    GROW (R3C2, R3C3, R3C4, R3C5)

    GROW (R3C2..R3C18)

Description:

The GROW function allows you to calculate the Growth Rate for a series of Values. The Growth Rate, for example, for two Values, is the amount of increase or decrease, expressed as a percentage, of the second Value over the first Value.

If you key in +GROW(2,3) and press [RETURN], the program will return a Value of 0.5 which, expressed as a percentage, means that the Growth Rate from the Value 2 to the Value 3 is 50%.

When you have many Values in a list, and the Values progress in an irregular pattern, the Growth Rate calculates the percentage of increase or decrease between each pair of values, and then averages those individual changes to arrive at an average rate of change for the entire series of Values, which becomes the Growth Rate for that series.

The worksheet illustrated at the top of the next page contains all the elements you might use in determining and examining Growth Rate.

The upper portion of the worksheet shows the known sales figures for past years. Just for clarity, the percentage increase for each of the periods is calculated by the Formulas in Column 3 and shown as a result in Column 4. You need not make those calculations to work with Growth Rate — it is done here only by way of explanation.

If you were to average those three percentage increases in sales, you would obtain an average increase of 18.8%. If you apply the Formula for Growth Rate in either of the three forms displayed in the middle of the worksheet, the GROW function will also return a Value of 18.8%.

Now go ahead and project future sales from that Growth Rate.

```
═══ 1 ═══ 2 ═══════════ 3 ═══════════ 4 ═══ 5 ═══
 1│   ITEM      AMOUNT           FORMULA          %-INCREASE  RESULT
 2│ ----------  ----------  --------------------  ---------  --------
 3│ SALES 1979  18,000.00
 4│      1980   20,000.00   +(C-2)/(R-1C-2)-1*100    11.1
 5│      1981   26,000.00   +(C-2)/(R-1C-2)-1*100    30.0
 6│      1982   30,000.00   +(C-2)/(R-1C-2)-1*100    15.4
 7│ ------------------------------------------------------------------
 8│ GROWTH RATE         +GROW (18000,20000,26000,30000)   18.8
 9│                     +GROW (R3C2,R4C2,R5C2,R6C2)        18.8
10│                     +GROW (R3C2..R6C2)                 18.8
11│ -------------------------------------------------------
12│ PROJECTED
13│ SALES:
14│      1983        (1 + R10C3) * R6C2                 35,649.57
15│      1984        (1 + R10C3) * R14C5                42,363.07
16│      1985        (1 + R10C3) * R15C5                50,340.84
17│
```

The lower portion of the worksheet shows predicted sales for the next three years, arrived at by taking the actual or predicted sales figure for each prior year and multiplying it by (1 + Growth Rate).

[WHATIF]. If you take the last period of "known" sales as your current period (Row 6 above), and experiment with different ending potential sales figures, then each estimated sales figure for the whole current period will change the Growth Rate for the entire series. By making different estimates, therefore, you can play [WHATIF] with the worksheet. And any change you make in the "known" series of sales will, by altering the Growth Rate, also alter the predictions of sales for future periods. You can see this situation operate within the worksheet illustrated by just keying in, say, 37000 in Row 6 Column 2.

You can set up a far more complex worksheet, with the GROW formula entered for each year, based on the cumulative Growth Rate for combined prior years. Then, by changing the sales figures for any year, the predicted sales figures for all succeeding years would alter.

Refer also to the material on Trend Line Analysis on page 161 of this Reference Section, which describes an alternative method that is often used in the same type of situations as Growth Rate.

Program Function: INTEGER

Formula: INT (Value)

Notation: INT (234.763987)

INT (R2 * R4 / R7)

INT (LOG(R6*R8))

Description:

INTEGER PORTION of a VALUE

The INT function returns the Integer portion of a Value, or any expression that evaluates to a Value. The Integer portion of a Value is any positive or negative whole number, or 0 .

It is important to remember that calculating the Integer portion of a Value does not Round that Value.

Keying in: +INT (4.746532) returns 4 .

The Integer portion of a negative number is the same Value as the Ceiling Value of that number.

The Integer portion of a positive number is the same Value as the Floor Value of that number.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

Program Function: LOGARITHM to the base e

Formula: LN (value)

Notation: LN (12750.75)

LN (coordinate)

LN (formula)

Description:

The LN function returns a Value equal to the logarithm to the base e , or natural logarithm, of the referenced Value.

While formulas utilizing logarithms to the base e are most often found in the calculus of differential equations, there is a special area of financial analysis that also uses this function to rapidly calculate the value of money, when <u>compounded continuously</u> over a period of time, at a given rate of interest.

Consider any Value that represents the sum of the principal-and-interest of one dollar: for example, $\$ 1.82$. The natural logarithm of that amount, divided by a known interest rate, will give the period over which that one dollar must be compounded continuously in order to reach $\$ 1.82$.

Example 1: How long will it take one dollar to amount to $\$ 1.82$ when continously compounded at an annual rate of 6% ?

+LN (1.82) / .06 will return <u>9.9806</u> .

Thus $\$ 1$ will take about 10 years to amount to $\$ 1.82$, or $\$ 1,000$ to amount to $\$ 1,820$ when it is compounded continuously at 6%.

Consider that same sum of principal-and-interest again. Now the natural logarithm of that amount, divided by the period, will give the interest rate required over that period for that dollar, compounded continuously, to amount to $1.82 .

While these calculations are performed using $1.00 as their basis Value, the result returned is proportional to any amount. Once you have the result returned for $1.00, you can multiply that result by any number: for instance, $1,000 and $1,820 would apply to all the results of these calculations, as would $2,000 and $3,640 .

Example 2: What interest rate will it require for one dollar to amount to $1.82 when continuously compounded over a period of ten years ?

+LN (1.82) / 10 will return .05988 .

Thus $1 will require an interest rate of just under 6% when compounded continuously over a period of ten year to amount to $1.82 . And $1,000 will require the same rate to amount to $1,820 .

There is more information about using the Constant **e**   under the listing of the EXP function in this Reference Section.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

Program Function: LOGARITHM to the base 10

Formula: LOG (value)

Notation: LOG (12750.75)
LOG (coordinate)
LOG (formula)

Description:

The LOG function returns a Value equal to the logarithm to the base 10, or common logarithm, of the referenced Value.

Example:	Row	Entry
	1	100
	2	800
	3	100
	4	+LOG (R1) would return a result of 2.
	5	+LOG (SUM(R1 .. R3)) would return a result of 3.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

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MAX

Program Function: MAXIMUM

Formula: MAX (list)

Notation: MAX (R3, R4, R8, R17)

                    MAX (SUM (R2 .. R4) , R6, R8 .. R20)

Description:

The MAXIMUM or greatest Value in a list of Values.

Example:	Row	Entry
	1	1
	2	2
	3	3
	4	-1
	5	-2
	6	-3
	7	+MAX (R1 .. R6) would return a result of 3.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

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MEDIAN

Program Function: ARITHMETIC MEDIAN

Formula: MEDIAN (list)

Notation: MEDIAN (R3, R4, R8, R17)

MEDIAN (R2, R4 .. R12, R29)

MEDIAN (SUM (R2 .. R4), R6, R8 .. R20)

Description:

The Arithmetic Median of a list of Values is the arithmetic point at which there are the same number of Values less than, and the same number of Values more than the Median Value.

The Arithmetic Median of the series: 2, 3, 4, 7, 9 is 4.

The Arithmetic Median of the series: 2, 3, 4, 7, 9, 11 is 5.5.

The Arithmetic Median of the series: 2, 3, 4, 7, 9, 11, 12 is 7.

In each of these examples, there are the same number of Values on either side of the Median Value, without regard to the magnitude of the individual Values in the list.

The Arithmetic Median of the series: 1, 2, 4, 6, 7 is 4.

The Arithmetic Median of the series: 1, 2, 4, 6, 500 is also 4.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

MIN

Program Function: MINIMUM

Formula: MIN (list)

Notation: MIN (R3, R4, R8, R17)

MIN (SUM (R2 .. R4) , R6, R8 .. R20)

Description:

The MINIMUM or least Value in a list of Values.

Example:	Row	Entry
	1	1
	2	2
	3	3
	4	-1
	5	-2
	6	-3
	7	+MIN (R1 .. R6) would return a result of −3.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

Program Function: NOT AVAILABLE: N/A

Formula: Entered as: NA

Notation: To enter into a Field in place of a Value: +NA

Description:

The function N/A is entered into a Field to indicate that the appropriate Value for that Field is <u>not available</u>.

It is important to note that whenever a reference is made to a Field, list of Fields or range of Fields that contains an N/A entry, the reference will also return a result of N/A.

Example:	Row	Entry
	1	1
	2	2
	3	N/A
	4	3
	5	4
	6	+SUM(R1..R5) would return a result of N/A.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

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Program Function: The Constant Pi π

Formula: The Formula for Pi is <u>PI</u>

Notation: PI will return the Value <u>3.141592654</u>

R6 * PI

2 * PI * SQR (R2)

Description:

The constant Pi is built into the program in order to make your Formulas and calculations using that constant easier to enter into a worksheet.

The PI function can be used as a separate entity, or nested into a Formula or calculation, as with various Trigonometric functions. For example, if you want to calculate twice the area of a circle, and have entered a Value for the radius of the circle in Row 2, current Column, then the expression $2 \times \pi \, r^2$ can be keyed in as:

2 * PI * SQR (R2)

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

RAND

Program Function: RANDOM NUMBER

Formula: RAND (lower limit Value, upper limit Value)

Notation: RAND (1 , 100)

RAND (R6C4 , R8C4)

RAND (SUM(R2..R4) , R6 * 4)

Description:

The RAND function of the program operates as a Random Number generator that returns a Random Number lying between whatever two limits you set with each use of the function.

The limits imposed may be in the form of any expression that evaluates to a Value. The first limit keyed in must be a lower Value than the second limit keyed in.

The most important thing to know about a Random Number generator is that it does indeed generate a truly random number, each time you calculate the RAND function.

In other words, if you key in +RAND (1 , 10) and press [RETURN] the program will return a random number between 1 and 10. If you now repeat exactly the same keystrokes, a completely different Value will be returned, and yet another different value the third time.

In addition, if you press [F4 Recalculate] to recalculate your worksheet, any expression that has been entered using the RAND function will once again return a different Value.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

ROUND

Program Function: ROUNDING of INTEGERS

Formula: ROUND (value, number of places)

Notation: ROUND (3.48576 , 2)

ROUND (R1 / R2 , 2)

ROUND (R4C2 * R1 / R2 , 2)

Description:

Regardless of the number of decimal places which the program is instructed to use in <u>displaying</u> Values, the Spreadsheet will always compute every Value <u>internally</u> to twelve places.

If you wish to simplify a calculation, however, you may direct the Spreadsheet to ROUND that one calculation to whatever degree of accuracy you choose, from 0 to 10 decimal places.

Example:	Row	Entry
	1	2
	2	3
	3	+ R1 / R2 would return 0.6666666666
	4	+ ROUND (R1 / R2 , 2)
		would return 0.67

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

Program Function: SQUARE of a VALUE

Formula: SQR (value)

Notation: SQR (15)   SQR (–15)

SQR (R3 C2)   SQR (R5 – R3)

SQR (formula)   SQR (SUM(R3 . . R5))

Description:

The SQR function returns the square of a Value. As shown in the examples of notation above, the Value can be any expression that evaluates to a Value (see page T-30 of this Reference Section).

Remember that the <u>square</u> of a negative Value will always be a <u>positive</u> Value. (Negative times negative yields positive.)

Squaring a Value is raising that Value to its <u>second power</u>. You can also raise a Value to any other power by calculating the Value (y) to the (x) power, as in y^x.

Page T-33 of this Reference Section describes this function.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

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SQRT

Program Function: SQUARE ROOT of a VALUE

Formula: SQRT (value)

Notation: SQRT (225)

SQRT (R12 C8)

SQRT (formula)

Description:

The SQRT function of the Spreadsheet returns the square root of a Value, or of any expression that evaluates to a Value, with one important exception.

You cannot calculate the square root of a negative Value. The Value must be positive, or the expression that evaluates to a Value must be either positive or absolute. If you attempt to calculate the square root of a negative Value, the Spreadsheet will enter ERROR in the Field where you have keyed in the square root calculation.

When the possibility exists that the Value which you wish to take the square root of is an expression that will result in a negative Value, you can always incorporate the ABS function within the square root function to assure that the Value will not be negative.

Example: The Value entered in R3C2 is 40 .
The Value entered in R4C2 is 265 .

If you key in +SQRT (R3C2 – R4C2), your screen will display ERROR, since R3C2 – R4C2 evaluates to a negative Value of – 225 . However, if you key in +SQRT (ABS(R3C2 – R4C2)) the expression will then return an Absolute Value whose square root is 15 .

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Program Function: SUM of VALUES

Formula: SUM (list)

Notation: SUM (R3, R4, R8, R17)

SUM (R2C3, R4 .. R7, R8C8 .. R12C8)

SUM (AVG(R1 .. R5) , R7 .. R12)

Description:

The SUM of a list of Values adds each Value in the list together. Within that list there can be Values, Absolute Values, Coordinates that reference Values, Ranges of Values, and Formulas which calculate to Values.

As in all other functions allowing an unlimited list, several levels of parentheses can also be accommodated within the envelope that comprises the list.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

Program Function: TREND

Formula: TREND (range of data points, period of desired data point)

Notation: TREND (R1..R6, 8)

TREND (R3C2..R8C2 , 8)

Description:

TREND LINE ANALYSIS

You can use the TREND function to make predictions of Values for future periods, based on the trend of known Values for prior time periods. Trend Line , Growth Rate and Linear Regression are similar methods of analyzing data and predicting future behavior, or common characteristics of known behavior.

The only characteristic of Trend Line Analysis that makes it at all different from Linear Regression is that the TREND function of the program assumes an equal distance or passage of time from one unit of data to the next.

Otherwise, TREND operates just like Linear Regression. You will be calculating a "best fit" straight line through your data, and then making an estimate of some future Value.

The accuracy, or degree of fit, of a Trend Line can be tested by calculating its Correlation Coefficient. A Value of 1 returned as a Correlation Coefficient would indicate a perfect fit of data. Other Values suggest a less perfect fit: 0.9 indicates a good fit; 0.77 is a fair fit; 0.6 is not a very good fit. To better understand how these two functions work together, see the section on Linear Regression.

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	DATA-POINT	PERFECT	STOCK DIVIDEND	CORP. PROFITS
	1	2	3	4	5
YEAR	NUMBER	TREND LINE	TREND	TREND
1	1	10.00	2.10	-2,600,000.00
2	2	20.00	1.35	-1,000,000.00
3	3	30.00	1.53	1,300,000.00
4	4	40.00	2.17	2,900,000.00
5	5	50.00	3.60	2,800,000.00
6	6	60.00	2.48	3,600,000.00
	+TREND (R4..R9, 7)	70.00	3.13	5,566,666.67
	+TREND (R4..R9, 10)	100.00	3.93	9,338,095.24
	+CORR (R4C2..R9C2,R4..R9)	1.00	0.62	0.95

The worksheet illustrated above shows three examples of a Trend Line projection from known data. In each case, you know what the Values were for each of the first six years.

The TREND formula requires two elements: the range of that group of data-points being considered; and the period number of the data-point for which you wish to predict a Value. Thus, when you key in the formula +TREND (R4..R9, 7) you are giving the location of the six data-points for the first six years, and asking for the predicted Value for the seventh year. Below that, on Row 13 you ask for the estimated Value for the 10th year , and check the goodness of fit by using the Correlation Coefficient function on Row 15 (see page T-110). In Column 3, you see a series that fits Trend Line Analysis perfectly; it even looks logical ! Column 5 has a "best fit" rating of 0.95 which is very good. Finally, the data in Column 2 don't fit together at all.

TRIG

Program Function: TRIGONOMETRIC FUNCTIONS

Formula: SIN (value)   TAN (value)

COS (value)   ARCTAN (value)

Notation: All angles are specified in radians: 2 pi radians = 360°.

Description:

To return the <u>sine</u> of the value:

SIN (value in no. of radians)

SIN (no. of degrees * 2 * PI / 360)

To return the <u>cosine</u> of the value:

COS (value in no. of radians)

COS (no. of degrees * 2 * PI / 360)

To return the <u>tangent</u> of the value:

TAN (value in no. of radians)

TAN (no. of degrees * 2 * PI / 360)

The <u>arc tangent</u> is the inverse function of the tangent. It returns the angle (in radians) whose arc is described by the <u>(value)</u> of the tangent.

ARCTAN (value of tangent): returns <u>angle</u> in radians.

The (value) can also be referenced by a Coordinate:

Example: SIN (R8 C3) would refer to a value (in radians)
located in Row 8 Column 3 on the worksheet.

Note: Formulas are VALUES, not Labels: Be sure to enter as a VALUE

TRUE
FALSE

Program Function: TRUE and FALSE

Formula: TRUE is a Value, not a Label

                    FALSE is a Value, not a Label

Notation: 25 > 50 press [F3 Calculate] returns FALSE

        + IF (TRUE, 25 , 100) press [F3 Calculate] returns 25

Description:

The Values TRUE and FALSE are the test functions for all of the Conditional Statements described on page T-95. They greatly facilitate the accurate construction of complicated IF statements.

TRUE and FALSE can be used to test an argument that is part of a Conditional Statement — or either one can be used as the argument itself. A simple example will illustrate both situations:

+ IF (R7 > 100, R3 , R4)

You can take any Conditional Statement, and test each part of it as you construct the statement. In the example above, you could begin by keying in only the argument itself, and testing it, to determine if the Value entered in R7 is indeed greater than 100:

key in + R7 > 100 press [F3 Calculate]

If R7 is greater than 100, the Value TRUE will be returned. If R7 is not greater than 100, FALSE will be returned. Next, use either TRUE or FALSE as the argument itself, to see if the desired Value is returned.

+ IF (TRUE, R3 , R4)

Now press [F3 Calculate], and the Value entered in R3 should be returned. Thus both argument and result have been tested to make certain that the Conditional Statement is operating as desired.

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If, for example, you put to sea on a wooden raft with a parrot and five companions, it is inevitable that sooner or later you will wake up one morning and begin to reflect on it.

—— Thor Heyerdahl

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