

Let your computer ANALYZE and FORECAST THE FUTURE with

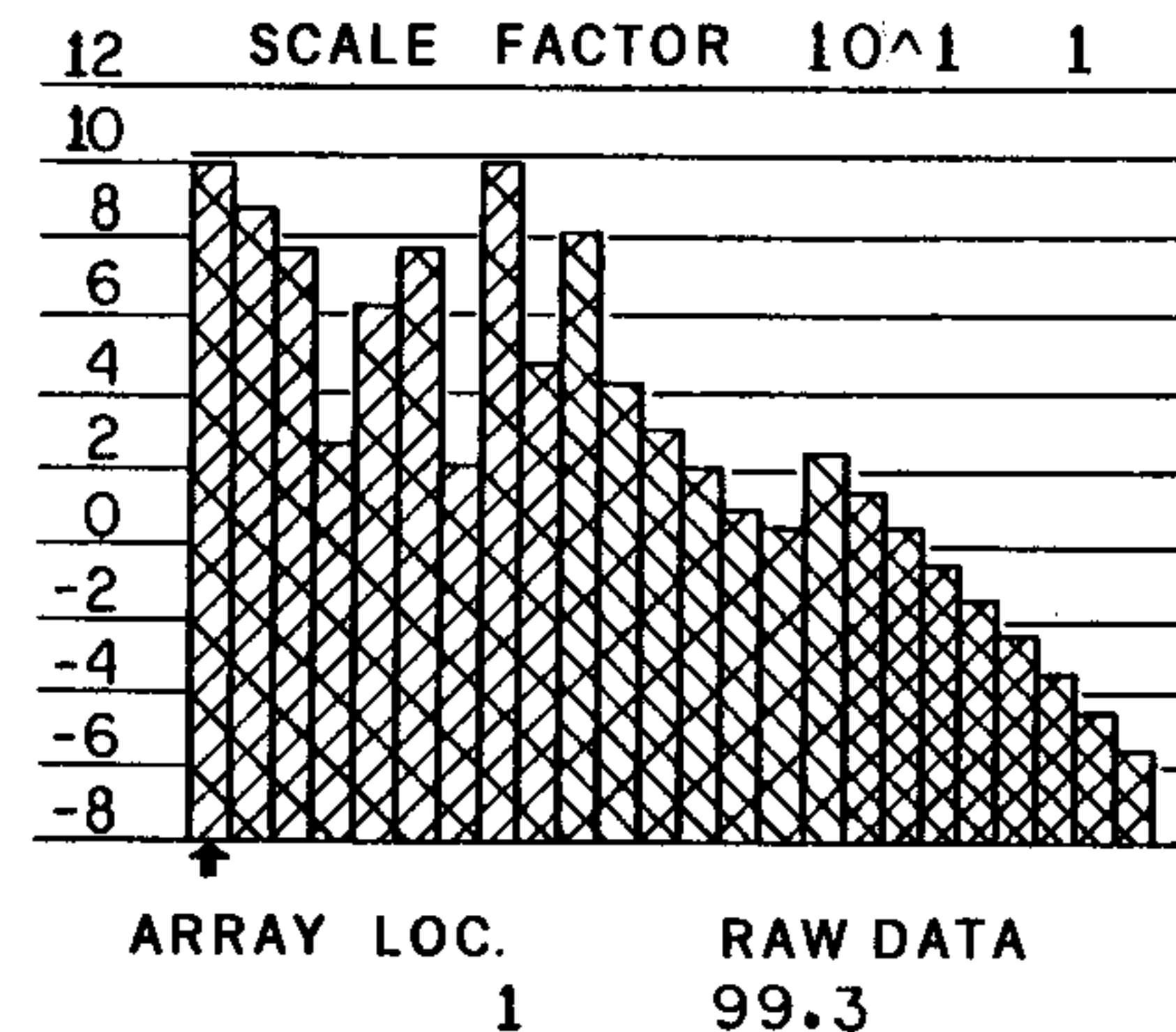
TRENDLINE ANALYSIS II

- Auto-scaling BAR GRAPHS on the screen, with one (1) pixel resolution, movable display and readouts of each data value.
- Bar graph PROJECTIONS (linear regressions) in three colors, using the reference region you specify, to help you PREDICT THE FUTURE based on the TREND you select.
- Storage of financial data (stock quotes, earnings, etc.) on disk or cassette.
- Up to 400 data capacity w/48K disk system; 220 capacity w/16K disk or cassette system.
- Menu-driven for ease of use.
- Hardcopy output of raw and calculated data.
- Bar graph hardcopy output on any 80 column printer.
- Date, filename, program function and your comments printed on each hardcopy.
- Retention and display of last filename used.
- Optional listing of file index on disk-based versions.
- Data compatibility between all three (3) versions and with the original TRENDLINE's files.
- Screen display of raw or calculated data.
- Simplified data entry, including insertion or deletion of data anywhere within your storage file.
- Three (3) types of calculations — SLOPE, MEAN, and STD. DEV.
- Three (3) calculation modes — SINGLE CALCULATIONS, MULTIPLE CALCULATIONS with FIXED ORIGINS, and MULTIPLE CALCULATIONS w/MOVING ORIGIN.
- Discussion of each type of calculation and its application.
- Concisely written instruction manual.
- Disk version includes both the 16K and 48K versions and automatically decides which will run on your system.

*** REQUIRES Extended BASIC Module. Printer optional. ***

TRENDLINE ANALYSIS II

Stock Market and Mathematical
Analysis Programs for the
Texas Instruments, Inc.
TI-99/4™ and TI-99/4A™
HOME COMPUTERS



program and text by
CURTIS D. GARCIA



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P.O. Box 912, Stafford, Texas 77477

Key Reference Guide

The following guide refers to keys which will cause certain actions to occur when depressed. These special functions only operate while viewing a bar graph on the monitor's screen.

<u>PRESS</u>	<u>ACTION</u>
FCTN 5 (BEGIN)	Return to the graph of the original data.
FCTN 6 (PROCEED)	Invoke the program's PROJECTION feature.
FCTN 7 (AID)	Jump to another section of displayed data.
FCTN 9 (BACK)	Return to the main menu.
E	Causes the bar graph to move to the next higher screen of displayed values.
X	Causes the bar graph to move to the next lower screen of displayed values.
D	Causes the arrow, which points to data locations, to move to the right on your screen.
S	Causes the arrow, which points to data locations, to move to the left on your screen.

TRENDLINE ANALYSIS II

TRENDLINE ANALYSIS II is a greatly enhanced version of the original TRENDLINE ANALYSIS. In addition to the powerful computational capabilities of the original TRENDLINE, it now offers BAR GRAPHS, either on your monitor or on your 80 column printer. PROJECTIONS (linear regressions) may also be made based on the values of your GRAPHED DATA. This version shall be referred to as TRENDLINE throughout this manual.

OVERVIEW

TRENDLINE was designed at the request of a stock market analyst. The analyst uses TRENDLINE to compute the SLOPE, MEAN or STANDARD DEVIATION over portions of the ARRAY to analyze and/or predict market activity. A short discourse on these three (3) computational theories is included in the CALCULATIONS section of this manual. You may utilize these analytical techniques or develop your own methods of interpreting the data.

TRENDLINE is a powerful mathematical tool, as such it may be used or abused. DYNAMIC DATA & DEVICES recommends that careful judgement be exercised in your stock transactions, and cannot be responsible for the results of such transactions based on any information obtained by using TRENDLINE.

THE PROGRAMS

If you've purchased TRENDLINE on disk, you'll find that there are five programs and one data file on the disk. The data file and the programs named LOAD and INTRO are used by both the 16K and the 48K memory versions, which are also on the disk.

The fifth disk program is INIT*. It needs to be run only if the file named '*' should become damaged or lost. Running INIT* will create a new copy of the file named '*'.

The cassette version is a single EXTENDED BASIC program, and does not require memory expansion.

These programs are not protected, so you may make a copy for everyday use and store the original in a safe place. Please do not allow friends to obtain 'pirated' copies.

It is also recommended that TRENDLINE users frequently copy their data files to avoid loss of data due to system malfunction or storage medium failure.

Happy computing. Now let's see how to get started...

MISCELLANEOUS NOTES

DISABLED KEYS

By the time the program reaches the MAIN MENU, the BREAK KEY will have been disabled by an ON BREAK NEXT command.

Disk system users with memory expansion will also find that the QUIT KEY has been disabled by a CALL LOAD(-31806,16).

These steps were taken to protect your data, as heavy use of the FUNCTION keys is made in the GRAPH feature of this program, and a careless keystroke could be very distressing to you.

You can exit the program only thru option 8 of the MAIN MENU. Type BYE then press ENTER to return to the TITLE SCREEN if the QUIT KEY has been disabled.

ALPHA LOCK KEY

While running TRENDLINE, the ALPHA LOCK KEY should remain in the depressed position. This is necessary because the inputs for single alphabet characters only check for upper-case.

DEFINITIONS

FILE and ARRAY: Numeric values are stored in an ARRAY when in the computer's memory. When stored on disk or tape, this data is referred to as a FILE. Consider these words equivalent when used in this manual. They are used to describe that group of numbers you will enter, have entered or have stored on disk or tape.

EOA: Standing for END OF ARRAY, this variable's value is set to the highest-numbered ARRAY ELEMENT to which you have assigned a value.

In this manual, when you see a statement such as (1-(EOA-1)), it should be read as 'one thru the value of EOA minus one'.

ORIGIN: This variable's value is the ARRAY ELEMENT selected by you to be the first used by a program function.

END: This variable's value is the ARRAY ELEMENT selected by you to be the last used by a program function.

ARRAY SIZE

The maximum ARRAY size is 400 ARRAY ELEMENTS for the 48K disk version, or 220 ARRAY ELEMENTS for the 16K or cassette versions.

Even though the ARRAY capacities vary, FILES from any version of TRENDLINE can be read by any of the other versions. If using the 16K or cassette versions to input a 400 ARRAY ELEMENT FILE from the 48K version, only the first 220 entries will be read. This feature allows the transfer of TRENDLINE FILE data between users, regardless of the TRENDLINE version they are using.

GETTING STARTED

I. Running the cassette version of TRENDLINE:

Equipment required:

99/4 or 99/4A Home Computer console.
T.I. Monitor or television.
Cassette recorder and interface cable.
EXTENDED BASIC module.

Place the EXTENDED BASIC module in the console's module port. Turn on the console and monitor, and the TEXAS INSTRUMENTS title screen will appear. Press any key to begin, then press 2 for EXTENDED BASIC and * READY * will appear on the screen.

If you do not have memory expansion, type CALL FILES(1) and press ENTER, then type NEW and press ENTER.

Now type OLD CS1 and press ENTER, then follow the prompts on the screen to load TRENDLINE from the cassette tape.

If you encounter difficulty in loading the program, refer to your computer instruction manual. You may also want to verify that your recorder's tone and volume levels are set correctly.

Once the program has been loaded into memory, the cursor will appear at the bottom of the screen. Type RUN and press ENTER.

II. Running the disk version of TRENDLINE:

Equipment required:

99/4 or 99/4A Home Computer console.
T.I. Monitor or television.
Disk Controller and Disk Drive(s).
Peripheral Expansion Box (if using Disk Controller Card).
EXTENDED BASIC module.

Turn on all peripherals and place the EXTENDED BASIC module in the console's module port. Place the TRENDLINE disk in disk drive one and turn on the console power. The TEXAS INSTRUMENTS title screen will now appear. Press any key to begin, then press 2 for EXTENDED BASIC.

The computer will now load and run the program named LOAD. If your system has memory expansion, no further action is required.

If you do not have memory expansion, the program will stop and remind you to type CALL FILES(1) and press ENTER, then to type NEW and press ENTER, and finally to type RUN "DSK1.INTRO" and press ENTER.

PRELIMINARY OPERATIONS

Before getting to the main part of the program, the following inputs are needed:

PRINTER USEAGE

WILL YOU USE A PRINTER? Y

There are several program functions that can use a printer to give you permanent records. These will be offered ONLY if you've answered Y to the above prompt. To do this, just press ENTER.

If you are sure you will not use a printer, type N and press ENTER, then proceed to DEFAULT DISK DRIVE on this page.

PRINTER OPEN STATEMENT:

DEFAULT

The *DEFAULT* offered is PIO for cassette users, and the last entry made by disk system users. If the *DEFAULT* is the desired printer open statement, press ENTER, otherwise type the desired open statement over the *DEFAULT* and press ENTER.

Cassette users may wish to modify the printer open statement *DEFAULT* to their printer's open statement. Change "PIO" to the desired open statement in line 240, then save the program to a blank cassette tape, keeping the original intact.

Several examples of printer open statements follow:

TP	T.I. THERMAL PRINTER
PIO	ALL PARALLEL PRINTERS
RS232/1.BA=9600.DA=7	TYPICAL SERIAL PRINTER

Consult your printer manual or RS232 manual for more specific information on printer open statements.

DATE: *DEFAULT*

The date is printed on all printouts. The *DEFAULT* for disk system users is the date entered the last time the program was run. There is no *DEFAULT* for cassette system users.

DEFAULT DISK DRIVE

(Cassette system users go to next page)

DATA IS IN DISK DRIVE: *DEFAULT*

Again, the default is the value entered when the program was last run. Type ENTER if this is the drive number desired for all file input and output, otherwise type the desired drive number, then press ENTER.

Now, LOADING PROGRAM appears at the bottom of the screen, as the computer automatically runs the appropriate version (16K or 48K memory) for your system.

PRELIMINARY OPERATIONS (CONTINUED)

If you indicated that you may use a printer, you will now see the following prompts on your screen:

TURN PRINTER ON

ANY KEY TO CONTINUE

Apply power to your printer and press any key. The program will now open a file to the printer for later use.

NOTE: The following prompt will appear at several points in the program (if you indicated that you'll be using a printer):

PRINTER COPY?(Y/N)

When this prompt appears, press Y if you desire the printout, otherwise press N.

All printouts include the following heading except for the printout of the bar-graph, which has a different layout:

DYNAMIC DATA AND DEVICES
name of program function
FILE: complete filename
DATE: date you entered

The lower-case text in the above heading will be replaced by current program parameters when you generate a printout.

MAIN MENU

The 'MAIN MENU' is the focal point of TRENDLINE. All program functions begin and end here. The MAIN MENU is shown below:

**** TRENDLINE ANALYSIS II ****

SELECT FUNCTION:

1. DISPLAY ARRAY
2. GRAPH ARRAY
3. CALCULATIONS
4. MODIFY ARRAY
5. STORE FILE
6. INPUT FILE
7. CREATE NEW ARRAY
8. QUIT

To execute a function, press its number. It is not necessary to press the ENTER KEY.

If there are no values in the ARRAY, selecting function 1, 3, 4 or 5 will display an error message on the screen.

MENU GUIDES

For better continuity of this manual, MENU GUIDES have been used. Each MAIN MENU function has a number assigned to it. The number of the function selected will be the first digit of the MENU GUIDE. As each successive menu is encountered, the selected function's number will be appended to the MENU GUIDE.

If you selected function 3 (CALCULATIONS) from the MAIN MENU, the MENU GUIDE would be 3. You will find CALCULATIONS discussed on a page with the heading 3 - CALCULATIONS.

If you select function 1 (SLOPE) from the CALCULATIONS MENU, the MENU GUIDE is now 3.1. SLOPE CALCULATIONS are explained on the page with the heading 3.1 - CALCULATIONS.

In order to perform the functions on your system as they are presented in the manual, you may now wish to either create your own array, or to input a sample file from your storage medium.

If you choose the former option, go now to MENU GUIDE 7 and create an ARRAY, then proceed to page 7.

If you choose the later option, go now to MENU GUIDE 6, input the file named SAMPLE, then proceed to page 7.

1 - DISPLAY ARRAY

When an ARRAY is in memory, its contents may be displayed on the screen and optionally printed to your printer.

The screen for this function is shown below:

**** DISPLAY ARRAY CONTENTS ****

STARTING ARRAY LOCATION?
(1-(EOA-1)) 1

At this prompt, you may specify where in the ARRAY you wish to begin viewing. The *DEFAULT* is ARRAY ELEMENT 1.

If you wish to start at the beginning of the ARRAY, simply press ENTER. Otherwise, type a number between 1 and the value of EOA-1 before pressing ENTER.

If you indicated you may use a printer, the following prompt will appear at the bottom of the screen:

PRINTER COPY?(Y/N)

Press Y for a printout, or N for none.

The screen will now appear as shown below:

LOC. VALUE LOC. VALUE

LOC. is the ARRAY ELEMENT whose contents are being displayed, and VALUE is the numeric value stored in that ARRAY ELEMENT.

Values will be displayed on the screen until it is filled or EOA is reached. The printer copy is printed at the same time, if previously requested.

If the screen fills before EOA is reached and a printer copy was not requested, this prompt will appear on the screen:

CONTINUE?(Y/N)

Press Y to continue listing the ARRAY, or N to return to the MAIN MENU.

When the EOA is reached, the following prompt appears at the bottom of the screen:

ANY KEY TO CONTINUE...

When ready, press any key to return to the MAIN MENU.

2 - GRAPH ARRAY

Selecting this function from the MAIN MENU passes the ARRAY in memory to the graphing subroutine. There is another option in the CALCULATIONS section that allows graphing the results of the CALCULATIONS performed. The operation of the graphing function is identical for either mode, except as specially noted.

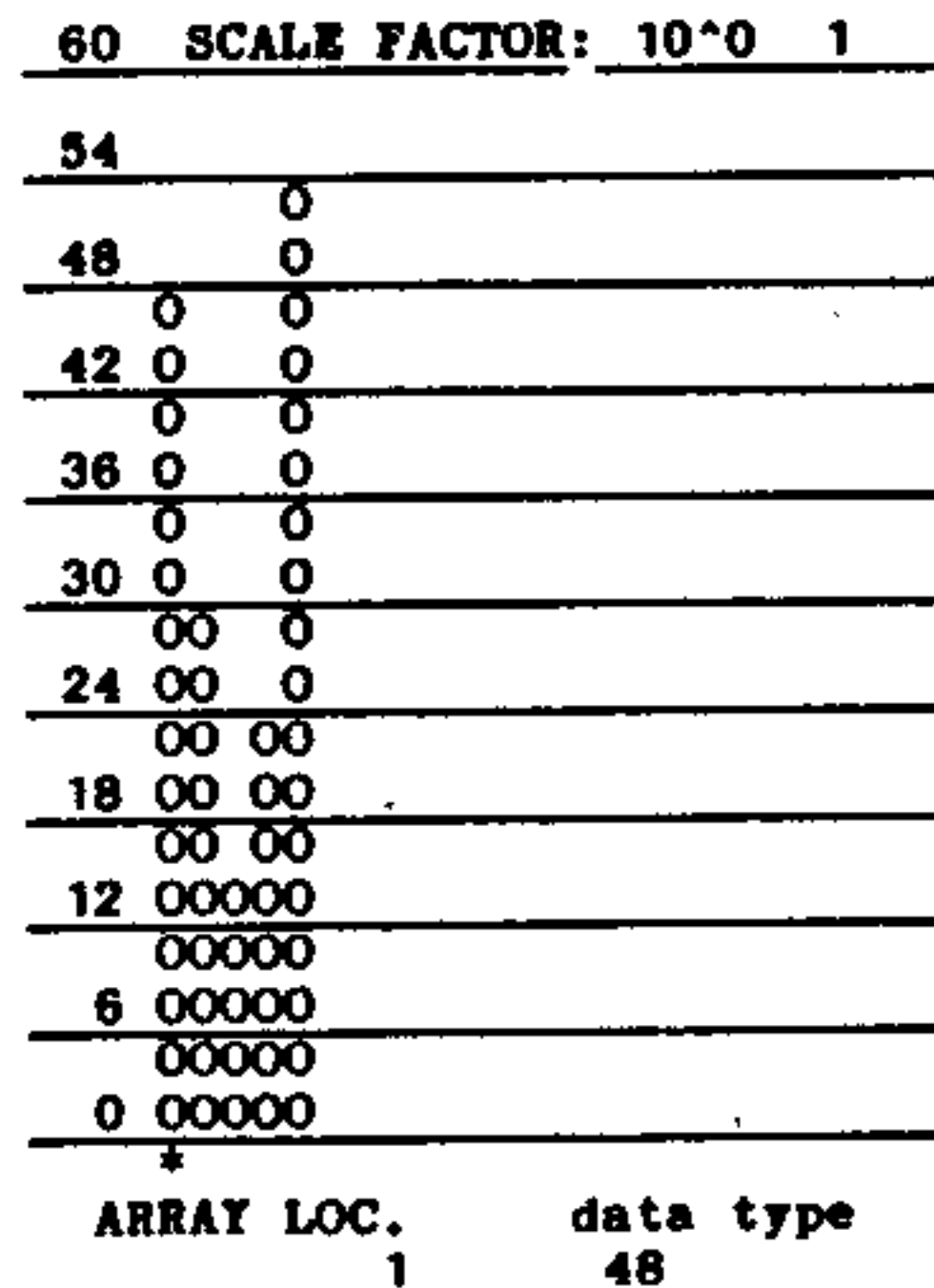
Attempting to GRAPH an ARRAY containing only one entry or an ARRAY in which all ARRAY ELEMENTS are of zero value could cause errors in the GRAPH routine. For this reason, if either of the above conditions exist, the program returns to the MAIN MENU.

The GRAPH routine performs several calculations to establish the SCALE FACTOR (power of 10) and the Y-axis increment required to display the entire ARRAY before displaying a graph similar to the one shown at the bottom of this page.

For an example, lets assume we have an ARRAY that contains 5 ELEMENTS with values as shown below:

ELEMENT	VALUE
1	48
2	30
3	15
4	24
5	54

A graph of this ARRAY would look similar to this:



Actual graphs on the screen use graphic characters instead of the letter O used above, and have one pixel vertical resolution.

2 - GRAPH ARRAY
(CONTINUED)

GRAPH DISPLAY FUNCTIONS

Refer to the screen on page 8 while reading the following:

The S and D keys move an arrow (shown as * on page 8) left and right to point at graphed ARRAY values. The numeric value of the ELEMENT pointed to is displayed in the bottom-right corner of the screen, and the ELEMENT number is shown in the upper-right corner of the screen. The data displayed under 'ARRAY LOC.' is also the ELEMENT number if graphing raw data, otherwise it shows the ARRAY LOCATIONS of the CALCULATION data being graphed.

The E and X keys move the displayed portion of the bar graph left and right in steps of 12 ARRAY ELEMENTS to allow viewing. The E KEY moves it left to show higher-numbered ARRAY ELEMENTS, while the X KEY moves it right, showing lower-numbered ELEMENTS. Program logic prevents exceeding the defined ARRAY limits.

AID (FUNCTION 7), lets you quickly change the segment of the ARRAY that is being displayed. When pressed, a *DEFAULT* appears in the upper-right corner of the screen. The *DEFAULT* value is the maximum allowed. You may now enter any number between 1 and the *DEFAULT*. This ELEMENT will be graphed in screen column 7, with the next 23 ARRAY ELEMENTS graphed to the right of it.

BEGIN (FUNCTION 5) restores the original data to the ARRAY after a PROJECTION (see page 10) and graphs the original data.

BACK (FUNCTION 9) exits the graph routine, and returns to the MAIN MENU. If you were graphing CALCULATIONS, the data is lost, though your raw data is still intact. If you were graphing raw data, it too is intact, unless you pressed BACK while PROJECTION data was on the screen. If the latter case is true, the modified ARRAY is returned in place of the original (see PAGE 10).

PRINT GRAPH

Pressing the P KEY while the graph is displayed invokes this function. The screen will clear and display the following:

PRINT ARRAY

FROM: 1

TO: EOA

COMMENTS:

Enter the FROM and TO values, representing the ARRAY ELEMENTS you wish to graph on your 80 column printer. The *DEFAULTS* will cause the entire ARRAY to be graphed.

Next you may enter your comments, up to 130 characters, to be included on the printout. The printout begins, returning to the previous screen upon completion.

2 - GRAPH ARRAY
(CONTINUED)

PROJECTION FEATURE

Pressing PROCEED (FUNCTION 6), when a graph is on the screen, invokes the PROJECTION feature. The ARRAY ELEMENTS are restored to the values they contained when the graph routine was entered, and this screen is displayed:

TRENDLINE PROJECTION

ENTER ARRAY LOCATIONS
FOR REFERENCE VALUES:

START (1-(EOA-1)):

END ((START+1)-EOA):

POINTS TO PROJECT?
(50 MAXIMUM)

Enter the START and END values within the range shown in the prompts. This establishes the reference region (ARRAY ELEMENTS) to be used in the PROJECTION calculation.

Now enter the number of POINTS TO PROJECT. This value must be between 1 and 50 for cassette or 16K disk versions, or between 1 and *DEFAULT* for the 48K disk version. Note that the PROJECTION may use ARRAY ELEMENTS numbered 50 higher than the ARRAY SIZE of the version of TRENDLINE you're using. This ensures that you can do a PROJECTION over any portion of your data.

Now, CALCULATING... appears at the bottom of the screen while the SLOPE of the reference region is calculated. Next, the SLOPE is added to the last ARRAY ELEMENT in the reference region, and the sum is placed in the next higher ARRAY ELEMENT. The SLOPE is again added to this sum and placed in the next higher ELEMENT until the requested number of POINTS TO PROJECT is reached. The modified ARRAY is then graphed on the screen.

You will notice that the graph bars are now in three colors. The meaning of the colors is shown below. The symbols in () are used in printer copies of the graph to show these conditions:

- RED (*) : Values not involved in the PROJECTION.
- YELLOW (B) : Reference region.
- GREEN (P) : PROJECTED (altered) values.

NOTE: If you want to do a PROJECTION on raw data ARRAY values modified by a previous PROJECTION, follow these steps:

- 1) Do the first PROJECTION in the normal manner.
- 2) While the PROJECTED data is on the screen, press BACK. The ARRAY is returned to the MAIN MENU. Note that the returned ARRAY cannot be larger than the ARRAY sent to the graph routine. This means that any PROJECTED values occupying ARRAY ELEMENTS exceeding the original ARRAY size will not be returned.
- 3) Press 2 for GRAPH ARRAY. The modified ARRAY will be passed to the graph routine and a second PROJECTION can be done.

3 - CALCULATIONS

TRENDLINE performs three complex mathematical calculations. SLOPE, MEAN or STANDARD DEVIATION calculations may be performed singly or in one of two multiple-calculation modes.

Before getting to the CALCULATION MENU, a brief review of the mathematics involved will be given:

SLOPE

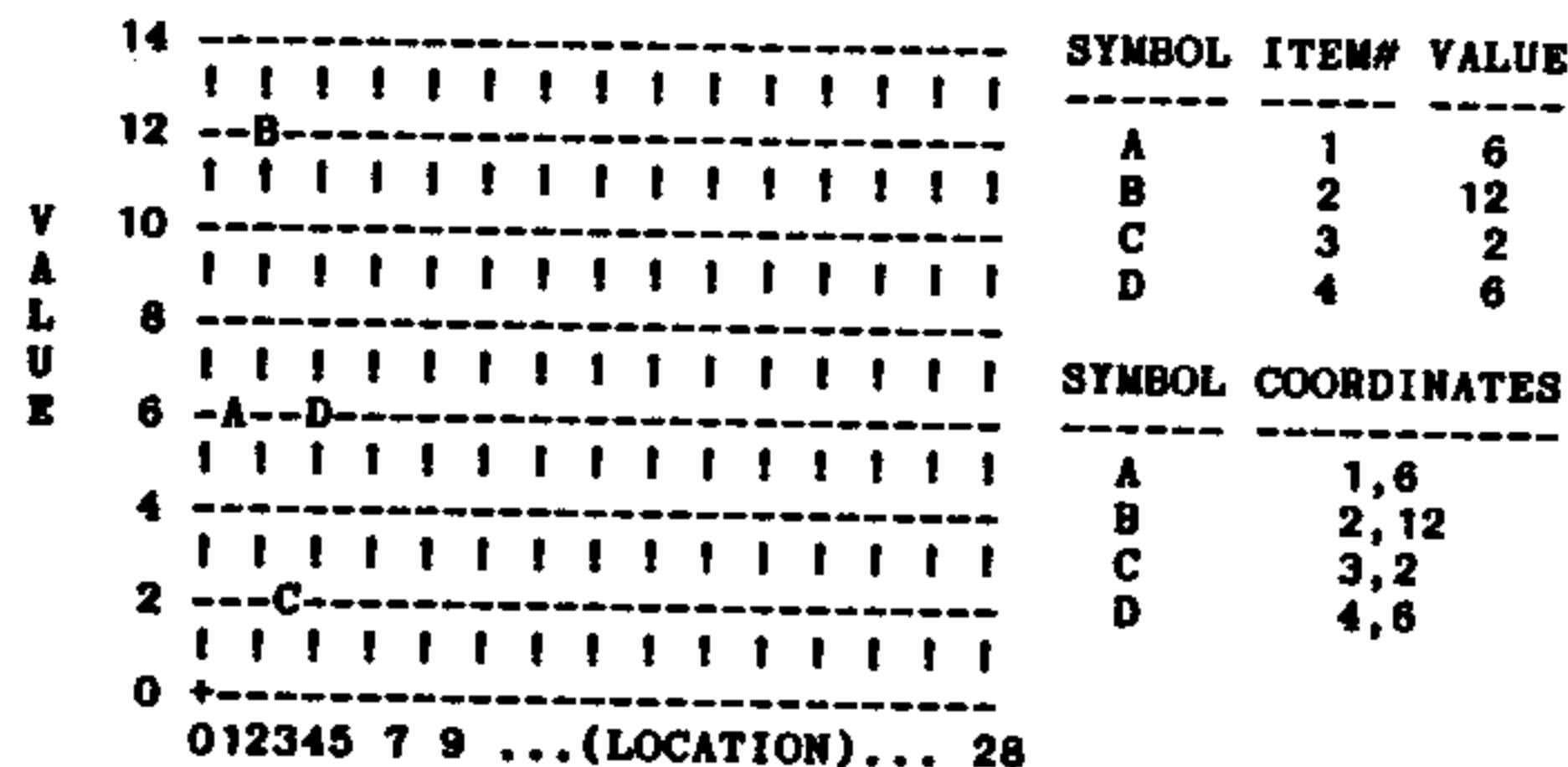


FIGURE 1

EQUATION: SLOPE = (Y2-Y1)/(X2-X1)

In FIGURE 1, above, "LOCATION" represents the "X" coordinate of the "X,Y" pair. "LOCATION" refers to the location of the stored data within the array (file).

"VALUE" represents the "Y" coordinate of that same pair and reflects the absolute value of the data stored in its associated location.

For example, if the first item stored in the array is 6, then the coordinates become: "1,6"; "1" for the location, "6" for the value at that location. The position of this set of coordinates is shown as "A" in FIGURE 1.

Point "B" on the graph has coordinates of "2,12" (2nd item with a value of "12"). Point "C", similarly, is "3,2" and "D" is "4,6". Now, let's examine the inter-relationship of the points.

The SLOPE between points "A" and "B" may be found by substituting the "X,Y" coordinates into the equation. This becomes:

$$\begin{aligned} \text{SLOPE} &= (12-6)/(2-1) \\ &= (6)/(1) \\ &= 6 \end{aligned}$$

Since the resultant SLOPE, six (6), is a positive number, the indication is that the SLOPE is on the "rise" or increasing.

3 - CALCULATIONS (CONTINUED)

If the SLOPE has been calculated on actual market daily closing prices, it would be evident that the market is on the "increase".

By examining the SLOPE for the values represented by symbols "B" and "C", we will see the mathematics of a "negative" slope:

$$\begin{aligned} \text{SLOPE} &= (Y_2 - Y_1) / (X_2 - X_1) \\ &= (2 - 12) / (3 - 2) \\ &= (-10) / (1) \\ &= -10 \text{ (a negative slope)} \end{aligned}$$

Since the SLOPE or TREND is negative, our logical understanding verifies that the stock is "down".

Simple day-to-day comparisons are too simple to require a calculator, much less a sophisticated home-computer. But what has been the TREND of our entire set of four (4) entries? It is not readily apparent, but the TREND is actually "down". The computer can rapidly examine and algebraically-sum the constituent slopes and let us know that the slope of our four (4) point data set is actually: (-2).

Therefore, the overall TREND of the four (4) day performance is "down", as indicated by the negative value of the answer.

3 - CALCULATIONS (CONTINUED)

MEAN

The MEAN or AVERAGE of a group of numbers may be represented by the following:

$$\begin{aligned} \text{EQUATION: MEAN} &= (Y_1 + Y_2 + Y_3 + \dots + Y_n) / N \\ \text{"N"} &\text{ represents the number of elements or entries.} \end{aligned}$$

Using our sample of data points from FIGURE 1, we get the following result:

Where: $Y_1=6$, $Y_2=12$, $Y_3=2$, $Y_4=6$

$$\begin{aligned} \text{MEAN} &= (6+12+2+6)/4 \\ &= 6.5 \end{aligned}$$

STANDARD DEVIATION

STANDARD DEVIATION is a bit more complex than SLOPE and MEAN, but since it is an important statistical tool, it warrants a place in TRENDLINE. It is defined as:

S.D. = THE SQUARE ROOT OF THE VARIANCE.

The VARIANCE of a data set indicates the amount of dispersion of the individual data values about the MEAN. The equation for the VARIANCE is:

$$\text{VARIANCE} = ((Y_1 - M)^2 + (Y_2 - M)^2 + \dots + (Y_n - M)^2) / (n - 1)$$

where M = the MEAN of the set and
 n = the number of data points in the set.

Let's try to compute the STANDARD DEVIATION of the four (4) data points given in FIGURE 1. Substituting into the VARIANCE equation:

$$\begin{aligned} \text{VARIANCE} &= ((6-6.5)^2 + (12-6.5)^2 + (2-6.5)^2 + (6-6.5)^2) / 3 \\ &= ((-.5)^2 + (5.5)^2 + (4.5)^2 + (-.5)^2) / 3 \\ &= (.25 + 30.25 + 20.25 + .25) / 3 \\ &= (51) / 3 \\ &= 17 \end{aligned}$$

But this is only the VARIANCE, so we must find the square-root of the answer to determine the STANDARD DEVIATION:

$$\text{S.D.} = \text{SQR}(17) = 4.1231$$

In the above equation, some authors divide by "n" rather than "n-1", but many feel that better accuracy may be attained from our version. When "n" is greater than 30, there is little difference in the versions.

3.1 - CALCULATIONS

SLOPE CALCULATIONS:

To perform SLOPE calculations, press 3 at the MAIN MENU. The CALCULATION MENU (MENU 3) appears:

*** CALCULATION MENU ***

1. SLOPE
2. MEAN
3. STANDARD DEVIATION

Now press 1 for SLOPE CALCULATION. MENU 3.1 (below) appears:

CALCULATION METHOD

1. SINGLE CALCULATION
OR MULTIPLE CALCULATIONS
WITH
2. STATIONARY ORIGIN
3. MOVING ORIGIN

Let's examine the possible variations of calculations which may be performed. To simplify the explanation, we will use a larger set of data points (or daily stock closing prices). This FILE has been stored on your TRENDLINE disk as DSK1.SAMPLE, and on the cassette version following the program.

The values contained in this FILE are:

<u>LOCATION:</u>	<u>VALUE:</u>
1	101.25
2	101.75
3	98.5
4	97.25
5	92.75
6	92.75
7	93
8	106.5
9	106.75
10	107.375

FIGURE 2 - FILENAME: "SAMPLE"

To view the data set more easily, let's place the values horizontally. The first entry, LOCATION #1, is on the left followed by LOCATION #2, LOCATION #3, ect.:

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
101.25	101.75	98.5	97.25	92.75	92.75	93	106.5	106.75	107.375

3.1.1 - CALCULATIONS (CONTINUED)

SINGLE CALCULATIONS - may be performed on any range of numbers in the data set. You may select the ORIGIN and END numbers to be included in the calculations by specifying their LOCATION within the ARRAY. All values stored in LOCATIONS between the ORIGIN and END LOCATIONS will also be included in the calculations.

In the example below, suppose you have selected to perform a SLOPE calculation upon values stored from LOCATION #3 to LOCATION #8. The values which have an "X" below them are those you selected from the menu. The values which have an "I" below them will also be included in the calculations. This may seem to be an over-simplified explanation, but it will "set the scene" for the more complex calculation selections to follow.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
101.25	101.75	98.5	97.25	92.75	92.75	93	106.5	106.75	107.375
		X	I	I	I	I	X		

The result of the calculation gives us the answer:

ARRAY LOC.	SLOPE
3 TO 8	0.77857

To perform SINGLE CALCULATIONS, press "1" while at MENU 3.1, shown on the previous page.

ORIGIN? (1-(EOA-1)) 1

is the next prompt shown by the program, with a *DEFAULT* of 1. Enter the ORIGIN of your choice and press ENTER.

END ARRAY LOCATION
FOR FIRST CALCULATION?
((ORIGIN+1)-EOA)

appears next. Type the desired END value and press ENTER. This prompt will appear if you are using a printer:

PRINTER COPY?(Y/N)

Press Y for a printout of the calculation results, or N for no printout.

The final prompt before the calculations are performed is:

GRAPH RESULTS? (Y/N)

Press Y if you desire the calculated values to be graphed, or N for no graphing. See MENU GUIDE 2 for GRAPHING FEATURE.

NOTE: The cassette and 16K disk versions can pass only the first 90 REPETITIONS to the graph routine. The 48K disk version is limited only by the number of REPETITIONS requested.

3.1.2 - CALCULATIONS

MULTIPLE CALCULATIONS WITH FIXED ORIGIN:

This method of calculation may be performed over any range of numbers in the data set. To describe the effects of this choice, let's look again at our LOCATIONS and VALUES from FIGURE 2:

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
101.25	101.75	98.5	97.25	92.75	92.75	93	106.5	106.75	107.375

To perform calculations in this mode, we must have pressed 2 at MENU #3.1, giving us the following prompt:

ORIGIN? (1-(EOA-1)) 1

To visualize our choices, let's accept the *DEFAULT* of 1 by pressing ENTER. We will place an "A" under location #1:

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
101.25	101.75	98.5	97.25	92.75	92.75	93	106.5	106.75	107.375
A									

The next prompt:

END ARRAY LOCATION
FOR FIRST CALCULATION?
((ORIGIN+1)-EOA)

will appear. For our example, we'll type "3" and press ENTER. We'll also mark our visual-aid by placing a "B" under the third LOCATION of the ARRAY:

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
101.25	101.75	98.5	97.25	92.75	92.75	93	106.5	106.75	107.375
A		B							

Now, a new prompt appears:

INCREMENT?

The INCREMENT VALUE may be any positive integer value that, when added to the ORIGIN value, does not exceed the EOA value. If ORIGIN+INCREMENT VALUE EOA, the computer will ask for another INCREMENT VALUE. Enter a smaller value until it is accepted.

Entering "2" for INCREMENT VALUE would cause the CALCULATIONS to be performed in the following manner (this will not actually occur until REPETITIONS on the next page has been entered):

- 1) Perform the SLOPE calculation on ARRAY LOCATIONS #1 thru #3.
- 2) Display the answer on the monitor (and printer if requested).
- 3) Increase the END variable by the INCREMENT VALUE.
- 4) Calculate the SLOPE again, from LOCATION #1 (FIXED ORIGIN) to LOCATION #5, (current value of END, "C" on the visual-aid).
- 5) Repeat the process for the number of REPETITIONS requested.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
101.25	101.75	98.5	97.25	92.75	92.75	93	106.5	106.75	107.375
A		B		C					

3.1.2 - CALCULATIONS (CONTINUED)

This brings us to the prompt:

REPETITIONS?(XX MAX.) XX

The maximum number of REPETITIONS possible, without exceeding the EOA value, is shown as XX, and offered as the *DEFAULT*. Suppose, in our previous example, we enter "4" as the number of REPETITIONS. The computer will perform the calculations and give us the following answers:

ARRAY LOC.	SLOPE
1 TO 3	-1.37500
1 TO 5	-2.15000
1 TO 7	-1.73214
1 TO 9	0.34583

As you can see, the END variable has been incremented from "3" to "5" to "7" to "9" as the REPETITIONS are performed.

In our above example, the END variable value has changed from position "B" to "C" to "D" to "E" in the visual-aid below:

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
101.25	101.75	98.5	97.25	92.75	92.75	93	106.5	106.75	107.375
A		B		C		D		E	

With a bit of experimenting on your part, you will soon learn how easy it is to handle this section of TRENDLINE; and will appreciate its computational power.

3.1.3 - CALCULATIONS
(CONTINUED)

MULTIPLE CALCULATIONS WITH MOVING ORIGIN:

This method of calculation may be performed over any range of numbers in the data set.

ORIGIN? (1-(EOA-1)) 1

In this example, we will select LOCATION #1 as our ORIGIN. Type 1 and press ENTER. We'll place an A under that LOCATION in our visual-aid:

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
101.25	101.75	98.5	97.25	92.75	92.75	93	106.5	106.75	107.375
A									

The next screen prompt should also be familiar to you by now:

END ARRAY LOCATION
FOR FIRST CALCULATION?
((ORIGIN+1)-EOA)

Again, this selection of LOCATION will cause the first calculation to be performed on the VALUES from the FIRST LOCATION to the LOCATION entered at this prompt, including all LOCATIONS which are between them.

Let's type 3 and press ENTER for the END ARRAY LOCATION. The letter B will mark it below:

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
101.25	101.75	98.5	97.25	92.75	92.75	93	106.5	106.75	107.375
A		B							

INCREMENT?

appears next. We'll type 4 and press ENTER.

REPETITIONS?(XX MAX.) XX

appears. XX is the maximum number of calculations allowed without exceeding the EOA value. We'll type 2 and press ENTER.

Results:	ARRAY LOC.	SLOPE
	1 TO 3	-1.37500
	5 TO 7	0.12500

On the visual-aid above, we marked the ORIGIN with an A. Then we marked the END ARRAY LOCATION with B. During the calculations the FIRST pass of computations were performed on the marked data set. Upon completion, the ORIGIN is incremented to LOCATION #5 (ORIGIN + INCREMENT), marked below as A2. At the same time, the END value is incremented to LOCATION #7 (END + INCREMENT), shown below as B2.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
101.25	101.75	98.5	97.25	92.75	92.75	93	106.5	106.75	107.375
A		B		A2		B2			

3.1.3 - CALCULATIONS
(CONTINUED)

Having gone through the previous exercises, you may be saying to yourself:

1) TRENDLINE has an awesome amount of computing power which was not obvious and...

2) TRENDLINE can automatically perform hundreds of calculations, BUT, how can I use this power to analyze stock market activity?

The Wall Street Stock Exchange is open five days a week. Each day, four main factors are disclosed to the investing public:

OPENING PRICE
HIGHEST PRICE
LOWEST PRICE
CLOSING PRICE

If a separate ARRAY were maintained for each of these factors on a daily basis, you could calculate the SLOPE, MEAN (AVERAGE) or STANDARD DEVIATION over each file in various ways to see day-to-day or week-to-week trends.

QUESTION: How does the Market behave on Tuesdays?

Since the Market is open five days a week, you could have the computer analyze the ARRAY using the MULTIPLE CALCULATIONS with MOVING ORIGIN function. Enter the ELEMENT number which contains the data from the Monday prior to the first Tuesday of interest as the ORIGIN. Enter ORIGIN+1 for the END ARRAY LOCATION value. The INCREMENT VALUE should be 5 (five market days/week). Enter the desired number of REPETITIONS, and you'll see your data.

QUESTION: What was the TREND for gains or losses for each week?

Once again, the five day basis comes in handy. Use the SLOPE calculation; MULTIPLE CALCULATIONS with MOVING ORIGIN. Select as the ORIGIN the ARRAY ELEMENT corresponding to the first Monday. The END ARRAY LOCATION will be the value of ORIGIN+4 (Friday). Enter 5 as the INCREMENT VALUE (five days/week). REPETITIONS may be set to the number of weeks you wish to have data for. You'll receive the SLOPE for each week of activity.

You may use the MEAN calculation function in the same manner to receive weekly averages.

Your computer will scan, compute and conveniently print these factors and more. Perhaps YOU will find that particular TREND that will make your investments less risky than just "playing a hunch".

3.2.1 - CALCULATIONS

MEAN CALCULATIONS:

3.2.1

SINGLE CALCULATIONS - Single calculations using MEAN are run in the same manner as single calculations using SLOPE. Please refer to PAGE 15 for details of operation. Just substitute the word "MEAN" for the word "SLOPE".

3.2.2

MULTIPLE CALCULATIONS WITH FIXED ORIGIN - performs in the same manner as the similar section described on PAGE 16. Substitute the word "MEAN" for the word "SLOPE" and follow the directions given.

3.2.3

MULTIPLE CALCULATIONS WITH MOVING ORIGIN - similar to the operations described on PAGE 18. Substitute the word "MEAN" for the word "SLOPE" and follow the directions.

STANDARD DEVIATION CALCULATIONS:

3.3.1

SINGLE CALCULATIONS - Single calculations using STANDARD DEVIATION are run in the same manner as single calculations using SLOPE. Refer to the instructions given on PAGE 15 and substitute the words "STANDARD DEVIATION" for the word "SLOPE".

3.3.2

MULTIPLE CALCULATIONS WITH STATIONARY ORIGIN - performs in the same manner as the similar section described on PAGE 16. Substitute the words "STANDARD DEVIATION" for the word "SLOPE" and follow the directions given.

3.3.3

MULTIPLE CALCULATIONS WITH MOVING ORIGIN - similar to the operations described on PAGE 18. Substitute the words "STANDARD DEVIATION" for the word "SLOPE" and follow the directions given.

4 - MODIFY ARRAY

Pressing 4 at the MAIN MENU will bring the menu shown below:

*** MODIFY ARRAY ***

1. CHANGE VALUES
2. INSERT VALUES
3. DELETE VALUES

Select the desired function from MENU #4 and proceed to the proper MENU GUIDE:

4.1 - CHANGE VALUES

** MODIFY ARRAY VALUES **

ARRAY ELEMENT?(1-MAX) 1

HIGHEST USED: 10

CURRENT VALUE: 101.25

(J TO JUMP, E TO EXIT)

In the above screen, MAX is the maximum ARRAY size allowed by your version of TRENDLINE (See ARRAY SIZE on Page 2).

The *DEFAULT* after ARRAY ELEMENT?(1-MAX) shows which ARRAY ELEMENT is being modified. Each time you press ENTER opposite CURRENT VALUE: *DEFAULT*, the ARRAY ELEMENT is incremented by 1.

HIGHEST USED is the EOA value; that is, the highest-numbered ARRAY ELEMENT which has been assigned a value by you.

CURRENT VALUE: *DEFAULT* is the value currently stored in the ARRAY ELEMENT named at the top of the screen. If the *DEFAULT* is the desired value, simply press ENTER, otherwise type in the desired value and press ENTER.

Values from FIGURE 2 (Page 14) have been used in the example screen above. It shows the ARRAY ELEMENT *DEFAULT* to be 1, the HIGHEST USED to be 10, and the CURRENT VALUE of ARRAY ELEMENT 1 to be 101.25.

To quit entering or modifying ARRAY values, type E over the CURRENT VALUE *DEFAULT* and press ENTER. The value of the ARRAY ELEMENT displayed is not altered.

To modify the auto-incrementing *DEFAULT* ARRAY ELEMENT being addressed, type J over the CURRENT VALUE *DEFAULT* and press the ENTER KEY. The cursor will then appear over the *DEFAULT* ARRAY ELEMENT. Type the ARRAY ELEMENT number desired and press ENTER. The value which you typed J over is not modified by this action.

NOTE: Values entered may contain 9 digits, only 6 of these may be to the left of the decimal. Attempting to enter a larger number will result in having to re-enter that value.

4 - MODIFY ARRAY
(CONTINUED)

4.2 - INSERT VALUES

This function allows you to insert new values anywhere in the ARRAY in memory. The screen is shown below:

INSERT ARRAY VALUES

BEGIN AT (1-(EOA-1)) 1
(ENTER 0 TO ABORT)

NUMBER TO INSERT?
(XX MAXIMUM)

The first prompt, BEGIN AT (1-(EOA-1)) 1, asks you to specify the first ARRAY ELEMENT where you wish to insert a value. Enter 0 to abort this function and return to the MAIN MENU, or enter an ARRAY ELEMENT number within the range shown in the prompt. For our example, let's enter a 3 for this prompt.

The second prompt is NUMBER TO INSERT? and the maximum number possible is shown on the second line of this prompt. Enter the number of new values you wish to insert and press ENTER. Assume we pressed 2 for this prompt. Using the ARRAY shown in FIGURE 2, (PAGE 14) let's see the results of the example inputs:

<u>ORIGINAL VALUE:</u>	<u>ARRAY LOCATION:</u>	<u>AFTER INSERT:</u>
101.25	1	101.25
101.75	2	101.75
98.5	3	0.0
97.25	4	0.0
92.75	5	98.5
92.75	6	97.25
93	7	92.75
106.5	8	92.75
106.75	9	93
107.375	10	106.5
-----	11	106.75
-----	12	107.375

As you can see, two ARRAY ELEMENTS were inserted, starting at location 3. The data originally in ARRAY ELEMENTS 3 and higher were pushed 2 ARRAY ELEMENTS higher to accommodate the insertion, and the value of the variable EOA was increased by 2.

If the EOA value before insertion plus the NUMBER TO INSERT value is greater than the ARRAY SIZE allowed by your version of TRENDLINE, then the values pushed beyond the maximum ARRAY SIZE are discarded by the program.

After inserting ARRAY ELEMENTS, you may assign values to them by using MENU FUNCTION 4.1, CHANGE VALUES.

4 - MODIFY ARRAY
(CONTINUED)

4.3 - DELETE VALUES

This function allows you to delete ARRAY ELEMENTS anywhere in the ARRAY in memory. The screen is shown below:

DELETE ARRAY VALUES

BEGIN AT (1-EOA) 1
(ENTER 0 TO ABORT)

NUMBER TO DELETE?
(XX MAXIMUM)

The first prompt, BEGIN AT (1-EOA) 1, asks you to specify the first ARRAY ELEMENT to delete. Enter 0 to abort this function and return to the MAIN MENU, or enter an ARRAY ELEMENT number within the range shown. For our example, let's enter a "3" for this prompt.

The second prompt is NUMBER TO DELETE? and the maximum number possible is shown on the second line of this prompt. Enter the number of ARRAY ELEMENTS to be deleted and press ENTER. Assume we pressed 2 for this prompt. Using the ARRAY shown in FIGURE 2, (PAGE 14) let's see the results of the example inputs:

<u>ORIGINAL VALUE:</u>	<u>ARRAY LOCATION:</u>	<u>AFTER DELETE:</u>
101.25	1	101.25
101.75	2	101.75
98.5	3	92.75
97.25	4	92.75
92.75	5	93
92.75	6	106.5
93	7	106.75
106.5	8	107.375
106.75	9	-----
107.375	10	-----

As you can see, two ARRAY ELEMENTS were deleted, starting at location 3. The data originally in ARRAY ELEMENTS 5 and higher were moved 2 ARRAY ELEMENTS towards the beginning of the ARRAY to fill in the spaces left by the deletion. The variable EOA was decremented by the number of ARRAY ELEMENTS deleted.

5 - STORE FILE

CASSETTE VERSION: Pressing 5 at the MAIN MENU will display the following:

CS1 - STORE FILE

CONTINUE?(Y/N)

If you desire to store the ARRAY in memory as a file on CS1, then press Y and follow the screen prompts. Pressing N returns you to the MAIN MENU immediately.

DISK VERSIONS: Pressing 5 at the MAIN MENU causes the program to access the default drive specified when the program started, and to display the following screen:

DISKNAME FREE: XXX

STORE FILE

LIST DISK INDEX? (Y/N)

If you wish to see the filenames already on the disk, press Y otherwise press N.

Next the following appears at the bottom of the screen:

LAST USED: DSK?.FILENAME
ENTER FILENAME OR:
REDO - FOR ANOTHER DISK
CS1 - FOR CASSETTE
EXIT - TO ABORT

You now have the following options:

- 1) Enter the FILENAME you wish to store your data under (on the default disk drive).
- 2) Enter REDO to read the index of another disk in the same disk drive (follow the screen prompts if you choose this).
- 3) Enter CS1 if you wish to store the FILE on a cassette.
- 4) Enter EXIT if you do not wish to store the data at all.

LAST USED will show the complete filename of the last FILE used, either for input or output, unless the ARRAY in memory was just created using MENU FUNCTION 7, CREATE NEW ARRAY.

NOTE: There is no protection against over-filling a disk. You need to monitor the FREE value (number of disk blocks unused) to avoid over-filling the disk and losing data.

NOTE: It is recommended that you use a separate disk for your data files (not the TRENDLINE DISK). If you do use the TRENDLINE disk for data files, do not use the following filenames:

INIT* * LOAD INTRO 16K 48K SAMPLE MAXFILE

6 - INPUT FILE

CASSETTE VERSION: Pressing 6 at the MAIN MENU will display the following:

CS1 - INPUT FILE

CONTINUE?(Y/N)

If you desire to input a FILE from CS1, press Y. Pressing N returns you to the MAIN MENU immediately.

Next, the program prompts you to enter a FILENAME. This will be included on all data output to your printer. Now follow the screen prompts to input your FILE.

DISK VERSIONS: Pressing 6 at the MAIN MENU causes the program to access the default drive specified when the program started, and to display the following screen:

DISKNAME FREE: XXX

INPUT FILE

LIST DISK INDEX? (Y/N)

If you wish to see the filenames already on the disk, press Y otherwise press N.

Next the following appears at the bottom of the screen:

LAST USED: DSK?.FILENAME
ENTER FILENAME OR:
REDO - FOR ANOTHER DISK
CS1 - FOR CASSETTE
EXIT - TO ABORT

You now have the following options:

- 1) Enter the FILENAME of the FILE you wish to input.
- 2) Enter REDO to read the index of another disk in the same disk drive (follow the screen prompts if you choose this).
- 3) Enter CS1 if you wish to input the FILE from a cassette.
- 4) Enter EXIT if you do not wish to input any data at all.

LAST USED will show the complete filename of the last FILE used, either for input or output, unless the ARRAY in memory was just created using MENU FUNCTION 7, CREATE NEW ARRAY.

7 - CREATE NEW ARRAY

Pressing 7 on the MAIN MENU allows you to CREATE a NEW ARRAY. If an ARRAY is in memory, the following prompt appears:

ARRAY IN MEMORY
WILL BE ERASED!

CONTINUE?(Y/N)

Press N if you do not want to CREATE a NEW ARRAY. The program will return to the MAIN MENU immediately.

Pressing Y will set the EOA variable and all ARRAY ELEMENTS to zero, and the LAST USED FILENAME is erased.

Now go to MENU GUIDE 4.1, CHANGE VALUES. Enter the new ARRAY values as described. Everything is the same as shown for MENU GUIDE 4.1 except the function title line, which is shown here:

*** CREATE NEW ARRAY ***

8 - QUIT

When you have completed your session with TRENDLINE, press 8 at the MAIN MENU. The following prompt will appear:

ARRAY IN MEMORY
WILL BE ERASED!

TERMINATE?

CONTINUE?(Y/N)

This gives you a last chance to reconsider, in case you might have pressed the wrong key. Press Y to terminate the program, or N to return to the MAIN MENU with your data still intact.