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PROGRAM DESCRIPTION

1

LINE CHART

What the Programs are Designed To Do:

The LINE CHART plotting package consists (as does each package in this Solutions Book) of two programs: a file creation/editing program and a plotting program. The editing program prompts the user for inputs by which data files that contain the information necessary to create plots using the HP 7470A plotter are created. The plot program translates these data files into the appropriate HP-GL* commands to create plots with the plotter. The programs are recorded on the included magnetic cards under the file names "LEDIT" and "LPLOT" respectively.

The package allows the user to plot single-page, single- or multiple-line charts. (The package should work with either the HP-IL option of the HP 7470A plotter or with other interface options if the appropriate interconnect device is used.) The axes are not movable: the x-axis is located at the bottom and the y-axis is at the extreme left side of the plot. The axes may be labeled, as may the plot as a whole (with a "main title" and "subtitle"), and the axes may be subdivided into numerically labeled segments using labeled tic marks. The user may select between six line types and two pen colors for use in plotting the line(s). Each line has a legend by which it may be described.

The programs interface nicely with mass storage and display devices. The programs work especially well with the HP 82163 Video Interface if it is specified as the DISPLAY IS device. Printers are not supported by the programs because of the nature of the plotter interface. The plotter must be addresses as the PRINTER IS device and therefore no other printer device may be accessed while running the programs.

* Hewlett-Packard Graphics Language - see your HP 7470A Interfacing and Programming Manual.

SAMPLE PROBLEM

The following example assumes that the user has loaded the edit and the plot programs into memory under the file names "LEDIT" and "LPLOT" respectively. The example also assumes that the file "LINEDATA" does not exist in memory, that the HP 7470A is on the HP-IL loop, that it has been assigned a device specifier and has been specified as the printer device (via the PRINTER IS command).

DISPLAY		KEYSTROKES
Line Pla	ot File Creation	run "ledit" [RTN]
Th cr nai	e initial prompts are straight forwa eate a new plot file and will use th me "LINEDATA".	rd. We would like to e default data file
New, ol	d file, quit (n/o/q)? n	[RTN]
New data	a file name? LINEDATA	[RTN]
Sin for The use ste	nce the file is new, it is empty. W r the plot's titles, and set the x- e titles used in this example are su ed for both the x- and y-axes is the eps of 10.	e must supply values and y-scale values. perfluous. The scale range 0 to 100 in
Main tid	tle:	Main Title [RTN]
Subtitle	e:	Subtitle [RTN]
X axis d	title:	X Axis [RTN]
Y axis d	title:	Y Axis [RTN]
X min,ma	ax,inc.: 0,0,0	0,100,10 [RTN]
Y min,ma	ax,inc.: 0,0,0	0,100,10 [RTN]
Number o	of lines: 1	2 [RTN]
Ond	ce the number of lines is specified,	descriptive legends,
lin	ne types and pen color must be chose	n for each line. The
leg	gend titles in the example are super	fluous. We will
se	lect line type 2 and default pen 1 (the left pen of the
HP	7470) for line one. For line two w	e will select line
typ	pe 7 and pen 2 (the right pen of the	HP 7470A).
Upper le	egend #1:	Line 1 [RTN]
Lower le	egend #1:	[RTN]
Line typ	pe & pen #1: 1,1	2 [RTN]
Upper le	egend #2:	Line 2 [RTN]
Lower le	egend #2:	(second line) [RTN]
Line typ	pe & pen #2: 1,1	7,2 [RTN]

2

SAMPLE PROBLEM

DISPLAY

KEYSTROKES

Each line must contain points to be plotted and these are specified as xy coordinate pairs. Note that all of the points specified must fall within the range 0 to 100 for both x and y in accordance with the scales selected above. Values outside this range would be rejected by the program.

Line	1,	# of points? 2	4 [RTN]
Line	1,	point 1: 0,0	[RTN]
Line	1,	point 2: 0,0	25,32 [RTN]
Line	1,	point 3: 0,0	50,19 [RTN]
Line	1,	point 4: 0,0	75,86 [RTN]
Line	2,	# of points? 2	5 [RTN]
Line Line	2, 2,	<pre># of points? 2 point 1: 0,0</pre>	5 [RTN] [RTN]
Line Line Line	2, 2, 2,	<pre># of points? 2 point 1: 0,0 point 2: 0,0</pre>	5 [RTN] [RTN] 15,25 [RTN]
Line Line Line Line	2, 2, 2, 2,	<pre># of points? 2 point 1: 0,0 point 2: 0,0 point 3: 0,0</pre>	5 [RTN] [RTN] 15,25 [RTN] 30,45 [RTN]
Line Line Line Line Line	2, 2, 2, 2, 2,	<pre># of points? 2 point 1: 0,0 point 2: 0,0 point 3: 0,0 point 4: 0,0</pre>	5 [RTN] [RTN] 15,25 [RTN] 30,45 [RTN] 63,37 [RTN]

Once all of the points for all of the lines are specified, the program cycles to permit either the creation of a new file or the editing of an old file. In this case, we will go back to modify the file just created. An existing file may reside on a mass storage device, so the program asks for the device specifier. No input for the device specifier indicates that the file exists in HP-75 memory. The file is found and its catalog information is displayed for user verification. ("tt:tt dd/dd/dd" in the example represents the time and date display corresponding to the file's creation time.)

New, old file, quit (n/	o/q)?n o[RTN]
Old data file name? LIN	EDATA [RTN]
Device specifier?	[RTN]
LINEDATA B 1021 tt:tt	dd/dd/dd

The user is asked whether or not the plot titles and scales are to be edited. We answer "yes". The existing values are redisplayed for editing. The value for the main title is changed by typing the new title over the old. Existing values are retained by pressing [RTN] as they are displayed.

SAMPLE PROBLEM

DISPLAY

Plot speed (f/m/s) ? s

4

KEYSTROKES

f [RTN]

Edit titles & scale (y/n/q)? n y [RTN] Main title: Main Title Fun and Games [RTN] Subtitle: Subtitle [RTN] X axis title: X Axis [RTN] Y axis title: Y Axis [RTN] X min, max, inc.: 0,100,10 [RTN] Y min, max, inc.: 0,100,10 [RTN] Since we may not want to change the legends, line types and pens, the program prompts us. In this case we do: a value for lower legend 1 is added. The other values are retained by pressing [RTN]. Number of lines: 2 [RTN] Edit legends (y/n/q)? n y [RTN] Upper legend #1: Line 1 [RTN] Lower legend #1: (first line) [RTN] Line type & pen #1: 2,1 [RTN] Upper legend #2: Line 2 [RTN] Lower legend #2: (second line) [RTN] Line type & pen #2: 7,2 [RTN] We opt not to change the values of the points in the lines. Edit points (y/n/q)? n [RTN] The program recycles and we choose to quit. New, old file, quit (n/o/q)? n q [RTN] Having created a data file, we choose to plot the information. The default file name is that of our file (since we chose the default in the edit program) and it still exists in memory. We are given a choice of plotting speeds: fast, medium and slow. We choose fast. The program proceeds to generate the plot. run "lplot" Line Plot Data file name? LINEDATA [RTN] Device specifier? [RTN] B 1036 tt:tt dd/dd/dd LINEDATA



Y Axis



CREATING A NEW FILE

DISPLAY KEYST

STEP (NEW) 1:

run "ledit" [RTN]

Line Plot File Creation

This output identifies the program and will remain in the display for the duration of the DELAY specified by the user. If the HP 82163 Video Interface is used, this display will appear at the top of the CRT and will remain there for the duration of the program.

New, old file, quit (n/o/q)? n n, o or q [RTN]

This prompt requests the type of file to be manipulated by the program. The program is capable of creating a new plot file or of modifying an existing plot file. The prompt also gives the option of quitting the program without manipulating a data file. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared.

The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response. Therefore, responses such as "new", "old" and "quit" are acceptable. The strings may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons, first character not n, o or q) will generate an error and cause the prompt to be repeated. Select "n" to create a new file ("n" is the default, so just press [RTN]).

STEP (NEW) 3:

New data file name? LINEDATA

8 character string [RTN]

This prompt requests the name of the data file to be created. Any string of up to 8 characters, upper or lower case, will be accepted. Strings longer than 8 characters or containing commas, semicolons or quotation marks will generate an error message and cause the prompt to be repeated. An invalid file specifier will not be detected until the program tries to access the file. At that time an error will be generated and the prompt will be redisplayed.

STEP (NEW) 2:

DISPLAY

KEYSTROKES

The default file name "LINEDATA" will be displayed any time the program is RUN or the program has cycled and "LINEDATA" was the last file name used. Otherwise, the last file name specified (even if it caused an error) will be displayed. The default file name may be used by pressing [RTN] with no input. The file name may be modified or replaced by pressing the appropriate keys (the [CLR], [SHIFT][DEL], [DEL], [I/R] and [BACK] keys are active at this time) before pressing [RTN] to accept the input.

If a file of the same name exists in memory, the catalog information of existing file will be displayed and the user will be asked if the file is to be purged.

'filename' exists in memory, purge (y/n)? n

> An affirmative response will purge the file and continue the program at step (NEW) 4. A negative response will cycle the program to step (NEW) 2 of the User Instructions without affecting the existing file. ("filename" in the above example will be replaced by the actual file name.)

up to 50 characters [RTN]

The program is asking for the main title of the plot. This title may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. The title will be plotted parallel to the x-axis along the top of the graph. Pressing [RTN] with no input is acceptabel and will cause no title to be plotted.

STEP (NEW) 5:

Subtitle:

up to 50 characters [RTN]

The program is asking for the subtitle of the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. The subtitle will be plotted parallel to the x-axis immediately below the main title (or immediately below the place the

STEP (NEW) 4:

Main Title:

DISPLAY

KEYSTROKES

main title would be). Pressing [RTN] with no input is acceptable and will cause no subtitle to be plotted.

STEP (NEW) 6:

X axis title:

up to 50 characters [RTN]

The program is asking for the title of the x-axis for the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. It will be plotted parallel to and immediately below the x-axis. Pressing [RTN] with no input is acceptable and will cause no title to be plotted.

Y axis title:

up to 50 characters [RTN]

The program is asking for the title of the y-axis for the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. It will be plotted parallel to and immediately to the left of the y-axis. Pressing [RTN] with no input is acceptable and will cause no title to be plotted.

X min, max, inc.: 0,0,0

3 numeric values [RTN]

This prompt requests the scaling of the x-axis and requires three numeric inputs separated by commas. The first value to be input is the leftmost x value to be plotted. It may be negative or positive, integer or real. The second input value is the rightmost x value to be plotted. It may be negative or positive, integer or real. The values are most commonly, but need not be, the smallest and largest x values, respectively. The program will allow the leftmost point on the x-axis (x-min) to be larger than the rightmost point (x-max). A plot in which the x-axis ranges from 100 to -100 is therefore allowed. The only restriction on the values of x-min and x-max is that they cannot be equal. Invalid inputs will generate an error and cause the prompt to be repeated.

STEP (NEW) 7:

STEP (NEW) 8:

DISPLAY

KEYSTROKES

The third input value is the x increment. This value specifies the distance between subdivisions (tic marks) on the axis. The input value is restricted by the values of x-min and x-max. The magnitude of the increment must be less than or equal to the distance between x-min and x-max. An input of 0,100,101 is therefore not allowed. The arithmetic sign of the increment must also agree with direction of increment. If the value of x-max is greater than that of x-min (an increase), the increment must be positive. A valid example is -5,5,1. If the value of x-min is greater than that of x-max (a decrease), the increment must be negative. A valid example is 5,-5,-1. The increment value cannot be zero.

All tics will be labeled with their x-coordinate. Tics should be spaced wide enough that the labels do not overlap.

STEP (NEW) 9:

Y min, max, inc.: 0,0,0

3 numeric values [RTN]

This prompt requests the scaling of the y-axis and requires three numeric inputs separated by commas. The first value to be input is the bottommost y value to be plotted. It may be negative or positive, integer or real. The second input value is the topmost y value to be plotted. It may be negative or positive, integer or real. The values are most commonly, but need not be, the smallest and largest y values, respectively. The program will allow the bottommost point on the y-axis (y-min) to be larger than the topmost point (y-max). A plot in which the y-axis ranges from 100 to -100 is therefore allowed. The only restriction on the values of y-min and y-max is that they cannot be equal. Invalid inputs will generate an error and cause the prompt to be repeated.

The third input value is the y increment. This value specifies the distance between subdivisions (tic marks) on the axis. The input value is restricted by the values of

DISPLAY

KEYSTROKES

y-min and y-max. The magnitude of the increment must be less than or equal to the distance between y-min and y-max. An input of 0,100,101 is therefore not allowed. The arithmetic sign of the increment must also agree with direction of increment. If the value of y-max is greater than that of y-min (an increase), the increment must be positive. A valid example is -5,5,1. If the value of y-min is greater than that of y-max (a decrease), the increment must be negative. A valid example is 5,-5,-1. The increment value cannot be zero.

All tics will be labeled with their y-coordinate. Tics should be spaced wide enough that the labels do not overlap.

STEP (NEW) 10:

Number of lines: 1

an integer [RTN]

The program is asking for the number of lines to be plotted. Valid input is a single integer between 1 and 50. All other inputs will generate an error and cause the prompt to be repeated. The program can store up to 50 different lines, but the physical limitations of the plot will not support this extreme. For example, more than 10 or 12 lines will cause crowding of the legends and with 2 pens and 7 line types only 14 distinct lines can be drawn.

STEP (NEW) 11:

Upper legend #1:

up to 50 characters [RTN]

The program is asking for the first half of the descriptive label for line 1. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. It will be plotted parallel to and immediately below the subtitle. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. Pressing [RTN] with no input is acceptable and will cause no upper legend to be plotted. Note that to prevent crowding, fewer than 50 characters should be used based on the number of legends to be plotted.

DISPLAY

KEYSTROKES

STEP (NEW) 12:

Lower legend #1:

up to 50 characters [RTN]

The program is asking for the second half of the descriptive label for line 1. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. It will be plotted parallel to and immediately below the upper legend. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. Pressing [RTN] with no input is acceptable and will cause no lower legend to be plotted. Note that to prevent crowding, fewer than 50 characters should be used based on the number of legends to be plotted.

STEP (NEW) 13:

Line type & pen #1: 1,1

2 integers [RTN]

The program is asking for the line type and pen number. Valid line type values are integers between 1 and 7 while valid pen numbers are 1 and 2. All other inputs will generate an error and cause the prompt to be repeated. A list of the line types can be found on page 6. Pen #1 is the left-hand pen on the HP 7470 plotter while pen #2 is the right-hand pen.

Steps (NEW) 11 through 13 will be repeated for each line as specified by step (NEW) 10.

STEP (NEW) 14:

Line 1, # of points? 2

integer [RTN]

The program is requesting the number of data points to be used in plotting the line. Since a line consists of a minimum of 2 points, this is the minimum and the default input. The program will accept up to 50 points per line. Any number of points, from 2 to 50 may be input. Any other input will generate an error and the prompt will be repeated. Once specified, the user must enter a value for each point. Mismatching the number specified here and the number of points actually entered will cause a variety of undesirable results.

DISPLAY

KEYSTROKES

STEP (NEW) 15:

Line 1, point 1: 0,0

2 real numbers [RTN]

The program is asking for the x- and y-coordinates of the first point to be plotted. Two real valued numbers must be specified that are within the scales specified in User Instruction steps (NEW) 8 and 9. Values outside these ranges will generate an error and cause the prompt to be repeated, as will non-numeric values and too few or too many inputs.

This step will be repeated for each data point in the line as specified in step (NEW) 14. Steps (NEW) 14 and 15 will be repeated for each line as specified in step (NEW) 10.

When all of the points in all of the lines have been specified, the program will cycle back to step (NEW) 2.

EDITING AN EXISTING FILE

DISPLAY	KEYSTROKES

STEP (OLD) 1:

run "ledit" [RTN]

Line Plot File Creation

This output identifies the program and will remain in the display for the duration of the DELAY specified by the user. If the HP 82163 Video Interface is used, this display will appear at the top of the CRT and will remain there for the duration of the program.

STEP (OLD) 2:

New, old file, quit (n/o/q)? n n, o or q [RTN]

This prompt requests the type of file to be manipulated by the program. The program is capable of creating a new plot file or of modifying an existing plot file. The prompt also gives the option of quitting the program without manipulating a data file. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared.

The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response. Therefore, responses such as "new", "old" and "quit" are acceptable. The strings may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons, first character not n, o or q) will generate an error and cause the prompt to be repeated. Select "o" to edit an existing file.

STEP (OLD) 3:

Old data file name? LINEDATA 8 character string [RTN]

This prompt requests the name of the data file to be manipulated. Any string of up to 8 characters, upper or

DISPLAY

KEYSTROKES

lower case, will be accepted. Strings longer than 8 characters or containing commas, semicolons or quotation marks will generate an error message and cause the prompt to be repeated. A string that represents an invalid file specifier will not be detected until the program tries to access the file. At that time an error will be generated and the prompt will be redisplayed.

The default file name "LINEDATA" will be displayed any time the program is RUN or if the program has cycled and "LINEDATA" was the last file name used. Otherwise, the last file name specified (even if it caused an error) will be displayed. The default file name may be used by pressing [RTN] with no input. The file name may be modified or replaced by pressing the appropriate keys (the [CLR], [SHIFT][DEL], [DEL], [I/R] and [BACK] keys are active at this time) before pressing [RTN] to accept the input.

STEP (OLD) 4:

Device specifier?

":" & 2 characters [RTN]

Since the old file may exist on some external mass storage device and not in memory, the program asks for the device specifier of the mass storage device. If no device specifier is input, the file is assumed to exist in memory. Device specifiers are of the form ":ab" where "a" is any alphabetical character and "b" is any alphanumeric character. The prompt will accept any input of up to 3 characters.

Any invalid input (string too long, commas, semicolons or quotation marks, first character not ":") will generate an error and cause the prompt to be repeated. An invalid device specifier will not be detected until the program tries to access the device. At such a time, an error will be generated and control will be passed to step (OLD) 2. There is an unavoidable hazard that exists if an invalid device specifier is input or the file does not exist on the specified device and does exist in memory. The program will not detect the invalid device specifier or the nonexistent external file until it has detected the duplicate file name in memory. The catalog information of the existing file will be displayed and the user will be asked if the file is to be purged.

DISPLAY

KEYSTROKES

'filename' exists in memory, purge (y/n)? n

> An affirmative response will purge the memory file before the program has verified the existence or nonexistence of the external file. The user should therefore be relatively certain that the file specifier inputs are accurate. ("filename" in the above example will be replaced by the actual file name.) A response of "n" will cycle the program to step (OLD) 2.

If the program has cycled and a device specifier has previously been input, the last used device specifier will be put into the display - even if it has caused an error. This default may be modified or removed before pressing [RTN] to accept the input.

Edit titles & scale (y/n/q)? n y, n or q [RTN]

Since the user may not desire to alter the values of the titles or scales, the program gives you the choice of skipping them or of quitting all together. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared. The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response. Therefore, responses such as "yes", "no" and "quit" are acceptable. The strings may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons, first character not y, n, or q) will generate an error and cause the prompt to be repeated.

A response of "y" will cause the program to continue at step (OLD) 6 while that of "n" will continue at step (OLD) 12.

STEP (OLD) 6:

Main Title: old title up to 50 characters [RTN]

The program is asking for the main title of the plot. This title may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters.

STEP (OLD) 5:

DISPLAY

KEYSTROKES

Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. The title will be plotted parallel to the x-axis along the top of the graph. Pressing [RTN] with no input will accept the old title (represented by "old subtitle" in the example above). The main title may be omitted by clearing the input display.

STEP (OLD) 7:

```
Subtitle: old subtitle
```

up to 50 characters [RTN]

The program is asking for the subtitle of the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. The subtitle will be plotted parallel to the x-axis immediately below the main title (or immediately below the place the main title would be). Pressing [RTN] with no input will accept the old subtitle (represented by "old subtitle" in the example above). The subtitle may be omitted by clearing the input display.

X axis title: old x-axis title

up to 50 characters [RTN]

The program is asking for the title of the x-axis for the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. It will be plotted parallel to and immediately below the x-axis. Pressing [RTN] with no input will accept the old title (represented by "old x-axis title" in the example above). The title may be omitted by clearing the input display.

STEP (OLD) 9:

Y axis title: old y-axis title

up to 50 characters [RTN]

The program is asking for the title of the y-axis for the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters.

STEP (OLD) 8:

DISPLAY

KEYSTROKES

Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. It will be plotted parallel to and immediately to the left of the y-axis. Pressing [RTN] with no input will accept the old title (represented by "old y-axis title" in the example above). The title may be omitted by clearing the input display.

STEP (OLD) 10:

X min, max, inc.: min, max, inc.

3 numeric values [RTN]

This prompt requests the scaling of the x-axis and requires three numeric inputs separated by commas. The first value to be input is the leftmost x value to be plotted. It may be negative or positive, integer or real. The second input value is the rightmost x value to be plotted. It may be negative or positive, integer or real. The values are most commonly, but need not be, the smallest and largest x values, respectively. The program will allow the leftmost point on the x-axis (x-min) to be larger than the rightmost point (x-max). A plot in which the x-axis ranges from 100 to -100 is therefore allowed. The only restriction on the values of x-min and x-max is that they cannot be equal. Invalid inputs will generate an error and cause the prompt to be repeated.

The third input value is the x increment. This value specifies the distance between subdivisions (tic marks) on the axis. The input value is restricted by the values of x-min and x-max. The magnitude of the increment must be less than or equal to the distance between x-min and x-max. An input of 0,100,101 is therefore not allowed. The arithmetic sign of the increment must also agree with direction of increment. If the value of x-max is greater than that of x-min (an increase), the increment must be positive. A valid example is -5,5,1. If the value of x-min is greater than that of x-max (a decrease), the increment must be negative. A valid example is 5,-5,-1. The increment cannot be zero.

All tics will be labeled with their x-coordinate. Tics should be spaced wide enough that the labels do not overlap.

Pressing [RTN] with no input will accept the existing values (represented by "min,max,inc." in the example above).

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STEP (OLD) 11:

Y min, max, inc.: min, max, inc.

3 numeric values [RTN]

This prompt requests the scaling of the y-axis and requires three numeric inputs separated by commas. The first value to be input is the bottommost y value to be plotted. It may be negative or positive, integer or real. The second input value is the topmost y value to be plotted. It may be negative or positive, integer or real. The values are most commonly, but need not be, the smallest and largest y values, respectively. The program will allow the bottommost point on the y-axis (y-min) to be larger than the topmost point (y-max). A plot in which the y-axis ranges from 100 to -100 is therefore allowed. The only restriction on the values of y-min and y-max is that they cannot be equal. Invalid inputs will generate an error and cause the prompt to be repeated.

The third input value is the y increment. This value specifies the distance between subdivisions (tic marks) on the axis. The input value is restricted by the values of y-min and y-max. The magnitude of the increment must be less than or equal to the distance between y-min and y-max. An input of 0,100,101 is therefore not allowed. The arithmetic sign of the increment must also agree with direction of increment. If the value of y-max is greater than that of y-min (an increase), the increment must be positive. A valid example is -5,5,1. If the value of y-min is greater than that of y-max (a decrease), the increment must be negative. A valid example is 5,-5,-1. The increment cannot be zero.

All tics will be labeled with their y-coordinate. Tics should be spaced wide enough that the labels do not overlap.

Pressing [RTN] with no input will accept the existing values (represented by "min,max,inc." in the example above).

STEP (OLD) 12:

Number of lines: old # of lines

an integer [RTN]

The program is asking for the number of lines to be plotted. Valid input is a single integer between 1 and 50. All other inputs will generate an error and cause the

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prompt to be repeated. The program can store up to 50 different lines, but the physical limitations of the plot will not support this extreme. For example, more than 10 or 12 lines will cause crowding of the legends and with 2 pens and 7 line types only 14 distinct lines can be drawn.

Pressing [RTN] with no input will accept the existing values (represented by "old # of lines" in the example above).

STEP (OLD) 13:

```
Edit legends (y/n/q)? n
```

y, n, or q [RTN]

Since the user may not desire to alter the values of the legends, line types or pen, the program gives you the choice of skipping them or of quitting all together. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared. The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response. Therefore, responses such as "yes", "no" and "quit" are acceptable. The strings may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons, first character not y, n, or q) will generate an error and cause the prompt to be repeated.

Note that an increase in the number of lines in step (OLD) 12 will disallow this option and execution will continue with step (OLD) 14.

A response of "y" will cause the program to continue at step (OLD) 14 while that of "n" will continue at step (OLD) 17.

STEP (OLD) 14:

Upper legend #1: old legend

up to 50 characters [RTN]

The program is asking for the first half of the descriptive label for line 1. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. It will be plotted parallel to and immediately below the subtitle. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. Pressing [RTN] with no input will accept the current value (represented by "old legend" in the example above). The legend may be omitted by clearing the input display. Note that to prevent crowding, many fewer than 50 characters should be used based on the number of legends to be plotted.

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STEP (OLD) 15:

Lower legend #1: old legend

up to 50 characters [RTN]

The program is asking for the second half of the descriptive label for line 1. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. It will be plotted parallel to and immediately below the upper legend. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. Pressing [RTN] with no input will accept the current value (represented by "old legend" in the example above). The legend may be omitted by clearing the input display. Note that to prevent crowding, many fewer than 50 characters should be used based on the number of legends to be plotted.

STEP (OLD) 16:

Line type & pen #1: line, pen

2 integers [RTN]

The program is asking for the line type and pen number. Valid line type values are integers between 1 and 7 while valid pen numbers are 1 and 2. All other inputs will generate an error and cause the prompt to be repeated. A list of the line types can be found on page 6. Pen #1 is the left-hand pen on the HP 7470 plotter while pen #2 is the right-hand pen. Pressing [RTN] with no input will accept the current value (represented by "line, pen" in the example above).

Steps (OLD) 14 through 16 will be repeated for each line as specified by step (OLd) 12.

- STEP (OLD) 17:
- Edit points (y/n/q)? n

y, n, or q [RTN]

Since the user may not desire to alter the values of the points, the program gives you the choice of skipping them or of quitting all together. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared. The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response. Therefore, responses such as "yes", "no" and "quit" are acceptable. The strings may be entered in either upper or

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lower case. Any invalid input (string too long, commas or semicolons, first character not y, n, or q) will generate an error and cause the prompt to be repeated.

Note that an increase in the number of lines in step (OLD) 12 will disallow this option and execution will continue with step (OLD) 19.

A response of "y" will cause the program to continue at step (OLD) 18 while that of "n" will continue at step (OLD) 2.

STEP (OLD) 18:

Edit line 1 (y/n/q)? n

y, n, or q [RTN]

Since the user may not desire to alter the values of the points in line 1, the program gives you the choice of skipping them or of quitting all together. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared. The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response. Therefore, responses such as "yes", "no" and "quit" are acceptable. The strings may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons, first character not y, n, or q) will generate an error and cause the prompt to be repeated.

Note that an increase in the number of lines in step (OLD) 12 will disallow this option and execution will continue with step (OLD) 19.

A response of "y" will cause the program to continue at step (OLD) 19 while that of "n" will continue at step (OLD) 2.

STEP (OLD) 19:

Line 1, # of points? old number integer [RTN]

The program is requesting the number of data points to be used in plotting the line. Since a line consists of a minimum of 2 points, this is the minimum and the default input. The program will accept up to 50 points per line. Any number of points, from 2 to 50 may be input. Any other input will generate an error and the prompt will be

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KEYSTROKES

repeated. Once specified, the user must enter a value for each point. Mismatching the number specified here and the number of points actually entered will cause a variety of undesirable results. Pressing [RTN] with no input will accept the current value.

STEP (OLD) 20:

Line 1, point 1: x, y 2 real numbers [RTN]

The program is asking for the x- and y-coordinates of the first point to be plotted. Two real valued numbers must be specified that are within the scales specified in User Instruction steps (OLD) 10 and 11. Values outside these ranges will generate an error and cause the prompt to be repeated, as will non-numeric values and too few or too many inputs. Pressing [RTN] with no input will accept the current values (represented by "x, y" in the example above).

This step will be repeated for each data point in the line as specified in step (OLD) 19. Steps (OLD) 19 and 20 will be repeated for each line as specified in step (OLD) 12.

When all of the points in all of the lines have been specified, the program will cycle back to step (OLD) 2.

PLOTTING

DISPLAY KEYSTROKES

STEP (PLOT) 1:

run "lplot" [RTN]

Line Plot

This output identifies the program and will remain in the display for the duration of the DELAY specified by the user. If the HP 82163 Video Interface is used, this display will appear at the top of the CRT and will remain there for the duration of the program.

STEP (PLOT) 2:

Data file name? LINEDATA

8 character string [RTN]

This prompt requests the name of the data file to be manipulated. Any string of up to 8 characters, upper or lower case, will be accepted. Strings longer than 8 characters or containing commas, semicolons or quotation marks will generate an error message and cause the prompt to be repeated. A string that represents an invalid file specifier will not be detected until the program tries to access the file. At that time an error will be generated and the prompt will be redisplayed.

The default file name "LINEDATA" will be displayed any time the program is RUN or if the program has cycled and "LINEDATA" was the last file name used. Otherwise, the last file name specified (even if it caused an error) will be displayed. The default file name may be used by pressing [RTN] with no input. The file name may be modified or replaced by pressing the appropriate keys (the [CLR], [SHIFT][DEL], [DEL], [I/R] and [BACK] keys are active at this time) before pressing [RTN] to accept the input. No input indicates that you want to quit the program. If the input display is empty when you press [RTN], the display(s) are cleared and the program ends.

DISPLAY

KEYSTROKES

STEP (PLOT) 3:

Device specifier?

":" & 2 characters [RTN]

Since the file may exist on some external mass storage device and not in memory, the program asks for the device specifier of the mass storage device. If no device specifier is input, the file is assumed to exist in memory. Device specifiers are of the form ":ab" where "a" is any alphabetical character and "b" is any alphanumeric character. The prompt will accept any input of up to 3 characters.

Any invalid input (string too long, commas, semicolons or quotation marks, first character not ":") will generate an error and cause the prompt to be repeated. An invalid device specifier will not be detected until the program tries to access the device. At such a time, an error will be generated and control will be passed to step (PLOT) 2. There is an unavoidable hazard that exists if an invalid device specifier is input or the file does not exist on the specified device and does exist in memory. The program will not detect the invalid device specifier or the nonexistent external file until it has detected the duplicate file name in memory. The catalog information of the existing file will be displayed and the user will be asked if the file is to be purged.

'filename' exists in memory, purge (y/n)? n

> An affirmative response will purge the memory file before the program has verified the existence or nonexistence of the external file. The user should therefore be relatively certain that the file specifier inputs are accurate. ("filename" in the above example will be replaced by the actual file name.) A response of "n" will cycle the program to step (OLD) 2.

If the program has cycled and a device specifier has previously been input, the last used device specifier will be put into the display - even if it has caused an error. This default may be modified or removed before pressing [RTN] to accept the input.

DISPLAY

KEYSTROKES

STEP (PLOT) 4:

Plot Speed (f/m/s)? s

f, m or s [RTN]

The program is asking whether it should plot fast, medium or slow. The selection is mostly user preference, but a slow speed may be required to prevent pen skipping on such things as slides for overhead projectors. Only "f", "m" and "s" are allowed inputs. All other inputs will generate an error and cause the prompt to be repeated.

The program continues from here to generate the plot. When finished, execution will continue at step (PLOT) 2.

ERROR MESSAGES

Number	Message	Description
16	Not enough memory.	Not enough memory exists in order to create or expand the data file.
33	Data type.	The information read from the data file is not of the correct type.
34	No data.	The program tried to read from the data file at a location in which no data is stored.
42	String too long.	The text the user has input is longer than that allowed by the prompt.
43	Numeric input.	The user entered text in response to a numeric prompt.
44	Too many inputs.	Either too many numeric inputs were specified or commas or semicolons were entered in a text string.
51	PRINT # to runfile.	The plot file specified is actually the current program file.
57 & 58	I/O error.	An error occurred when trying to access the HP-IL interface.
62	File not found.	The specified data file was not found either in memory or on the specified mass storage device.
63	Invalid filespec.	Reported only by the plot program: the file name or device specifier is not legal.

Number	Message	Description
63 - 68	File error.	An error occurred when trying to access the data file.
92 - 97	Mass storage error.	The mass storage device has malfunctioned.
98	Not a plot file.	The data file specified is not recognized as being a plot file.
99	Invalid parameter.	The value input is not in the range required by the prompt.
nn	Unable to run.	This is the default message when an error occurs that is not one of those listed above. The error number is reported so that the associated HP-75 error message can be determined.

Length in bytes:

LEDIT	=	5183
LPLOT	=	4440

Variables:

	the edit program
A\$[4]	the user's response to yes/no/quit and new/old/quit questions.
B\$[50]	contains the currently accessed title information.
C\$ [50]	contains the lower legend text.
D\$[3]	the device specifier.
E\$[20]	the error message.
F\$[8]	the file name.
E	an integer variable containing the current error number.
I	an integer variable used as an index in several instances.
L	an integer variable containing the number of lines to be plotted.
LO	an integer variable containing the line type.
N	an integer variable used as a flag to indicate whether or not the file is new. 1 = new, 0 = old.
0	an integer variable that contains the previous number of lines.
P	an integer variable containing the pen number.
S	an integer variable containing the number of points to be plotted.

S0	an integer variable containing the old number of points to be plotted.
X(50,2)	a real array containing the data points for the line.
XO	a real variable containing either the value of x-min or y-min.
X1	a real variable containing either the value of x-max or y-max.
X2	a real variable containing the value of either the x- or y-increment.
	the plot program
A\$[4]	the user's response to yes/no/quit and new/old/quit questions.
B\$[50]	contains the currently accessed title information.
D\$[3]	the device specifier.
E\$[20]	the error message.
F\$[8]	the file name.
Е	an integer variable containing the current error number.
F	a real variable that contains the multiplication factor used to convert the x-axis scale to absolute plotter units.
F1	a real variable that contains the multiplication factor used to convert the y-axis scale to absolute plotter units.
I	an integer variable used as an index in several instances.

J	an integer variable used as an index in several instances.
К	an integer variable containing the number of points to be plotted.
L	an integer variable containing the number of lines to be plotted.
LO	an integer variable containing the line type.
P	an integer variable containing the pen number.
P1	an integer variable containing the containing the plotting offset in characters.
S	an integer variable containing the plot speed.
x	a real variable containing the x-coordinate of the current point.
XO	a real variable containing the value of x-min.
X1	a real variable containing the value of x-max.
X2	a real variable containing the value of the x-increment.
Y	a real variable containing the y-coordinate of the current point.
YO	a real variable containing either the value of y-min.
¥1	a real variable containing the value of y-max.
Y2	a real variable containing the value of the y-increment.

Functions: (only the plot program contains user defined functions)

FNL (H,X,Y,P\$,P,S\$[50],R1,R2)

This function generates all of the labels used in the plot. The parameter H specifies the relative size of the characters. X and Y are the coordinates of the label in absolute plotter units. P\$ is either "C", "L", or "R" indicating whether the label is to be centered, left justified or right justified with respect to the

coordinates. P is the offset in character heights of the label from the coordinates. S\$ is the text to be plotted. R1 and R2 are the rise and run of the label (i.e., the angle between R1 and R2 is the slope on which the label is plotted).

FNM (X,Y)

This function moves the pen (in the up position) to the absolute plotter coordinates specified by X and Y.

FND (X,Y)

This function puts the pen down and draws a line to the absolute plotter coordinates specified by X and Y.

All of the above function return 1 if an error was generated and 0 if they terminate normally.

Data files:

A plot data file is organized as follows:

Line 1 = contains the character "1" used to identify the file as a line plot file.

Line 2 = contains the main title text.

Line 3 = contains the subtitle text.

Line 4 = contains the x - axis title text.

Line 5 = contains the y-axis title text.

Line 6 = contains the x - axis scale values.

Line 7 = contains the y-axis scale values.

Lines 9 through 8 + the number of lines - each line contains the legend text, line type and pen number for the corresponding plot line.

Lines 51 through 50 + the number of lines - each line contains the number of points to be plotted in the corresponding line.

Lines 100 through 100 * the number of lines - the 100 element array representing the xy pairs for each line is stored beginning on each of these lines. The arrays will always take up more than one line, so several lines immediately following each of these lines (line numbers incremented by 1) may contain portions of the array.
10 ! 20 ! Line plot file creation program 30 ! HP-75C Graphics Solutions Book 40 ! February 1983 50 ! 60 DATA "Main title", "Subtitle", "X axi Data for title loop s title","Y axis title" 70 DISP CHR\$(27)&"ELine Plot File Crea Identify program, clear DISPLAY tion" IS device 80 OPTION BASE 1 Option base used by X(50,2)90 DIM A\$[4],B\$[50],C\$[50],D\$[3],E\$[20 String variables],F\$[8] 100 INTEGER E, I, L, LO, N, O, P, S, SO Integer variables 110 REAL X(50,2),X0,X1,X2 Real variables 120 F\$="LINEDATA" @ D\$="" Initialize file name, device spec 130 ! 140 ! file query routine 150 !160 GOSUB 1920 @ GOSUB 1670 ! Clear di splay, set error trap. 170 INPUT "New, old file, quit (n/o/q) ? ", "n";A\$ 180 ON POS("NOQ", UPRC\$(A\$[1,1]))+1 GOT Determine selected routine 0 150, 190, 190, 1960 based on input from line 170 190 ! 200 IF UPRC\$(A\$[1,1])="N" THEN N=1 ELS Set new file flag E N=O 210 ON ERROR GOSUB 1720 @ GOTO 220 Set error trap for file name input 220 IF N THEN DISP "New"; ELSE DISP "01 d"; 230 INPUT " data file name? ",F\$;F\$ 240 ON ERROR GOSUB 1720 @ GOTO 250 Set error trap for device spec input 250 IF NOT N THEN INPUT "Device specif ier? ",D\$;D\$ ELSE 280 260 IF D\$="" THEN 350 If memory resident file, skip tests Test for a bad device specifier 270 IF POS(D\$,":")#1 THEN E=63 @ GOSUB 1750 @ GOTO 250 280 E=0 @ ON ERROR E=ERRN 290 IF N THEN CAT F\$ ELSE COPY D\$ TO F 45 300 OFF ERROR 310 IF N AND NOT E THÊN GOSUB 1590 ! D uplicate file 320 IF N THEN 370 If new file, skip nonexistent error 330 IF E#64 AND E THEN GOSUB 1750 @ GO If not duplicate file, report error TO 130 ! If not duplicate file error. 340 IF E THEN GOSUB 1590 @ GOTO 280 If duplicate file, prompt to purge 350 GOSUB 1670 ! Set error trap. 360 CAT F\$ Display copied file information 370 GOSUB 1670 ! Set error trap. Create and/or address data file 380 ASSIGN # 1 TO F\$,BASIC If new file, store line plot 390 IF N THEN PRINT # 1 ; '1' @ GOTO 4 4Ö ident, skip ident segment

400 READ # 1 ; A\$ Verify that file is plot file 410 IF A\$#'1' THEN E=98 @ GOSUB 1750 @ GOTO 150 420 ! 430 ! Prompt for titles 440 ! If new file, skip edit option 450 IF N THEN 500 Set error trap for error query 460 ON ERROR GOSUB 1730 @ 60TO 470 470 GOSUB 1920 ! Clear display 480 INPUT "Edit titles & scale (y/n/q) ? ","n";A\$ Determine routine to branch to 490 ON POS("YNQ", UPRC\$(A\$[1,1]))+1 GOT based on input from step 4808 0 470,500.750.1960 500 GOSUB 1920 @ RESTORE 60 ! Clear di splay, restore prompt data. Loop to read titles 510 FOR I=2 TO 5 520 GOSUB 1670 ! Set error trap 530 IF NOT N THEN READ # 1.I : B\$ ELSE If not new file, read old values B\$="" Read prompt string 540 READ C\$ Set error trap for title input 550 ON ERROR GOSUB 1730 @ 6010 560 560 DISP C\$; @ INPUT ": ",B\$;B\$ 570 GOSUB 1670 ! Set error trap. Set fatal error trap Store title 580 PRINT # 1,I : B\$ 590 NEXT I 600 ! 610 ! Prompt for scaling 620 ! 630 FOR I=6 TO 7 Loop to read scales If not new file, read/initialize 640 IF NOT N THEN READ # 1.I ; XO.X1.X 2 ELSE X0, X1, X2=0 650 ON ERROR GOSUB 1730 @ 60T0 660 Set error trap for scale input 660 IF I=6 THEN DISP "X";ELSE DISP "Y" First pass is x scale, second is y 670 INPUT " min, max, inc.: ", STR\$ (XO)&" "&STR\$(X1)&","&STR\$(X2);X0,X1,X2 680 IF SGN(X2)#SGN(X1-X0) THEN E=99 @ If increment not right direction, GOSUB 1750 @ GOTO 660 report error 690 IF ABS(X2)>ABS(X1-X0) OR X0=X1 OR If increment larger than scale or NOT X2 THEN E=99 @ GOSUB 1750 @ GOTO 6 =0 of min = max then report error ЬÖ 700 GOSUB 1670 ! Set error trap. Set fatal error trap 710 PRINT # 1,I ; X0,X1,X2 Store the scales values 720 NEXT I 730 ! 740 ! Prompt for # of lines 750 ! 760 GOSUB 1920 ! Clear display. If not new file, read number of 770 IF NOT N THEN READ # 1,8 ; L ELSE lines, else number of lines = 11 = 1 Store old number of lines 780 O=L 790 ON ERROR GOSUB 1730 @ GOTO 760 Set error trap

800 INPUT "Number of lines: ",STR\$(L);	
810 IF L<1 OR L>50 THEN E=99 @ GOSUB 1 750 @ GOTO 760 820 GOSUB 1670 ! Set error trap 830 PRINT # 1,8 ; L 840 !	If number of lines is out of range, report error Set fatal error trap
850 ! Clear old data. 860 FOR I=L+1 TO O 870 GOSUB 1670 ! Set error trap. 880 PRINT # 1,I+8 @ PRINT # 1,I+50 890 J=0 @ ON ERROR GOTO 930 900 RESTORE # 1,I*100+J @ PRINT # 1,I* 100+J	Loop to clear unnecessary line data Set fatal error trap Clear legends/data points for unused lines Clear unused data points
910 J=J+1 920 GOTO 900 930 NEXT I 940 !	
950 ! Prompt for legends, line type, p en	
960 ! 970 IF L>O OR N THEN 1020 980 ON ERROR GOSUB 1730 @ GOTO 990 990 GOSUB 1920 ! Clear display. 1000 INPUT "Edit legends (y/n/q)? ","n	If new file/lines skip cond edit Set error trap for edit prompt
";A\$ 1010 ON POS("YNQ",UPRC\$(A\$[1,1]))+1 GO TO 990,1020,1150,1960 1020 FOR I=1 TO L 1030 GOSUB 1920 @ GOSUB 1670 ! Clear d	Determine routine to branch to based on input from line 1000 Loop for line legend input
<pre>isplay, set error trap. 1040 IF NOT N AND I<=0 THEN READ # 1,I +8; B\$,C\$,L0,P ELSE B\$,C\$="" @ L0,P=1 1050 DN ERROR GOSUB 1730 @ GOTO 1060 1060 DISP "Upper legend #"&STR\$(I); @</pre>	If old data, read it, else initialize values Set error trap for upper legend
<pre>INPUT ": ",B\$;B\$ 1070 ON ERROR GOSUB 1730 @ GOTO 1080 1080 DISP "Lower legend #"&STR\$(I); @ INPUT ": ",C\$;C\$ 1090 DISP "Line type & pen #"&STR\$(I); @ INPUT ": ",C\$;C\$</pre>	Set error trap for lower legend
P	
1100 IF LO<1 OR LO>7 OR P<1 OR P>2 THE N E=99 @ GOSUB 1750 @ GOTO 1090 1110 PRINT # 1,I+8 ; B\$,C\$,LO,P 1120 NEXT I	If line type or pen out of range, report error Store values
1140 ! Prompt for data points	
1150 ! 1160 IF L>O OR N THEN 1210 1170 ON ERROR GOSUB 1730 @ GOTO 1180	If new lines, skip conditional edit Set error trap for edit prompt

1180 GOSUB 1920 ! Clear display. 1190 INPUT "Edit points (y/n/q)? ","n" : A\$ 1200 ON POS("YNQ", UPRC\$(A\$[1,1]))+1 GO Determine routine to branch to based on input from line 1100 TO 1180,1210,1560,1960 Read x-axis scale 1210 READ # 1,6 : X0,X1,X2 Read y-axis scale 1220 READ # 1,7 ; YO,Y1,Y2 1230 ! Loop for line data input 1240 FOR I=1 TO L 1250 IF L>O OR N THEN 1300 If new lines, skip conditional edit 1260 ON ERROR GOSUB 1730 @ GOTO 1270 Set error trap for edit prompt 1270 GOSUB 1920 ! Clear display. 1280 DISP "Edit line "&STR\$(I); @ INPU T " (y/n/q)? ","n";A\$ Determine routine to branch to 1290 ON POS("YNQ",UPRC\$(A\$[1,1]))+1 GO TO 1270.1300.1540.1960 based on input from line 1280 1300 GOSUB 1920 @ GOSUB 1670 ! Clear d isplay, set error trap. 1310 IF NOT N AND I<=O THEN READ # 1.I If exists, read old number of points +50 ; S ELSE S=2 Store old number of points, set 1320 SO=S @ ON ERROR GOSUB 1730 @ GOTO error trap for points input 1330 1330 DISP "Line "&STR\$(I)&". # of poin ts"; @ INPUT "? ",STR\$(S);S 1340 IF S<2 OR S>50 THEN E=99 @ GOSUB If number of points is out of range, 1750 @ GOTO 1330 report error 1350 GOSUB 1670 ! Set error trap. Set fatal error trap 1360 PRINT # 1,I+50 : S @ IF N OR I>0 Store number of points, or THEN PRINT # 1,I*100 ; S initialize file for their storage 1370 IF NOT N AND I<=O THEN RESTORE # If points exist, read and skip array 1, I*100 @ READ # 1 ; X(,) @ GOTO 1390 initialization routine 1380 FOR J=1 TO 50 @ X(J,1),X(J,2)=0 @ Clear array NEXT J Loop for data point input 1390 FOR J=1 TO S 1400 ON ERROR GOSUB 1730 @ GOTO 1410 1410 DISP "Line "%STR\$(I)%", point "%S TR\$(J); 1420 INPUT ": ",STR\$(X(J,1))&","&STR\$(X(J,2));X(J,1),X(J,2)1430 IF XO>X1 THEN 1450 1430-1480: test to see if data point 1440 IF X(J,1)<X0 OR X(J,1)>X1 THEN E= falls between scale minimum and 99 @ GOSUB 1750 @ GOTO 1410 ELSE 1460 maximum 1450 IF X(J.1)>XO DR X(J.1)<X1 THEN E= 99 @ GOSUB 1750 @ GOTO 1410 1460 IF YO>Y1 THEN 1480 1470 IF X(J,2)<YO OR X(J,2)>Y1 THEN E= 99 @ GOSUB 1750 @ GOTO 1410 ELSE 1490 1480 IF X(J,2)>YO OR X(J,2)<Y1 THEN E= 99 @ GOSUB 1750 @ GOTO 1410 1490 IF NOT MOD(J,10) THEN GOSUB 1920 If display is nearly full, clear it 1500 NEXT J 1510 FOR J=S+1 TO SO @ X(J,1),X(J,2)=0 Clear unused points @ NEXT J

1520 GUSUB 1670 ! Set error trap. Set fatal error trap 1530 RESTORE # 1, I*100 @ PRINT # 1 ; X Store data point array (,) 1540 NEXT I Close file 1550 ASSIGN # 1 TO * 1560 GOTO 150 ! Back to the beginning. 1570 ! 1580 ! Prompt to purge duplicate file 1590 ! 1600 IF NOT N THEN CAT F\$ Display duplicate file catalog 1610 ON ERROR GOSUB 1720 @ GOTO 1620 Set error trap for file purge prompt 1620 DISP "'"&F\$&"' exists in memory," @ DISP " purge (y/n)"; @ INPUT "? "." n":A\$ 1630 ON POS("NY",UPRC\$(A\$[1,1]))+1 GOT Determine which routine to branch to based on input from line 1620 0 1620,1660,1640 1640 PURGE F\$ Purge duplicate memory file 1650 RETURN Don't accumulate return address on 1660 POP @ GOTO 130 ! Escape the subro return stack if its not to be used utine. 1670 ! Set fatal error trap 1680 ! Set error trap. 1690 ON ERROR GOSUB 1730 @ GOTO 150 Report error and restart program 1700 RETURN 1710 ! 1720 ! error detection Error report routine 1730 ! 1740 E=ERRN 1750 ! 1760 Es="Unable to run" 1770 IF E=16 THEN E\$="Not enough memor y. " 1780 IF E=33 THEN E\$="Data type." 1790 IF E=34 THEN E\$="No data." 1800 IF E=42 THEN E\$="String too long. 1810 IF E=43 THEN E\$="Numeric input." 1820 IF E=44 THEN E\$="Too many inputs. 1830 IF E=51 THEN E\$="PRINT # to runfi le." 1840 IF E=57 OR E=58 THEN E\$="I/O erro r." 1850 IF E=62 THEN E\$="File not found." 1860 IF E>62 AND E<69 THEN E\$="File er ror." 1870 IF E>91 AND E<98 THEN E\$="Mass st orage error." 1880 IF E=98 THEN E\$="Not a plot file. ... 1890 IF E=99 THEN E\$="Invalid paramete ۳. ¹¹

1900 BEEP 1000 @ DISP "Error "&STR\$(E) &", "&E\$ @ WAIT 2 1910 RETURN 1920 ! 1930 ! Clear display 1930 ! Clear display 1940 DISP CHR\$(27)&"%CHR\$(0)&CHR\$(2) &CHR\$(27)&"J"; 1950 RETURN 1960 ! 1970 ! End program 1980 DISP CHR\$(27)&"E"&CHR\$(27)&"H"; 1990 ASSIGN # 1 TO * 2000 END
Clear ext display from second line
Clear display(s) and close data file

10 ! 20 ! Line plot program 30 ! HP-75 Graphics Solutions Book 40 ! February 1983 50 ! 60 DISP CHR\$(27)&"ELine Plot" Identifies program and clears HP82183A specified as DISPLAY IS 70 OPTION BASE 1 device (via control E) 80 ! Allocates string variables 90 DIM A\$[3],B\$[50],D\$[3],E\$[20],F\$[8] Allocates integer variables 100 INTEGER E, I, J, K, L, LO, P, P1, S Allocates the real variables 110 REAL F, F1, X, X0, X1, X2, Y, Y0, Y1, Y2 120 F\$="LINEDATA" @ D\$="" Initialize file name and device specifier 130 1 Label function 140 DEF FNL(H,X,Y,P\$,P,S\$[50],R1,R2) ! Label No error: return 0; error: return 1 150 FNL=0 @ ON ERROR FNL=1 Send to plotter: pen up, set 160 PRINT "PU;SR"&STR\$(H*.24)&","&STR\$ relative character dimensions (H/2)&":" 170 PRINT "DI"&STR\$(R1)&","&STR\$(R2)&" Send to plotter: set label direction ; ^н 180-200: determine label offset from 180 P1=-LEN(S\$) coordinates in characters 190 IF P\$="R" THEN P1=-P1 200 IF P\$="C" THEN P1=P1/2 Plotter: absolute coordinates X.Y 210 PRINT "PA"&STR\$(X)&","&STR\$(Y)&";" 220 PRINT "CP"&STR\$(P1)&","&STR\$(P)&"; Send to plotter: offset from coordinates in character spacing Send to plotter: plot text string 230 PRINT "LB"&S\$&CHR\$(3) 240 END DEF 250 ! Move function 260 DEF FNM(X,Y) ! Move No error: return 0; error: return 1 270 FNM=0 @ ON ERROR FNM=1 Send to plotter: pen up, move to 280 PRINT "PU"&STR\$(X)&","&STR\$(Y)&";" absolute coordinates X,Y 290 END DEF 300 ! Draw function 310 DEF FND(X,Y) ! Draw No error: return 0; error: return 1 320 FND=0 @ ON ERROR FND=1 HP-IL timeout off for long lines 330 STANDBY ON Send to plotter: pen down, move to 340 PRINT "PD"&STR\$(X)&","&STR\$(Y)&";P absolute coordinates X,Y, pen up U: " Restore timeout trap 350 STANDBY OFF 360 END DEF 370 ! 380 GOSUB 1660 ! Clear display 390 GOSUB 1630 ! Set error trap. 400 INPUT "Data file name? ",F\$;F\$ If no file name, quit program 410 IF F\$="" THEN 1690 ! Quit on no in put. 420 ON ERROR GOSUB 1490 @ GOTO 430 Set error trap for device specifier 430 INPUT "Device specifier? ",D\$;D\$ input 440 IF D\$#"" AND POS(D\$,":")#1 THEN E= Test for invalid device specifier 63 @ GOSUB 1510 @ GOTO 430 450 E=0 @ ON ERROR E=ERRN

Test for file existence or attempt 460 IF D\$="" THEN CAT F\$ ELSE COPY D\$ to copy TO F\$ 470 OFF ERROR If memory file specified and not in 480 IF D\$="" AND E THEN GOSUB 1510 @ G memory, report error OTO 380 If memory file, skip error routine 490 IF D\$="" OR NOT E THEN 560 500 IF E#64 THEN GOSUB 1510 @ GOTO 380 If error other than dup file, report error ! If not duplicate file. 510 CAT F\$ @ ON ERROR GOSUB 1490 @ GOT Display duplicate file catalog, set error trap for purge prompt 0 520 520 DISP "'"&F\$&"' exists in memory," @ DISP " purge (y/n)"; @ INPUT "? ","n "¦A\$ 530 ON POS("NY", UPRC\$(A\$E1,13)) GOTO 5 Determine routine to branch to based on input from line 520 20,380,540 540 PURGE F\$ Purge memory file 550 GOTO 450 ! Retrv copy. Set fatal error trap 560 GOSUB 1630 ! Set error trap. 570 ASSIGN # 1 TO F\$, BASIC Assign channel to data file Read (supposed) file identifier 580 READ # 1 : A\$ 590 IF A\$#"1" THEN E=98 @ GOSUB 1510 @ If file is not line plot file, report error and restart program GOTO 380 600 ! 610 GOSUB 1660 ! Clear display 620 INPUT "Plot speed (f/m/s)? ","s";A \$S 630 IF NOT POS("FMS",UPRC\$(A\$E1,1])) T If not valid plot speed input, HEN E=99 @ GOSUB 1510 @ GOTO 600 report error 640 IF UPRC\$(A\$[1,1])="F" THEN S=38 @ 640-650: determine plot speed GOTO 660 650 IF UPRC\$(A\$[1,1])="M" THEN S=15 EL SF S=3 660 PRINT "IN, PA. VS"&STR\$(S)&"SP1:" Send to plotter: initialize, plot absolute, select velocity, select 670 ! 680 ! Plot titles, frame graph. pen 1 Read main title 690 READ # 1 : B\$ 700 IF FNL(4.7,5600,7479,"C",-.5,B\$,1, Plot main title O) THEN GOSUB 1490 @ GOTO 370 710 GOSUB 1630 ! Set error trap. Set fatal error trap Read subtitle 720 READ # 1 ; B\$ 730 IF FNL(3.7.5600.7207."C".-.5.B\$.1. Plot subtitle ○) THEN GOSUB 1490 GOTO 370 740 IF FNM(1300,750) THEN GOSUB 1490 @ 740-780: frame plot GOTO 370 750 IF FND(1300,6150) THEN GOSUB 1490 ֎ GOTO 370 760 IF FND(9900,6150) THEN GOSUB 1490 @ GOTO 370 770 IF FND(9900,750) THEN GOSUB 1490 @ GOTO 370 780 IF FND(1300,750) THEN GOSUB 1490 @ GOTO 370 790 GOSUB 1630 ! Set error trap. Reset fatal error trap

800 READ # 1 ; B\$ Read x-axis title 810 IF FNL(3,5600,279,"C",-.5,B\$,1,0) Plot x-axis title THEN GOSUB 1490 @ GOTO 370 820 GOSUB 1630 ! Set error trap. Reset fatal error trap 830 READ # 1 : B\$ Read y-axis title 840 IF FNL(3,250,3450,"C",-.5,B\$,0,1) Plot y-axis ttile THEN GOSUB 1490 @ GOTO 370 850 GOSUB 1630 ! Set error trap. Reset fatal error trap 860 READ # 1 ; X0,X1,X2,Y0,Y1,Y2 Read x- and y-scale values 870 ! 880 ! Plot X-tics & tic labels. 890 F=8600/ABS(X1-X0) @ J=0 Scale factor/label value counter 900 FOR I=1300 TO 9900 STEP ABS(X2*F) Loop to plot and label x-tics 910 IF FNM(I,750) THEN GOSUB 1510 @ GO Move to tic location TO 370 920 PRINT "XT" Send to plotter: plot x-tic 930 IF FNL(3,I,750,"C",-1,STR\$(X0+X2*J Label tic),1,0) THEN GOSUB 1510 @ GOTO 370 940 J=J+1 Increment label value counter 950 NEXT I 960 ! 970 ! Plot Y-tics & tic labels. 980 GOSUB 1630 ! Set error trap. Reset fatal error trap 990 F1=5400/ABS(Y1-Y0) @ J=0 Scale factor/label value counter 1000 FOR I=750 TO 6150 STEP ABS(Y2*F1) Loop to plot and label y-tics 1010 IF FNM(1300,I) THEN GOSUB 1510 @ Move to tic location GOTO 370 1020 PRINT "YT" Send to plotter: plot y-tic 1030 IF FNL(3,1200,I,"L",-.25,STR\$(YO+ Label tic Y2*J),1,0) THEN GOSUB 1510 @ GOTO 370 1040 J=J+1 Increment label value counter 1050 NEXT I 1060 ! 1070 ! Plot legends & lines. 1080 GDSUB 1630 ! Set error trap. Reset fatal error trap 1090 READ # 1 ; L Read # of lines 1100 FOR I=1 TO L Loop to plot lines and line legends 1110 GOSUB 1630 ! Set error trap. Reset fatal error trap 1120 RESTORE # 1.I+8 1130 READ # 1 ; B\$ Read upper legend 1140 PRINT "SP1:LT:" Pen 1, solid line 1150 IF FNL(2.6.1300+I*(8600\(L+1)).68 Plot upper legend 00, "C", 0, B\$, 1, 0) THEN GOSUB 1490 @ GOT 0 370 1160 GOSUB 1630 ! Set error trap. Reset error trap 1170 READ # 1 ; B\$,LO,P Lower legend, line type, pen value 1180 IF FNL(2.6,1300+I*(8600\(L+1)),68 Plot lower legend 00, "C", -1, B\$, 1, 0) THEN GOSUB 1490 @ GO TO 370 1190 PRINT "SP"&STR\$(P)&";LT"&STR\$(LO) Plotter: select line type and pen 8" : "

1200 IF FNM(1000+I*(8600\(L+1)),6400) THEN GOSUB 1490 @ GOTO 370 1210 IF FND(1600+I*(8600\(L+1)),6400) THEN GOSUB 1490 @ GOTO 370 1220 !	1200-1210: sample line for legend
1230 GOSUB 1630 ! Set error trap. 1240 READ # 1,I+50 ; K 1250 READ # 1,I*100 ; X,Y 1260 IF X0>X1 THEN 1300 1270 IF Y0 <y1 1290<br="" then="">1280 IF FNM(ABS(X0-X)*F+1300,6150-ABS(Y1-Y)*F1) THEN GOSUB 1490 @ GOTO 370 E LSE 1340 1290 IF FNM(ABS(X0-X)*F+1300,750+ABS(Y 0-Y)*F1) THEN GOSUB 1490 @ GOTO 370 EL SE 1340 1300 IF Y0<y1 1320<br="" then="">1310 IF FNM(9900-ABS(X1-X)*F,6150-ABS(Y1-Y)*F1) THEN GOSUB 1490 @ GOTO 370 E LSE 1340 1320 IF FNM(9900-ABS(X1-X)*F,750+ABS(Y 0-Y)*F1) THEN GOSUB 1490 @ GOTO 370 E LSE 1340 1320 IF FNM(9900-ABS(X1-X)*F,750+ABS(Y 0-Y)*F1) THEN GOSUB 1490 @ GOTO 370 EL SE 1340</y1></y1>	Reset fatal error trap Read # of data points Read first data pair 1260-1320: move to scaled location
1340 FOR J=1 TO K-1 1350 GDSUB 1630 ! Set error trap. 1360 READ # 1 ; X,Y 1370 IF X0>X1 THEN 1410 1380 IF Y0 <y1 1400<br="" then="">1390 IF FND(ABS(X0-X)*F+1300,6150-ABS(Y1-Y)*F1) THEN GDSUB 1490 @ GDTO 370 E LSE 1440 1400 IF FND(ABS(X0-X)*F+1300,750+ABS(Y 0-Y)*F1) THEN GDSUB 1490 @ GDTO 370 EL SE 1440 1410 IF Y0<y1 1430<br="" then="">1420 IF FND(9900-ABS(X1-X)*F,6150-ABS(Y1-Y)*F1) THEN GDSUB 1490 @ GDTO 370 E LSE 1440 1430 IF FND(9900-ABS(X1-X)*F,750+ABS(Y 0-Y)*F1) THEN GDSUB 1490 @ GDTO 370 E LSE 1440 1430 IF FND(9900-ABS(X1-X)*F,750+ABS(Y 0-Y)*F1) THEN GDSUB 1490 @ GDTO 370 EL SE 1440 1430 IF FND(9900-ABS(X1-X)*F,750+ABS(Y 0-Y)*F1) THEN GDSUB 1490 @ GDTO 370 EL SE 1440 1440 NEXT J 1450 NEXT I 1460 !</y1></y1>	Loop to plot data points Reset fatal error trap Read next data pair 1370-1430: plot scaled location
1460 ! 1470 PRINT "PUO,O;SP;" 1480 GDTO 1690 ! Clear display, end. 1490 ! 1500 E=ERRN 1510 ! 1520 E\$="Unable to run." 1530 IF E=33 THEN E\$="Data type." 1540 IF E=34 THEN E\$="No data."	Plotter: absolute coordinates 0,0 End program Error report routine

1550 IF E=42 THEN E\$="String too long. .. 1560 IF E=43 THEN E*="Numeric input." 1570 IF E=44 THEN E\$="Too many inputs. .. 1580 IF E=62 THEN E\$="File not found." 1590 IF E=63 THEN E\$="Invalid filespec . 11 1600 IF E=99 THEN E\$="Invalid paramete r- " '' 1610 BEEP 1000 @ DISP "Error "&STR\$(E) &", "&E\$ @ WAIT 2 1620 RETURN 1630 ! 1640 ON ERROR GOSUB 1490 @ GOTO 380 1650 RETURN 1660 ! 1670 DISP CHR\$(27)&"%"&CHR\$(0)&CHR\$(2) &CHR\$(27)&"J": 1680 RETURN 1690 ! 1700 DISP CHR\$(27)&"E"&CHR\$(27)&"H"; 1710 ASSIGN # 1 TO * 1720 END

Fatal error routine Report error, restart program

Clear external display second line

Clear display(s), close data file

PROGRAM DESCRIPTION

BAR CHART

What the Programs are Designed To Do:

The BAR CHART plotting package consists (as does each package in this Solutions Book) of two programs: a file creation/editing program and a plotting program. The editing program prompts the user for inputs by which data files that contain the information necessary to create plots using the HP 7470A plotter are created. The plot program translates these data files into the appropriate HP-GL[#] commands to create plots with the plotter. The programs are recorded on the included magnetic cards under the file names "BEDIT" and "BPLOT" respectively.

The package allows the user to plot single-page, multiple bar charts. (The package should work with either the HP-IL option of the HP 7470A plotter or with other interface options if the appropriate interconnect device is used.) The axes are not movable: the x-axis is located at the bottom and the y-axis is at the extreme left side of the plot. The axes may be labeled, as may the plot as a whole (with a "main title" and "subtitle"). The user may select between six hatch types and two pen colors for use in plotting the bars. Each bar type has a legend by which it may be described.

The programs interface nicely with mass storage and display devices. The programs work especially well with the HP 82163 Video Interface if it is specified as the DISPLAY IS device. Printers are not supported by the programs because of the nature of the plotter interface. The plotter must be addressed as the PRINTER IS device and therefore no other printer device may be accessed while running the programs.

* Hewlett-Packard Graphics Language - see your HP 7470A Interfacing and Programming Manual.

The following example assumes that the user has loaded the edit and the plot programs into memory under the file names "BEDIT" and "BPLOT" respectively. The example also assumes that the file "BARDATA" does not exist in memory, that the HP 7470A is on the HP-IL interface, that it has been assigned a device specifier and has been specified as the printer device (via the PRINTER IS command). DISPLAY KEYSTROKES run "bedit" [RTN] Bar Plot File Creation The initial prompts are straight forward. We would like to create a new plot file and will use the default data file name "BARDATA". New, old file, quit (n/o/q)? n [RTN] New data file name? BARDATA [RTN] Since the file is new, it is empty. We must supply values for the plot's titles, and set the y-scale values. The titles used in this example are superfluous. The scale used for the y-axis is the range 0 to 100 in steps of 10. Main title: Main Title [RTN] Subtitle: Subtitle [RTN] X axis title: X Axis [RTN] Y axis title: Y Axis [RTN] Y min, max, inc.: 0,0,0 0,100,10 [RTN] 4,3 [RTN] Number of bars, levels: 1,1 Once the number of bars and bar levels are specified. descriptive legends, hatch types and pen color must be chosen for each bar. The legend titles in the example are

chosen for each bar. The legend titles in the example are superfluous. We will select hatch type 2 and default pen 1 (the left-hand pen of the HP 7470A) for level one. For level two we will select hatch type 3 and pen 2 (the right-hand pen of the HP 7470A). For level three we will select hatch type 4 and pen 1.

DISPLAY

KEYSTROKES

Upper legend #1: Level 1 [RTN] [RTN] Lower legend #1: 2 [RTN] Hatch type & pen #1: 1,1 Level 2 [RTN] Upper legend #2: Lower legend #2: (second set) [RTN] Hatch type & pen #2: 2.1 3,2 [RTN] Upper legend #3: Level 3 [RTN] (third set) [RTN] Lower legend #3: Hatch type & pen #3: 3,1 4 [RTN] Each group of bars on the x-axis may be titled. X label 1? Group 1 [RTN] X label 2? Group 2 [RTN] Group 3 [RTN] X label 3? X label 4? Group 4 [RTN] Each bar must have a height that is specified by its y coordinate. Note that all of the heights specified must fall within the range 0 to 100 in accordance with the scale selected above. Values outside this range would be rejected by the program. Level 1, bar 1: 0 10 [RTN] Level 1, bar 2: 0 20 [RTN] Level 1, bar 3: 0 30 [RTN] Level 1, bar 4: 0 40 [RTN] 20 [RTN] Level 2, bar 1: 0 Level 2, bar 2: 0 30 [RTN] Level 2, bar 3: 0 40 [RTN] Level 2, bar 4: 0 50 [RTN] Level 3, bar 1: 0 30 [RTN] Level 3, bar 2: 0 40 [RTN] Level 3, bar 3: 0 50 [RTN] Level 3, bar 4: 0 60 [RTN] Once all of the heights for all of the bars are specified.

Once all of the heights for all of the bars are specified, the program cycles to permit either the creation of a new file or the editing of an old file. In this case, we will go back to modify the file just created. An existing file may reside on a mass storage device, so the program asks for the device specifier. No input for the device specifier indicates that the file exists in HP-75 memory. The file is found and its catalog information is displayed for user verification. ("tt:tt dd/dd/dd" in the example represents the time and date display corresponding to the file's creation time.)

DISPLAY	KEYSTROKES
New, old file, quit (n/o/q)? n Old data file name? BARDATA Device specifier? BARDATA B 370 tt:tt dd/dd/dd	O [RTN] [RTN] [RTN]
The user is asked whether or are to be edited. We answer are redisplayed for editing. is changed by typing the new values are retained by pressi displayed.	not the plot titles and scales "yes". The existing values The value for the main title title over the old. Existing ng [RTN] as they are
Edit titles & scale (y/n/q)? n Main title: Main Title Subtitle: Subtitle X axis title: X Axis Y axis title: Y Axis Y min,max,inc.: 0,100,10	y [RTN] Fun and Games [RTN] [RTN] [RTN] [RTN] [RTN]
Since we may not want to chan pens, the program asks us. I lower legend 1 is added. The pressing [RTN].	ge the legends, hatch types and in this case we do: a value for other values are retained by
Number of bars, levels: 4,3	[RTN]
Edit legends (y/n/q)? n Upper legend #1: Level 1 Lower legend #1: Hatch type & pen #1: 2,1 Upper legend #2: Level 2 Lower legend #2: (second set) Hatch type & pen #2: 3,2 Upper legend #3: Level 3 Lower legend #3: (third set) Hatch type & pen #3: 4,1	y [RTN] [RTN] (first set) [RTN] [RTN] [RTN] [RTN] [RTN] [RTN] [RTN] [RTN] [RTN]
We opt to change neither the for the heights of the bars.	x-axis labels nor the values
Edit x-axis labels (y/n/q)? n Edit bar data (y/n/q) n	[RTN] [RTN]
The program recycles and we c	hoose to quit.

DISPLAY

KEYSTROKES

New, old file, quit (n/o/q)? n q [RTN]

Having created a data file, we choose to plot the information. The default file name is that of our file (since we chose the default in the edit program) and it still exists in memory. We are asked whether the bars are to be stacked or grouped. First we will choose grouped, later we will repeat the plot with stacked bars for the sake of comparison. We are given a choice of plotting speeds: fast, medium and slow. We choose fast.

	run "bplot"
Bar Plot	-
Data file name? BARDATA	[RTN]
Device specifier?	[RTN]
BARDATA B 384 tt:tt dd/dd/dd	
Stacked or grouped plot (s/g)? g	[RTN]
Plot speed (f/m/s) ? s	f [RTN]

The program procedes to generate the plot. When through, it recycles and prompts for a new data file. We will rerun the program plotting the bars as stacked.

Data file name? BARDATA	[RTN]
Device specifier?	[RTN]
BARDATA B 384 tt:tt dd/dd/dd	
Stacked or grouped plot (s/g)? g	s [RTN]
Plot speed (f/m/s) ? s	f [RTN]

Note after the plot has finished that the bars labeled "Group 3" and "Group 4" meet the top of the plot. The stacking of these bars has caused them to exceed the specified scale. This fact is signified by the label "(Range Error)" in the upper right-hand corner of the plot. The offending bars are marked with a dot between the x-axis and the bar's x-axis title.

At this point, the program has returned to the data file prompt. Inputting no name will cause the program to terminate.

Data file name? BARDATA

[CLR][RTN]





sixA Y



Type number

CREATING A NEW FILE

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DISPLAY	KEYSTROKES
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STEP (NEW) 1:

run "bedit" [RTN]

Bar Plot File Creation

This output identifies the program and will remain in the display for the duration of the DELAY specified by the user. If the HP 82163 Video Interface is used, this display will appear at the top of the CRT and will remain there for the duration of the program.

New, old file, quit (n/o/q)? n n, o or q [RTN]

This prompt requests the type of file to be manipulated by the program. The program is capable of creating a new plot file or of modifying an existing plot file. The prompt also gives the option of quitting the program without manipulating a data file. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared.

The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response. Therefore, responses such as "new", "old" and "quit" are acceptable. The strings may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons, first character not n, o or q) will generate an error and cause the prompt to be repeated. Select "n" to create a new file ("n" is the default, so just press [RTN]).

STEP (NEW) 3:

New data file name? BARDATA

8 character string [RTN]

This prompt requests the name of the data file to be created. Any string of up to 8 characters, upper or lower case, will be accepted. Strings longer than 8 characters or containing commas, semicolons or quotation marks will generate an error message and cause the prompt to be

STEP (NEW) 2:

DISPLAY

KEYSTROKES

repeated. An invalid file specifier will not be detected until the program tries to access the file. At that time an error will be generated and the prompt will be redisplayed.

The default file name "BARDATA" will be displayed any time the program is RUN or the program has cycled and "BARDATA" was the last file name used. Otherwise, the last file name specified (even if it caused an error) will be displayed. The default file name may be used by pressing [RTN] with no input. The file name may be modified or replaced by pressing appropriate keys (the [CLR], [SHIFT][DEL], [DEL], [I/R] and [BACK] keys are active at this time) before pressing [RTN] to accept the input.

If main memory is specified (by no input) and a file of the same name exists in memory, the catalog information of the existing file will be displayed and the user will be asked if the file is to be purged.

'filename' exists in memory, purge (y/n)? n

> An affirmative response will purge the file and continue the program at step (NEW) 4. A negative response will cycle the program to step (NEW) 2 of the User Instructions without affecting the existing file. ('filename' in the above example will be replaced by the actual file name.)

Main Title:

up to 50 characters [RTN]

The program is asking for the main title of the plot. This title may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. The title will be plotted parallel to the x-axis along the top of the graph. Pressing [RTN] with no input is acceptable and will cause no title to be plotted.

STEP (NEW) 5:

Subtitle:

up to 50 characters [RTN]

The program is asking for the subtitle of the plot. This may be any string of text, excluding commas, semicolons and

STEP (NEW) 4:

DISPLAY

KEYSTROKES

quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. The subtitle will be plotted parallel to the x-axis immediately below the main title (or immediately below the place the main title would be). Pressing [RTN] with no input is acceptable and will cause no subtitle to be plotted.

STEP (NEW) 6:

X axis title:

up to 50 characters [RTN]

The program is asking for the title of the x-axis for the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. It will be plotted parallel to and immediately below the x-axis. Pressing [RTN] with no input is acceptable and will cause no title to be plotted.

STEP (NEW) 7:

```
Y axis title:
```

up to 50 characters [RTN]

The program is asking for the title of the y-axis for the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. It will be plotted parallel to and immediately to the left of the y-axis. Pressing [RTN] with no input is acceptable and will cause no title to be plotted.

```
STEP (NEW) 8:
```

Y min, max, inc.: 0,0,0

3 numeric values [RTN]

This prompt requests the scaling of the y-axis and requires three numeric inputs separated by commas. The first value to be input is the bottommost y value to be plotted. It may be negative or positive, integer or real. The second input value is the topmost y value to be plotted. It may be negative or positive, integer or real. The values are most commonly, but need not be, the smallest and largest y values, respectively. The program will allow the bottommost point on the y-axis (y-min) to be larger than

DISPLAY

KEYSTROKES

the topmost point (y-max). A plot in which the y-axis ranges from 100 to -100 is therefore allowed. The only restriction on the values of y-min and y-max is that they cannot be equal. Invalid inputs will generate an error and cause the prompt to be repeated.

The third input value is the y increment. This value specifies the distance between subdivisions (tic marks) on the axis. The input value is restricted by the values of y-min and y-max. The magnitude of the increment must be less than or equal to the distance between y-min and y-max. An input of 0,100,101 is therefore not allowed. The arithmetic sign of the increment must also agree with direction of increment. If the value of y-max is greater than that of y-min (an increase), the increment must be positive. A valid example is -5,5,1. If the value of y-min is greater than that of y-max (a decrease), the increment must be negative. A valid example is 5,-5,-1. The increment value cannot be zero.

All tics will be labeled with their y-coordinate. Tics should be spaced wide enough that the labels do not overlap.

STEP (NEW) 9:

Number of bars, levels: 1,1

two integers [RTN]

The program is asking for the number of bars and levels to be plotted. Valid input for the number of bars is an integer between 1 and 50. Valid input for the number of levels is an integer between 1 and 14. All other inputs will generate an error and cause the prompt to be repeated. The program can store up to 50 different bar groups, but the physical limitations of the plot will not support this extreme. For example, more than 10 or 12 bar groups will cause crowding of the legends and with 2 pens and 6 hatch types only 12 distinct bars can be drawn.

STEP (NEW) 10:

Upper legend #1:

up to 50 characters [RTN]

The program is asking for the first half of the descriptive label for line 1. This may be any string of text,

DISPLAY

KEYSTROKES

excluding commas, semicolons and quotation marks, of up to 50 characters. It will be plotted parallel to and immediately below the subtitle. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. Pressing [RTN] with no input is acceptable and will cause no upper legend to be plotted. Note that to prevent crowding, many fewer than 50 characters should be used based on the number of legends to be plotted.

STEP (NEW) 11:

```
Lower legend #1:
```

up to 50 characters [RTN]

The program is asking for the second half of the descriptive label for line 1. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. It will be plotted parallel to and immediately below the upper legend. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. Pressing [RTN] with no input is acceptable and will cause no lower legend to be plotted. Note that to prevent crowding, many fewer than 50 characters should be used based on the number of legends to be plotted.

STEP (NEW) 12:

Hatch type & pen #1: 1,1 2 integers [RTN]

The program is asking for the hatch type and pen number. Valid hatch type values are integers between 1 and 6 while valid pen numbers are 1 and 2. All other inputs will generate an error and cause the prompt to be repeated. A list of the hatch types can be found on page 51. Pen #1 is the left-hand pen on the HP 7470A plotter while pen #2 is the right-hand pen.

Steps (NEW) 10 through 12 will be repeated for each line as specified by step (NEW) 9.

STEP (NEW) 13:

```
X label 1?
```

up to 50 characters [RTN]

Each group of bars may be labeled. This input may be a string of up to 50 characters excluding commas, semicolons

DISPLAY

KEYSTROKES

and quotation marks. Invalid inputs will generate an error message and cause the prompt to be repeated. Pressing [RTN] with no input is acceptable and will cause no label to be plotted. Note that to prevent crowding, many fewer than 50 characters should be used based on the number of labels to be plotted.

This prompt will be repeated for each group of bars as specified in step (NEW) 8.

STEP (NEW) 14:

Level 1, bar 1: 0

a real number [RTN]

Each bar must have a height to be plotted. Note that all of the heights specified must fall within the range specified in step (NEW) 8 or an error will be generated and the prompt repeated. No check is made to see if the accumulated bar heights would excede the scale if the bars were to be stacked. The prompt is repeated for each bar in each level as specified in step (NEW) 8.

Once all of the heights for all of the bars are specified, the program will cycle back to step (NEW) 2 to permit either the creation of a new file or the editing of an old file.

EDITING AN EXISTING FILE

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	DISPLAY	KEYSTROKES

STEP (OLD) 1:

run "bedit" [RTN]

Bar Plot File Creation

This output identifies the program and will remain in the display for the duration of the DELAY specified by the user. If the the HP 82163 Video Interface is used, this display will appear at the top of the CRT and will remain there for the duration of the program.

New, old file, quit (n/o/q)? n n, o or q [RTN]

This prompt requests the type of file to be manipulated by the program. The program is capable of creating a new plot file or of modifying an existing plot file. The prompt also gives the option of quitting the program without manipulating a data file. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared.

The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response. Therefore, responses such as "new", "old" and "quit" are acceptable. The strings may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons, first character not n, o or q) will generate an error and cause the prompt to be repeated. Select "o" to edit an existing file.

STEP (OLD) 3:

Old data file name? BARDATA

8 character string [RTN]

This prompt requests the name of the data file to be manipulated. Any string of up to 8 characters, upper or lower case, will be accepted. Strings longer than 8 characters or containing commas, semicolons or quotation

STEP (OLD) 2:

DISPLAY

KEYSTROKES

marks will generate an error message and cause the prompt to be repeated. A string that represents an invalid file specifier will not be detected until the program tries to access the file. At that time an error will be generated and the prompt will be redisplayed.

The default file name "BARDATA" will be displayed any time the program is RUN or if the program has cycled and "BARDATA" was the last file name used. Otherwise, the last file name specified (even if it caused an error) will be displayed. The default file name may be used by pressing [RTN] with no input. The file name may be modified or replaced by pressing the appropriate keys (the [CLR], [SHIFT][DEL], [DEL], [I/R] and [BACK] keys are active at this time) before pressing [RTN] to accept the input.

STEP (OLD) 4:

Device specifier?

":" & 2 characters [RTN]

Since the old file may exist on some external mass storage device and not in memory, the program asks for the device specifier of the mass storage device. If no device specifier is input, the file is assumed to exist in memory. Device specifiers are of the form ":ab" where "a" is any alphabetical character and "b" is any alphanumeric character. The prompt will accept any input of up to 3 characters.

Any invalid input (string too long, commas, semicolons or quotation marks, first character not ":") will generate an error and cause the prompt to be repeated. An invalid device specifier will not be detected until the program tries to access the device. At such a time, an error will be generated and control will be passed to step (OLD) 2. There is an unavoidable hazard that exists if an invalid device specifier is input or the file doesn't exist on the specified device and does exist in memory. The program will not detect the invalid device specifier or the nonexistent external file until it has detected the duplicate file name in memory. The catalog information of the existing file will be displayed and the user will be asked if the file is to be purged.

DISPLAY

KEYSTROKES

'filename' exists in memory, purge (y/n)? n

> An affirmative response will purge the memory file before the program has verified the existence or nonexistence of the external file. The user should therefore be relatively certain that the file specifier inputs are accurate. ("filename" in the above example will be replaced by the actual file name.) A response of "n" will cycle the program to step (OLD) 2.

If the program has cycled and a device specifier has previously been input, the last used device specifier will be put into the display - even if it has caused an error. This default may be modified or removed before pressing [RTN] to accept the input.

STEP (OLD) 5:

Edit titles & scale (y/n/q)? n y, n or q [RTN]

Since the user may not desire to alter the values of the titles or scales, the program gives you the choice of skipping them or of quitting all together. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared. The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response. Therefore, responses such as "yes", "no" and "quit" are acceptable. The strings may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons, first character not y, n, or q) will generate an error and cause the prompt to be repeated.

A response of "y" will cause the program to continue at step (OLD) 6 while that of "n" will continue at step (OLD) 11.

STEP (OLD) 6:

Main Title: old title up to 50 characters [RTN]

The program is asking for the main title of the plot. This title may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or

DISPLAY

KEYSTROKES

quotation marks) will generate an error and cause the prompt to be repeated. The title will be plotted parallel to the x-axis along the top of the graph. Pressing [RTN] with no input will accept the old title (represented by "old title" in the example above). The main title may be omitted by clearing the input display.

STEP (OLD) 7:

Subtitle: old subtitle

up to 50 characters [RTN]

The program is asking for the subtitle of the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. The subtitle will be plotted parallel to the x-axis immediately below the main title (or immediately below the place the main title would be). Pressing [RTN] with no input will accept the old subtitle (represented by "old subtitle" in the example above). The subtitle may be omitted by clearing the input display.

STEP (OLD) 8:

X axis title: old x-axis title

up to 50 characters [RTN]

The program is asking for the title of the x-axis for the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. It will be plotted parallel to and immediately below the x-axis. Pressing [RTN] with no input will accept the old title (represented by "old x-axis title" in the example above). The title may be omitted by clearing the input display.

STEP (OLD) 9:

Y axis title: old y-axis title

up to 50 characters [RTN]

The program is asking for the title of the y-axis for the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters.

DISPLAY

KEYSTROKES

Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. It will be plotted parallel to and immediately to the left of the y-axis. Pressing [RTN] with no input will accept the old title (represented by "old y-axis title" in the example above). The title may be omitted by clearing the input display.

STEP (OLD) 10:

Y min, max, inc.: min, max, inc.

3 numeric values [RTN]

This prompt requests the scaling of the y-axis and requires three numeric inputs separated by commas. The first value to be input is the bottommost y value to be plotted. It may be negative or positive, integer or real. The second input value is the topmost y value to be plotted. It may be negative or positive, integer or real. The values are most commonly, but need not be, the smallest and largest y values, respectively. The program will allow the bottommost point on the y-axis (y-min) to be larger than the topmost point (y-max). A plot in which the y-axis ranges from 100 to -100 is therefore allowed. The only restriction on the values of y-min and y-max is that they cannot be equal. Invalid inputs will generate an error and cause the prompt to be repeated.

The third input value is the y increment. This value specifies the distance between subdivisions (tic marks) on the axis. The input value is restricted by the values of y-min and y-max. The magnitude of the increment must be less than or equal to the distance between y-min and y-max. An input of 0,100,101 is therefore not allowed. The arithmetic sign of the increment must also agree with direction of increment. If the value of y-max is greater than that of y-min (an increase), the increment must be positive. A valid example is -5,5,1. If the value of y-min is greater than that of y-max (a decrease), the increment must be negative. A valid example is 5,-5,-1. The increment cannot be zero.

All tics will be labeled with their y-coordinate. Tics should be spaced wide enough that the labels do not overlap.

DISPLAY

KEYSTROKES

Pressing [RTN] with no input will accept the existing values (represented by "min,max,inc." in the example above).

STEP (OLD) 11:

Number of bars, levels: old # bars, levels two integers [RTN]

The program is asking for the number of bars and levels per bar to be plotted. Valid inputs are two integers where the number of bars is greater than 0 and the number of levels is between 1 and 14. All other inputs will generate an error and cause the prompt to be repeated.

Pressing [RTN] with no input will accept the existing values (represented by "old" # of bars, levels in the example above).

The program is capable of generating either stacked or grouped bar charts. When dealing with stacked bars, each complete bar is referred to as a bar and each section of the bar is referred to as a level. When dealing with grouped bars, each group is referred to as a bar and each bar in a group is a level.

Edit legends (y/n/q)? n

y, n, or q [RTN]

Since the user may not desire to alter the values of the legends, hatch types or pens, the program gives you the choice of skipping them or of quitting all together. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared. The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response. Therefore, responses such as "yes", "no" and "quit" are acceptable. The strings may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons, first character not y, n or q) will generate an error and cause the prompt to be repeated.

Note that an increase in the number of levels in step (OLD) 11 will skip this option and execution will continue with step (OLD) 13.

STEP (OLD) 12:

DISPLAY

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A response of "y" will cause the program to continue at step (OLD) 13 while that of "n" will continue at step (OLD) 16.

STEP (OLD) 13:

Upper legend #1: old legend

up to 50 characters [RTN]

The program is asking for the first half of the descriptive label for level 1. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. It will be plotted parallel to and immediately below the subtitle. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. Pressing [RTN] with no input will accept the current value (represented by "old legend" in the example above). The legend may be omitted by clearing the input display. Note that to prevent crowding, many fewer than 50 characters should be used based on the number of legends to be plotted.

STEP (OLD) 14:

Lower legend #1: old legend

up to 50 characters [RTN]

The program is asking for the second half of the descriptive label for level 1. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. It will be plotted parallel to and immediately below the upper legend. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. Pressing [RTN] with no input will accept the current value (represented by "old legend" in the example above). The legend may be omitted by clearing the input display. Note that to prevent crowding, many fewer than 50 characters should be used based on the number of legends to be plotted.

STEP (OLD) 15:

Hatch type & pen #1: hatch, pen 2 integers [RTN]

The program is asking for the hatch type and pen number. Valid hatch type values are integers between 1 and 6 while

DISPLAY

KEYSTROKES

valid pen numbers are 1 and 2. All other inputs will generate an error and cause the prompt to be repeated. A list of the hatch types can be found on page 51. Pen #1 is the left-hand pen on the HP 7470A plotter while pen #2 is the right-hand pen. Pressing [RTN] with no input will accept the current value (represented by "hatch, pen" in the example above).

Steps (OLD) 13 through 15 will be repeated for each level as specified by step (OLD) 11.

STEP (OLD) 16:

Edit x-axis labels (y/n/q)? n

y, n, or q [RTN]

Since the user may not desire to alter the values of the x-axis labels, the program gives you the choice of skipping them or of quitting all together. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared. The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response. Therefore, responses such as "yes", "no" and "quit" are acceptable. The strings may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons, first character not y, n, or q) will generate an error and cause the prompt to be repeated.

Note that an increase in the number of bars in step (OLD) 11 will cause this option to be skipped and execution will continue with step (OLD) 17.

A response of "y" will cause the program to continue at step (OLD) 17 while that of "n" will continue at step (OLD) 18.

STEP (OLD) 17:

X label 1? old label up to 50 characters [RTN]

Each group of bars may be labeled. This input may be a string of up to 50 characters excluding commas, semicolons and quotation marks. Invalid inputs will generate an error message and cause the prompt to be repeated. Pressing [RTN] with no input is acceptable and will cause no label

DISPLAY

KEYSTROKES

to be plotted. Pressing [RTN] with the default (current) input will cause the current x-axis label to be plotted. Note that to prevent crowding, many fewer than 50 characters should be used based on the number of labels to be plotted.

This prompt will be repeated for each group of bars as specified in step (OLD) 11.

STEP (OLD) 18:

```
Edit bar data (y/n/q)? n
```

y, n, or q [RTN]

Since the user may not desire to alter the heights of the bars, the program gives you the choice of skipping them or of quitting all together. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared. The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response. Therefore, responses such as "yes", "no" and "quit" are acceptable. The strings may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons, first character not y, n, or q) will generate an error and cause the prompt to be repeated.

Note that an increase in the number of bars or levels in step (OLD) 11 will cause this option to be skipped and execution will continue with step (OLD) 19.

A response of "y" will cause the program to continue at step (OLD) 19 while that of "n" will continue at step (OLD) 2.

STEP (OLD) 19:

Edit level 1 (y/n/q)? n y, n, or q [RTN]

Since the user may not desire to alter the values of the points in level 1, the program gives you the choice of skipping them or of quitting all together. If the latter option is selected, both the HP-75's display and the specified DISPLAY IS device are cleared. The prompt will accept any input string of up to 4 characters. Only the first character is used in the evaluation of the response.

DISPLAY

KEYSTROKES

Therefore, responses such as "yes", "no" and "quit" are acceptable. The strings may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons, first character not y, n, or q) will generate an error and cause the prompt to be repeated.

Note that an increase in the number of bars in step (OLD) 11 will skip this option and execution will continue with step (OLD) 20.

A response of "y" will cause the program to continue at step (OLD) 20 while that of "n" will continue at step (OLD) 2.

STEP (OLD) 20:

Level 1, bar 1? old value real number [RTN]

Each bar must have a height to be plotted. Note that all of the heights specified must fall within the range specified in step (OLD) 10 or an error will be generated and the prompt repeated. No check is made to see if the accumulated bar heights would excede the scale if the bars were to be stacked. The prompt is repeated for each bar in each level as specified in step (OLD) 11.

Once all of the heights for all of the bars are specified, the program will cycle back to step (OLD) 2 to permit either the creation of a new file or the editing of an old file.

PLOTTING

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STEP (PLOT) 1:

run "bplot" [RTN]

Bar Plot

This output identifies the program and will remain in the display for the duration of the DELAY specified by the user. If the the HP 82163 Video Interface is used, this display will appear at the top of the CRT and will remain there for the duration of the program.

STEP (PLOT) 2:

Data file name? BARDATA

8 character string [RTN]

This prompt requests the name of the data file to be manipulated. Any string of up to 8 characters, upper or lower case, will be accepted. Strings longer than 8 characters or containing commas, semicolons or quotation marks will generate an error message and cause the prompt to be repeated. A string that represents an invalid file specifier will not be detected until the program tries to access the file. At that time an error will be generated and the prompt will be redisplayed.

The default file name "BARDATA" will be displayed any time the program is RUN or if the program has cycled and "BARDATA" was the last file name used. Otherwise, the last file name specified (even if it caused an error) will be displayed. The default file name may be used by pressing [RTN] with no input. The file name may be modified or replaced by pressing the appropriate keys (the [CLR], [SHIFT][DEL], [DEL], [I/R] and [BACK] keys are active at this time) before pressing [RTN] to accept the input. No input indicates that you want to quit the program. If the input display is empty when you press [RTN], the display(s) are cleared and the program ends.
DISPLAY

KEYSTROKES

STEP (PLOT) 3:

Device specifier?

":" & 2 characters [RTN]

Since the file may exist on some external mass storage device and not in memory, the program asks for the device specifier of the mass storage device. If no device specifier is input, the file is assumed to exist in memory. Device specifiers are of the form ":ab" where "a" is any alphabetical character and "b" is any alphanumeric character. The prompt will accept any input of up to 3 characters.

Any invalid input (string too long, commas, semicolons or quotation marks, first character not ":") will generate an error and cause the prompt to be repeated. An invalid device specifier will not be detected until the program tries to access the device. At such a time, an error will be generated and control will be passed to step (PLOT) 2. There is an unavoidable hazard that exists if an invalid device specifier is input or the file does not exist on the specified device and does exist in memory. The program will not detect the invalid device specifier or the nonexistent external file until it has detected the duplicate file name in memory. The catalog information of the existing file will be displayed and the user will be asked if the file is to be purged.

'filename' exists in memory, purge (y/n)? n

> An affirmative response will purge the memory file before the program has verified the existence or nonexistence of the external file. The user should therefore be relatively certain that the file specifier inputs are accurate. ("filename" in the above example will be replaced by the actual file name.) A response of "n" will cycle the program to step (OLD) 2.

If the program has cycled and a device specifier has previously been input, the last used device specifier will be put into the display - even if it has caused an error. This default may be modified or removed before pressing [RTN] to accept the input.

DISPLAY

KEYSTROKES

STEP (PLOT) 4:

Stacked or grouped plot (s/g)? g s or g [RTN]

The program is asking whether the plot is to be stacked or grouped. Only "s" or "g" may be input. All other inputs will cause an error and the prompt will be repeated.

Note that the input data can always be used to generate a grouped plot because all bar heights are checked on input to ensure that they are within the range specified for the y-axis. If the user has specified a y-axis range that is large enough to accomodate stacking of the bars, the stacked option may be chosen. If the stacked option is chosen and stacking causes a range error, the plot will continue but "(Range Error)" will be plotted in the upper right-hand corner of the page and the offending bar will be marked with a "." immediately above its x-axis label. In such a case, the user may use the "edit" program to alter the y-axis scale and replot the chart.

STEP (PLOT) 5:

Plot Speed (f/m/s)

f, m or s [RTN]

The program is asking whether it should plot fast, medium or slow. The selection is mostly user preference, but a slow speed may be required to prevent pen skipping on such things as slides for overhead projectors. Only "f", "m" and "s" are allowed inputs. All other inputs will generate an error and cause the prompt to be repeated.

The program continues from here to generate the plot. When finished, execution will continue at step (PLOT) 2.

ERROR MESSAGES

Number	Message	Description
16	Not enough memory.	Not enough memory exists in order to create or expand the data file.
33	Data type.	The information read from the data file is not of the correct type.
34	No data.	The program tried to read from the data file at a location in which no data is stored.
42	String too long.	The text the user has input is longer than that allowed by the prompt.
43	Numeric input.	The user entered text in response to a numeric prompt.
44	Too many inputs.	Either too many numeric inputs were specified or commas or semicolons were entered in a text string.
51	PRINT # to runfile.	The plot file specified is actually the current program file.
57 & 58	I/O error.	An error occurred when trying to access the HP-IL interface.
62	File not found.	The specified data file was not found either in memory or on the specified mass storage device.
63	Invalid filespec.	Reported only by the plot program: the file name or device specifier is not legal.

Number	Message	Description
63 - 68	File error.	An error occurred when trying to access the data file.
92 - 97	Mass storage error.	The mass storage device has malfunctioned.
98	Not a plot file.	The data file specified is not recognized as being a plot file.
99	Invalid parameter.	The value input is not in the range required by the prompt.
nn	Unable to run.	This is the default message when an error occurs that is not one of those listed above. The error number is reported so that the associated HP-75 error message can be determined.

Minimum byte requirement:

BEDIT	=	5504
BPLOT	=	8426

Variables: the edit program ____ A\$[4] the user's response to yes/no/quit and new/old/quit questions. B**\$**[50] contains the currently accessed title information. C\$[50] contains the lower legend text. D**\$**[3] the device specifier. E\$[20] the error message. F\$[8] the file name. В the number of bars. Ε an integer variable containing the current error number. Η the hatch type. Ι an integer variable used as an index in several instances. J bar counter. Κ counter used to delete bars from the data file if the current number is smaller than the old number. L an integer variable containing the number of levels to be plotted. Ν an integer variable used as a flag to indicate

whether or not the file is new. 1 = new, 0 = old.

0	an integer variable that contains the previous number of bars.
01	an integer variable that contains the previous number of levels.
Ρ	an integer variable containing the pen number.
Y	the height of the current bar.
YO	the minimum y scale value.
¥1	the maximum y scale value.
Υ2	the y scale increment.
	the plot program
A\$[4]	the user's response to yes/no/quit and new/old/quit questions.
B\$[50]	contains the currently accessed title information.
C\$[50]	contains the lower legend text.
D\$[3]	the device specifier.
E\$[20]	the error message.
F\$[8]	the file name.
В	the number of bars.
Е	an integer variable containing the current error number.
E1	the plot error flag - indicates whether stacking has caused a range error.
F	the step distance in plotter units between hatch marks - used in FNH\$.

F1	a real variable that contains the multiplication factor used to convert the y-axis scale to absolute plotter units.
G	cross hatching flag - used by FNH\$.
I, J, K	integer variables used as indices in several instances.
L	an integer variable containing the number of levels to be plotted.
L1	the x-axis location in absolute plotter units of the lower left-hand corner of the bar.
L2	the y-axis location in absolute plotter units of the lower left-hand corner of the bar.
P	an integer variable containing the pen number.
P1	an integer variable containing the containing the plotting offset in characters.
R 1	the x-axis location in absolute plotter units of the upper right-hand corner of the bar.
R2	the y-axis location in absolute plotter units of the upper right-hand corner of the bar.
S	an integer variable containing the plotting speed.
Т	stacked plot flag.
Y	a real variable containing the height of current bar.
Υ()	a real-valued, single dimensioned array containing the stacked height of the bars.
YO	a real variable containing the value of y-min.
¥1	a real variable containing the value of y-max.
Υ2	a real variable containing the value of the y-increment.

Functions: (only the plot program contains user defined functions)

FNB\$ (L1,L2,R1,R2)

This function generates the plot of the bar perimeter. The parameters are the lower left xy coordinates and the upper right xy coordinates.

FNH\$ (L1,L2,R1,R2,H)

This function generates the plot of the bar hatching. The parameters are the lower left xy coordinates and the upper right xy coordinates and the hatch type (H=1 to 6).

FNL\$ (H,X,Y,P\$,P,S\$[50],R1,R2)

This function generates all of the labels used in the plot. The parameter H specifies the relative size of the characters. X and Y are the coordinates of the label in absolute plotter units. P\$ is either "C", "L", or "R" indicating whether the label is to be centered, left justified or right justified with respect to the coordinates. P is the offset in character heights of the label from the coordinates. S\$ is the text to be plotted. R1 and R2 are the rise and run of the label (i.e., the angle between R1 and R2 is the slope on which the label is plotted).

FNM\$(X,Y)

This function moves the pen (in the up position) to the absolute plotter coordinates specified by X and Y.

All of the above functions return the null string and are used solely for their parameter passing properties.

Data files: A plot data file is organized as follows: Line 1 = contains the character "b" used to identify the file as a bar plot file. Line 2 = contains the main title text.

Line 3 = contains the subtitle text.

Line 4 = contains the x - axis title text.

Line 5 = contains the y-axis title text.

Line 6 = contains the y-axis scale values.

Line 8 = contains the number of bars and levels to be plotted.

Lines 9 through 8 + the number of levels = each line contains the legend text, hatch type and pen number for the corresponding bar.

Lines 51 through 50 + the number of bars = each line contains x-axis label for the corresponding bar.

Lines 100 through (100 * the number of levels) + the number of bars = the bar heights for the bars in each level are stored between lines numbered Level * 100 and (Level + 1) * 100.

10 ! 20 ! Bar plot file creation program 30 ! HP-75C Graphics Solutions Book 40 ! March 1983 50 ! 60 DATA "Main title","Subtitle","X axi Data for title input prompts s title","Y axis title" see steps 440 to 580 70 DISP CHR\$(27)&"EBar Plot File Creat Clear DISPLAY IS device and display i on " program identifier 80 WIDTH INF Eliminate default linefeeds 90 DIM A\$[4],B\$[50],C\$[50],D\$[3],E\$[20 Allocate strings],F\$[8] 100 INTEGER B.E.I.J.K.L.N.0.01.P Allocate integer variables 110 REAL Y, YO, Y1, Y2 Allocate string variables 120 F\$="BARDATA" @ D\$="" Default file name and device 130 ! specifier 140 ! File query 150 ! 160 GOSUB 1970 @ GOSUB 1710 ! Clear di splay & set error trap 170 INPUT "New, old file, quit (n/o/q) ? ", "n":A\$ 180 ON POS("NOQ", UPRC\$(A\$[1,1]))+1 GOT 0 150,190,190,2020 190 1 200 IF UPRC\$(A\$[1,1])="N" THEN N=1 ELS Establish "new file" flag condition E N=Ö 210 ON ERROR GOSUB 1780 @ GOTO 220 On error display error message. 220 IF N THEN DISP "New";ELSE DISP "01 repeat prompt d": 230 INPUT " data file name? ",F\$;F\$ 240 ON ERROR GOSUB 1780 @ GOTO 250 Display error, repeat prompt 250 IF NOT N THEN INPUT "Device specif Prompt for device specifier only if ier? ",D\$;D\$ ELSE 280 file exists 260 IF D\$="" THEN 340 If no input or new file, skip 270 IF POS(D\$,":")#1 THEN E=63 @ GOSUB If bad device spec., display message 1800 @ GOTO 250 and repeat prompt 280 E=0 @ ON ERROR E=ERRN Initialize error flag 290 IF N THEN CAT F\$ ELSE COPY D\$ TO F Find file \$ 300 IF N AND NOT E THEN GOSUB 1630 ! D New file and no error on CAT means uplicate file duplicate file 310 IF N THEN 360 If "new" then skip "old" errors 320 IF E#64 AND E THEN GOSUB 1800 @ GO If error not duplicate file, display TO 130 ! If not duplicate file error. message and repeat prompt 330 IF E THEN GOSUB 1630 @ GOTO 280 Error is duplicate file - ask purge 340 GOSUB 1710 ! Set error trap. 350 CAT F\$ File must be in main memory now 360 GOSUB 1710 ! Set error trap. 370 ASSIGN # 1 TO F\$,BASIC Open file 380 IF N THEN PRINT # 1 ; 'b' @ GOTO 4 Store plot file identifier in first 30 record of new file 390 READ # 1 : A\$ Read first record of old file

400 IF A\$#'b' THEN E=98 @ GOSUB 1800 @ First element of existing file must GOTO 150 be "b" 410 ! 420 ! Titles 430 ! 440 IF N THEN 490 If "new", skip edit option 450 ON ERROR GOSUB 1780 @ GOTO 460 On error, repeat prompt 460 GOSUB 1970 ! Clear display 470 INPUT "Edit titles & scale (y/n/q) ? ", "n":A\$ 480 ON POS("YNQ", UPRC\$(A\$[1,1]))+1 GOT 0 460,490,710,2020 490 GOSUB 1970 @ RESTORE 60 ! Clear di splay, restore prompt data. 500 FOR I=2 TO 5 Record 2 through 5 of data file 510 GDSUB 1710 ! Set error trap 520 IF NOT N THEN READ # 1, I : B\$ ELSE Read the string if is exists B\$="" 530 READ C\$ Read the input prompt 540 ON ERROR GOSUB 1780 @ GOTO 550 On error, repeat prompt 550 DISP C\$; @ INPUT ": ",B\$;B\$ 560 GOSUB 1710 ! Set error trap. 570 PRINT # 1,I ; B\$ Store in the data file 580 NEXT I 590 ! 600 ! Scaling 610 ! 620 IF NOT N THEN READ # 1,6 ; YO,Y1,Y Read the scale if it exists 2 ELSE Y0, Y1, Y2=0 630 ON ERROR GOSUB 1780 @ GOTO 640 On error, repeat prompt 640 INPUT "Y min, max, inc.: ", STR\$(YO)& ", "&STR\$(Y1)&", "&STR\$(Y2); Y0, Y1, Y2 650 IF SGN(Y2)#SGN(Y1-Y0) THEN E=99 @ If increment not in direction GOSUB 1800 @ GOTO 640 of scale 660 IF ABS(Y2)>ABS(Y1-Y0) OR Y0=Y1 OR If increment too large, y max = NOT Y2 THEN E=99 @ GOSUB 1800 @ GOTO 6 y min or increment = 0, then error **4**0 670 GOSUB 1710 ! Set error trap. 680 PRINT # 1,6 : Y0,Y1,Y2 Store scale values in file 690 ! 700 ! # of bars & levels 710 ! 720 GOSUB 1970 ! Clear display. 730 IF NOT N THEN READ # 1,8 ; B,L ELS Read number of bars and levels if E B, L=1they exist 740 O=B @ O1=L 750 ON ERROR GOSUB 1780 @ GOTO 720 On error, repeat prompt 760 INPUT "Number of bars, levels: ",S TR\$(B)&","&STR\$(L);B,L 770 IF L<1 OR L>14 OR B<1 THEN E=99 @ Values out of range, generate error GOSUB 1800 @ GOTO 720 780 GOSUB 1710 ! Set error trap 790 PRINT # 1,8 ; B,L Store in file

800 !	1
810 ! Clear old legends	
820 !	
830 GOSUB 2000 ! Set error trap.	
840 FOR I=L+1 TO 01	From new number of levels to old
850 PRINT # 1,I+8 ! Clear old legends	Delete record
860 NEXT I	
870 IF O>B THEN K=O ELSE K=B	K = Max (O,B)
880 FOR I=L+1 TO 01 @ FOR J=1 TO K @ P	Delete excess bars
RINT # 1.100*I+J @ NEXT J @ NEXT I	
890 IF 01 X THEN K=01 FLSE K=1	L = Max (01,L)
900 FOR I=B+1 TO O P FOR J=1 TO K P PR	Delete excess levels
INT # 1.100*J+I @ NEXT J @ NEXT I	
910 !	
920 ! Legends, batch type, per	
930 1	
940 TE L SO1 OR N THEN 990	New or additional level, skip edit
950 AN ERROR GASUE 1780 & GATA 940	On error, repeat prompt
960 609UB 1970 / Clear display	
970 INPUT "Edit logonde (v/p/g)? " "p"	
·Δα	
990 AN PAC/YVNAY HEPC#/A#F1 11\\+1 CAT	
0 040 000 1130 2020	
0,700,770,1130,2020	For each level
1000 COCUP 1970 @ COCUP 1710 Class d	
icolay ant array tara	
1010 IF NOT N AND IZ-01 TUEN DEAD # 1	Pead logand titles match turns and
IVIO IF NOT N AND IK=UI THEN READ # 1,	nead legend cicles, match type and
170 ; B\$,U\$,H,F ELSE B\$,U\$="" @ H=MUD(pen color il chey exist
1-1,0/+1 @ F=1 1020 DN EEDOD 000UD 1700 0 00T0 1070	On owners repeat meant
1020 UN ERRUR GUSUB 1780 @ GUTU 1030	on error, repeat prompt
IVSV DISP "Upper legend #"&S(R\$(I); @	
INFUL ": ", B\$;B\$ 1040 DN FEEDE DOOUD 1700 D COTO 1050	On onnon noncot manual
1040 UN ERROR GUSUB 1780 @ GUTU 1050	on error, repeat prompt
1050 DISP "Lower legend #"&SIR\$(1); @	
INPUT ": ",U\$;U\$	On ennon noncet succest
1050 UN ERRUR GUSUB 1/80 @ GUTU 10/0	on error, repeat prompt
1070 DISP "Hatch type & pen #"&STR\$(I)	
; @ INPUT ": ",STR\$(H)&","&STR\$(P);H,P	
1080 IF H<1 OR H>6 OR P<1 OR P>2 THEN	If inputs out of range, error
E=99 @ GOSUB 1800 @ GOTO 1070	
1090 PRINT # 1,I+8 ; B\$,C\$,H,P	Store in data file
1100 NEXT I	
1110 !	
1120 ! X-axis labels	
1130 !	
1140 IF B>O OR N THEN 1210	If new or additional bars, skip edit
1150 GOSUB 1970 ! Clear display	
1160 FOR I=B+1 TO O @ PRINT # 1,50+I @	Delete extra bars
NEXT I	
1170 ON ERROR GOSUB 1780 @ GOTO 1180	ûn error, repeat prompt
1180 GOSUB 1970 ! Clear Display	
1190 INPUT "Edit x-axis labels (y/n/q)	
? ", "n"; A\$	

1200 ON POS("YNQ",UPRC\$(A\$[1,1]))+1 GO	
TD 1180,1210,1310,2020	
1210 GOSUB 1970 ! Clear Display	
1220 GOSUB 1710	Set error trap
1230 FOR I=1 TO B	For each bar
1240 IF NOT N AND IK=0 THEN READ # 1,5	Read label if it exists
0+I : B\$ ELSE B\$=""	
1250 ON ERROR GOSUB 1780 @ GOTO 1260	On error, repeat prompt
1260 DISP "X label "&STR\$(I):	
1270 INPUT "? ".B\$:B\$	
1280 GOSUB 1710	Set fatal error trap
1290 PRINT # 1.50+I : B\$	Store label in file
1300 NEXT I	
1310 !	
1320 ! Bar data	
1330	
1340 TE L X01 OR N OR BX0 THEN 1390	If new facts or bars skin edit
1350 ON EPPOP COCUP 1700 & COTO 1340	On error report prompt
1340 GOCUP 1970 Clear Dicelay	on error, repeat prompt
1370 INPUT "Edit bar data (v/a/a)? " "	
-U-At	
□ [HP] 1700 ON DOC/UVNOU UDDC#/A#F1 11\\.1 CO.	
1360 UN FUS("INQ",UFRUP(HPL1,137)+1 60 TO 17(A 170A 150A 3000	
1700 000UD 1070 0 000UD 1710 1 01	
1340 GUSUB 1470 @ GUSUB 1710 ! Llear d	
isplay & set error trap	Cat gool a walker
1400 READ # 1,6 ; $YO, Y1, Y2$	Get scale values
1410 FUR 1=1 TU L	For each level
1420 IF I>01 OR L=1 OR N OR B>0 THEN 1	lf new level, skip edit
470	
1430 ON ERROR GOSUB 1780 @ GOTO 1440	On error, repeat prompt
1440 GOSUB 1970 ! Clear display	
1450 DISP "Edit level "&STR\$(I)&" (y/n	
/q) "; @ INPUT "? ","∩";A\$	
1460 ON POS("YNQ",UPRC\$(A\$[1,1]))+1 GO	
TO 1440,1470,1570,2020	
1470 GOSUB 1970 @ GOSUB 1710 ! Clear d	
isplay & set error trap	
1480 FOR J=1 TO B	For each prompt
1490 IF I<=01 AND NOT N AND J<=0 THEN	Get bar height, if it exists
READ # 1,100*I+J ; Y ELSE Y=0	
1500 ON ERROR GOSUB 1780 @ GOTO 1510	On error, repeat prompt
1510 DISP "Level "&STR\$(I)&", bar "&ST	
R\$(J); @ INPUT "? ",STR\$(Y);Y	
1520 IF YO>Y1 THEN 1540	If scale from high to low
1530 IF Y <yo or="" y="">Y1 THEN E=99 @ GOSUB</yo>	Is height out of range?
1800 @ GOTO 1500 ELSE 1550	-
1540 IF Y>YO OR Y <y1 @="" e="99" gosub<="" td="" then=""><td>If scale from low to high -</td></y1>	If scale from low to high -
1800 @ GOTO 1500	is height out of range?
1550 GOSUB 1720 @ PRINT # 1,100*I+J ;	Store height
Y	-
1560 NEXT J	Next bar
1570 NEXT I	Next level
1580 !	

Close file 1590 ASSIGN # 1 TO * 1600 GDTO 150 ! Back to the beginning. 1610 ! 1620 ! Purge duplicate file 1630 ! 1640 IF NOT N THEN CAT F\$ 1650 ON ERROR GOSUB 1770 @ GOTO 1660 On error, repeat prompt 1660 DISP "'"&F\$&"' exists in memory," @ DISP " purge (y/n)"; @ INPUT "? "," n":A\$ 1670 ON POS("NY", UPRC\$(A\$[1,1]))+1 GOT 0 1660,1700,1680 1680 PURGE F\$ 1690 RETURN 1700 POP @ GOTO 130 ! Escape the subro utine. 1710 ! 1720 ! Set error trap 1730 ! 1740 ON ERROR GOSUB 1780 @ GOTO 150 Report error, restart at beginning of program 1750 RETURN 1760 ! 1770 ! error detection 1780 ! 1790 E=ERRN Save error number 1800 ! 1810 E\$="Unable to run" Default error message 1820 IF E=16 THEN E\$="Not enough memor ¥." 1830 IF E=33 THEN E\$="Data type." 1840 IF E=34 THEN E\$="No data." 1850 IF E=42 THEN E\$="String too long. ... 1860 IF E=43 THEN E\$="Numeric input." 1870 IF E=44 THEN E\$="Too many inputs. 1880 IF E=51 THEN E\$="PRINT # to runfi le." 1890 IF E=57 OR E=58 THEN E\$="I/O erro r. " 1900 IF E=62 THEN E\$="File not found." 1910 IF E>62 AND E<69 THEN E\$="File er ror." 1920 IF E>91 AND E<98 THEN E\$="Mass st orage error." 1930 IF E=98 THEN E\$="Not a plot file. 1940 IF E=99 THEN E\$="Invalid paramete r. " 1950 BEEP 1000 @ DISP "Error "&STR\$(E) &". "&E\$ @ WAIT 2 1960 RETURN 1970 !

1980 ! Clear display 1990 ! 2000 DISP CHR\$(27)&"%"%CHR\$(0)&CHR\$(2) &CHR\$(27)&"J"; 2010 RETURN 2020 ! 2030 ! End program 2040 ! 2050 DISP CHR\$(27)&"E"&CHR\$(27)&"H"; Clear display, home cursor 2060 ASSIGN # 1 TO * Close data file 2070 END

```
10 !
20 ! Bar plot program
30 ! HP-75 Graphics Solutions Book
40 ! Series 70 Users' Library
50 ! March 1983
60 !
70 DISP CHR$(27)&"EBar Plot" ! Program identifier
80 !
90 OPTION BASE 1
100 DIM A$[3],B$[50],C$[50],D$[3],E$[20],F$[8]
110 INTEGER B, E, E1, F, G, H1, I, J, K, L, L1, L2, P, P1, R1, R2, S, T
120 REAL F1, Y, Y0, Y1, Y2, Y(50)
130 F$="BARDATA" ! Default file name
140 D$="" ! Default device specifier
150 !
160 ! Function to generate labels
170 !
180 DEF FNL$(H,X,Y,P$,P,S$150],R1,R2)
190 P1=-LEN(S$) ! Left justified
200 IF P$="R" THEN P1=-P1 ! Right justified
210 IF P$="C" THEN P1=P1/2 ! Centered
220 PRINT USING "K" ; "PU:SR":H*.24:",":H/2:";" ! Relative character siz
e
230 PRINT USING "K" ; "DI";R1;",";R2;";" ! Absolute direction
240 PRINT FNM$(X,Y) ! Move
250 PRINT USING "K" ; "CP";P1;",";P;";" ! Move characters relative to x,
v
260 PRINT "LB"&S#&CHR#(3)&"PU;" ! Plot label
270 FNL$="" ! Dummy value
280 END DEF
290 !
300 ! Function to hatch bars
310 !
320 DEF FNH$(L1,L2,R1,R2,H)
330 ON H GDTD 460,340,350,360,370,380 ! Select hatch type
340 F=200 @ G=0 @ GOTO 390 ! H=2: wide, single hatch
350 F=100 @ G=0 @ GOTO 390 ! H=3: narrow, single hatch
360 F=200 @ G=1 @ GOTO 390 ! H=4: wide, cross-hatch
370 F=100 @ G=1 @ GOTO 390 ! H=5: narrow, cross-hatch
380 F=20 @ G=0 ! H=6: fill
390 PRINT USING "K" ; "IW";L1;",";L2;",";R1;",";R2;";" ! Plotting window
is bar perimeter
400 !
410 FOR K=L2-(R1-L1) TO R2 STEP F ! Hatching loop
420 PRINT USING "K" ; "PU";L1;",";K;";PD";R1;",";K+R1-L1;";"
430 IF G THEN PRINT USING "K" ; "PU";R1;",";K;";PD";L1;",";K+R1-L1;";"
440 NEXT K
450 !
460 PRINT "PU;IW;" ! Lift pen, restore plotting window
470 FNH$="" ! Dummy value
480 END DEF
490 !
```

```
500 ! Move function
510 !
520 DEF FNM$(X.Y) = "PU"&STR$(X)&","&STR$(Y)&";"
530 !
540 ! Function to generate bar
550 !
560 DEF FNB$(L1,L2,R1,R2)
570 PRINT FNM$(L1,L2) ! Move to lower left corner
580 PRINT USING "K" ; "PD";L1;",";R2;",";R1;",";R2;",";R1;",";L2;",";L1;
",";L2;";PU;" ! Draw
590 FNB<sup>$=""</sup> ! Dummy value
600 END DEF
610 !
620 ! File query
630 !
640 PWIDTH INF ! Eliminate default line feeds to plotter
650 WIDTH INF ! Eliminate default line feeds to display
660 GOSUB 2230 ! Clear display
670 GOSUB 2180 ! Set error trap
680 INPUT "Data file name? ",F$;F$
690 IF F$="" THEN 2280 ! Quit on no input
700 !
710 ON ERROR GOSUB 2040 @ GOTO 720
720 INPUT "Device specifier? ".D$:D$
730 IF D$#"" AND POS(D$,":")#1 THEN E=63 @ GOSUB 2060 @ GOTO 720
740 !
750 E=0 ! Initialize error variable
760 ON ERROR E=ERRN
770 IF D$="" THEN CAT F$ ELSE COPY D$ TO F$ ! Try to find the file
780 IF D$="" AND E THEN GOSUB 2060 @ GOTO 640 ! File not found in memory
790 IF D$="" OR NOT E THEN 900 ! No problems
800 !
810 IF E#64 THEN GOSUB 2060 @ GOTO 640 ! If not duplicate file
820 CAT F$ ! Does file exist?
830 ON ERROR GOSUB 2040 @ GOTO 840
840 DISP "'"&F$&"' exists in memory,"
850 INPUT " purge (y/n)? ","n";A$
860 ON POS("NY", UPRC$(A$[1,1]))+1 GOTO 840,640,870
870 PURGE F$
880 GOTO 750 ! Retry copy
890 !
900 GOSUB 2180 ! Set error trap
910 ASSIGN # 1 TO F$, BASIC
920 READ # 1 : A$ ! First record in file
930 IF A$#"5" THEN E=98 @ GOSUB 2060 @ GOTO 640 ! Not a bar plot file
940 !
950 ! Stacked or grouped plot?
960 !
970 ON ERROR GOSUB 2040 @ GOTO 980
980 GOSUB 2230 ! Clear display
990 INPUT "Stacked or grouped plot (s/g)? ","g";A$
1000 DN POS("SG", UPRC$(A$[1,1]))+1 GDTD 970,1010,1030
1010 T=1 ! Stacked plot
```

```
1020 GOTO 1040
1030 T=0 ! Grouped plot
1040 !
1050 ! Plotter speed
1060 !
1070 ON ERROR GOSUB 2040 @ GOTO 1080
1080 GOSUB 2230 ! Clear display
1090 INPUT "Plot speed (f/m/s)? ","s";A$
1100 IF NOT POS("FMS", UPRC$(A$[1,1])) THEN E=99 @ GOSUB 2060 @ GOTO 940
1110 IF UPRC$(A$[1,1])="F" THEN S=38 @ GOTO 1140 ! Plot fast
1120 IF UPRC$(A$[1,1])="M" THEN S=15 ELSE S=3 ! Plot medium, else slow
1130 !
1140 PRINT "IN,PA,VS"&STR$(S)&"SP1;" ! Initialize plotter, absolute unit
s, select speed & pen
1150 !
1160 ! Plot titles, frame graph
1170 !
1180 GOSUB 2180 ! Set error trap.
1190 READ # 1 ; B$ ! read main title
1200 PRINT FNL$(4.7,5600,7479,"C",-.5,B$,1,0) ! Plot main title
1210 READ # 1 ; B$ ! Read subtitle
1220 PRINT FNL$(3.7,5600,7207,"C",-.5,B$,1,0) ! Plot subtitle
1230 PRINT FNB$(1300,750,9900,6150) ! Frame plot
1240 GOSUB 2180 ! Set error trap
1250 READ # 1 ; B$ ! Read x axis title
1260 PRINT FNL$(3,5600,279,"C",-.5,B$,1,0) ! Plot x axis title
1270 READ # 1 ; B$ ! Read y axis title
1280 PRINT FNL$(3,250,3450,"C",-.5,B$,0,1) ! Plot y axis title
1290 READ # 1 ; Y0,Y1,Y2,B,L ! Read y min, y max, y inc, # bars, # level
S
1300 !
1310 ! Plot X-labels
1320 !
1330 GOSUB 2180 ! Set error trap
1340 !
1350 FOR I=1 TO B ! For each bar
1360 READ # 1,50+I ; B$ ! Read bar label
1370 PRINT FNL$(3,1300+8600\(B+1)*I,750,"C",-1,B$,1,0) ! Plot bar label
1380 NEXT I
1390 !
1400 ! Plot Y-tics & tic labels
1410 !
1420 GOSUB 2180 ! Set error trap
1430 F1=5400/ABS(Y1-Y0) ! Y scale factor
1440 J=0 ! Tic number
1450 !
1460 FOR I=750 TO 6150 STEP ABS(Y2*F1) ! Move along y axis
1470 PRINT FNM$(1300,I) ! Move to tic location
1480 PRINT "YT;" ! Place tic mark
1490 PRINT FNL$(3,1200,I,"L",-.25,STR$(Y0+Y2*J),1,0) ! Label tic
1500 J=J+1 ! Next tic
1510 NEXT I
1520 !
```

```
1530 ! Plot legends & bars
1540 !
1550 E1=0 ! Initialize bar height error flag
1560 IF NOT T THEN 1620 ! Grouped plot
1570 !
1580 FOR J=1 TO B ! Clear accumulator for each bar
1590 Y(J)=0
1600 NEXT J
1610 !
1620 FOR I=1 TO L ! For each level
1630 GOSUB 2180 ! Set error trap
1640 READ # 1,I+8 ; B$,C$,H1,P ! Upper legend, lower legend, hatch type,
pen #
1650 F1=1300+I*(8600\(L+1)) ! X location of legend
1660 PRINT "SP1:LT:" ! Select pen 1. solid line
1670 PRINT FNL$(2.6,F1,6800,"C",0,B$,1,0) ! Plot upper legend label
1680 PRINT FNL$(2.6,F1,6800,"C",-1,C$,1,0) ! Plot lower legend label
1690 PRINT USING "K" ; "SP";P;";" ! Select pen
1700 PRINT FNB$(F1-300,6200,F1+300,6550) ! Plot legend bar
1710 PRINT FNH$(F1-300,6200,F1+300,6550,H1) ! Hatch legend bar
1720 !
1730 FOR J=1 TO B
1740 READ # 1,100*I+J ; Y ! Read bar height
1750 IF T THEN 1810 ! Stacked plot
1760 L1=INT(((L+1)*(2*J-1)+2*I-1)*8600/(2*(L+1)*(B+1))+1300) ! Lower lef
t x coordinate
1770 L2=750 ! Lower left y coordinate
1780 R1=INT(((L+1)*(2*J-1)+2*I+1)*8600/(2*(L+1)*(B+1))+1300) ! Upper rig
ht x coordinate
1790 R2=INT(750+Y*5400/ABS(Y1-Y0)) ! Upper right y coordinate
1800 GOTO 1920
1810 L1=INT((4*J-1)*2150/(B+1)+1300) ! Lower left x coordinate
1820 R1=INT((4*J+1)*2150/(B+1)+1300) ! Upper right x coordinate
1830 L2=INT(750+Y(J)*5400/ABS(Y1-Y0)) ! Lower left y coordinate
1840 Y(J)=Y(J)+Y ! Accumulate stacked bar height
1850 R2=INT(750+Y(J)*5400/ABS(Y1-Y0)) ! Upper right y coordinate
1860 IF R2<=6150 THEN 1920 ! If stacked height is not out of range
1870 IF L2>6150 THEN L2=6150 ! If the base of the bar > max heigt
1880 R2=6150 ! New bar height
1890 PRINT FNL$(2,1300+8600\(B+1)*J,750,"C",-.4,".",1,0) ! Identify the
out of range bar
1900 IF NOT E1 THEN PRINT FNL$(2,10250,7479,"L",-1,"(Range Error)",1,0)
! Plot error message
1910 E1=1 ! Flag error so message is not replotted
1920 PRINT FNB$(L1,L2,R1,R2) ! Plot bar
1930 PRINT FNH$(L1,L2,R1,R2,H1) ! Hatch bar
1940 NEXT J ! Next bar
1950 !
1960 NEXT I ! Next level
1970 !
1980 ! Put pen away & recycle program
1990 !
2000 PRINT "PUO,0;SP;" ! Move to 0,0 & replace pen
```

```
2010 GOTO 610
2020 !
2030 ! Error detection
2040 !
2050 E=ERRN
2060 !
2070 E$="Unable to run."
2080 IF E=33 THEN E$="Data type."
2090 IF E=34 THEN E$="No data."
2100 IF E=42 THEN E$="String too long."
2110 IF E=44 THEN E$="Too many inputs."
2120 IF E=62 THEN E$="File not found."
2130 IF E=63 THEN E$="Invalid filespec."
2140 BEEP 1000
2150 DISP "Error "&STR$(E)&", "&E$
2160 WAIT 2
2170 RETURN
2180 !
2190 ! Set error trap
2200 !
2210 ON ERROR GOSUB 2040 @ GOTO 640
2220 RETURN
2230 !
2240 ! Clear display
2250 !
2260 DISP CHR$(27)&"%"&CHR$(0)&CHR$(2)&CHR$(27)&"J";
2270 RETURN
2280 !
2290 ! End program
2300 !
2310 DISP CHR$(27)&"E"&CHR$(27)&"H";
2320 ASSIGN # 1 TO *
2330 END
```

PROGRAM DESCRIPTION

PIE CHART

What the Programs are Designed To Do:

The PIE CHART plotting package consists (as does each package in this Solutions Book) of two programs: a file creation/editing program and a plotting program. The editing program prompts the user for inputs by which data files that contain the information necessary to create plots using the HP 7470A plotter are created. The plot program translates these data files into the appropriate HP-GL[#] commands to create plots with the plotter. The programs are recorded on the included magnetic cards under the file names "PEDIT" and "PPLOT" respectively.

The package allows the user to plot single-page, single pie charts. (The package should work with either the HP-IL option of the HP 7470A plotter or with other interface options if the appropriate interconnect device is used.) The plot may be labeled with a main title and subtitle. The user may select between six hatch types for use in plotting the sections.

The programs interface with mass storage and display devices. Printers are not supported by the programs because of the nature of the plotter interface. The plotter must be addressed as the PRINTER IS device and therefore no other printer device may be accessed while running the programs. If a mass storage device is used, it is assumed to have the device specifier ":CA".

* Hewlett-Packard Graphics Language - see your HP 7470A Interfacing and Programming Manual.

SAMPLE PROBLEM

The following example assumes that the user has loaded the edit and the plot programs into memory under the file names "PEDIT" and "PPLOT" respectively. The example also assumes that the file "PDATA" does not exist in memory, that the HP 7470A is on the HP-IL interface, that it has been assigned a device specifier and has been specified as the printer device (via the PRINTER IS command).

	و و و و و و و و و و و و و و و و و و و
DISPLAY	KEYSTROKES

run "pedit" [RTN]

The initial prompts are straight-forward. We would like to create a new plot file and will use the default data file name "PDATA".

Create a NEW Plot File <u>Y/N</u> ?	y [RTN]
Data File Name: PDATA	[RTN]

Since the file is new, it is empty. We must supply values for the plot's titles, number of slices and characteristics for each slice. The titles used in this example are superfluous in this case.

Main title: Subtitle: Main Title [RTN] Subtitle [RTN]

Slice units are the units with which the slices are labeled. The value of each slice is expressed in these units and the fraction of the pie taken up by the slice is determined by the program. If the units chosen are percentage, the program keeps track of the total and generates an error if the final size of the pie is greater than 100%.

Slice units: %	[RTN]
Number of Slices:	6 [RTN]

The labels used here are arbitrary. Six slices are chosen to demonstrate the six different hatchtypes. Each slice is approximately one sixth of the pie. We will explode alternate slices.

Slice 1 Label:	Slice #1 - [RTN]
Slice 1 Value: 🔏	17 [RTN]
Slice 1 Hatchtype:	1 [RTN]
Explode slice 1 Y/N?	n [RTN]

SAMPLE PROBLEM

DISPLAY

KEYSTROKES

Slice 2 Label: Slice #2 - [RTN] Slice 2 Value: 🖇 17 [RTN] Slice 2 Hatchtype: 2 [RTN] Explode slice 2 Y/N? y [RTN] Slice 3 Label: Slice #3 - [RTN] Slice 3 Value: 🔏 17 [RTN] Slice 3 Hatchtype: 3 [RTN] Explode slice 3 Y/N? n [RTN] Slice 4 Label: Slice #4 - [RTN] Slice 4 Value: 🔏 16 [RTN] Slice 4 Hatchtype: 4 [RTN] Explode slice 4 Y/N? y [RTN] Slice 5 Label: Slice #7 - [RTN] Slice 5 Value: % 16 [RTN] Slice 5 Hatchtype: 1 [RTN] Explode slice 5 Y/N? n [RTN] Slice 6 Label: Slice #6 - [RTN] Slice 6 Value: % 17 [RTN] Slice 6 Hatchtype: 6 [RTN] Explode slice 6 Y/N? y [RTN] We have made an error in slice 5 and wish to correct it. Edit File Y/N? y [RTN] Edit Titles \overline{Y}/N ? n [RTN] Edit Slices $\overline{Y}/\overline{N}$? y [RTN] Slice units: % [RTN] Add, Move, Change, Delete, eXit: c [RTN] Slice # to change: 5 [RTN] Slice 5 Label: Slice #7 -Slice #5 - [RTN] Slice 5 Value: 16 🖇 [RTN] Slice 5 Hatchtype: 1 5 [RTN] Explode slice 5 Y/N? n [RTN] <u>Add, Move, Change, Delete, eXit:</u> x [RTN] Plot Y/N? y [RTN] PPLOT B 5770 11:22 05/12/83

SAMPLE PROBLEM

KEYSTROKES

Having created a data file, we choose to plot the information. The default file name is that of our file (since we chose the default in the edit program) and it still exists in memory. We are given a choice of plotting speeds: fast, medium and slow. We choose fast. Data Filename: PDATA [RTN] PDATA B 217 tt:tt dd/dd/dd Plot Rate (F,M,S): f [RTN]

The program procedes to generate the plot.

DISPLAY





CREATING A NEW FILE

DISPLAY	KEYSTROKES

STEP (NEW) 1:

run "pedit" [RTN]

STEP (NEW) 2:

Create a NEW Plot File Y/N? y [RTN]

This prompt requests the type of file to be manipulated by the program. The program is capable of creating a new plot file or of modifying an existing plot file.

The response character may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons) will generate an error and cause the prompt to be repeated. Select "y" to create a new file ("y" is the default, so just press [RTN]).

13 character string [RTN]

This prompt requests the name of the data file to be created. Any string of up to 13 characters, upper or lower case, will be accepted. Strings longer than 13 characters or containing commas, semicolons or quotation marks will generate an error message and cause the prompt to be repeated. An invalid file file specifier will not be detected until the program tries to access the file. At that time an error will be generated and the prompt will be redisplayed.

The default file name may be used by pressing [RTN] with no input. The file name may be modified or replaced by pressing appropriate keys (the [CLR], [SHIFT][DEL], [DEL], [I/R] and [BACK] keys are active at this time) before pressing [RTN] to accept the input.

- STEP (NEW) 4:
- Main title:

50 character string [RTN]

The program is asking for the main title of the plot. This title may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs

STEP (NEW) 3:

Data File Name: PDATA

DISPLAY

KEYSTROKES

(containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. The title will be plotted along the top of the graph. Pressing [RTN] with no input is acceptable and will cause no title to be plotted.

STEP (NEW) 5:

Subtitle:

50 character string [RTN]

The program is asking for the subtitle of the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. The subtitle will be plotted immediately below the main title (or immediately below the place the main title would be). Pressing [RTN] with no input is acceptable and will cause no subtitle to be plotted.

- STEP (NEW) 6:
- Slice units: %

3 character string [RTN]

The program is asking for the value units that each slice represents. This symbol will be plotted, along with the slice's value, after its label. The default is percent (%). Any three-character string may be used excluding those containing commas, semicolons and quotation marks. Invalid strings will cause an error and the prompt will be repeated. The slice unit string may be omitted.

If the chosen string units are percentage, the program will test the accumulated total for all of the slices and generate an error if it is greater than 100.

STEP (NEW) 7:

```
Number of Slices:
```

integer [RTN]

The program is asking for the number of slices to be plotted. Valid input for the number of slices is an integer between 1 10. All other inputs will generate an error and cause the prompt to be repeated.

KEYSTROKES DISPLAY STEP (NEW) 8: Slice 1 Label: 17 character string [RTN] The program is asking for the descriptive label for slice 1. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 17 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. Pressing [RTN] with no input is acceptable and will cause no descriptive label to be plotted. STEP (NEW) 9: Slice 1 Value: % integer [RTN] The program is asking for the size of the slice in the appropriate units (the example assumes "%"). Input must be an integer between 1 and 99 (if units are percentage) or between 1 and 9999. Real numbers may be input but are rounded to integers for use. All other inputs will cause the prompt to be repeated. STEP (NEW) 10: Slice 1 Hatchtype: integer [RTN] The program is asking for the hatch type of the slice. Valid hatch type values are integers between 1 and 6. All other inputs will generate an error and cause the prompt to be repeated. A list of the hatch types can be found on page 93. STEP (NEW) 11: Explode slice 1 Y/N? y or n [RTN] The program is asking whether the slice is to be "pulled" away from the other slices in the plot. The program requires a single character response. Inputs of more than one character will cause an error and the prompt will be repeated. Any single-character input, other than "n" or "N" will be interpreted as "yes".

DISPLAY

KEYSTROKES

STEPS (NEW) 8 through 11 will be repeated for each slice as specified in STEP (NEW) 7.

STEP (NEW) 12:

Edit File Y/N?

y or n [RTN]

The newly created file may now be edited. The program requires a single character response. Inputs of more than one character will cause an error and the prompt will be repeated. Any single-character input, other than "n" or "N" will be interpreted as "yes".

See User Instructions for "Editing an Existing File" beginning with step (OLD) 4 to edit the file.

A negative response will cause the program to continue at step (NEW) 13.

- STEP (NEW) 13:
- Plot Y/N?

y or n [RTN]

The program is asking whether the file should be plotted or not. The program requires a single character response. Inputs of more than one character will cause an error and the prompt will be repeated. Any single-character input, other than "n" or "N" will be interpreted as "yes". The use of this option requires either that the plot program be in file "PPLOT" in main memory or that it be in file "PPLOT" on device ":CA".

See User Instructions for "Plotting" beginning at step (PLOT) 2 to plot the file.

A negative response will cause the program terminate.

	EDITING AN EXISTIN	G FILE
DISP	LAY	KEYSTROKES
STEP	(OLD) 1:	run "pedit" [RTN]
STEP	(OLD) 2:	
Creat	te a NEW Plot File <u>Y/N</u> ?	n [RTN]
	This prompt requests the type of file the program. The program is capable file or of modifying an existing plo	e to be manipulated by of creating a new plot t file.
	The response character may be entered lower case. Any invalid input (strin semicolons) will generate an error an be repeated. Select "n" to edit an o	d in either upper or ng too long, commas or nd cause the prompt to existing file.
STEP	(OLD) 3:	
Name	of File to Edit: PDATA	13 character string [RTN]
	This prompt requests the name of the data file to be edited. Any string of up to 13 characters, upper or lower case, will be accepted. Strings longer than 13 characters or containing commas, semicolons or quotation marks will generate an error message and cause the prompt to be repeated. An invalid file specifier will not be detected until the program tries to ac- cess the file. At that time an error will be generated and the prompt will be redisplayed. If the specified file is not found in memory, device ":CA" is searched. If the file is not found on device ":CA", an error occurs and the prompt is repeated.	
	The default file name may be used by input. The file name may be modified the appropriate keys (the [CLR], [SH [BACK] keys are active at this time)	pressing [RTN] with no d or replaced by pressing IFT][DEL], [DEL], [I/R] an before pressing [RTN] to

accept the input.

DISPLAY

KEYSTROKES

STEP (OLD) 4:

Edit Titles <u>Y/N</u>?

y or n [RTN]

Since the user may not desire to alter the values of the titles, the program gives you the choice of skipping them. The response string may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons) will generate an error and cause the prompt to be repeated. Single character responses other than "n" or "N" will be interpreted as yes.

A response of "y" will cause the program to continue at step (OLD) 5 while that of "n" will continue at step (OLD) 7.

STEP (OLD) 5:

Main title: old title

50 character string [RTN]

The program is asking for the main title of the plot. This title may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. The title will be plotted along the top of the chart. Pressing [RTN] with no input will accept the old title (represented by "old title" in the example above). The main title may be omitted by clearing the input display.

STEP (OLD) 6:

Subtitle: old subtitle

50 character string [RTN]

The program is asking for the subtitle of the plot. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 50 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. The subtitle will be plotted immediately below the main title (or immediately below the place the main title would be). Pressing [RTN] with no input will accept the old title (represented by "old subtitle" in the example above). The main title may be omitted by clearing the input display.

DISPLAY

KEYSTROKES

STEP (OLD) 7:

Edit Slices Y/N?

y or n [RTN]

Since the user may not desire to alter the values of the slices, the program gives you the choice of skipping them. The response string may be entered in either upper or lower case. Any invalid input (string too long, commas or semicolons) will generate an error and cause the prompt to be repeated. Single character responses other than "n" or "N" will be interpreted as yes.

A response of "y" will cause the program to continue at step (OLD) 8 while that of "n" will continue at step (OLD) 19.

STEP (OLD) 8:

Slice units: %

3 character string [RTN]

The program is asking for the value units that each slice represents. Default is percent. Any three-character string may be used excluding those containing commas, semicolons and quotation marks. Invalid strings will cause an error and the prompt will be repeated. The slice unit string may be omitted.

If the chosen string units are percentage, the program will test the accumulated total for all of the slices and generate an error if it is greater than 100.

STEP (OLD) 9:

Add, Move, Change, Delete, eXit: a, m, c, d or x [RTN]

This is the branch point for selecting the following options:

Add: add a slice to the pie at any location. Go to step (OLD) 10.

Move: move a slice in the pie from one location to another in the pie. Go to step (OLD) 11.

Change: alter the characteristics of a slice in the pie. Go to step (OLD) 13.

DISPLAY	KEYSTROKES
Delete: remove a slice from the	pie. Go to step (OLD) 14.
eXit: leave the slice-editing s to step (OLD) 19.	ection of the program. Go
The response string may be ente Any invalid input (string too l generate an error and cause the	red in either upper or lower case, ong, commas or semicolons) will prompt to be repeated.
STEP (OLD) 10:	
Add after slice #:	integer [RTN]
The response to this prompt shown new slice is to be inserted. Of the total number of slices will cause the slice to be inserted tion will continue at step (OLD	uld be the slice after which the nly integers in the range 0 to be accepted. Inputting 0 will before the first slice. Execu-) 15.
STEP (OLD) 11:	
Slice # to be moved:	integer [RTN]
The response to this prompt is integers in the range 1 to the be accepted.	the slice to be moved. Only total number of slices will
STEP (OLD) 12:	
Put after slice #:	integer [RTN]
The response to this prompt is a slice is to be moved. Only into total number of slices will be cause the slice to be inserted b Execution will continue at step	the location to which the egers in the range O to the accepted. Inputting O will before the first slice. (OLD) 9.
STEP (OLD) 13:	
Slice # to change:	integer [RTN]
The response to this prompt show slice to be changed. Only inter total number of slices will be a	uld be the number of the gers in the range 1 to the accepted. Execution will

continue at step (OLD) 15.

DISPLAY

KEYSTROKES

STEP (OLD) 14:

Slice # to delete:

integer [RTN]

The response to this prompt is the slice to be deleted. Only integers in the range 1 to the total number of slices will be accepted. Execution will continue at step (OLD) 9.

STEP (OLD) 15:

Slice n Label:

17 character string [RTN]

The program is asking for the descriptive label for slice n, the slice to be altered or added. This may be any string of text, excluding commas, semicolons and quotation marks, of up to 17 characters. Erroneous inputs (containing commas, semicolons or quotation marks) will generate an error and cause the prompt to be repeated. Pressing [RTN] with no input is acceptable and will cause no descriptive label to be plotted.

STEP (OLD) 16:

Slice n Value: %

integer [RTN]

The program is asking for the size of the slice in the appropriate units (the example assumes "%"). Input must be an integer between 1 and 99 (if units are percentage) or between 1 and 9999. Real numbers may be input but are rounded to integers for use. All other inputs will cause the prompt to be repeated.

```
STEP (OLD) 17:
```

Slice n Hatchtype:

integer [RTN]

The program is asking for the hatch type of the slice. Valid hatch type values are integers between 1 and 6. All other inputs will generate an error and cause the prompt to be repeated. A list of the hatch types can be found on page 93.

STEP (OLD) 18:

Explode slice n Y/N?

y or n [RTN]

The program is asking whether the slice is to be "pulled" away from the other slices in the plot. The program requires a single character response. Inputs of more than one character

DISPLAY

KEYSTROKES

will be repeated. Any single-character input, other than "n" or "N" will be interpreted as "yes". Execution continues with step (OLD) 9.

STEP (OLD) 19:

Plot <u>Y/N</u>?

y or n [RTN]

The program is asking whether the file should be plotted or not. The program requires a single character response. Inputs of more than one character will cause an error and the prompt will be repeated. Any single-character input, other than "n" or "N" will be interpreted as "yes".

See User Instructions for "Plotting" beginning at step (PLOT) 2 to plot the file.

A negative response will cause the program to terminate.

PLOTTING			
DISPLAY		KEYSTROKES	
STEP	(PLOT) 1:	run "pplot" [RTN]	
STEP	(PLOT) 2:		
Data	Filename? PDATA	13 character string [RTN]	
	This prompt requests the name of the data file to be manipu- lated. Any string of up to 13 characters, upper or lower case, will be accepted. Strings longer than 13 characters or containing commas, semicolons or quotation marks will generate an error message and cause the prompt to be repeated. A string that represents an invalid file specifier will not be detected until the program tries to access the file. At that time an error will be generated and the prompt will be redisplayed. Press [RTN] to accept the default file name. The catalog information for the selected file will be displayed		
STEP	(PLOT) 3.	it is accessed.	
Plot	Rate (F M S).	f mors [RTN]	
	The program is asking whether it shou slow. The selection is mostly user p may be required to prevent pen skippi for overhead projectors. Only "f", " All other inputs will generate an err be repeated. The program continues from here to ge	ld plot fast, medium or reference, but a slow speed ng on such things as slides m" and "s" are allowed inputs or and cause the prompt to nerate the plot.	
ERROR MESSAGE

Number	Message	Description
16	Not enough memory	Not enough memory exists in order to create or expand the data file.
42	Line too long	The text the user has input is longer than that allowed by the prompt.
43	Number only	The user entered text in response to a numeric prompt.
44	No commas	Either too many numeric inputs were specified or commas or semicolons were entered in a text string.
56	Error in HP-IL loop	The HP-IL loop is broken or some other physical error has occurred. The loop should be checked.
62	No file: name	The specified data file was not found either in memory or on the specified mass storage device.
63	Invalid name	The file name or device specifier is illegal.
68	Wrong file type	An error occurred when trying to access the data file.
34 or 42	Not a plot file	The data file specified is not reconized as being a plot file.
nn	Unable to run	This is the default message when an error occurs that is not one of those listed above. The error number is reported so that the associated HP-75 error message can be determined.

Variables:

	the edit program
و الله الله الله الله الله الله الله الل	
A\$[1]	y/n response; response to option prompt.
В	not used.
B0	 file has been copied from cassette to memory. file has not been copied.
B1	<pre>1 - file not on memory. 0 - file in memory.</pre>
B2	matches D until out of the file creation routines, then B2=0. It is used by the error message routine.
C\$[3]	STR\$(T1)
D	1 - edit existing file. 0 - create new file.
D1	slice hatch type; slice type in %.
D2	temporary storage of hatch type.
D\$	dummy storage from file; STR\$(D1).
D9 \$	slice size input.
E\$[20]	error message.
F\$	file name.
G \$ [3]	units label.
I	slice index.
J	slice after which to add; slice to move.
К	slice after which to move.
L\$[50]	file name + device specifier; title.

L2\$	temporary storage of slice title.
N	pointer to file; number of slices.
P\$	ESC&"< <u>Y/N</u> "
R	index to records in the data file.
S\$	"Main Title: "; "Subtitle: "; slice title.
T1	slice size; total percent represented by slices; hatch type.
T2	temporary storage of slice size.
Y\$	first character(s) read from data file.
	the plot program
Α	angle index for pie perimeter; midangle of slice.
A 1	lower bound of current slice.
A2	upper bound of current slice.
A3	tempory storage of slice midangle.
A2(10)	slice sizes.
A3(10)	slice hatch types.
A4(10,3)	minimum, maximum and midangle for each slice.
A5(4,6)	not used.
A6(4)	not used.
A\$	plot rate response; dummy input.
В	temporary storage of slice lower bound.
ВО	 file has been copied from cassette to memory. file has not been copied.

С	index for hatch direction.
D	index for hatch lines through slice.
D1	x coordinate of hatch intersection with low bound.
D2	x coordinate of hatch intersection with high bound.
E	1
E\$	error message.
G1	character height; label length.
G2	character width; number of spaces to shift label
G3	number of lines to shift label.
G4	temporary storage of label postiion variable.
G5	250 - minimum x coordinate.
G6	279 - minimum y coordinate.
G7	10250 - maximum x coordinate.
G8	7479 - maximum y coordinate.
G9	label position.
Н	hatch type.
H1	character height parameter.
H2	character width parameter.
I	plot speed; slice index.
L	label offset from slice; temp. storage.
L1	1250 - minimum x coordinate of pie plot area.
L2	8850 - maximum x coordinate of pie plot area.
L3	350 - minimum y coordinate of pie plot area.

L4	7400 - maximum y coordinate of pie plot area.
L\$[50]	file name + device specifier; title; subtitle.
Ν	file index; number of slices.
0	temporary storagae of label offset.
Р	pen number.
P1	narrow hatch flag.
P2	cross hatch/fill flag.
Р3	temporary storage.
Р4	hatch line angle.
Р9	SQR(2)
Q	coordinate adjustment for hatch line endpoints.
Q3	x coordinate adjustment for scaling function.
Q4	y coordinate adjustment for scaling function.
Q5	x scale factor for scaling function.
Q6	y scale factor for scaling function.
Q8	not used.
Q9	1/plotter scale factor (ratio of plotter height to width).
R	file pointer; unscaled radius of the pie.
R 1	angle between low bound of slice and hatch line in counter clockwise direction.
R2	angle between low bound and high bound of slice in counter clockwise direction.
R3	angle between low bound and high bound of slice in counter clockwise direction.
S	distance between hatch lines.
S\$[5]	units characters.

Т	total of pie slices in percent.
Τ1	scale factor for intersection of hatch line and low bound of slice.
Τ2	scale factor for intersection of hatch line and high bound of slice.
x	x coordinate to plot (absolute plotter units).
X 1	preliminary scaling of x coordinate.
X2	scaling of x coordinate of intersection.
Х3	temporary storage.
X9	x coordinate of pie tip.
X\$	file name; first character from data file.
Y	y coordinate to plot (absolute plotter units).
¥1	preliminary scaling of y coordinate.
¥2	scaling of y coordinate of intersection.
¥3	temporary storage.
¥9	y coordinate of pie tip.
Z	index to slice terminals.

10 ! 20 ! Pie Plot File Creation 30 ! HP-75 Graphics Solutions Book 40 ! May 1983 50 ! 60 DIM A\$[1].C\$[3].E\$[20].G\$[3].L\$[50] ,L2\$[17],S\$[17],P\$[5],F\$[13] 70 INTEGER I.J.K.N.T1.T2.B.B0.B1.B2.D. D1,D2 80 P\$=CHR\$(27)&'<'&CHR\$(217)&'/'&CHR\$(Used with y/n questions 206)90 D.B.B2=0 @ F\$='PDATA' 100 ! 110 ! data file assignment 120 ! 130 ON ERROR GOSUB 2190 @ GOTO 140 140 DISP 'Create a NEW Plot File '&P\$: @ INPUT A\$ 150 IF UPRC\$(A\$)='N' THEN 220 Default is yes, branch on no 160 ON ERROR GOSUB 2190 @ GOTO 170 170 INPUT 'Data File Name: ',F\$;F\$ New file prompt 180 L\$=F\$ 190 ON ERROR GOSUB 2190 @ GOTO 400 200 PURGE F\$ Make room for file 210 GOTO 400 Branch to create 220 D=1 ! file exists/old file File is to be edited 230 BO,B1=0 240 ON ERROR GOSUB 2190 @ GÓTO 250 250 INPUT 'Name of File to Edit: '.F\$; Old file name prompt F \$ 260 B2=1 Edit mode and file creation flag 270 L\$=F\$ 280 ON ERROR GOSUB 2190 @ GOTO 310 290 CAT F\$ Does file exist? 300 DISP 310 ON ERROR GOSUB 2190 @ GOTO 330 320 IF B1 THEN B1=0 @ GOTO 350 ELSE 40 If file is in memory... Ö 330 IF BO THEN PURGE F\$ If file was copied from cassette... 340 6010 220 Try new file 350 L\$=F\$&':CA' Drive must be assigned ":CA" 360 CAT L\$ Does file exist on tape? 370 DISP 'LOADING FILE' 380 COPY L\$ TO F\$ Copy from cassette to memory 390 BO=1 File was copied 400 ASSIGN # 1 TO F\$, BASIC 410 IF D=0 THEN PRINT # 1 ; 'p' @ GOTO If new file, initialize 490 ! if new file 420 READ # 1 : Y\$ 430 IF Y#='p' THEN 470 Test existing file

440 DISP 'NOT A PLOT FILE'	
400 WAIL 2 440 ODTO OFA	
480 8010 230	
480 1	
490 B2≡0	No longon in file exection
500 ON ERROR GOSLIB 2190 & GOTO 510	No longer in life creation
510 TE D THEN DISP 'Edit Titles '&Ps:	
© INPUT Δ\$ \ if file evists, promot fo	
r edit ontion	
520 IF UPRC\$(A\$)='N' THEN 680	Default is ves, branch on no
530 !	
540 ! titles	
550 !	
560 N=10	Index to file
570 S\$='Main Title: '	Prompt string
580 IF D THEN READ # 1,N ; L\$ ELSE L\$=	
'' ! read title if file exists	
590 ON ERROR GOSUB 2190 @ GOTO 600	
600 DISP S\$; @ INPUT '',L\$;L\$	Prompt for title input
610 PRINT # 1,N ; L\$	Store in file
620 IF N#10 THEN 650	If through prompting
630 S\$='Subtitle: '	New prompt string
635 N=11	Next record
640 GOTO 580	Loop
650 !	
660 ! slices	
6/0 !	
680 IF DEO IMEN GSE: % @ GUIU /IO ! 1+	
new file, provide default (po nice / this clisser / tek, a inclut At	
700 DIGF EULC SILLES $@F \neq i$ @ INFO(H \neq 700 TE UDDC#(A#)-7N? TUEN 1700 ELSE DE	Drench on no defeult to use
$\Delta D \pm 1.20 + G \le N$	Branch on no, default is yes
710 ON ERROR GOSUR 2190 & GOTO 720	
720 INPUT 'Slice units: '.G\$:G\$	
730 IF D THEN PRINT # 1.20 : G\$.N @ GO	Store units in old file
TO 840 ! store units in new file	
740 ON ERROR GOSUB 2190 @ GOTO 750	
750 INPUT 'Number of Slices: ';N	
760 IF N<1 OR N>10 THEN GOSUB 2150 @ G	
OTO 750	
770 PRINT # 1,20 ; G\$,N	
780 FOR I=1 TO N	For each slice
790 S\$,D\$,C\$=''	
800 GOSUB 1880	Get slice values
810 NEXT I	
820 GOTO 1580	Go to wrap-up
830 !	
840 ! edit slice	
800 ! 0/0 prop # 1.00 - D# N	
OOV NEHU # $1,20$; $D \Rightarrow, N$ OTO ON EDDOD COCHE 2100 0 COTO 000	Read number of slices
900 DICE CHP\$ (193) 2770 C 0010 000	Tanut anomat
CON DIEL CHINAVIANS COP POINTS CONS. OA	input prompt

e,';CHR\$(195)&'hange,'; 290 DISP CHR\$(196)&'alata a'*CHR\$(216)	
CALLI I CAA THEHT ??.Ad	
$\frac{700}{1000} \frac{1000}{1000} \frac$	Propeh to engrandista ventina
710 IF UFRUP(HP)- H THEN 11EA	branch to appropriate routine
920 IF UPRC#(A#)='M' (HEN 1100 970 IF UPRC#(A#)='M' (HEN 1100	
730 IF UFRUP(HP)- C THEN 1310 040 IF UPRC#(AA)-2D2 THEN 1470	
740 IF UFRU#(H#)- D THEN 1400 OFA TE UPDC#(A#)-?Y? THEN 1400 ELCE 07	
ADO IF UFRU®(H#)- X THEN 1000 ELDE OF	
760 : 970 Ladd clica	
770 : aud sille	
700 : 000 AN EPEAR CACUD 2100 & CATA 1000	
1000 INPUT 20dd offer clico the 201	
1000 INFUT HUU ATLER SILLE #; ;0	
1010 IF UNO OK UZN THEN BUSUB 2150 C G	II Slice out of range
1000 IC I-N TUCH 1070	
1020 IF U-N (HEN 1070 1070 EOD D-N120 TO 1201 OTED1	li last slice
1030 FOR K - N + 20 IO J + 21 Sign - 1	Make room for insertion
1040 REMD + 1, R = 39, 01, 11 1050 DotNT + 1, 0.1, 026, 01, 71	
1000 FRINT # 1,RT1 ; $\Im P_{2}D1,11$ 1040 NEVT D	
1070 NEAT N 1070 Re De Ce-77	
1000 1-111	
1000 1-011 1000 COCUP 1000	Cot alies information
1100 N-N+1	Get slice information
1110 N-NTI 1110 PEAD # 1 20 • D¢	
1120 PRINT # 1 20 • D\$ N	
$1120 \text{ FRINT # 1,20 ; D_{2,N}$	Pool to options
1140	back to options
1150 L move elice	
1160 1	
1170 ON ERROR GOSLIB 2190 @ GOTO 1180	
1180 INPUT 'Slice # to be moved:':J	
1190 IF J<1 OR J>N THEN GOSUB 2150 @ G	Slice in range?
OTO 1180	Siloc in lange.
1200 INPUT 'Put after slice #: ':K	
1210 IF K <o k="" or="">N OR J=K THEN GOSUB 2</o>	Slice in range?
150 @ GOTO 1200	51100 III / UIBC.
1220 READ # 1,J+20 ; S\$,D1,T1	Get slice to be moved
1230 IF K <j 1240="" @="" els<="" goto="" k="K+1" td="" then=""><td>Move slices up or down depending</td></j>	Move slices up or down depending
E GOSUB 2090 @ GOTO 1280	on J and K
1240 FOR R=J+19 TO K+20 STEP -1	Move slices up to J
1250 READ # 1,R ; L2\$,D2,T2	
1260 PRINT # 1,R+1 ; L2\$,D2,T2	
1270 NEXT R	
1280 PRINT # 1,K+20 ; S\$,D1,T1	Insert slice
1290 GOTO 870	Branch back to options
1300 !	···· ····· ··· ·······················
1310 ! change slice	
1320 !	
1330 ON ERROR GOSUB 2190 @ GOTO 1340	
1340 INPUT 'Slice # to change: ';I	

1350	IF I<1 OR I>N THEN 1340 READ # 1 I+20 • S% D1 T1	Is slice in range?
1370	TE TINIO THEN TIMETANO	det Silce to change
1390	na=crpa(n1)	
1390		
1400	609/18 1980	Cet slice data
1410	6010 970	Branch back to option
1400		Branen back to option
4.4.3.0	· I choul cuto cu	
1440		
1450		
1460	INPUT 'Clice # to delete, '.]	
1470	TE IZI OD INN THEN COOLD 2150 D C	Is slipp in manga?
oro ·	IF UNI UN UZN FREN OUDUD 2100 @ 0 -	is since in Pange?
1480	K=N @ IE JKEN THEN GOSHR 2070	Shift slices over deletion
1400	Needing and the state of the st	Deargement glige count
1500	$PEAD \pm 1.20 \cdot D4$	Decrement Slice count
1510	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Store new count
1510	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Delete slice
1520	$\begin{array}{c} \mathbf{COTO} \mathbf{P} \mathbf{I}_{\mathbf{P}} [\mathbf{V} \mid \mathbf{Z}] \\ \mathbf{COTO} \mathbf{P} \mathbf{TO} \end{array}$	Branch to option
1.00000		Branch to option
1540	·	
1840	: wrach cith	
1576	AN EPPAR CACHE 210A & CATA 150A	
1500	DIGD $2 \text{Edit} = 2170 \text{ Color 1000}$	
1800	TE HEECK (ACHINE CEN); CINEOL HA	
1070 106 I	r urruptonala sile	
470 :	TE CANTAL TILE	No tost if not d
1410	IF 0974 7. IFICN 1700 Ti	
1400	COR R-01 TO NLOG	IOUAL 70 For each glice
1620	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	For each slice
1640	T1T1-D1	Add to total
1450	NEYT D	Next slice
1660	TE T1/=100 THEN 1700	Total N 10042
1670	$\frac{1}{1} \frac{1}{1} \frac{1}$	
1480	$M\Delta TT 2$	
1490		Cycle to options
1700	AN ERRAR GASUR 219A & GATA 1710	cycle to options
1710	DIGP 'Plot '2P& \oplus INPUT $\Delta =$	Plot option
1720	$TE (IPPC% (\Delta \%) = 'N' THEN END$	If no end
1730	B1=0	Assume file not loaded
1740	ON ERROR GOSLIB 2190 & GOTO 1780	ASSume TITE NOT TOAded
1750	F\$.1\$='PPIOT'	
1760	CAT FS	Test for file
1770	DISP	
1780	ON ERROR GOSLIB 2190 @ END	
1790	IF NOT B1 THEN 1840	If file in memory
1800	L\$=F\$&':CA'	Cassette specifier
1810	CAT L\$	Test for file
1820	DISP 'LOADING FILE'	
1830	COPY L\$ TO F\$	Copy file to memory
1840	RUN F\$	
1850	1	

1860 ! get slice 1870 !	
1880 DN ERROR GDSDB 2190 @ GD10 1890 1890 DISP 'Slice';I:'Label: '; @ INPUT '',S\$;S\$	
1900 ON ERROR GOSUB 2190 @ GOTO 1910 1910 IF B THEN B=0 @ GOTO 1970 1920 DISP 'Slice':I:'Value: ':	
1930 IF D\$='' THEN PUT '' 1940 INPUT '',D\$&' '&G\$;D9\$ 1950 IF D9\$[1 1]<'0' OF D9\$[1 1]>'9' T	Put CHR\$(136), the I/R key Input slice value If legal numeric, get value
HEN 1920 ELSE D1=VAL(D9\$)	
1960 IF (D1<1 OR D1>99) AND G\$='%' OR	Test for range
(D1<1 OR D1>9999) THEN GOSUB 2150 @ GO	
TO 1920	
1970 ON ERROR GOSUB 2190 @ GOTO 1980	
1980 IF B THEN B=0 @ GOTO 2010	
1990 DISP 'Slice';I;'Hatchtype: '; @ I	
NPUT '',C\$;T1	If out of mongo
GOTO 1990	II out of range
2010 ON ERROR GOSUB 2190 @ GDTO 2020	
2020 DISP 'Explode slice';1;P\$; @ INPU	
	If no, then value - value + 10
2030 IF UPRUN(AD)#IN' IHEN II=II+IO 2040 DDINT # 1 I/200 - C# D1 II	Store slice values
2040 FRINT # 1,1720 ; 3\$,01,11 2050 RETURN	
2040 I	
2070 L move forward	
2070 . move forward	
2090 FOR R=J+21 TO K+20	Move indexed slices down one
2100 READ # 1.R : L2\$.D2.T2	
2110 PRINT # 1.R-1 : L2\$.D2.T2	
2120 NEXT R	
2130 RETURN	
2140 !	
2150 DISP 'OUTSIDE LIMITS'	Range error
2160 WAIT 2	
2170 RETURN	
2180 !	
2190 ! error reporting	
2200 !	
2210 !	
2220 E\$='UNABLE TO RUN'	
2230 IF ERRN=42 AND B2=0 THEN E\$='LINE	
100 LUNG1 @ 5010 2350 2240 in total 2350	
2240 IF ERRNEAS THEN ENET NUMBER UNLY.	
2050 TE N THEN D-1	
2200 IF D THEN DHI 2240 TE EDDN-14 THEN E4-7NOT ENDIGH ME	
ATON IL EURIA-IO ILEN ED- NOI ENOOR NE WUDNA	
2270 IF ERRN=44 THEN ES='NO COMMAG' @	
GOTO 2350	

2280 IF ERRN=34 OR ERRN=42 AND B2 THEN E\$='NOT A PLOT FILE' & GOTO 2350 2290 IF ERRN=56 THEN E\$='ERROR IN HP-I L LOOP' 2300 IF ERRN=63 THEN E\$='INVALID NAME' € GOTO 2350 2310 IF ERRN<>62 THEN 2330 2320 IF ERRN=62 AND L\$<>F\$ THEN E\$='NO FILE: '%F\$ @ GOTO 2350 ELSE B1=1 @ RE TURN 2330 IF ERRN=68 THEN ES='WRONG FILE TY PE' @ GOTO 2350 2340 DISP 'ERR':ERRN:E\$; @ END 2350 DISP E\$ 2360 WAIT 2 2370 RETURN

	1
10 !	
20 ! Pie Plot Program	
30 ! HP-75 Graphics Solutions Book	
40 ! May 1983	
50 !	
60 OPTION BASE 1	
70 OPTION ANGLE DEGREES	
80 DIM A2(10),A3(10),A4(10,3),A5(4,6),	
A6(4),L\$[50],S\$[5]	
90 STANDBY UN	
100 B1=0	File in memory
100 UN ERRUR GUSUB 1380 @ GUTU 120	File not conied
120 B0=0 170 V = 7 BDATA?	File not copied
140 NTCD (Dete Cilesence (
150 TNPHT ?? Y& Y&	
140 L45m245	
170 AN FRAR GASUB 1580 & GATA 200	
180 CAT X\$	Is file in memory?
190 DISP	ib iiic in memory.
200 ON ERROR GOSUB 1580 @ GOTO 220	
210 IF B1 THEN B1=0 @ GOTO 240 ELSE 29	If file not in memory
0	
220 IF BO THEN PURGE X\$	If file in memory from COPY
230 GOTO 120	Try new file name
240 L\$=X\$&':CA'	Default mass storage specifier
250 CAT L\$	Is file there?
260 DISP 'LOADING FILE'	
270 COPY L\$ TO X\$	Copy from mass storage
280 B0=1	Copy successful
290 ASSIGN # 1 TO X\$,BASIC	
300 READ # 1 ; X\$	Read first text from file
STO IF X\$442°D' THEN DISK 'NUT A FLUT F	
TLE' & WAIT 2 & GUTU 120	On summer was set as a state
320 UN ERRUR BUID 330 330 INDUT 2016+ Date (E M C), 2.04	On error repeat prompt
330 INFO) FIUL RACE (F,H,S); ;H# 346 IE HEDC&(A&)-?E? THEN 1-39 ELGE T=	Soloot plot grood
15	Select plot speed
350 IF HPRC\$(A\$)='S' THEN I=3	
360 PRINT USING 'K' : 'IN:VS'.I	Initialize: set plotter speed to I
370 !	
380 ! Titles	
390 !	
400 ON ERROR GOSUB 1580 @ END	
410 G5=250	x minimum
420 G6=279	y minimum
430 67=10250	x maximum
440 68=7479	
450 Q9=(G7-G5)/(G8-G6)	
460 Q8=(G8-G6)/100	
470 P=1	
480 GUSUB 1740	

```
490 H1=4.7
                                               Letter size parameters
500 H2=.5
510 69=6
                                               Center text
520 X=5050
                                               Center of chart
530 Y=68
                                               Top of chart
540 N=10
550 READ # 1,N ; L$
                                               Title or subtitle
560 GOSUB 1780
                                               Set relative character size
570 GOSUB 1750
                                               Move (X,Y)
580 GOSUB 1830
                                               Label (G9,L$)
590 IF N=10 THEN N=11 @ H1=3.7 @ Y=720
                                               Smaller characters and new y
O @ GOTO 550
                                               coordinate for subtitle
600 !
610 ! Pie
620 !
630 T.B=0
640 R=20
650 READ # 1,R ; S$,N
                                               Units character(s) and # of slices
660 FOR I=1 TO N
                                               For each slice
670 READ # 1,I+R : L$,A2(I),A3(I)
                                               Slice label, size, hatch type
680 IF S$#'%' THEN T=T+A2(I) ELSE T=1
                                               Accumulate total %
690 A3(I)=A3(I)-1
                                               Decrement hatch type
700 NEXT I
710 IF S$#'%' THEN T=T/100
                                               Calculate fractional %
720 FOR I=1 TO N
                                               For each slice
730 A4(I_1) = B
                                               Lower bound of slice I
740 A4(I.3)=B+360*A2(I)/T/100
                                               Upper bound of slice I
750 \text{ A4}(I,2) = A4(I,1) + (A4(I,3) - A4(I,1)) /
                                               Mid-angle of slice I
2
760 B=A4(I,3)
                                               Next lower bound
770 NEXT I
                                               Next slice
780 L1=1250 @ L2=8850 @ L3=350 @ L4=74
                                               Bounds of pie area
ÔÖ
790 Q5=(L2-L1)/24
                                               Constants for use with FNX7 & FNY7
800 \ Q6 = (L4 - L3) / 22
810 Q3=L1+12*Q5
820 Q4=L3+10*Q6
830 DEF FNX7(X7) = 05*X7+03
                                               Scale x coordinate
840 DEF FNY7(Y7) = 0.6 \times Y7 + 0.4
                                               Scale y coordinate
850 P=2
                                               Pen 2
860 GOSUB 1740
                                               Pen up: select pen P
870 E=1
                                               Functionless constant
880 R=6.5
                                               Modified radius of pie
890 FOR I=1 TO N
                                               For each slice
900 X9=0
910 Y9=0
920 A3=A4(I,2)
930 H=A3(I)
                                               Hatch type
940 IF H<10 THEN 980
                                               Not "exploded"
950 X9=E*COS(A3)
                                               Coordinates of slice midpoint
960 Y9=E*SIN(A3)
970 !
980 ! Section
```

990 ! 1000 X=FNX7(X9) 1010 Y=FNY7(Y9) Move (X, Y)1020 GOSUB 1750 1030 GOSUB 1760 Draw (X,Y) 1040 A1=A4(I,1) 1050 A2=A4(I,3) 1060 FOR A=A1 TO A2 STEP 5 1070 X=FNX7(X9+R*COS(A)) 1080 Y=FNY7(Y9+R*SIN(A)) Draw (X.Y) 1090 GOSUB 1760 1100 NEXT A 1110 X=FNX7(X9+R*COS(A2)) 1120 Y=FNY7(Y9+R*SIN(A2)) Draw (X,Y) 1130 GOSUB 1760 1140 X=FNX7(X9) 1150 Y=FNY7(Y9) Draw (X.Y) 1160 GOSUB 1760 Hatch slice 1170 IF H>O AND H#10 THEN GOSUB 1990 1180 NEXT I 1190 ! 1200 ! legends 1210 ! Pen 1 1220 P=1 1230 GOSUB 1740 1240 H1=2.75 1250 H2=.45 1260 GOSUB 1780 1270 L=R+.5 1280 FOR I=1 TO N 1290 X9=0 1300 Y9=0 1310 A=A4(I.2) 1320 IF A3(I)<10 THEN 1360 1330 X9=E*COS(A) slice point 1340 Y9=E*SIN(A) 1350 ! 1360 ! Skip Explode 1370 ! 1380 IF A>=330 OR A<30 THEN 0=2 1390 IF A>=30 AND A<90 THEN 0=1 1400 IF A>=90 AND A<150 THEN 0=7 1410 IF A>=150 AND A<210 THEN 0=8 1420 IF A>=210 AND A<270 THEN 0=9 1430 IF A>=270 AND A<330 THEN 0=3 1440 GOSUB 1770 G9=0 1450 X=FNX7(X9+L*COS(A)) 1460 Y=FNY7(Y9+L*SIN(A)) 1470 GOSUB 1750 Move (X,Y)1480 READ # 1,20+I ; L\$ 1490 L\$=L\$&? '&STR\$(A2(I))&? '&S\$ 1500 GOSUB 1830 1510 NEXT I

Convert to plottable units Lower bound of slice I Upper bound of slice I Draw perimeter of slice Coordinates of upper bound Midpoint coordinates Pen up; select pen P Midpoint coordinates Set character size Offset from slice perimeter Midangle of slice I If not exploded Coordinates of middlemost Parameters for placing label based on slice orientation Coordinates of label origin

Move (X,Y) Get slice label Slice label + size + units Label (G9,L\$)

1520 X,Y=0	
1530 GDSUB 1750	Move (0,0)
1540 P=0	
1550 GOSUB 1740	Pen up; select pen P
1560 END	
1570 !	
1580 ! error	
1590 !	
1600 E\$='UNABLE TO RUN'	
1610 IF ERRN=16 THEN E\$='NOT ENOUGH ME	
MORY'	
1620 IF ERRN=34 OR ERRN=42 THEN E\$='NO	
T A PLOT FILE' © GOTO 1690	
1630 IF ERRN=56 THEN E\$='ERROR IN HP-I	
L LOOP"	
1640 IF ERRN=63 THEN E\$='INVALID NAME'	
1650 IF ERRN<>62 THEN 1670	
1660 IF L\$<>X\$ THEN E\$="NO FILE: "&X\$	
© GOTO 1690 ELSE B1=1 © RETURN	
1670 IF ERRN=68 THEN E\$='WRONG FILE TY	
PE' @ GOTO 1690	
1680 DISP 'ERR';ERRN;E\$; @ END	
1690 DISP E\$; W INPUT ', HIT RIN ';A\$	
1700 RETURN	
1720 : HP-6L	
1730 ! 1740 potet lotes u/u , upu.cou d o offi	Pon unt select non P
1740 FRINT USING "K" ; "FU;SF",F @ RET .	ren up, serect pen r
URN 17EA DDINT HOING URU , UDH.DAU V U U V	Move (X X)
GOTTION	
4740 RETURN 1740 RETNETISTIC (2010) - "RD. RAT V " V V	Draw (X,Y)
A RETIRN	
1770 G9=0 & RETURN	
1780 G1=H1*-5	Select relative character size
1790 G2=H1*H2*(1/09)*.67	
1800 PRINT USING 'K' : 'SR'.62.'.'.61	
1810 RETURN	
1820 !	
1830 ! LABEL	
1840 !	
1850 G1=LEN(L\$)	
1860 G2,G3=0	
1870 G4=MOD(G9,10)	
1880 IF G4>=4 AND G4<=6 THEN G2=-(G1	
33)/2	
1890 IF G4>6 THEN G2=-(G133)	Left justify
1900 IF MOD(64,3)=2 THEN 63=25	Move down quarter line
1910 IF MOD(G4,3)=0 THEN G3=5	Move down half line
1920 IF G9>=11 AND G9<=13 THEN G2=G2+.	1920-1950: never used
1930 IF G9>=1/ IHEN G2=G266	
1940 IF 69=11 UR 69=14 UR 69=17 THEN 6	

3=63+.5 1950 IF G9=13 OR G9=16 OR G9=19 THEN G 3=63-.5 1960 PRINT USING "K" : "CP",G2,",",G3, ";LB",L\$,CHR\$(3) @ RETURN 1970 PRINT USING "K" ; "PU;" @ RETURN Pen up 1980 ! 1990 ! Hatch 2000 ! 2010 P1=0 2020 P2=0 2030 H=MOD(H,10) H>10 if slice exploded 2040 IF H=1 OR H=3 THEN P1=1 Narrow hatch 2050 IF H=3 OR H=4 THEN P2=1 Cross hatch 2060 IF H=5 THEN P1=11 Fill 2070 P3=10*(1+1*P1) Calculate hatch width 2080 S=R/P3/2 2090 Z=0 For each hatch direction 2100 FOR C=0 TO P2 2110 P4=135-90*(C=1) Hatch angle 2120 R1=MOD(360+(A1-P4),360) Angle between low bound & hatch line 2130 R2=MOD(360+(A2-P4),360) Angle between high bound/hatch line 2140 R3=MOD(360+(R2-R1),360) Angle between low and high bound 2150 P9=SQR(2) 2160 D1=R*COS(R1) x coord. of intersection low bound 2170 D2=R*COS(R2) x coord. of intersection high bound 2180 IF ABS(D1)<.01 THEN D1=0 Round coordinates 2190 IF ABS(D2)<.01 THEN D2=0 2200 IF R1=90 OR R1=270 THEN R1=R1-.00 Ö1 2210 IF R2=90 OR R2=270 THEN R2=R2-.00 01 2220 T1=-TAN(R1)/P9*(1-2*C) Scale factors for line intercepts 2230 T2=-TAN(R2)/P9*(1-2*C) 2240 FOR D=R-S TO O STEP -S 2250 IF R3>180 OR D>D1 OR D>D2 THEN 23 ОÖ 2260 GOSUB 2680 Scale 2270 GOSUB 2870 Line intercept move 2280 GOSUB 2820 Line intercept draw 2290 GOTO 2430 2300 IF 360-R1>R3 OR D<D1 OR D<D2 THEN 23502310 GOSUB 2680 Scale 2320 GOSUB 2720 Perimeter intercept move 2330 GOSUB 2770 Perimeter intercept draw 2340 GOTO 2430 2350 IF D>D1 THEN 2390 2360 GOSUB 2680 Scale 2370 GOSUB 2720 Perimeter intercept move 2380 GOSUB 2820 Line intercept draw 2390 IF D>D2 THEN 2430 2400 GOSUB 2680 Scale

2410 GOSUB 2870 Line intercept move 2420 GOSUB 2770 Perimeter intercept draw 2430 NEXT D 2440 FOR D=D TO -R+S STEP -S 2450 IF R<180 THEN L=180 2460 IF R1>=180 THEN L=540 2470 IF L-R1>R3 OR D>D1 OR D>D2 THEN 2 520 2480 GOSUB 2680 Scale 2490 GOSUB 2720 Perimeter intercept move 2500 GOSUB 2770 Perimeter intercept draw 2510 GOTO 2650 2520 IF R3>=180 OR D<D1 OR D<D2 THEN 2 570 2530 GOSUB 2680 Scale 2540 GOSUB 2820 Line intercept move 2550 GOSUB 2870 Line intercept draw 2560 GOTO 2650 2570 IF D<D1 THEN 2610 2580 GOSUB 2680 Scale 2590 GOSUB 2820 Line intercept move 2600 GOSUB 2770 Perimeter intercept draw 2610 IF D<D2 THEN 2650 2620 GOSUB 2680 Scale 2630 GOSUB 2720 Perimeter intercept move 2640 GOSUB 2870 Line intercept draw 2650 NEXT D 2660 NEXT C 2670 RETURN 2680 Y1=D/P9 Preliminary scaling of points 2690 X1=X9-Y1*(1-2*C) 2700 Y1=Y9+Y1 2710 RETURN 2720 Q=SQR(R^2-D^2)/P9 Scale factor for perimeter 2730 X2=X1-Q 2740 Y2=Y1-Q*(1-2*C) 2750 GOSUB 2920 2760 RETURN 2770 Q=SQR(R^2-D^2)/P9 2780 X2=X1+0 2790 Y2=Y1+Q*(1-2*C) 2800 GOSUB 2920 Plot coordinate 2810 RETURN 2820 Q=D*T1 Scale factor for line intercept 2830 X2=X1+Q*(1-2*C) 2840 Y2=Y1+Q 2850 GOSUB 2920 Plot coordinate 2860 RETURN 2870 Q=D*T2 Scale factor for line intercept 2880 X2=X1+Q*(1-2*C) 2890 Y2=Y1+Q 2900 GOSUB 2920 Plot coordinate **2910 RETURN**

2920 IF Z#0 THEN 2970 2930 X=FNX7(X2) Scale the coordinates to be plotted 2940 Y=FNY7(Y2) 2950 GOSUB 1750 Move (X,Y) 2960 GOTO 3120 2970 IF Z#1 THEN 3020 2980 X=FNX7(X2) Scale the coordinates 2990 Y=FNY7(Y2) 3000 GOSUB 1760 Draw (X,Y) 3010 GOTO 3120 Increment Z and return 3020 IF Z#2 THEN 3060 3030 X3=X2 3040 Y3=Y2 3050 GOTO 3120 Increment Z and return 3060 X=FNX7(X2) Scale the coordinates 3070 Y=FNY7(Y2) 3080 GOSUB 1750 Move (X,Y)3090 X=FNX7(X3) @ Y=FNY7(Y3) @ GOSUB 1 Scale the coordinates 760 3100 Y=FNY7(Y3) 3110 GOSUB 1760 Draw (X,Y) 3120 Z=MOD(Z+1,4) 3130 RETURN 3140 END

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GRAPHICS

LINE PLOT BAR PLOT LINE PLOT

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