CHARTPAK-128

Professional Charts and Graphs from your Commodore 128 computer

Published by

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INTRODUCTION

CHARTPAK-128 lets you create data charts easily. It also includes a simple data entry/update facility that allows you to create and adjust your statistical data for charting.

OPERATION

The simplest way to use CHARTPAK-128 is to key in your data, adjust the chart specifications using several of the menu options, and then draw the chart on the screen. The **M** key returns you to the MAIN MENU while keeping the chart available at the touch of the **C** key. If you wish to change any of the chart specifications, you can do so and then immediately redisplay the new chart. After you have designed a chart to your satisfaction, you can get a permanent hardcopy on your printer.

You may save the chart specifications to disk for use at another time, or for use with other data files. The data may be saved to disk. Data is saved on disk separately from the chart specifications. **NOTE:** In order to allow use of the same names for data and chart specifications files, CHARTPAK-128 automatically adds **D.** to the beginning of each data file name on disk when writing the files to disk and **S.** to the beginning of each specification filename on disk.

HARDWARE REQUIRED

You will need a Commodore 128 computer with a 1571 or 1541 disk drive. Also, a 40-column monitor is necessary for proper display of CHARTPAK-128 graphics.

For hardcopy printouts of your charts, you will require a compatible dot-matrix printer. See APPENDIX A for more information on printers and interfaces.

LOADING CHARTPAK-128

Before you begin, make sure the 40/80 column switch is in the "up" position (i.e. 40-column).

Insert the distribution diskette into the disk drive. Type BOOT and <RETURN>, or simply press the 128's reset button near the power switch. The message **BOOTING CHARTPAK-128** will appear as the program loads and starts up, then the copyright screen will appear. For a few seconds the screen will turn into blocks of all colors. This is normal.

The remainder of CHARTPAK-128 then loads into the computer. It takes about 60 seconds to load on a 1571 disk drive (3 minutes on a 1541 disk drive). Some noises from the disk drive are normal. When the loading process finishes, the CHARTPAK-128 MAIN MENU appears.

DISTRIBUTION DISKETTE

The distribution diskette cannot be duplicated by standard computer equipment. A backup diskette can be obtained for a nominal charge from Abacus Software. Please remit your registration card when you make a request for your backup diskette.

DEFINITIONS

This manual uses a number of terms that may or may not be familiar to you. To avoid confusion, these terms are explained next.

•DATA ITEMS AND DATA VALUES

A data item is the name for something (an entity) about which we can associate a number called a data value. Another name for data item is a point. An example of a data item is the high temperature for a given hot day and the data value is 90 (degrees).

•DATA SET

This is a name that applies to a group of related data items—for example, the daily high temperatures, recorded day-to-day for a month, is a data set.

A second data set is the daily low temperatures for a month or year. We call these types of data sets one-dimensional.

Some data sets require two values for each point (an X and a Y coordinate). An example is a data set that has a lifespan value (years) for varying number of cigarettes per day. We call these types of data sets two-dimensional.

•DATA GROUPINGS

For one-dimensional data sets, you must have a way to group the data points. This is the data grouping name. It may be dates, months, years or any other identification of the individual points.

For two-dimensional data sets, no special data grouping is needed because each point has two values.

•INDEPENDENT AXIS

For the one-dimensional case, this is the axis that shows the data grouping information.

For the two-dimensional case, this is the X-axis, which goes from left to right.

•DEPENDENT AXIS

In the one-dimensional case, this is the axis that displays the data values.

In the two-dimensional case, this is the Y-axis, which goes from bottom to top.

•LEGENDS

These are the "labels" that describe the information about each axis on the chart.

GETTING STARTED WITH CHARTPAK-128

CHARTPAK-128 is easy to use because you interact with it through menu selections. Each menu and input screen has a number in the upper left corner. The REFERENCE SECTION of this manual is arranged by those numbers to make it easy to find more information about a screen entry.

All of the menus have an option [0] that returns you to the MAIN MENU if you decide that you don't want to select any options on the currently displayed menu.

If you accidentally get into a menu option that you don't want, press the **F1** key to return to the MAIN MENU.

Most options in CHARTPAK-128 are selected by moving a marker arrow along the list of options. Use either set of cursor keys—the four single ones in the upper part of the keyboard, or the two at the lower right (with <SHIFT>). Press the <RETURN> key to register your selection and go to the next prompt.

When you are asked to key data into the computer, a prompt of —> appears for numeric data in front of the value already in the computer. Simply press <RETURN> to accept that value. If you want to change that value, key in your new data using either set of number keys, and press <RETURN>. If a number is negative, key the minus sign first, then the digits. For scientific notation, key the fraction portion first, then the letter E, then the exponent (i.e. 1.25E5).

For string type input (such as labels and titles), the prompt is —>> in front of the default value. As with numeric data, press <RETURN> to accept that value, or key in your new data and press <RETURN>. Any characters, including commas, may be included in strings except the quote mark (use an apostrophe (') instead).

CHARTPAK-128 has 3 screens:

On the first screen you will see the menu and data screen. This is an ordinary BASIC screen through which you will enter all data and make all charting option selections.

The second screen is the chart screen. This is 640 points wide by 360 points high. This gives us a resolution of 230,000 points. The C-128 can display only a quarter of the screen at a time in its "window". You can move the window around over the entire chart screen by using the cursor keys on the keyboard. The upper four cursor keys move the window in jumps of 24 pixels at a time. The bottom cursor keys (with shift) move you to the four quadrants (corners) of the chart screen instantly.

The third screen is the top view screen. There will be times when you want to see what the overall chart looks like before you print it. On this top view screen, the image is compressed in half vertically and horizontally so you can see the overall picture, although often you cannot read the details of the screen because the lettering gets compressed below adequate resolution. This can be viewed at anytime by pressing the T key.

CHARTPAK-128 automatically switches between these screens and gives you the option of switching by pressing the C for chart, the T for top view, and the M for menu.

The next section will familiarize you with some of the basics of this powerful package.

A CHARTPAK-128 TUTORIAL

This section is designed to introduce you to the range of possibilities and capabilities of CHARTPAK-128—to give you "hands-on" experience creating charts and graphs with this exceptional package.

The first step is to load CHARTPAK-128 into the computer. If you have not already done so, see the section titled LOADING CHARTPAK-128.

If you make a mistake during this tutorial, you can probably correct the mistake by returning to the MAIN MENU and reselecting the function. If you are at an input screen, you can always break out by pressing the **F1** key.

For demonstration purposes, let's assume you have a lemonade stand that you operate for ten weeks during the summer of 1985. The summer is over and you want to make a chart showing how well (or poorly) you did. Each week, you made a budget based on the expected weather conditions. Your actual sales and budget for the summer were:

WEEK	SALES	BUDGET
1	$15.20	$16.00
2	$17.35	$12.00
3	$20.70	$17.00
4	$33.15	$ 8.00
5	$21.91	$ 8.00
6	$17.16	$ 8.00
7	$13.45	$10.00
8	$ 8.92	$12.00
9	$20.11	$10.00
10	$13.17	$18.00
TOTAL	$181.12	$119.00

To make a chart using this data, start by selecting the INPUT & MODIFY DATA. Press 1 at the MAIN MENU.

Next we set up the global information about the data.

Select option 5: **GLOBAL DATA SPECS**. The first question on screen [1.5] is: **TWO DIM? (Y/N)**. Since each set of numbers (sales and budget) has only one value each, answer **N** and press <RETURN>. This tells CHARTPAK-128 that the data is *not* two-dimensional.

The next question is about the data grouping. Since we are using weeks, select the week option by pressing the up cursor key to move the marker and then press <RETURN>.

The next prompt is to enter the starting week number. Since we are starting with week 1 (default), press <RETURN>. You are now back at the MAIN MENU.

Now from the MAIN MENU select 1: **INPUT & MODIFY DATA**. Next select 1 again: **INPUT DATA FROM KEYBOARD**. The first prompt at screen [1.1] asks you to enter the data set number into which you will enter the data values. We'll put ACTUAL SALES into data set 1 and BUDGET into data set 2. Press <RETURN> to enter data for data set 1.

The message **CLEARING DATA SET-SURE? (Y)** is displayed. This tells you that you are about to clear the data from the data set you selected. If you have selected the wrong data set, press any key except **Y** and you will be returned to the MAIN MENU. Since we *do* want to enter new data into data set 1, press **Y** to clear the data and continue.

The next prompt is for the data set name. Key ACTUAL 1985 as the name and press <RETURN>.

Next you are asked to enter the number of data items (points). Key 10 (number of weeks) and press <RETURN>.

The next prompt is **IN SEQUENCE? (Y/N)**. This lets you select whether you want to key the data in point sequence or select points and accumulate values. Since the sales values are listed in sequence, press **Y**.

Now key the sales values from the table on page 7. For example, key: **15.20** <ENTER> for the first item. The 10-key numeric keypad makes it really easy. As values are accepted by the computer, they are shown on the screen. When the tenth value is entered, you are returned to the MAIN MENU. If you make a mistake in keying a value, you can correct it before pressing <RETURN>. If you don't realize that you made a mistake until later (or the data has changed for some other reason), the ALTER option (menu selections[1/2]) allows you to change any data value.

Now in a similar manner, enter the BUDGET data. From MAIN MENU [0] select options 1 (INPUT & MODIFY DATA). Then from screen [1] enter another 1 (INPUT DATA FROM KEYBOARD). Type 2 to select the next data set number and press <RETURN>.

The message **CLEARING DATA SET-SURE(Y)** appears again to remind you that you will be clearing data out of data set 2 this time. Press **Y**.

Type BUDGET 1985 for the data set name and press <RETURN>. The number of data items prompted defaults to 10, so just press <RETURN>. Enter the budget values from page 9. Since there are no cents, you can type 16 <ENTER> for the first value, etc.

The next step is to define the chart type. From MAIN MENU [0], select menu option 3 (DEFINE CHART). Next select option 1 (CHART TYPE). The marker is already pointing at vertical graph, so just press <RETURN>. Type **N** to the **ALTER DISPLAY SEQ?** prompt and you are returned to the MAIN MENU.

To see the chart, select option 2 (DISPLAY CHART ON SCREEN) from the MAIN MENU [0]. Before displaying the chart, you are prompted to enter today's date and your initials. These will be put in the lower right corner of your chart as a record datestamp. Press <RETURN>.

The screen will clear and the message **Creating chart...** will appear at the bottom of the screen. You will see various lines, numbers and words being put on the chart screen, but you're only seeing the upper left hand corner of the chart. At this time all lines, etc. are in black on the white screen (color is not added until the chart is completed). After a few seconds a tone sounds to indicate that the chart has been completed. At the same time the bottom line of the screen shows the various options you have. The first part says **CRSRS:UP=SCROLL**. This means that the upper four cursor keys can be used to scroll your window around over the chart screen. Try this now. The down arrow key moves your window down the screen and the right arrow key moves your window to the right.

The second part of the prompt says **LOW=QUAD**, which means two cursor keys in the lower part of the keyboard move you to the four quadrants (corners) of the chart screen. With these two cursor keys you must press and hold the shift key to get the opposite functions.

The next prompt says **MENU**. This means that if you press the **M** key you will be returned to the MAIN MENU.

The fourth prompt says **TOP VIEW**. If you press the letter **T**,the screen will temporarily be blanked and then will show you the top view of the entire chart. Try this now.

On the Top View screen you have two prompt options. One is pressing the **M** to go back the MAIN MENU, or you can press **C** to go back to the chart screen.

The chart you see contains many options that are selected automatically by CHARTPAK-128. The following steps are meant to improve the chart by controlling these features.

Before going any further, you should save the data you keyed in. You should **remove the distribution diskette** from the drive and replace it with one on which you want to save the new data. If the diskette has not been initialized (NEWed), you can do so by selecting option 6—FILE UTILITIES—from the MAIN MENU [0] and then option 5—NEW DISKETTE. Answer the subsequent prompts with the correct information. **Be very careful, since the NEW command completely erases all data and programs on a diskette!!**

Now to save the data, press **M** to return to the MAIN MENU and select option 4 (SAVE CHART). Select option 1 (SAVE DATA). The next prompt is for the disk drive number. Unless you are using a diskette drive number other than 8, just press <RETURN>. The data filename may be up to 16 characters long. LEMON85 is a good filename to use. Key the name and press <RETURN>. The disk drive runs for a few seconds and the returns you to the MAIN MENU.

From this point on, option selection from the MAIN MENU is shown using a [/ /] format. For example, to get to the chart type selection screen, you have to select option 3, then 1. This is shortened to [3/1].

The chart vertical axis is automatically set to the range of the data—it ranges from the lowest to the highest values of the data values. To make the chart look more normal, we need to fix up the dependent axis (data values).

Go to [3/2/2] to change dependent axis information. First key $$$ SALES $$$ for the legend and press <RETURN>. Since we want a normal scale, press <RETURN> for the default. The minimum value default is 0 and we probably want to leave it at that value, so press <RETURN>.

To improve the chart appearance, enter the value 40 for the maximum value, instead of the 33.15 computed earlier. You'll have to space over the numerals left by: **33.15**. Leave the base value at 0, the bottom for bar charting options. Also leave the # of divisions (horizontal lines) at 4, since this gives us four lines, each at 10, 20, 30 and 40 values.

The next prompt says **DIVISIONS: LINES/TICS ONLY.** Normally the chart will be divided into four divisions with lines going the full width of the chart. However, if you only want tic marks along the left-hand axis of the chart, you would use the cursor key to move the arrow under **TICS ONLY** option. For this example leave it at lines by pressing <RETURN>. Press return to accept the default color (BLACK).

Display the chart [2] to see the new dependent axis. Remember to press the **M** key to return to the MAIN MENU. If you want to make any more changes, simply go back to screen [3/2/2].

The independent axis in this example is the data grouping information (weeks). To improve this, go to [3/2/1]. Key --1985-- for the legend and press <RETURN>. The GRP NAMES are normally shown horizontally, but because they are 4 characters long (WK10) we want to show them vertically. Press the cursor right key and <RETURN>. Press <RETURN> at the color prompt to accept the default color.

Display the chart using [2] again to see how the new independent axis looks. Note how the weeks overlap the bottom legend. This can be fixed by altering the chart shape. Press the **M** key to return to the MAIN MENU and then go to [3/2/3]. Notice the flashing cursor in the lower left hand corner. Use the cursor up key (with <SHIFT>) and the flashing cursor moves up. Put it up about halfway between the 0 and 10. You may also move the flashing cursor sideways to allow more room along the left side if needed. Press <RETURN>. Now the flashing cursor is in the upper right corner. Since there is no reason to change anything now, simply press <RETURN>.

Now display the chart [2] to see if the bottom legend is satisfactory.

Next let's fix the title. Press **M** again and then go to screen [3/4/1] and key **LEMONADE STAND SALES**. Press <RETURN>.

The next prompt is for title size/character set. The C-128 basically has four character sets:

- upper case and symbols
- reversed upper case and symbols
- upper/lower case
- reversed upper/lower case

In addition to these sets, CHARTPAK-128 allows four sizes of these characters for use in a chart title:

- Normal is the same size as all other lettering on the chart
- High is double height but same width
- Wide is double wide but normal height
- Large is both double high and double wide

In this example let's use the wide upper case size by moving the marker down to that option (little more than halfway down with the cursor down key) and then pressing <RETURN>. The next prompt is for the title color. The default is black (like everything else). If you only have a black and white printer, it doesn't matter what color you use so you can just leave it at the default of black.

If you have a color printer, or want to show the charts in color, you can select another color for the title by moving the cursor sideways under the color you want and then pressing <RETURN>.

The next option is whether you want the title underlined or not. Select yes or no by pressing the **Y** or **N** keys and <RETURN>.

The last step is to position the title on the chart. The chart will be shown with a flashing `X` at the upper left corner of the word of the present title. Simply use the cursor keys to move the `X` on the screen to position the title on the screen where you want it. Press <RETURN> when it is in the proper position.

Now let's move the data set legend to the right. Go to screen [3/4/2] and move the flashing cursor using the right cursor key , so the cursor is on the right half of the chart, above `WK 6`.

Now let's change the line markings. Go to [3/3/1]. Notice at the top of the screen it says **`LINE OPTIONS, DATA SET 1, ACTUAL 1985`**. The next line gives you line type, and there are five options. The marker next to the first option `SOLID` means the

line will be shown as a solid line on the chart. Press <RETURN> to select the SOLID line.

The next prompt is for the plotting symbol. The default plotting symbol is the data set number, in this case, 1. You can use any of the Commodore symbols or letters or even a couple of letters as the plotting symbol. In this case let's use the big solid dot. Press and hold the shift key and press the **Q** (see the dot on the front of the Q key?), then <RETURN>. For the time being set the default color of black.

Now the same information needs to be entered for the second data set—Budget 1985. Use the cursor down key to select a DASHED line type and then press <RETURN>. Change the plotting symbol to the letter B (for Budget) and press <RETURN>; leave the color at the default by pressing <RETURN>. Now display your work (option 2) and see how these specifications have changed your chart.

If you're satisfied, save the chart specifications. First press **M** and then go to [4/2]. After the disk drive device number prompt, you should see the name under which you saved the data. You may use the same name for the specs, since CHARTPAK-128 adds **S.** in front of the name of specification files on disk. Press <RETURN>. The disk will run for about 10 seconds, and then return to the MAIN MENU.

Suppose we want to add last year's data to this chart. Remove your data diskette and insert the distribution diskette once again. On the distribution diskette is LEMON84, a file with budget and actual from last year. To add this to your chart, go to screen [1/8] to use the directory. After choosing device 8, you then select which files to be shown. The default is data files, so press <RETURN> and the first 20 entries of the directory are displayed. Press <RETURN> again to continue.

The prompt asks you for the number of the filename that you want to select. Key the number shown along the left side of the screen for file LEMON84 and press <RETURN>. The READ DATA FILE screen asks for a device, so simply press <RETURN> to accept the default.

Then the name of the file you selected is displayed. If OK, press <RETURN>.

The next prompt is **DIF FILE (Y/N)**. Since we're not using a DIF file, press N. Now you are presented with each data set saved in the file. The first is **ACTUAL 1984**. Since we want that data, press Y to read it in. Next select data set 3 into which CHARTPAK-128 will read the data by pressing 3 and <RETURN>. The next screen shows the next data set in the file (**BUDGET 1984**). Since it is last year's budget, it's worthless, so bypass it by pressing N. The next prompt is to choose whether or not to accept data group names (WK 1, WK 2, etc). Since the names are already in the computer, press N to bypass.

Go to screen [2] to see how that third data set is added to your chart.

Go to screen [3/3/1]. Select NO LINE. Change the plotting character for the new data set to the letter L (for Last year). Note that you have to review (and may change) the specs for the other lines before the third data set options are shown.

If you want the chart drawing to go much more quickly, you can select a fast mode option by going to the options menu [3/3/4]. The first prompt lets you change the dash line interval. Press <RETURN> to default. The second lets you control whether the box around the chart will be drawn. Default this spec also. The third prompt lets you control FAST mode. If you press Y to select it, you won't see the chart during drawing, but it will cut the drawing time in half. The last option lets you select the character set to be used for everything except the title.

Go to screen [2] to plot the revised chart.

You can easily change this to a bar chart. Press M and go to screen [3/1] and select Vertical Bars as the chart type. Press N to bypass altering the display sequence. Try displaying the new bar chart using [2].

Unless you override it, the bar width and bar spacing are automatically calculated so that the bar chart will fill the full width

of the chart screen. Notice that all the bars are the same, empty rectangles. To change this, press **M** and then go to screen [3/3/2].

The first prompt is the bar grouping. The default is mixed, which means that the first data value from each data set are shown together, then the second value from each data set, etc. Press <RETURN> to leave the mixed grouping. The next prompt is for the bar width, which is the automatically calculated value. If you want bars narrower than this, you can insert the new number here. If you want the system to recalculate the bar width put 0 in this value. For now we can leave it alone as 12. The next prompt is for the space between the bars. This is automatically set at one quarter the bar width by the calculation routine, but you can change this.

The next prompt is for the bar filling options. The options are shown at the top of the screen, and `DATA SET 1` and its name are shown in the middle of the screen.

Notice that the arrow is pointing to the default—that is, the empty bar. Use the left and right cursor keys to move the arrow through the pattern options and then down into the solid colors. Select the third filling option (`Horizontal Lines`) for the fill option of the first data set (`ACTUAL`). Press <RETURN>.

The next prompt is for the drawing color. Accept the default. Now you are prompted for the same information for data set 2—`BUDGET 1985`. Use the rightmost fill options (dots) for this data set along with the default drawing color and then use the vertical lines as the fill options for data set 3—`ACTUAL 84`. Now select option 2 from the `Main Menu` to draw the bar chart. Note that some of these options take considerably longer to fill a bar than others.

Go to the `TOP VIEW` (**T**) and note how the mixed type of bar chart has interspersed the three data sets. Go to screen [3/3/2] and select the `GROUPED` bar grouping, and put 0 in the bar width to force recalculation. Default all the rest and then go to screen [2] to display the chart in grouped format, and then press **T**.

To see the use of the display sequence alteration, go to screen [3/3/2] and go back to the `Mixed` bar grouping and put 0 into the bar width value. Default the other options. Go to screen [3/1] to

select chart type and press <RETURN> to select same (`Vertical Bars`). Press **Y** at the **ALTER DISP SEQ?** prompt. The four data set names in the computer are shown (note that 4 still has a default name). Press 1 and <RETURN> to select data set 1 and the press 3 and <RETURN> to select data set 3. This shows **ACTUAL 1985** and **ACTUAL 1984** only. Press <RETURN> to end the sequence. Your choice is now shown. If OK, press **Y** to go back to the `MAIN MENU`. Go to screen [2] to see the chart.

Note also that you should change the data grouping axis legend to something like `SUMMER WEEKS` or `WEEK COMPARISON` by going [3/2/1].

To see how the base value works, let's assume we want to see how much above or below an average of 12 per week our sales are. Go to screen [3/2/2] and key 12 in the base value and press <RETURN>. You can let the other values default. Then draw the chart. Notice how the bars go up and down from the 12 value, but they look strange without a line.

Let's add one. Go to the reference lines screen [3/5]. Press <RETURN> to select line 1 (the default). Then you are asked for the value at the ends of the line. The value at the left should be 12. Normally you want the same value on the other end so that you will have a horizontal line. Enter 12 and press <RETURN>. Then enter a second 12 for the other end. Then select a solid line by pressing <RETURN>. Choose the default color. Now display the chart again with screen [2].

To change this to a horizontal chart, go to screen [3/1] to select chart type `Horizontal Bars`. Press **N**, then display the chart. Note that the following changes are needed:

Go to screen [3/2/1]. Change `GRP NAMES` back to horizontal along the left edge.

Go to screen [3/2/3]. Move the bottom of the rectangle down under the 0 with the flashing `X`, and then move over to the right (to about 5) and press <RETURN>. Move the top corner down (under `ACTUAL 1984`) and press <RETURN>.

To differentiate the bars, go to the bar chart options [3/3/2]. Press <RETURN> to accept the current bar grouping, change bar width to 0, and leave the present bar spacing. For data set 1 (ACTUAL 1985), select bar fill type (solid black) and black drawing color. For the second data set (ACTUAL 1984) select open bar type and drawing color 1.

Now go to [2] to display the chart again.

You can do a pie chart of the current year sales by going to [3/1]. Select a pie chart by moving the cursor up and <RETURN>. Before displaying, go to [3/3/4] and turn off the FAST mode so you can see the pie chart being drawn. When you display the chart [2], you're asked which data set you want displayed. Key 1 and <RETURN> to choose data set 1 (ACTUAL 1985).

Then you will be asked how you want each segment of the pie chart displayed. There are three attributes for each segment—fill type, color and separation.

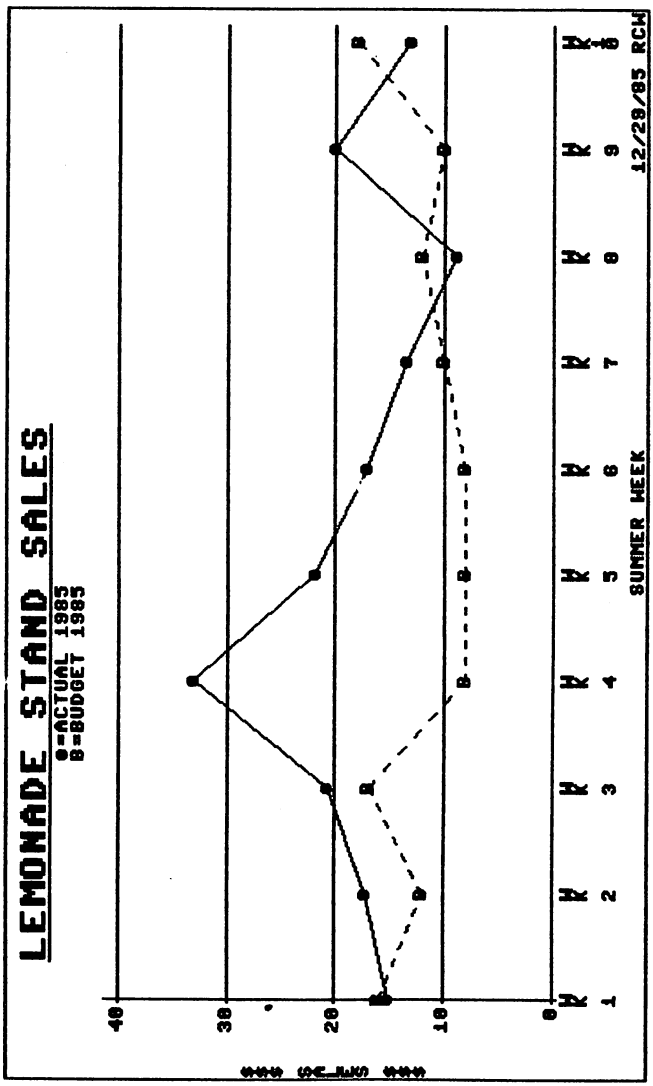
The first option is fill type. There are 10 choices. The topmost is no fill at all, the next 8 are crossed hatch lines at different angles represented on the screen. The last option fills the segment with a solid color. Use the up and down cursor keys to select the option you want for each segment. To make it simple at this time accept the default choice (solid) by pressing <RETURN>.

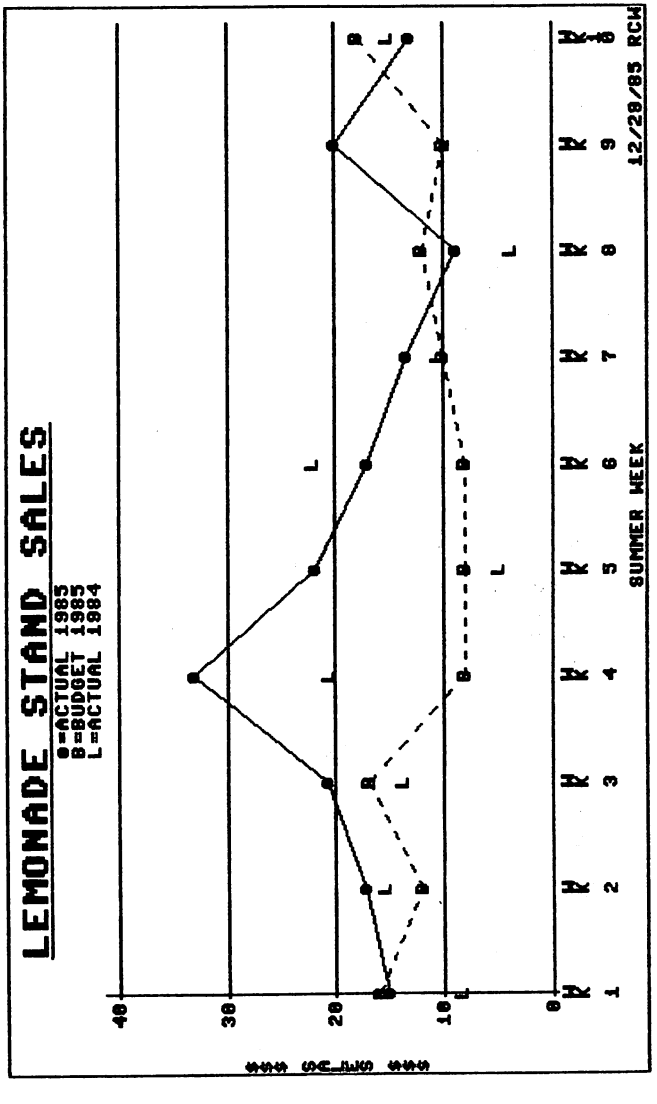
The next option is the color to be used to draw the segment and filling of the segment. Select this as you have other colors, by using the sideways cursor keys and pressing <RETURN> for your selection.

The last attribute is separation from the center. Use the sideways cursor keys to select separation ranging from none to maximum. We'll move the cursor one step to the right from the word NONE so there will be some separation between the segments. After you have entered this information for the first segment then you are prompted for the same information for the second segment, etc. When you have entered the 10th segment choice, the pie chart will be drawn.

To improve the distinction between segments of the pie chart you can go to the chart drawing option (2) and select data set 1 again.

Change all weeks except week 4 (the one we want to highlight) to the topmost bar selection (1); that will give us vertical lines, leave the color at black, and no separation. For week 4, leave the fill of solid black and about a middle amount of separation. This will highlight that particular week as our best. See the example charts following this text.


LEMONADE STAND SALES
A=ACTUAL 1985
B=BUDGET 1985
$$$ SALES $$$
40
30
20
10
0
1
2
3
4
5
6
7
8
9
SUMMER WEEK
12/29/85 RCH


LEMONADE STAND SALES
A=ACTUAL 1985
B=BUDGET 1985
L=ACTUAL 1984
40
30
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7
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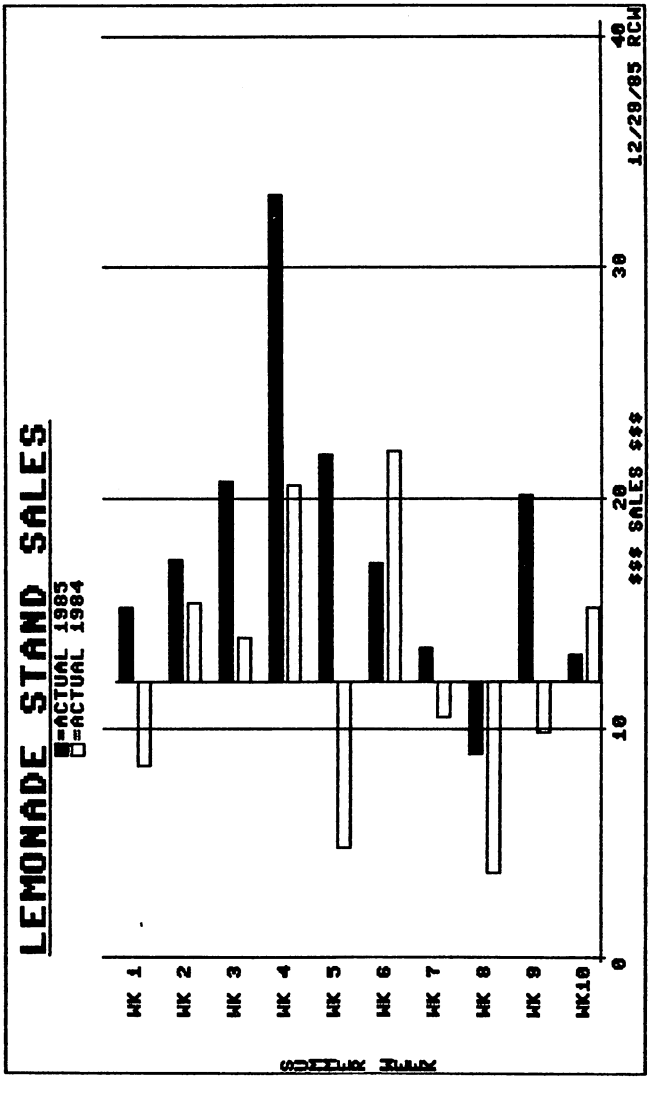
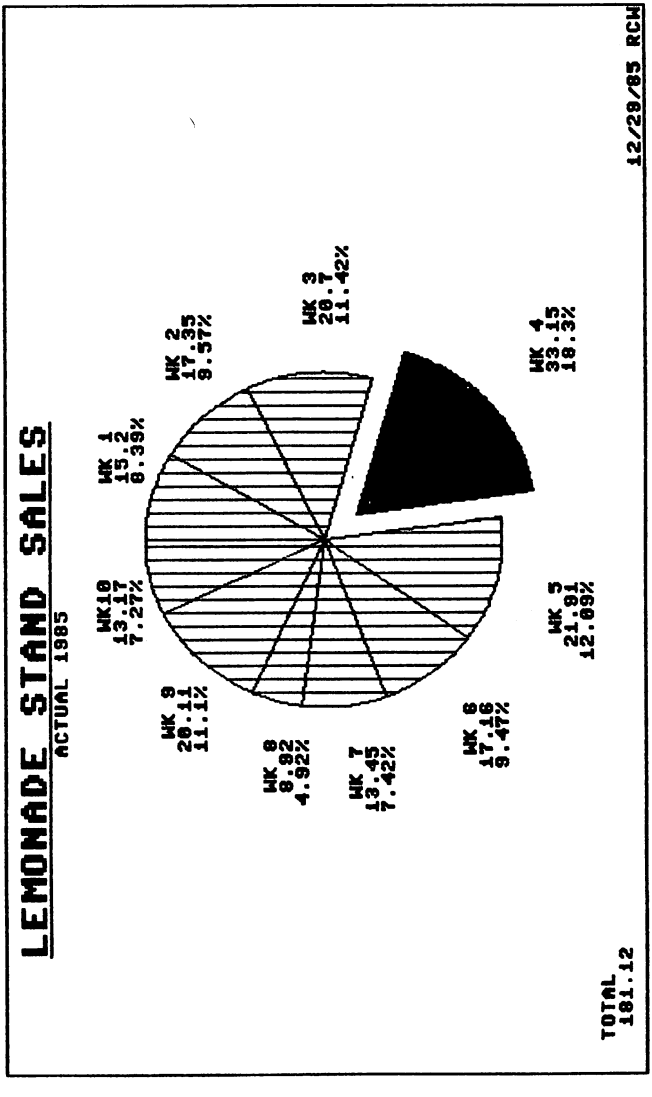
9
SUMMER WEEK
12/28/85 RCH


LEMONADE STAND SALES
■=ACTUAL 1985
□=ACTUAL 1984
$$$ SALES $$$
0
10
20
30
40
12/28/85 RCW
WK 1
WK 2
WK 3
WK 4
WK 5
WK 6
WK 7
WK 8
WK 9
WK10
WEEK NUMBER


LEMONADE STAND SALES
ACTUAL 1985
12/29/85 RCH
WK 1
15.2
8.39%
WK 2
17.35
9.57%
WK 3
20.7
11.42%
WK 4
33.15
18.3%
WK 5
21.91
12.09%
WK 6
17.16
9.47%
WK 7
13.45
7.42%
WK 8
8.92
4.92%
WK 9
20.11
11.1%
WK10
13.17
7.27%
TOTAL
181.12

Reference Section

[0] MAIN MENU
[1] INPUT & MODIFY DATA
[2] DISPLAY CHART ON SCREEN
[3] DEFINE CHART
[4] SAVE CHART
[5] PRINT CHART
[6] FILE UTILITIES
[7] PRINTER CONFIGURATIONS
[8] EXIT TO AUTOBOOT

- Demonstration Charts
- DIF File Example

[0] MAIN MENU

This menu is the main control point for CHARTPAK-128. All functions return to this menu.

A menu function is selected by pressing the appropriate number key. The <RETURN> key is not necessary.

At the bottom of the screen is a reminder that pressing the **C** key will display the chart on the screen, pressing the **T** key will display a top view of the chart. You can return to this MAIN MENU by pressing the **M** key from either of these two other displays.

A reminder also shows you that the **F1** key escapes to the MAIN MENU (from anywhere).

Here are the menu's options:

0.1 INPUT & MODIFY DATA

This option takes you to all of the menus concerned with entry and correction of data for the chart. This is normally the starting point for any chart.

0.2 DISPLAY CHART ON SCREEN

This option draws the chart on the screen, based on the data and specifications in the computer. When the chart is completed, press the **M** key to switch back to the CHARTPAK-128 MAIN MENU. For the top view, press **T**.

If you haven't specified a chart type, you are transferred to the CHART TYPE screen [3/1].

If the chart to be drawn is a pie chart, you are asked to specify the color and fill options of each pie segment. If a BASIC error occurs during the drawing of the chart, the drawing process is stopped and the error message is shown.

See APPENDIX B—ERROR MESSAGES for the messages and their causes.

0.3 DEFINE CHART

This option takes you to all of the chart specification and option menus. These menus allow you to select and adjust the chart display parameters.

0.4 SAVE CHART

This option takes you to the menu where you can save the data and/or the chart specifications. They are saved separately so that the same specifications may be used with a variety of data sets to produce a group of comparative charts. Similarly, one set of data may be displayed several different ways using other specifications.

0.5 PRINT CHART

This option reproduces the chart display onto an attached printer. Because this function copies the screen display to the printer, the chart must first be displayed on screen (option 2).

0.6 FILE UTILITIES

This menu option takes you to the menu where you can rename, copy and delete files or initialize (NEW) diskettes.

0.7 PRINTER CONFIGURATION

This option lets you select and setup CHARTPAK-128 for your printer and printer interface. This also sets up the default printout size.

0.8 EXIT TO AUTOBOOT

This option resets the computer for normal BASIC operation and automatically tries to load another program from disk. Before the resetting process starts, you are asked **ARE YOU SURE? (Y/N)**. Press the **Y** key to do the reset. Pressing any other key returns you to the MAIN MENU.

[1] INPUT AND MODIFY DATA MENU

1.1 INPUT DATA FROM KEYBOARD

The first prompt is for the data set number into which you want to key your data. The list of data sets available in memory is displayed with their numbers. Enter the number of the data set desired and press <RETURN> Your selection is checked against the maximum you have setup in screen [1/4]. If you are within the maximum, the message **CLEARING DATA SET-SURE ?(Y)** is displayed to remind you that the data set you selected will be cleared. Press **Y** to continue. Pressing any other key returns you to the MAIN MENU. The data set is cleared by setting all data values to zero.

Next you are asked to key in a name for this data set. CHARTPAK-128 supplies a default name (DATA SET N) if you just press <RETURN>. If you do not want the default, key in the name of your choice and press <RETURN>. You may also change the data set name later through the ALTER DATA AND NAMES screen [1/2].

Next you are asked to key in the number of points contained in this data set. CHARTPAK-128 supplies a default number (2) if you just press <RETURN>. If you do not want the default, key in the number of your choice and <RETURN>.

The next prompt is **IN SEQUENCE? (Y/N)**. If you key **Y**, then CHARTPAK-128 asks you for the point values in sequence. If you key **N**, then you can key the point values in random sequence, and the data is accumulated in each point.

Next you are prompted for the data values. For one-dimensional data, you are prompted for only one value per data item. For two-dimensional data, you are prompted for both an X and Y value (unless you previously selected automatic X or Y option).

As you key the data, the last 13 values are displayed on the screen.

When the last data value is entered, you are returned to the MAIN MENU.

If you are not keying the data in sequence, you are asked for the point number that you want to enter. The current data points around that point are shown on the screen and you can key the value. That value is *added* to the point value and the total is displayed on the screen. Then you're asked for the next point. When finished, key 0 as the data point # to exit.

1.2 ALTER DATA AND NAMES

The first prompt is for the number of the data set to be changed. The list of data set names and their numbers is displayed. Enter the number of the data set. If you want to change the data set names, key in -1. if you want to change the data group names, key a 0. Then press <RETURN>.

Next you are prompted to enter the starting data item to be changed (1 = first item, 2 = second, etc.). Key in the item number and <RETURN>.

The display shows the data item number, the data group name and the data value (x and y values for two-dimensional data sets) for up to 13 data items, beginning at the specified data item. To change a value, key in the data item number and press <RETURN>. Then you are prompted for the new data value. For two-dimensional data, both X and Y data are shown. If you want to add a data item at the entry number (and push the rest of the list up), type an up-arrow (^) and then the data value to be added. If you wish to delete a data item (and slide the rest down), type a left-arrow (<).

After each data item is entered, the revised list is shown. You may quit by typing a 0 and <RETURN>. You are then returned to the MAIN MENU.

If you want to see a point out of the range currently being displayed, key the point number desired and press <RETURN>. The points around and including your selection are displayed. Key the new value and press <RETURN>.

1.3 CLEAR/COPY/MOVE DATA SET

This option presents another menu.

1.3.1 CLEAR

CLEARing a data set sets all data values within that data set to zero. You are prompted to enter the number of the data set to be cleared. Key in the data set number and <RETURN>. The message **CLEAR DATA SET-SURE? (Y)** is displayed to remind you that the data set you selected will be cleared. Press **Y** to continue. Pressing any other key returns you to the MAIN MENU.

1.3.2 COPY

COPYing a data set moves all data items from the FROM data set to the TO data set and leaves the FROM data set intact. First you are prompted to enter the number of the FROM data set. Key 0 and <RETURN>.

Next you are prompted to enter the number of the TO data set. Key in the data set number and <RETURN>.

1.3.3 MOVE

MOVEing a data set moves all data items from the FROM data set to the TO data set and clears the FROM data set to zero.

First you are prompted to enter the number of the FROM data set. Key in the data set number and <RETURN>.

Next you are prompted to enter the number of the TO data set. Key in the data set number and <RETURN>. The message **CLEAR DATA SET-SURE? (Y)** is displayed to remind you that the data set from which the data was moved will be cleared. Press **Y** to continue. Pressing any other key returns you to the MAIN MENU.

1.4 DATA SET SIZE

This option lets you set the number of data sets and the maximum size of all the data sets. Initially, CHARTPAK-128 defaults to 4 data sets, each containing 60 points. The number of data sets times the number of points in each data set must be kept at or below 800 (4x200), because of memory limitations.

WARNING--Because this option establishes arrays in BASIC, **all of memory is cleared**. Therefore all data values, chart specifications and names are lost when this option is selected.

The message **CLEARING ALL DATA AND SPECS - SURE (Y)** is displayed to remind you that all data sets will be cleared. Press **Y** to continue. Pressing any other key returns you to the MAIN MENU without any changes.

Key in the number of data sets and press <RETURN>, then key in the maximum number of points and press <RETURN>.

1.5 GLOBAL DATA SPECS

This option sets up data grouping information. The first prompt asks if you are using **TWO DIM? (Y/N)** (two-dimensional data). Press <RETURN> to accept the default (**N**).

Otherwise key **Y** and press <RETURN> for two-dimensional data. If you are using two-dimensional data, then the following prompts appear:

For **X OR Y AUTOMATIC?**, answer with an X for x-values automatically increasing, and a Y for y-values automatically increasing, or press <RETURN> for neither.

When you select X or Y the following prompts appear:

STARTING VALUE? Enter the starting value for automatic numbering and <RETURN>.

INCREMENT? Enter the amount (may be negative) to be added to the value of each data item and <RETURN>.

At this point, for two-dimensional data, you are returned to the MAIN MENU.

For all other cases, you are asked:

HOW IS DATA GROUPED? The first six options are:

```
DAY      [SMTWTFS...]
WEEK     [WK1..WK2..]
MONTH    [JFMAMJJASOND]
MONTH    [JAN.FEB.MAR..]
QUARTER  [QTR1.QTR2...]
YEAR     [1982 1983...]
```

Move the marker up and down with the cursor keys and press <RETURN>.

For each of these options you are asked for a starting period (which month, which day, etc.). CHARTPAK-128 automatically fills the data group with these selected names. The seventh option allows you to specify each name:

```
OTHER [ACTUAL BUDGET FORECAST..]
```

First you are prompted to enter the number of names within the group. Enter the number and press <RETURN>. Next you are prompted for each name. Each name is limited to 27 characters (including spaces). Enter each name and press <RETURN>. You are then returned to the MAIN MENU.

1.6 DATA SET CALC/PRINT

All of these functions (except printout) provide DATA REDUCTION. For a discussion of these concepts and examples of the use of these options, see the section DATA REDUCTION TUTORIAL.

Some of these options use the current screen display parameters (in 3.2.1 and 3.2.2) to determine the starting and ending data points for lines, so for best results you should set up the screen display options first. See [3] **DEFINE CHART MENU.**

This menu option [1/6] takes you to the data set calculation and printing menu that has the following options:

1.6.1 DATA SET CALCS

This function lets you add, subtract, multiply or divide data sets and/or constant values. The choices are:

1.6.1.1 DATA SET ADDITION

DS R = DS A + DS B: Add data sets/values

1.6.1.2 DATA SET SUBTRACTION

DS R = DS A - DS B: Subtract data sets/values

1.6.1.3 DATA SET MULTIPLICATION

`DS R = DS A * DS B:` Multiply data sets/values

1.6.1.4 DATA SET DIVISION

`DS R = DS A / DS B:` Divide data sets/ values

After selecting one of these options, you are asked if the calcs are to be done on the `X-values`, `Y- values` or `Both`. Unless the data sets are two- dimensional, you should take the default value (X only). If the data sets *are* two dimensional, you can select which of the sets of values are to be manipulated. Key the letter **X**, **Y** or **B** to indicate your choice and press <RETURN>.

The next prompt asks you to select the data set where the result is to be placed. The list of data sets and their names is displayed. You may select the same data set as one of the factors (for example, you can multiply data set two by 2 and put the result back into data set 2 by selecting data set 2 as the result and one of the factors). Key the number of the result data set and press <RETURN>.

The next prompt asks you to select the data set for factor A. Note that for subtraction and division the distinction between factor A and factor B is important. The list of data sets and their names are displayed. If you want to use a constant for factor A, then key a value of 0 (none of the data sets) and press <RETURN>.

Make a similar selection for the data set to be used for factor B in the calculation.

If you selected a constant factor in the calculations (by keying a 0 as the data set number), you will be asked for the X factor and/or the Y factor depending on the answer you gave to the X,Y or Both prompt above. Key the value and press <RETURN>.

You are returned the the MAIN MENU when the calculations are completed. You can select option [1/2]: ALTER DATA AND NAMES to see the new values and/or change the name of a new data set.

1.6.2 DATA SET AVERAGE/STD DEV

This option analyzes a data set and sets up to three lines on a chart for the average value, the average plus and the average minus a number of standard deviations. This works primarily with one-dimensional data.

The first prompt asks you to select the data set from which values are to be averaged. The list of data sets and their names is displayed. Key the number of the data set and press <RETURN>.

CHARTPAK-128 will add up the values in the data set and show you the total of the x values, the average and the standard deviation. If you need to save these values you may select the print screen option by pressing **Y** (the values are used to setup the lines but are not otherwise saved in the system).

The next prompt asks you in which line (1-6) you want to show the average. (If you don't want to show the average, key 0). Next you will be asked whether the line is to be solid or dashed or no line. Move the marker and press <RETURN>. Next select the line color.

The next prompts handle the standard deviation. First you are asked for the number of standard deviations you want the lines displaced (key a 0 to ignore standard deviations). Then you are asked for the line number which will be set to the average + n standard deviations. Then specify its type and color. Last, you are asked for the same information about the average - n standard deviations line.

The lines may be adjusted or suppressed through option [3/5]: REFERENCE LINES. See the section DATA REDUCTION TUTORIAL for a discussion and examples of these concepts.

1.6.3 LEAST SQUARES

This option computes a least-squares "best fit" line through the values in a data set. The equation of the line is used to setup the chart lines with values so the line and the line plus and minus the residual variance may be plotted.

The first prompt asks you to select the data set from which values are to be used. The list of data sets and their names is displayed. Key the number of the data set and press <RETURN>.

The data is evaluated and a number of resulting values are shown on the screen. These are explained in the DATA REDUCTION TUTORIAL. If you need any of these, select the print screen option by pressing **Y**.

The next prompt asks you which line (1-6) you want to show the regression line. (If you don't want to show the line, key 0). Next you will be asked whether the line is to be solid or dashed or no line. Press <RETURN>. Next select the line color. The next prompts handle the residual variance (which is like the standard deviation for an average). First you are asked for the number of residual variances you want the lines displaced. (key a 0 to ignore). Then you are asked for the line number which will be set to the average + n residual variance. Then specify its type and color. Last, you are asked for the same information about the average - n residual variances line.

The lines may be adjusted or suppressed through option [3/5]: REFERENCE LINES. See the DATA REDUCTION TUTORIAL for a discussion and examples of these concepts.

When a least-squares line is computed on one-dimensional data, the x value used is the data point number (1, 2, 3... etc).

1.6.4 EXPONENTIAL SMOOTHING

This option reduces the variation in the data and attempts to determine the trend by exponential smoothing. The simple smoothed value for each point is placed in another data set. Optionally, the trend may be calculated and smoothed and placed into another data set. Further the smoothed trend can be used to improve the smoothed data estimate by applying a trend adjustment, correcting for the natural trend lag.

The first prompt asks you to select the data set whose values are to be used. The list of data sets and their names is displayed. Key the number of the data set and <RETURN>.

The next prompt asks you to select the data set into which the exponentially smoothed values are to be placed. The list of data sets and their names is displayed. Key the number of the data set and press <RETURN>.

The next prompt asks you to select the data set into which the smoothed trend values are to be placed. If you do not want to calculate and smooth the trend, key the value 0. The list of data sets and their names is displayed. Key the number of the data set or 0 and press <RETURN>.

The next prompt asks you to select the data set into which the trend-adjusted smoothed values are to be placed. If you do not want to trend-adjust the smoothed values, key the value 0. The list of data sets and their names is displayed. Key the number of the data set or 0 and press <RETURN>.

The next prompt asks to supply the initial values to be used in the smoothing. First is the initial value of the smoothed data. Key the value and press <RETURN>.

If you selected trend smoothing, you are now asked for the initial value of the trend. Key the value and press <RETURN>.

Next you are asked for the smoothing constants (default is .1). This determines how much weight is given to the most current data (.1=10%) the value may be any number greater than 0 and less than 1. The larger this value is, more emphasis will be given to recent data and less to old data. Key a value and press <RETURN>.

If you selected trend smoothing, you must specify the smoothing factor for the trend. Key a value and press <RETURN>.

If trend-adjusted smoothed values were chosen, you must enter the value of the trend correction factor. The "standard" value is supplied as the default. A larger number will increase the amount of trend correction applied, and a smaller number will decrease this. Key a value and press <RETURN>.

The calculations are performed and you are returned to the MAIN MENU. The new data sets are given names which include the factors you selected and the original data set name. If the smoothing factor is .15 and the data set name is SALES, the smoothed data set would be named S.15[SALES]. The trend is named in a similar way with T and the trend smoothing factor and the original data set name. The trend-adjusted data set is named with a TA and the trend correction factor in the name.

1.6.5 PRINT DATA

This option lets you print the values in up to four data sets on an attached printer.

The first prompt is for the secondary address for the printer. This address is used with the Commodore printers (1525, MPS801, 1526) and Okimate 10 to select normal uppercase characters (secondary address 0) or upper/lowercase

(secondary address 7). For other printers, an interface is used and if programmable, the secondary address is used to setup the interface. Usually a secondary address of 0 is normal uppercase, but if it doesn't work, consult the interface manual. The default of 0 is automatically supplied. Key another value or press <RETURN>.

Next you must select the data sets to be printed. The list of numbers and names of all data sets in the computer is shown. You are asked to select the data sets you want (up to 2 if two dimensional data, 4 if not) in the sequence they are to be shown from left to right. When you have selected all that you want (or will fit), key a 0 to terminate this input. The list of data sets you have selected are redisplayed and you must key Y to accept and use the list, or key N to re-create the list. The data sets will be printed on device 4.

1.8 DISPLAY DIRECTORY

This option allows you to scan the diskette directory and to select the file you want to read. CHARTPAK-128 supplies a default device number of 8 for the disk drive device number. If you don't want the default, move the cursor and press <RETURN>.

Next you are asked for the type of files to be searched:

`ALL FILES`: all files on diskette

`DATA FILES`: only data files—those with a **`D.`** prefix

`SPECIFICATION FILES`: only those beginning with **`S.`**

Move the cursor or press <RETURN> to accept the default selection of that type (`DATA FILES`).

The size and name of the first 20 files of that type on the diskette are displayed. There is also an entry number at the left edge of the screen.

To select a file to read, key the entry number corresponding to the name and press <RETURN>. The filename corresponding to the entry number is automatically supplied at the next filename prompt. If you want to see the next 20 or the entire list again, key 0 (zero) and press <RETURN>.

If for some reason you do not see the name you want, select a number higher than the last number shown and you will be returned to the MAIN MENU.

1.9 READ DATA FILE

This option allows you to read a data file. The first prompt is for the disk drive device number. Enter the device number and <RETURN>.

Next you are prompted for the filename of the data file to be read. If you previously used the DIRECTORY DISPLAY function, the name you selected is automatically shown here. Otherwise enter the filename and press <RETURN>.

The next prompt is **DIF FILE (Y/N)**. If you're not reading a DIF file, press **N** and these prompts will appear: **DATA SET NAME**, followed by the name of the first data set from the disk file. You are asked to **Y TO ACCEPT, N TO BYPASS** and must press **Y** or **N**. This allows you to selectively read saved data sets into differing data set numbers.

When all of the data sets are reviewed, you are prompted **ACCEPT DATA GROUP NAMES - Y TO ACCEPT, N TO BYPASS**. If you key **Y**, the data group names previously saved in the file area read in. If you key **N**, the default data group names are used (which may be changed later).

If you are reading a DIF file, answer **Y** to the **DIF FILE (Y/N)** prompt. See section entitled DIF FILE EXAMPLE at the end of the REFERENCE SECTION for prompts and responses.

[2] DISPLAY CHART

When this option is chosen CHARTPAK-128 will draw the chart according the the chart specifications previously selected. After the chart is drawn, you may use the **M** key to return to the MAIN MENU. The **T** key allows you to see a top view of the chart screen at any time.

If you haven't selected a chart type you will be automatically switched to menu [3/1] (CHART TYPE).

Before drawing the chart you are asked to supply a date and your intitials as documentation in the lower right corner of the chart. If you don't want anything, just press <RETURN>. Instead of your initials you could refer to some other documents or source fo the data. The total length can't exceed 27 characters.

If you selected a pie chart, you will be asked to supply the number of the data set to be displayed. The list of data set names is shown. Key a number and press <RETURN>. Then you will be asked to select the fill option color and line separation options for each data point in the data set.

[3] DEFINE CHART MENU

3.1 CHART TYPE

There are 9 types of charts available with CHARTPAK-128:

```
PIE CHART
HORIZONTAL BARS
HORIZONTAL 3D BARS
HORIZONTAL GRAPH
VERTICAL BARS
VERTICAL 3D BARS
VERTICAL GRAPH
X-Y PLOT
COMPARISON PLOT
```

The PIE CHART displays only one (1) one-dimensional data set at a time.

The X-Y PLOT displays only two-dimensional data.

All other types work with one-dimensional data sets.

This menu also appears automatically when you display a chart [2] and no chart type has been selected.

After selecting a chart type, you are asked: **ALTER DISPLAY SEQ? (Y/N)**. Normally data set 1 is shown first, data set 2 second, etc. and all data sets in memory are shown on a chart. This option lets you choose the data sets to be shown and the sequence in which they are to be shown.

If you type **N**, then you are returned to the MAIN MENU.

If you type **Y**, then CHARTPAK-128 shows you the current selected data sets and their names and then the list of all data sets and names. You are then asked to enter the numbers of the data sets you want to appear on the chart and the sequence in which you want to see them. Type the data set number and <RETURN> for each dat set you want to

display. When you have entered all of the data set numbers you want to display, type a 0 and <RETURN>. Then the new selected list is shown and the prompt **OK (Y/N)**. If the list is correct, key **Y** and <RETURN> and you are returned to the MAIN MENU. If not, key **N** and <RETURN> and you can redo the selection process.

For a chart type C (comparison), data set selection is required, as you must select the two data sets to be compared. The first data set is shown in the horizontal direction and the second in the vertical direction.

3.2 CHART SHAPE

This option does not appear on the DEFINE CHART menu for a PIE chart type.

The menu has three options:

3.2.1 GROUPING/INDEPENDENT AXIS INFO

LEGEND: This is the data to be displayed along this axis. Enter the name of the legend desired and press <RETURN>.

The next items with a * show only for X-Y and comparison charts.

* NORMAL OR LOG SCALE: You can select a normal or logarithmic scale along this axis. All values must be greater than 0 for log scale to work. Move the cursor and press <RETURN>.

* MIN VALUE: This is the smallest value along the axis. This value defaults to the smallest data value after keying [1/1] or file reading [1/9]. Key the value and <RETURN>.

* MAX VALUE: This is the highest number along the axis. This value defaults to the largest data value after keying [1/1] or file reading [1/9]. Key in the desired value, <RETURN>.

* NUMBER OF DIVISIONS: This is the number of reference lines and values (in addition to the minimum line) along the axis. Normally you adjust the minimum, maximum and number of divisions to get even values long the axis. Key in the desired value and press <RETURN>.

* DIVISION LINES/TICS ONLY: Normally division lines are drawn all the way across the chart. By selecting the tics only option you can supress those lines and instead only the tic marks are shown next to the values along the axis. Move the cursor keys and press <RETURN>.

GRP NAMES -> HORIZONTAL/VERTICAL- This option lets you control whether the group names are shown horizontally or vertically along the axis. Move the cursor accordingly and press <RETURN>.

COLOR: This option lets you select a color for the axis, legend, group names and scale lines. Move the cursor to the color desired and press <RETURN>.

You are then returned to the MAIN MENU.

3.2.2 VALUE/DEPENDENT AXIS INFO

LEGEND: This is the name to be shown along this axis. Key in the name of the legend desired and press <RETURN>.

SCALE: NORMAL OR LOG: This options allows either normal or logarithmic scale on this axis. Note that all values must be greater than 0 for log scale to work. Move the cursor and press <RETURN>.

MIN VALUE: This is the smallest value along the axis. This value defaults to the smallest value after keying [1/1] or file reading [1/9]. Key in the desired value and press <RETURN>.

MAX VALUE: This is the largest value along the axis. This value defaults to the largest value after keying [1/1] or file reading [1/9]. Key in the desired value and press <RETURN>.

BASE VALUE: This is the number to be used as the bottom or starting point of bars on bar charts. Normally this is equal to the minimum value. However, in the case of a variance bar chart, where the values can be both positive and negative, set the maximum to the largest positive number, the minimum to the largest negative number and then the base value to 0. This draws the bars going both up and down. This can also be used to chop off the bottom of bars to show just the top parts and the differences more clearly.

NUMBER OF DIVISIONS: This is the number of reference lines and values (in addition to the minimum line) along the axis. Normally you adjust the minimum, maximum and number of divisions to get even values along the axis. Key in the desired value and press <RETURN>.

DIVISION LINES/TICS ONLY: Normally the division lines are drawn all the way across the chart. By selecting the tics only option, you can supress those lines and instead only the tic marks are shown next to the values along the axis. Move the cursor to your selection and press <RETURN>.

COLOR: This option lets you select the color for the axis, legend, group names and scale lines. Move the cursor to the color desired and press <RETURN>.

You are then returned to the MAIN MENU.

3.2.3 SELECT GRAPH RECTANGLE

This option lets you adjust the shape of the chart by moving the two diagonal corners with the cursor control keys. When this option is selected, the graphics screen (displaying the last chart drawn) is shown with a flashing cursor in the lower left corner. Use the cursor control keys to move the corner where

you want it to appear and then press <RETURN>. Then the flashing cursor appears in the upper right corner. Again, move the cursor with the cursor control keys and then press <RETURN>. You are then returned to the MAIN MENU.

3.3 CHART OPTIONS & COLORS MENU

Only some of these options appear, depending on the type of chart selected.

3.3.1 LINE CHARTING OPTIONS

These prompts repeat for each data set:

Data set number and name:

LINE TYPE: There are five choices:

SOLID	line (default)
DASHED	line
NO LINE	-
BAR END	(for charts where 2 data sets specify a range of values such as stock price range).
MARKER	(to add a marker on a bar such as a stock closing price).

Move the cursor to the desired choice and press <RETURN>.

PLOTTING SYMBOL: The default for each plotting symbol is the data set number. You may change to any letter (or two letters) or graphic symbol. Key in the desired symbol and press <RETURN>.

COLOR: The default line color is black. Move the cursor to the color desired and press <RETURN>.

When all data sets are reviewed, you are returned to the MAIN MENU.

3.3.2 BAR CHART OPTIONS

BAR GROUPINGS: There are three ways to show the data sets in bar chart form.

The first is **MIXED**, where all of the data from all data sets for the first data grouping is shown, then all data for the second data grouping, etc.

The second is **GROUPED**, where all of data set 1 data is shown first, then all of data set 2 is shown next, etc.

The third is **STACKED**, where data set 1 data is shown first, then data set 2 data is stacked on top of data set 1, etc.

Select by moving the cursor, and press <RETURN>.

CHARTPAK-128 computes the minimum and maximum value after the data is entered, assuming normal bar charting is used. Therefore when you select stacking, the maximum value of the dependent axis needs to be increased to handle the sum of the data values.

You also must enter:

BAR WIDTH: This is the width of each bar on the screen in pixels. Enter the desired bar width and press <RETURN>. If you want to use automatic bar width calculation, leave bar width at 0.

SPACE BETWEEN BARS: This is the number of pixels space left between each bar. Enter the desired number of pixels and press <RETURN>.

BAR FILLING OPTIONS: There are 24 ways to fill a bar. Select one of the following for each data set by moving the cursor.

NONE: the bar is not filled in (an empty box)

VERTICAL LINES: the bar is filled with vertical lines

HORIZONTAL LINES: the bar is filled with horizontal lines

CROSSHATCH: the bar is filled with both vertical and horizontal lines.

RIGHT DIAG BARS: the bar is filled withdiagonal bars going down from left to right

LEFT DIAG BARS: the bar is filled with diagonal bars going up from left to right

DIAG CROSSHATCH: the bar is filled with both diagonal bars creating a diagonal crosshatch

DOTS: the bar is filled with dots

The first 4 options fill bars much faster than the others. Bars may be filled with solid colors by moving the cursor past the eighth option to a color bar.

There are two cautions. First, because of the way the Commodore 128 high resolution mode works, there may be color bleeding into adjacent bars or points unless there is a lot of room around each bar. Second, unless you are using a color printer, colors give no difference on a printout, so all bars look alike on paper.

The last prompt asks for the bar drawing color. This is useful with the bar filling options to give the bars color on the screen (and the data set names) although there is still no difference on the printout. Select the color and press <RETURN>. After doing this for each data set, you are then returned to the MAIN MENU.

3.3.3 PIE CHART OPTIONS

FILL SPACING: This option allows you to control the density of the fill lines on a pie chart. The default value is 4. If you want the lines closer together, reduce this number (although chart line will take longer). If you want the fill lines to be further apart increase this number. Press <RETURN>.

SHOW % (**Y**/**N**): Normally the data group name, the value and the percentage of the total is shown for each pie chart segment. If you want to suppress the percentage display, select NO for this option by pressing the letter **N** and <RETURN>.

3.3.4 OTHER OPTIONS

DASH LINE INTERVAL: The normal interval for dash line spacing is 5. If you want the dashes to be closer together decrease this number and press <RETURN>.

BOX AROUND CHART (**Y**/N): This option lets you control whether you want the box drawn automatically around the chart or not.

FAST OPTION DURING CHART DRAWING (**Y**/N): This option lets you control if you want to see the chart as it is being drawn. If you select yes to fast draw, you will not be able to see the chart as it is being drawn (the screen is automatically blanked by the C128). Press **N** or **Y** and <RETURN>.

CHARACTER SET (EXCEPT TITLE): This lets you change the character set to upper and lower case or the reversed normal characters or reversed upper and lower for all text on chart except the title. You may have to shift the screen to read the upper/lower case options on the entry screens. Do this by pressing both the **Shift** and **C=** keys at the same time.

Select your choice by moving the cursor and press <RETURN>.

You are then returned to the MAIN MENU.

3.4 CHART DESCRIPTIONS

This option lets you add descriptive information to your chart. You can give the chart a title or add legends/footnotes to the chart.

3.4.1 CHART TITLE

The first prompt asks you for the title of the chart. Key the title (which may be 72 characters long) and <RETURN>.

TITLE SIZE /CHAR SET: There are 16 combinations of size, upper and lower case and reversed or not that can be used to display the chart title. Move the cursor up and down and press <RETURN> to register your choice.

COLOR: Move the cursor to the left or right to specify the color you want the title to be, the default is black. Press <RETURN>.

UNDERLINE (**Y/N**): This option lets you control whether the title will be underlined or not. Press **Y** or **N** and <RETURN>.

The graphic screen (displaying the last chart drawn) is shown with a flashing cursor in the title position (normally the upper left corner) Use the cursor control keys to move the flashing cursor to the desired position and then <RETURN>.

You are then returned to the MAIN MENU.

3.4.2 DATA SET LEGEND POSITIONS

This option displays the graphic screen and shows a flashing cursor at the last position of the data set legend (upper left corner). Use the cursor control keys to move the flashing cursor to desired position and then press <RETURN>.

3.4.3 NOTE LINES

There are 6 lines available of up to 72 characters each for additional notes that can be added to the chart. These can be used to reference data sources, as second or third title lines or to supply additional descriptions on the horizontal axis. For each line you can specify the text, it's color and position on the chart. The default has the six lines positioned one below each other in the lower right quadrant of the chart.

`NOTE NUMBER (1-6)` : Select the note number you wish to enter or change.

`NOTE LINE`: Enter the text of up to 72 characters for the note. If you want to use upper and lower case you must control this through the overall chart character set otherwise use upper case only.

Next specify the note color by moving the cursor and pressing <RETURN>.

The chart screen will be shown with the flashing `X` marking the beginning of the note line on the chart. Use the cursor keys to move the note line around. Press <RETURN>..

3.5 REFERENCE LINES

You may add up to six "help" lines to the chart. They may represent any data values, such as the minimum, maximum and average of a salary scale for a job.

In the one-dimensional case, the lines are drawn across the chart. Normally both ends are the same values, although you can make them different.

In the two-dimensional case, you must give the X and Y values of the end points of each line.

LINE NUMBER: Enter the number of the line you wish to describe (1-6) and then <RETURN>.

VALUES: < and ^ END. This is the value (or X & Y coordinates) of the left end of the line in the vertical graph or bar case, or the upper end in the horizontal or bar graph case. Key in the value desired and press <RETURN>.

>V END: This is the value of the right or lower end of the line. Key in the value desired and press <RETURN>.

LINE TYPE: SOLID, DASHED, OR NO LINE: Move the cursor and press <RETURN>. The NO LINE option removes a line previously displayed.

COLOR: Select the color number of the line and then <RETURN>.

3.8 DISPLAY DIRECTORY

The prompts and their meanings are the same as the DISPLAY DIRECTORY screen [1/8].

(SPEC FILES) is the default.

3.9 READ CHART SPECS FILE

This option allows you to read a chart specification file. The first prompt is for the disk drive device number. Select the device number and press <RETURN>.

Next you are prompted for the filename of the specification file. If you previously used the DISPLAY DIRECTORY function, the name you selected is automatically shown here. You may press <RETURN> to accept that filename. Otherwise enter a new filename and press <RETURN>. After the specification file is read, you are returned to the MAIN MENU.

[4] SAVE CHART MENU

4.1 SAVE DATA

All of the data sets in the computer are saved to disk. If you want to select only certain data sets to load, this is done when reading them into the computer [1/9].

The first prompt is for the disk drive device number. Enter the device number and press <RETURN>.

The second prompt is for the filename. The filename must not have **S.** or **D.** as the first character. Enter the filename and press <RETURN>.

CHARTPAK-128 saves the data file to disk. If a file with the same name already exists, you see the prompt: **REPLACE? (Y/N)**. If you press **Y**, the data from memory overwrites the old file on the disk. If you press any other key (including <RETURN>), you are returned to the start of this menu.

4.2 SAVE SPECIFICATIONS

All of the chart specifications in the computer are saved to disk.

The first prompt is for the disk drive device number. Enter the device number and press <RETURN>.

The second prompt is for the filename. Enter the filename and press <RETURN>.

CHARTPAK-128 saves all of the specs to disk. If a file with the same name already exists on the disk, you see the prompt: **REPLACE? (Y/N)**. If you press **Y**, the specs from memory overwrite the old file on the disk and CHARTPAK-128 will do a diskette COLLECT.

If you press any other key (including <RETURN>), you are returned to the start of the menu again.

4.3 DISPLAY DIRECTORY

The prompts and their meaning are the same as the DISPLAY DIRECTORY screen [1/8].

A FILE TYPE of (ALL FILES) is the default.

[5] PRINT CHART

This option reproduces your chart on a connected printer.

5.0 PRINT CHART

The message **Press space bar to abort printout** is shown to remind you how to abort a printout.

The prompt is **SELECT FORMAT:**

The name of your printer type is shown and then the various size options you my select. The cursor is placed at the default you selected in the configuration or at the last choice you made.

Move the cursor and press <RETURN>.

If you need to change printers, you can return to the MAIN MENU by pressing **F1**, then select the printer configuration option 7.

Once the printout starts, the screen is blanked to a grey color (to make the printout go as fast as possible). If you encounter problems with the paper or want to abort the printout part-way through, press and hold the spacebar until the MAIN MENU returns.

[6] FILE UTILITIES MENU

6.1 DELETE DATA FILE

This option removes the specified data file from the disk.

The first prompt is for the disk drive device number. Enter the device number and press <RETURN>.

The second prompt is for the data filename to be deleted. Enter the filename and press <RETURN>.

6.2 DELETE SPECIFICATION FILE

This option removes a specification file from disk.

The first prompt is for the disk drive device number. Enter the device number and <RETURN>.

The second prompt is for the filename to be deleted. Enter the filename and <RETURN>.

6.3 RENAME FILE

This option allows you to rename a file on disk (perhaps to avoid a conflict with another filename).

The first prompt is for the disk drive device number. Enter the device number and <RETURN>.

The second prompt asks you to specify the new name, followed by a = and then the name of the file to be changed and press <RETURN>.

You must include the `D.` or `S.` prefix.

6.4 COPY FILE: SINGLE DISK

This option allows you to make a copy of a file on the same diskette.

The first prompt is for the disk drive device number. Enter the device number and <RETURN>.

The second prompt asks you to enter the name of the destination and source files in the form `new=old`.

You must include the **D.** or **S.** prefix.

6.5 NEW DISKETTE

This option initializes a diskette. Be aware that **all data on the diskette is destroyed** by this option.

The first prompt is for the disk drive device number. Enter the device number and press <RETURN>.The second prompt asks you for a diskette name. You may enter up to 16 characters and press <RETURN>. The third prompt asks you for a diskette identifier. Enter a two-character (alphanumeric) identifier and press <RETURN>.

6.6 COLLECT DISKETTE

This option lets you collect (validate) a diskette and eliminate any unclosed files (* on the right side of the file name).

6.8 DISPLAY DIRECTORY

The prompts are the same as the `DISPLAY DIRECTORY` screen [1/8]. `FILE TYPE (ALL FILES)` is the default.

[7] PRINTER CONFIGURATIONS

This procedure records information about your printer, interface and choices on the CHARTPAK-128 diskette. This is normally done only when you change printers or interfaces, or in case the information in the configuration record becomes unreadable.

Since you will be writing onto the CHARTPAK-128 diskette, the reminder is shown that the write-protection notch must be **UNCOVERED**.

Next, the list of all printer types supported in CHARTPAK- 128 is shown. Select the one you want by moving the cursor and pressing <RETURN>.

The next prompt asks for the device number of the printer (4 is the default). Press <RETURN> to accept the default or change it.

* GRAPHIC SECONDARY ADDRESS. This is a secondary address that is used to setup interfaces if used. See Appendix A for usual values.

* ASCII TRANSLATE (Y/N). In some cases it is necessary for CHARTPAK-128 to pre-translate ASCII codes to printer interfaces. See Appendix A for these values.

The next prompt is for the text screen secondary address. (Used for screen copies in data reduction [1/6]). Press <RETURN> or change the value.

Next, the list of chart size choices is shown. Select the one you want as the default by moving the cursor and pressing <RETURN>.

You are returned to the MAIN MENU after being reminded to put the tape back on the write-protect notch.

[8] EXIT TO AUTOBOOT

This option resets the C-128 computer for normal BASIC operation and will start the autoboot process from disk. If you want to load another program, remove the CHARTPAK-128 disk and insert the new disk, then proceed with this option. Before the resetting process starts, you are asked **ARE YOU SURE? (Y/N)**. Press the Y key to do the reset. Pressing any other key returns you to the MAIN MENU.

DEMONSTRATION CHARTS

Now you have mastered the basics of chartmaking with your '128! To show some of the other features of this powerful package, there are a series of data file and chart specifications included on the distribution diskette. These charts are also reprinted in APPENDIX F. Simply follow these instructions:

If CHARTPAK-128 is not in the computer, load and run it.

Go to screen [1/8] and select data files (1). Select data file name DATA.1 and press <RETURN>. Then press <RETURN> two more times and the disk drive should start reading. All of the demonstration files are non-DIF files, so answer **N** the prompt. You are prompted for data set selection. Press **Y**/<RETURN>/**Y**/<RETURN>/**Y**/<RETURN> and **Y** to read in all of the data sets and data group names.

You should be returned to the MAIN MENU. Go to screen [3/8] to read in the spec file. After the disk drive device default, select spec files and <RETURN>. Select **DATA.1A** and read it into CHARTPAK-128.

When the MAIN MENU reappears, go the screen [2]. Key in the date and your initials and press <RETURN> to draw the chart. This is a 12-month bar chart of three sales regions. Note the three different types of bar filling and that these are mixed bars (M). Printouts of these charts are included at the end of this section.

The next several examples all use the same data sets, as you can display a group of data sets many different ways.

Go to screen [3/9] (from now on we will key the filenames directly and always default the device number) and change the A in **DATA.1A** to a B (to read in **DATA.1B**). Then display it. Note that this is similar, only uses the grouping (G) bar option. The rainbow in the left group is not intentional; it is due to the video system's high density vertical lines.

Now go to screen [3/9] and select **DATA.1C** spec file and display it. This is an example of stacked bars. Note that the bars are wide and easier to read, and the top shows the total sales of the three combined.

Go to screen [3/9] and read in **DATA.1D**. Again this is the same data, only shown in a vertical graph format.

Go to screen [3/9] and read in **DATA.1E**. This is a horizontal bar chart of the data.

Go to screen [3/9] and read in **DATA.1F** and display it. This is an example of stacked horizontal bars. It uses diagonal filling and dots. Note also that the right side is moved in slightly to show all of the top value (250).

To clear all of the data sets, go through screen [1/4]. Press **Y** to clear the data sets. Use default sizes - 4 data sets and 60 points. Go to screen [1/9] and after the device default, type **DATA.2** as the filename. Accept all data sets and group names. Then go to screen [3/9] and read in **DATA.2** and display. Since this is a pie chart, you are first asked to select a data set to display. Select 1 and then you are asked if you want to change colors. Press **N** to use the saved values.

Again reset the data sets by going to screen [1/4]. Press **Y** to proceed with clearing the data sets.

Read in data file **DATA.3** and spec file **DATA.3A**. This is a vertical graph comparison of actual data versus budget for a fiscal year.

Reset the data sets [1/4] and read in data file **DATA.4** and spec **DATA.4**. This is an example of using color, although you will notice it is impossible to keep it from bleeding into the horizontal lines (due to the 128's hi-res design). This is a Mixed bar chart.

Reset CHARTPAK-128 using screen [1/4] and read in data file **DATA.5** and spec file **DATA.5A**. This is a wage scale comparison, and includes three lines, a solid one for the mid-range

($23500), and dashed lines at the edges of the range (18,800 and 28,200). The note lines have been used to identify the values and lines.

Go to screen [3/9] and read in **DATA.5AL** and see the same data on a log scale.

The next example requires changing the data set size to 1 X 108. Simply go to screen [1/4] and enter 1 for the number of data sets, and 108 for the maximum number of points. Go to screen [1/9] and read in **DATA.6** and spec file **DATA.6** . Note that the bottom of the chart has been moved up, the bar width is 1 and the bar spacing is 0.

The next examples are X-Y charts taken from a high school chemistry lab. The experiment is to measure the solubility (amount of a substance which can be dissolved) of three compounds at various temperatures of the solution. The three compounds are ammonium chloride, sodium nitrate and potassium nitrate. There are four data points for each compound. The temperature of the solution is the X-value and the number of grams which can be dissolved in 10 milliliters is the Y-value.

Go to screen [1/4] and use the two defaults for number of data sets and data items. Then go to screen [1/9] and read the data file **SOL-CURVE**. Respond **Y** and <RETURN> to the data set name and number prompts for the three compounds and **Y** to the data grouping names. Don't worry about the 'funny' characters in the names.

Next go to screen [3/9] and read the chart specifications. The filename is also **SOL-CURVE**. Display the chart on screen [2]. Note that the a "help" line (entered on screen [3/5]) was used to extend the line for Potassium Nitrate (P line) down into the lower corner. Note also that this chart uses the upper/lower case features of CHARTPAK-128. When using these you must switch the menu screen displays to upper/lower case (press the **Shift** and **C=** keys at the same time) in order to see the legends, etc. as you enter or alter them.

Look at the charts and notice how all of the curves seem to have a slight bend in them, bending up towards the right. This is usually the case when a relationship has a constant RATE of increase. To see if this is true, we changed the dependent axis to a log scale. To see the resulting chart, go to screen [3/9] and load **SOL-CURVEL**. Then display the chart using screen [2]. Note also how the data set legends are moved to a free space on the chart.

The next two examples show how the bar and marker options of the line charts are used. Go [1/4] to reset the data and setup 4 data sets of 100 points each. Read in **CHRYSLER STK** data sets 1, 2, and 3. Notice that one is high price, the second is low price and the third is the closing price for each day.

Now read in the chart specs with the same name (go [3/8]) and then draw the chart. The line is a least squares regression line computed using [1/6/3]. To see how the data sets are tied to line options, go [3/3/1] and see that data set 1 (high price) is marked as a bar end, data set 2 (low) is also an end and data set 3 (close) is setup as a marker.

Another example is the **PROMOTION** data and spec on disk. Go [1/4], then [1/8] and [3/8], then draw the chart. See how easily you can make a schedule chart?

DIF FILE EXAMPLE

A DIF file example is included on the diskette. It was written by CALC-RESULT (ADVANCED) from a very ordinary budget worksheet (see APPENDICES C and G). The data we want to chart are Total Sales, All Direct Costs, Overhead Costs, and Net Profit. The file was saved by rows.

Start by resetting the data sets using screen [1/4], using the defaults for the number of data sets and (55) for the number of points. Go to [1/8] to read the directory on device 8. Select data files (option 1) and <RETURN>. You will see all the data files on the diskette, and they are reprinted in APPENDIX G as well. Select **DIF BUDGET** by keying its number and <RETURN>. You will be on screen 1/9. Press <RETURN> twice to read the DIF file on device 8. The prompt DIF FILE? (Y/N) will appear. Press **Y**. The next prompt is **saved by rows? (y/n)**. Since it was, press **Y**. The prompt is **are data sets rows? (y/n)**. Since we want categories (rows) of income and expense to be charted, answer **Y**.

The next prompt is data group names from 1st cell? (y/n) . Since we want the data group names to be Qtr 1, Qtr 2, etc., (1st cells (rows) across top), answer **Y**. Then you will be asked **data set names from labels? (y/n)**. Since CALC-RESULT doesn't put labels into DIF files, press **N**.

Finally, you are told the name of each data set CHARTPAK encounters (the first is blank). The prompt is **y:accept, n:bypass**. Press **N** for the first. The next is **SALES APPLES**. Press **N** again. Keep pressing **N** until **TOTAL SALES** appears. Then press **Y**, since that's one of the ones we want. Then you will have to select the data set in CHARTPAK where it is to go (use the default-1). Press <RETURN>. In the same way, select the other three data sets (All Direct Costs, Overheads, and Net Profit) and put them into data sets 2, 3, and 4. Then you must finish out the rows of data by pressing **N** to the rest of the data set prompts.

The message **reading rest of data** appears for about 15 seconds while the data is read in. You are then returned to the MAIN MENU.

By now you should be able to manage chart specifications to create the results like DIF Example A and B at the end of this section. If not, there are specification files **DIF-BUDGET.A** and **DIF-BUDGET.B** on the diskette that you can read in through [3/9].

The same DIF file may be used to prepare a sales mix comparison (stacked bar chart) shown in example C. Simply start over with [1/4] and read in the three sales lines (APPLES, ORANGES, and BANANAS) as the data sets, then do a stacked-bar presentation (**DIF-BUDGET.C** is a spec file for this if you're lazy).

Example D uses the same DIF file, but the data sets are not rows, they're columns (quarters). Start by reading the DIF file again [1/9], only specify the file was saved by rows but the data sets are NOT rows. The next prompt is **DATA GROUP NAMES FROM LABELS? (Y/N)**. Since CALC-RESULT does not use labels, respond N. The next prompt asks if the data group names come from the first cell. Answer Y. Accept the four quarters of data into data sets 1-4 and bypass the year data set. Use [1/2] and select option 0 (data group names) to shorten the names to a maximum of 11 characters so they will fit the vertical format. The spec file **DIF-BUDGET.D** will show the example.

Data Reduction Tutorial

- Introduction
- Averages and Standard Deviation
- Least-Squares Lines
- Two-Dimensional Data
- Exponential Smoothing

INTRODUCTION

This tutorial lets you use CHARTPAK-128 to show the results of simple data reduction methods and help you learn how CHARTPAK-128 works.

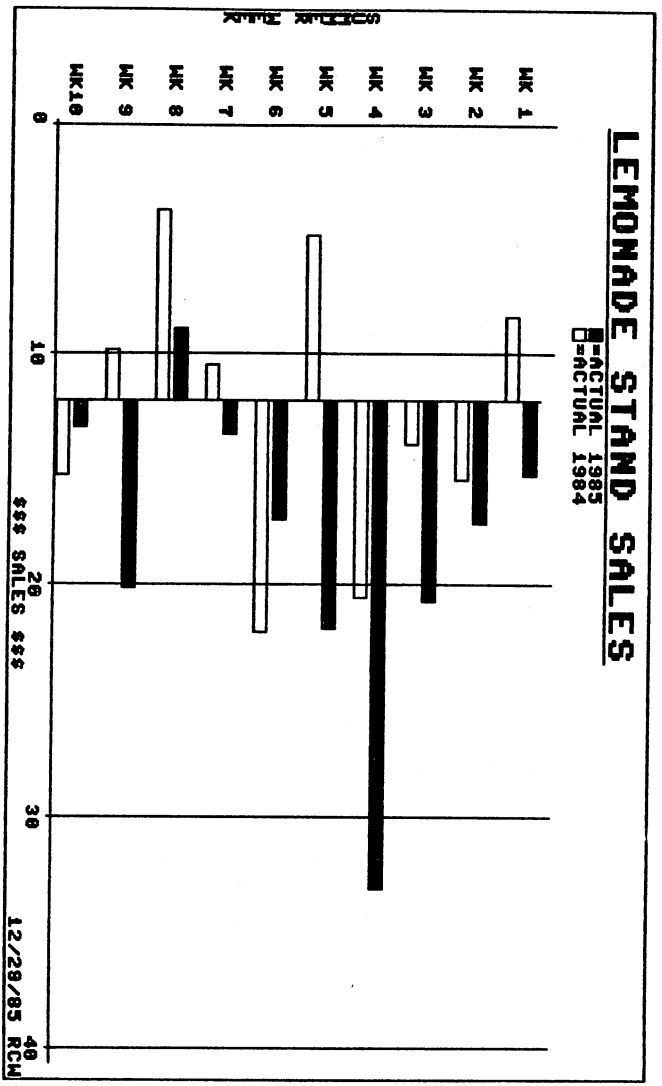
If you haven't gone through the CHARTPAK-128 TUTORIAL in the introductory section of the manual, you should do that first to gain familiarity with the menus and operation.

If you haven't already done so, load CHARTPAK-128 into the computer.

DATA REDUCTION can be simply described as the steps taken to try and find the *Truth* in sets of numbers so the *Truth* can be used to predict the future. Measurements often contain small errors due to inaccuracy of measurement, or the data contains "noise" effects (such as the day-to-day variation in sales at a grocery store, even though the monthly sales levels may be pretty constant). The *Truth* is important because it can show us *what's really happening*, so we can plan for the future.

The easiest data reduction methods involve data set arithmetic. In the section CHARTPAK-128 TUTORIAL you made a chart showing how the two years of lemonade stand sales compare, as in Figure 1. (Refer back to pages 9 through 11).

Figure 1


LEMONADE STAND SALES
■=ACTUAL 1985
□=ACTUAL 1984
WK 1
WK 2
WK 3
WK 4
WK 5
WK 6
WK 7
WK 8
WK 9
WK10
0
10
20
30
40
$$$ SALES $$$
12/29/85 RCW

Even that chart didn't really help get at the *Truth* about how much we are ahead or behind last year's sales. What we need is a chart showing the percent that this year is ahead or behind last year, for each week.

Go to menu [1/8] and read the LEMONEX data sets into the computer. The LEMONEX file contains Actual 85, Budget 85 and Actual 84 data. Then go to [3/9] and read the spec file, then draw/display the chart with option [2].

Now what we want to to do is compute the percent change of '84 vs '85. We'l do that by dividing our 85 data by 84 data to get the ratio, subtract the constant value one (1) from the ratio, and then multiply by 100. We'll put the results into data set 4. Do the following to accomplish these computational steps:

[1/6/1/4] (Divide) : DS 4 (ratio) = DS 1 (Actual 85) divided by DS 3 (Actual 84).

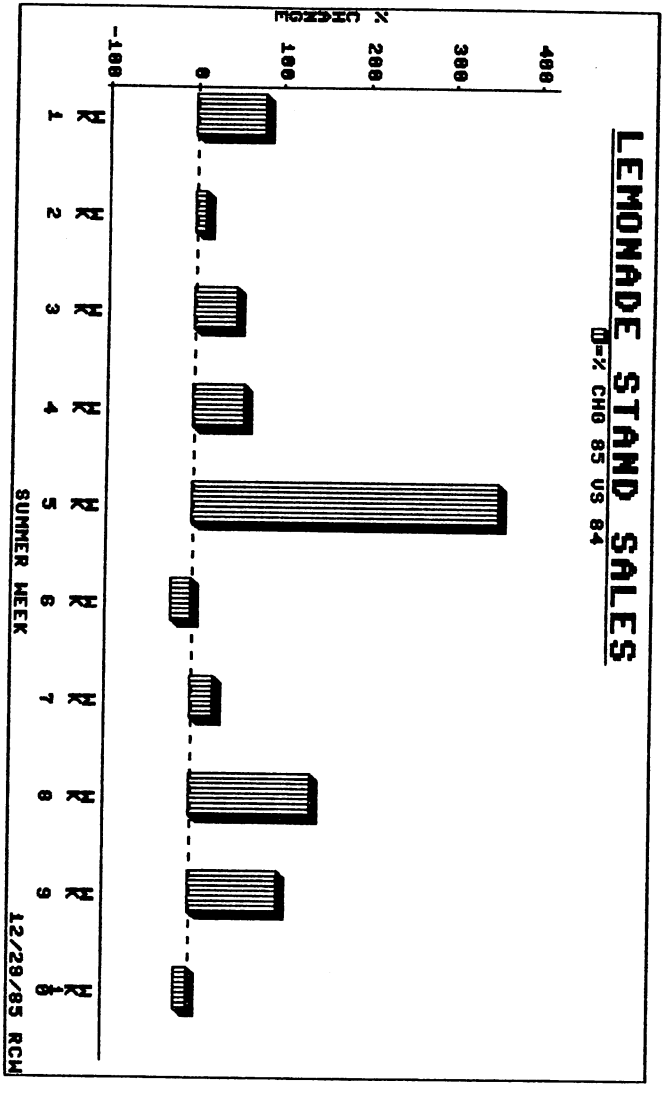
[1/6/1/2] (Subtract) : DS 4 (ratio-1) = DS 4 (ratio) minus DS 0 (constant value 1)

[1/6/1/3] (Multiply) : DS 4 (percent vs 84) = DS 4 (ratio-1) times DS 0 (constant value 100)

Use [3/1] to change the chart type to 3D vertical bars and change the display sequence (show data set 4 only). Go to [1/2] to change the data set 4 name to % chg 85 vs 84.

Go to [3/2/2] and change the axis legend to PERCENT 85 vs 84, the min and max values to -100 and 400 to handle the range of values, the base value to 0, and the number of divisions to 5. Plot the chart as in Figure 2. You might want to change bar width, add lines, etc.

Figure 2


LEMONADE STAND SALES
0=% CH0 85 U3 84
% CHANGE
-100
0
100
200
300
400
1
2
3
4
5
6
7
8
9
10
SUMMER WEEK
12/29/85 RCH

Use [1/6/5] to print the the data in all three data sets as in Figure 3:

Figure 3

PT #	DATA GROUP NAME	ACTUAL 1985 > X-VALUE <	:ACTUAL 1984 > X-VALUE <	:%CHNG 85VS84 > X-VALUE <
1	WK 1	15.2	8.4	80.952381
2	WK 2	17.35	15.45	12.2977347
3	WK 3	20.7	13.88	49.1354467
4	WK 4	33.15	20.6	60.9226301
5	WK 5	21.91	4.8	356.458333
6	WK 6	17.16	22	-22
7	WK 7	13.45	10.5	28.0952381
8	WK 8	8.92	3.71	140.431267
9	WK 9	20.11	9.85	104.162437
10	WK 10	13.17	15.2	-13.3552632

Note that the printout tries to align the data on four decimal places, but when the number of decimal places exceeds four, the decimal point has to "float" in the column.

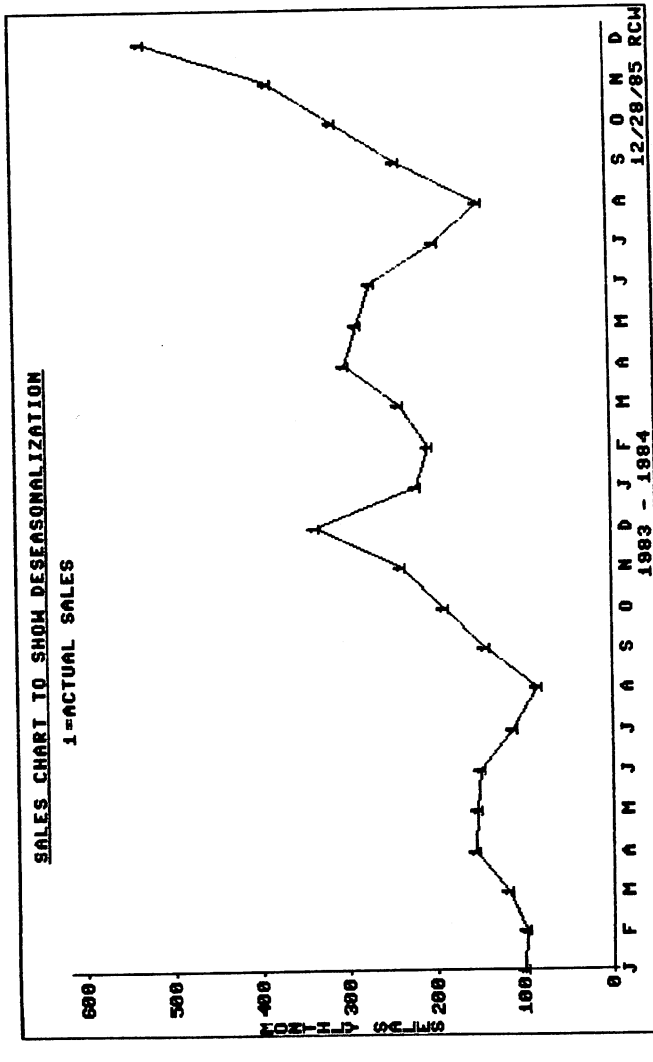
The data set calculations are set up so if one data set has fewer points than the other, the short data set is re-used. This allows you to set up a series of 12 monthly factors in one data set (for instance, data set 2) and then divide several years of monthly sales (data set 1) by those 12 factors.

Look at the sales data in Figure 4 and the chart Figure 5.

Figure 4

PT #	DATA GROUP NAME	ACTUAL SALES > X-VALUE <	:SEASONAL FACT: > X-VALUE <
1	J	100	1
2	F	99	.9
3	M	120	1
4	A	156	1.2
5	M	154	1.1
6	J	150	1
7	J	112	.7
8	A	85	.5
9	S	144	.8
9	S	144	.8
10	O	190	1
11	N	240	1.2
12	D	336	1.6
13	J	220	0
14	F	207	0
15	M	240	0
16	A	300	0
17	M	286	0
18	J	270	0
19	J	196	0
20	A	145	0
21	S	240	0
22	O	310	0
23	N	384	0

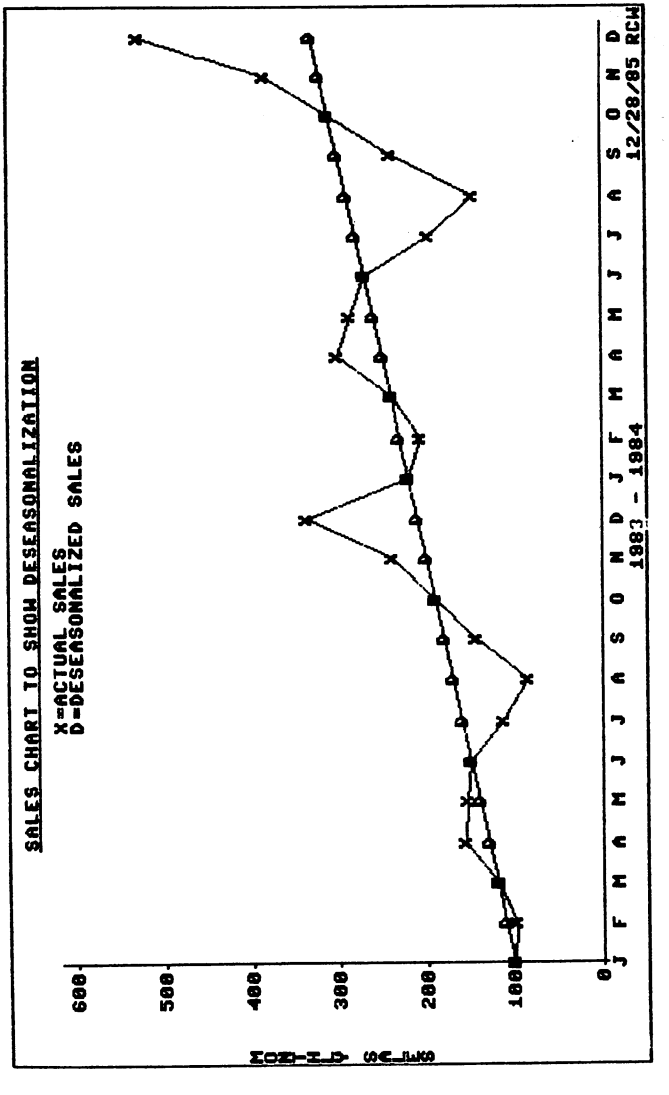
Figure 5


SALES CHART TO SHOW DESEASONALIZATION
1=ACTUAL SALES
SALES (THOUSANDS)
600
500
400
300
200
100
0
J F M A M J J A S O N D J F M A M J J A S O N D
1983 - 1984
12/28/85 RCW

There is obviously an uptrend, but just how much of an uptrend? If we have accumulated the seasonal factors from several years, or outside source (trade association seasonal factors, for example), we could load these 12 values into a data set and then divide the actual sales by the seasonal factors to create a "deseasonalized" data set. When this is plotted—*Truth* !

See Figure 6.
P.S.The Real World is seldom this good!

Figure 6


SALES CHART TO SHOW DESEASONALIZATION
X=ACTUAL SALES
D=DESEASONALIZED SALES
600
500
400
300
200
100
0
J F M A M J J A S O N D J F M A M J J A S O N D
1983 - 1984
12/28/85 RCH

AVERAGES AND STANDARD DEVIATIONS

When we don't have a good set of indices to use to eliminate seasonal variations, we tend to use an average to cut out the variation and get at the underlying Truth . We may not realize it, but whenever we select an average we are assuming that the Truth does not have any trend in it—it's flat. Be careful, since this can be a *very bad assumption* in many cases.

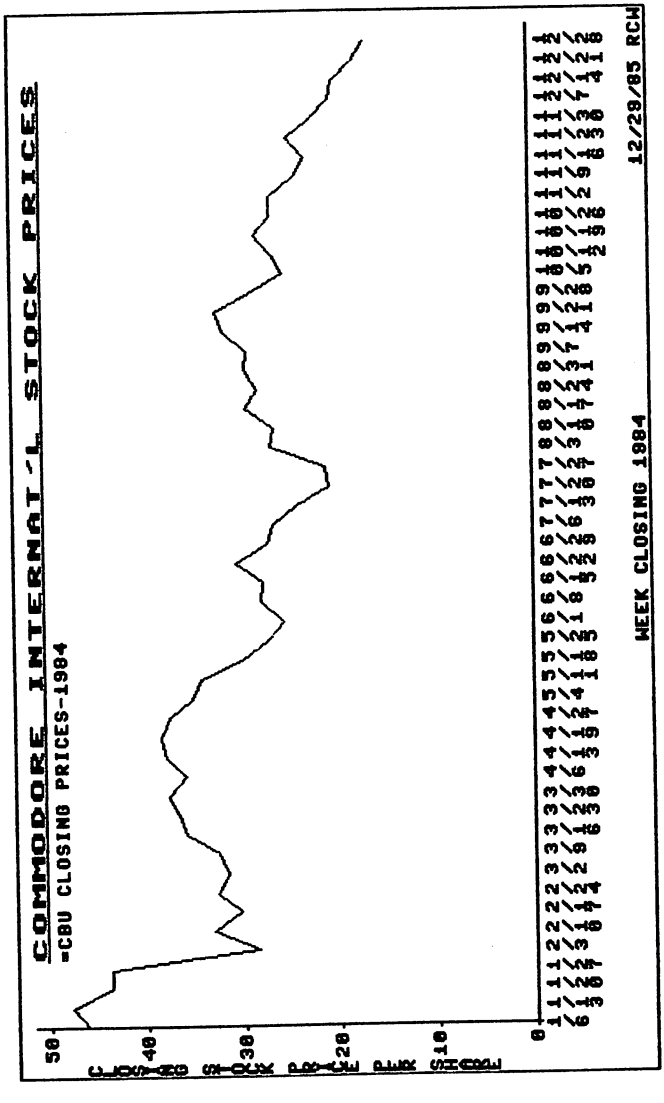
To demonstrate the the use of averages, there is a data set on disk that has Commodore stock prices at the end of each week for all of 1984.The filename is `CBU WEEKLY`.

Restart CHARTPAK, then go to menu [1/4] to set up 4 data sets of 60 each (the default). Then read the data set into memory (and the data group names). There is a spec file with the same name to make the charting easy.

These prices can be charted as in Figure 7.

To compute and display the average, go to [1/6/2] and select the price data set (1) to be averaged. Note that the total, average and standard deviation are shown.

Figure 7


COMMODORE INTERNAT'L STOCK PRICES
-CBU CLOSING PRICES-1984
50
40
30
20
10
0
WEEK CLOSING 1984
12/29/85 RCH

Look at these values for a minute:

TOTALX=1552: This is a total of all 52 closing prices for the year.

AVGX=29.8461539: This is the average, calculated by dividing 1552 by 52.

STDDEVX=6.78984033: This is the standard deviation, which is a statistical measure of the spread of the data points above and below the average.

In most cases, the average plus or minus one standard deviation (29.85 + 6.79 = 36.64 and 29.85—6.79 = 23.06) contain 68% of all the data points. The average plus two standard deviations usually contains 95% of the data points.

A frequent use of standard deviation of sales is to determine how much inventory to carry. If you know you sell an average of 20 units every week and it takes one week to receive stock, and your standard deviation of sales is 5 units, then you know that 2/3 of the time (68%) your sales will not be more than 25 nor less than 15. If you stock 25, you should have enough to prevent stockouts two-thirds of the time. Actually it will be 84%, because you won't stockout if your sales are lower than 15, either.

So in this example (Commodore stock prices) we know that two-thirds of the time the price should fall between 23.06 and 36.64. More precisely, this happens 69.2% of the time.

Since the computer is most useful when it lets you actually *see* this, do the following:

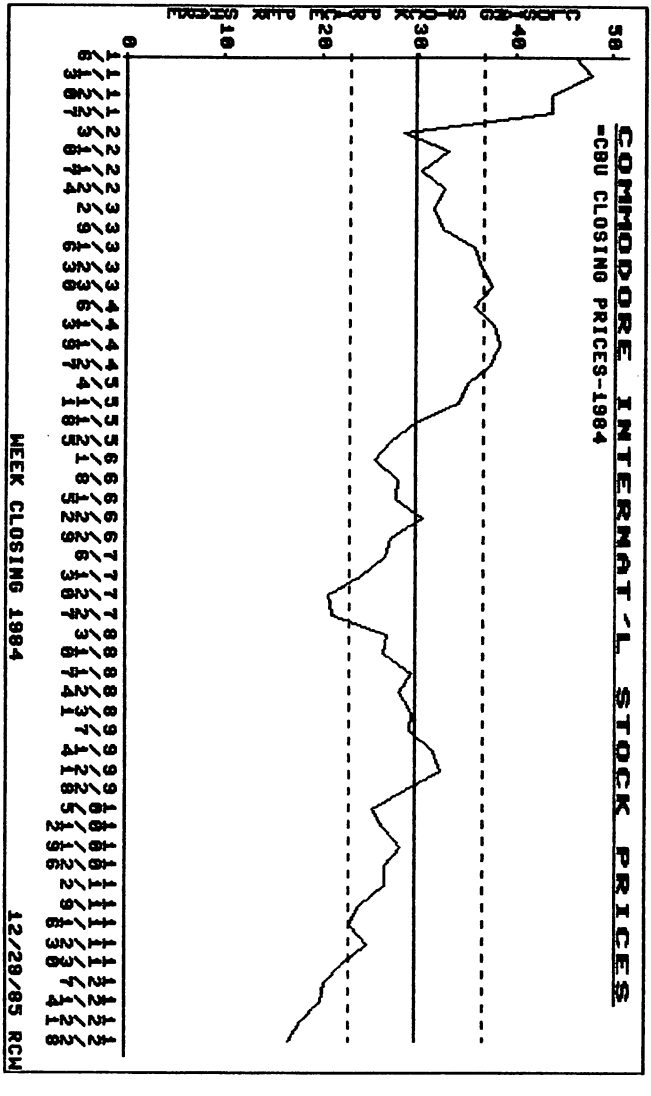
To continue with the AVERAGE function, the next prompt asks you which line should contain the average. Press <RETURN> to accept the default (1). Then press <RETURN> to accept the default for the line type (S) and black color.

The next prompt asks for the number of standard deviations you want to see above and below the average. Press <RETURN> to accept the default (1).

The next prompt asks you for the line number where the average + 1 standard deviation is to go. Press <RETURN> to accept the default (2). Next set this line to a dashed line (press cursor down). Select black and press <RETURN>.

Do the same for the other line (average - 1 standard deviation). Now display/draw the chart [2]. See Figure 8.

Figure 8


COMMODORE INTERMAT'L STOCK PRICES
-CBU CLOSING PRICES-1984
WEEK CLOSING 1984
12/28/85 RCW

To further understand the lines, go to [3/5] and select line 1 (the average). See that the average value is shown at both ends of the line. In the same way examine line 2 and 3 and see the values of the average plus and minus one standard deviation.

Press the **C** key to display the chart again. Notice how this *is not* a good forecast for the future, since it assumes no trend? In fact, the next week's end price was 17.75!

LEAST-SQUARES LINE

A technique that is better than the average is a least-squares line computation. This technique finds the line that fits in between a set of data points, so that the total of the squares of the distance between each point and the line is minimized. There are other method but this is most popular. The big advantage is that this line will slope and should pick up any trend in the data that the simple average will not. Just as with the average, all you have to do is to go to [1/6/3], select the data set of the data and specify the types of the three lines. Do it now, but stop before selecting the line options.

The screen shows all of the intermediate values computed in the process of determining the regression line. They stand for:

TX,TY : the total of X and Y values

XX, YY, XY : the totals of X squared, Y squared and X*Y
XB, YB : the average of X and Y

CR : coefficient of correlation between X and Y (0 means no correlation, -1 or +1 is perfect correlation).

SY : Residual variance of the line with the y-values in the data

YI : Y-intercept of the least-squares line

SL : slope of the least-squares line

As mentioned above, for one-dimensional data like this, the data point number (1-52) is used as the x-coordinate of the data.

TX = 1378	(the total of the x values, 1 through 52)
TY = 1552	(the sum of the y values, like we had in the average)
XX = 48230	(the sum of each of the numbers 1-52 squared)
YY = 48718.5316	(the sum of the squares of the y values—the prices)
XY = 36915.25	(the sum of the product of x and y for each data point)
XB = 26.5	(the average of the x values (1-52)
YB = 29.846154	(the average of the y values, -agrees with the average example
CR = -.795005951	(the correlation coefficient—pretty good; it's negative because the data doesn't' go up as you increase x (go right), it goes down)
SY = 4.11872825	(the residual variance; the deviations in y not explained by the regression line. Note that this is considerably smaller than the std. deviation in the average case (6.79). This means that the regression line is a better predictor of the data. As with the standard deviation, it means that 68% of the time the data will be within 4.12 of the regression line).
YI = 39.37726256	(the Y-intercept of the regression line [where the line crosses the vertical axis when the x point is 0]).

SL = -.359664476 (the slope of the regression line). These two values allow the system and you to compute the y value of the regression line at any x point as follow:

•Y = X * SL + YI

•Y = X * -.36 + 39.38

•if X = 1 then Y = -.36 + 39.38
which is 39.02

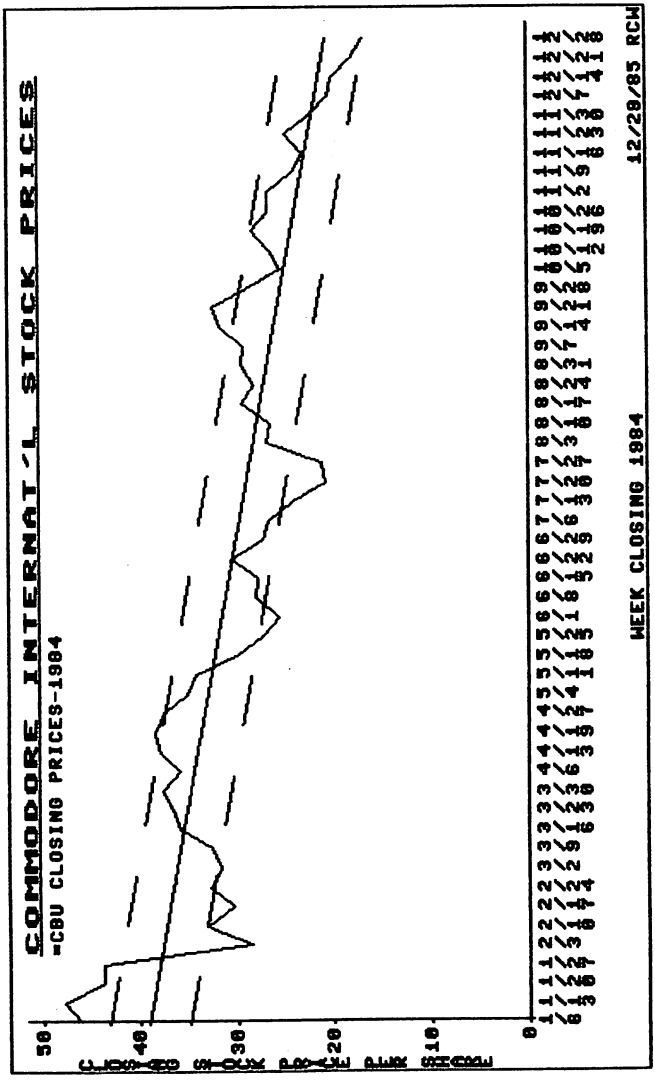
•if X = 52 then Y = 52 * (-.36) + 39.38
which is 20.66

Now continue with lines. Since you had line 1 solid before, and the std deviation lines dashed in the average example, you will be able to default through all of the line options. CHARTPAK-128 will automatically change the values.

Then select [2] to draw/display the chart as in Figure 9.

Notice how the regression line more clearly picked up the trend (Truth...). This could be used to forecast where the stock price might be in the near future, based solely on the past. (You must judge whether the past is a good predictor of the future).

Figure 9


COMMODORE INTERNAT'L STOCK PRICES
=CBU CLOSING PRICES-1984
WEEK CLOSING 1984
12/28/85 RCW

You extend the line for future periods, as follows:

If x = 53 then Y = -.36 * 53 + 39.38, which is 20.3 (vs actual price of 17.75 for the next week).

You can see the line values by displaying the values of line 1 (go to [3/5]). The value at the left side (point 1) is 39.017598 and the value at the right side (point 52) is 20.6747097.

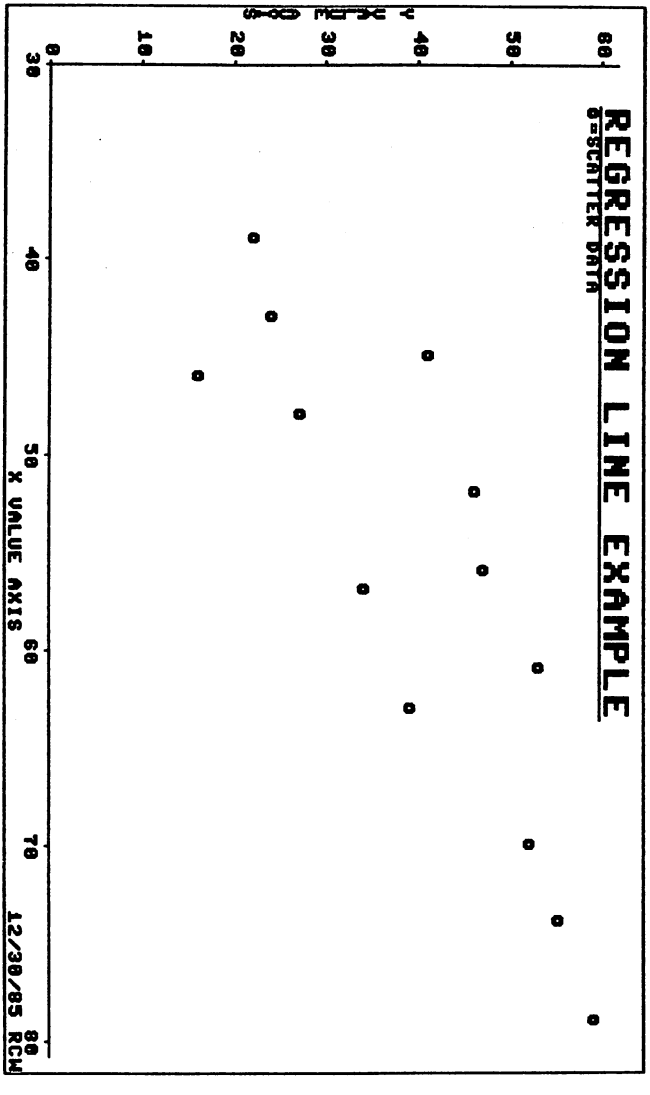
Be careful—these lines are computed from a data set and will not change automatically if data is added or changed in the data set. To recompute, simply go to [1/6/3] and select the data set. You will have to specify the number of std dev or residual variances (it is not saved), but can then take defaults through the lines.

TWO-DIMENSIONAL DATA

The least-squares line is the only method really suitable for the x-y plotting mode. As an example, go [1/4] and reset data sets. Read in the file X-Y REGR (one data set and group names). Go [3/9] and read in the specifications with the same name. This is an x-y chart. Go to [2] to draw the chart. See Figure 10.

This is a scatter diagram of 13 (x, y) pairs of points. What is the line that best fits the data?

Figure 10

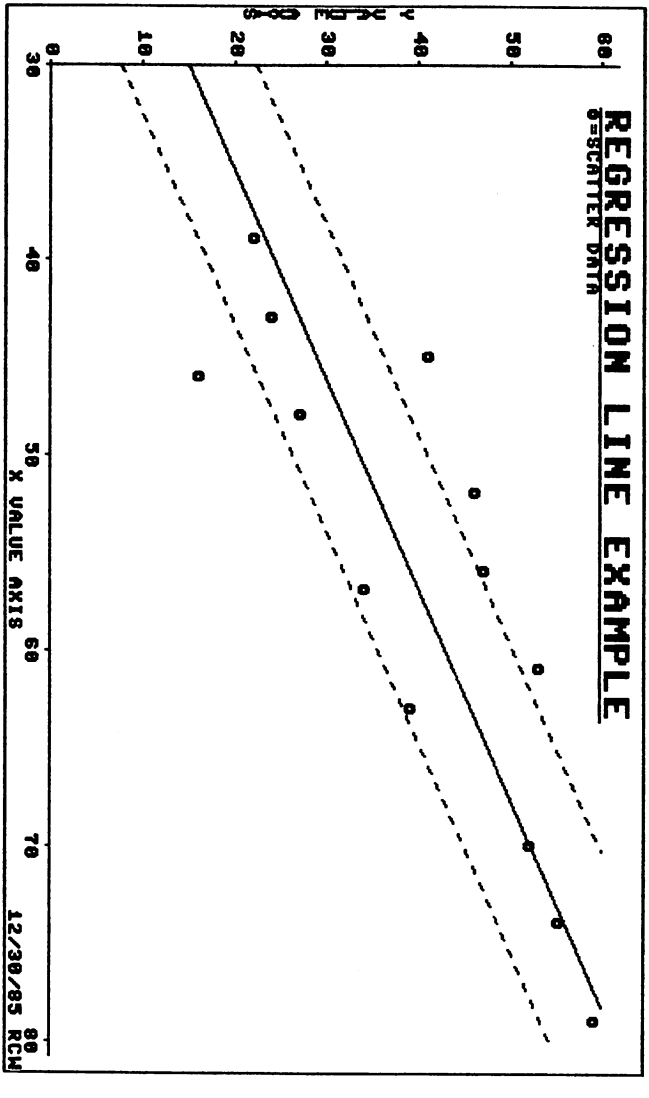

REGRESSION LINE EXAMPLE
0=SCATTER DATA
Y VALUE AXIS
X VALUE AXIS
12/30/85
RCW

Go to [1/6/3] and select data set 1 as input. Make the regression line solid and the +/- 1 residual variance lines dashed and then plot the chart. It should look like Figure 11.

Note that 8 of the 13 points (61%) are within the residual variance lines.

The biggest limitation with least-square lines is that the line is straight. There are techniques that try to fit curved lines through data but are beyond the scope of this program and tutorial. An alternative method that is easy to use and gives very good results with one-dimensional data is exponential smoothing.

Figure 11


REGRESSION LINE EXAMPLE
O=SCATTER DATA
Y VALUE AXIS
0
10
20
30
40
50
60
30
40
50
60
70
80
X VALUE AXIS
12/30/85 RCW

EXPONENTIAL SMOOTHING

This is a data reduction technique that eliminates the random variation in a set of numbers to get at the Truth hidden under those numbers. To understand it, let's first look at weighting factors.

In the simple averaging process of all of the data, each number gets the same weight. If you had two years of monthly sales data, each month contributes 1/24 to the average. If you add another month, the new month (as well as each of the other 24 months) contributes 1/25 of the average, and so on. While this may be easy to calculate, it is poor as a base for forecasting the future, since it doesn't put any more value on recent information than sales data that is two years old! It actually gives less and less weight to current information (1/25 instead of 1/24, etc).

One way people improve on this is to use a moving average. Here you decide that 12 months is as far back as you care about. So compute the average of the last twelve months. (Note each of these now counts for 1/12 of the average—*double* the weight it had before. Also note that all information more than 12 months old is completely ignored).

Now when a new month's sales data is available, you discard the oldest and only use the prior 11 months plus the latest. Note that each of the last 11 months has the same weight as before (1/12), and the new month is weighted 1/12.

This is clearly better than the simple average. (Incidentally, by using a 12-month span, the month-to-month effects of annual seasonal variations are cancelled out).

The problem remains that the most recent month is given no more weight than data 12 months old. A way to solve this is to reduce the number of months in your moving average, but if you reduce it to say, 4, then the average will probably jump around too much to be reliable.

Some years ago, in the early dawn of the computer age, exponential smoothing was developed. It's easy to compute and has the great advantage that the weighting for each month gets less and less as the months get older. For example, if the current month has a weight of 1, then the prior month has a weight of .85, the one prior to that is .72, .61, .52 and so on downward. This seems to correspond nicely to reality where the most recent data is the most important. The speed at which the data is ignored is controlled by a smoothing factor (.15 in the example above corresponds roughly to a 12 month moving average). A value of .9 would consider the current month data only and ignore the past almost completely.

The formula is:

Current smoothed value =
(smoothing constant * current month value)
+ ((1-smoothing constant)
* last month smoothed value).

Using 100 as the old smoothed value, 121 for the new value and .15 for smoothing constant, the formula works out to:

new smoothed value = (.15 * 121) + (.85 * 100)

which equals 103.15, up from 100 the prior month.

If sales were 115 the following month, the value would be:

new smoothed value = (.15 * 115) + (.85 * 103.15)

which equals 104.93.

So, while sales went from a 100 average to 121, then 115, our smoothed sales level went from 100 to 103.1 to 104.9

If you want a more responsive smoothing, use .25 as the smoothing factor. Then the results become 105.25 and 107.65.

The choice of a smoothing factor value is not "cut and dried"— it's up to you to judge which method seems to work best. Often the only way is to try several and see which seems most "comfortable".

The trend can be computed as the change between last month's smoothed value and this month's smoothed value. The variations in the trend can be reduced by exponential smoothing also. The smoothing factor for the trend is separate from the one for the data, so they may be different (although you *usually* have them the same).

Since the objective is to get at the Truth, we want to eliminate any errors due to the exponential smoothing and trend calculation methods. The only problem is that if a sudden real jump in the data occurs, the system will lag behind.

The solution is to multiply the trend by a factor and add it to the simple smoothed value to correct for the trend lag. This is called trend-adjusted smoothing.

See the data listing in Figure 12 and chart in Figure 13. Note how the line for the trend-adjusted smoothing rises faster (and actually overshoots the step function slightly). The factor used to multiply times the trend is usually:

[(1- trend smoothing factor)/trend smoothing factor]

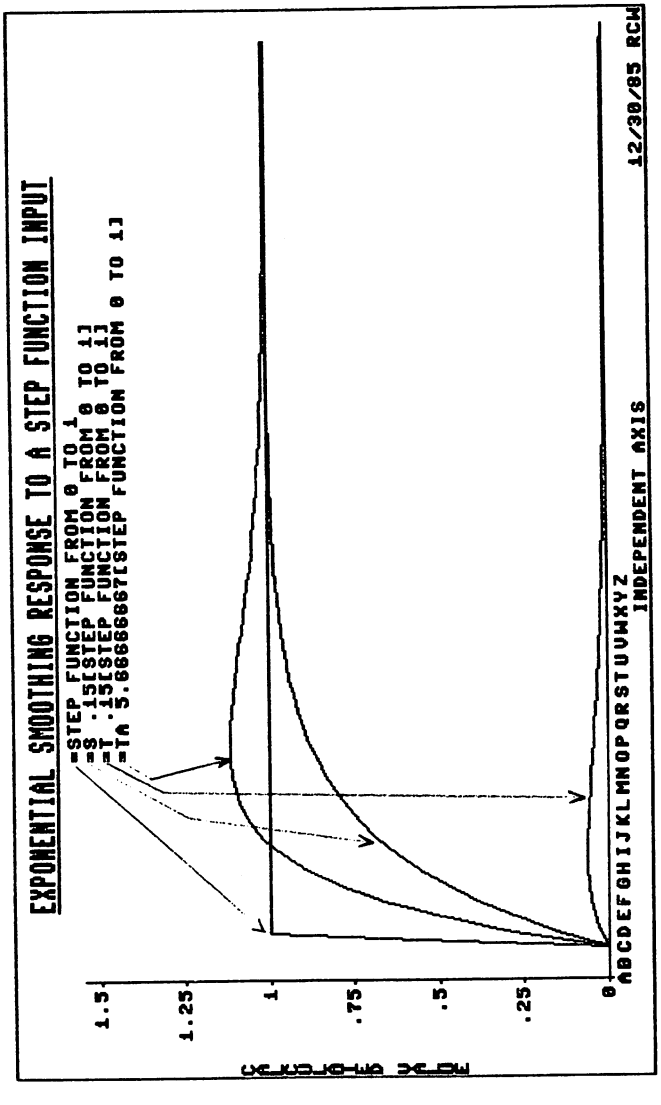
If the smoothing factor is .2 (in the example to follow), then the multiplier is (1-.2)/.2 or .8/.2 or 4.

Figure 12

DATA TABLE

PT #	DATA GROUP NAME	STEP FUNCTION:S > X-VALUE <	.15[STEP FU:T > X-VALUE <	.15[STEP FU:TA > X-VALUE <	5.66666667: > X-VALUE <
1	A	0	0	0	0
2	B	0	0	0	0
3	C	0	0	0	0
4	D	1	.15	.0225	.2775
5	E	1	.2775	.03825	.49425
6	F	1	.385875	.04876875	.66223125
7	G	1	.47799375	.05527125	.7911975
8	H	1	.556294688	.0587257031	.889073672
9	I	1	.622850484	.0599002172	.962285849
10	J	1	.679422912	.0594010487	1.01682885
11	K	1	.727509475	.0577038759	1.05449811
12	L	1	.768383054	.0551793313	1.08106593
13	M	1	.803125596	.0521138129	1.0984372
14	N	1	.832656756	.0487264151	1.10877311
15	O	1	.857758243	.0451826758	1.11379341
16	P	1	.879094586	.041605714	1.11486022
17	Q	1	.89723033	.0380852305	1.11304664
18	R	1	.912645781	.0346847635	1.10919277
19	S	1	.925748914	.0314475189	1.10395152
20	T	1	.936886577	.0284010405	1.09782581
21	U	1	.94635359	.0255609364	1.0911989
22	V	1	.954480552	.0229338482	1.08435898
23	W	1	.961240469	.0205197517	1.07751906
24	X	1	.967054398	.0183138784	1.07083304
25	Y	1	.971996239	.0163080727	1.06440865
26	Z	1	.976196803	.0144919464	1.05831783
27		1	.979767282	.0128537264	1.05260507
28		1	.98280219	.0113809036	1.04729398
29		1	.985381862	.0100687186	1.0423926
30		1	.9875745828	.88051908E-03	1.03789752
31		1	.989438395	7.8280131E-03	1.03379714
32		1	.9910226366	.89144734E-03	1.03007417
33		1	.992369246	.05972086E-03	1.02670766
34		1	.993513854	5.3224548E-03	1.02367443
35		1	.9944867764	.67002488E-03	1.02095025
36		1	.995313764	.09356867E-03	1.01851065
37		1	.9960166963	.58497376E-03	1.01633155
38		1	.9966141913	.13685204E-03	1.01438969
39		1	.9971220632	.74250494E-03	1.01266292
40		1	.9975537532	.39588279E-03	1.01113042
41		1	.997920692	.89154094E-03	1.00977276
42		1	.9982325871	.82459426E-03	1.00857195
43		1	.9984976991	.59867191E-03	1.00751151
44		1	.998723044	1.3858729E-03	1.00657632
45		1	.9989145871	.20672348E-03	1.00575269
46		1	.9990773991	.85013675E-03	1.00502818
47		1	.9992157899	.13374758E-04	1.00439158
48		1	.9993334217	.94813288E-04	1.00383283
49		1	.9994334086	.89909314E-04	1.00334289
50		1	.9995183975	.99171233E-04	1.00291137
51		1	.9995906375	.20131637E-04	1.00253805
52		1	.9996520424	.51322555E-04	1.00220954
53		1	.9997042353	.91453254E-04	1.00192247
54		1	.99974863	.39389973E-04	1.00167181
55		1	.99978631	2.9413797E-04	1.00145309
56		1	.9998183642	.54825308E-04	1.00126237
57		1	.9998454892	.20488219E-04	1.00109418
58		1	.9998687681	.91058881E-04	1.00095144
59		1	.9998884531	.65352784E-04	1.00082545
60		1	.9999051851	.43859687E-04	1.00071586

Figure 13


EXPONENTIAL SMOOTHING RESPONSE TO A STEP FUNCTION INPUT
=STEP FUNCTION FROM 0 TO 1
=S .15ISTEP FUNCTION FROM 0 TO 11
=T .15ISTEP FUNCTION FROM 0 TO 11
=TA 5.8666667ISTEP FUNCTION FROM 0 TO 11
1.5
1.25
1
.75
.5
.25
0
ABCDEFGHIJKLMNOPQRSTUVWXYZ
INDEPENDENT AXIS
12/30/85 RCW

To see this in action, reload the Commodore stock price data. Restart CHARTPAK-128 with 4 data sets of 60 each (default) by going to menu [1/4]. Then read the data file **CBUWEEKLY** into memory (and the data group names). There is a spec file with the same name to make the charting easy read it into memory through menu [3/9]. Draw the chart (option 2) to confirm that it is loaded correctly.

Go to [1/6/4] to smooth this data. Select data 1 (price data) as the FROM data set and then put the smoothed results into data set 2, the trend into data set 3 and the trend- adjusted values into data set 4.

Use 40 as the starting value for the data smoothing and 0 for the initial trend (these only need to be fairly good, since the real data overwhelms these values quickly).

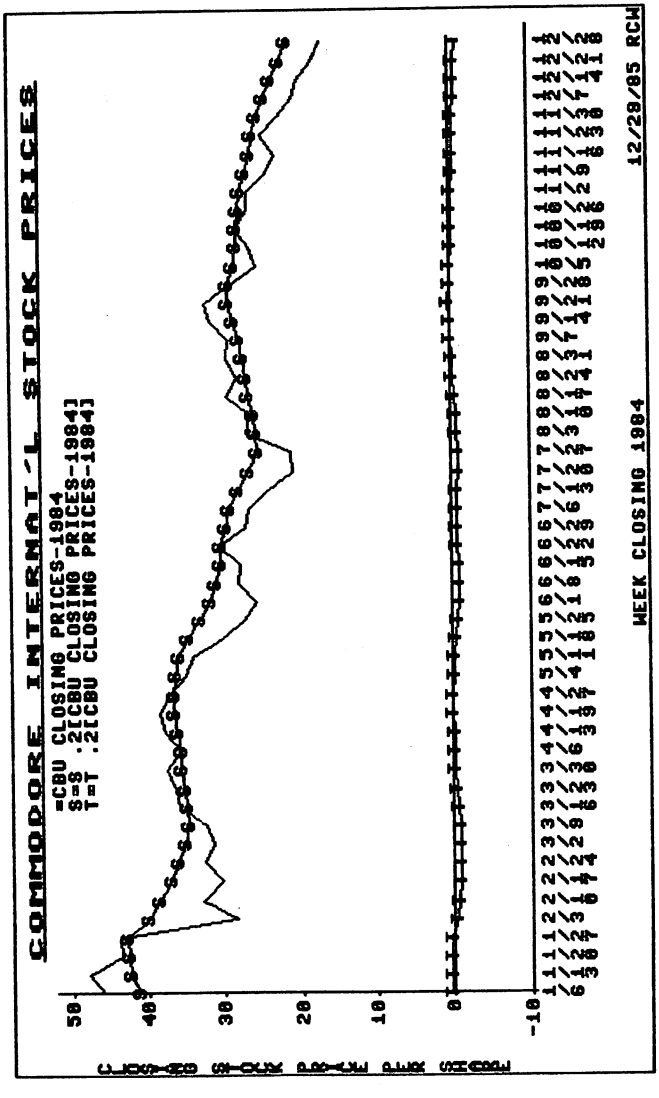
Use .2 as the smoothing factor for the data, .2 as the smoothing factor for the trend and the default value (4) for the trend adjustment.

Go to [3/1] and select data sets 1,2,3 for plotting (you will have to adjust the dependent axis to min of -10 and base value of -10.Set the number of divisions to 6, since the trend goes negative.

Also change the plotting characters by going [3/3/1]. Change them to **S** (for Smoothing) and **T** (for Trend), as in Figure 14.

Note that the trend only moves slightly. If you wanted to highlight it you could multiply it by 10.

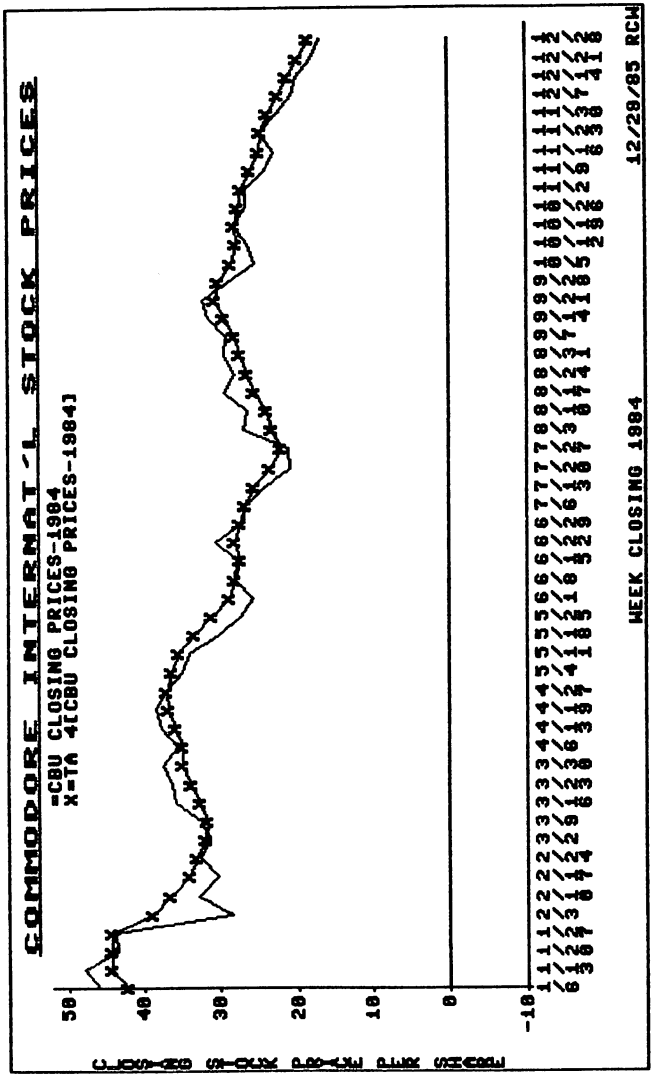
Figure 14


COMMODORE INTERNAT'L STOCK PRICES
=CBU CLOSING PRICES-1984
S=S .2[CBU CLOSING PRICES-1984]
T=T .2[CBU CLOSING PRICES-1984]
50
40
30
20
10
0
-10
WEEK CLOSING 1984
12/29/85 RCW

Note the names—and the fact that the curve now follows the data and gives us a hint at the Truth, or at least the way the price will move in the short term future.

Go to [3/1] and change the display sequence to 1 (raw prices) and data set 4 (trend-adjusted). See Figure 15. Compare the simple smoothing from Figure 14 with the new trend-adjusted smoothing.

Figure 15


COMMODORE INTERMAT'L STOCK PRICES
=CBU CLOSING PRICES-1984
X=TA 4[CBU CLOSING PRICES-1984]
50
40
30
20
10
0
-10
WEEK CLOSING 1984
12/28/85 RCW

These techniques provide good values as predictors of the future if the "environment" does not change. For example, the Commodore price next week will most probably be the price predicted by extending the current trend line and the current smoothed price as long as nothing else in the computer or stock market changes materially.

To see this, print out the data sets (all 4) as in Figure 16. The price in the next week would be estimated by extending the smoothed value of data set 4 (18.16) by one trend (-.7589). The sum is 17.40 against the actual 17.75!

Don't get too excited yet—these methods only know what's in the numbers and nothing about the outside world. If, for example, ATARI announces the introduction of a new computer, Commodore's stock price may change in a way that neither exponential smoothing nor least squares or averaging can predict. The trick in forecasting well is to use the techniques included here to determine the current fundamental levels and trends and then factor those values by good information and even "hunches" about other possible external factors.

Figure 16

	CBU CLOS P:S	.2CCBU CLOS:T	.2CCBU CLOS:TA	4CCBU CLOS:
PT # NAME	> X-VALUE <	> X-VALUE <	> X-VALUE <	> X-VALUE <
1 1/6	46	41.2	.240000001	42.16
2 1/13	47.75	42.51	.454000001	44.326
3 1/20	43.625	42.733	.407800002	44.3642
4 1/27	43.75	42.9364	.366920002	44.40408
5 2/3	28.5	40.04912	-.283919999	38.91344
6 2/10	33	38.639296	-.509100799	36.6028928
7 2/17	30.375	36.9864368	-.737852479	34.0350269
8 2/24	32.75	36.1391495	-.759739454	33.1001916
9 3/2	31.625	35.2363196	-.78835754	32.0828894
10 3/9	32.5	34.6892557	-.740138816	31.7285004
11 3/16	35.875	34.9262445	-.544673278	32.7475514
12 3/23	36.5	35.2409956	-.372788405	33.749842
13 3/30	37.625	35.7177965	-.202870549	34.9063143
14 4/6	35.75	35.7242372	-.161008299	35.080204
15 4/13	37.75	36.1293898	-.0477761276	35.9382852
16 4/19	38.375	36.5785118	.0516035092	36.7849259
17 4/27	37.375	36.7378095	.0731423364	37.0303788
18 5/4	35	36.3902476	-.0109985101	36.3462535
19 5/11	34.125	35.937198	-.0994087102	35.5395632
20 5/18	30	34.7497584	-.317014889	33.4816989
21 5/25	27.25	33.2498068	-.55360225	31.0353978
22 6/1	25.625	31.7248454	-.74787407	28.7333491
23 6/8	28	30.9798763	-.747293072	27.990704
24 6/15	27.75	30.3339011	-.72702951	27.425783
25 6/22	30.5	30.3671209	-.574979649	28.0672023
26 6/29	27.125	29.7186967	-.589668554	27.3600225
27 7/6	26.625	29.0999573	-.59548271	26.7180265
28 7/13	24	28.0799659	-.680384461	25.358428
29 7/20	20.75	26.6139727	-.837506204	23.2639479
30 7/27	21.125	25.5161782	-.889563871	21.9579227
31 8/3	26.75	25.7629425	-.662298223	23.8639289
32 8/10	26.375	25.885354	-.5.5356279	23.8639289
33 8/17	29.375	26.5832832	-.264699184	25.5244865
34 8/24	28.125	26.8916266	-.150090676	26.2912639
35 8/31	29.375	27.3883013	-.0207376031	27.3053509
36 9/7	29.25	27.760641	.0578778671	27.9921525
37 9/14	31.625	28.5335128	.200876654	29.3370194
38 9/21	32.25	29.2768103	.30936081	30.5142535
39 9/28	28.875	29.1964482	.231416238	30.1221132
40 10/5	25.375	28.4321586	.0322750622	28.5612588
41 10/12	26.5	28.0457269	-.0514662961	27.8398617

42	10/19	28.25	28.0865815	-.0330021071	27.9545731
43	10/26	26.625	27.7942652	-.0848649447	27.4548054
44	11/2	26.625	27.5604122	-.114662563	27.1017619
45	11/9	24	26.8483297	-.234146536	25.9117436
46	11/16	23	26.0786682	-.341250417	24.7136621
47	11/23	24.875	25.837931	-.321146886	24.5533435
48	11/30	22.5	25.1703448	-.39043475	23.6086058
49	12/7	20.5	24.2362759	-.499161593	22.2396295
50	12/14	20	23.3890207	-.568780308	21.1138995
51	12/21	18	22.3112166	-.670585073	19.6288763
52	12/28	16.75	21.1989732	-.75891672	18.1633064

Appendices

- A: Printer/Interface Support
- B: Error Messages
- C: CHARTPAK-128 File Format
- D: File Conversion Program
- E: Note on Using Color
- F: Demonstration Charts
- G: DIF FILE Demonstration Charts

APPENDIX A

PRINTER / INTERFACE SUPPORT

CHARTPAK-128 includes printer modules for most popular printers. The module is selected in the configuration option (7) of the main menu.

For Commodore 1525, 1526, MPS801 and OKIMATE 10 color printers, no special information is needed after the module is selected.

For all other printers which must use an interface, CHARTPAK-128 will require secondary address information. The table below is a guide to popular interfaces.

CHARTPAK-128 also supports the EPSON MX-series with Graftrax; EPSON FX-series; EPSON RX-series; STAR Gemini; C.ITOH Prowriter 8510A; EPSON JX SERIES (COLOR); OKIMATE 10, Black and White or Color. To support these printers you must connect the printer to the 128 or 1571 disk drive with one or the parallel printer interfaces listed in the chart on the following page:

MANUFACTURER	MODEL	2ND.ADDRESS	TRANSLATE	SWTCHES ON
CARDCO	CARD?/A	5	N	—
CARDCO	CARD?/G	25	N	—
ECX, INC.	C-6401	0	N	*
MICROWORLD ELECTRONIX	MW-302	0	Y	3,4
		0	N	3
MSD INC.	CPI	0	N	1,3,5

*Requires that the three-position switch is set completely on.

The SECONDARY ADDRESS and ASCII TRANSLATE? prompts should be answered as per the above table.

When using the PROWRITER, the secondary address/switch settings for the interface are the same as with the MX-80, if the PROWRITER sw 1-7 is OPEN and sw 1-8 is CLOSED.

APPENDIX B

ERROR MESSAGES

BARS TOO WIDE: occurs when the width of the bars and spaces between the bars exceeds the display area. When this occurs, press <RETURN> and then go to screen [3/3/3] to change the bar width and/or space between the bars or change the bar width to 0 for automatic sizing.

DISKETTE ERRORS: occur during diskette operations. The error number, message, track and sector are shown. The only message not shown is number 63 FILE EXISTS. When this occurs, it is handled by asking you if you want to replace the file or not.

GREATER THAN MAX-RESIZE: occurs when trying to put a data item into the computer which exceeds the size of the arrays set up. If the data must be read in, go to screen [1/4] to adjust the size of the data set, but beware that all of the data in memory is erased during the resizing.

ERROR-NO 2-DIM PIE: occurs when attempting to display a pie chart and the data is two-dimensional. Either select a different chart type (X) or use the global data specs on screen [1/5] to change the data to one-dimensional.

OUTSIDE RANGE: occurs when the base value selected on screen [3/2/2] is outside of the minimum-maximum range at the time. Enter a number within the range.

OUT OF RANGE: occurs when selecting a data set outside of the range of number currently in the computer.

INCREASE DATA SET SIZE TO nn: occurs when reading data sets from diskette which have more points than setup in the computer. The data set size may be changed on screen [1/4], but all data in the computer is erased.

OTHER BASIC ERRORS: Should you encounter any BASIC errors when using CHARTPAK-128, you can recover without losing any data by pressing any key.

BOTH CONSTANTS!: occurs if you specify constants for both A and B data sets in the data set calculation function. Press <RETURN> and you can reselect the A and B data sets.

ONLY ONE BAR END SPECIFIED: for the bar line option of the line charting options [3/3/1] you must specify 2 data sets with the bar line option B.

APPENDIX C

CHARTPAK-128 FILE FORMAT

DATA FILES

Data files written and read by CHARTPAK-128 have a **D.** as the first two characters and are standard Commodore sequential files. The data is in the following sequence:

```
(N = NUMERIC DATA, $ = STRING DATA IN QUOTES)
```

N	1	the number of data sets in the file
N	2	the maximum number of points in any data set

For each data set:

N	1	the number of points in the data set
$	2	the data set name (in quotes)
N	3	the x/y pairs of data values (for one-dim data the y values are 0).

After the last data set:

$	1	the data group names (in quotes)

BUSICALC FILES

Although CHARTPAK-128 cannot create BUSICALC files, it can read them. BUSICALC files have an ! as the first position of the filename on disk. The file is organized as follows:

N	1	column number of the upper left cell in the file
N	2	row number of the upper left cell in the file
N	3	column number of the lower right cell in the file

N	4	row number of the lower right cell in the file
N	5	the column width
N	6	the data values from the cells in column by column sequence

•BUSICALC is a product of SKYLES ELECTRIC WORKS

CHARTPAK-128 SPECIFICATION FILES

CHARTPAK-128 specification files are standard COMMODORE sequential files. The diskette filename has **S.** as the first two characters.

N	1	independent axis number of divisions
N	2	dependent axis number of divisions
N	3	x-position of lower left graph rectangle
N	4	y-position of lower left graph rectangle
N	5	independent axis color number
N	6	dependent axis color number
N	7	character set code (1-4)
N	8	printer device number
N	9	bar width
N	10	bar spacing
N	11	chart title x-coordinate
N	12	chart title y-coordinate
N	13	chart title color number
N	14	auto increment starting number
N	15	auto increment increment
N	16	group code selection
N	17	starting number
N	18	number of active data sets
N	19	max. number of points in all data sets
N	20	min x-value (ind. axis)
N	21	min y-value (dep. axis)
N	22	max x-value (ind. axis)
N	23	max y-value (dep. axis)
N	24	number of data sets to be selected for display
N	25	pie chart segment separation
N	26	data set legend x-coordinate
N	27	data set legend y-coordinate
N	28	x-position of upper right graph rectangle
N	29	y-position of upper right graph rectangle
N	30	group name switch 0=horiz,1=vertical
N	31	bar chart base value
N	32	log switch-independent axis(0=norm,1=log)
N	33	log switch-dependent axis(0=norm,1=log)
N	34	chart type (1-9)

$	35	dependent axis legend
$	36	independent axis legend
N	37	bar grouping (1-3)
$	38	chart title
$	39	two dimension (Y/N)

For each active data set:

$	40	line type (S,D,N,B or M)
$	41	not used
$	42	plotting character
N	43	line color number
N	44	bar filling number

For the maximum number of data points:

$	45	data group names

For the six possible "help" lines:

$	46	line type (S,D, or null)
N	47	line color number
N	48	end point x-value
N	49	end point y-value
N	50	other end point x-value
N	51	other end point y-value

For the six possible note lines:

$	52	line text
N	53	line color
N	54	line X coordinate
N	55	line Y coordinate

For the maximum number of data sets:

N	56	data set numbers in display sequence

DIF FILE REFERENCE

The DIF-file reading routines in CHARTPAK-128 are in accordance with the DIF file standard (see references below).

The file consists of a header section and the data section.

HEADER SECTION

The header section consists of a number of items describing the data organization. Each item in the header consists of four fields:

$	1	Topic (such as "TABLE" or "LABEL")
N	2	Vector number (then describing a column)
N	3	Value (such as the number of columns or rows in the data)
$	4	The column heading or string data associated with the item.

Note that these are written in BASIC in three print statements:

```
PRINT T$ (topic)
PRINT V1,V2 (the two fields vector # and value)
PRINT C$ (the string data)
```

Heading topics recognized by CHARTPAK-128 are:

TABLE	(the title of the worksheet)
VECTORS	(the number of columns)
TUPLES	(the number of rows)
LABEL	(the column headings) **Note**—the DIF standard allows for multiple-line labels, but CHARTPAK only reads one-line labels.
DATA	(signals end of heading section)

Any other topics in the heading section are ignored.

DATA SECTION

Each item in the data section consists of three fields describing one "cell" of the worksheet:

N	1	Type indicator (0=numeric data, 1=string data, -1=Beginning of Tuple (BOT) or End of Data (EOD) marker)
N	2	Numeric value of the data item (if type = 0)
$	3	String value (if data type = 1)

Note that these are written in BASIC in two print statements:

```
PRINT V1,V2 (the two fields--type and value)
PRINT C$ (the string data)
```

In the data section, CHARTPAK-128 recognizes BOT, EOD, and data value items only.

DIF FILE REFERENCES

"DIF: A FORMAT FOR DATA EXCHANGE BETWEEN APPLICATIONS PROGRAMS"
BYTE magazine, November 1981, pp 174+
Candace E. Kalish & Malinda F. Mayer
DIF Clearinghouse
POBox 527
Cambridge, MA 02139

THE DIF FILE
for users of VisiCalc and other software
Donald H. Beil
Reston Publishing Company, Inc.
Reston, VA

APPENDIX D

FILE CONVERSION PROGRAM

To use information from Busicalc 1 or Multiplan spreadsheets in CHARTPAK-128, the file conversion program included on disk must be used first. The steps are as follows:

Save the calculated data in Busicalc, using a filename starting with "!" (this saves the calculated values, no the formulas)

or

Save the data in Multiplan using the SYLK option.

Remove the diskette with the data from the drive. Insert the CHARTPAK-128 diskette and type:

RUN"FILE CONVERSION" <RETURN>

You will be asked for the number of data sets and the maximum number of points (just like screen [1/4]). Accept the default values or change them and press <RETURN>.

Select the input device number by accepting the default (8) or changing it and press <RETURN>.

Key the data file name and press <RETURN>. Press **D** for DIF file **S** for SYLK file or **B** for BUSICALC file.

You will be asked questions depending on the type of file.

DIF file reading is the same as described in menu [1/9]. After the data has been processed you will get the prompt to select the ;output device number (default is the same as input). Next you will be asked for the filename of the output file (default is the same name). You should key a different name so that the original data will not be destroyed.

The DIF file data will be saved to disk in CHARTPAK-128 format.

Now you must load CHARTPAK-128 and read the data file just written.

SYLK files are read into a large array. The actual SYLK records are displayed on the screen as read. After all records have been read, the message **done reading** appears. The next prompt asks if data sets are rows. Is so, press **Y**, otherwise press **N**. Next, you specify the name, column number and row numbers (these are used for the data set and data group names). Next, you must specify the first and last data columns and first and last data rows (the rectangle containing the data values).

You are then asked to select the data sets and the data set numbers into which they are placed. After the data has been processed you will get the prompt to select the output device number (default is the same as input).

Next, you will be asked for the filename of the output file (default is the same name). You should key a different name so that the original data will not be destroyed.

The spreadsheet data will be saved to disk in CHARTPAK-128 format.

Now load CHARTPAK-128 and read the data file just written.

BUSICALC file prompts start with **Are data sets rows? (y/n).**

Press **Y** if you want the rows to be data sets or else press **N**.

Next you must select if the data group names are to come from the first column or row. Then you are asked how many of the data columns are to be used. Last, you are prompted for each data set (showing the column or row number from the original sheet).

After the data has been processed you will get the prompt to select the output device number (default is the same as input).

Next you will be asked for the filename of the output file (default is the same name). You should key a different name so that the original data will not be destroyed.

The BUSICALC 1 spreadsheet data will be saved to disk in CHARTPAK-128 format.

Just load CHARTPAK-128 and read the data file just written.

APPENDIX E

NOTE ON USING COLOR

The graphic screen in CHARTPAK-128 is divided into 3600 cells (45 rows of 80 cells per row). In any one cell, only one color is allowed (in addition to the background color). The color that will show in a cell is the last color written to that cell.

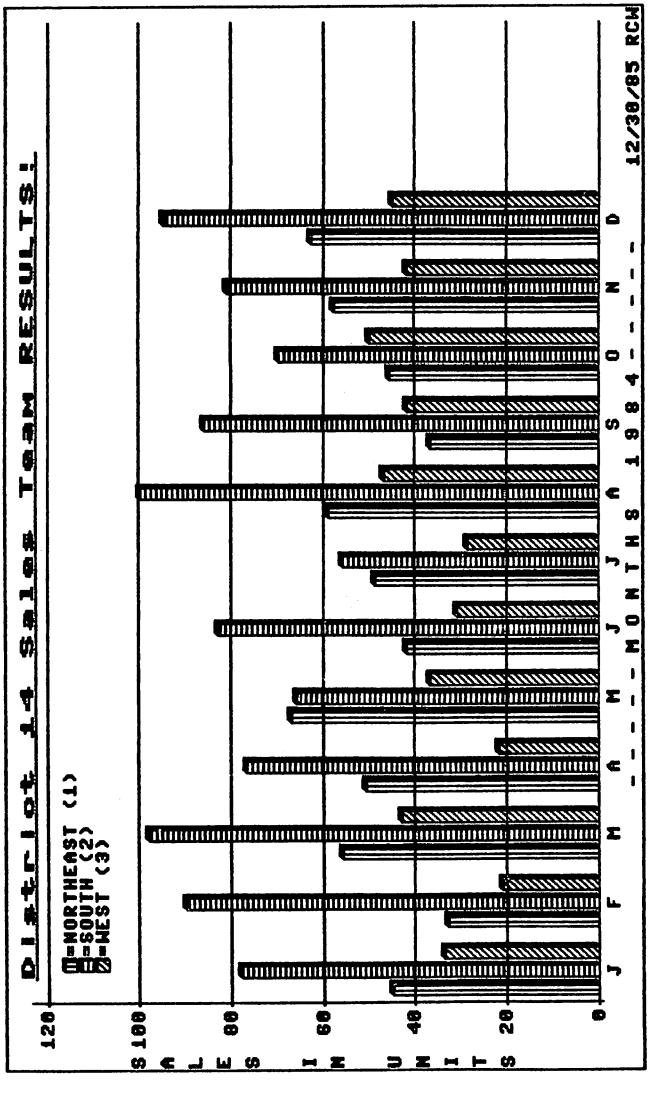
When you write the reference grid on the screen in black and then plot a line in green, you will see the green change the color of the reference grid where both lines cross through the same cell.

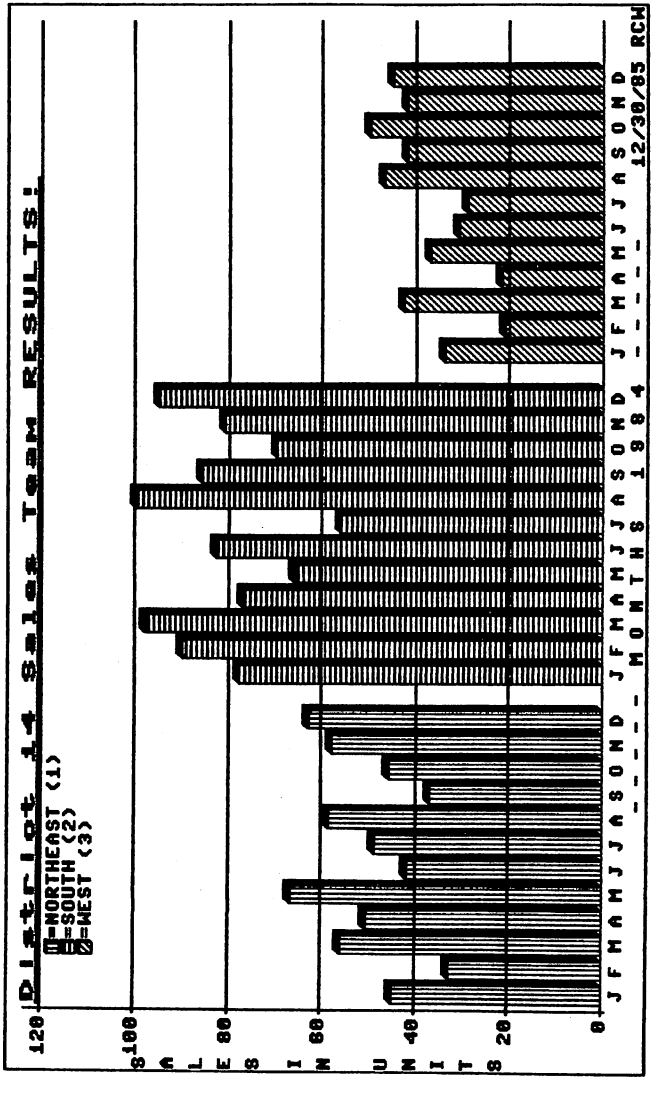
Solutions to these problems are to use bars instead of lines where possible, adjust the bar width and bar spacing to minimize the bleeding (each cell is 8 wide), and use the `TIC MARK ONLY` option for the number of divisions on 3/2/1 and 3/2/2 to avoid writing the division grid at all. You may also need to adjust the position of the chart title (3/4/1) and/or the position of the data set legends (3/4/2) to eliminate bleeding.

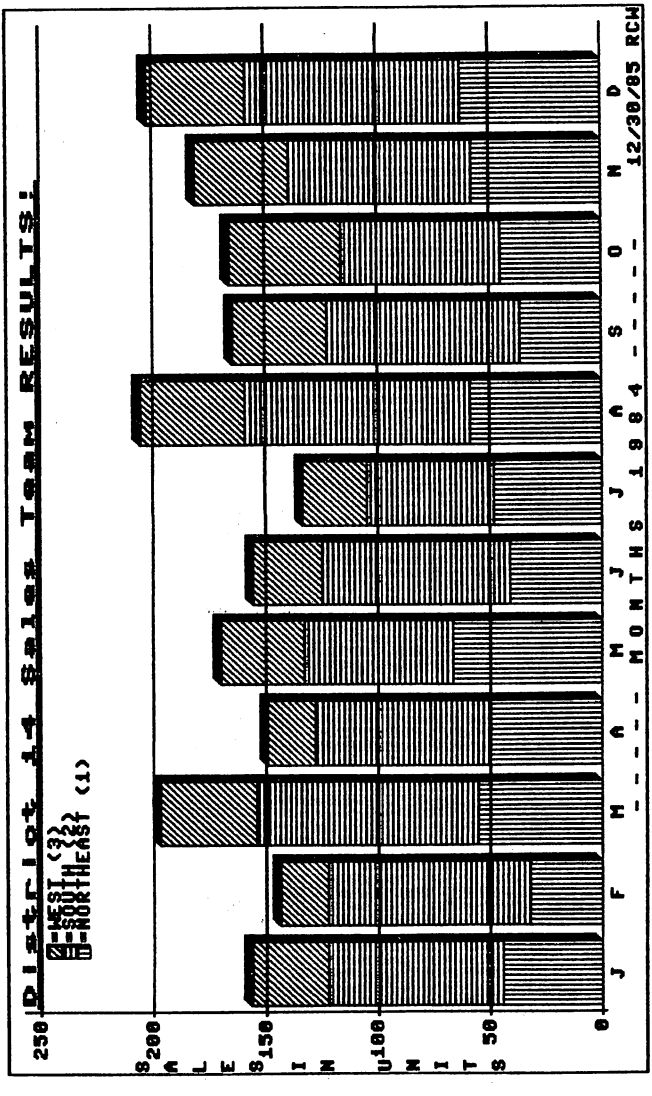
Also note with color printers that some colors are solid, while others have half-tone patterns. This was necessary to generate the 16 Commodore colors using the three colors of the ribbon. For best color resolution on small printouts, use the solid colors (black, blue, green, red, yellow, cyan).

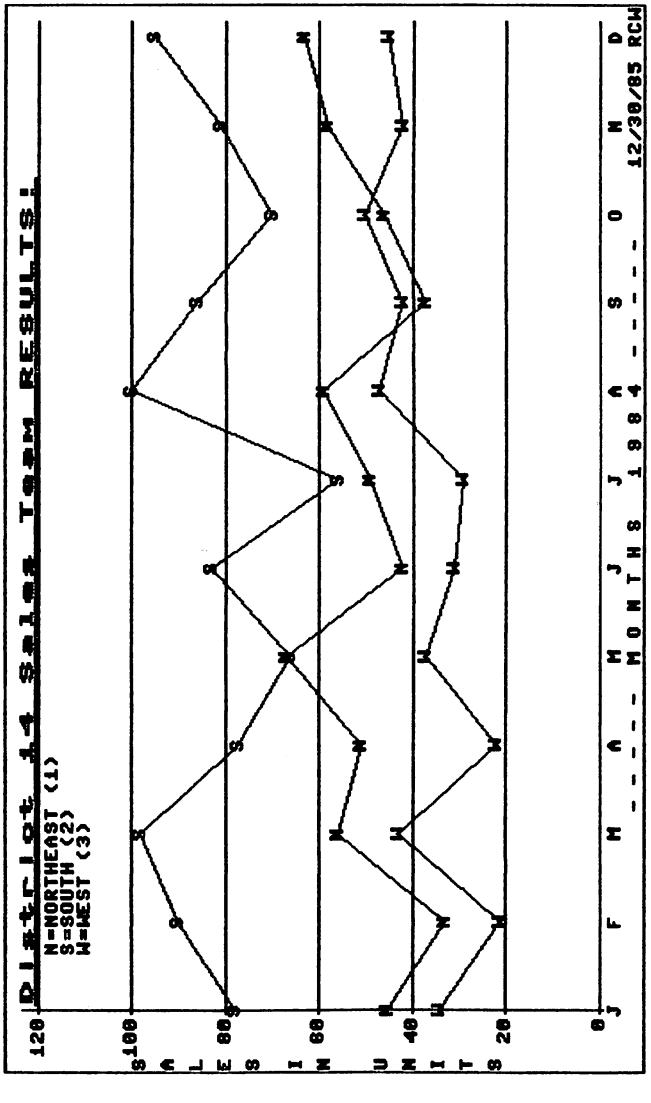
APPENDIX F

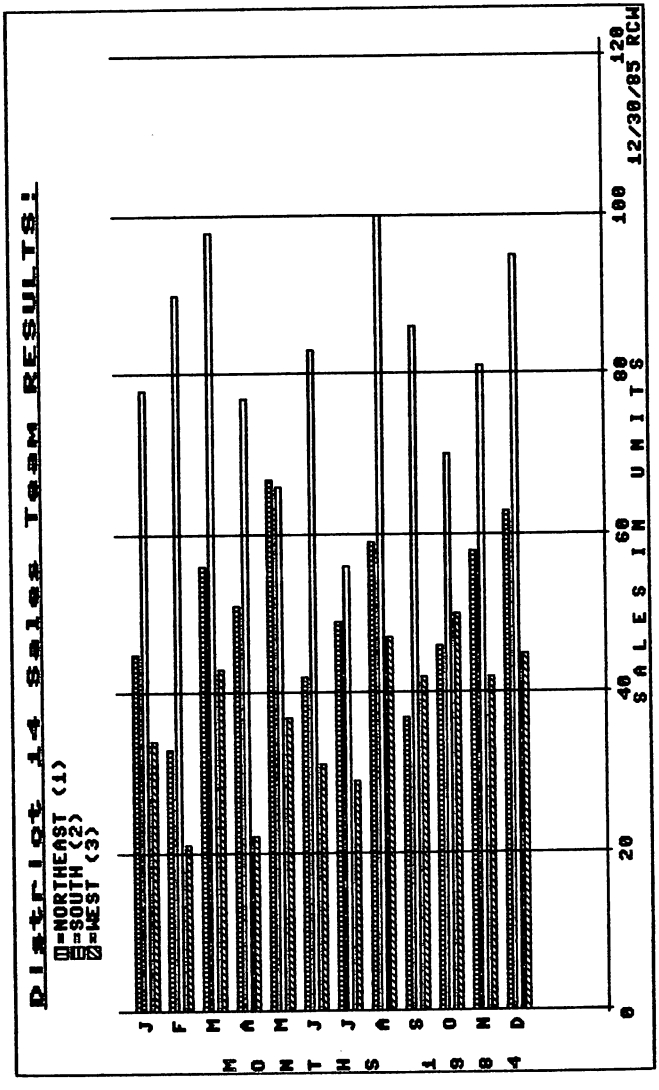
DEMONSTRATION CHARTS

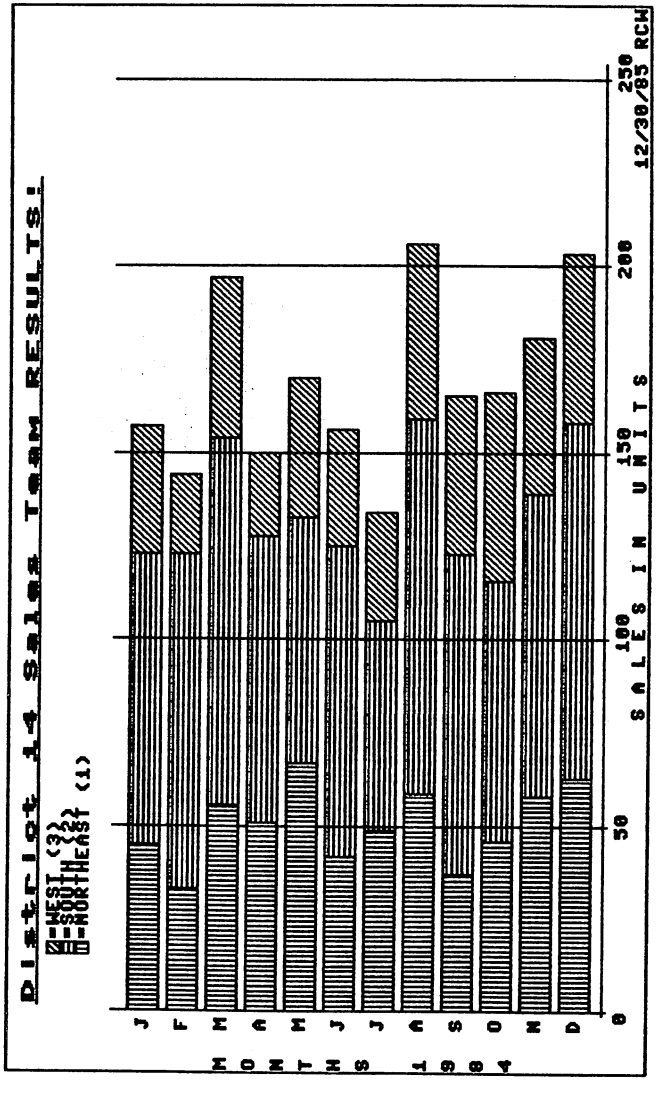


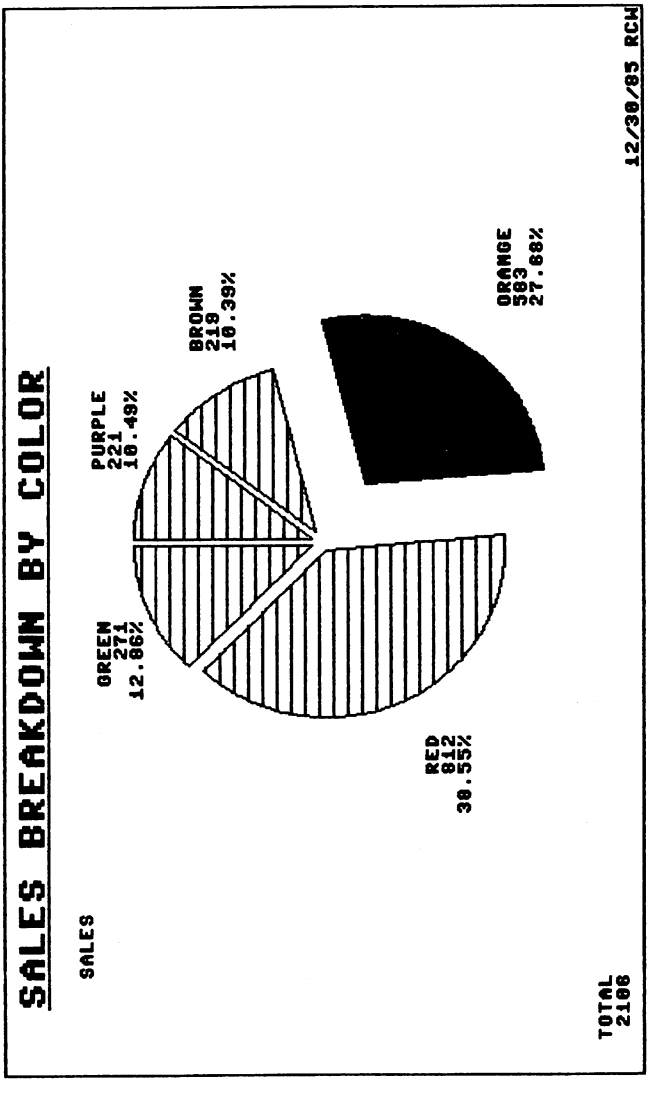

District 14 Sales Team RESULTS!
1=NORTHEAST (1)
2=SOUTH (2)
3=WEST (3)
SALES IN UNITS
120
100
80
60
40
20
0
J F M A M J J A S O N D J F M A M J J A S O N D
MONTHS 1984
12/30/85 RCM

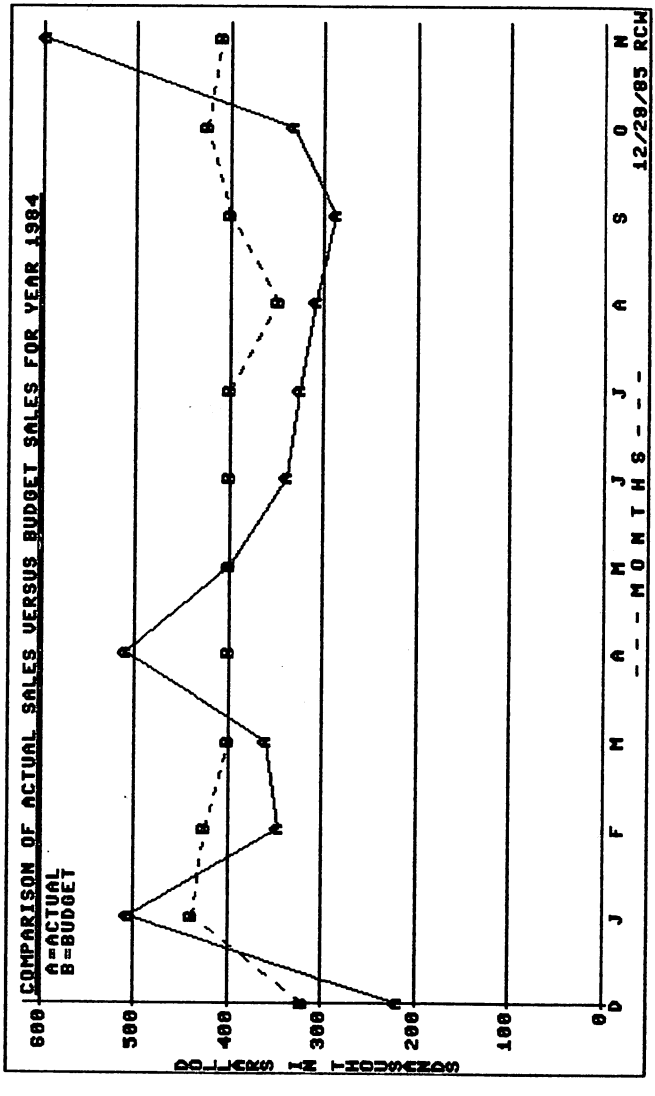

District 14 Sales Team RESULTS!
WEST (3)
SOUTH (2)
NORTHEAST (1)
250
200
150
100
50
0
SALES UNITS
J F M A M J J A S O N D
------ MONTHS 1984 ------
12/30/85 RCW

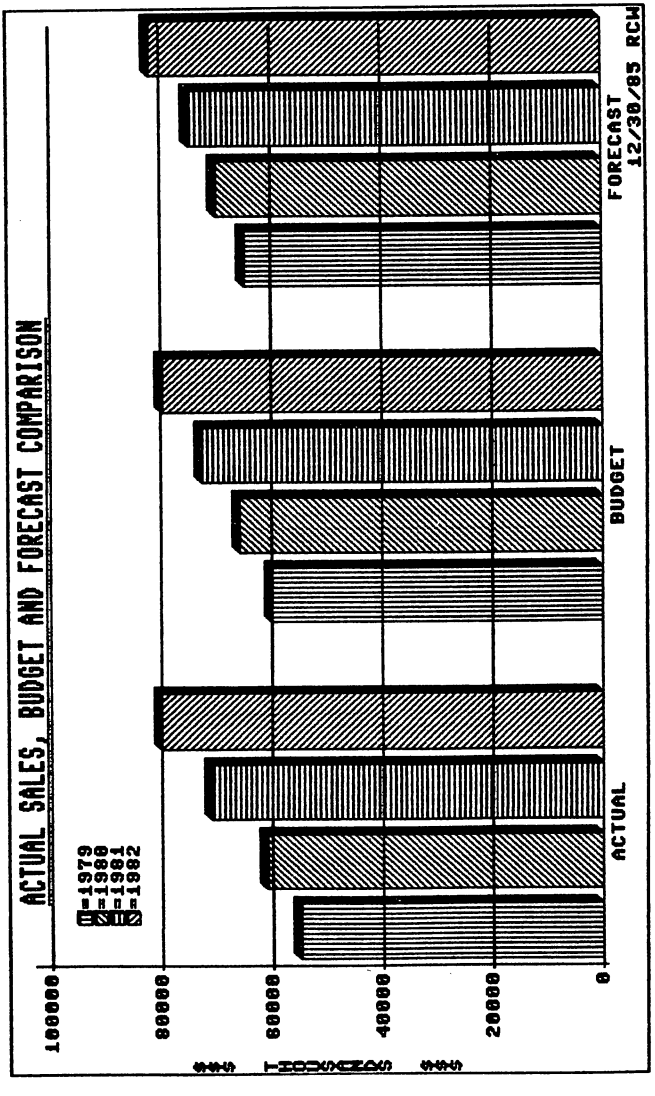

District 14 Sales Team RESULTS!
N=NORTHEAST (1)
S=SOUTH (2)
W=WEST (3)
SALES IN UNITS
120
100
80
60
40
20
0
J F M A M J J A S O N D
MONTHS 1984
12/30/85 RCW

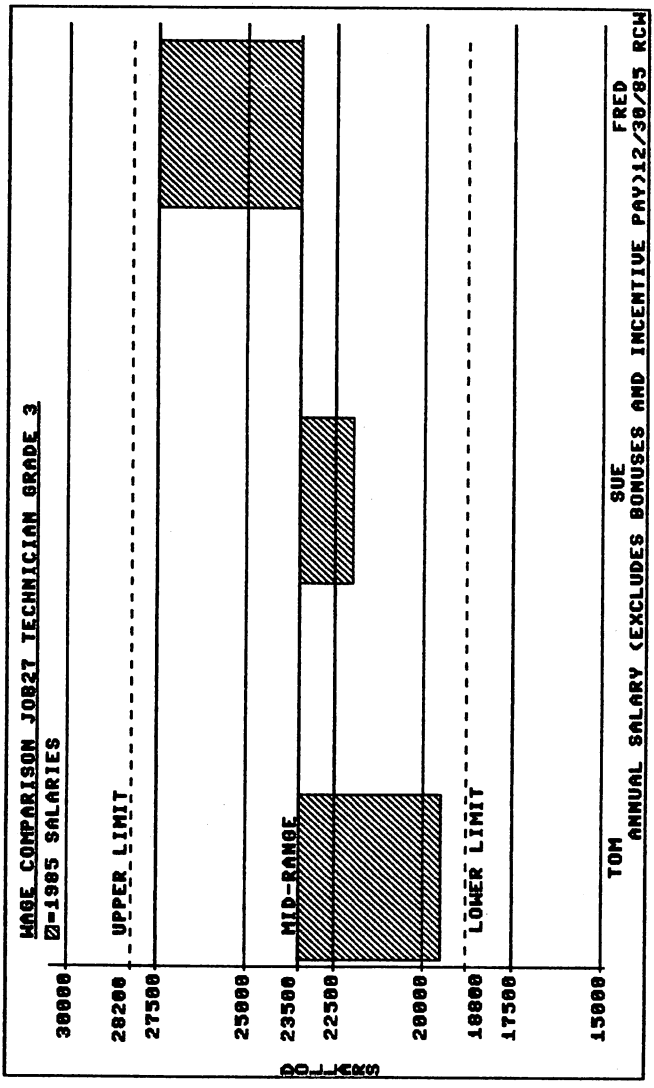

Plot 14 sales team RESULTS
=NORTHEAST (1)
=SOUTH (2)
=WEST (3)
SALES IN UNITS
0
20
40
60
80
100
120
12/30/85 RCH
J
F
M
A
M
J
J
A
S
O
N
D

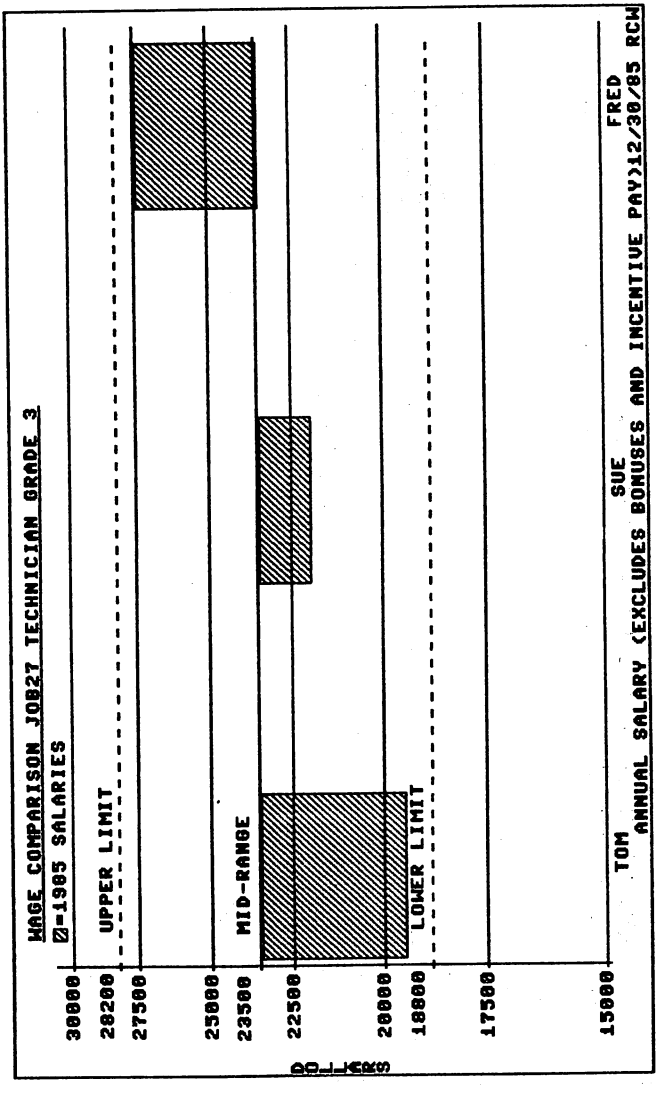

District 14 Sales Team RESULTS!
2=WEST (3)
1=NORTHEAST (1)
0
50
100
150
200
250
SALES IN UNITS
12/30/85 RCW
J
F
M
A
M
J
J
A
S
O
N
D
MONTHS 1984

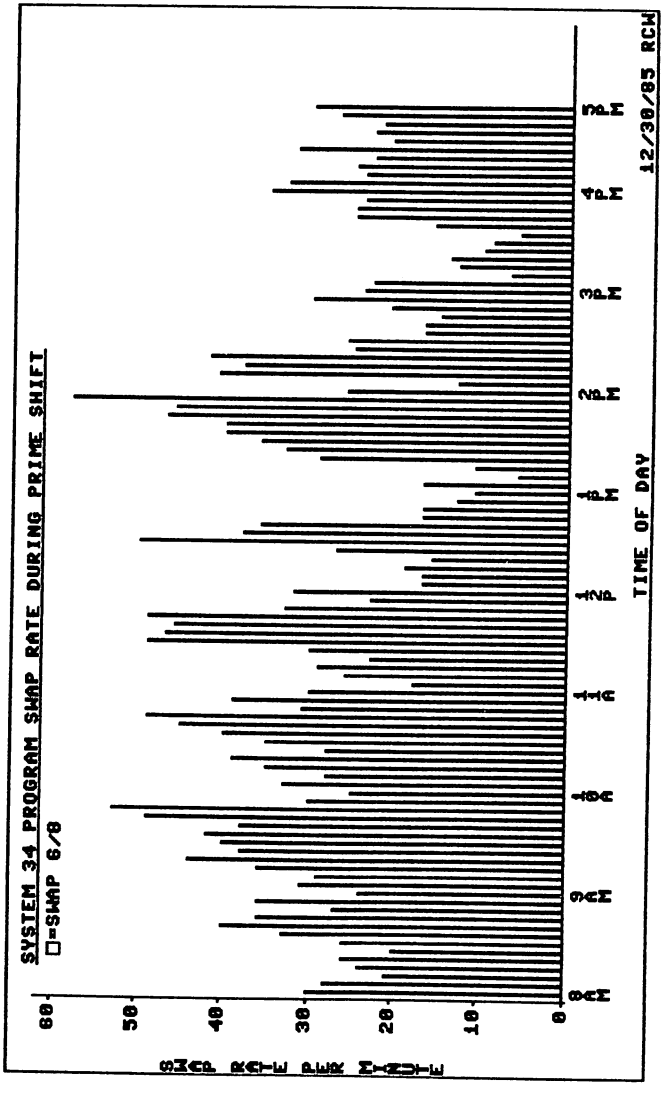

SALES BREAKDOWN BY COLOR
SALES
PURPLE
221
10.49%
BROWN
219
10.39%
ORANGE
583
27.68%
GREEN
271
12.86%
RED
812
38.55%
TOTAL
2106
12/30/85 RCW

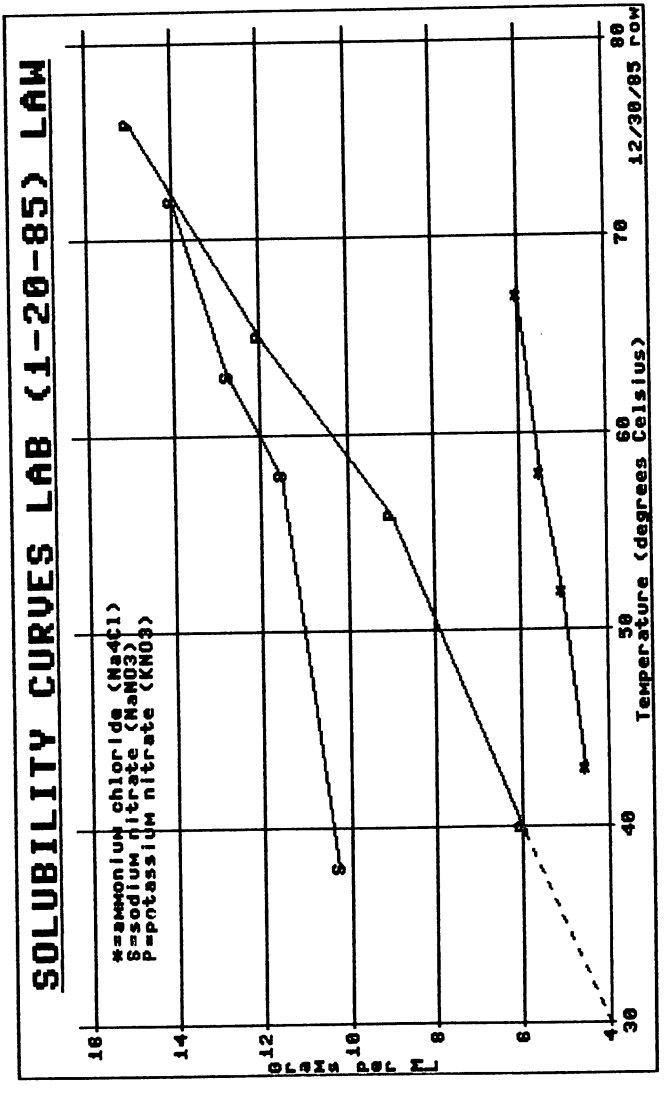

COMPARISON OF ACTUAL SALES VERSUS BUDGET SALES FOR YEAR 1984
A=ACTUAL
B=BUDGET
600
500
400
300
200
100
0
D J F M A M J J A S O N
---MONTHS---
12/29/83 RCH

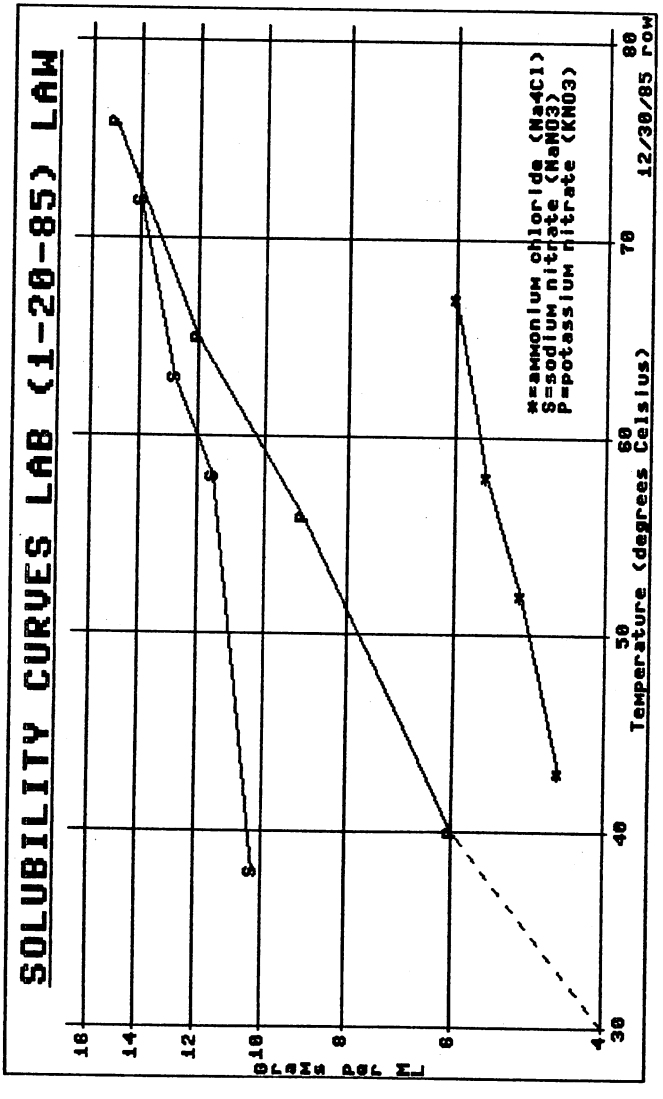

ACTUAL SALES, BUDGET AND FORECAST COMPARISON
1=1979
2=1980
3=1981
4=1982
100000
80000
60000
40000
20000
0
ACTUAL
BUDGET
FORECAST
12/30/85 RCW

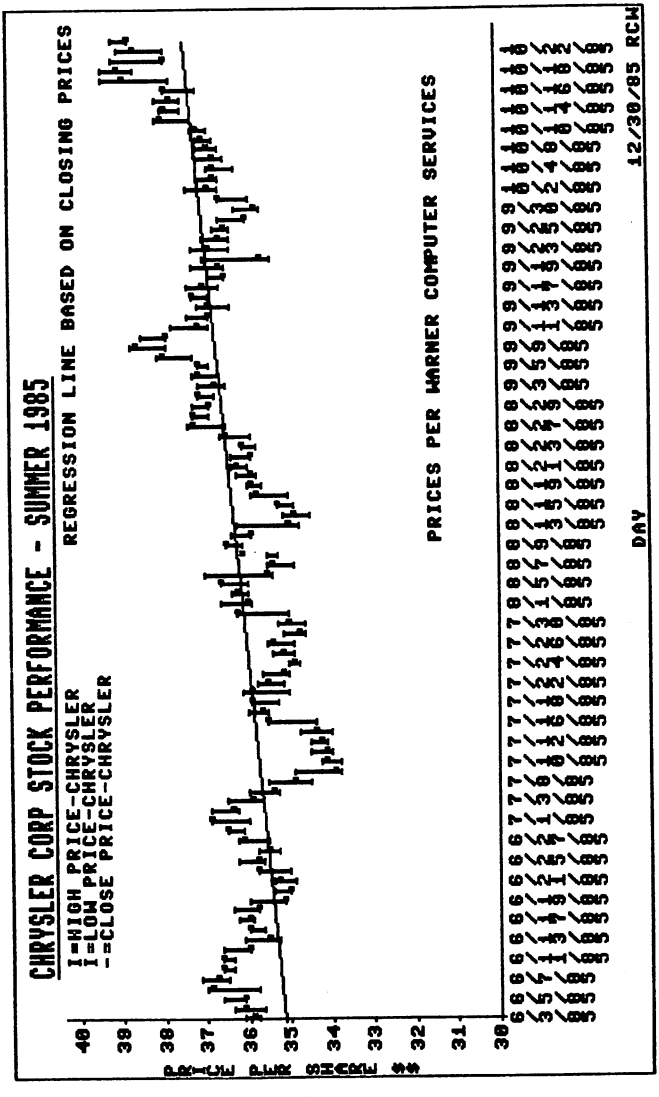

WAGE COMPARISON JOB27 TECHNICIAN GRADE 3
Ø-1985 SALARIES
UPPER LIMIT
MID-RANGE
LOWER LIMIT
DOLLARS
30000
28200
27500
25000
23500
22500
20000
18000
17500
15000
TOM
SUE
FRED
ANNUAL SALARY (EXCLUDES BONUSES AND INCENTIVE PAY)12/30/85 RCW

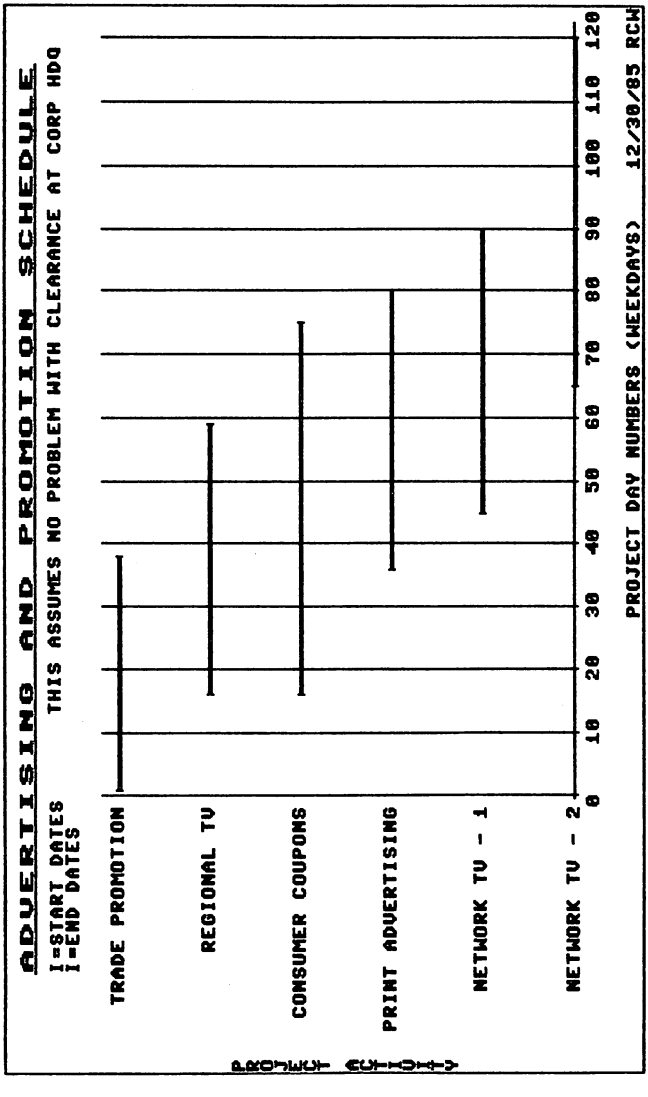

WAGE COMPARISON JOB27 TECHNICIAN GRADE 3
Ø=1985 SALARIES
30000
28200
27500
25000
23500
22500
20000
18000
17500
15000
UPPER LIMIT
MID-RANGE
LOWER LIMIT
DOLLARS
TOM
SUE
FRED
ANNUAL SALARY (EXCLUDES BONUSES AND INCENTIVE PAY)12/30/85 RCW


SYSTEM 34 PROGRAM SWAP RATE DURING PRIME SHIFT
□=SWAP 6/0
12/30/85 RCW
TIME OF DAY
60
50
40
30
20
10
0


SOLUBILITY CURVES LAB (1-20-85) LAW
*=ammonium chloride (NaCl)
S=sodium nitrate (NaNO3)
P=potassium nitrate (KNO3)
16
14
12
10
8
6
4
30
40
50
60
70
80
Temperature (degrees Celsius)
12/30/85 row


SOLUBILITY CURVES LAB (1-20-85) LAW
*=ammonium chloride (Na4Cl)
S=sodium nitrate (NaNO3)
P=potassium nitrate (KNO3)
Temperature (degrees Celsius)
12/30/85 row

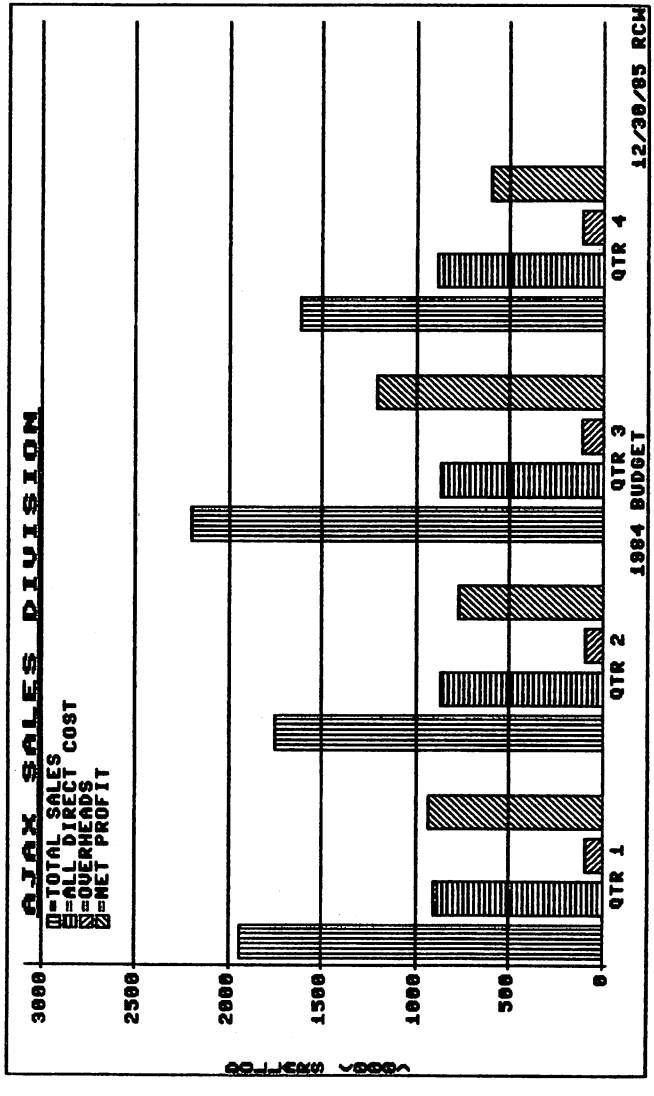

CHRYSLER CORP STOCK PERFORMANCE - SUMMER 1985
I=HIGH PRICE-CHRYSLER
I=LOW PRICE-CHRYSLER
-=CLOSE PRICE-CHRYSLER
REGRESSION LINE BASED ON CLOSING PRICES
PRICES PER WARNER COMPUTER SERVICES
DAY
12/30/85 RCW

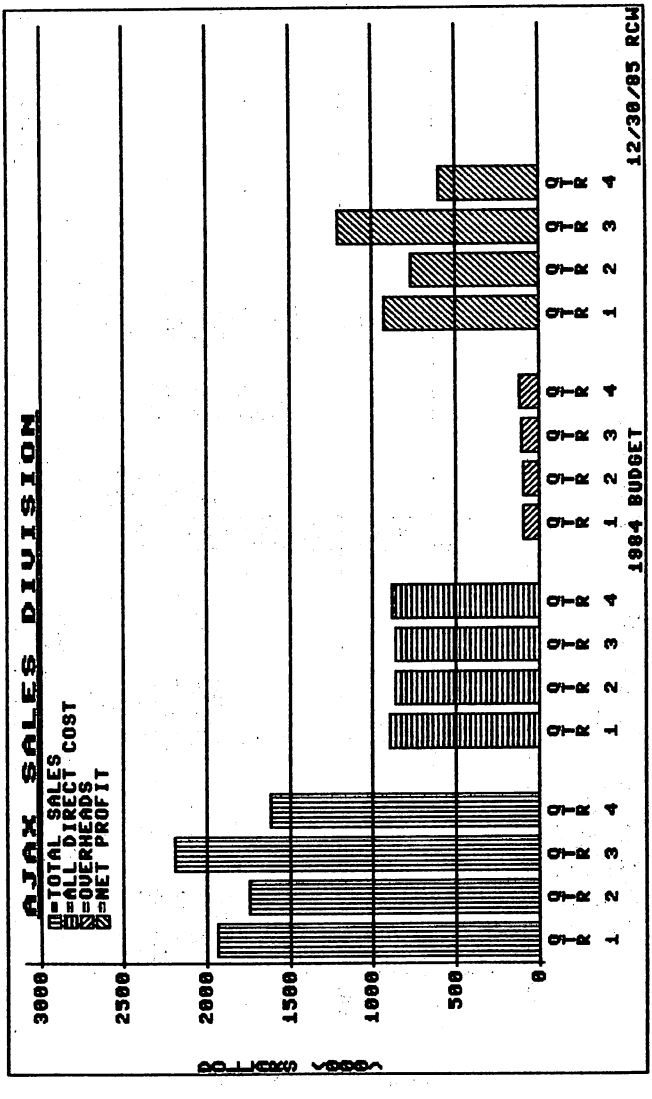

ADVERTISING AND PROMOTION SCHEDULE
I=START DATES
I=END DATES
THIS ASSUMES NO PROBLEM WITH CLEARANCE AT CORP HDQ
TRADE PROMOTION
REGIONAL TV
CONSUMER COUPONS
PRINT ADVERTISING
NETWORK TV - 1
NETWORK TV - 2
PROJECT ACTIVITY
0 10 20 30 40 50 60 70 80 90 100 110 120
PROJECT DAY NUMBERS (WEEKDAYS) 12/30/85 RCW

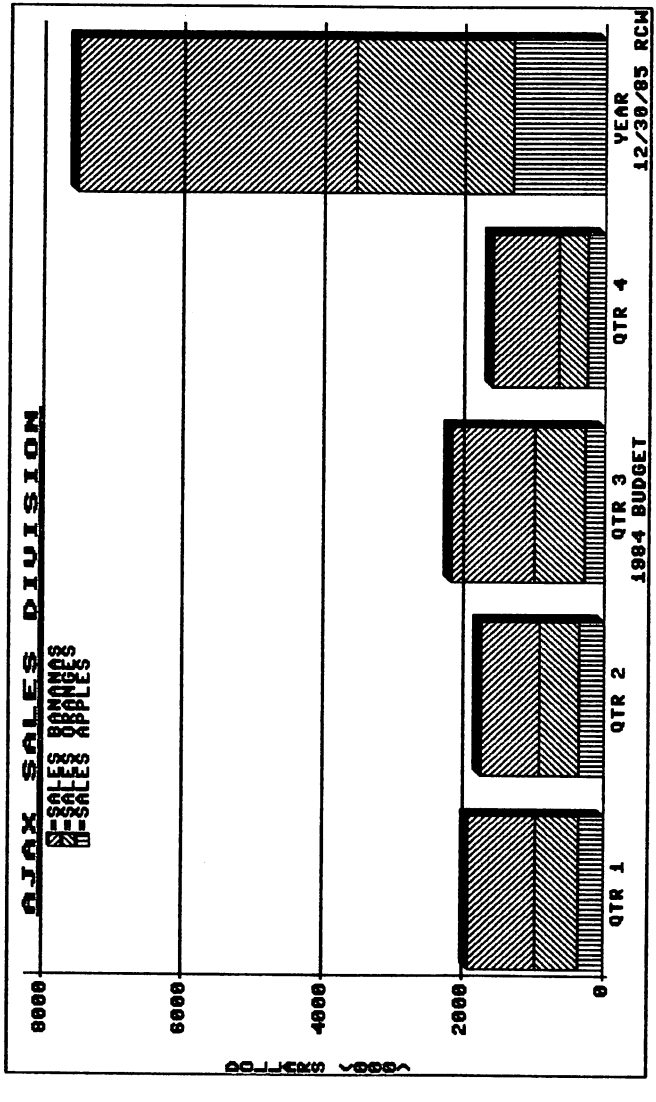
APPENDIX G

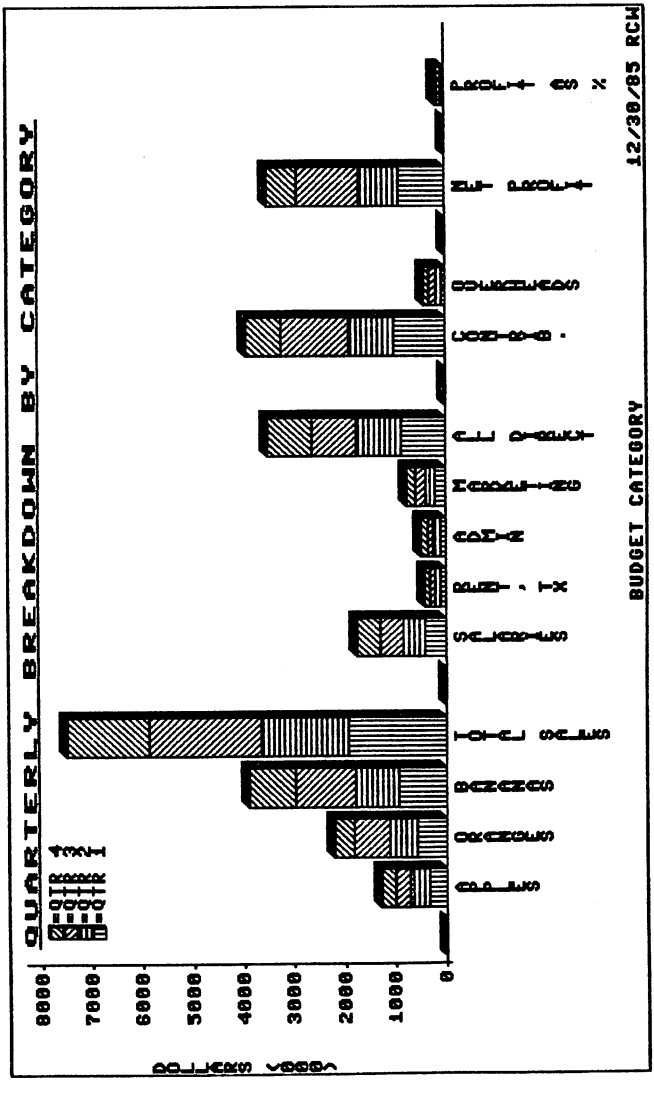
DIF FILE EXAMPLES

1984 BUDGET	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Sales APPLES	375	375	300	275	1325
Sales ORANGES	600	550	700	400	2250
Sales BANANAS	970	830	1200	946	3946
TOTAL SALES	1945	1755	2200	1621	7521
Salaries	440	440	450	460	1790
Rent, local tax	110	115	110	110	445
Administration	140	125	120	140	525
Marketing	215	195	190	185	785
ALL DIRECT COSTS	905	875	870	895	3545
CONTRIBUTION	1040	880	1330	726	3976
OVERHEADS	103	100	115	120	438
NET PROFIT	937	780	1215	606	3538
PROFIT AS %	48	44	55	37	47

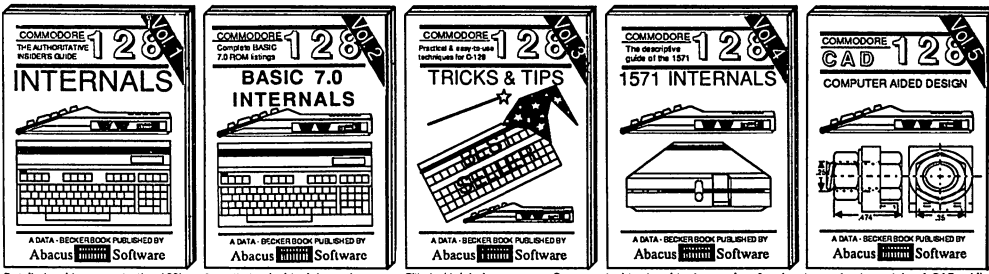

AJAX SALES DIVISION
=TOTAL SALES
=ALL DIRECT COST
=OVERHEADS
=NET PROFIT
3000
2500
2000
1500
1000
500
0
QTR 1
QTR 2
QTR 3
QTR 4
1984 BUDGET
12/30/85 RCW


AJAX SALES DIVISION
=TOTAL SALES
=ALL DIRECT COST
=OVERHEADS
=NET PROFIT
3000
2500
2000
1500
1000
500
0
Q1-R 1 2 3 4
1984 BUDGET
12/30/85 RCH


AJAX SALES DIVISION
1-SALES BANANAS
2-SALES ORANGES
3-SALES APPLES
8000
6000
4000
2000
0
QTR 1
QTR 2
QTR 3
QTR 4
YEAR
1984 BUDGET
12/30/85 RCH


QUARTERLY BREAKDOWN BY CATEGORY
12/30/85 RCW
BUDGET CATEGORY
8000
7000
6000
5000
4000
3000
2000
1000
0

C-128™ and C-64™ LIBRARY



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Insiders' guide for novice & advanced users. Covers sequential & relative files, & direct access commands. Describes DOS routines. Commented listings. 500pp $19.95

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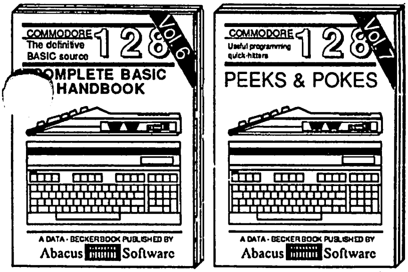

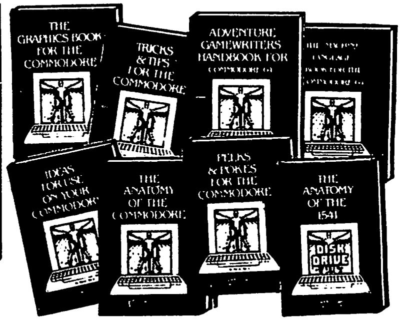

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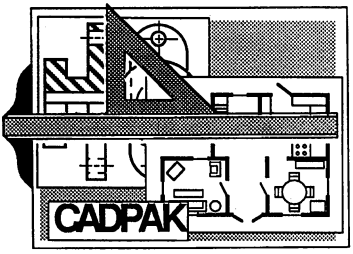

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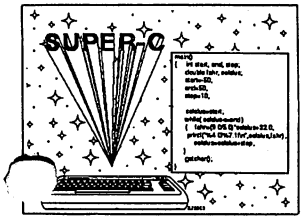

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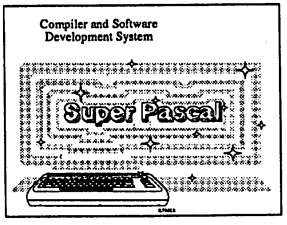

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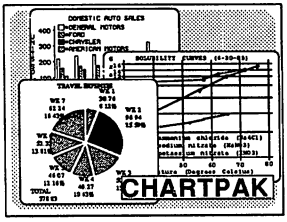

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