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GLFRC MODELING GROUP SOFTWARE

PLT

A USER'S MANUAL

by

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INTRODUCTION

PLT is a fully interactive graphics program which was designed by the Modeling Group at GLFRC to process the output of mathematical models. In addition to model outputs, several other types of data are readily handled by PLT: data gathered by mechanical or electronic devices, and any other type of experimental data consisting of a series of measurements repeated several times in a sequence of observations.

In particular, data where one of the measurements is some ordered quantity (e.g. time) are appropriate for PLT. Where the sequence of observations has no specific order, PLT can be used to produce clouds of points (scatter diagrams).

PLT responds to a series of commands which it reads from the terminal screen. Graphs can be built gradually, and can be displayed (using the GRAPH command) at any time during a session.

Once a graph has been prepared to the user's satisfaction, it is possible to save the graph on disk for later reproduction or further development.

PLT has some built-in error detection capabilities, particularly with respect to the SYNTAX and LOGIC of commands issued by the user. The error message appearing on the screen, however, is general and does not spell-out errors. Rather, it suggests that the user consult the HELP facility which explains command syntax and usage.

A note on the notation used in this manual to describe command syntax: only the capitalized portion of words is needed in commands, and arguments between [] are optional (can be omitted). Thus, only the first 3 letters of commands are needed, and literal arguments may be abbreviated to only the first letter if desired.

1.0 DATA PREPARATION AND ENTRY

1.1 The Structure of PLT Data Sets

PLT handles data which can be represented in a MATRIX or TABLE, where columns are different measurements (hereafter VARIABLES) and lines are repetitions (hereafter OBSERVATIONS) (Table 1).

Table 1

Generalized structure of the PLT data set

Observation (line)	Variable (column)					
	1	2	3	...	n-1	n
1	val(1,1)	val(1,2)	val(1,3)	...	val(1,n-1)	val(1,n)
2	val(2,1)	.	.	.	.	.
3	val(3,1)	.	.	.	.	.
.
.
.
r-1	val(r-1,1)	.	.	.	.	.
r	val(r,1)	val(r,2)	val(r,3)	...	val(r,n-1)	val(r,n)

As an example for the remainder of this manual, we use a hypothetical data set representing various measurements (variables) made repeatedly (10 observations) on the shoots of a coniferous tree during the growth season. In this case, one of the variables is time (an ordered variable). The other variables are: proportion of maximum shoot weight and length, and the relative concentration of nitrogen,

phosphorus, fats and sugars in the needles. Thus a series of 7 measurements (including time) were observed 10 times (Table 2).

Table 2

Hypothetical data set suitable for PLT

J u D l a i t a e n	Proportion of maximum Shoot		Relative concentration			
	weight	length	nitrogen	phosphor	fats	sugars
106.	0.000	0.000	1.000	0.800	0.600	0.200
121.	0.031	0.015	0.995	0.790	0.577	0.650
136.	0.162	0.070	0.972	0.780	0.555	0.860
151.	0.376	0.166	0.918	0.750	0.533	0.945
166.	0.606	0.298	0.832	0.694	0.511	0.948
181.	0.792	0.456	0.719	0.606	0.488	0.914
196.	0.913	0.626	0.589	0.486	0.466	0.865
211.	0.975	0.789	0.450	0.335	0.444	0.810
226.	0.997	0.924	0.308	0.240	0.422	0.755
241.	1.000	1.000	0.250	0.200	0.400	0.700

1.2 Preparation of Data Sets for PLT

PLT reads data sets from files stored on disk on the PDP-11/70. The files can be prepared in several ways, including the use of MINITAB, key-punched CARDS, or through the PDS file EDITOR.

These data files must reflect the line and column structure illustrated in Tables 1 and 2. Using our example, the file PLTDEMO.DAT was stored on disk (Table 3).

Table 3

Data in Table 2 entered in a disk file

106.	0.000	0.000	1.000	0.800	0.600	0.200
121.	0.031	0.015	0.995	0.790	0.577	0.650
136.	0.162	0.070	0.972	0.780	0.555	0.860
151.	0.376	0.166	0.918	0.750	0.533	0.945
166.	0.606	0.298	0.832	0.694	0.511	0.948
181.	0.792	0.456	0.719	0.606	0.488	0.914
196.	0.913	0.626	0.589	0.486	0.466	0.865
211.	0.975	0.789	0.450	0.335	0.444	0.810
226.	0.997	0.924	0.308	0.240	0.422	0.755
241.	1.000	1.000	0.250	0.200	0.400	0.700

1.2.1 File format -

PLT reads data files in a LIST-DIRECTED format. This means that no specific format is required, except that all values must be separated by at least one space, or a comma. Observations which are too long (too many measurements per observation) to fit on one line (or card) can be split into as many lines as necessary. This, provided that each new observation starts on a new line. This is normally done when files are written by MINITAB or on cards. Note that MINITAB puts *'s at the end of lines when observations are split, and that these must be removed from the file before processing by PLT (use the PDS editor for this).

1.2.2 Size of Data Sets -

PLT will process files which contain between 2 and 16 measurements per observation (thus up to 16 variables in a file). There is also a limit of 1000 observations per file.

Whenever the product of the number of variables (n) by

the number of observations (r) is $n \times r > 2000$, the input file cannot be processed all at once by PLT. The SELECT command described in this manual, is intended to get around this size limitation, allowing to read only some of the columns of a file at a time.

1.2.3 Missing Values -

PLT handles missing data, but missing values must be entered in the data file by giving them a value below the minimum datum (e.g. missing values at or below -1). Once this missing value code has been given to PLT by using the MISSING command, any value at or below this specified code will be considered missing.

2.0 THE PLT COMMANDS

The following sections describe the various PLT commands, their syntax and usage. We divide PLT commands into 5 groups:

1. Data definition commands
2. Graph structure commands
3. Data presentation commands
4. Lettering commands
5. Program control commands

2.1 Data Definition Commands

2.1.1 The FILE Command -

SYNTAX: FILE FILENAME N

where

N is the number of variables in file
FILENAME

The FILE command is issued to define the name of the disk file (FILENAME) where the data are stored, and the number of columns, or variables (N) per observation in this file.

The FILENAME parameter may be any valid file specification, including other than default disk drive, account or version number. For example, DR0:[11,54]PLTDEMO.DAT;1 is a valid FILENAME parameter. So is PLTDEMO.DAT if you are logged into account [11,54].

When the input file has been successfully found and opened, PLT reads it to the end or until a maximum of 2000 values (not observations) is reached, whichever comes first. If an error is made in the file specification, a severe error occurs and execution is terminated.

Upon successful completion of a FILE command, PLT prints the number of observations read on the terminal screen. Each column, or variable read-in by PLT is automatically identified by a number between 1 and N (the second parameter of the FILE command). Whenever a PLT command requires the id number of a variable, it is the POSITION of this variable in the input file that is required. The only

exception to this is when the SElect command has been issued. Then, this id number refers to the position of the variable in the column series specified in the most recent SElect command (see below).

EXAMPLE

```
PLT> FIL DR0:[11,54]PLTDEMO.DAT 7
or if logged into [11,54]:
PLT> FIL PLTDEMO.DAT 7
```

ERROR MESSAGE

PLT will return an error message and will not complete execution of a FILE command if there are strange characters in the input FILE (e.g. *'s).

2.1.2 The SElect Command -

SYNTAX: SElect NN
where

NN is the number of columns to be selected from the input file specified in a previous FILE command. Here, $2 < NN < N$ must hold (N is the total number of columns in the input file).

This command cannot be used before a file has been defined in a FILE command. After the SElect command is issued, PLT prompts the user for NN columns to be selected in the input file. PLT then reads the file again, skipping columns which were not specified in the selected list. The net effect of this is similiar to having a new input file containing only the columns specified. Variable id numbers are changed to reflect the new data structure.

EXAMPLE

Imagine file JUNK.DAT containing 8 variables, and 500 observation. Such a file cannot be processed all at once by PLT, since $N \times R > 2000$. The following commands can circumvent this problem:

1. PLT> FIL JUNK.DAT 8
NUMBER OF OBSERVATIONS READ: 250
2. PLT> SEL 4
ENTER SELECTED COLUMNS: 1 3 5 7
NUMBER OF OBSERVATIONS READ: 500
PLT>

At this point, columns 1,3,5, and 7 of file JUNK.DAT correspond to variables 1,2,3, and 4 in PLT (respectively). Any series of PLT commands can be issued to process these data. Issue the SElect command again when other columns are to be processed:

3. PLT> SEL 4
ENTER SELECTED COLUMNS: 1 2 4 6
NUMBER OF OBSERVATIONS READ: 500
PLT>

Now, PLT variables 1 through 4 correspond to columns 1,2,4, and 6 of the file JUNK.DAT.

ERROR MESSAGE

PLT will return an error message and will not complete execution of the SElect command if:

1. a file has not been previously defined
2. NN is not in the range [2,N]
3. one of the selected columns is > N.

2.1.3 The MISSing Command -

SYNTAX: MISSing V [Interpolate]
where

V is a value AT OR BELOW which a value in the data is to be considered missing for the purposes of graphic display. Interpolate (abbreviated if desired) is an option described below.

Missing values can be present in any column of an input file, as long as they are ALL identified by the same value (or any value lower than V) within the file.

Missing values are disregarded in evaluating data minimum and maximum, and in graphic display. They are not altered except when the Interpolate option is specified. If a missing value is encountered in the X variable (abscissa),

none of the Y variables, will be plotted for the observation. If a missing value occurs in a Y-variable (ordinate) only that value will not be displayed.

The Interpolate option is useful when the user wishes missing values to be approximated by linear interpolation between values in ADJACENT OBSERVATIONS. The Interpolate option is of limited usefulness as it will produce erroneous results if :

1. the first or last observation in a file contains missing values or
2. 2 or more CONSECUTIVE missing values are encountered anywhere within a column.

Use this option with caution.

EXAMPLE

```
PLT> MIS -1
PLT>
```

ERROR MESSAGE: None

2.1.4 The XVariable Command -

SYNTAX: XVariable ID
where

ID is a valid variable id number (in the range [1,N], or [1,NN] if the SElect command was used).

Only one X variable can be defined in a graph. This variable can be changed at any time by re-issuing the XVariable command. Immediately following this command, PLT evaluates the X variable minimum and maximum for axis pre-

evaluates the X variable minimum and maximum for axis preparation.

EXAMPLE

1. PLT> XVA 1
PLT>
Defines variable 1 as the X variable of the graph.
2. PLT> XVA 2
Changes the X variable, and re-evaluates abscissa min and max

ERROR MESSAGE

PLT will return an error message, and will not execute the XVariable command if the ID parameter is not in the range [1,N], or [1,NN] if the SElect command was used.

2.1.5 The YVariable Command -

SYNTAX: YVariable [ID]
where

ID is any variable number in the range [1,N], or [1,NN] if the SElect command is in effect.

Up to 8 Y variables can be defined on a single graph. Issuing the YVariable command ADDS variable ID to the list of ordinate variables to be plotted (the plot queue). To clear the plot queue, and thus allow a new set of up to 8 Y variables, omit the ID parameter in the YVariable command.

EXAMPLE

1. PLT> YVA 3
PLT> YVA 4
PLT> YVA 5
Produce a 3-variable plot queue. Issuing
2. PLT> YVA
PLT> YVA 5
PLT> YVA 6
Creates a new 2-variable plot queue.

Every time a YVariable command is issued, the ordinate min and max for the plot is re-evaluated to accommodate the new entry in the plot queue. PLT refers to the variables in the plot queue as CURVES. Thus, after the above string of commands, 2 curves are defined. Curve 1 is a plot of variable 5, and curve 2 of variable 6. The graph structure commands described below all refer to CURVES, and NOT VARIABLES.

ERROR MESSAGE

PLT will return an error message and will not execute the YVariable command if:

1. the ID parameter is invalid (outside the range [1,N], or [1,NN] if the SElect command is in effect).
2. the plot queue is full (8 curves).

2.2 Graph Structure Commands

The screen of VT-640 and Tektronix 4010 graphic terminals consists of a matrix of phosphorous dots called addressable points, which can be illuminated electronically, in order to produce images. There are 1023 columns of such dots along the horizontal aspect of the screen, each containing a vertical series of 780 dots. (thus 1023 x 780 dots on the screen). The graphics software is a series of instructions prepared by the computer to illuminate some of these points. Any point outside the addressable screen cannot be displayed.

The general structure of a PLT graph is illustrated in Figure 1. Most of the aspects of this structure can be modified by a PLT graph-structure command.

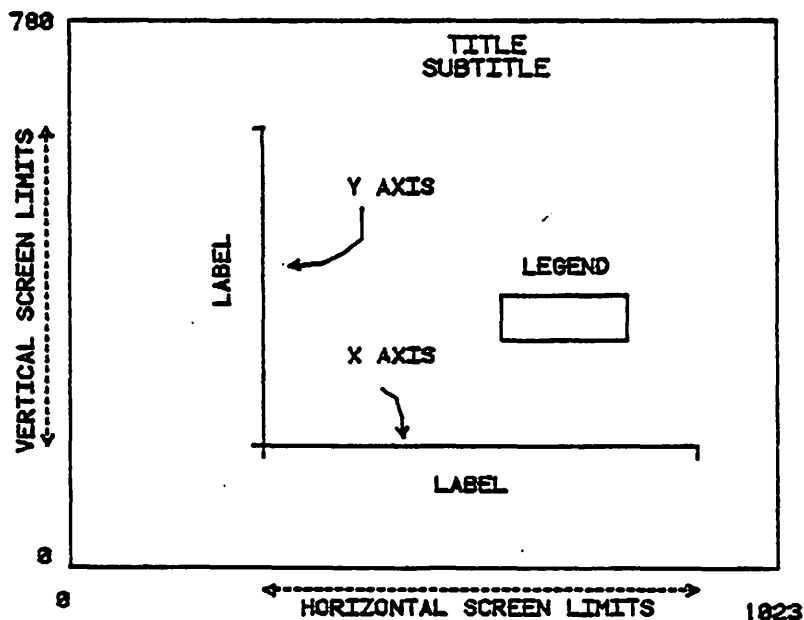


FIGURE 1: STRUCTURE OF THE PLT GRAPH.

2.2.1 The SCReen command -

SYNTAX: SCReen [ASPECT MIN MAX]

where

ASPECT is either Horizontal or Vertical (abbreviated if desired) MIN and MAX are VALID screen limits (Figure 1).

The SCReen command controls the POSITION and LENGTH of the axes on the terminal screen. Thus, it can be used to alter the SHAPE, SIZE, and POSITION of the the entire graph. The command is useful in :

1. changing the size of the graph with respect to the lettering (which cannot be altered on our terminals).
2. allowing more than one set of axes on a single graph (although these cannot be displayed simultaneously on the screen, they can be on the hard-copy terminals or pen plotter).

By default, the screen limits are set by PLT at [200,850] on the horizontal, and [170,655] on the vertical. These values are thought to produce generally satisfactory results, providing a good height/width ratio between the axes, leaving sufficient space on all sides for lettering.

When altering these limits, it is recommended to leave some empty space below the X-axis and to the left of the Y-axis for tic marks and axis labels. Thus the lower HORIZONTAL limit should be >150, and the lower VERTICAL limit >100.

Drawing several GRAPHS on the same page is a rather specialized use requiring some familiarity with the equip-

ment and software. But practise makes good. For example, if a figure is to contain 2 graphs of equal dimensions, one below the other, the vertical screen limits could be set by the following string of commands:

EXAMPLE

1. PLT> SCR V 100 300
for the LOWER graph
2. PLT> SCR V 450 650
for the UPPER graph

The result being 2 rather thin graphs (Figure 2). Omitting the X axis label in the upper graph, and using more of the vertical screen's addressable space would lead to larger graphs.

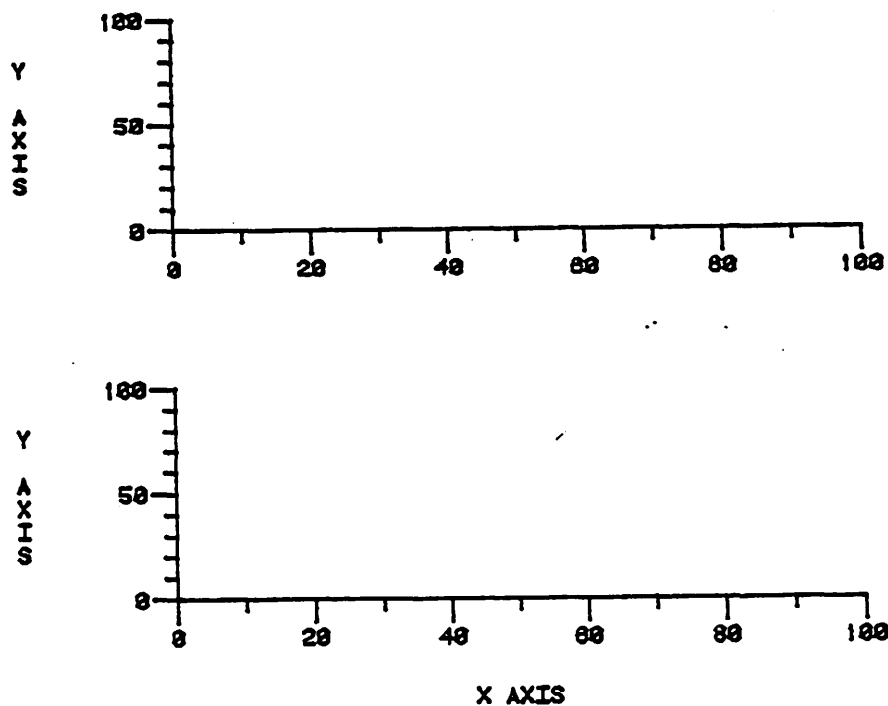


FIGURE 2: USE OF THE SCREEN COMMAND

3. When the parameters of the SCReen command are omitted, PLT prints the current screen limits on the terminal:

PLT> SCR

PRESENT LIMITS	X	Y
MIN	200.0000	170.0000
MAX	850.0000	655.0000

PLT>

ERROR MESSAGE

PLT will return an error message and will not execute the SCReen command if:

1. the second parameter begins with a character other than H or V, or
2. the MIN or MAX parameter is invalid (Too large).

2.2.2 The AXIs Command -

SYNTAX: AXIS [ID MIN MAX]

where

ID is the axis identity (either X or Y), and
MIN < MAX are the axis minimum and maximum
desired.

This command allows the user to choose the range of values to be displayed on the graph. However PLT is programmed to choose the "best" axis MIN and MAX, taking into CONDISERATION the actual data MIN and MAX, whether real or specified in the AXIs command. This is necessary in order to produce neat tic-mark labels. Thus, specified axis MINS and MAXS may not be obeyed exactly, but PLT will try to accommodate them as much as possible (it will display AT LEAST the range specified or more, never less).

EXAMPLE

1. PLT> AXI X 100 250
PLT>
2. When the parameters of the AXIs command are omitted, PLT prints the current axis MIN and MAX values:

PLT> AXI

PRESENT LIMITS

X

Y

MIN

100.0000

0.0000

MAX

250.0000

1.0000

PLT>

Data values outside ranges specified by the AXIS command will not be displayed, and curves will be clipped at the axis limits (Figure 3).

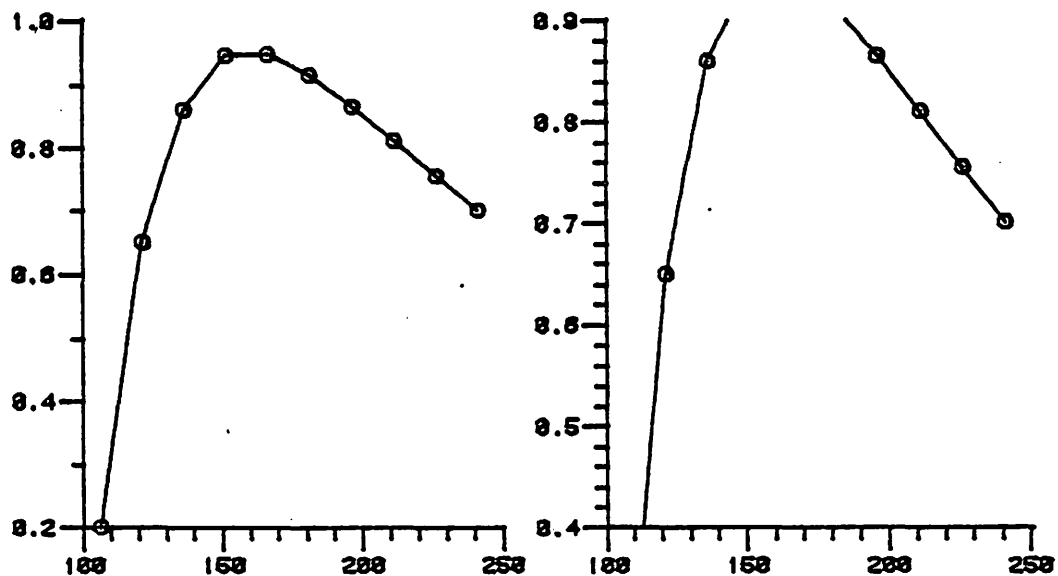


FIGURE 3: USE OF THE AXIS COMMAND (NOTE THE CLIPPING)

ERROR MESSAGE

PLT will return an error message and will not execute the AXIS command if:

1. the ID parameter is not X or Y
2. if MIN greater or equal MAX

2.2.3 The TRANSform Command -

SYNTAX: TRANSform AXIS TYPE

where

AXIS is either X, Y, or Both (may be abbreviated) and TYPE is either Logarithmic or Numerical (may be abbreviated).

The TRANSform command is used to get one or both axes on a logarithmic scale (and to revert to numerical scale). This may seem like a straight forward command. However, the user should keep in mind that the logarithm of zero or any negative value is impossible. Attempting a log transformation on a variable containing such values will cause the computer to send some error messages to the screen during plotting. PLT will not execute a TRANSform command if the minimum of the axis to be transformed is zero or less. However, if the user has used the AXIs command to change this minimum, PLT will not prevent this type of error.

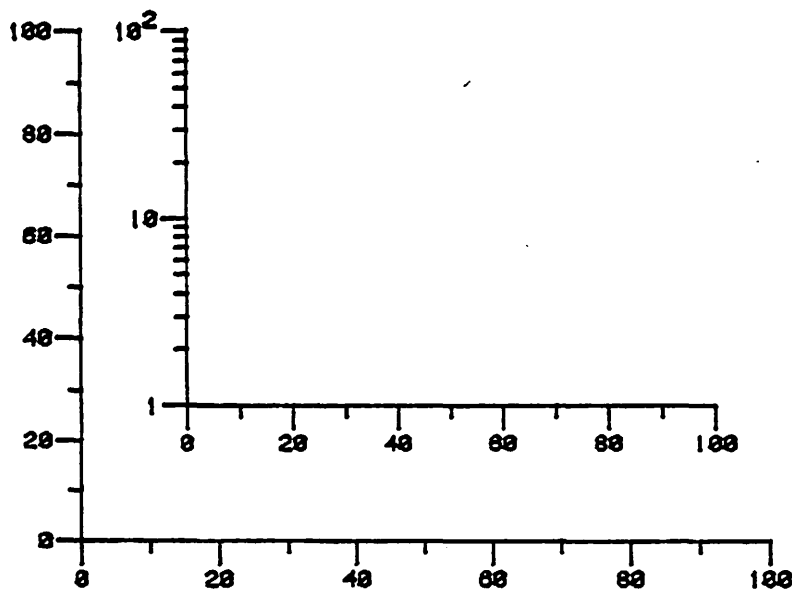
EXAMPLE

```
PLT> TRA Y LOG
```

```
PLT>
```

Produces a logarithmic Y axis (Figure 4)

FIGURE 4. USE OF THE TRANSFORM COMMAND



ERROR MESSAGE

PLT will return an error message and will not execute the TRANSform command if:

1. the AXIS parameter's first character is not X, Y or B
2. the TYPE parameter's first character is not L or N
3. the relevant axis minimum is zero or less.

2.3 Data And Curve Representation Commands

By default, PLT draws solid lines from one point to the next for all the curves in a plot queue. The data representation commands modify this.

2.3.1 The SYMBOL Command -

SYNTAX: SYMBOL ID TYPE
where

ID is a valid curve number (between 1 and the number of variables in the plot queue), and TYPE is a valid symbol type (Table 4).

TABLE 4

SYMBOLS AVAILABLE

0	-----		
1	-----	O	
2	-----	X	
3	-----	Δ	
4	-----	□	
5	-----	★	
6	-----	◇	
7	-----	|	
8	-----	+	
9	-----	|	
10	-----	|	
11	-----	▽	

SIZES

0 -----> 2

. . □ □ □ □

The SYMBOL command is used to change the symbol representing data points for curves in the plot queue. No symbol is displayed if TYPE is zero.

ERROR MESSAGE

PLT will return an error message and will not execute the SYMBOL command if ID is larger than the present plot queue.

2.3.2 The SIZE Command -

SYNTAX: SIZE V

where

V is the desired size (any number > 0.)

The SIZE command is used to modify the size of the symbols used to draw data points. By default, the size is 1. A value $V > 1$ will reduce it, while $V < 1$ will increase it. Zero produces a dot for any symbol, while 2 is probably as large as any one would wish (Table 4).

ERROR MESSAGE

PLT will return an error message and will not execute the SIZE command if $V < 0$.

2.3.3 The LINE Command -

SYNTAX: LINE ID TYPE

where

ID is a valid curve number (between 1 and the number of variables in the plot queue), and TYPE is a valid line type (Table 5).

TABLE 5

LINE TYPES AVAILABLE

-1	
0	_____
1	-----
2	-----
3	-----
4	-----
5	- - - - -
6	_____
7	- - - - -
8	_____
9	▲—▲ —▲—▲

Additional line types may be designed by the user by referring to the Tektronix Terminal Control System Reference

Manual p 3 - 13. The line-types provided here are designed for clarity.

ERROR MESSAGE

PLT will return an error message and will not execute a LINE command if ID is not a valid curve number.

In Figure 5, an example of the use of the SYMBOL, SIZE and LINE commands is illustrated.

```
PLT> FILE PLTDEMO.DAT 7
NUMBER OF OBSERVATIONS READ: 10
PLT> XVAR 1
PLT> YVAR 2
PLT> YVAR 3
PLT> SIZE .7
PLT> SYM 1 1
PLT> SYM 2 2
PLT> LIN 1 8
PLT> LIN 2 1
PLT> GRA
```

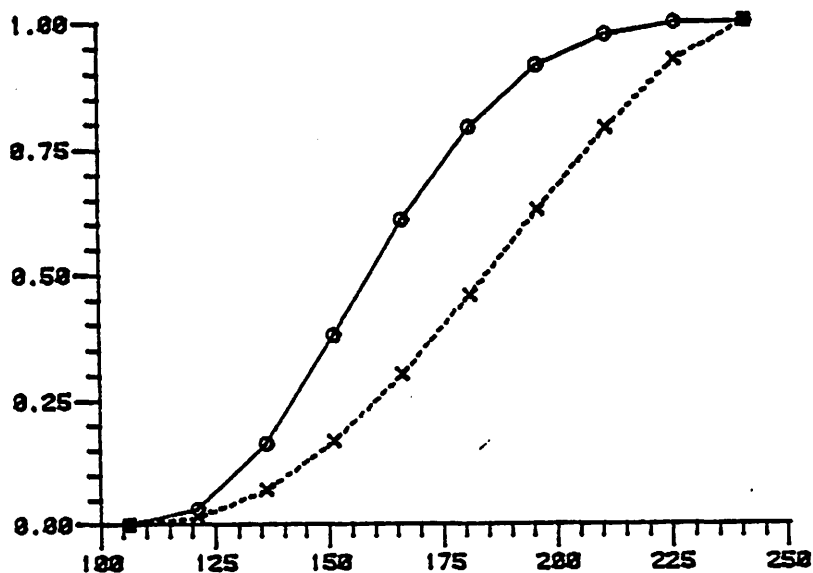


FIGURE 5: USE OF THE DATA PRESENTATION COMMANDS

2.4 Lettering Commands

The VT-640 and Tektronix 4010 graphic terminals currently in use at GLFRC and FPMI do not have very extensive lettering capabilities, and therefore there is a lack of flexibility in PLT's lettering commands. For example, text cannot be printed at an angle, and there is only one size and font for characters. The modelling Group has developed the lettering capabilities of the Digital Pen Plotter, however, and special requirements such as angled writing, different character sizes, and subscript or superscript lettering can be done on final drafts when necessary (to be avoided whenever possible because of increased work load).

Three types of standard lettering of graphs are offered by PLT:

1. a LEGEND with variable names of up to 15 characters.
2. Axis labels up to a number of characters which can take-up the length of the relevant axis, and
3. two graph-title lines which may cover the length of the X axis of the graph.

2.4.1 The LEGend command -

SYNTAX: LEGend ID [NAME]
 or LEGend Function
where

ID is the id number of a curve in the plot queue. NAME is any string of up to 15 characters. Alternatively, Function is either Locate or Suppress (may be abbreviated).

The LEGend command is used to identify curves, their associated line and symbol, by name on the graph. When the NAME parameter is omitted, the corresponding curve will not be represented in the legend. When NAME is only blanks (one or more), the line and symbol samples for the curve will appear in the legend, without a name.

Thus, in its name-definition form, the LEGend command is used to determine which curves will be represented in the legend, and their names.

EXAMPLES

1. PLT> LEG 1 CURVE NUMBER 1
Will cause PLT give a sample of curve 1's line and symbol type, with its name, in the legend.
2. PLT> LEG 2 <space> <space>
Would provide a sample of curve 2's line and symbol, without a name, and
3. PLT> LEG 3 <return>
Would remove curve 3 from the legend (not from the graph) if it was there in the first place.

The legend is positioned INTERACTIVELY on the terminal screen after the other elements of the graph have been drawn, anywhere above the X axis and to the right of the Y axis, provided there is enough space on the screen to do so (as determined by PLT). To enable the legend location facility, issue:

PLT> LEG Loc

The response of PLT to this command is not immediate but will take effect after the next GRaph command. Then, the cross-hair cursor will appear on-screen, and the user may locate the legend.

The legend may be conceptualized as a rectangle of sufficient dimensions to comprise a sample of each curve's line type (length adjustable through the SAMple command below), its symbol type, and its name (as long as the longest name specified by the user, up to 15 characters) (Figure 6). This rectangle obviously has 4 corners, known to PLT as

1. upper left hand corner
2. upper right hand corner
3. lower left hand corner
4. lower right hand corner

(see Figure 6)

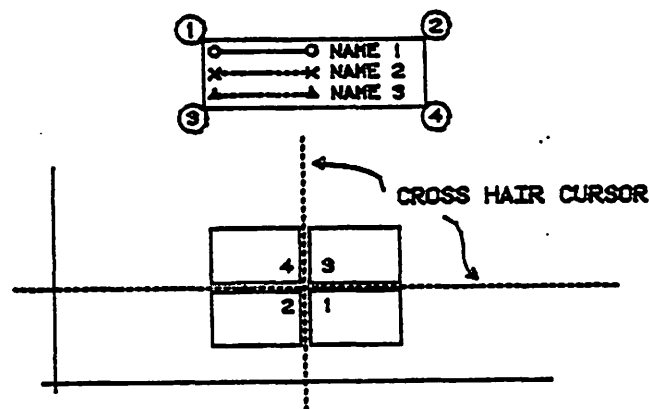


FIGURE 8: LOCATING THE LEGEND INTERACTIVELY

When the cross-hair cursor appears on the screen, PLT is expecting the user to enter 1 of the following characters, followed by carriage-return:

- 1 . upper left hand corner of the legend here
- 2 . upper right hand corner of the legend here
- 3 . lower left hand corner of the legend here
- 4 . lower right hand corner of the legend here

D . draw legend in LAST position successfully tested

S . suppress legend-locating

The cross-hair cursor can be moved by the "arrow keys" on the VT-640 terminal, or by the directional wheels on the Tektronix 4010. If the legend can fit on the screen at the location specified, a dot will appear on the screen at the location entered (It may be necessary to move the VT-640 cursor to see this dot). Nothing happens otherwise. The cross-hair cursor reappears for another trial OR to either draw the legend ("D") or suppress it ("S"). When "D" is pressed, PLT draws the legend in the last position successfully tested for space (Figure 6).

It is possible to determine the approximate dimensions of the legend to assist in locating it properly, by trying to locate corner 2 (upper right-hand) near the origin of the axes, since PLT does not allow the legend to overlap the axes. Then, one may be better able to find a location where the legend will not overwrite other elements of the graph.

Finally, to disable legend drawing at any time, issue:

PLT> LEG Suppress

ERROR MESSAGE

PLT will return an error message and will not execute the LEGend command if the first argument is not a valid curve number between 1 and the size of the plot queue, "L" or "S".

2.4.2 The SAMple Command -

SYNTAX: SAMple [LENGTH]
where

LENGTH is the length of the line samples (in screen units) to appear on the legend.

By default, length = 70. Any realistic length (from 0 to, say, 300 units) may be specified. If the length parameter is omitted, PLT will print the present line-sample length.

ERROR MESSAGE

Unless a typing error occurs, PLT will accept any length value.

2.4.3 The LABel Command -

SYNTAX: LABel

This command instructs PLT that axis labels are to be entered. PLT will immediately prompt the user for axis labels. If no label is desired on one of the axes, press return without entering any characters at the appropriate prompt.

Old labels are erased automatically once a LABel command is issued. The labels are centered automatically, and will be truncated if too long to be printed along the axis.

EXAMPLE

```
PLT> LAB
X-axis label: Label of The X axis
Y-axis label: Label of The Y axis
```

ERROR MESSAGE: None

2.4.4 The TITles Command -

SYNTAX: TITles

This command operates similarly to the LABels command. Here again old titles are erased when TITles is issued. Pressing return without entering characters skips the relevant title-line (there are 2). Title lines are positioned automatically above the Y-axis, and centered.

EXAMPLE

```
PLT> TIT
Line 1 of title:  title line
Line 2 of title:  subtitle
```

ERROR MESSAGE: None

An example of PLT's lettering is illustrated in Figure 7.


```
PLT> SAM 100
PLT> LEG 1 SHOOT WEIGHT
PLT> LEG 2 SHOOT LENGTH
PLT> LEG LOC
PLT> LAB
X-AXIS LABEL: JULIAN DATE
Y-AXIS LABEL: PROPORTION
PLT> TIT
LINE 1 OF TITLE: HYPOTHETICAL DATA SET IN
LINE 2 OF TITLE: FILE PLTDEMO.DAT
PLT> GRA
```

HYPOTHETICAL DATA SET IN
FILE PLTDEMO.DAT

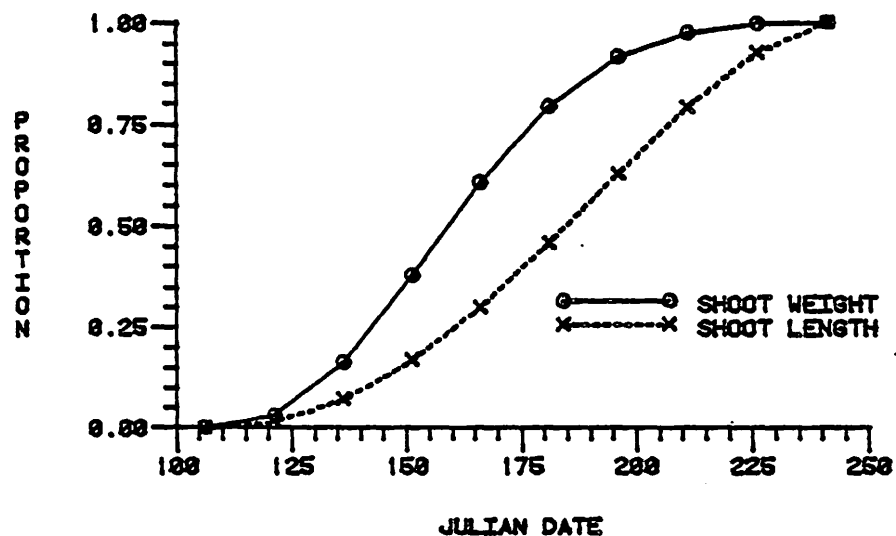


FIGURE 7: USE OF THE LETTERING COMMANDS

2.5 Program Control Commands

The following commands do not act on the graph but give instructions to PLT as to what to do.

2.5.1 The GRAPh Command -

SYNTAX: GRAPh

The command instructs PLT to produce the graph on the terminal screen. It can be issued repeatedly at any stage to display the graph as it is developed.

Once the graph has been drawn, the user must press return to pursue. The screen will be cleared following a return.

ERROR MESSAGE: None

2.5.2 The PENplot Command -

SYNTAX: PENplot

This command is used to produce copies of the graph on the Digital pen plotter ONLY. DO NOT issue this command if you are not working the Textronix 4010, or if the pen plotter has not be properly prepared. Otherwise, the graphic terminal may be disabled and the current PLT session will be lost. Before issuing the PENplot command, make sure that

1. the pen plotter is "ON"
2. the margins have been set
3. paper is positioned on the plotter

4. the "load" and "local" keys are disabled, and
5. the pen cap has been removed.

Execution of the Penplot command is immediate and cannot be interrupted. Press return AT THE END of the graph to pursue.

ERROR MESSAGE: None

2.5.3 The SAVe Command -

SYNTAX: SAVe FILENAME
where

FILENAME is a valid IAS file specification.

This command creates a file containing all the parameters needed to reproduce the graph in its present form at some later time (during the same or another PLT session). Whenever a user is satisfied with a graph, and wishes to obtain a copy from the pen plotter, he should save his graph under an appropriate name, for later retrieval. We suggest using file type PLT for simplicity.

EXAMPLE

PLT> SAV JUNK.PLT

ERROR MESSAGE: None

2.5.4 The RETrieve Command -

SYNTAX: RETrieve FILENAME
where

FILENAME is a valid IAS file specification.

This command reads from file "filename" the parameters needed to produce a previously saved graph. Only files created by the PLT SAVE command can be retrieved. Immediately following the RETrieve command, PLT will read the original data file and the usual message reporting the number of observation read will be displayed.

EXAMPLE

```
PLT> RET JUNK.PLT  
NUMBER OF OBSERVATIONS READ: 10
```

ERROR MESSAGE

PLT will return an error message and will not execute the RETrieve command if the specified file was not created by a PLT SAVE.

2.5.5 The CLEAr Command -

SYNTAX: CLEAr

This command is equivalent to starting PLT anew. Initial values are restored, file names are erased, and the plot queue, variable names, line and symbol types are obliterated.

ERROR MESSAGE: None

2.5.6 The HELp Command -

SYNTAX: HELp [COMmand]
where

COMmand is any valid PLT command (may be abbreviated to 3 letters).

This facility provides a summary of the information in this manual, command-by-command, as a refresher. If COMmand

is not a valid PLT command, the HELp command will not be executed. If the COMmand parameter is omitted, the HELp facility will list the PLT commands available (Table 6). The HELp facility is a subprogram of PLT, and the prompt HELP> will appear at the end of a HELp printout, awaiting another COMmand parameter. To exit the HELp facility, simply press return.

TABLE 6

THE HELP FACILITY IN PLT

PLT COMMANDS AVAILABLE:

COMMAND	DESCRIPTIONS
FILE	DEFINE INPUT FILE
SELECT	SELECT A SUBSET OF COLUMNS IN INPUT FILE
XVARIABLE	CHOOSE THE X-VARIABLE TO THE GRAPH
YVARIABLE	ADD A Y-VARIABLE TO THE GRAPH
	CLEAR Y-VARIABLE REGISTER
TRANSFORM	LOG/NUMERICAL AXES
LINE	SELECT A LINE TYPE FOR CURVE
SYMBOL	SELECT A SYMBOL FOR THE VALUES OF A Y-VARIABLE
SIZE	SIZE OF SYMBOLS
LEGEND	NAME Y-VARIABLES, ENABLE THE LEGEND POSITIONING FACILITY
SAMPLE	CHANGE LENGTH OF LINE-SAMPLE IN LEGEND
LABELS	X, Y AXIS TITLES
TITLES	GRAPH TITLE LINES (2)
SCREEN	CHANGE SIZE & SCREEN LOCATION OF GRAPH
AXIS	ADJUST AXIS MIN & MAX
HELP	BRIEF DESCRIPTION OF COMMAND SYNTAX USE
MISSING	MISSING VALUES IN X OR Y
GRAPH	TO DO THE GRAPH ON EVERY TERMINAL EXCEPT PENPLOTTER
PENPLOT	OUTPUT TO PENPLOTTER
CLEAR	RESTORE MEMORY TO INITIAL VALUES
SAVE	SAVE THE PLOTTING PARAMETERS FOR LATER USE
RETRIEVE	RETRIEVE SAVED PLOTTING PARAMETERS
BYE	TERMINATES PROGRAM EXECUTION

ENTER A COMMAND, OR <RETURN> TO GET OUT
HELP>

ERROR MESSAGE: None

2.5.7 The BYE Command -

SYNTAX: BYE

This command terminates PLT and returns control to PDS.

3.0 COMMAND SYNTAX SUMMARY

FILE FILENAME N	2 < N < 16
SELEct NN	2 < NN < N
MISSing V	
XVARIABLE ID	1 < ID < N or NN
YVARIABLE [ID]	1 < ID < N or NN
SCREen [ASPECT MIN MAX]	ASPECT = H or V
AXIS [ID MIN MAX]	ID = X or Y, MIN < MAX
TRANSform AXIS TYPE	AXIS = X, Y, or B TYPE = L or N
SYMBOL ID TYPE	1 < ID < plot queue
SIZE V	
LINE ID TYPE	1 < ID < plot queue
LEGend ID [NAME]	1 < ID < plot queue
LEGend FUNCTION	FUNCTION = L or S
SAMple [LENGTH]	
LABel	
GRAPh	
PENplot	
SAVe FILENAME	
RETrieve FILENAME	
CLEAr	
HELp [COMmand]	
BYE	