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A PORTABLE INTERACTIVE PLOTTER FOR DIGITAL X-Y DATA(U)
DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT
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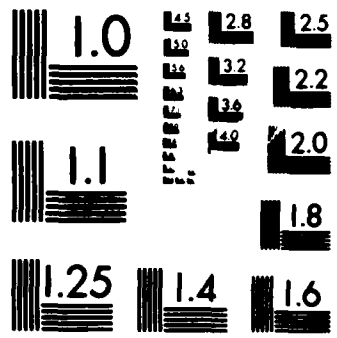
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David W. Taylor Naval Ship Research and Development Center

Bethesda, MD 2084-5000

DTNSRDC CMLD-86/45 December 1986

Computation, Mathematics and Logistics Department
Research and Development Report

A PORTABLE INTERACTIVE PLOTTER FOR DIGITAL X-Y DATA

by

Gordon C. Everstine

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REPORT DOCUMENTATION PAGE

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2a SECURITY CLASSIFICATION AUTHORITY		3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for Public Release; Distribution Unlimited	
2b DECLASSIFICATION/DOWNGRADING SCHEDULE		5 MONITORING ORGANIZATION REPORT NUMBER(S)	
4 PERFORMING ORGANIZATION REPORT NUMBER(S) CMLD-86/45		7a NAME OF MONITORING ORGANIZATION	
6a NAME OF PERFORMING ORGANIZATION David Taylor Naval Ship Research & Development Center	6b OFFICE SYMBOL (if applicable) Code 1844	7b ADDRESS (City, State, and ZIP Code)	
6c ADDRESS (City, State, and ZIP Code) Bethesda, Maryland 20084		9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
8a NAME OF FUNDING/SPONSORING ORGANIZATION Naval Sea Systems Command	8b OFFICE SYMBOL (if applicable) SEA-55Y3	10 SOURCE OF FUNDING NUMBERS	
8c ADDRESS (City, State, and ZIP Code) Washington, DC 20362		PROGRAM ELEMENT NO 63569N	PROJECT NO S1255001
		TASK NO	WORK UNIT ACCESSION NO 1211-701
11 TITLE (Include Security Classification) A PORTABLE INTERACTIVE PLOTTER FOR DIGITAL X-Y DATA			
12 PERSONAL AUTHOR(S) Gordon C. Everstine			
13a TYPE OF REPORT	13b TIME COVERED FROM _____ TO _____	14 DATE OF REPORT (Year, Month, Day) 1986 December	15 PAGE COUNT 13
16 SUPPLEMENTARY NOTATION			
17 COSATI CODES		18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB-GROUP	
		<i>Display on plotter system and plot of data</i>	
19 ABSTRACT (Continue on reverse if necessary and identify by block number)			
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20 DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS		21 ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
22a NAME OF RESPONSIBLE INDIVIDUAL Gordon C. Everstine		22b TELEPHONE (Include Area Code) 202-227-4410	22c OFFICE SYMBOL Code 1844

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ABSTRACT

This report describes the use of a computer program called IPLOT for interactively generating X-Y plots of digital data. The program is built around the widely-available DISSPLA plotting software in order to be as portable as possible. IPLOT has command and input file structures similar to those of the IDDS program used at DTNSRDC, except that IPLOT can label axes and generate logarithmic plots. A checkpoint/restart capability is included.

ADMINISTRATIVE INFORMATION

This work was sponsored by the Foundation Acoustic Design Program, Task Area S1255001, Element 63569N, DTNSRDC Work Unit 1211-701. The Naval Sea Systems Command program manager was Richard Chiu (NAVSEA 55Y3).

INTRODUCTION

For many engineering analyses performed on a computer, there is a need to make X-Y plots quickly in an interactive mode where the analyst can easily select the curves to be plotted together, the scaling, the window size, the line styles, and the labeling. Some of this need has been satisfied for many years at DTNSRDC with the IDDS program¹ written by Melvin Haas and others of the Numerical Mechanics Division of DTNSRDC. However, the mainframe version of IDDS is machine-dependent and may not be converted for use on the new Cray/Sperry computer system to be installed in a few months at DTNSRDC. (Development is continuing on the Apollo version of IDDS called AIDDS. Since AIDDS is written in the C language for a UNIX system, it may eventually be available on the new Sperry/Cray system.) In addition, IDDS is unable to label axes or to make logarithmic plots, both of which capabilities are useful for the display of results generated by the acoustic radiation program

NASHUA. As a result, a new interactive plotting program (IPLOT) was written as a general replacement for the X-Y plotting capabilities in IDDS. (The other capabilities in IDDS are not being addressed.)

IPLOT was built around and designed to run on any computer which has access to the Display Integrated Software System and Plotting Language (DISSPLA),² versions of which are available at many computer centers. To date, IPLOT has been run on both the CDC Cyber 176 and DEC VAX 11/780 computers at DTNSRDC. IPLOT is written in Fortran 77 and, as is, interfaces with a Fortran 4 version of DISSPLA³ (which DTNSRDC has). The conversion of IPLOT to interface with a Fortran 77 version of DISSPLA would require changing a few of the calls to DISSPLA routines, since Hollerith, rather than character, variables must be passed to a Fortran 4 version of DISSPLA. However, all necessary character variables exist in IPLOT to ease the conversion to a Fortran 77 version of DISSPLA.

IPLOT can interface with all the Tektronix and DEC terminals in common use at DTNSRDC. Other terminals could easily be added to the program, since DISSPLA supports a wide variety of terminals. IPLOT has the capabilities to make plots with logarithmic as well as linear axes and to label the axes.

IPLOT uses an input file structure and a command structure similar to those used in IDDS. Thus, many formatted data files in use with IDDS can be converted for use with IPLOT with a single command of an editor.

IPLOT also has a checkpoint/restart capability so that the plotting parameters (device, scaling, labeling, etc.) specified in one session can be retrieved for use in a subsequent session. The local file name IPLOTXX is used for both the checkpoint file and the restart file.

I PLOT PROGRAM USAGE

INPUT DATA FILE

The file containing the X-Y pairs must be a formatted file with each curve defined in the following way:

- Record 1: A 10-character left-adjusted "short name" for the curve. This name is used for identifying the curve during the interactive plotting session.
- Record 2: An 80-character left-adjusted "long name" for the curve
- Record 3: N (the number of X-Y pairs in the curve) (integer)
- Records 4,5, ... : X₁, Y₁, X₂, Y₂, X₃, Y₃, ... ,X_N, Y_N (real)

The above set of records is repeated for each curve placed on the file. Each record is an 80-character "card image." All numeric data are read using free-field formats, so that the X-Y pairs may be written using any real format on any number of card images. There are no restrictions on the number of curves contained on a file. If a logarithmic plot is desired, the actual values of the data rather than the logarithms of the data are supplied on this input file.

THE INTERACTIVE SESSION

At DTNSRDC, the executable form of I PLOT is stored on the mass store file I PLOT under the user name CAEE. Before executing this program interactively, the user must attach the data file(s) containing the X-Y pairs. Multiple files are allowed. In general, any combination of curves from any number of files can be plotted on the same graph. The axes may be either linear or logarithmic, and axes may be numbered and labeled. The

window size (the size of the box containing the graph) may be adjusted to facilitate overlaying other plots.

To continue a previous plotting session, the restart file must be attached and given the local file name IPLOTXX. At the beginning of execution, IPLOT checks for the existence of IPLOTXX. If the file exists, IPLOT retrieves the plotting parameters so that the user is ready to continue his previous session where he left off. As the new session proceeds, IPLOTXX is replaced whenever a plot is made or the session is ended.

IPLOT COMMANDS

IPLOT uses a free-field input format with the various data fields separated by commas, which are required. Blanks may be placed before or after the commas to improve readability. In general, a parameter which is omitted remains unchanged from that set previously. The allowable commands are summarized as follows:

- | | |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C,FILENAME | - List contents of file FILENAME. For each curve on the file, this listing includes the short name, the number of X-Y pairs, the maximum and minimum ordinate values, and the long name. |
| E | - Exit from program. |
| H | - Help (i.e., print summary of commands). |
| I | - Toggle to use or not use integer labels on linear axes. |
| L,NX,NY | - Use logarithmic axis, where NX and NY are the number of cycles along x and y, respectively (integer). (A zero value is used to specify a linear axis.) Entering L with no parameters is equivalent to L,0,0. |

- M - Toggle to mark or not mark the ends of the curves with numerical symbols.
- P, FN₁, SN₁, LS₁, FN₂, SN₂, LS₂, ... - Plot some curves, where FN = filename, SN = short name of curve, LS = line style desired (1-9). To plot the points with symbols not connected by a line, enter LS = 0. IPLOT selects the symbols. If several curves have been plotted, the first few can subsequently be plotted by entering P followed by a number of commas equal to three times the number of curves desired (e.g., P,,,,,).
- Q - Quit (same as Exit).
- R - Repeat last plot command.
- S, XMIN, DX, XMAX, YMIN, DY, YMAX - Scale a plot using the specified minimum, incremental step, and maximum values of X and Y. This command is required, since there is no default scaling. For a logarithmic axis, for which the number of cycles is specified, only the minimum value is used. For integer values, the decimal points may be omitted on CDC (but not on VAX).
- T, <string> - Specify the title of the plot.
- V - Verify (i.e., display) the current values of the user-selected parameters.
- W, RX, RY - Change the current window size by the factors RX and RY in the X and Y directions, respectively. To restore the default window size, enter W with no parameters.
- X, <string> - Specify the x-axis label.
- Y, <string> - Specify the y-axis label.

All the above commands except the plot command (P) have as their only effect the setting of one or more parameters or the display of some information. When the plot command is issued, the current values of all parameters and labels (which can be displayed with the V command) are used

for the plot. In general, the commands may be entered in any order, except that S (scale) must precede P (plot), since there is no default scaling in IPLOT.

After each plot is made, the program pauses to allow the user to make a copy of the plot. To return to the "command mode," the CDC user enters a space followed by the carriage return; the VAX user need only press the carriage return.

Sample plots (both linear and logarithmic) are shown in Figs. 1 and 2 for illustration. The second figure also uses the curve marking option. All plots were made from the same data.

ACKNOWLEDGMENT

Kevin G. Brady of the User Services Branch (DTNSRDC Code 1892.1) is gratefully acknowledged with pleasure for sharing his considerable expertise on DISSPLA and Fortran.

EXAMPLE WITH LINEAR AXES

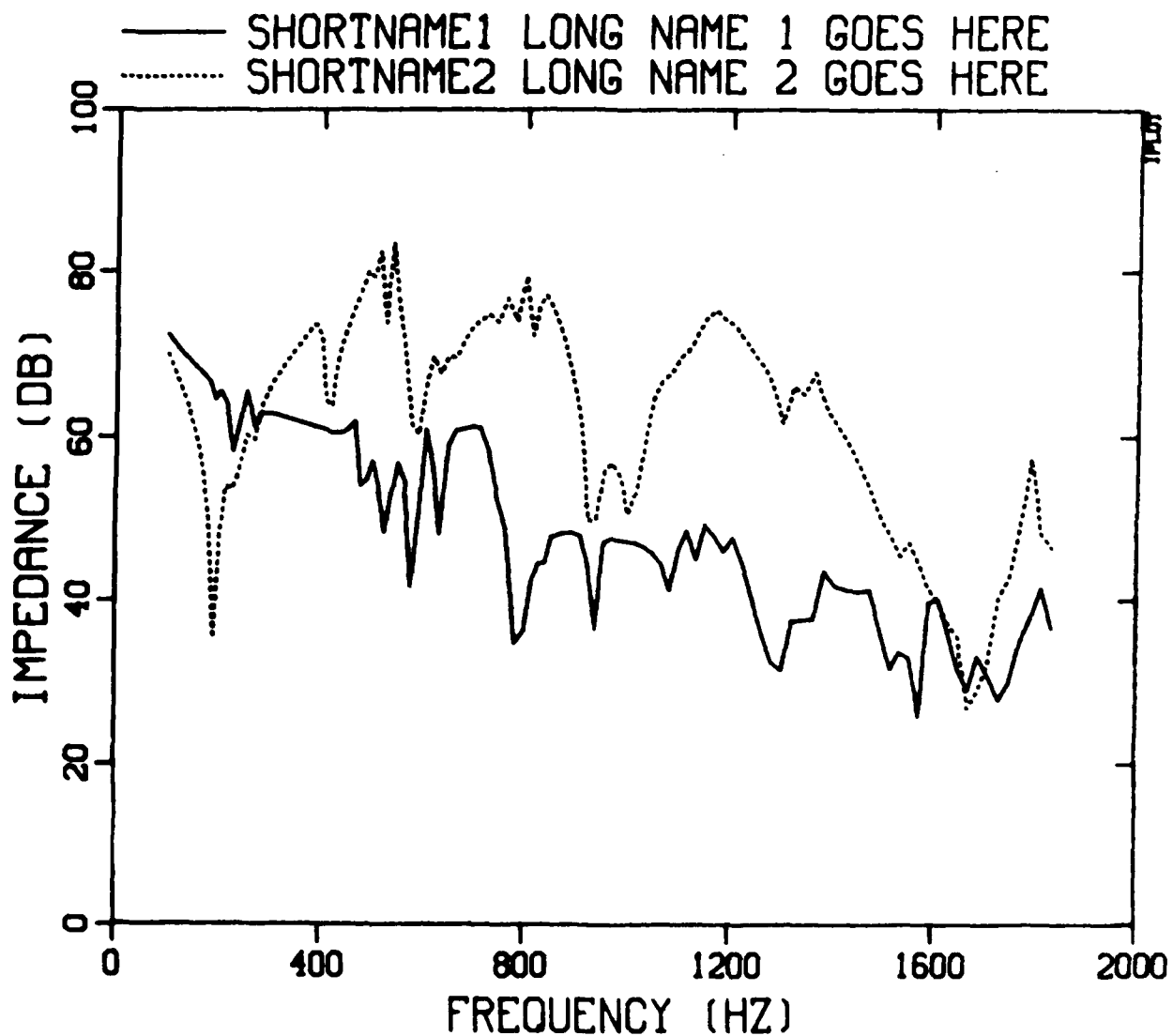


Fig. 1. Sample plot with linear axes.

EXAMPLE WITH LOGARITHMIC X-AXIS

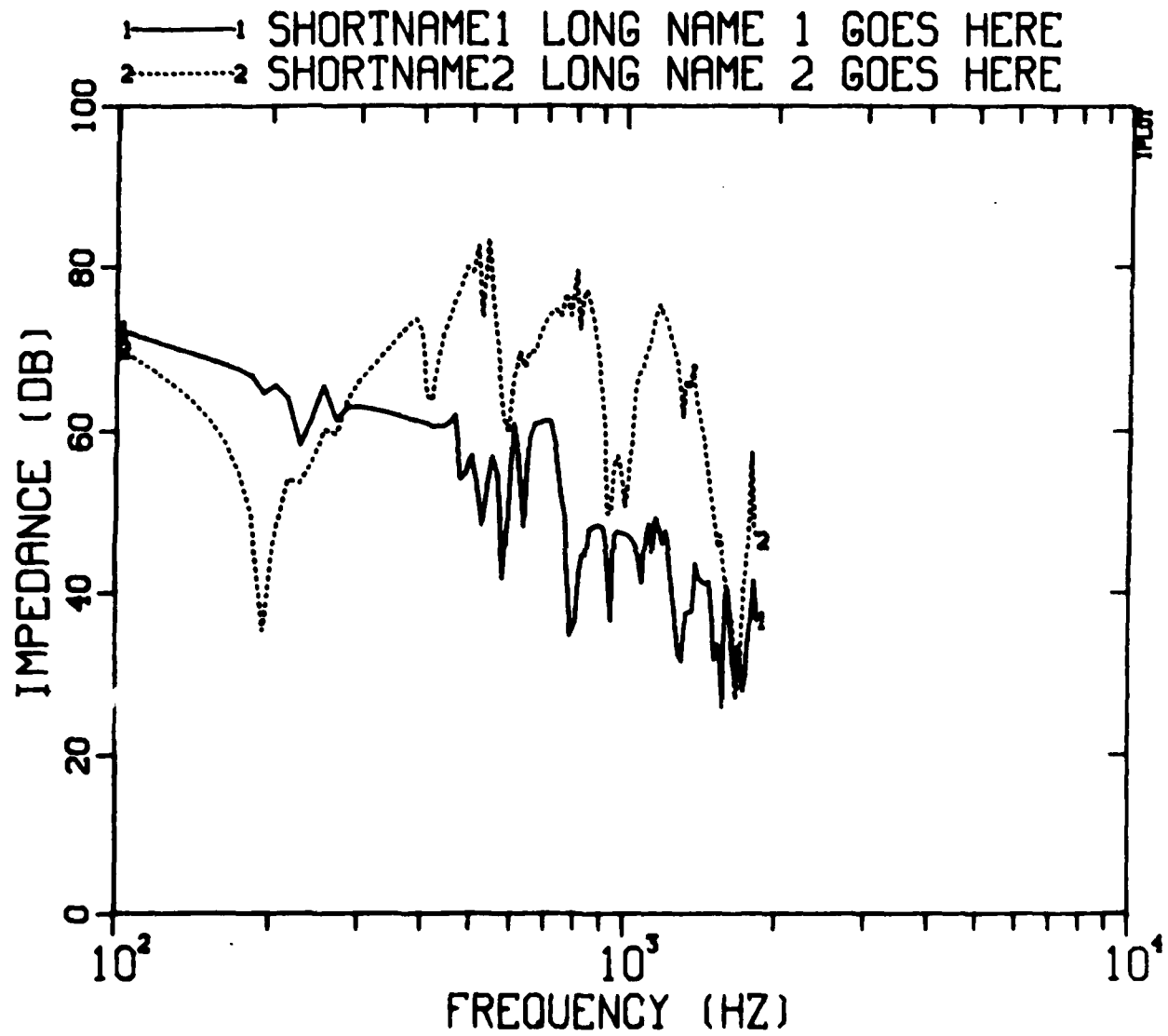


Fig. 2. Sample plot with logarithmic x-axis and curves marked.

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