PSSPLT Program Manual
PSS®E 34.8.2

February 2021

SIEMENS

Siemens Industry, Inc.
Siemens Power Technologies International
400 State Street
Schenectady, NY 12301-1058 USA
+1 518-395-5000
www.siemens.com/power-technologies

Table of Contents

List of Figures

List of Tables

Chapter 1
PSSPLT Overview

1.1. PSSPLT Functional Description

PSSPLT is structured around a comprehensive set of functional program modules called *activities*. Each activity performs a distinct computational, input, output, or data manipulation function that is needed in the course of plotting.

PSSPLT is entered by starting up the master program module. The master module immediately invites the user to select an activity. The selected activity is immediately executed, performing its processing operation on the appropriate files. The activity retains control until either:

- Its processing is successfully completed.
- Its processing encounters an error condition.
- It is interrupted and terminated by the user.

Each of these conditions returns control back to the master module. The master module again invites the user to select another activity. Any activity may be selected at any time, but the determination of which activities are meaningful must be made by the user on the basis of the recent sequencing of activities.

1.2. PSSPLT Operations

The use of PSSPLT requires several types of operation on its host computer. Among these are:

- Creating and filling files that are to be used as input files to PSSPLT.
- Running the PSSPLT program.

The first operation requires the use of commands and functional programs of the host computer's operating system. The user of PSSPLT does not need to be an expert in the use of the host's operating system, but a brief study of those computer system manuals covering basic terminal keyboard and text editor operations will generally be beneficial.

The PSSPLT user needs only a very minimal knowledge of computer system protocol in order to make productive use of the PSSPLT package. Because it is not necessary to become proficient with a complicated computer command language, users can focus on the task at hand: solving engineering problems. The casual PSSPLT user will need to become comfortable with the basic capabilities of the text editor and a small subset of system keyboard commands. More advanced users will find it to their advantage to familiarize themselves with the various disk file and magnetic tape utility programs and the host computer's file system organization.

The purpose of this manual is to explain the console operating procedures needed to execute the operations listed above, to specify input data formats for PSSPLT, to present detailed descriptions on the operation of each PSSPLT activity, and to assist the user in interpreting PSSPLT output messages.

Chapter 2
File Considerations

The functions performed by PSSPLT require several different types of data. Consequently, the user of PSSPLT must have some familiarity with the file structure of the host computer. The purpose of this chapter is to describe the relationship between PSSPLT and the file system in sufficient detail to allow the planning engineers to effectively perform their studies using PSSPLT without having to get bogged down with program/file details.

2.1. User File Directory (UFD)

To execute PSSPLT, the user must be attached to a User File Directory (UFD, disk, or directory). A UFD may be viewed as a catalog of files that belong to a particular user. Once created, a directory may contain an unlimited number of files and subdirectories. (Henceforth, *directory* may also be read as *subdirectory*.)

It is perfectly permissible for a single user to have more than one directory created for personal use. For example, a user might set up one directory for each of several different studies being performed.

The volume of data that users keep available on-line depends upon the rules set up within their own computer installation. This is a function of the number of users with access to the system, the size and number of on-line disk drives, and the backup/retrieval facilities available for off-line storage.

Ideally, the assigning and creating of directories should be the responsibility of one or two people within the organization. The natural candidate is the person assigned the role of system manager.

2.2. File Classes

Users of PSSPLT must understand the categories of files that the program uses. PSSPLT takes full advantage of the file management capabilities of the host operating system, which allows the program to be used at all times without the need to select file assignments before it is started up. As a result, the user has a great degree of flexibility in the use of files during an interactive problem solving session with PSSPLT. Users can instruct PSSPLT to read from or write into virtually any existing file at any time and can have PSSPLT create a new file whenever necessary. The prerequisite for full use of this capability is a sound understanding of the distinct classes of files used by PSSPLT.

A file class is a distinction imposed by PSSPLT, not by the computer's file management system.

The classes of files used by PSSPLT are summarized in Table 2-1 PSSPLT File Classes. The user may assign any name up to 64 characters long to any file. A file is always identified by this user-assigned name, both within the computer's file management system and within PSSPLT activities. The following subsections discuss these file classes in some detail.

Table 2.1. PSSPLT File Classes

File Class	Created by	Type	Accessible to
Input data files	User via keypunch, text editor, or auxiliary program	Source	PSSPLT and user
Output listing	PSSPLT	Source	User files
Response files	PSSPLT or user via text editor	Source	PSSPLT and user
Plot files	PSSPLT or compatible PTI program	Binary or Source	PSSPLT
Graphic output files	PSSPLT	Binary or Source	Graphic devices
Option file	PSSPLT	Binary	PSSPLT

2.2.1. Input Data Files

Input data files may be created by reading card decks or magnetic tapes from external sources (other computer installations) or by the typing and file editing facilities of the host computer.

The principal PSSPLT input data files are as follows:

1. *Binary Plot Files* Binary plot files are created by PSSPLT (via activity RAWC, section 4.21) or by a PTI program designed to produce a plot file that is compatible with PSSPLT's binary plot file format. A series of data points within the plot file is referred to as a channel. (When used in conjunction with PSS®E, these binary plot files are normally referred to as channel output files.)

2. *Source Plot Files* Source plot files are written by a PSSPLT activity. They are normally created by activity RAWC, section 4.21 after a valid binary plot file has been read. Source plot files can be printed or edited and can be used to transfer plot data between different computers.

3. *Scale Data Files* Scale data files are source files that contain scaling data for the plot data.

4. *Relay Data Files* Relay data files contain data used to superimpose PSS®E relay characteristics over plots of x versus y values.

2.2.2. Output Listing Files

Some PSSPLT report generating activities, such as IDNT, section 4.7; PRNT, section 4.16; RANG, section 4.3; and SCAN, section 4.8, may write their output to the user terminal, to a high-speed printing unit, or to a named file. When an output listing file is selected, the report is written into that file in exactly the same format as if it was being printed directly to a printing device. If the user requests output to a named file that already exists, that file is utilized with its previous contents being overwritten (refer to activity POPT, section 4.2 for details about the file overwrite option). If the file requested by the user does not exist, it is created immediately by the output activity.

Once written, the output listing file is available to all standard file manipulation functions; it may be printed, transferred to magnetic tape, examined with the text editor, or simply discarded.

Users may instruct PSSPLT to create as many output listing files as they wish. However, it is good practice to limit the number of these files since they can use a large amount of disk storage capacity. Soon after being created, output listing files should be processed (i.e., dumped from disk to magnetic tape, floppy disks, and/or microfiche for archival purposes) and then deleted from the disk (see Section 2.6, Deleting Files).

2.2.3. Binary Plot Files

Binary plot files are read by the PSSPLT activities. They are selected via activity CHNF, section 4.1 or MCHN, section 4.10 in response to a filename specification and contain the values of the plot data (channels) at regular intervals. Unlike output listing files, binary plot files cannot be intelligibly printed by the standard file management functions of the computer.

As with output listing files, it is advisable to minimize the number of plot files by dumping them to magnetic tape when necessary for archival purposes and deleting or reusing their names as soon as the plotting of a simulation run has been completed.

2.2.4. Response Files

Response files allow the PSSPLT user to automate the execution of a sequence of activities. A response file is an ordinary source file that may be typed in by the user with the text editor before starting PSSPLT. A response file for the performance of a given function contains an *exact* image of the activity commands and all other inputs that would be typed by the user at the console during a PSSPLT run in the interactive mode.

Response files may be used to execute an entire program run when all requirements can be determined in advance. They may also be used as a convenience to save typing of a specific subset of activity commands that is needed frequently in the application of PSSPLT.

Constructing a response file requires intimate familiarity with the exact details of the PSSPLT dialog. For purposes of accuracy, the best way to build a response file is to run PSSPLT in the interactive mode while

performing the task that the response file is to duplicate. Users can do this by using PSSPLT activity ECHO, section 5.2, to record user responses to a file.

For further details on the use of response files, see Batch Operation, section 3.7; ECHO, section 5.2; and IDEV, section 5.4.

2.2.5. Graphic Output Files

Graphic output files are created when plots are generated on most hard copy graphic devices via activity PLOT (see PLOT, section 4.13). The name and format of these files depend on the plotting device selected. Normally, these files are simply printed or spooled to the appropriate device.

2.2.6. Option Files

The PSSPLT option file is a binary file created by PSSPLT which saves the options set by the user in activity POPT, section 4.2. Once this file is created, it overrides the default POPT options every time PSSPLT is executed. If this file does not exist, the default PSSPLT options are used. PSSPLT first checks to see if there is an option file in the user's directory. If the file is not present, PSSPLT checks to see if the file exists in the master parameter directory. (See PSS®E Compatibility Reference, Section 4.1, PSS®E Compatibility for details. On the IBM VM/CMS computers, the master options file must be renamed to $PSSPLT OPT.)

2.3. PSSPLT Data Files

Before PSSPLT can be started up, the user must create and fill those files needed for its input. Files needed for PSSPLT output will be created by PSSPLT as needed. The importance of planning and noting the contents of all files cannot be overemphasized. It is strongly recommended that, along with study notes, users keep a record of the names and contents of all significant files in their directory.

The definitions of the various input data files used by PSSPLT are contained in Chapter 6, Examples of this manual under the activity descriptions of the PSSPLT activities that utilize them.

The types of data files used by PSSPLT and the activities that use them are summarized in Table 2-2 PSSPLT Data File Summary. Note that some files need not be created if the activities that use them are not going to be executed.

Table 2.2. PSSPLT Data File Summary

PSSPLT Designation	File Type	Essential/Optional	Used by Activities
Plot File	Binary	One is essential; more are optional	Essential to operation of PSSPLT
Plot File	Source	Optional	RAWC, section 4.21
Scale Data	Source	Optional	RANG, section 4.3 and SLCT, section 4.12
Relay Data	Source	Optional	RELY, section 4.17; CRLY, section 4.19; WRLY, section 4.18; SLCT, section 4.12; and PLOT, section 4.13
POPT Options	Binary	Optional	Created by POPT, section 4.2; read on PSSPLT start-up.

2.4. Creating Input Files

As is seen from Table 2-2 PSSPLT Data File Summary there are source files that are designated as input files to various PSSPLT activities. Such files must be created in the user's directory prior to executing the PSSPLT activities which utilize them. A source file must be filled with some data at the time it is created. The initial fill of data need not be the final content of the file since additional data and corrections may be placed in the file by the text editor at a later time if desired. The content and formats of the various PSSPLT data files are described in Chapter 4, Plotting Activity Descriptions and Chapter 5, Miscellaneous Activity Descriptions of this manual under the activities that use them.

2.4.1. Via the Text Editor

The primary tool for creating and preparing input data files for PSSPLT is the host computer's text editor. A detailed description of text editors is beyond the scope of this manual.

2.4.2. Via PSSPLT

As shown in Table 2-2 PSSPLT Data File Summary, activity RAWC, section 4.21 writes out a source plot file using an existing binary file and can also read in a source file to create a binary plot file. Activity RANG, section 4.3 writes out scale data in the form of a PSSPLT input scale data file. Activity POPT, section 4.2 writes out the binary option file which is subsequently read when PSSPLT is executed.

2.5. Files Created by PSSPLT

Files need not be created or specified prior to initiating PSSPLT. The name of an output file is requested by an activity when it is required. If the filename selected already exists, PSSPLT overwrites the entire contents of the file (see activity POPT, section 4.2 for the file overwrite option). If the specified filename does not already exist, it is created in the user's directory.

2.6. Deleting Files

Any file created by the user or by PSSPLT may be deleted from the user's directory when it is no longer required. A file should be purged as a matter of course when its contents have become obsolete or invalid.

Although an unlimited number of files may be contained in a directory, users should be careful not to accumulate unneeded files in a working directory. If users are not disciplined in this regard, confusion can result even if care is taken in noting the significance of each file on the file planning sheet. Furthermore, disk space is unnecessarily wasted and, although the disks have large capacities, they are finite.

Files that are not current but that do need to be retained for documentation or archival purposes should be kept on some off-line bulk storage medium (e.g., magnetic tape).

2.7. Study File Catalog

PSSPLT uses files in a manner that gives users great freedom in adapting the handling of input, the recording of cases, and the handling of output as they progress with their work. As with all systems that give a user great flexibility and many options, PSSPLT also gives users the responsibility of managing their options.

At any time, PSSPLT can overwrite the contents of a file that already exits. PSSPLT does not generally append to files; each time users direct PSSPLT to write to a specific filename using a file-writing activity, such as PRNT, section 4.16 or RANG, section 4.3, the writing commences at the *start* of that file, destroying its previous contents. (See activity POPT, section 4.2, for the file overwrite option.)

In more than 50 man-years of PSSPLT use and its predecessors, this mode of operation has been found to be the preferred way of handling files. It simply requires that users keep effective records of the files they have created and practice a systematic method of assigning filenames. The best type of record is a concise, written catalog that can be used for reference while running PSSPLT.

Chapter 3
Console Procedures

This chapter describes those procedures necessary to access PSSPLT from a terminal work station. Included are the methods used to run PSSPLT either interactively or in batch mode and the disposition of PSSPLT reports.

3.1. How to Approach PSSPLT

The new user, after reading the preceding sections, may form the impression that PSSPLT is a complex and difficult program. It must be recognized, however, that PSSPLT is a tool that allows its user to handle a variety of plotting and related functions within a single integrated program system. The user will find, however, that after a very few work sessions with PSSPLT, he will have become quite comfortable with "driving" PSSPLT, and his attention is refocused from concern over "which buttons to push when" to solving his engineering problem.

The new user approaching PSSPLT should recognize the need to gain a firm understanding of two separate aspects of PSSPLT. These are:

1. The roles of the files in handling input data and in building up a library of files that represent system conditions at selected stages of a study.

2. The capabilities of the individual PSSPLT activities and the sequencing of these activities to achieve the desired results.

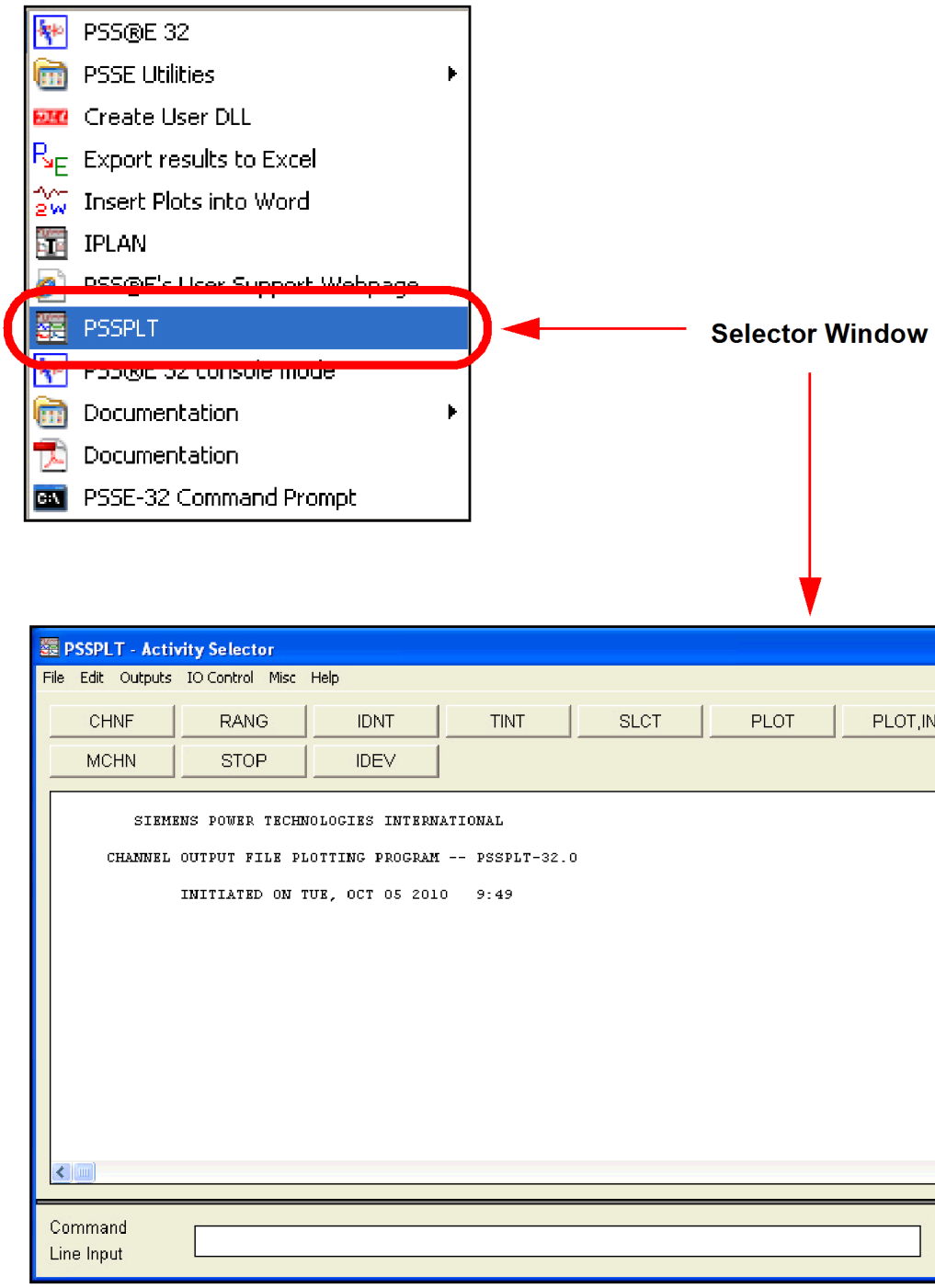
The role of the PSSPLT files has been discussed in Chapter 2, File Considerations. The detailed format requirements of each user-filled file are described in Chapter 4, Plotting Activity Descriptions and Chapter 5, Miscellaneous Activity Descriptions under the activity description of the activity that reads it. The mechanics involved in the second aspect listed above is described in the remainder of this manual.

3.2. Getting on the System

To use PSSPLT on the host computer from a user terminal workstation, the user needs to have one or more directories assigned to him by the system manager prior to "logging in" to the system.

3.3. PSSPLT Start-Up Procedure

Start PSSPLT by selecting PSSE 32 > PSSPLT (pssplt) from the Start Menu.



Select **`File > Stop`** from the Activity Selector menu to exit the PSSPLT application.

PSSPLT's Graphical User Interface (GUI) has been developed for use on systems that provide comprehensive windowing support. PSSPLT is always started up as a "windows" mode program where each PSSPLT operation is initiated from the "Activity Selector" window. Individual PSSPLT "activities" may be executed in either "windows" mode, where all interaction between PSSPLT and the user takes place in pop-up windows, or "line" mode, where the communication mechanism is a question and answer dialog in the "Activity Selector" window. Refer to Interruption of PSSPLT by the User, section 3.4 for details.

PSSPLT may also be started such that a set of activity commands and dialog that are contained in a Response File (see Section 2.2.4, Response Files and Section 3.6, Response File Operation) are automatically executed.

On OSF/Motif systems (see the *PSS® E Program Operation Manual,* Section 4.2.2, Command Line Interface), PSSPLT is started by specifying its entry point name, pssplt. To specify a start-up Response File, the program entry point or program name is followed by the token "-inpdev" and the name of a valid Response File. For example, to start PSSPLT and have the Response File myresp.idv automatically executed, either of the following commands may be specified:

```
pssplt -inpdev myresp.idv
```

On PCs running Microsoft Windows (see the *PSS® E Program Operation Manual*, GUI Windows, section 4.2.1), PSSPLT is started up double-clicking on their icons. A start-up Response File may be specified by changing the "Command Line" in the "Program Item Properties" dialog.

For details on GUI operation, refer to the *PSS® E GUI Users Guide*. Note that the GUI parameter file for PSSPLT is named WINPLT.PRM.

Activity selection in PSSPLT is done in the same manner as in the other PSS®E programs. Refer to Section 4.2, Activity Selection of the *PSS® E Program Operation Manual*.

3.4. Interruption of PSSPLT by the User

Interruption is handled in PSSPLT in the same manner as in other PSS®E programs. Please refer to Section 4.3, Interruption of PSS®E by the User of the *PSS®E Program Operation Manual*.

3.5. Selecting Output Devices

Selecting interactive device codes is handled in PSSPLT in the same manner as in the other PSS®E programs. Please refer to Section 4.4, Virtual Output Devices of the *PSS®E Program Operation Manual*.

3.6. Response File Operation

Once a study has progressed through the initial investigative phase, it is frequently necessary to produce large numbers of plots of substantially repetitive format. In making such plots, the user may relieve himself of the need to manually input essentially the same set of activity commands at the PSSPLT console by prepackaging his activity commands and responses to PSSPLT questions in a source file. PSSPLT may then be instructed to operate in the standard way, but to accept inputs that would normally come from the interactive terminal from a designated "Response File" instead.

A Response File may be initiated by specifying its name in an @INPUT or @CHAIN command (see below); to IDEV (see IDEV, section 5.4); or with the -INPDEV program start-up option. PSSPLT then accepts dialog input from the designated Response File until one of the following occurs:

1. An @END command is read from the Response File.
2. The end of the Response File is reached.
3. Another Response File is initiated with an @INPUT or @CHAIN command.
4. The command @PAUSE is read (the dialog input device IDEV is then temporarily reassigned to the user's terminal until the command @CONTINUE is entered; see IDEV, section 5.4 for further details).
5. IDEV is selected with no filename specified.
6. Activity "IDEV,filename" is selected.
7. Activity STOP is selected.

The suggested way to make up a Response File is to execute activity "ECHO,filename" upon entering PSSPLT (see ECHO, section 5.2). Then the first complete run or sequence of activities should be executed in the normal interactive manner, followed by the selection of ECHO with no file name specified. The resulting "ECHO" file will contain, in Response File form, an exact image of the dialog necessary to duplicate the PSSPLT work session. This basic Response File is tailored for subsequent runs by changing file names, channel numbers, plotting scales, and so on.

As an example, suppose that users often need to select the same channels for plotting. They could use the text editor or use ECHO as described above to set up a Response File named select.idv containing the following lines:

```
SLCT 1 0 300 2 0 300 3 0 300 4 0 300 5 0 300 6 0 300 IDEV
```

Then, instead of manually selecting SLCT, section 4.12 and so on to obtain the plot, the user would execute the select.idv Response File. Full details on Response File operation can be found in Running a Response File, section 16.12 of the *PSS®E Program Operation Manual*.

3.7. Batch Operation

Batch operation of PSSPLT is handled in the same manner as the other PSS®E programs. Please refer to Section 16.5, Batch Commands of the *PSS®E Program Operation Manual*.

3.8. Program Run-Time Options

When PSSPLT is loaded on the system, a set of default run-time options is established; refer to the host-specific platform guide for details. These options are:

1. *Graphical Output Device Descriptor*. The graphics terminal type defines the destination of the displays produced by PLOT, section 4.13.

2. *Plotting Parameters*. Plotting parameters, such as line types, grid overlays, and default plotting type, etc.

3. *File Overwrite Option*. PSSPLT may operate in either an *overwrite* mode or an *ask before overwriting* mode when a preexisting filename is specified to a PSSPLT file-writing activity.

4. *Output Device Page Lengths*. The number of lines per page on the user's CRT terminal, on the two primary hard copy output devices, and in disk files are recognized when these devices are used as the output destination of PSSPLT reports.

5. *Screen Clearing Codes*. These character codes are written to the user's terminal at the beginning of each page of PSSPLT output reports when the CRT terminal is selected as the output destination. These terminal-dependent codes should correspond to the character sequence required to clear the screen and position the cursor at the "home" position.

Each time PSSPLT is initiated, the default options, as established when PSSPLT is compiled and loaded, are enforced. The user may override the default option settings described above via activity POPT (see POPT, section 4.2). Furthermore, the user may change a given option several times during a PSSPLT work session with repeated executions of activity POPT.

In addition, the default activity selection mode (brief or menu; see Section 3.4, Interruption of PSSPLT by the User) is established at PSSPLT installation. This may be changed during a PSSPLT work session via activity MENU (see MENU, section 5.5).

The following option is also established during PSSPLT installation. To change this requires recompiling the root of PSSPLT (PSSPLT.FLX). Refer to the host-specific product usage manual provided with your PSS®E installation for more information.

Chapter 4
Plotting Activity Descriptions

4.1. CHNF

The plot file selection activity, CHNF, is used to select a binary plot file to be used for subsequent operations. The 64 character filename may be specified at the time activity CHNF is invoked. For example, to select the plot file OUTPUT.CHN, activity CHNF could be selected with the activity command "CHNF,OUTPUT.CHN".

If no file is specified or if a file system error condition is encountered in opening the designated file, the user is asked to:

```
ENTER PLOT DATA FILE NAME (-1 TO EXIT):
```

This request is repeated until either a valid filename is entered or a "-1" is entered to terminate activity CHNF.

When a valid plot filename has been entered, activity CHNF displays the two line title stored with the plot file. The two-line title for the selected plot file is not used if any channels have been already selected for plotting. If the title to be used is different from the title displayed, the title which will be used is also displayed. See activity LFTI, section 4.5 for information on changing the two line title.

Activity CHNF is not sensitive to any interrupt control code options.

4.2. POPT

The plotting option setting activity, POPT, enables the user to override most of the default plotting option settings as established when PSSPLT is installed on the system (refer to Section 3.8, Program Run-Time Options).

4.2.1. User Plotting Option Settings

Activity POPT uses the suffix *SAVE* to save the user's POPT options into the binary file PSSPLT.OPT. (This file cannot be edited by the user.) When starting PSSPLT, the program first checks to see if the file PSSPLT.OPT exists in the user's directory; if so, those options are read in and override the default PSSPLT options. If the file does not exist in the user's directory, then the program checks to see if the file exists in the master directory; if so, those options are read in and override the default PSSPLT options. Refer to the host-specific manual for your machine for details on the master directory. If the file PSSPLT.OPT does not exist in either directory, the default PSSPLT options are used.

If the file PSSPLT.OPT was created by a previous version of PSSPLT, only the options that were available at that time will be affected when the file is read.

4.2.2. Operation of Activity POPT

When invoked, activity POPT displays the current settings of all options that may be modified as in the following example:

```
PRESENT OPTION SETTINGS ARE: 1=GRAPHICS OUTPUT DEVICE..... 0 2=PLOT
LINE TYPE...PATTERN+SYMBOLS 3=COLOR OPTION.....COLORS 4=MAXIMUM
PLOTS.....6 5=NUMBER OF TIME INTERVALS.....10 6=TIC MARK
DELTA..... 0.250 7=RELAY CLIP BOUNDARY..... 0.250 8=LINE PRIN-
TER PLOT WIDTH.....100 9=GRID LINES OPTION.....0 10=CRT RE-
PLOT OPTION.....ON 11=TIME AXIS ANNOT.....TIME 12=MIN &
MAX CALCULATION.....APPROX 13=FUNCTION DELIMITER OPTION.....[ ] 14=PRINT
CHANNEL #S FROM SLCT...YES 15=PLOTS PER PAGE.....1 16=DELTA
TIME INTERVAL... 0.0000 17=FILE OVERWRITE OPTION.....YES 18=CHANGE PLOT
TITLES.....NO LINES PER PAGE: 19=FILE OUTPUT.....60
20=CRT TERMINAL.....24 21=PRINTER-1.....58
22=PRINTER-2.....60 ENTER CODE OF OPTION TO BE CHANGED:
```

The user may then change the default setting of any option by entering its numeric option code (the number shown on the line describing the option and its current setting). Following such a change, the option menu is again displayed with any new setting shown and another option may then be modified. This process is repeated until a zero (or simply a carriage return) is specified for the code of the option to be changed.

Option setting 1 is the default descriptor describing the graphics output device. For this option, activity POPT displays a table of the graphics output devices supported by PSSPLT at your installation. The user is then instructed to:

```
ENTER DESIRED PLOTTING DEVICE:
```

where the response is one of the numeric device codes shown in the displayed table.

The graphics output device setting defines the destination for the graphic output of activity PLOT, section 4.13. If a code of zero (= NONE) is entered, activity PLOT invites the user to select the output destination at the time it is invoked; otherwise, the designated device is automatically used.

Care should be taken to designate the correct numeric device code, especially when the user's terminal is a Tektronix or Tektronix-compatible graphics CRT. Specifying a CRT terminal type other than that actually being used can lead to undesirable results. For example, if a terminal without hardware drawing of dashed and dotted lines is in use and a terminal type having these features is specified, dashed and dotted lines will be drawn as solid lines.

Option code 2 allows the user to change the characteristics of the plot curves. Up to six curves may be drawn on a plot and the characteristics serve as identifiers for the different curves. When option code 2 is selected, the following message is printed:

```
DEFAULT PLOTTED LINE TYPE IS PATTERN & SYMBOLS ENTER 0 FOR SOLID, 1 FOR PATTERNED,
2 FOR SYMBOLS, 3 FOR BOTH:
```

The user can select one of the four characteristics for plot identification. (If a device that supports color is selected, the curves will be drawn in the appropriate color regardless of the characteristics selected.) If zero is selected, plots are represented only by solid lines. It will not be possible to distinguish between different curves. If one is selected, different line styles (dashes and dots) are used to identify curves. If two is selected, symbols (or markers) are drawn on the curves at regular intervals to identify the curves. If three is selected, both symbols and line types are used to identify curves.

Option 3 determines whether plotting will be in color or monochrome, thus there are only two possible settings. Entering the corresponding option code causes activity POPT to switch to that setting. Alternatively, a carriage return, <CR>, can be used to cause activity POPT to switch the option to the alternate setting.

Option code 4 allows the user to set the maximum number of curves that may be included on a time plot. The user is requested to respond to the following prompt:

```
DEFAULT MAXIMUM PLOTS IS 6 ENTER MAXIMUM PLOTS PER PAGE (1-6):
```

where the response is a value from 1 through 6.

Option code 5 allows the user to select the number of time intervals, or time axis tic marks, for subsequent plots. The following prompt is issued and the user must enter a response with a value from 2 through 31:

```
DEFAULT NUMBER OF TIME INTERVALS IS 10 ENTER # OF PLOT INTERVALS ON TIME AXIS
(2-31):
```

Option code 6 allows the user to modify the time interval between tic marks on X-Y plots. The user is requested to respond to the prompt:

```
DEFAULT TIC MARK DELTA IS 0.250 ENTER TIC MARK DELTA FOR XY PLOTS (0.0-1.0):
```

where the response is a value from 0.0 to 1.0 representing seconds. If zero is selected, no tic marks are drawn other than one signifying the starting point for the plot.

Option code 7 allows the user to specify the distance from the plotting frame at which relay characteristics plotting is suppressed. The user is requested to respond to the prompt:

```
DEFAULT RELAY CLIP BOUNDARY IS 0.250 ENTER CLIP BOUNDARY FOR RELAY PLOTS
(0.1-1.0):
```

where the response is a value from 0.1 to 1.0 and represents inches. The clip boundary is intended to keep the area surrounding the plotting frame from becoming cluttered and, thereby, making the plot unreadable.

Option code 8 is used to select the plotting width for line printer style plots. The user is requested to respond to the prompt:

```
DEFAULT LINE PRINTER PLOT WIDTH IS 100 ENTER L.P. PLOT WIDTH (60 OR 100):
```

A plotting width of 60 is normally selected only when the printer (or CRT) to which the plot is to be directed is limited to eighty columns. Otherwise, a width of 100 will generate higher resolution plots.

Option 9 allows the user to control the drawing of grids over the resulting plot. If set to 0, no grid is drawn. For plots other than log or semi-log plots, a setting of 1 will cause grid lines to be drawn at the tic mark intervals while option 2 draws an even denser grid to enable very accurate interpretation of plots. If option 9 is set to 3, then a very loose, crosshatch type grid, is drawn at the tick mark intervals. For log or semi-log plots, a setting of 1 will cause thick grid lines to be drawn at the tic marks. A setting of 2 will cause medium grid lines and a setting of 3 will cause light grid lines to be drawn at the tic marks.

Option 10 is used to enable or disable copying of plots after displaying them on CRT's. This option affects the dialog in activity PLOT, section 4.13. Option 10 may have one of two settings and entering the corresponding option code causes activity POPT to switch to that setting. Alternatively, a carriage return, <CR>, can be used to cause activity POPT to switch the option to the alternate setting.

Option 11 can be used to change the time axis label from the time plots. Normally, this would be left at "TIME." If changed, the label can be up to 20 characters long.

Option code 12 allows the user to control how the functions' channel minimum and maximum limits are calculated in activity SLCT (see SLCT, section 4.12). The user is requested to respond to the following prompt:

```
DEFAULT MIN & MAX CALCULATION IS APPROX. ENTER <CR> TO TOGGLE, 0 APPROXIMATE,
1 FOR ACTUAL:
```

A setting of 0 will cause a quick, approximate calculation of the channel minimum and maximum limits on each function. These are based on the CMIN and CMAX data calculated in activity RANG (see RANG, section 4.3).

A setting of 1 will cause an actual calculation of the channel minimum and maximum limits on each function. These are based on the actual channel data found in the channel input file and will take longer to process. A carriage return, <CR>, can be used to cause activity POPT to switch the option to the alternate setting.

Option code 13 allows the user to choose a delimiter to be used for the channel identifiers. When option code 13 is selected, the following message is printed:

```
DEFAULT FUNCTION DELIMITER OPTIONS IS [ ] ENTER 0 FOR NONE, 1 FOR [ ], 2 FOR < >:
```

The user can select one of the three delimiters to be used to enclose their channel identifiers.

Option code 14 allows the user to print or suppress the channel numbers. The user is requested to respond to the prompt:

```
DEFAULT PRINT CHANNEL #S FROM SLCT IS YES ENTER <CR> TO TOGGLE, 0 PRINT CHANNEL
#S, 1 DO NOT PRINT:
```

A setting of 0 will cause the channel numbers to be printed in activities PLID, section 4.14, PLOT, section 4.13, and SLCT, section 4.12. A setting of 1 will suppress the channel numbers. A carriage return, <CR>, can be used to cause activity POPT to switch the option to the alternate setting.

Option code 15 allows the user to choose the number of actual plots per page for hard copy devices only. The user is requested to respond to the prompt:

```
DEFAULT PLOTS PER PAGE IS 1 ENTER # OF PLOTS PER PAGE (1,2, OR 4):
```

An interactive device will default to 1 plot per page. A setting of 2 will cause the 2 plots to be rotated 90°, separated by a center line. A setting of 4 will create a plot in each quadrant of the paper.

Option code 16 allows the user to choose an interval between points plotted. If, for example, the interval is set to 17 msec. and the points are separated by 5 msec., every fourth point will be plotted. If the interval is set to zero, every data point will be plotted. The user is requested to respond to the prompt:

```
DEFAULT DELTA TIME FOR PLOTTING INTERVAL IS 0.0000 ENTER DELTA TIME FOR PLOTTING
INTERVAL:
```

Option code 17 allows the user to choose if the file overwrite option is activated or not. If the user chooses not to allow overwriting then when PSSPLT tries to write to an existing file, the user is asked if they want to write over this existing file. The user is requested to respond to the prompt:

```
DEFAULT FILE OVERWRITE OPTION IS YES ENTER <CR> TO TOGGLE, 0 FILE OVERWRITE,
1 NO OVERWRITE:
```

A carriage return, <CR>, can be used to cause activity POPT to switch the option to its alternative setting. A response of 0 allows file overwriting without being prompted and a response of 1 causes the user to be prompted if the file already exists.

Option code 18 allows the user to input a plot title when a user defined function is used. The user is requested to respond to the prompt:

```
DEFAULT CHANGE PLOT TITLE IS NO ENTER <CR> TO TOGGLE, 0 DO NOT CHANGE, 1 CHANGE
PLOT TITLES:
```

A response of 1 will allow the user to change each plot title when in activity SLCT, section 4.12.

Option code 19 allows the user to change the number of lines per page on file output. Activity POPT instructs the user to:

```
ENTER LINES PER PAGE FOR FILE OUTPUT:
```

Option code 20 allows the user to change the number of lines per page for output to the CRT terminal. Activity POPT instructs the user to:

```
ENTER LINES PER PAGE FOR CRT TERMINAL:
```

Option code 21 allows the user to change the number of lines per page for the printer defined as PRINTER-1 at installation time. Activity POPT instructs the user to:

```
ENTER LINES PER PAGE FOR PRINTER-1:
```

Option code 22 allows the user to change the number of lines per page for the printer defined as PRINTER-2 at installation time. Activity POPT instructs the user to:

```
ENTER LINES PER PAGE FOR PRINTER-2:
```

Activity POPT is not sensitive to any interrupt control code options.

4.3. RANG

The channel data limits activity, RANG, allows the user to determine channel data minimum and maximum limits and, optionally, save the limit data for use with subsequent PSSPLT sessions. When invoked, activity RANG responds with:

```
OPTIONS ARE 0 - NO MORE 1 - GENERATE ACTUAL & ADJUSTED SCALES 2 - WRITE SCALE FILE
3 - READ SCALE FILE 4 - DISPLAY SCALES 5 - OVERRIDE SCALES 6 - GENERATE ACTUAL
SCALES 7 - READ DYPRN4 FILE 8 - GENERATE COMMON SCALE SELECT DESIRED OPTION:
```

Once a set of scales has been calculated, reading in a new plot file using activities CHNF, section 4.1 or MCHN, section 4.10 will not initialize the scales. The old scale values will remain until activity RANG is executed again.

When option 1 is selected, activity RANG searches through the data for all channels and determines the actual minimum and maximum values for each channel. The actual minimum and maximum values are then used to determine a reasonable range to use when plotting the channel.

Option 1 also sets the values of TSTART and TSTOP if they are currently set to the default values (see activity TINT, section 4.4). The value for TSTOP will be the largest time value in the channel file. The value for TSTART will be set equal to 0. If a plot format with logarithmic time scale is selected (activity PTYP, section 4.9), the value for TSTART will be the value four decades less than the scaled up value for TSTOP. For example, if TSTOP is 1024, its scaled value will be set to 10000 and the value for TSTART will be set to 1. The value of TSTOP will remain at 1024.

Option 2 allows the user to save the current channel limits and ranges to a file. The user is asked to:

```
ENTER SCALE FILENAME (0 FOR NONE):
```

If the user has overridden any suggested ranges during execution of activity SLCT, section 4.12, the user values are saved rather than the values determined by activity RANG.

Option 3 allows the user to read a previously saved scale data file into memory for use when plotting channel data. Only the minimum and maximum scaled ranges are read in. The actual minimum and maximum values previously calculated for each channel are not overwritten. The user is prompted for a filename as with option 2 above.

Option 4 is used to display generated scale data. Both the actual minimum and maximum values and the scaled minimum and maximum values are displayed. The user is first asked to specify the output destination. The user is then requested to

```
ENTER CHANNEL RANGE (0 TO EXIT):
```

Two positive numbers, indicating the range of channel numbers for which identifiers are requested should be entered. For example, if "1,999" were entered, identifiers from channel number one through channel number 999 would be listed. If the second number is not entered, or is less than or equal to the first number, a single identifier representing that channel number would be displayed. If the first channel number is zero, activity RANG terminates.

After selecting a channel number range, the user is requested to:

```
ENTER IDENTIFIER MASK (ENTER FOR NO MASK):
```

If no identifier mask is entered by simply typing a carriage return or depressing the enter key, all identifiers in the channel number range specified above are displayed. If a mask defined by the following description is entered, only those identifiers which "match" the specified mask are displayed.

The mask consists of up to 12 alphanumeric characters, including imbedded asterisks ("*") which are interpreted as string matching characters. Each "*" represents any number of characters, including zero, which may be imbedded between other substrings specified in the mask. Any number of asterisks may be imbedded in the mask, as long as the total number of characters does not exceed 12. The following examples illustrate the effect of different masks.

ANG*

All channels with identifiers that begin with "ANG".

*ST

All channels with identifiers that contain the string "ST" anywhere in the 16-character name. The listing produced would include identifiers "ANG-6STGAS" or "STATION" but not "ANG-SXT" or "S-TOWN".

ANG*ST

All channels with identifiers that begin with "ANG" and which, in addition, contain the string "ST". The listing would include identifiers "ANG-6STGAS" or "ANGST-GAS" but not "XANG-6ST" or "ANG-SXT".

After the selected channel identifiers have been tabulated, the above prompt for the channel number range is repeated.

Option 5 gives users the ability to override the calculated channel scales as obtained by selecting option 1. The user is first instructed to:

```
ENTER INPUT FILENAME (1 FOR TERMINAL, 0 FOR NONE):
```

If "1" is selected, the user is prompted to:

```
ENTER MASK,ICHAN1,ICHAN2,CMIN,CMAX:
```

where MASK is the identifier mask as described above (under option 4), CMIN and CMAX are the desired minimum and maximum scale values, and ICHAN1 and ICHAN2 define the range of channel numbers to which the values are to be applied.

A message is then displayed, verifying the input followed by a count of the number of channels for which the scale values were changed. The above prompt is repeated until "END", "-1" or a blank line is entered.

If the input is to come from a file, the same method is taken except there are no prompts. The input format is the same as for terminal input and the same method is used to terminate input.

Option 6 searches through the data for all channels and determines only the actual minimum and maximum values for each channel.

Option 7 allows the user to read a scaled data file created by the auxiliary program DYPRN4. The channel numbers and their corresponding minimum and maximum ranges are read in for use when plotting channel data. The actual minimum and maximum values for each channel are not overwritten. The user is prompted for a filename as with option 3.

Option 8 finds a common scale by scaling to the overall minimum and maximum value of all channels within a specified range. The user is requested to:

```
ENTER CHANNEL RANGE (0 TO EXIT):
```

See option 4 for details about the channel range. After selecting a channel range, the user is requested to:

```
ENTER IDENTIFIER MASK (ENTER FOR NO MASK):
```

See RANG, section 4.3 for details about this identifier mask.

This option searches through the data and determines the actual minimum and maximum for each channel. The minimum value of all the actual minimum values and maximum value of all the actual maximum values are scaled. These two values are set equal to the adjusted scales for all channels.

Activity RANG is not sensitive to any interrupt control code options.

4.4. TINT

The time interval activity, TINT, is used to set the beginning and ending times for subsequent plots. At program start-up, PSSPLT sets the beginning time to -9999.0 and the ending time to +9999.0. These times are automatically set to actual run times (rounded to the next whole second) when activity RANG (see RANG, section 4.3) is invoked and data is scaled. It may be desirable, at times, to override the derived time interval.

Activity TINT normally outputs the message:

```
CURRENT VALUE FOR TSTART = -9999.0000, TSTOP = 9999.0000 ENTER STARTING TIME,
ENDING TIME:
```

If a new TSTART and TSTOP are entered, the new values are used. If a carriage return is entered, the time interval is left unchanged.

If a LOG scale has been selected for the time interval, PSSPLT sets the beginning time to 1.0 and the ending time to 10000. These times can be automatically set to actual run times when activity RANG, section 4.3 is invoked and data is scaled. For this plotting type, activity TINT outputs the message:

```
CURRENT VALUE FOR TSTART = 1.0, TSTOP = 10000. ENTER NEW STARTING TIME, ENDING
TIME (ROUND TO A POWER OF 10):
```

If a new TSTART and TSTOP are entered and they are not a power of 10, the values are adjusted. The value for TSTART reduced to the nearest power of 10 and the value of TSTOP is increased to the nearest power of 10. If either value is less than or equal to 0, the question is repeated until a valid TSTART and TSTOP are entered.

Activity TINT is not sensitive to any interrupt control code options.

4.5. LFTI

The plot title activity, LFTI, allows the user to change the two title lines read from the original plot file. Activity LFTI outputs the message:

```
PLOT TITLE LINE 1 = CHANGE IT? 1 ENTER NEW TITLE LINE OR <CR> TO DELETE
********************************************************** :
```

In response to the above prompt, a new title line, up to 60 characters, can be entered. Activity LFTI then prompts to change the second plot title line:

```
PLOT TITLE LINE 2 = CHANGE IT? 1 ENTER NEW TITLE LINE OR <CR> TO DELETE
********************************************************** :
```

The action is the same as with the first title line.

The changed plot title will be used for all PSSPLT activities. During a PSSPLT session, the user can restore the original plot title of the output file selected in activity CHNF, section 4.1 or the first output file selected in MCHN by executing the activity with the suffix, RSTR. If the plot title is changed and CHNF is subsequently executed, the plot title will remain in the changed state. When activity PLOT, section 4.13 is executed and a new plot file read in, the plot title will be the two-line title in the new plot file.

The user can restore the two-line title from the current plot file by executing the activity with the suffix CUR.

Activity LFTI is not sensitive to any interrupt code options.

4.6. SUBT

The subtitle activity, SUBT, allows the user to input two title lines that will be output in the header of subsequent reports and plots, along with the two title lines that were read from the plot file. Activity SUBT outputs the message:

```
SUBTITLE LINE 1 = CHANGE IT? 1 ENTER NEW SUBTITLE LINE OR <CR> TO DELETE
********************************************************** :
```

In this case, subtitle line 1 is blank. In response to the above prompt, the desired subtitle line, up to 60 characters, can be entered. Activity SUBT then prompts for the second subtitle line:

```
SUBTITLE LINE 2 = CHANGE IT? 1 ENTER NEW SUBTITLE LINE OR <CR> TO DELETE
********************************************************** :
```

The action is the same as with the first subtitle line.

Activity SUBT is not sensitive to any interrupt control code options.

4.7. IDNT

The channel identification listing activity, IDNT, tabulates a listing of channel identifiers. The user is first asked to specify the output destination (see Section 3.5, Selecting Output Devices). After the output destination has been specified, activity IDNT asks:

```
ENTER CHANNEL RANGE (0 TO EXIT):
```

Two positive numbers, indicating the range of channel numbers for which identifiers are requested should be entered. For example, if "1,999" were entered, identifiers from channel number 1 through channel number 999 would be listed. If the second number is not entered, or is less than or equal to the first number, a single identifier representing that channel number would be displayed. If the first channel number is zero, activity IDNT terminates.

After selecting a channel number range, the user is requested to:

```
ENTER IDENTIFIER MASK (ENTER FOR NO MASK):
```

If no identifier mask is entered by typing a carriage return or depressing the enter key, all identifiers in the channel number range specified above are displayed. If a mask defined by the following description is entered, only those identifiers that "match" the specified mask are displayed.

The mask consists of up to twelve alphanumeric characters, including imbedded asterisks ("*") which are interpreted as string matching characters. Each "*" represents any number of characters, including zero, that may be imbedded between other substrings specified in the mask. Any number of asterisks may be imbedded in the mask as long as the total number of characters does not exceed 12. The following examples illustrate the effect of different masks.

ANG*

All channels with identifiers which begin with "ANG".

*ST

All channels with identifiers that contain the string "ST" anywhere in the 16-character name. The listing produced would include identifiers "ANG-6STGAS" or "STATION" but not "ANG-SXT" or "S-TOWN".

ANG*ST

All channels with identifiers that begin with "ANG" and which, in addition, contain the string "ST". The listing would include identifiers "ANG-6STGAS" or "ANGST-GAS" but not "XANG-6ST" or "ANG-SXT".

After the selected channel identifiers have been tabulated, the above prompt for the channel number range is repeated.

Activity IDNT is not sensitive to any interrupt control code options.

4.8. SCAN

The channel data information activity, SCAN, tabulates various channel characteristics. When invoked, activity SCAN responds with:

```
OPTIONS ARE 0 - NO MORE 1 - LOWEST OF CHANNEL MINIMUMS 2 - HIGHEST OF CHANNEL
MAXIMUMS 3 - MAXIMUM CHANNEL SPREAD 4 - WORST CHANNEL DEVIATIONS 5 - CHANNELS
OUTSIDE SPECIFIED BAND 6 - WORST CHANNEL DEVIATIONS BY PERCENTAGE SELECT DESIRED
OPTION:
```

For options 1 through 6, the user is first asked to specify the output destination (Section 3.5, Selecting Output Devices). The user is then requested to:

```
ENTER CHANNEL RANGE (0 TO EXIT):
```

After selecting a channel number range, the user is requested to:

```
ENTER IDENTIFIER MASK (ENTER FOR NO MASK):
```

(See Section 4.3, RANG or Section 4.7, IDNT, for further explanation on the two previous questions.)

For options 1 through 4 and option 6, the user is then requested to:

```
ENTER NUMBER OF CHANNELS TO OUTPUT:
```

The maximum number of channels output is equal to 50.

Option 1 tabulates the n channels with the lowest actual minimum values that match the mask along with the time at which the minimum value occurred.

Option 2 tabulates the n channels with the highest actual maximum values that match the mask along with the time at which the maximum value occurred.

Option 3 tabulates the n channels with the maximum channel spread, that is, the channels with the largest difference in actual maximum and minimum values. The actual minimum and maximum values at which the spread occurred are also tabulated.

Option 4 tabulates the n channels with the largest deviation from their initial channel data value that match the mask. The initial channel value and the time at which the maximum deviation occurred are also output.

Option 5 allows the user to tabulate all channels that go outside a specified band, that is, channels with the actual minimum less than the lower band and the channels with the actual maximum greater than the upper band. The user is asked to:

```
ENTER SPECIFIED BAND:
```

The lower band followed by the higher band is input. The channels that match the mask are output. Either the lower or upper band limit can be effectively turned off by entering a very small or large value for that limit.

Option 6 tabulates the n channels with the largest percent deviation from their initial channel data value that match the mask. The initial channel value is also output along with the time at which the largest deviation occurred.

Activity SCAN bases the actual channel minimums and maximums on the entire time interval in the plot file. If activity TINT, section 4.4 is called previous to activity RANG, section 4.3, then the actual minimums and maximums are chosen by the time interval from activity TINT.

Activity SCAN is not sensitive to any interrupt control code options.

4.9. PTYP

The plotting format selection activity, PTYP, is used to establish the format of subsequent plots. By default, PSSPLT assumes time plots for a plotting device. Suffixes recognized by activity PTYP are shown in Table 4-1 Suffixes Recognized by Activity PYTP.

Table 4.1. Suffixes Recognized by Activity PYTP

Type of Plot	Suffix	Description
Time	TIME or blank (default)	Time versus X value.
X versus Single Y	XY	X value versus single Y value.
Line Printer Format	LP	Time versus Y value on line printer.
Time Derivative (R-Rdot)	RD	X value versus time derivative of the X value.
Fast Fourier Transform	FFT	Fast Fourier Transform analysis.
Log-Log	LOG	Log of time (or X value) versus log of Y value.
Semi-Log	SLOG	As with LOG-LOG except either axis can be semilog.
X Versus Multiple Y	XM	X value versus up to six Y values.
Modal Analysis	MA	Time versus modal decomposition of simulation results.

Functions (FUNC, section 4.11) are not recognized by "LP," "RD," or "FFT" plots. All functions are recognized by "TIME" plots. "XY" and "XM" plots allow all functions except time derivative. Log and semi-log plots recognize all functions, but user defined functions may not contain the functions "LOG" or "LOG10".

The following sections describe the dialog that is initiated when activity PTYP is invoked with the suffix "LOG", "SLOG" or "FFT".

4.9.1. LOG Plotting Format

When the suffix "LOG" is chosen, the activity responds with:

```
OPTIONS ARE: 1 - LOG(X) VS LOG(Y) 2 - LOG(TIME) VS LOG(Y) ENTER LOG TYPE (0
TO EXIT):
```

If the user does not choose an option, the plotting type will default to time plots.

4.9.2. SLOG Plotting Format

When the suffix "SLOG" is chosen, the activity responds with:

```
OPTIONS ARE: 1 - LOG(X) VS Y 2 - LOG(TIME) VS Y 3 - TIME VS LOG(Y) ENTER SEMI-
LOG TYPE (0 TO EXIT):
```

If the user does not choose an option, the plotting type will default to time plots.

4.9.3. FFT Plotting Format

Upon selecting PTYP FFT activity PTYP responds with:

```
FAST FOURIER PLOT FORMAT SELECTED. PRESENT OPTION SETTINGS ARE: 1=PERFORM FFT
FUNCTION..........YES 2=PEFORM DC FUNCTION.............NO 3=PEFORM HANNING
FUNCTION.........NO 4=NUMBER OF SKIPPED TIME STEPS.... 0 ENTER CODE OF OPTION
TO BE CHANGED:
```

The default option setting is to perform a Fast Fourier Transform (FFT) analysis. Options 2, 3, and 4 are used to invoke signal processing operations prior to performing the FFT function.

Option 1 allows the user to perform the FFT. The user is prompted:

```
DEFAULT FFT FUNCTION OPTION IS YES ENTER <CR> TO TOGGLE, 0 FOR FFT FUNCTION,
1 FOR NO FUNCTION:
```

If option 2 is chosen, the dc component is subtracted from the channels chosen in activity SLCT, section 4.12. The user is prompted:

```
DEFAULT DC FUNCTION OPTION IS NO ENTER <CR> TO TOGGLE, 0 FOR NO FUNCTION, 1
FOR DC FUNCTION:
```

Option 3 allows the user to perform the Hanning function for the selected channels. It is used to eliminate spurious high frequencies at frequency boundaries. The channels chosen in activity SLCT, section 4.12 are multiplied by the Hanning function. The user is prompted:

```
DEFAULT HANNING FUNCTION OPTION IS NO ENTER <CR> TO TOGGLE, 0 FOR NO FUNCTION,
1 FOR HANNING FUNCTION:
```

Any combination of options 1 through 3 are allowed. The order of when the functions are performed is:

```
DC FUNCTION HANNING FUNCTION FFT FUNCTION
```

If all three functions are requested, the dc function will be performed and the Hanning function will be performed on the channel with the dc component removed. Finally, the FFT function will be performed. If all three functions are turned off, the plotting type will change to time plots.

Option 4 allows the user to choose how many time steps to skip in the plot file. The user is prompted:

```
DEFAULT NUMBER OF SKIPPED TIME STEPS IS 0 ENTER NUMBER OF SKIPPED TIME STEPS:
```

Typing a carriage return or depressing the enter key will cause the value to remain unchanged. If the user chooses to skip time steps, the size of the FFT may change and the plot produced will be less accurate.

After the options are selected, PSSPLT will parse through the selected plot file and determine the size of the FFT. Size information concerning the selected plot file is then sent to the screen. Activities CHNF, section 4.1 and TINT, section 4.4 should be executed before PTYP FFT so that a valid plot file is selected, and start and end times for extracting the time domain data set are established. Using activity TINT allows the user to perform the FFT on any part of the selected channel, permitting analysis on only the portion of data which is of concern.

The size of the plot file will cause PSSPLT to select a 4096, 2048, 1024, 512, 256, or 128-point FFT. PSSPLT interpolates between points to generate the FFT with the next higher power of two. If there are less than 64

data points, PSSPLT will not perform an FFT. If there are more than 4096 data points, PSSPLT will perform the FFT on the first 4096 data points in the selected plot file.

Activity POPT, section 4.2 with an option code of 12 should be performed prior to channel selection. This changes scaling from approximate to actual, and instructs activity SLCT, section 4.12 to give minimum and maximum values of the FFT. Otherwise, zeros will appear in the minimum and maximum values.

Activity SLCT, section 4.12 is used to select the channel and to provide scaling for either the dc function, Hanning function, or the magnitude and phase response of the FFT, depending on the options selected. The user then, executes activity PLOT, section 4.13.

While PTYP FFT is selected, activity PLOT, section 4.13 will always prompt the user for a starting and ending frequency. This allows magnification of the frequency scale. Note that several operations of activity PLOT can be used successively to generate the desired scaling on the horizontal axis. To change scales on the vertical axis, the user must repeat steps beginning at activity SLCT, section 4.12.

An example of a FFT plotting session is shown in Chapter 6, Examples.

Activity PTYP is not sensitive to any interrupt control code options.

4.10. MCHN

The multiple plot file selection activity, MCHN, is used to select a maximum of six binary plot files to be used for subsequent operations. It is assumed that the different plot files contain the same channels in the same sequence. The user is requested to:

```
ENTER PLOT DATA FILE NO. n (-1 TO EXIT):
```

This request is repeated until either a valid filename is entered, a total of six plot files are entered, or a "-1" is entered to terminate activity MCHN.

When multiple plot files are selected, activity PLOT, section 4.13 will plot channels from the different files allowing a maximum of six plots per page. The function chosen in activity FUNC, section 4.11 will again apply to all of the plot files. If there are a total of six plots chosen, then one function is allowed to be plotted to produce six plots.

The two-line title for each selected plot file is not used if any channels have been already selected for plotting. If the title to be used is different from the title displayed, the title that will be used is also displayed. See activity LFTI, section 4.5 for information on changing the two-line title.

Multiple plot files may be used to plot time plots and X-Y plots. Multiple file line printer format time plots are not allowed.

Once activity MCHN is executed, subsequent calls to activities CHNF, section 4.1 or MCHN will close all previously opened plot files. This enables the user to choose another file or set of files.

The following activities recognize only the first file selected in activity MCHN for their execution:

IDNT, section 4.7		LFTI, section 4.5
PRNT, section 4.16		SUBT, section 4.6
SCAN, section 4.8		PLID, section 4.14
SLCT, section 4.12		CHID, section 4.20
RANG, section 4.3		

Activity MCHN is not sensitive to any interrupt control code options.

4.11. FUNC

The channel function specification activity, FUNC, allows the user to choose a function. All functions are recognized by "TIME" plots. "XY" and "XM" plots allow all functions except the time derivative function. The "LP," "RD," and "FFT" plotting types do not recognize any functions. When invoked, activity FUNC issues the prompt:

```
PLOTTING FUNCTIONS ARE: 0 - EXIT ACTIVITY 1 - CHANNEL VALUE (NO FUNCTION) 2 -
USER DEFINED ARITHMETIC FUNCTION 3 - ALL BUT SPECIFIED FREQUENCY COMPONENT 4
- SPECIFIED FREQUENCY COMPONENT 5 - LOW FREQUENCY COMPONENT 6 - HIGH FREQUENCY
COMPONENT 7 - UPPER ENVELOPE 8 - LOWER ENVELOPE 9 - INTEGRATE SIGNAL 10 -
FOURIER COMPONENTS OF A ; DEL T=B ; DEL FREQ=C 11 - PEAK OF 3 PHASE RECTIFIED
SIGNAL 12 - D AXIS COMPONENT 13 - Q AXIS COMPONENT 14 - ZERO SEQUENCE COMPONENT
15 - POSITIVE SEQUENCE COMPONENT 16 - NEGATIVE SEQUENCE COMPONENT 17 - TIME
DERIVATIVE SELECT FUNCTION:
```

The function chosen has no effect on previously selected channels. Therefore, it is possible to generate a series of curves using up to six different functions. For example, it may be desirable to plot the curve for a reference angle, plot additional angles relative to that reference, and plot the time derivative on the same plotting page. You can mix and match the functions allowing up to six plots per page.

A selection of function 1 sets the function equal to "A." A selection of function 2 causes the prompt:

```
ENTER DESIRED EXPRESSION:
```

where the user inputs the desired function.

The following functions and operators are allowed in an expression:

```
+ addition - subtraction * multiplication / division ** exponentiation - nega-
tion ABS(X) absolute value of expression X ATAN(X) arctangent of expression X
ATAN2(Y,X) arctangent of expression (Y,X) CABS(X,Y) complex absolute of (X,Y)
COS(X) cosine of expression X LOG natural log of expression XLOG10 log of ex-
pression X SIN(X) sine of expression X SQRT(X) square root of expression X
```

The only six variables to be used in the function are:

```
A, B, C, D, E, F
```

The user is required to use the six variables in alphabetical order; this is NOT to say that A must appear before B in the function, but if the variables A and C are used, then B must also appear in the function.

Once the expression has been entered and tested to be well formed, the activity terminates. Activity SLCT, section 4.12 can then be executed to choose channels for the active function. If more functions are required for plotting, activity FUNC can be executed repeatedly until a maximum of six functions with each allowing a maximum of six channels have been selected.

A detailed explanation of functions 3 through 16 can be found in Appendix C.

A selection of function 17 allows the user to plot time derivatives. The time derivative function of a channel calculates the change in successive channel values divided by their delta time. The time derivative will be plotted versus time.

After a function has been selected, activity SLCT, section 4.12 must be executed so the new function can be performed on new channels. Even if the channel numbers do not change between functions, activity SLCT must be executed so the channels can be run through the function.

Activity FUNC is not sensitive to any interrupt control code options.

4.12. SLCT

The plot channel selection activity, SLCT, is used to select one or more channels to be plotted when activity PLOT, section 4.13 is invoked.

4.12.1. Operation of Activity SLCT

If no suffix, or an invalid suffix, is entered at the time activity SLCT is invoked, selected channels are added to the list of channels previously selected for plotting. If the suffix "NEW" is entered, or activity PLOT has been invoked, or activity SLCT is being invoked for the first time, then the number of channels already selected is set to zero. The suffix "CHANGE" allows the user to change the minimum and maximum scales on previously selected channels. Activity SLCT can be invoked with the suffix "CHANGE" after activity PLOT has been invoked.

When invoked without the "CHANGE" suffix, activity SLCT displays the number of channels already selected for plotting along with the name of the current plot file.

```
CURRENT CHANNEL FILE IS: out1 0 CHANNELS SELECTED (OUT OF A MAXIMUM OF 6)
```

Please note that the maximum number of channels which can be selected depends on the plotting type (see activity PTYP, section 4.9).

It is recommended that after using activity FUNC, section 4.11, the user executes activity SLCT so that the channels can be processed through the new function.

Selecting Channels for Time Plots

Activity SLCT allows up to six plot channel curves to be plotted on a single plot. Refer to POPT, section 4.2 for information on changing the maximum number of curves allowed on a plot. The user is prompted to enter one to six channels to be plotted using the function currently in effect (see FUNC, section 4.11). The format of the prompt varies slightly according to the number of channels to be entered as a set.

```
ENTER CHANNEL NUMBER (0 FOR NO MORE):
```

or

```
ENTER n CHANNEL NUMBERS (0 FOR NO MORE)
```

where 'n' is number of channels (two through six) required for the defined function. If activity FUNC, section 4.11 has not been executed, the default function is A. The prompt for channel number(s) is repeated until a zero is entered or the maximum number of curves has been defined.

The prompt for minimum and maximum scales depends on whether or not channel ranges have been established (refer to activity RANG, section 4.3). When channel ranges have not been established, the prompt

```
CURRENT CHANNEL FILE IS: out1 0 CHANNELS SELECTED (OUT OF A MAXIMUM OF 6)
```

is displayed. If no values are entered, the displayed CMINA and CMAXA are used. If a new CMINA or CMAXA is entered, the values are entered in the channel range tables which can be saved to a file by invoking activity RANG, section 4.3. If "R" is entered, the selection of that channel is ignored and the user is prompted to select another channel.

If channel scales have been set RANG, section 4.3, then the channel prompts appear as follows:

```
ENTER CHANNEL NUMBER (0 FOR NO MORE): 1 CHANNEL 1 [ANG1NUC-A ] MIN (CMINA) MAX
(CMAXA) ACTUAL: 60.33 339.8 SCALES: 0.0000 500.0 ENTER NEW SCALES (MIN,MAX) OR
'R' TO RE-SELECT CHANNEL):
```

Activity SLCT bases the actual and adjusted minimums and maximums on the entire time interval in the plot file. If activity TINT, section 4.4 is called previous to activity RANG, section 4.3, then the actual and adjusted minimums and maximums are chosen by the time interval from activity TINT.

When plotting two or more channels as an arithmetic expression or a function, it is recommended to execute activity POPT, section 4.2, and change the minimum and maximum calculation to actual. This change will find the actual minimum and maximum of the function.

Selecting Channels for X-Y Plots

Activity SLCT allows only one curve to be plotted on a single plot when the plotting type is "XY." The user is prompted to enter one1 to six channels to be plotted using the function currently in effect (see FUNC, section 4.11). The format of the prompt varies slightly according to the number of channels to be entered as a set.

```
ENTER "X" CHANNEL NUMBER (0 TO EXIT)
```

or:

```
ENTER n CHANNEL NUMBERS FOR "X" (0 TO EXIT):
```

The prompts for the minimum and maximum scales are the same as described above for time plots. Next the user is prompted for the Y channel(s):

```
ENTER "Y" CHANNEL NUMBER (0 TO EXIT):
```

or:

```
ENTER n CHANNEL NUMBERS FOR "Y" (0 TO EXIT):
```

The user is then prompted for the Y channel scales as described above.

If a relay data file had been previously read via activity RELY, section 4.17, the user is then prompted to

```
ENTER RELAY ID (0 FOR NONE):
```

If a valid 16-character relay identifier is entered, a message denoting the type of relay selected is displayed and activity SLCT terminates. If the identifier does not match any that were read by activity RELY, section 4.17, the above prompt is repeated.

Selecting Channels for Line Printer Plots

The dialog for selecting channels for line printer plots is the same as described above for time plots except functions are not allowed.

Selecting Channels for R - RDOT Plots

Activity SLCT allows only one curve to be plotted on a single plot when the plotting type is "RD." Channel functions are ignored for "RD" plots. Activity SLCT first requests:

```
ENTER CHANNEL NUMBER (0 FOR NO MORE):
```

The prompts for the minimum and maximum are the same as for time plots. Next, the user is prompted for the scales of the TIME DERIVATIVE of channel n:

```
TIME DERIVATIVE CHNL #n: CMIN = 0.0 CMAX = 0.0 ENTER CMIN, CMAX (OR "R" TO
RE-SELECT CHANNEL):
```

If actual and minimum and maximum calculation has been specified (see Section 4.2.2, Operation of Activity POPT), then the actual CMIN and CMAX values are displayed. Otherwise, both CMIN and CMAX are set to zero and the user must enter a valid minimum and maximum value.

If a relay data file had been previously read via activity RELY, section 4.17, the user is then prompted to:

```
ENTER RELAY ID (0 FOR NONE):
```

If a valid 16-character relay identifier is entered, a message denoting the type of relay selected is displayed and activity SLCT terminates. If the identifier does not match any that were read by activity RELY, section 4.17, the above prompt is repeated.

Selecting Channels for FFT Plots

When the plotting type is "FFT", activity SLCT allows plots, of either the dc function (time plot), Hanning function (time plot), or the magnitude and phase of a channel, to be plotted on a single plot. Functions are ignored for "FFT" plots. Activity SLCT first requests:

```
ENTER 1 CHANNEL NUMBER (0 FOR NO MORE):
```

The user is then prompted for the scales of the dc function, Hanning function, or the magnitude and phase of the channel, depending on the options chosen in activity PTYP, section 4.9. If actual minimum and maximum calculation has been specified (see Section 4.2.2, Operation of Activity POPT), then the actual CMIN and CMAX values are displayed.

Selecting Channels for Log-Log Plots

Activity SLCT allows only one curve to be plotted on a single plot when the plotting type is LOG(X) versus LOG(Y). The user is prompted to enter one to six channels to be plotted using the function currently in effect (see Section 4.11, FUNC). The user is allowed either a user-defined function or no function. The user-defined function may not contain the functions "LOG" or "LOG10". The format of the prompt varies slightly according to the number of channels to be entered as a set.

```
ENTER "X" CHANNEL NUMBER (0 TO EXIT)
```

or:

```
ENTER n CHANNEL NUMBERS FOR "X" (0 TO EXIT)
```

The prompt for the minimum and maximum scales depends on whether or not channel ranges have been established (see Section 4.3, RANG). The user is prompted to:

```
ENTER CMIN, CMAX AS A POWER OF 10 (OR 'R' TO RE-SELECT CHANNEL):
```

If the value for CMIN or CMAX is less than or equal to 0, the question is repeated. If either value entered is not a power of 10, the value is scaled up for CMAX and down for CMIN.

The user is then prompted for the Y channel scales as described above. Relays are not allowed with this plotting type.

When LOG(TIME) versus LOG(Y) has been selected, activity SLCT allows up to six plot channel curves to be plotted on a single plot. The user is prompted to enter one to six channels to be plotted using the function currently in effect. The user is allowed either a user-defined function or no function. The user-defined function may not contain the functions "LOG" or "LOG10". The prompt for channel numbers is the same as in the section on time plots, see Section , Selecting Channels for Time Plots.

The prompt for the minimum and maximum scales depends on whether or not channel ranges have been established. The user is prompted to:

```
ENTER CMIN, CMAX AS A POWER OF 10 (OR 'R' TO RE-SELECT CHANNEL):
```

If the value for CMIN or CMAX is less than or equal to zero, the question is repeated. If either value entered is not a power of 10, the value is scaled up for CMAX and scaled down for CMIN.

Selecting Channels for Semi-Log Plots

Activity SLCT allows only one curve to be plotted on a single plot for LOG(X) versus Y plots. The user is prompted to enter the channels to be plotted using the function currently in effect. For the X channel, the user is allowed to have either a user-defined function or no function. The user-defined function may not have the functions "LOG" or "LOG10". The user is prompted to:

```
ENTER "X" CHANNEL NUMBER (0 TO EXIT): 1 CHANNEL 1 [ANG1NUC-A ] MIN (CMINL) MAX
(CMAXL) ACTUAL: 0.0000 0.0000 SCALES: 0.1000E-12 0.1000E-09 ENTER NEW SCALES
(MIN,MAX) ROUNDED TO A POWER OF 10 (OR 'R' TO RE-SELECT CHANNEL):
```

If the value for CMIN or CMAX is less than or equal to zero, the question is repeated. If either value entered is not a power of 10, the value is scaled up for CMAX and scaled down for CMIN.

The prompts for the Y channel are the same as in XY plots in Section , Selecting Channels for X-Y Plots.

Relays are not allowed with this plotting type.

For LOG(TIME) versus Y plots, activity SLCT allows up to six plot channel curves to be plotted on a single plot. The user is prompted to enter one to six channels based on the function currently in effect. The prompt for channel numbers is the same as for TIME plots, Section , Selecting Channels for Time Plots.

Activity SLCT allows up to six channel curves to be plotted on a single plot when plotting TIME versus LOG(Y). The user is prompted to enter one to six channels to be plotted using the function currently in effect (see

Section 4.12 SLCT). The user is allowed to have either a user-defined function or no function. The user defined function may not contain the functions "LOG" or "LOG10". The prompt for channel numbers is the same as in the section on time plots, 4.12.1.1. The prompt for the minimum and maximum scales depends on whether or not channel ranges have been established. The user is prompted to:

```
ENTER CHANNEL NUMBER (0 FOR NO MORE): 1 CHANNEL 1 [ANG1NUC-A ] MIN (CMINL)
MAX (CMAXL) ACTUAL: 60.33 196.4 SCALES: 10.00 1000. ENTER NEW SCALES (MIN,MAX)
ROUNDED TO A POWER OF 10 (OR 'R' TO RE-SELECT CHANNEL):
```

If the value for CMIN or CMAX is less than or equal to zero, the question is repeated. If either value is not a power of 10, then the value is scaled up for CMAX and scaled down for CMIN.

Selecting Channels for XM Plots

Activity SLCT allows up to six plot channel curves to be plotted versus a single channel curve when the plotting type is "XM". The user is prompted to enter from one to six channels to be plotted using the function currently in effect (see Section 4.11, FUNC). The format of the prompt varies slightly according to the number of channels to be entered as a set. The user is first prompted for the X channel:

```
ENTER "X" CHANNEL NUMBER (0 TO EXIT):
```

or:

```
ENTER n CHANNEL NUMBERS FOR "X" (0 TO EXIT):
```

The prompt for the minimum and maximum scales are the same as described for time plots. Next the user is prompted for the channels for one to six y-axis curves. The number of channels required for each curve depends on the function currently in effect:

```
ENTER "Y" CHANNEL NUMBER (0 TO EXIT):
```

or:

```
ENTER n CHANNEL NUMBERS FOR "Y" (0 TO EXIT):
```

The user is then prompted for the scales. This plotting type is similar to the time plots because the user can choose a function with activity FUNC, section 4.11and then choose the X channel number. The user can continue to choose a different function for each succeeding Y channel curve. Once the X channel numbers are chosen (with or without a function), they will be used for all Y channel curves.

Changing Channel Scales

When activity SLCT is invoked with the suffix "CHANGE", a list of selected channels is displayed and the user is prompted for one for which the scales are to be modified. For example:

```
SELECTED PLOTS ARE... CHNL# 1: [ANG1NUC-A] CMIN = 10.00 CMAX = 1000. CHNL# 3:
[ANG1URBGEN] CMIN = 10.00 CMAX = 1000. CHNL# 4: [ANG1MINE] CMIN = 0.0000 CMAX
= 250.0 ENTER PLOT NUMBER 1 THRU 3 (0 FOR NO MORE):
```

The above dialog is repeated until zero is entered for the plot number.

Activity SLCT is not sensitive to any interrupt control code options.

4.13. PLOT

The plotting activity, PLOT, generates the plots defined by invoking previous activities such as SLCT, section 4.12 and PTYP, section 4.9.

For modal analysis plots, refer to Section 4.13.3, Modal Analysis Plotting. Note that modal analysis is only available in nonintegrated mode.

For "FFT" plots, the user is requested to enter a plotting frequency range:

```
CURRENT VALUE FOR FSTART = 0.0, FSTOP = 10.0 ENTER STARTING FREQUENCY, ENDING
FREQUENCY:
```

If a new FSTART and FSTOP are entered, this frequency range will be plotted. If a carriage return is entered, the frequency range is unchanged.

For log and semi-log plots, the axes representing a log scale have tic marks drawn on the plot representing logarithmic values. If at any time during the plotting of a channel, the channel function value is less than or equal to 0, the program warns the user:

```
WARNING: NEGATIVE NUMBERS ENCOUNTERED
```

The plot will continue. If the channel function value is less than or equal to 0 on the X-axis, the value to plot is set equal to 0. If the channel function value is less than or equal to 0 on the Y-axis, the value to plot is set equal to the maximum Y value.

For LOG(TIME) versus LOG(Y) plots and TIME versus LOG(Y) plots, the number of decades on the y-axis for all plots is taken from the plot with the largest number of decades. If a channel curve has a smaller number of decades, the minimum and maximum plotting range are scaled. For example, if three curves are to be plotted with the following minimum and maximum values:

Curve	1	2	3
Min	1	1	.01
Max	10	10000	10
Decades	1	4	3

The curves will be scaled so they all have four decades. The process is to first decrease the minimum by a factor of 10 and if necessary, increase the maximum by a factor of 10, and so on:

Curve	1	2	3
Min	.01	1	.001
Max	100	10000	10

The rest of the operation of activity PLOT is dependent upon whether or not the activity is invoked with the suffix "IN".

4.13.1. Noninteractive Plotting

When activity PLOT is invoked without the suffix "IN", a noninteractive graphics mode is initiated. This mode allows users to send plots directly to hard copy graphic devices or to preview them on the CRT screen before committing them to hard copy.

Activity PLOT requests the user to enter a 25-character plotting label:

```
ENTER 25 CHARACTER LABEL: ************************* :
```

The label is included on the side of the plot in bold lines if the plot is directed to a monochrome device or in color if the plot is directed to a color device.

If a plotting device has not already been specified, or if a device was not specified during installation, activity PLOT then presents a tabulation of valid plotting devices and prompts the user to select one.

After a valid plotting device is selected, the plot is drawn. When the plot is directed to a hard copy device such as a Versatec or a Calcomp, activity PLOT terminates when the plot is completed. If the plot is directed to a graphic CRT, however, activity PLOT pauses when the drawing is completed to allow the user to view it. Entering a space and a carriage return will cause the plot to be erased. If the REPLOT flag is on (POPT, section 4.2), the following prompt is issued:

```
ENTER: 0 = RETURN 3 = REPEAT PLOT ON NEW DEVICE:
```

If option three is selected, the tabulation of valid plotting devices is displayed and the user is prompted to select one. The previous plot will be redrawn to the selected device.

Activity PLOT is sensitive to the following interrupt control code when in noninteractive graphics mode:

```
S AB
```

This code will terminate the plot on only graphic CRTs.

4.13.2. Interactive Plotting

When invoked with the suffix "IN", activity PLOT enters an interactive mode that allows customization of plots before they are committed to hard copy. If an interactive graphic device has not already been selected, the user is requested to select an appropriate device. The choice for graphic devices is limited to three devices that support interactive graphics (i.e., CRT screens). In this mode, the display is separated into four areas:

- The lower left portion of the display is the "display area" and contains the plot; it uses about 90% of the total display area.
- The top left portion of the display contains a three-line scrolling "dialog area" for instructions from the program, user responses, and error messages. At the right side of the dialog area is a pair of arrows. By selecting the "up arrow" or "down arrow", the user may scroll through the dialog area to review previously displayed lines. The last 24 lines are kept in a dialog buffer.
- The top right portion is an "information area" displaying the upper right ("U.R.") and lower left ("L.L.") coordinates of the plotting page. Also displayed in this area is the current "action mode" (see below).

- The right side of the display is the "menu area" containing a menu of commands.

The following paragraphs describe the command menu and the use of each command. A command is selected either by moving the graphics cursor to the appropriate command box in the menu area and striking the space bar on the keyboard or depressing a button on the "mouse," or simply by typing the single character abbreviation code associated with each command; in either case, a carriage return should not be entered. Then the parameters required for the corresponding command are specified, either through positioning the cursor at the desired location in the diagram display area and striking the space bar or a "mouse" button, or by entering the appropriate response in the dialog area followed by a carriage return. On any invalid entries or other error conditions, an error message is printed in the dialog area.

Selecting a new command "cancels" the current command and starts the processing of the new command. Commands may be selected at any time *except* when activity PLOT has positioned the graphics cursor to the dialog area and is expecting a keyboard response.

The following commands and their single-character abbreviation codes are contained in the command menu:

CANCL (X)

Cancel the current command.

RFRSH (R)

Redraw the current display. On some graphic CRTs, the display area may contain overwritten areas following data change operations.

COPY (C)

Copy the "display area" to any of the graphics devices supported by PSSPLT on the system.

ACTON (A)

Changes the "action mode" for manipulating components. Actions are:

"ADD" Add new components to the plot.

"DELETE" Delete components from the plot.

"MOVE" Move components on the plot.

LABEL (L)

Allows entering a new 25-character plot label on the plot. The label will be placed at the lower right corner of the "display area". To change an existing label, simply reenter it.

NOTE (N)

Allows notes to be manipulated on the current plot. The user is presented with instructions appropriate for the current "action mode." The instructions are repeated until a new menu command is selected. Up to 50 lines of notes can be entered on the plot.

When the action mode is ADD, the user is requested to select the location for the note. Requests for text are then issued until a blank line is entered. All the text entered in this cycle is treated as a single entity or "block." The user is then requested to select a location for the next note.

POINT (P)

Allows pointers to be manipulated on the plot. The user is presented with instructions appropriate for the current "action mode". The instructions are repeated until a new menu command is selected. Up to 50 lines of notes can be entered on the plot.

Each pointer consists of three points with the first being the location of an arrowhead. Once a pointer has been entered, the user is requested to define the next pointer.

Also, if time-based plots (PTYP,TI) are to be plotted, the following additional commands exist:

FNDTIM (F)

Display the data value that is a specified y-axis percentage ("%") distance between two points on a curve. If this command is selected, the following prompt appears:

```
POINT AND CLICK CURVE STARTING POINT
```

In response, the user moves the cursor or mouse to the desired point and depresses the space bar or clicks the mouse button. If the selected point is not on a unique curve, then the following message appears:

```
SELECTED POINT DOES NOT LIE ON A UNIQUE CURVE. PLEASE SELECT THE DESIRED CURVE
```

The user should then point the cursor or mouse at the desired curve (or curve identifier located to the right of the plot area) and depress the space bar or click the mouse button for selection.

If the selected point does not lie on a curve, then the following message appears:

```
SELECTED POINT DOES NOT LIE ON A CURVE PLEASE TRY AGAIN
```

If the selected point lies outside of the plotting area, then the following message appears:

```
POINT IS NOT IN PLOTTING AREA PLEASE TRY AGAIN
```

Once a valid starting point has been selected (a vertical line is used to mark this point), the user is asked to select the curve ending point by responding to the following prompt:

```
POINT AND CLICK ENDING POINT
```

The user responds in a manner similar to the starting point selection. When a valid ending point is selected (a vertical line marks the ending point), the user is asked to specify the desired y-axis distance (%) between the two points to locate the desired target (viewing) point. This distance is the specified distance from the starting point.

```
ENTER THE DESIRED TARGET POINT LOCATION AS A % OF THE DISTANCE BETWEEN THE
TWO POINTS.
```

After the percent distance is entered, the target point coordinates are displayed in the dialog area.

During the dialog session, except when entering the distance%, the user may select the cancel command (X-CANCL) to terminate the command and return to the command menu.

VALUE (V)

This command displays the plot data coordinates for a selected point on a curve. A point is selected in a manner similar to the command FNDTIM. Once selected, the desired target point coordinates are displayed.

This command continues to prompt and display point coordinates until command DONE (D) is selected.

SCALE (S)

This command allows a plot curve to be redrawn with new minimum, maximum scale values. The user is asked to select the curve or curves to be rescaled by responding to the following prompt:

```
POINT AND CLICK A CURVE OR SELECT DONE
```

In response to this prompt, the user moves the cursor to the desired plot curve or curve identifier and depresses the space bar or clicks the mouse button. If the point of selection does not lie on a unique curve, then the following message appears:

```
SELECTED POINT IS NOT ON A CURVE OR NOT ON A UNIQUE CURVE
```

The prompt reappears. The user may select multiple curves to be rescaled to the same minimum, maximum scale values by continuing to select curves (selected curves are highlighted) until command DONE (D) is selected.

After command DONE (D) has been selected or all curves have been selected, the user is asked to specify the new minimum, maximum channel values by responding to the following prompt:

```
ENTER THE NEW CHANNEL MIN & MAX VALUES :
```

The user responds by entering the new minimum scale value, followed by a space or a comma, and the new maximum value. A blank response for any value causes the existing values to be used. These values are listed at the top and bottom of each channel identifier.

Except when entering the new scale values, the user may select the cancel (X-CANCL) command to terminate the rescaling command.

MASK (M)

This command removes a section or sections of a curve or curves from the plot display.

The user is asked to select the curve(s) to be masked by responding to the following prompt:

```
POINT AND CLICK A CURVE OR SELECT DONE
```

The user selects a curve similar to the SCALE (S) command.

The user continues to select curves (selected curves are highlighted) until command DONE (D) is selected or all curves have been selected. The user is then asked to select a pair of time coordinates, which define each masking interval by responding to the following prompts:

```
POINT AND CLICK THE INTERVAL STARTING POINT. POINT AND CLICK THE ENDING POINT.
```

In response to each prompt the user may click any point in the plotting area associated with the desired starting or ending time coordinate. (Note that the masking interval ending point must be greater than the masking interval starting point.)

The user may continue selecting masking intervals until command DONE (D) is selected or a maximum of 20 intervals has been entered.

4.13.3. Modal Analysis Plotting

Introduction

The modal analysis section in PSSPLT serves as an aide in the interpretation of dynamic simulation results; particularly in analyses of cases with poor damping. It is common practice in such cases to let simulations run for an extended period of time (10 to 30 seconds), allowing well-damped modes to die out and the system to regain linearity. The remaining lightly damped modes are then characterized in terms of frequency and damping (i.e., their eigenvalues). Oscillation nodes and antinodes are determined by comparing the relative oscillation amplitudes and phases of representative units in the system. Similar analyses on bus voltages render the oscillations' electrical centers. These investigations provide the mode shape associated with each oscillation; or, in linear analysis terminology, the eigenvector associated with each eigenvalue.

Eigenvalue and eigenvector information is valuable in assessing both the severity of the damping problems and the best approach to their solution. Solutions to dynamic instabilities include application of Power System Stabilizers (PSS), application of FACTS devices, and network reinforcements. Comparison of damping performances before and after application of a particular remedial action, or between alternative remedial actions (e.g., PSSs at alternative locations) guides the engineer towards the most cost-effective solution.

The manual techniques of identifying eigenvalues have been automated in this modal analysis section of PSSPLT. When invoked, the program will take any channel (or function of one or more channels) and will decompose the signal into its dominant modes of oscillation. Information is given in terms of complex eigenvalues and associated eigenvector components.

Real and imaginary parts of eigenvalues are proportional to the modes' damping and frequencies, respectively. Comparison of eigenvector components obtained from different locations in the system, but sharing the same modal components allows reconstruction of their associated mode shapes.

Two alternative methods of modal decomposition are included. One makes use of Prony's method and is best suited for cases where linearity has been restored. The other method is based on recursive least-square approximations and is better suited for evaluation of nonlinear simulation results.

Methodology

The main idea behind modal decomposition is that any linear system response can be decomposed into a summation of terms like the following:

$$\text{Output} = \sum\left(A_i \times e^{\sigma_i \times t}\right) + \sum\left(B_j \times e^{\sigma_j \times t} \times \cos(w_j \times t + \phi_j)\right)$$

That is, a summation of exponential and damped (or undamped) sinusoidal terms. Each exponential component is associated with one real eigenvalue σ i. Similarly, each sinusoidal term is associated with two complex

conjugate eigenvalues, of real and imaginary σ j and +/-wj parts, respectively. Participation and phase of each term is dictated by its respective Ai, or Bj and ϕ j coefficient. The larger a particular Ai or Bj coefficient is relative to those of other modes, the more dominant is the particular mode. The less negative (or more positive) the associated σ i or σ j exponent is, the longer the mode will "linger" relative to other better damped modes. The order of the system is defined as the sum of the number of eigenvalues, real and complex, which describe its response.

Linear systems theory indicates that there are as many roots or eigenvalues as there are states in the dynamic model. For large dynamic models, this would result in tens of thousands of terms in (4.1). However, the theory also says that due to pole-zero cancellations, only a few of those roots are excited by a particular disturbance, and even fewer are observable on any particular output signal. In other words, for the majority of modes, Ai or Bj are either zero or negligible. Further, of the remaining modes, most are well damped and "die out" quickly.

As a consequence, it is common to observe that well into a simulation, only a few modes subsist, showing either a single lightly damped oscillation (two complex conjugate modes), or, in some instances, two or more oscillation modes (normally indicated by the presence of beating).

It is those few remaining modes that these analysis techniques are intended to capture. It is their associated Ai and σ i, or Bj, σ j, wj and ϕ j factors that the techniques will produce. Two alternative algorithms are offered in the program; one employing Prony analysis techniques; the other utilizing least-squares approximations.

Prony techniques have been described in a number of technical publications [1] . They are characterized by providing an exact model (barring numerical imprecisions) of the simulation results under consideration. This precision, however, can prove to be a hindrance when analyzing nonlinear cases. Consider, for example, a case with a single lightly damped oscillation mode whose frequency changes slightly within the time window of interest. Because it is designed to exactly fit the simulation results with a linear model, Prony techniques will go to great lengths to derive modes of similar frequencies, some of which dominating the initial part of the time window, while others dominating the later parts of the window. The results in such cases can be quite confusing and may require significant judgement in their interpretation.

For cases where Prony analysis fails to render the expected results, least squares techniques are an attractive alternative. Under the least square mode of operation, the analyst would typically select a relatively low model order n to describe the system. The algorithm would then "initialize" by exactly fitting the first 2n points in the selected time window. Following initialization, it analyzes the remaining data by recursively adjusting the initial model so as to render an n^{th} order least-square approximation of the time window of interest. Execution time can be significantly larger than for the Prony techniques, particularly when high-order models are required and/or when a large number of time steps are selected.

Two options are given under least squares analyses. In one option, only eigenvalues are determined with least squares, while eigenvectors are calculated by Prony analysis to fit the initial 2n points. This option is the fastest of the two and will render more exact eigenvector calculations at initial time. Under the second least-squares option, both eigenvalues and eigenvectors are calculated with least squares. This option is more time consuming but will render a better fit throughout the time window of interest.

Whatever technique is employed, two indices and graphical techniques are provided to assess the model's adequacy. The two indices are:

- *Percent Error*. Calculated as the ratio (multiplied by 100), throughout the time window, of the summation of absolute values of differences between model and actual data divided by the summation of absolute

[1] "Initial Results in Prony Analysis of Power System Response Signals", J.F. Hauer, C.J. Demeure, and L.L. Scharf, IEEE Transactions on Power Systems, February 1990, Vol. 5, No. 1, pp. 80-89.

values of differences between actual data and the first actual data point. In other words, it is the absolute value of error, in percentage of the average deviation relative to the first data point.

- *Signal/Noise Ratio*. The square of differences between actual data and first data point (signal) and between model and actual data (noise) are summated throughout the time window. The square root of their ratio is calculated and expressed in decibels (20 times the decimal logarithm).

In addition to these indices, the user can graphically compare actual with model data. Model data can be expressed as an aggregate of all components or as any combination of individual components.

Operation

Modal analysis techniques are enabled by selecting PTYP,MA. In this mode, only one selection under SLCT is allowed. Activity FUNC, section 4.11 is fully supported. The algorithms are invoked by selecting activity PLOT.

Following selection of an output device, PLOT will prompt the user for a time interval for the analyses. As mentioned above, it is recommended that the user select an interval well into the simulation, thus eliminating well-damped modes and minimizing nonlinearities. Optionally, the time interval can be chosen graphically by pointing at initial and final times on the curve with the cursor. The time interval should encompass at least one or two complete periods of the dominant mode(s) of interest.

The time interval will either be accepted or rejected by the program. Reasons for rejection include a "straight-line" output and an unequal time separation between points in the channel file. The techniques are based on the assumption of equal separation between time values. Thus, when preparing a simulation, the user must be careful about invoking activities RUN or MRUN within the time window of interest. The same goes for HVdc line mode switching and relay actions. All of these actions have the potential for altering the time spacing between data values, unless data is written to the channel file at every time step.

If the time interval is accepted, the program will indicate the total number of data points within that interval and the time step in seconds. Both numbers need to be examined by the user:

- Prony techniques allow a maximum of 100 (50th order, half the number of points) points to be investigated. The least square methods will analyze any number of points, but execution times may prove unacceptable beyond 100 points.

- To prevent aliasing, the time step must be such that its inverse is larger than four times the maximum frequency of interest (i.e., a sampling rate of at least four times per period). For example, a 0.1-sec time step would be acceptable for analysis of oscillation modes of up to 2.5 Hz.

- For "noisy" signals (i.e., those directly affected by the load flow solution, such as bus voltages and line flows), the least square methods work best with larger time steps. Larger time steps will render a larger initialization window, thus preventing noise from excessively biasing the initial "nth" order estimate (see Section , Methodology).

If the number of points is excessive and the time step is small, the user is given the opportunity to change one at the expense of the other. The user is prompted for an NPLT factor, conceptually identical to the NPLT factor in activity RUN. If, for example, the user chooses an NPLT factor of 2, only every other data point is to be investigated by the algorithms.

It is important to recognize, however, that independently of the NPLT factor selected, the above-described percent error and signal/noise factors, as well as all graphical output, are determined on the basis of the original total number of points.

Having selected NPLT, the user is prompted to choose between Prony and least-squares techniques and between full least-squares calculation or eigenvalue least squares calculation only. Next the user is prompted for a "range" of orders to be examined. Reasons to examine a range as opposed to a particular model order are:

- In the case of Prony techniques, the algorithms may become numerically ill-conditioned and render erroneous solutions at one or more model orders. It is recommended that five or more orders be examined. For example, if the maximum order is 35 (total of 70 points), it is suggested that the range of 30 to 35 be investigated.

- In the case of least-square techniques, it is sometimes difficult to estimate beforehand what the necessary order will be. A minimum range of three is recommended to model a single undamped oscillation mode (two orders for the oscillation, one order for its average). A range of 3 to 10, however, may indicate the best order for the particular signal.

Once a range is selected, the program will sequentially explore the orders one at a time, displaying their respective percentage error and signal/noise ratios. Errors of 10% or less and signal/noise ratios of 20 or more will normally render acceptable approximations. Based on this information, the user may either select a new range or proceed to calculation of a specific model order. By default, the program will select the model order that results in the lowest percentage error.

Upon selection of a specific model order, the following information is displayed on the terminal and on the output device:

- File name and titles

- Channel identifier

- Time interval

- Component number. Real and imaginary part of eigenvalue in sec-1 and rad/sec, respectively. These correspond to si, sj, and wj in ((4.1)). Magnitude and angle (°) of associated eigenvector component. These correspond to Ai, Bj, and fj in ((4.1)). Frequency in Hz or equivalent time constant in seconds if a complex eigenvalue or negative real eigenvalue, respectively.

- Percent error and signal/noise ratio

- Calculation method and model order

The attentive user will realize that if the number of listed eigenvalues are added (making sure to count complex eigenvalues twice) the result may fall short of the model order. This is because, in addition to actual modes, the algorithms generate numerical modes similar to those encountered in numerically unstable cases (i.e., with alternate signs on each time step). For the purpose of these analyses, these modes are irrelevant and are therefore not listed.

Finally, the user is given the option to plot the calculation results; i.e., the results of equation ((4.1)) as a function of time. In all cases the original curve is plotted. The user is given the option to plot all components, or combinations of selected components.

Application Guidelines

As explained above, these techniques work best for lightly damped simulation results once linearity is regained. A typical analysis of such cases would proceed as follows:

- Include in channel output files rotor angles of representative units throughout the system. For small isolated systems include rotor speeds. Rotor angles integrate speed changes and thus are bound to appear as ramps in simulation results, thus making it difficult to see any imbedded oscillations. Speeds, on the other hand, are less sensitive to minor disturbances. For very small systems with large frequency excursions either relative angles or the derivative of rotor speeds may prove best for these analyses.

- Also include voltage magnitudes of buses where you suspect electrical centers to occur.

- Perform the modal analysis of one or more representative channels, attaining a "feel" for the order ranges required as well as the optimum calculation method.

- Recognizing that these calculation techniques may become time consuming, it is best to take advantage of PSS®E's capabilities for response file operation. Their application relieves the user from the tedious task of scanning all channels of interest. Activities OPEN, section 5.11 and CLOS, section 5.12 can be used to concentrate all analysis results in a single output file.

- Once modal analyses have been performed on all channels of interest, the user can identify dominant modes of oscillation throughout the system. By comparing eigenvector components associated with identical (or similar) eigenvalues on different channels, the user can also reconstruct the mode shape associated with a particular eigenvalue.

Application Example

A 6-cycle (100-msec.) three-phase fault was simulated at time 0.1 sec on bus 152 of PSS®E's SAVNW 20-bus example (see Figure 4-1). The fault was assumed cleared by opening ties 3004-152 and 3006-153. Figure 4-2 shows rotor speeds for the 5- to 8-sec time interval. Mere observation of the plot suggests a well-damped oscillation of approximately 1-Hz frequency. The MINE, CATDOG, and URBGEN units are oscillating against the NUC-A and NUC-B units. The HYDRO unit, located in the vicinity of the electrical center, is indifferent to the oscillation. It is worth noticing that out of the five possible electromechanical oscillation modes (number of units minus one); only one dominant mode remains 5 sec into the simulation. This "automatic filtering" by the system of irrelevant eigenvalues is the main justification for these modal analysis techniques.

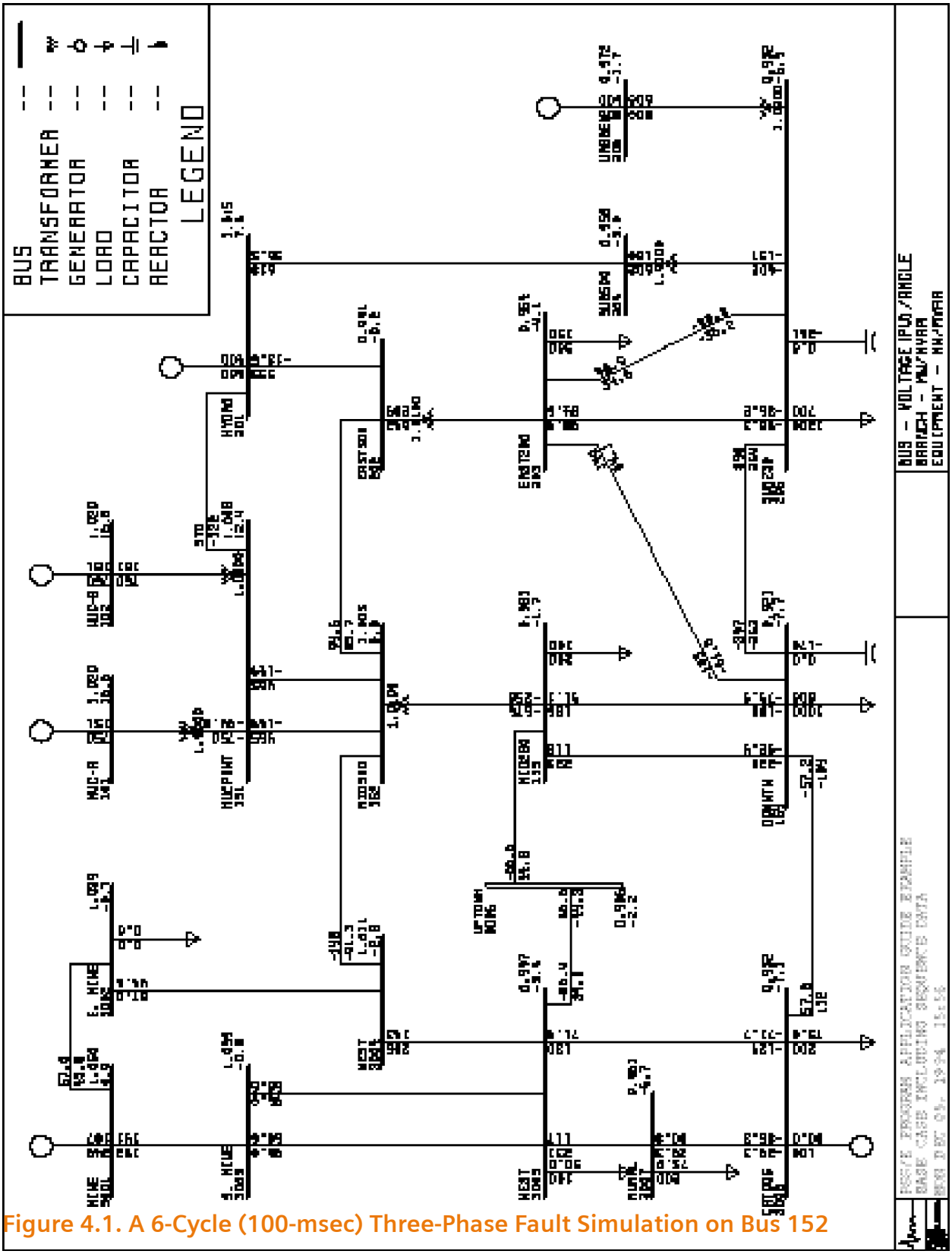


Figure 4.1. A 6-Cycle (100-msec) Three-Phase Fault Simulation on Bus 152

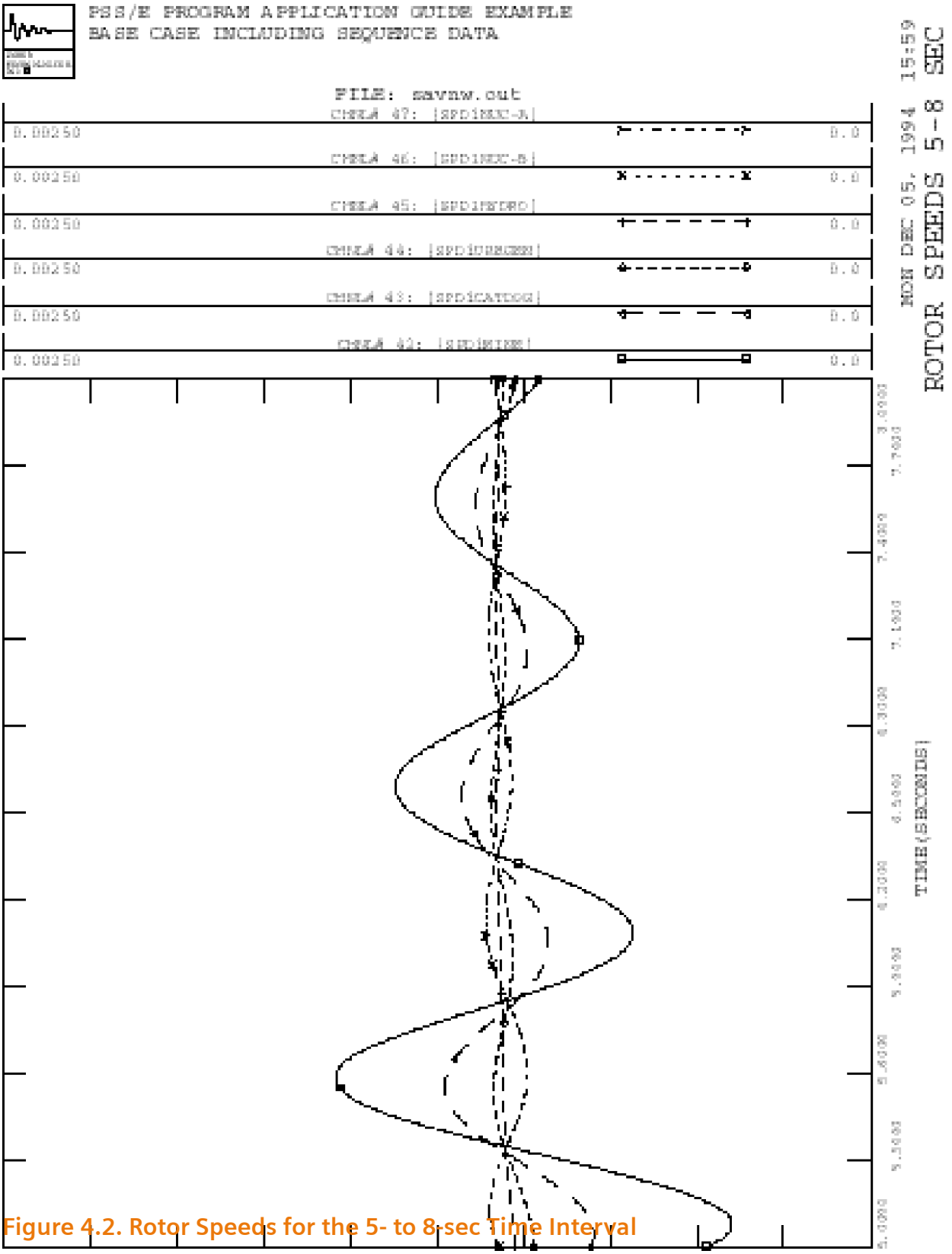


Figure 4.2. Rotor Speeds for the 5- to 8-sec Time Interval

Modal analysis results for the Figure 4-2 traces are summarized in Figure 4-3. In all cases the method of calculation was least squares for both eigenvalues and eigenvectors.With a default time step of 8.33 msec, an NPLT factor of 2 (together with an NPLT of 3 selected at RUN time) reduced the number of data points to 60, while maintaining an acceptable time step of 0.05 sec.

The results in Figure 4-3 show that all traces can be decomposed into three dominant modes:

- An overdamped, nonoscillatory large time constant mode, representing the long-term trend of system frequencies.
- An overdamped, nonoscillatory but small time constant mode, the result of short-term governor effects on frequencies.
- An oscillatory mode of approximately 1 Hz frequency and 0.08 damping ratio. Damping ratio is calculated as follows:

$$\zeta = \frac{-\sigma}{\sqrt{\sigma^2 + \omega^2}} = \frac{0.49}{\sqrt{0.49^2 + 6.24^2}} \approx 0.08$$

where σ and ω are the real and imaginary parts of the eigenvalue, respectively.

These three modes, as well as a negligible 2-Hz mode, are depicted in Figure 4-4 for the MINE speed trace. Figure 4-4 indicates an excellent match throughout the time window of interest.

Finally, taking all eigenvector components for the 1-Hz mode, and normalizing them based on the MINE component, the eigenvector is reconstructed as follows:

Table 4.2.

Bus #	Name	Magnitude	Angle (°)
3001	MINE	1.	0.
3008	CATDOG	0.356	11.7
206	URBGEN	0.077	25.0
201	HYDRO	0.008	71.0
102	NUC-B	0.123	168.6
101	NUC-A	0.123	168.6

Eigenvector magnitudes and angles confirm the previous observation that the oscillation antinodes are the coherently moving NUC-A and NUC-B units, and the nearly coherently moving MINE, CATDOG, and URBGEN units. The indifference of the HYDRO unit to this mode is confirmed by the very small magnitude of the eigenvector for this unit. Were the analyst intending to improve this mode's damping, application of Power System Stabilizers would follow the following criteria:

- Large units.

- Units that oscillate most (i.e.; large eigenvector magnitudes).
- Units with medium to fast responding excitation systems.

Based on these guidelines, the MINE unit would be the first candidate for PSS application.

```
CHANNEL: CHNL# 42: [SPD1MINE]
MODAL COMPONENTS
-------------------------------------------------------------------------------
COMP. EIGENVALUE EIGENVECTOR
NO REAL IMAGINARY MAGNITUDE ANGLE REMARKS
-------------------------------------------------------------------------------
1 -0.792672E-02 -- 0.11000E-02 -- TCNST: 126.156 SC.
2 -0.492880 6.24342 0.65502E-03 147.01 FREQ.: 0.994 HZ.
3 -1.03313 -- -0.78939E-04 -- TCNST: 0.968 SC.
4 -1.22924 12.9226 0.60447E-06 -130.82 FREQ.: 2.057 HZ.
CHANNEL: CHNL# 43: [SPD1CATDOG]
MODAL COMPONENTS
-------------------------------------------------------------------------------
COMP. EIGENVALUE EIGENVECTOR
NO REAL IMAGINARY MAGNITUDE ANGLE REMARKS
-------------------------------------------------------------------------------
1 -0.966984E-02 -- 0.11076E-02 -- TCNST: 103.414 SC.
2 -0.496387 6.24690 0.23327E-03 158.68 FREQ.: 0.994 HZ.
3 -0.946170 -- -0.90316E-04 -- TCNST: 1.057 SC.
4 -1.15252 11.9980 0.46684E-05 2.53 FREQ.: 1.910 HZ.
CHANNEL: CHNL# 44: [SPD1URBGEN]
MODAL COMPONENTS
-------------------------------------------------------------------------------
COMP. EIGENVALUE EIGENVECTOR
NO REAL IMAGINARY MAGNITUDE ANGLE REMARKS
-------------------------------------------------------------------------------
1 -0.754901E-02 -- 0.10985E-02 -- TCNST: 132.468 SC.
2 -1.00916 -- -0.82052E-04 -- TCNST: 0.991 SC.
3 -0.508107 6.24576 0.50116E-04 171.96 FREQ.: 0.994 HZ.
4 -1.29683 12.7294 0.22342E-05 6.04 FREQ.: 2.026 HZ.
CHANNEL: CHNL# 45: [SPD1HYDRO]
MODAL COMPONENTS
-------------------------------------------------------------------------------
COMP. EIGENVALUE EIGENVECTOR
NO REAL IMAGINARY MAGNITUDE ANGLE REMARKS
-------------------------------------------------------------------------------
1 -0.109172E-01 -- 0.11127E-02 -- TCNST: 91.599 SC.
```

```
2 -0.948404 -- -0.86176E-04 -- TCNST: 1.054 SC.
3 -0.747322 6.33780 0.48814E-05 -141.96 FREQ.: 1.009 HZ.
4 -0.766605 12.6965 0.56031E-06 2.98 FREQ.: 2.021 HZ.

CHANNEL: CHNL# 46: [SPD1NUC-B]
MODAL COMPONENTS
--------------------------------------------------------------------------------
COMP. EIGENVALUE EIGENVECTOR
NO REAL IMAGINARY MAGNITUDE ANGLE REMARKS
--------------------------------------------------------------------------------
1 -0.938325E-02 -- 0.11061E-02 -- TCNST: 106.573 SC.
2 -0.945401 -- -0.94323E-04 -- TCNST: 1.058 SC.
3 -0.488012 6.24054 0.80207E-04 -44.39 FREQ.: 0.993 HZ.
4 -1.04639 12.4923 0.77609E-06 39.69 FREQ.: 1.988 HZ.

CHANNEL: CHNL# 47: [SPD1NUC-A]
MODAL COMPONENTS
--------------------------------------------------------------------------------
COMP. EIGENVALUE EIGENVECTOR
NO REAL IMAGINARY MAGNITUDE ANGLE REMARKS
--------------------------------------------------------------------------------
1 -0.938325E-02 -- 0.11061E-02 -- TCNST: 106.573 SC.
2 -0.945401 -- -0.94323E-04 -- TCNST: 1.058 SC.
3 -0.488012 6.24054 0.80207E-04 -44.39 FREQ.: 0.993 HZ.
4 -1.04639 12.4923 0.77609E-06 39.69 FREQ.: 1.988 HZ.
```

Modal Analysis Results

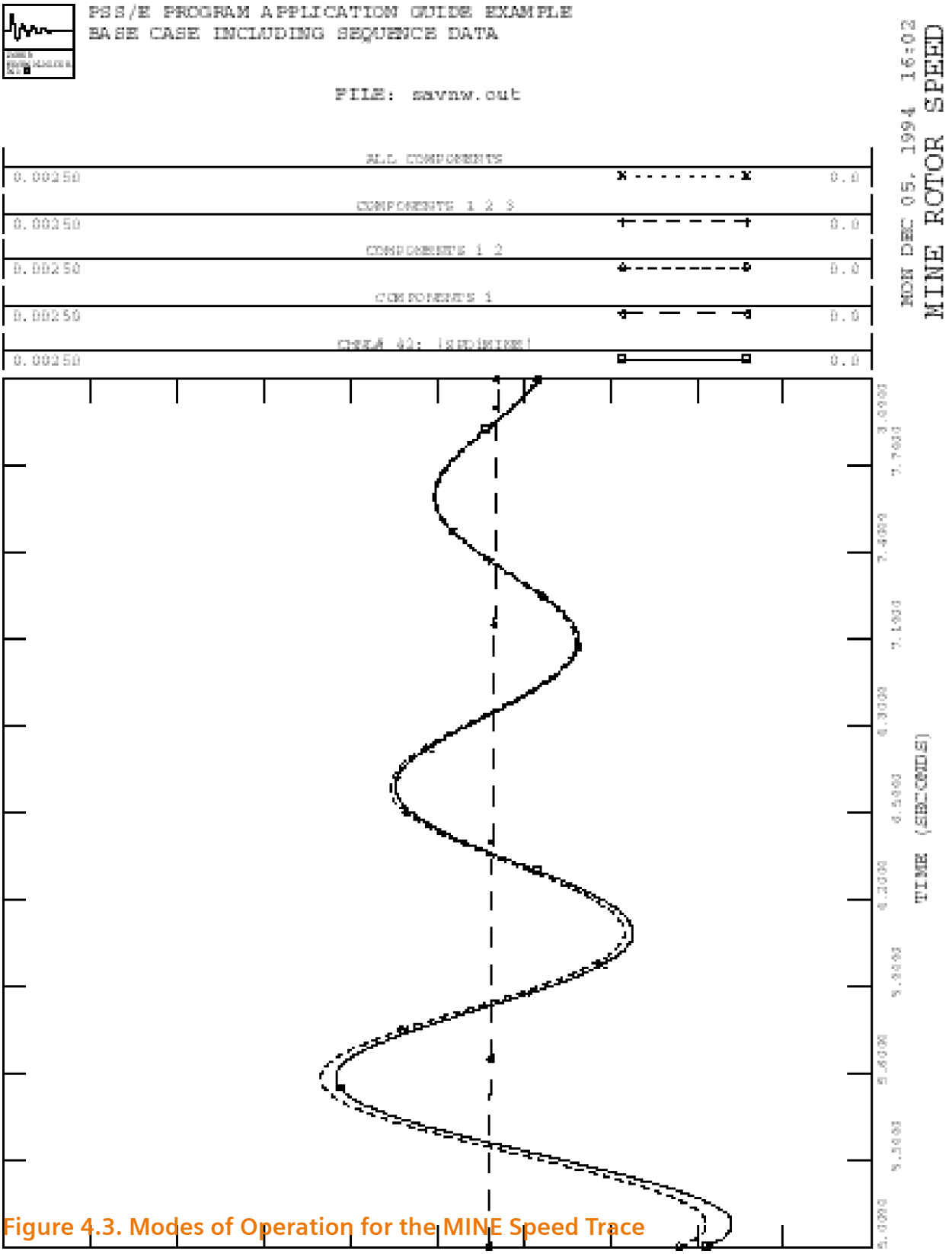


Figure 4.3. Modes of Operation for the MINE Speed Trace

Another alternative for damping improvement is application of SVCs (with or without stabilizing signals). SVCs should be applied where voltages oscillate most. Postprocessing of bus voltage traces indicates that the largest voltage oscillations (mode electrical center) occur in the vicinity of the EAST500 and MID500 buses. Thus, these locations should be tried first.

Whatever the methods for damping improvement and whatever their siting, their relative benefits to system performance can be easily assessed by comparison of the damping ratios and oscillation frequencies resulting from their application.

Whether considering a 200, 2,000 or a 20,000 case simulation, the same concepts and techniques are still applicable as long as the analyst runs the simulation long enough so that all well-damped modes have dissipated their energy and linearity is restored.

4.14. PLID

The plotting activity, PLID, generates plots based on a chosen channel range and mask. Activity PLID is valid only for time and line printer format plots. Activity PLID recognizes a user-defined function involving one channel, (e.g., 60*A or SQRT(A)). Activity PLID asks:

```
ENTER CHANNEL RANGE (0 TO EXIT):
```

After selecting a channel range, the user is requested to:

```
ENTER IDENTIFIER MASK (ENTER FOR NO MASK):
```

See activity RANG, section 4.3, or IDNT, section 4.7, for further explanation of the previous two questions.

If activity PLID has no suffix, then after the mask has been selected, the user is requested to:

```
ENTER PLOTS MIN & MAX (0=RANG CALCULATION 1=FIXED SCALE):
```

If the user chooses a setting of 0, then the minimum and maximum limits calculated in activity RANG, section 4.3 will be used. If activity RANG has not been executed by the user, activity PLID will automatically execute it.

The following prompt is displayed:

```
USE COMMON SCALE ON EACH PLOTTING PAGE (Y/N)?
```

If the response is "Y" or "YES", then the plots on each page are scaled as an entity. If the user chooses a setting of 1, then the user is requested to:

```
ENTER MIN & MAX SCALE FOR ALL PLOTS:
```

This minimum and maximum scale chosen by the user will be used for all channels plotted for all plot pages.

Activity PLID requests the user to enter a 25-character plotting label:

```
ENTER 25 CHARACTER LABEL: ************************* :
```

This label is included on the side of all the plots in bold lines if the plot is directed to a monochrome device or in color if the plot is directed to a color device.

If a plotting device has not already been specified, or if a device was not specified during installation, activity PLID then presents a tabulation of valid plotting devices and prompts the user to select one.

After a valid plotting device is selected, the plots are drawn. When the plots are directed to a hard copy device such as a Versatec or a Calcomp, activity PLID terminates when all the plots are completed. If the plots are directed to a graphic CRT, however, activity PLID pauses when a drawing is completed to allow the user to view it. When the output has been displayed to an IBM 3279 CRT, the drawing can be sent to an IBM 3287 printer by depressing the PF4 or PF16 function key. If PLID was not invoked with the suffix "IN", entering a carriage return (On the IBM 3279, use the ENTER key) will cause the plot to be erased. If the REPLOT flag is on (see POPT, section 4.2), the following prompt is issued:

```
ENTER: 0 = RETURN 3 = REPEAT PLOT ON NEW DEVICE:
```

If option 3 is selected, the tabulation of valid plotting devices is displayed and the user is prompted to select one. The previous plot will be redrawn to the selected device.

If option 0 is selected and there are more channels to be plotted to a graphic CRT, then the next plot is displayed.

If activity PLID was invoked with the suffix "IN", then the plot is restricted to an interactive graphics device and the plot is performed in the mode as described in activity PLOT (Section 4.13.2, Interactive Plotting).

This procedure continues until all channels have been plotted.

Activity PLID is sensitive to the interrupt control code

```
S AB.
```

This code will terminate the plot on only graphic CRTs and then continues with the next plot.

4.15. CLSP

The plot file closing activity, CLSP, allows the user to end a plot job and have it sent to a spooled device, such as the Versatec, without terminating PSSPLT.

The resulting dialog is device dependent but can be described by three general cases:

1. For nonspooled devices, such as pen plotters and graphic CRT's, no user-visible action is taken.

2. For spooled devices, such as the Versatec, the user is requested to enter the number of copies desired along with the queue or device name to which the plot is to be sent. When a valid entry, normally one through five, has been entered, the user is informed of the status (which may be an error condition). If the number of entries selected is zero, the plot file is saved in the user's directory and the appropriate message is displayed.

3. Some devices, such as the Calcomp pen plotters, will not generate dialog at the time the plot is closed, but may generate additional dialog the next time activity PLOT, section 4.13 or PLID, section 4.14 are invoked.

The above action is taken, in turn, for each plotting device to which plotting has been performed in the current session. An implicit call to activity CLSP is generated when activity STOP, section 5.8 is invoked.

Activity CLSP is not sensitive to any interrupt control code options.

4.16. PRNT

The channel tabulation activity, PRNT, is used to obtain a tabular listing of the values of one or more channels at each time step. The user is first asked to specify the output destination (see Section 3.5, Selecting Output Devices). After the output destination has been specified, activity PRNT responds with:

```
ENTER UP TO 5 CHANNELS TO PRINT, (-1 FOR NONE, 0 FOR ALL)
```

If minus one (-1) is entered, activity PRNT is terminated. A carriage return or zero response will cause all channels to be selected. Otherwise, up to five individual channels are selected for output.

When output from activity PRNT is directed to the user's CRT, the user is prompted for the next action to be taken after each screen full of data are displayed:

```
ENTER -1 TO EXIT, 0 FOR NEW CHANNELS:
```

or:

```
ENTER -1 TO EXIT, 0 FOR NEW CHANNELS, 1 FOR NEXT PAGE:
```

The second of the two prompts is displayed when the time step for the channels being displayed has not reached the ending time interval as defined by activity TINT, section 4.4. If -1 is selected, activity PRNT is terminated. A response of zero will cause activity PRNT to prompt for the next set of five channels or, if all channels were selected for output, to display the next set of five channels. A response of 1 to the above prompt will cause the data for subsequent time steps to be displayed for the current set of channels.

Note that activity PRNT bases the channel time interval to display on the entire time interval in plot file. If activity TINT, section 4.4 is called previous to activity RANG, section 4.3, then the channel time interval to display is based on the time interval chosen by activity TINT.

Activity PRNT is not sensitive to any interrupt control code options.

4.17. RELY

The relay characteristics input activity, RELY, picks up relay characteristics source data that can be used to superimpose relay characteristics over subsequent XY plots. A 32-character filename may be specified at the time activity RELY is invoked. For example, to select the relay file RELY.DAT, activity RELY could be selected with the activity command "RELY,RELY.DAT". If no file is specified, or if a file system error condition is encountered in opening the designated file, the user is asked to:

```
ENTER RELAY FILE NAME (-1 TO EXIT):
```

If the response is "-1", activity RELY is terminated, otherwise the file is opened for reading, and if an error occurs the above request is repeated. When done, a count of relay records read is displayed.

If a relay data file had previously been read in, the relay data file is appended to the previous data and a count of the total relay records read is displayed. When two or more relays have the same relay identifier, the last duplicate relay read is used.

The relay characteristics file consists of a series of source lines with the following fields (the data are entered in free-format):

```
IDENT,TYPE,PARM1,PARM2,...PARMn
```

where:

IDENT

Is a 16-character field that is used to identify the relay to be selected (see Section , Selecting Channels for X-Y Plots)) for display on the plot. This identifier can be of any syntax as long as there are no embedded blanks, commas, or slashes. An identifier "END" is used for end of file.

TYPE

Is a 6-character identifier for the relay type. The valid types are:

CIROS1 Double circle or lens out-of-step relay. DISTR1 Distance relay. LOEXR1 Loss of excitation relay. RELAY2 Relay checking. RELAYG Special Manitoba Hydro relay. RXR1 RXR1 Distance relay. SLNOS1 Straight line out-of-step relay. SLLP1 Tripping relay. SLYPN1 G.E. directional comparison and overcurrent relay. USER User-defined relay model.

PARM1

PARM1 through PARMn has up to 18 values, depending on the relay type. The meanings of the parameter values are described below.

- The following is a description of each of the relays that are supported by PSSPLT. The remark in parenthesis, following the parameter description, refers to the corresponding ICON, CON, or VAR on the relay data sheet (see Chapter 11, Line Relay Model Data Sheets of the *PSS®E Model Library*).

4.17.1.

CIROS1 - Double Circle or Lens Out-of-Step Relay

Parameters:

1. Relay type (ICON I+1) ABS VAL = 1 for double circle ABS VAL = 2 for lens
2. ZONE 1 diameter (CON J+1)
3. ZONE 1 center line angle in degrees (CON J+2)
4. ZONE 1 center distance (CON J+3)
5. ZONE 2 diameter (CON J+4)
6. ZONE 2 center line angle in degrees (CON J+5)
7. ZONE 2 center distance (CON J+6)
8. 1st blinder type (CON J+10)
9. 1st blinder intercept (CON J+11)
10. 1st blinder rotation in degrees (CON J+12)
11. 2nd blinder type (CON J+13)
12. 2nd blinder intercept (CON J+14)
13. 2nd blinder rotation in degrees (CON J+15)

If parameter 2 or 5 is zero, then the corresponding zone will not be drawn.

4.17.2.

DISTR1 - Distance or Loss-of-Excitation Distance Relay

Parameters:

1. Relay type (ICON I+1)
2. ZONE 1 diameter (CON J+1)
3. ZONE 1 center line angle in degrees (CON J+2)
4. ZONE 1 center distance (CON J+3)
5. ZONE 2 diameter (CON J+5)
6. ZONE 2 center line angle in degrees (CON J+6)
7. ZONE 2 center distance (CON J+7)
8. ZONE 3 diameter (CON J+9)
9. ZONE 3 center line angle in degrees (CON J+10)
10. ZONE 3 center distance (CON J+11)
11. 1st blinder type (CON J+18)

12. 1st blinder intercept (CON J+19)
13. 1st blinder rotation in degrees (CON J+20)
14. 2nd blinder type (CON J+21)
15. 2nd blinder intercept (CON J+22)
16. 2nd blinder rotation in degrees (CON J+23)
17. Direction unit angle for impedance relay (CON J+12)

If parameter 2, 5, or 8 is zero, then the corresponding zone will not be drawn.

4.17.3.

LOEXR1 - Distance or Loss-of-Excitation Distance Relay

All distances and diameters are on MBASE.

Parameters:

1. ZONE 1 diameter (CON J+1)
2. ZONE 1 center line angle in degrees (CON J+2)
3. ZONE 1 center distance (CON J+3)
4. ZONE 2 diameter (CON J+5)
5. ZONE 2 center line angle in degrees (CON J+6)
6. ZONE 2 center distance (CON J+7)
7. ZONE 3 diameter (CON J+9)
8. ZONE 3 center line angle in degrees (CON J+10)
9. ZONE 3 center distance (CON J+11)

If parameter 1, 4, or 7 is zero, then the corresponding zone will not be drawn.

4.17.4.

RELAY2 - Relay Checking Model

Parameters:

1. Branch resistance
2. Branch reactance

There are no special flags or meanings. Zone diameters are hard coded within the program.

4.17.5.

RELAYG - Special Manitoba Hydro Relay (NOT SUPPLIED WITH PSS®E!)

Parameters:

1. Relay angle in degrees (CON L)
2. Forward reach (CON L+1)
3. Reverse reach (CON L+2)
4. Inner characteristic setting in degrees (CON L+3)
5. Outer characteristic setting in degrees (CON L+4)

If parameter 4 or 5 is zero, then the corresponding characteristic will not be plotted.

4.17.6.

RXR1 - RXR1 Distance Relay

Parameters:

1. Record sequence numbers 1 through 4
2. Record sequence numbers 2 through 9 - R,X coordinates (CONs J through J+27)

The R,X coordinate pairs are entered four pairs per record with the exception of the fourth record, which contains only two pairs. For example:

```
SAMPLE,RXR1,1,R1,X1,...,R4,X4          SAMPLE,RXR1,2,R5,X5,...,R8,X8          SAMPLE
RXR1,3,R9,X9,...,R12,X12 SAMPLE,RXR1,4,R14,X14,R15,X15
```

4.17.7.

SLNOS1 - Straight Line Out-of-Step Relay

Parameters:

1. Angle of 1st pair of blinders in degrees (CON J+1)
2. X intercept of the 1st line (CON J+2)
3. X intercept of the 2nd line (CON J+3)
4. Angle of 2nd pair of blinders in degrees (CON J+4)

5. X intercept of the 3rd line (CON J+5)
6. X intercept of the 4th line (CON J+6)
7. 1st blinder type (CON J+10)
8. 1st blinder intercept (CON J+11)
9. 1st blinder rotation in degrees (CON J+12)
10. 2nd blinder type (CON J+13)
11. 2nd blinder intercept (CON J+14)
12. 2nd blinder rotation in degrees (CON J+15)

If parameters 1 or 4 are zero, then the corresponding pairs of blinders will not be drawn. If parameters 2, 3, 5, or 6 are zero, then the corresponding line will not be drawn.

4.17.8.

SLLP1 - Tripping Relay

Parameters:

1. Resistance value of upper intersection (CON J+4)
2. Reactance value of upper intersection (CON J+5)
3. Resistance value of lower intersection (CON J+6)
4. Reactance value of lower intersection (CON J+7)
5. Perpendicular distance to inner center (CON J+8)
6. Perpendicular distance to middle center (CON J+9)
7. Perpendicular distance to outer center (CON J+10)

4.17.9.

SLYPN1 - G.E. Directional Comparison and Overcurrent Relay

Parameters:

1. ZONE 1 diameter (CON J+1)
2. ZONE 1 center line angle in degrees (CON J+2)
3. ZONE 1 center distance (CON J+3)
4. ZONE 2 forward reach (CON J+5)
5. ZONE 2 reverse reach (CON J+6)

6. ZONE 2 center line angle in degrees (CON J+7)
7. ZONE 2 circle diameter (CON J+8)
8. ZONE 4 (reverse reaching) diameter (CON J+14)
9. ZONE 4 center line angle in degrees (CON J+15)
10. ZONE 4 center distance (CON J+16)

Parameters 4, 5, and 6 are used to determine zone 3.

4.17.10.

USER - User-Defined Relay Model

Any number of parameters can be used to define the relay to be drawn in terms of straight lines, circles, lenses, and peanuts (or tomatoes). Up to 18 parameters can be entered on a single card as defined below. If more than 18 parameters are needed, the model can be continued on the following card.

Parameters:

N - Relay component where:

1 =

Straight line N+3 1st lens half angle from origin N+4 2nd lens half radius N+5 2nd lens half center distance from origin N+6 2nd lens half angle from origin

6 =

Lens N+1 1st lens half radius N+2 1st lens half center X coordinate N+3 1st lens half center Y coordinate N +4 2nd lens half radius N+5 2nd lens half center X coordinate N+6 2nd lens half center Y coordinate

7 =

Peanut N+1 1st peanut half radius N+2 1st peanut half center distance from origin N+3 1st peanut half angle from origin N+4 2nd peanut half radius N+5 2nd peanut half center distance from origin N+6 2nd peanut half angle from origin

8 =

Peanut N+1 1st peanut half radius N+2 1st peanut half center X coordinate N+3 1st peanut half center Y coordinate N+4 2nd peanut half radius N+5 2nd peanut half center X coordinate N+6 2nd peanut half center Y coordinate

99 =

Continue on next relay record

All angles are in degrees, counterclockwise from the x-axis. Activity RELY is not sensitive to any interrupt control code options.

4.18. WRLY

The relay output file selection activity, WRLY, is used to write relay data to a file. The 32-character filename maybe specified at the time activity WRLY is invoked. For example, to select the relay output file WRELAY.DAT, activity WRLY could be selected with the activity command "WRLY,WRELAY.DAT".

If no file is specified, or if a file system error condition is encountered in creating the designated file, the user is asked to:

```
ENTER RELAY FILE NAME (-1 TO EXIT):
```

This request is repeated until either a valid filename is entered or a "-1" is entered to terminate activity WRLY.

When a valid relay output filename has been entered, activity WRLY writes the relay data to the file, and then terminates. Activity RELY, section 4.17 can be used to read this new relay data file.

Activity WRLY is not sensitive to any interrupt control code options.

4.19. CRLY

The relay characteristics change activity, CRLY, allows the user to change the relay characteristics of the data read in. Activity CRLY requests the user to:

```
ENTER RELAY ID (* TO LIST IDS, -1 TO EXIT):
```

If a -1 is entered, activity CRLY is terminated. A carriage return will cause all the relays to be printed. If a relay identifier is entered and it includes embedded asterisks ("*"), then the identifiers that match the mask are printed.

When a valid relay identifier is input, activity CRLY responds with dialog according to the relay type. Once the changes have been made, activity CRLY prompts for the next relay identifier.

4.20. CHID

The channel change identification activity, CHID, allows the user to change the name of a channel. When invoked, activity CHID responds with:

```
ENTER CHANNEL NUMBER (0 TO EXIT): OLD CHANNEL IDENTIFIER:
```

After selecting a valid channel number the channel name is printed and activity CHID prompts with:

```
CHANGE IT?
```

A response of 0 or carriage return will leave the channel identifier the same and a new channel number is asked for. A response of 1 causes activity CHID to prompt with:

```
ENTER NEW CHANNEL IDENTIFIER: NEW CHANNEL IDENTIFIER:
```

If a carriage return is entered, the channel identifier remains the same, otherwise the channel identifier is changed and printed.

Activity CHID is not sensitive to any interrupt control code options.

4.21. RAWC

The reading and writing of plot source files activity, RAWC, allows the user to read a plot source file and create a plot file or read a plot file and create a plot source file. When invoked, activity RAWC responds with:

```
OPTIONS ARE: 0 - NO MORE 1 - READ SOURCE CHANNEL FILE 2 - WRITE SOURCE CHANNEL
FILE SELECT OPTION:
```

Option 1 will cause activity RAWC to prompt with:

```
ENTER SOURCE CHANNEL FILENAME:
```

followed by:

```
ENTER BINARY CHANNEL FILENAME:
```

Activity RAWC then reads the source file and creates a binary plot file that can be used by activities CHNF, section 4.1 and MCHN, section 4.10.

Option 2 will cause activity RAWC to prompt with:

```
ENTER BINARY CHANNEL FILENAME:
```

and then:

```
ENTER SOURCE CHANNEL FILENAME:
```

After the source file name is entered, activity RAWC prompts with:

```
ENTER UP TO 20 CHANNELS OR CR OR ALL:
```

If a carriage return is entered, then all channels are output to the source file. If one or more numbers are entered, activity RAWC processes the selected channels and then continues to prompt with the following prompt until a carriage return in entered:

```
ENTER UP TO 20 CHANNELS:
```

The source plot file is structured as follows:

- NCHAN, VERSION Where NCHAN is the number of channel identifiers to follow and VERSION is the channel file version number. Version 1.0 is associated with revisions of PSSPLT previous to 22. Version 2.0 is associated with Version 22 or higher of PSSPLT. Any version of PSSPLT can read a Version 1.0 channel file.
- "NCHAN" identifiers are formatted as follows:

  VERSION = 1.0 12 characters long, padded with blanks as needed, with 10 identifiers per line.

  VERSION = 2.0 32 characters long, padded with blanks as needed, with 4 identifiers per line.
- Title line 1.
- Title line 2.

- NCHAN, TIME
- "NCHAN" channel values (10 per line).

The last two items are repeated until the time for NCHAN = 0.0 and the value for TIME = -9999.

The following example illustrates the source plot file where the number of channels (NCHAN) is 12 and the version is 1.0:

```
    12.000       1.0000
ANG1NUC-A   ANG1HYDRO   ANG1URBGEN  ANG1MINE    ANG1CATDOG   P 1NUC-A    P 1HYDRO    P 1URBGEN   P 1MINE
P 1CATDOG
 Q 1NUC-A    Q 1HYDRO
PSS®E PROGRAM APPLICATION GUIDE EXAMPLE
BASE CASE INCLUDING SEQUENCE DATA
   12.000     -0.16667E-01
   60.333       30.578       26.851       13.600       22.057       7.4999       5.9999       7.9999
2.4888      0.99999
   1.5112       4.0001
   12.000     -0.83333E-02
   60.333       30.578       26.851       13.600       22.057       7.4999       5.9999       7.9999
2.4888      0.99999
   1.5112       4.0001
```

The following example illustrates the source plot file where the number of channels (NCHAN) is 64 and the version is 2.0:

```
 64.000       2.0000
ANG1NUC-A                    ANG1HYDRO                    ANG1URBGEN                   ANG1MINE
ANG1CATDOG                    P 1NUC-A                     P 1HYDRO                     P 1URBGEN
 P 1MINE                      P 1CATDOG                    Q 1NUC-A                     Q 1HYDRO
 Q 1URBGEN                    Q 1MINE                      Q 1CATDOG                   ET 1NUC-A
ET 1HYDRO                    ET 1URBGEN                   ET 1MINE                     ET 1CATDOG
EFD1NUC-A                    EFD1HYDRO                    EFD1URBGEN                   EFD1MINE
EFD1CATDOG                   SPD1NUC-A                    SPD1HYDRO                    SPD1URBGEN
SPD1MINE                     SPD1CATDOG                   PM 1NUC-A                    PM 1HYDRO
PM 1URBGEN                     V-HYDRO                      V-SUB230                   M  201-  204
M  205-  154                 R  201-  204                 X  201-  204                 R  205-  154
X  205-  154                 SPD1MINE                     SPD1CATDOG                   SPD1URBGEN
SPD1HYDRO                    SPD1NUC-B                    SPD1NUC-A                      V-MINE
  V-S. MINE                    V-WEST                       V-RURAL                      V-CATDOG
  V-DOWNTN                     V-MID230                     V-SUB230                     V-EAST230
  V-EAST500                    V-MID500                     V-NUCPANT                    V-NUC-A
  V-NUC-B                      V-HYDRO                      V-SUB500                     V-URBGEN
PSS®E PROGRAM APPLICATION GUIDE EXAMPLE
BASE CASE INCLUDING SEQUENCE DATA
   64.000     -0.16667E-01
   60.334      30.578      26.851      13.600      22.057      7.5000      6.0000      8.0000      2.4888      1.00000
   1.5111      4.0000      6.0000      1.8725      0.80000     1.0200      1.0149      0.97170     1.0500      0.95170
   2.1838      2.8430      2.4921      1.6566      2.8515      0.00000     0.00000     0.00000     0.00000     0.00000
  0.84028     0.83719     0.81059      1.0149     0.93195      616.06      477.46      0.16650     0.15344E-01 0.15166
  0.10045     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000      1.0500      1.0393      0.99664
  0.96120     0.95170     0.92107     0.98148     0.93195     0.95410     0.99114      1.0052      1.0079       1.0200
   1.0200      1.0149      0.95830      0.97170
   64.000     0.83333E-02
   60.334      30.578      26.851      13.600      22.057      7.5000      6.0000      8.0000      2.4888      1.00000
   1.5111      4.0000      6.0000      1.8725      0.80000     1.0200      1.0149      0.97170     1.0500      0.95170
   2.1838      2.8430      2.4921      1.6566      2.8515     0.76058E-09 0.19247E-09 0.49671E-09 0.13711E-09 0.51740E-09
  0.84028     0.83719     0.81059      1.0149     0.93195      616.06      477.46      0.16650     0.15344E-01 0.15166
  0.10045     0.13711E-09 0.51740E-09 0.49671E-09 0.19247E-09 0.76058E-09 0.76058E-09  1.0500      1.0393      0.99664
  0.96120     0.95170     0.92107     0.98148     0.93195     0.95410     0.99114      1.0052      1.0079       1.0200
   1.0200      1.0149      0.95830      0.97170
  0.00000     -9999.0
```

Activity RAWC is not sensitive to any interrupt control code options.

4.22. SORT

The binary plot file sort activity, SORT, allows the user to read in a binary plot file and sort the channel data by time. The sorted channel data is written to a new binary file. The user is requested to:

```
ENTER BINARY CHANNEL FILENAME:
```

After a binary file name is entered, the user is asked to:

```
ENTER SORTED CHANNEL FILENAME:
```

The channel data is read from the binary file and sorted by time intervals.

Activity SORT is not sensitive to any interrupt control code options.

Chapter 5
Miscellaneous Activity Descriptions

5.1. CATA

The directory listing activity, CATA, tabulates an alphabetical listing of the names of files contained in the current directory. This catalog is printed at the progress report output device (see Section 3.5, Selecting Output Devices).

When no suffix is specified in invoking activity CATA, a listing of the names of all files in the directory is printed.

Otherwise, the suffix is treated as a partial filename specification, and the names of all files in the directory that appropriately contain this character string as a part of their name are listed. The activity suffix may contain imbedded asterisks (*) which are treated as *wild card characters* matching zero, one or more characters. For example, selecting activity CATA with the activity command `CATA,AB` will produce a tabulation of all files whose names begin with *AB*; the activity command `CATA,*AB` results in a tabulation of all files that contain the consecutive characters *AB* anywhere in their name.

The actual implementation of activity CATA differs among the various host computers of PSSPLT. There may be certain host computers on which it is not implemented.

Activity CATA is not sensitive to any interrupt control code options.

5.2. ECHO

The dialog echoing activity, ECHO, enables the writing of all subsequent user dialog input to a designated echo file.

5.2.1. Operation of Activity ECHO

When activity ECHO is initiated, if an echo file has previously been opened with an earlier execution of activity ECHO, it is closed and the message:

```
CLOSING ECHO FILE old-echo-filename
```

is printed. If activity ECHO was selected with no suffix specified, it is terminated and the echoing of subsequent user responses is disabled.

When invoked with the activity command `ECHO,filename`. If `filename` contains no suffix, activity ECHO automatically appends the suffix *IDV* to the specified name. The file is then opened as an echo file and activity ECHO prints the message:

```
OPENED ECHO FILE filename
```

All subsequent dialog input is then written to the file `filename`. If some file-system-related error occurs in opening the echo file, an appropriate error message is printed and activity ECHO is terminated with the echoing of subsequent user responses disabled.

Activity ECHO is not sensitive to any interrupt control code options.

5.2.2. Application Notes

The file built by activity ECHO is in the form of a PSSPLT Response File, which may be specified in an @INPUT or @CHAIN command or in an IDEV, section 5.4 activity command to exactly reproduce a sequence of PSSPLT activity commands and responses to instructions. Files written by activity ECHO are source files that may be modified with the text editor (e.g., to specify different channel filenames, channel numbers, and so on) to tailor the original set of user responses to the application at hand.

Activity ECHO copies to the echo file those user inputs that are entered into PSSPLT as part of the interactive dialog. In addition, whenever a PSSPLT bulk data input activity is reading data from the dialog input device (rather than from a bulk data input file), these data records are also recorded in the echo file.

When activities are being executed in line mode (see *PSS®E Program Operation Manual,* Section 4.2.2, Command Line Interface), the line mode dialog is written to the echo file verbatim. For activities being executed in windows mode (see *PSS®E Program Operation Manual,* GUI Windows, section 4.2.1), the equivalent line mode dialog is written to the echo file.

Equivalent dialog corresponding to data changes implemented via interactive graphics is *not* captured in an active echo file.

When an echo file is activated, a MENU activity command corresponding to the current line mode activity selection method is written to the ECHO file.

Refer to Section 2.2.4, Response Files; Section 3.7, Batch Operation; Section 3.8, Program Run-Time Options; and MENU, section 5.5 for further details.

5.3. HELP

The help activity, HELP, prints brief summary documentation at the dialog output device (normally the user's terminal; see Section 3.5, Selecting Output Devices).

When an activity name is specified as a suffix in selecting activity HELP (e.g., HELP, SLCT), a summary description of that activity is displayed.

When invoked with one of its optional suffixes, activity HELP tabulates a listing of activities as follows:

ALL

All PSSPLT activities grouped by type of function performed.

PL

Activities accessible from the PSSPLT activity selector.

MS

Miscellaneous activities accessible from the PSSPLT activity selector.

NEW

A list of activities added at the current release of PSSPLT, and a description of the major modifications incorporated in the current release.

For each of the special suffixes above except NEW, activity HELP lists the names of the appropriate PSSPLT activities. With the designation of the additional suffix FULL (e.g., HELP, PL, FULL), the tabulation is expanded to include a single line description of each activity listed.

Activity HELP is sensitive to the option setting defining the number of lines on the CRT terminal (see Section 3.8, Program Run-Time Options). It pauses at the end of each screen full, giving the user the opportunity to go on to the next page or to terminate activity HELP.

Activity HELP is not sensitive to any interrupt control code options.

5.4. IDEV

The dialog input device selection activity, IDEV, is used to change the source from which PSSPLT accepts the user's portion of its conversational dialog to a Response File.

5.4.1. Line Mode

Executing activity IDEV in line mode (see *PSS®E Program Operation Manual,* Section 16.12, Running a Response File) should be considered an obsolete capability, which is retained for backwards compatibility purposes. The generalized Response File capability described in Section 3.7, Batch Operation is a far more flexible method of using response files since it provides for:

1. Initiating response files in response to any PSSPLT line mode prompt, not just at the activity selector level.

2. Both "nesting" and "chaining" of response files.

Selecting activity "IDEV, filename" is equivalent to entering an `@CHAIN, filename` command in the Command Line Input field at the activity selector level. Activity IDEV supports the argument passing capability of the generalized Response File operation (see *PSS® E Program Operation Manual*, Section 16.7.2, Arguments in Response Files).

5.4.2. Windows Mode

Response File operation may be initiated by selecting activity IDEV from the *IO Control* menu bar entry. `@INPUT` and `@CHAIN` commands may be issued from response files as well as in the `Command Line Input` field of the activity selector window (see Section 5.4.1, Line Mode; they may not be specified in customized window data fields or in the *General Input* window's input field.

5.4.3. Application Notes

The Response File must contain an *exact* image of the line mode user responses that would normally be typed by the user in terminal input mode. Therefore, the manual creation of a Response File, which is done with the text editor, requires an intimate familiarity with the PSSPLT dialog, particularly for dialog-intensive activities such as SLCT and PLOT (in modal analysis mode).

The recommended method of setting up a Response File, therefore, is to first execute the sequence of activities to be implemented in terminal input mode with an ECHO, section 5.2.

Activity IDEV provides for temporarily "leaving" the Response File, allowing the user to enter one or more responses from the system input device (normally the user's terminal), and then returning control back to the Response File. Upon encountering the command `@PAUSE` in the Response File, terminal or command file input, as appropriate, is enabled until the command `@CONTINUE` is entered. The next response is taken from the Response File at the line following the `@PAUSE` line.

In using this control structure, it is the user's responsibility to ensure that the @CONTINUE response is entered at a point in the dialog such that the instructions and questions from PSSPLT remain in synchronism with the responses contained in the Response File.

The `@PAUSE` and `@CONTINUE` commands may be abbreviated to as few characters as are necessary to uniquely identify the @ command (i.e., `@P` and `@CO` respectively).

Further information on Response File operation may be found in the *PSS®E Program Operation Manual, Section 4.4, Virtual Output Devices;* Section 16.12, Running a Response File*; and Section 16.5, Batch Commands*.

Activity IDEV is not sensitive to any interrupt control code options.

5.5. MENU

The activity selection mode switching activity, MENU, allows the user to set the method of activity selection to either the menu mode or the brief mode.

When no suffix is specified in selecting activity MENU, PSSPLT is switched from its current mode of operation to the alternate mode. When activity MENU is selected with the suffix ON, the menu mode is enabled; specifying the suffix OFF to activity MENU enables the brief mode of activity selection.

The default mode of activity selection is established when PSSPLT is installed on the system.

Activity MENU is not sensitive to any interrupt control code options.

5.6. ODEV

The dialog output device selection activity, ODEV, is used to change the destination to which PSSPLT writes its portion of the conversational dialog to either the user's terminal, a file in the user's directory, or a hard copy printing device (line printer or Versatec electrostatic printer/plotter).

When invoked, activity ODEV instructs the user, at the current dialog output device, to select the new device to be used for PSSPLT instructions to the user (see Selecting Output Devices, section 3.5). Specifying either zero or one to the device selection request assigns dialog output to the user's terminal.

Once the new dialog output device is selected and activity ODEV is terminated, all subsequent instructions and requests for input from PSSPLT will be written to this device. It follows, then, that activity ODEV should not be used to direct PSSPLT's dialog output to a device other than the user's terminal when dialog input is taken from the user's terminal (i.e., when activity IDEV, section 5.4 has not been used to activate Response File operation). Otherwise, the user will be driving blind. Therefore, activity ODEV, if used, should only be invoked from a Response File: once at the beginning to direct PSSPLT's questions to a permanent storage medium, and once prior to exiting the response file (with the activity command `IDEV`) to direct the dialog output back to the user's terminal.

When a hard copy device is specified to activity ODEV, the output is not printed until either dialog output is reassigned elsewhere with a subsequent execution of activity ODEV, or PSSPLT is terminated with activity STOP, section 5.8.

The destination specified in activity ODEV may be the same as that specified in activity PDEV, section 5.7, and OPEN, section 5.11.

On systems that give the user the ability to record a session in a disk file, the importance of activity ODEV is reduced.

Activity ODEV is not sensitive to any interrupt control code options.

5.7. PDEV

The progress report output device selection activity, PDEV, is used to change the destination to which PSSPLT writes its progress report output to either the user's terminal, a file in the user's directory, or a hard copy printing device (line printer or Versatec electrostatic printer/plotter). Progress report output consists of those portions of standard PSSPLT output, which are not a part of the conversational dialog.

When invoked, activity PDEV instructs the user, at the current dialog output device, to select the new device to be used for PSSPLT progress report output. Specifying either zero or one to the device selection request assigns progress report output to the user's terminal.

Once the new progress report output device is selected and activity PDEV is terminated, all subsequent progress reports will be directed to the destination selected.

When a hard copy device is specified to activity PDEV, the output is not printed until either progress report output is reassigned elsewhere with a subsequent execution of activity PDEV, or PSSPLT is terminated with activity STOP, section 5.8.

The destination specified in activity PDEV may be the same as that specified in activities ODEV, section 5.6, and OPEN, section 5.11. The progress report output destination is totally independent of the output device specified for report generating activities.

On systems that give the user the ability to record a session in a disk file, the importance of activity ODEV, section 5.6 is reduced.

Activity PDEV is not sensitive to any interrupt control code options.

5.8. STOP

The PSSPLT termination activity, STOP, is the normal exit from PSSPLT. When selected, activity STOP closes the PSSPLT working files (see Section 2.2, File Classes) along with any files which are active as a result of activities IDEV, section 5.4; ODEV, section 5.6; PDEV, section 5.7; ECHO, section 5.2; or OPEN, section 5.11. It then returns the user to operating system level.

Activity STOP does not effect the status of any command files or log files which might be "open" (see Section 3.7, Batch Operation).

Activity STOP is not sensitive to any interrupt control code options.

5.9. TEXT

The null activity, TEXT, does not really do anything. However, it does provide a mechanism by which the user may insert descriptive comments in a Response File at any point at which the next activity to be executed is specified. In addition, it enables the user to insert comments into the PDEV, section 5.7, or ODEV, section 5.6 output if any of these features have been used to preserve hard copy records of the PSSPLT work session.

In response to the prompt `ACTIVITY?`, the user may enter the activity name `TEXT` followed by any descriptive text that is suitable; for example:

```
TEXT *** HAVE YOUR MESSAGE PRINTED HERE!
```

Activity TEXT is not sensitive to any interrupt control code options.

5.10. TIME

The timing statistics activity, TIME, allows the user to obtain execution time statistics during a PSSPLT work session. When invoked with the suffix INIT, or on the first selection of activity TIME following entry into PSSPLT, the timers are initialized and a message is printed at the progress report output device as in the following example:

```
TUE JUL 03, 1990 08:36 - TIMER INITIALIZED
```

is printed at the progress report output device.

On subsequent executions of activity TIME when no suffix is specified, activity TIME prints a summary of elapsed, CPU and disk channel times, in seconds, since the previous execution of activity TIME, and cumulative times from the point at which the timers were last initialized. This tabulation, which is printed at the progress report output device, is of the form:

```
TUE JUL 03, 1990 08:36 ELAPSE CPU DISK SINCE LAST "TIME" XX.XXX X.XXX X.XXX
CUMULATIVE XX.XXX X.XXX X.XXX
```

Activity TIME is not sensitive to any interrupt control code options.

5.11. OPEN

The report output device selection activity, OPEN, allows the user to preselect the destination for output reports generated by the PSSPLT output reporting activities.

When initiated, activity OPEN first *CLOSes* the previously *OPENed* output device if any, and then instructs the user, at the current dialog output device, to select the new device to be used for PSSPLT reports. Specifying either zero or one to the device selection request assigns reports to the user's terminal.

Once the report output device is selected and activity OPEN is terminated, the prompt, `ENTER OUTPUT DEVICE,` is suppressed for subsequent PSSPLT reporting activities and the output is automatically sent to the device selected in activity OPEN. When the selection is a file or high-speed printing device, output reports are stacked in the order in which they are generated.

When a hard copy device is selected in activity OPEN, the output is not printed until activity OPEN, CLOS, section 5.12, or STOP, section 5.8 is selected.

The device specified in activity OPEN applies to all reporting activities. However, it does not affect those activities whose output is a data file intended to be read by PSSPLT or some other program (e.g., activity RANG, section 4.3).

Activity OPEN is not sensitive to any interrupt control code options.

5.12. CLOS

The report output device closing activity, CLOS, terminates output to the previously *OPENed* selection and returns to the operating mode in which each reporting activity requests the user to select the destination for its report.

Activity CLOS is not sensitive to any interrupt control code options.

5.13. PATH

The directory pathname activity, PATH, allows the user to specify the directory, UFD, or disk where files are to be read from or written to. When invoked, activity PATH responds with:

ENTER PATHNAME PREFIX FOR USE WITH "&" FILENAMES:

The valid pathname can be used with activities such as CHNF, section 4.1 and MCHN, section 4.10. When a filename is asked for, it can be preceded with an ampersand (*&*). The *&* will tell what directory the file is located in or will be written to.

Activity PATH is not sensitive to any interrupt control code options.

Chapter 6
Examples

Example 1

Typical dialogue to generate a time plot. In this case, the angle for channel 1 was plotted and then the angles for channels 2 through 5 were plotted relative to the first curve.

Example 2

Generate four plots per page with each plot involving a different function.

Example 3

Generate a time plot using channels 7 and 8 from three plot files.

Example 4

Generate an X-Y plot with DISTR1 relay characteristics superimposed.

Example 5

Generate an X-Y plot from two different plot files. DISTR1 relay characteristics are superimposed.

Example 6

Generate an FFT plot. Channels 1, 2, and 3 are plotted followed by the composite of the three channels. The Hanning function is performed on channel 4 and plotted. The FFT is performed on channel 4, the composite, and a new frequency range is selected for the FFT plot.

Example 7

Generate log and semilog plots. The first is a plot of the LOG(X) versus LOG(Y). The second is a plot of the LOG(X) versus Y.

6.1. Example 1

Typical dialogue to generate a time plot. In this case, the angle for channel 1 was plotted and then the angles for channels 2 through 5 were plotted relative to the first curve.

Table 6.1.

```
$ pssplt
PSS/E Version 22
Copyright (c) 1976-1993 Power Technologies, Inc.
This program is a confidential unpublished work created and first
licensed in 1976. It is a trade secret which is the property of
Power Technologies Inc. All use, disclosure, and/or reproduction
not specifically authorized by Power Technologies, Inc. is prohibited.
This program is protected under the copyright laws of non-U.S.
countries and by application of international treaties. All Rights
Reserved Under The Copyright Laws.

POWER TECHNOLOGIES INCORPORATED
CHANNEL OUTPUT FILE PLOTTING PROGRAM -- PSSPLT-22.0
INITIATED ON THU OCT 21, 1993 16:44
ACTIVITY? chnf out
PLOT DATA FILE: out
PSS/E PROGRAM APPLICATION GUIDE EXAMPLE
BASE CASE INCLUDING SEQUENCE DATA
ACTIVITY? rang

OPTIONS ARE
0 - NO MORE 1 - GENERATE ACTUAL & ADJUSTED SCALES
2 - WRITE SCALE FILE 3 - READ SCALE FILE
4 - DISPLAY SCALES 5 - OVERRIDE SCALES
6 - GENERATE ACTUAL SCALES 7 - READ DYPRN4 FILE
8 - GENERATE COMMON SCALE
SELECT DESIRED OPTION: 1

OPTIONS ARE
0 - NO MORE 1 - GENERATE ACTUAL & ADJUSTED SCALES
2 - WRITE SCALE FILE 3 - READ SCALE FILE
4 - DISPLAY SCALES 5 - OVERRIDE SCALES
6 - GENERATE ACTUAL SCALES 7 - READ DYPRN4 FILE
8 - GENERATE COMMON SCALE
SELECT DESIRED OPTION:
ACTIVITY? popt
PRESENT OPTION SETTINGS ARE:
```

```
1=GRAPHICS OUTPUT DEVICE..... 0 2=PLOT LINE TYPE...PATTERN+SYMBOLS
3=COLOR OPTION.....COLORS 4=MAXIMUM PLOTS.....6
5=NUMBER OF TIME INTERVALS.....10 6=TIC MARK DELTA..... 0.250
7=RELAY CLIP BOUNDARY..... 0.250 8=LINE PRINTER PLOT WIDTH.....100
9=GRID LINES OPTION.....0 10=CRT REPLOT OPTION.....ON
11=TIME AXIS ANNOT.....TIME (SECONDS) 12=MIN & MAX CALCULATION.....APPROX
13=FUNCTION DELIMITER OPTION.....[ ] 14=PRINT CHANNEL #S FROM SLCT...YES
15=PLOTS PER PAGE.....1 16=DELTA TIME INTERVAL... 0.0000
17=FILE OVERWRITE OPTION.....YES 18=CHANGE PLOT TITLES.....NO
LINES PER PAGE:
19=FILE OUTPUT.....60 20=CRT TERMINAL.....24
21=QMS PS2000 .....72 22=QMS_PS800 .....80
ENTER CODE OF OPTION TO BE CHANGED:
12

DEFAULT MIN & MAX CALCULATION IS APPROX
ENTER <CR> TO TOGGLE, 0 APPROXIMATE, 1 FOR ACTUAL:

PRESENT OPTION SETTINGS ARE:
1=GRAPHICS OUTPUT DEVICE..... 0 2=PLOT LINE TYPE...PATTERN+SYMBOLS
3=COLOR OPTION.....COLORS 4=MAXIMUM PLOTS.....6
5=NUMBER OF TIME INTERVALS.....10 6=TIC MARK DELTA..... 0.250
7=RELAY CLIP BOUNDARY..... 0.250 8=LINE PRINTER PLOT WIDTH.....100
9=GRID LINES OPTION.....0 10=CRT REPLOT OPTION.....ON
11=TIME AXIS ANNOT.....TIME (SECONDS) 12=MIN & MAX CALCULATION.....ACTUAL
13=FUNCTION DELIMITER OPTION.....[ ] 14=PRINT CHANNEL #S FROM SLCT...YES
15=PLOTS PER PAGE.....1 16=DELTA TIME INTERVAL... 0.0000
17=FILE OVERWRITE OPTION.....YES 18=CHANGE PLOT TITLES.....NO
LINES PER PAGE:
19=FILE OUTPUT.....60 20=CRT TERMINAL.....24
21=QMS PS2000 .....72 22=QMS_PS800 .....80
ENTER CODE OF OPTION TO BE CHANGED:

ACTIVITY? slct

CURRENT CHANNEL FILE IS: out
0 CHANNELS SELECTED (OUT OF A MAXIMUM OF 6)

ENTER CHANNEL NUMBER (0 FOR NO MORE): 1
CHANNEL 1 [ANG1NUC-A ]
MIN (CMINA) MAX (CMAXA)
ACTUAL: 60.33 339.8
SCALES: 0.0000 500.0
ENTER NEW SCALES (MIN,MAX) OR 'R' TO RE-SELECT CHANNEL):

ENTER CHANNEL NUMBER (0 FOR NO MORE):
```

```
ACTIVITY? func

PLOTTING FUNCTIONS ARE:
0 - EXIT ACTIVITY
1 - CHANNEL VALUE (NO FUNCTION)
2 - USER DEFINED ARITHMETIC FUNCTION
3 - ALL BUT SPECIFIED FREQUENCY (HZ) COMPONENT
4 - SPECIFIED FREQUENCY (HZ) COMPONENT
5 - LOW FREQUENCY (HZ) COMPONENT
6 - HIGH FREQUENCY (HZ) COMPONENT
7 - UPPER ENVELOPE
8 - LOWER ENVELOPE
9 - INTEGRATE SIGNAL
10 - FOURIER COMPONENTS OF A ; DEL T=B ; DEL FREQ=C
11 - PEAK OF 3 PHASE RECTIFIED SIGNAL
12 - D AXIS COMPONENT
13 - Q AXIS COMPONENT
14 - ZERO SEQUENCE COMPONENT
15 - POSITIVE SEQUENCE COMPONENT
16 - NEGATIVE SEQUENCE COMPONENT
17 - TIME DERIVATIVE
SELECT FUNCTION: 2

ENTER DESIRED EXPRESSION: a-b

ACTIVITY? slct

CURRENT CHANNEL FILE IS: out
1 CHANNELS SELECTED (OUT OF A MAXIMUM OF 6)

FUNCTION = A-B

ENTER 2 CHANNEL NUMBERS (0 FOR NO MORE): 2 1

CHNL#'S 2,1: [ANG1HYDRO]-[ANG1NUC-A]
CMIN = -33.70 CMAX = -17.61
ENTER NEW SCALES (MIN,MAX) OR 'R' TO RE-SELECT CHANNEL): -100 0

FUNCTION = A-B

ENTER 2 CHANNEL NUMBERS (0 FOR NO MORE): 4 1

CHNL#'S 4,1: [ANG1MINE]-[ANG1NUC-A]
CMIN = -54.15 CMAX = -26.75
ENTER NEW SCALES (MIN,MAX) OR 'R' TO RE-SELECT CHANNEL): -100 0

FUNCTION = A-B

ENTER 2 CHANNEL NUMBERS (0 FOR NO MORE): 5 1

CHNL#'S 5,1: [ANG1CATDOG]-[ANG1NUC-A]
CMIN = -45.51 CMAX = -18.74
```

```
ENTER NEW SCALES (MIN,MAX) OR 'R' TO RE-SELECT CHANNEL): -100 0

FUNCTION = A-B

ENTER 2 CHANNEL NUMBERS (0 FOR NO MORE):

ACTIVITY? plot

ENTER 25 CHARACTER LABEL :
*************************
: EXAMPLE1

SUPPORTED PLOTTING DEVICES ARE:
0 = NONE 2 = HP 7221A
3 = TEKTRONIX 4010 4 = TEKTRONIX 4014
5 = TEKTRONIX 4014 W/EGM 6 = TEKTRONIX 4662
7 = TEKTRONIX 4663 11 = GRPG FILE
17 = TEKTRONIX 4105/04/06 18 = TEKTRONIX 4107/09
20 = TEKTRONIX 4112 21 = TEKTRONIX 4113
22 = TEKTRONIX 4114 23 = TEKTRONIX 4115/4125
25 = X Window (B&W) 27 = HP 7470A
28 = HP 7475A 31 = QMS LASERGRAFIX
33 = TEKTRONIX 4111 37 = TEKTRONIX 41XX FILE
38 = HP-GL FILE 39 = X Window
40 = TEKTRONIX 4010/4014 FILE 41 = POSTSCRIPT
99 = INDE. PLOT FILE
SELECT PLOTTING DEVICE [,PARM FILE]: 41

ACTIVITY? STOP

ENTER NUMBER OF COPIES (0 TO 5), DEVICE NAME FOR PS DEVICE: 0

YOUR PLOT FILE HAS BEEN SAVED AS PSPL001
```

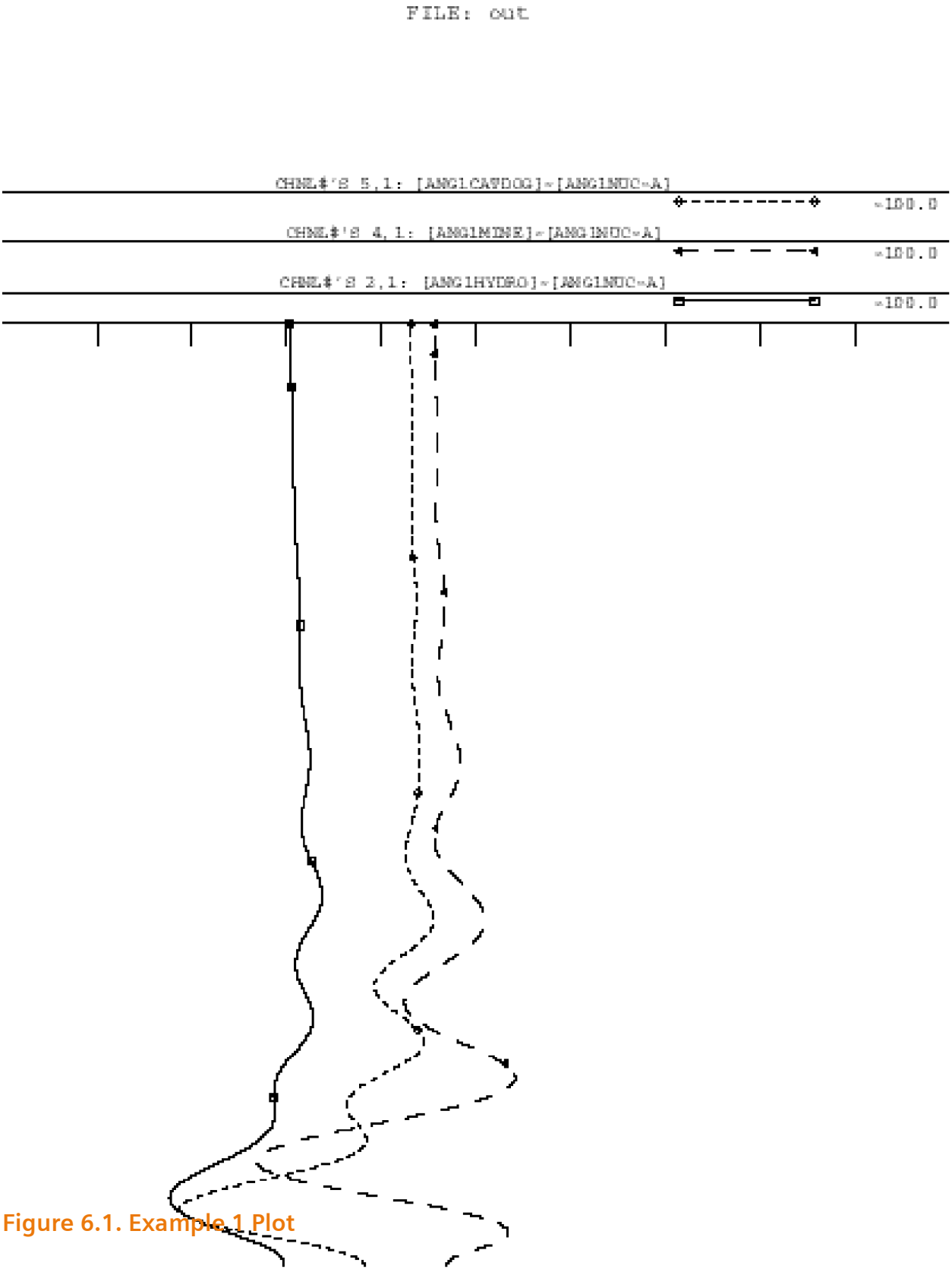


Figure 6.1. Example 1 Plot

6.2. Example 2

Generate four plots per page with each plot involving a different function.

```
$ pssplt

PSS/E Version 22
Copyright (c) 1976-1993 Power Technologies, Inc.
This program is a confidential unpublished work created and first
licensed in 1976. It is a trade secret which is the property of
Power Technologies Inc. All use, disclosure, and/or reproduction
not specifically authorized by Power Technologies, Inc. is prohibited.
This program is protected under the copyright laws of non-U.S.
countries and by application of international treaties. All Rights
Reserved Under The Copyright Laws.

POWER TECHNOLOGIES INCORPORATED
CHANNEL OUTPUT FILE PLOTTING PROGRAM -- PSSPLT-22.0
INITIATED ON FRI OCT 22, 1993 08:21
ACTIVITY? chnf out
PLOT DATA FILE: out
PSS/E PROGRAM APPLICATION GUIDE EXAMPLE
BASE CASE INCLUDING SEQUENCE DATA
ACTIVITY? rang

OPTIONS ARE
0 - NO MORE 1 - GENERATE ACTUAL & ADJUSTED SCALES
2 - WRITE SCALE FILE 3 - READ SCALE FILE
4 - DISPLAY SCALES 5 - OVERRIDE SCALES
6 - GENERATE ACTUAL SCALES 7 - READ DYPRN4 FILE
8 - GENERATE COMMON SCALE
SELECT DESIRED OPTION: 1

OPTIONS ARE
0 - NO MORE 1 - GENERATE ACTUAL & ADJUSTED SCALES
2 - WRITE SCALE FILE 3 - READ SCALE FILE
4 - DISPLAY SCALES 5 - OVERRIDE SCALES
6 - GENERATE ACTUAL SCALES 7 - READ DYPRN4 FILE
8 - GENERATE COMMON SCALE
SELECT DESIRED OPTION:
ACTIVITY? popt

PRESENT OPTION SETTINGS ARE:
1=GRAPHICS OUTPUT DEVICE..... 0 2=PLOT LINE TYPE...PATTERN+SYMBOLS
3=COLOR OPTION.....COLORS 4=MAXIMUM PLOTS.....6
```

```
5=NUMBER OF TIME INTERVALS.....10 6=TIC MARK DELTA..... 0.250
7=RELAY CLIP BOUNDARY..... 0.250 8=LINE PRINTER PLOT WIDTH......100
9=GRID LINES OPTION.....0 10=CRT REPLOT OPTION.....ON
11=TIME AXIS ANNOT........TIME (SECONDS) 12=MIN & MAX CALCULATION.....APPROX
13=FUNCTION DELIMITER OPTION.....[ ] 14=PRINT CHANNEL #S FROM SLCT...YES
15=PLOTS PER PAGE.....1 16=DELTA TIME INTERVAL... 0.0000
17=FILE OVERWRITE OPTION.....YES 18=CHANGE PLOT TITLES.....NO
LINES PER PAGE:
19=FILE OUTPUT.....60 20=CRT TERMINAL.....24
21=QMS PS2000 .....72 22=QMS_PS800 .....80
ENTER CODE OF OPTION TO BE CHANGED:
12

DEFAULT MIN & MAX CALCULATION IS APPROX
ENTER <CR> TO TOGGLE, 0 APPROXIMATE, 1 FOR ACTUAL:

PRESENT OPTION SETTINGS ARE:
1=GRAPHICS OUTPUT DEVICE..... 0 2=PLOT LINE TYPE...PATTERN+SYMBOLS
3=COLOR OPTION.....COLORS 4=MAXIMUM PLOTS.....6
5=NUMBER OF TIME INTERVALS.....10 6=TIC MARK DELTA..... 0.250
7=RELAY CLIP BOUNDARY..... 0.250 8=LINE PRINTER PLOT WIDTH......100
9=GRID LINES OPTION.....0 10=CRT REPLOT OPTION.....ON
11=TIME AXIS ANNOT........TIME (SECONDS) 12=MIN & MAX CALCULATION.....ACTUAL
13=FUNCTION DELIMITER OPTION.....[ ] 14=PRINT CHANNEL #S FROM SLCT...YES
15=PLOTS PER PAGE.....1 16=DELTA TIME INTERVAL... 0.0000
17=FILE OVERWRITE OPTION.....YES 18=CHANGE PLOT TITLES.....NO
LINES PER PAGE:
19=FILE OUTPUT.....60 20=CRT TERMINAL.....24
21=QMS PS2000 .....72 22=QMS_PS800 .....80
ENTER CODE OF OPTION TO BE CHANGED:
15

DEFAULT PLOTS PER PAGE IS 1
ENTER # OF PLOTS PER PAGE (1,2,or 4): 4

PRESENT OPTION SETTINGS ARE:
1=GRAPHICS OUTPUT DEVICE..... 0 2=PLOT LINE TYPE...PATTERN+SYMBOLS
3=COLOR OPTION.....COLORS 4=MAXIMUM PLOTS.....6
5=NUMBER OF TIME INTERVALS.....10 6=TIC MARK DELTA..... 0.250
7=RELAY CLIP BOUNDARY..... 0.250 8=LINE PRINTER PLOT WIDTH......100
9=GRID LINES OPTION.....0 10=CRT REPLOT OPTION.....ON
11=TIME AXIS ANNOT........TIME (SECONDS) 12=MIN & MAX CALCULATION.....ACTUAL
13=FUNCTION DELIMITER OPTION.....[ ] 14=PRINT CHANNEL #S FROM SLCT...YES
15=PLOTS PER PAGE.....4 16=DELTA TIME INTERVAL... 0.0000
17=FILE OVERWRITE OPTION.....YES 18=CHANGE PLOT TITLES.....NO
```

```
LINES PER PAGE:
19=FILE OUTPUT.....................60 20=CRT TERMINAL.................24
21=QMS PS2000 .....................72 22=QMS_PS800 .................80
ENTER CODE OF OPTION TO BE CHANGED:
18

DEFAULT CHANGE PLOT TITLES IS NO
ENTER <CR> TO TOGGLE, 0 DO NOT CHANGE, 1 CHANGE TITLES:

PRESENT OPTION SETTINGS ARE:
1=GRAPHICS OUTPUT DEVICE..... 0 2=PLOT LINE TYPE...PATTERN+SYMBOLS
3=COLOR OPTION.................COLORS 4=MAXIMUM PLOTS.................6
5=NUMBER OF TIME INTERVALS..........10 6=TIC MARK DELTA..... 0.250
7=RELAY CLIP BOUNDARY..... 0.250 8=LINE PRINTER PLOT WIDTH......100
9=GRID LINES OPTION.................0 10=CRT REPLOT OPTION.............ON
11=TIME AXIS ANNOT........TIME (SECONDS) 12=MIN & MAX CALCULATION.....ACTUAL
13=FUNCTION DELIMITER OPTION.........[ ] 14=PRINT CHANNEL #S FROM SLCT...YES
15=PLOTS PER PAGE.....................4 16=DELTA TIME INTERVAL... 0.0000
17=FILE OVERWRITE OPTION.............YES 18=CHANGE PLOT TITLES...........YES
LINES PER PAGE:
19=FILE OUTPUT.....................60 20=CRT TERMINAL.................24
21=QMS PS2000 .....................72 22=QMS_PS800 .................80
ENTER CODE OF OPTION TO BE CHANGED:

ACTIVITY? slct

CURRENT CHANNEL FILE IS: out
0 CHANNELS SELECTED (OUT OF A MAXIMUM OF 6)

ENTER CHANNEL NUMBER (0 FOR NO MORE): 1
CHANNEL 1 [ANG1NUC-A ]
MIN (CMINA) MAX (CMAXA)
ACTUAL: 60.33 339.8
SCALES: 0.0000 500.0
ENTER NEW SCALES (MIN,MAX) OR 'R' TO RE-SELECT CHANNEL):

ENTER CHANNEL NUMBER (0 FOR NO MORE):

ACTIVITY? plot

ENTER 25 CHARACTER LABEL :
*************************
: EXAMPLE 2

SUPPORTED PLOTTING DEVICES ARE:
0 = NONE 2 = HP 7221A
3 = TEKTRONIX 4010 4 = TEKTRONIX 4014
5 = TEKTRONIX 4014 W/EGM 6 = TEKTRONIX 4662
7 = TEKTRONIX 4663 11 = GRPG FILE
```

```
17 = TEKTRONIX 4105/04/06 18 = TEKTRONIX 4107/09
20 = TEKTRONIX 4112 21 = TEKTRONIX 4113
22 = TEKTRONIX 4114 23 = TEKTRONIX 4115/4125
25 = X Window (B&W) 27 = HP 7470A
28 = HP 7475A 31 = QMS LASERGRAFIX
33 = TEKTRONIX 4111 37 = TEKTRONIX 41XX FILE
38 = HP-GL FILE 39 = X Window
40 = TEKTRONIX 4010/4014 FILE 41 = POSTSCRIPT
99 = INDE. PLOT FILE
SELECT PLOTTING DEVICE [,PARM FILE]: 41

ACTIVITY? func

PLOTTING FUNCTIONS ARE:
0 - EXIT ACTIVITY
1 - CHANNEL VALUE (NO FUNCTION)
2 - USER DEFINED ARITHMETIC FUNCTION
3 - ALL BUT SPECIFIED FREQUENCY (HZ) COMPONENT
4 - SPECIFIED FREQUENCY (HZ) COMPONENT
5 - LOW FREQUENCY (HZ) COMPONENT
6 - HIGH FREQUENCY (HZ) COMPONENT
7 - UPPER ENVELOPE
8 - LOWER ENVELOPE
9 - INTEGRATE SIGNAL
10 - FOURIER COMPONENTS OF A ; DEL T=B ; DEL FREQ=C
11 - PEAK OF 3 PHASE RECTIFIED SIGNAL
12 - D AXIS COMPONENT
13 - Q AXIS COMPONENT
14 - ZERO SEQUENCE COMPONENT
15 - POSITIVE SEQUENCE COMPONENT
16 - NEGATIVE SEQUENCE COMPONENT
17 - TIME DERIVATIVE
SELECT FUNCTION: 2

ENTER DESIRED EXPRESSION: a-b

ACTIVITY? slct

CURRENT CHANNEL FILE IS: out
0 CHANNELS SELECTED (OUT OF A MAXIMUM OF 6)

FUNCTION = A-B

ENTER 2 CHANNEL NUMBERS (0 FOR NO MORE): 4 1

CHNL#'S 4,1: [ANG1MINE]-[ANG1NUC-A]
CMIN = -54.15 CMAX = -26.75
ENTER NEW SCALES (MIN,MAX) OR 'R' TO RE-SELECT CHANNEL): -100 0
```

```
ENTER NEW PLOT TITLE: DIFFERENCE PLOT
FUNCTION = A-B
ENTER 2 CHANNEL NUMBERS (0 FOR NO MORE):
ACTIVITY? plot
ENTER 25 CHARACTER LABEL :
************************
: EXAMPLE 2

ACTIVITY? func
PLOTTING FUNCTIONS ARE:
0 - EXIT ACTIVITY
1 - CHANNEL VALUE (NO FUNCTION)
2 - USER DEFINED ARITHMETIC FUNCTION
3 - ALL BUT SPECIFIED FREQUENCY (HZ) COMPONENT
4 - SPECIFIED FREQUENCY (HZ) COMPONENT
5 - LOW FREQUENCY (HZ) COMPONENT
6 - HIGH FREQUENCY (HZ) COMPONENT
7 - UPPER ENVELOPE
8 - LOWER ENVELOPE
9 - INTEGRATE SIGNAL
10 - FOURIER COMPONENTS OF A ; DEL T=B ; DEL FREQ=C
11 - PEAK OF 3 PHASE RECTIFIED SIGNAL
12 - D AXIS COMPONENT
13 - Q AXIS COMPONENT
14 - ZERO SEQUENCE COMPONENT
15 - POSITIVE SEQUENCE COMPONENT
16 - NEGATIVE SEQUENCE COMPONENT
17 - TIME DERIVATIVE
SELECT FUNCTION: 2
ENTER DESIRED EXPRESSION: 60*(1+a)
ACTIVITY? slct
CURRENT CHANNEL FILE IS: out
0 CHANNELS SELECTED (OUT OF A MAXIMUM OF 6)

FUNCTION = 60*(1+A)
ENTER 1 CHANNEL NUMBERS (0 FOR NO MORE): 28
CHNL# 28: 60*(1+[SPD1URBGEN])
CMIN = 60.00 CMAX = 60.90
ENTER NEW SCALES (MIN,MAX) OR 'R' TO RE-SELECT CHANNEL): 60 61
ENTER NEW PLOT TITLE:
FUNCTION = 60*(1+A)
```

```
ENTER 1 CHANNEL NUMBERS (0 FOR NO MORE):
ACTIVITY? plot
ENTER 25 CHARACTER LABEL :
************************
: EXAMPLE 2
ACTIVITY? func

PLOTTING FUNCTIONS ARE:
0 - EXIT ACTIVITY
1 - CHANNEL VALUE (NO FUNCTION)
2 - USER DEFINED ARITHMETIC FUNCTION
3 - ALL BUT SPECIFIED FREQUENCY (HZ) COMPONENT
4 - SPECIFIED FREQUENCY (HZ) COMPONENT
5 - LOW FREQUENCY (HZ) COMPONENT
6 - HIGH FREQUENCY (HZ) COMPONENT
7 - UPPER ENVELOPE
8 - LOWER ENVELOPE
9 - INTEGRATE SIGNAL
10 - FOURIER COMPONENTS OF A ; DEL T=B ; DEL FREQ=C
11 - PEAK OF 3 PHASE RECTIFIED SIGNAL
12 - D AXIS COMPONENT
13 - Q AXIS COMPONENT
14 - ZERO SEQUENCE COMPONENT
15 - POSITIVE SEQUENCE COMPONENT
16 - NEGATIVE SEQUENCE COMPONENT
17 - TIME DERIVATIVE
SELECT FUNCTION: 1
ACTIVITY? slct
CURRENT CHANNEL FILE IS: out
0 CHANNELS SELECTED (OUT OF A MAXIMUM OF 6)

ENTER CHANNEL NUMBER (0 FOR NO MORE): 28
CHANNEL 28 [SPD1URBGEN ]
MIN (CMINA) MAX (CMAXA)
ACTUAL: 0.0000 0.1496E-01
SCALES: 0.0000 0.2500E-01
ENTER NEW SCALES (MIN,MAX) OR 'R' TO RE-SELECT CHANNEL): 0 .02
ENTER CHANNEL NUMBER (0 FOR NO MORE):
ACTIVITY? func
PLOTTING FUNCTIONS ARE:
0 - EXIT ACTIVITY
```

```
1 - CHANNEL VALUE (NO FUNCTION)
2 - USER DEFINED ARITHMETIC FUNCTION
3 - ALL BUT SPECIFIED FREQUENCY (HZ) COMPONENT
4 - SPECIFIED FREQUENCY (HZ) COMPONENT
5 - LOW FREQUENCY (HZ) COMPONENT
6 - HIGH FREQUENCY (HZ) COMPONENT
7 - UPPER ENVELOPE
8 - LOWER ENVELOPE
9 - INTEGRATE SIGNAL
10 - FOURIER COMPONENTS OF A ; DEL T=B ; DEL FREQ=C
11 - PEAK OF 3 PHASE RECTIFIED SIGNAL
12 - D AXIS COMPONENT
13 - Q AXIS COMPONENT
14 - ZERO SEQUENCE COMPONENT
15 - POSITIVE SEQUENCE COMPONENT
16 - NEGATIVE SEQUENCE COMPONENT
17 - TIME DERIVATIVE
SELECT FUNCTION: 17

ACTIVITY? slct

CURRENT CHANNEL FILE IS: out
1 CHANNELS SELECTED (OUT OF A MAXIMUM OF 6)


FUNCTION = TIME DERIVATIVE

ENTER CHANNEL NUMBER (0 FOR NO MORE): 3

TIME DERIVATIVE OF CHNL# 3: [ANG1URBGEN]
CMIN = 0.0000 CMAX = 324.8
ENTER NEW SCALES (MIN,MAX) OR 'R' TO RE-SELECT CHANNEL): 0 500

FUNCTION = TIME DERIVATIVE

ENTER CHANNEL NUMBER (0 FOR NO MORE):

ACTIVITY? plot

ENTER 25 CHARACTER LABEL :
************************
: EXAMPLE 2

ACTIVITY? STOP

ENTER NUMBER OF COPIES (0 TO 5), DEVICE NAME FOR PS DEVICE: 0

YOUR PLOT FILE HAS BEEN SAVED AS PSPL002
```

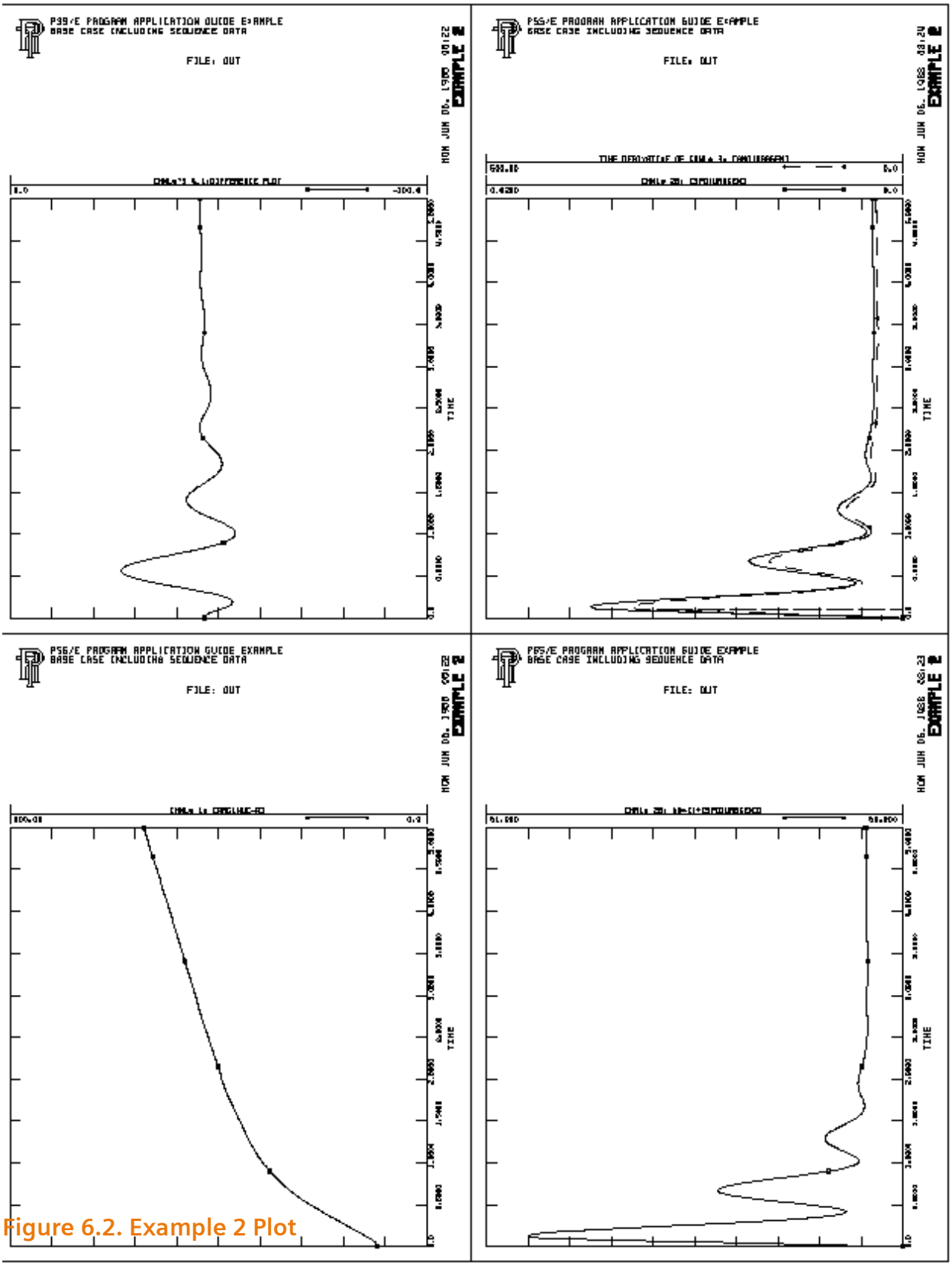


Figure 6.2. Example 2 Plot

6.3. Example 3

Generate a time plot using channels 7 and 8 from three plot files.

```
$ pssplt
PSS/E Version 22
Copyright (c) 1976-1994 Power Technologies, Inc.
This program is a confidential unpublished work created and first
licensed in 1976. It is a trade secret which is the property of
Power Technologies Inc. All use, disclosure, and/or reproduction
not specifically authorized by Power Technologies, Inc. is prohibited.
This program is protected under the copyright laws of non-U.S.
countries and by application of international treaties. All Rights
Reserved Under The Copyright Laws.

POWER TECHNOLOGIES INCORPORATED
CHANNEL OUTPUT FILE PLOTTING PROGRAM -- PSSPLT-22.0
INITIATED ON MON JAN 17, 1994 08:26

ACTIVITY? mchn
ENTER PLOT DATA FILE NO. 1 (-1 TO EXIT): out1
PLOT DATA FILE TITLE:
LIGHT LOAD 1996 - 0 TNB/PUB TRANSFERS

ENTER PLOT DATA FILE NO. 2 (-1 TO EXIT): out2
PLOT DATA FILE TITLE:
PSS/E PROGRAM APPLICATION GUIDE EXAMPLE
BASE CASE INCLUDING SEQUENCE DATA
CONTINUING TO USE TITLE LINES:
LIGHT LOAD 1996 - 0 TNB/PUB TRANSFERS

ENTER PLOT DATA FILE NO. 3 (-1 TO EXIT): out3
PLOT DATA FILE TITLE:
PSS/E PROGRAM APPLICATION GUIDE EXAMPLE
BASE CASE INCLUDING SEQUENCE DATA
CONTINUING TO USE TITLE LINES:
LIGHT LOAD 1996 - 0 TNB/PUB TRANSFERS

ENTER PLOT DATA FILE NO. 4 (-1 TO EXIT): -1
ACTIVITY? tint
CURRENT VALUE FOR TSTART = -9999.0000, TSTOP = 9999.0000
ENTER STARTING TIME (SECONDS), ENDING TIME (SECONDS) : 0 2
ACTIVITY? rang
```

```
OPTIONS ARE
0 - NO MORE 1 - GENERATE ACTUAL & ADJUSTED SCALES
2 - WRITE SCALE FILE 3 - READ SCALE FILE
4 - DISPLAY SCALES 5 - OVERRIDE SCALES
6 - GENERATE ACTUAL SCALES 7 - READ DYPRN4 FILE
8 - GENERATE COMMON SCALE
SELECT DESIRED OPTION: 1

OPTIONS ARE
0 - NO MORE 1 - GENERATE ACTUAL & ADJUSTED SCALES
2 - WRITE SCALE FILE 3 - READ SCALE FILE
4 - DISPLAY SCALES 5 - OVERRIDE SCALES
6 - GENERATE ACTUAL SCALES 7 - READ DYPRN4 FILE
8 - GENERATE COMMON SCALE
SELECT DESIRED OPTION:

ACTIVITY? slct

ENTER CHANNEL NUMBER (0 FOR NO MORE): 7
CHANNEL 7 [ P 1HYDRO ]
MIN (CMINA) MAX (CMAXA)
ACTUAL: -0.9141 7.729
SCALES: -10.00 15.00
ENTER NEW SCALES (MIN,MAX) OR 'R' TO RE-SELECT CHANNEL):

ENTER CHANNEL NUMBER (0 FOR NO MORE): 8
CHANNEL 8 [ P 1URBGEN ]
MIN (CMINA) MAX (CMAXA)
ACTUAL: 0.1044 10.61
SCALES: 0.0000 25.00
ENTER NEW SCALES (MIN,MAX) OR 'R' TO RE-SELECT CHANNEL):

ACTIVITY? plot

ENTER 25 CHARACTER LABEL :
*************************
: EXAMPLE 3

SUPPORTED PLOTTING DEVICES ARE:
0 = NONE 2 = HP 7221A
3 = TEKTRONIX 4010 4 = TEKTRONIX 4014
5 = TEKTRONIX 4014 W/EGM 6 = TEKTRONIX 4662
7 = TEKTRONIX 4663 11 = GRPG FILE
15 = APOLLO - FRAME WINDOW 16 = APOLLO - BORROW MODE
17 = TEKTRONIX 4105/04/06 18 = TEKTRONIX 4107/09
20 = TEKTRONIX 4112 21 = TEKTRONIX 4113
22 = TEKTRONIX 4114 23 = TEKTRONIX 4115/4125
```

```
25 = X Window (B&W) 27 = HP 7470A
28 = HP 7475A 31 = QMS LASERGRAFIX
33 = TEKTRONIX 4111 34 = APOLLO - DIRECT WINDOW
35 = APOLLO - BITMAP FILE 37 = TEKTRONIX 41XX FILE
38 = HP-GL FILE 39 = X Window
40 = TEKTRONIX 4010/4014 FILE 41 = POSTSCRIPT
99 = INDE. PLOT FILE
SELECT PLOTTING DEVICE [,PARM FILE]: 41

ACTIVITY? stop

ENTER NUMBER OF COPIES (0 TO 5), DEVICE NAME FOR PS DEVICE: 0

YOUR PLOT FILE HAS BEEN SAVED AS PSPL002
```

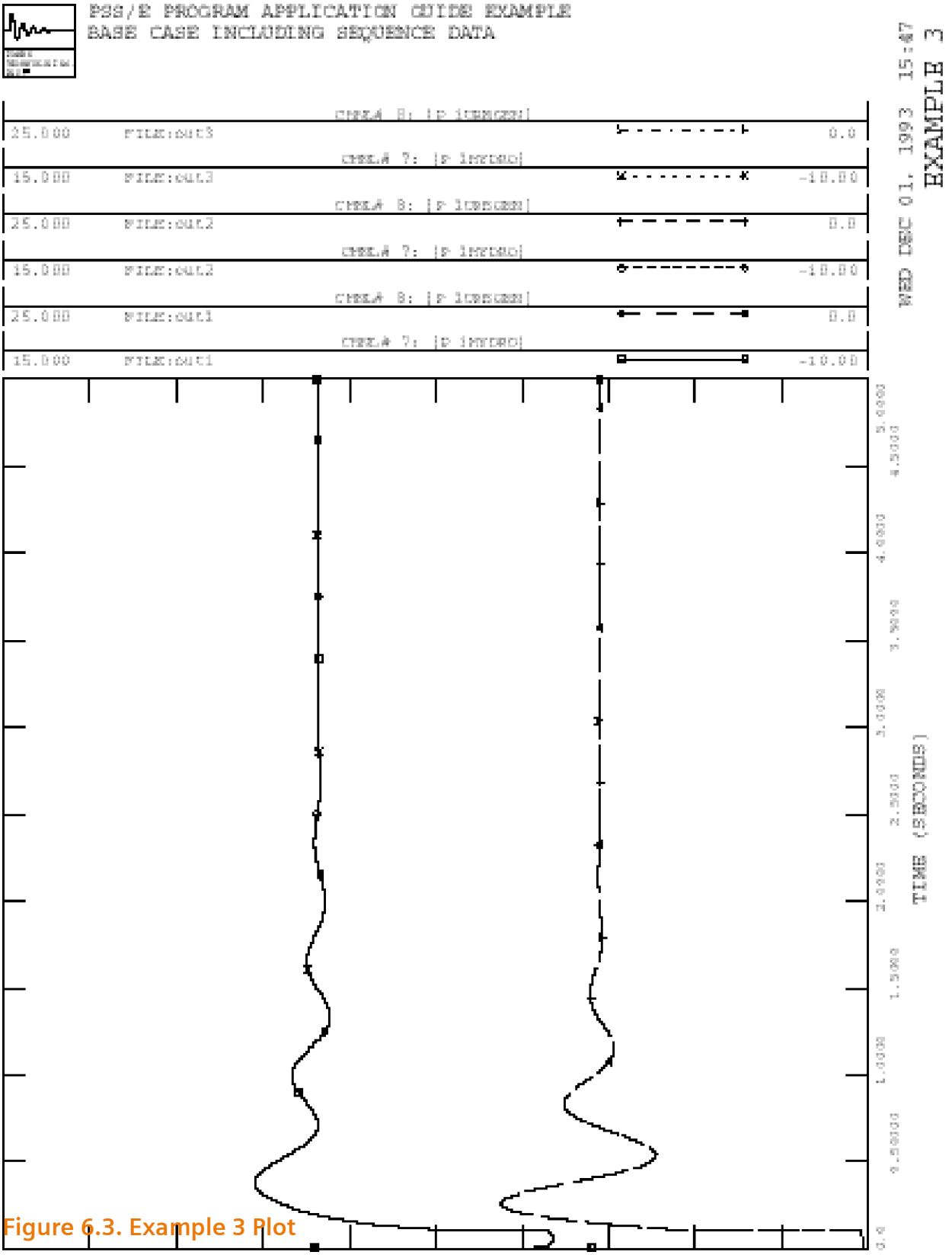


Figure 6.3. Example 3 Plot

6.4. Example 4

Generate an X-Y plot with DISTR1 relay characteristics superimposed.

```
$ PSSPLT
POWER TECHNOLOGIES INCORPORATED
CHANNEL OUTPUT FILE PLOTTING PROGRAM -- PSSPLT-17.0
INITIATED ON MON JUN 06, 1988 10:01

ACTIVITY? CHNF OUT
PSS/E PROGRAM APPLICATION GUIDE EXAMPLE
BASE CASE INCLUDING SEQUENCE DATA

ACTIVITY? TINT
CURRENT VALUE FOR TSTART = -999.0000, TSTOP = 999.0000
ENTER STARTING TIME, ENDING TIME : 0 5

ACTIVITY? RELY R1
1 RELAY RECORDS ACCEPTED.

ACTIVITY? PTYP XY
X-Y PLOT FORMAT SELECTED.

ACTIVITY? SLCT
ENTER "X" CHANNEL NUMBER (0 TO EXIT): 38
CHANNEL 38 [R 201- 204] MIN = 0.0, MAX = 0.0
ENTER CMIN, CMAX (OR 'R' TO RE-SELECT CHANNEL): -.2 .3
ENTER "Y" CHANNEL NUMBER (0 TO EXIT): 39
CHANNEL 39 [X 201- 204] MIN = 0.0, MAX = 0.0
ENTER CMIN, CMAX (OR 'R' TO RE-SELECT CHANNEL): -.2 .3
ENTER RELAY ID (0 FOR NONE): R1
DISTR1 RELAY SELECTED TO OVERLAY PLOT.

ACTIVITY? PLOT
ENTER 25 CHARACTER LABEL :
************************
: EXAMPLE 4
SUPPORTED PLOTTING DEVICES ARE:
0 = NONE 2 = HP 7221A
3 = TEKTRONIX 4010 4 = TEKTRONIX 4014
5 = TEKTRONIX 4014 W/EGM 6 = TEKTRONIX 4662
7 = TEKTRONIX 4663 15 = APOLLO - FRAME WINDOW
16 = APOLLO - BORROW MODE 17 = TEKTRONIX 4105/04/06
18 = TEKTRONIX 4107/09 20 = TEKTRONIX 4112
```

```
21 = TEKTRONIX 4113 22 = TEKTRONIX 4114
23 = TEKTRONIX 4115/4125 27 = HP 7470A
28 = HP 7475A 31 = QMS LASERGRAFIX
33 = TEKTRONIX 4111 34 = APOLLO - DIRECT WINDOW
35 = APOLLO - BITMAP FILE 36 = IMAGEN
37 = TEKTRONIX 41XX FILE 38 = HP-GL FILE
40 = TEKTRONIX 4010/4014 FILE 41 = POSTSCRIPT
99 = INDE. PLOT FILE
ENTER DESIRED PLOTTING DEVICE: 41

ACTIVITY? STOP

ENTER NUMBER OF COPIES (0 TO 5), DEVICE NAME FOR PS DEVICE: 0
YOUR PLOT FILE HAS BEEN SAVED AS PSPL004
```

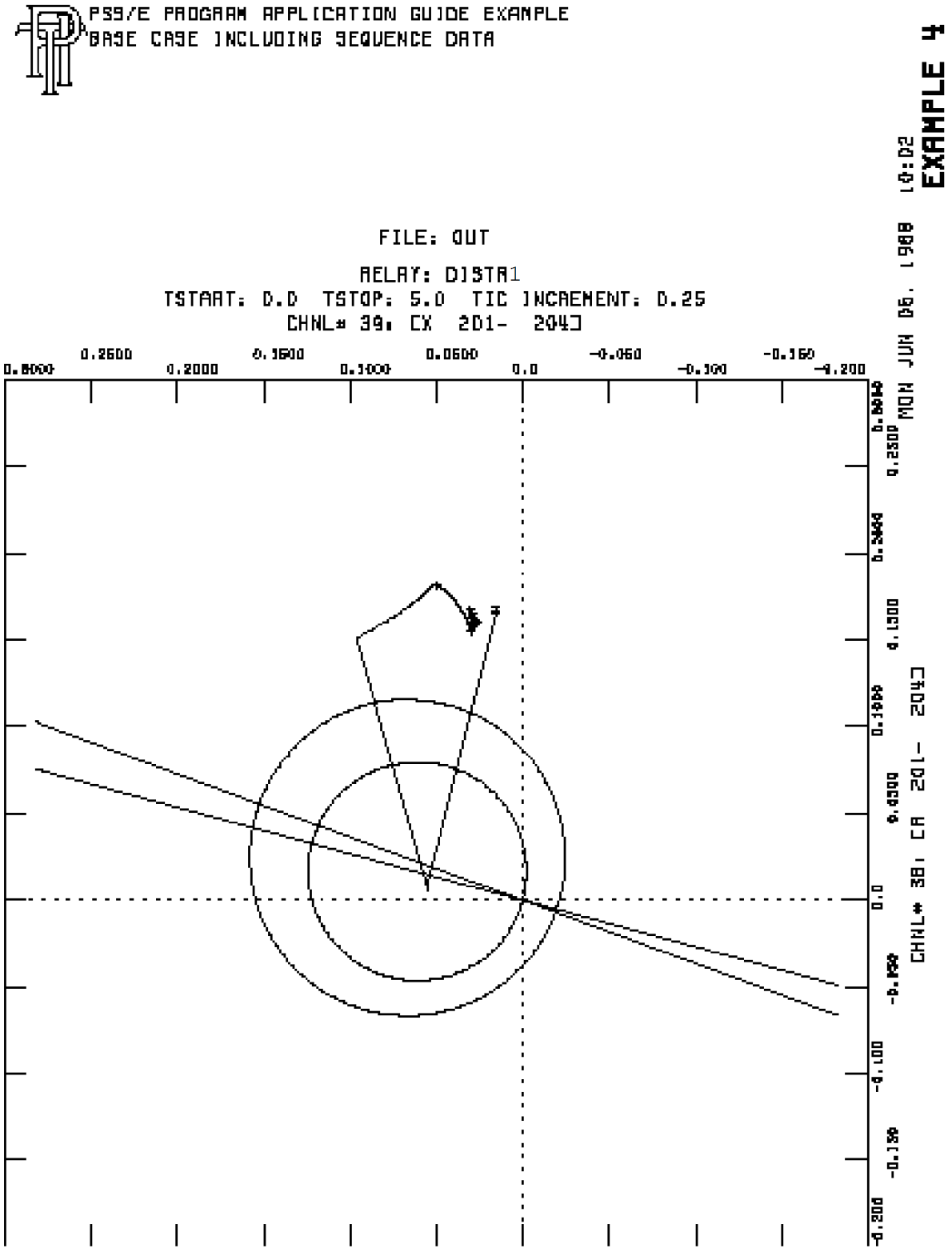


Figure 6.4. Example 4 Plot

6.5. Example 5

Generate an X-Y plot from two different plot files. DISTR1 relay characteristics are superimposed.

```
$ PSSPLT
POWER TECHNOLOGIES INCORPORATED
CHANNEL OUTPUT FILE PLOTTING PROGRAM -- PSSPLT-17.0
INITIATED ON MON JUN 06, 1988 10:03

ACTIVITY? MCHN
ENTER PLOT DATA FILE NO. 1 (-1 TO EXIT): OUT1
ENTER PLOT DATA FILE NO. 2 (-1 TO EXIT): OUT3
ENTER PLOT DATA FILE NO. 3 (-1 TO EXIT): -1

ACTIVITY? TINT
CURRENT VALUE FOR TSTART = -999.0000, TSTOP = 999.0000
ENTER STARTING TIME, ENDING TIME : 0 5

ACTIVITY? PTYP XY
X-Y PLOT FORMAT SELECTED.

ACTIVITY? RELY R1
1 RELAY RECORDS ACCEPTED.

ACTIVITY? SLCT
ENTER "X" CHANNEL NUMBER (0 TO EXIT): 38
CHANNEL 38 [R 201- 204] MIN = 0.0, MAX = 0.0
ENTER CMIN, CMAX (OR 'R' TO RE-SELECT CHANNEL): -.2 .3
ENTER "Y" CHANNEL NUMBER (0 TO EXIT): 39
CHANNEL 39 [X 201- 204] MIN = 0.0, MAX = 0.0
ENTER CMIN, CMAX (OR 'R' TO RE-SELECT CHANNEL): -.2 .3
ENTER RELAY ID (0 FOR NONE): R1
DISTR1 RELAY SELECTED TO OVERLAY PLOT.

ACTIVITY? PLOT
ENTER 25 CHARACTER LABEL :
************************
: EXAMPLE 5
SUPPORTED PLOTTING DEVICES ARE:
0 = NONE 2 = HP 7221A
3 = TEKTRONIX 4010 4 = TEKTRONIX 4014
5 = TEKTRONIX 4014 W/EGM 6 = TEKTRONIX 4662
7 = TEKTRONIX 4663 15 = APOLLO - FRAME WINDOW
16 = APOLLO - BORROW MODE 17 = TEKTRONIX 4105/04/06
```

```
18 = TEKTRONIX 4107/09 20 = TEKTRONIX 4112
21 = TEKTRONIX 4113 22 = TEKTRONIX 4114
23 = TEKTRONIX 4115/4125 27 = HP 7470A
28 = HP 7475A 31 = QMS LASERGRAFIX
33 = TEKTRONIX 4111 34 = APOLLO - DIRECT WINDOW
35 = APOLLO - BITMAP FILE 36 = IMAGEN
37 = TEKTRONIX 41XX FILE 38 = HP-GL FILE
40 = TEKTRONIX 4010/4014 FILE 41 = POSTSCRIPT
99 = INDE. PLOT FILE
ENTER DESIRED PLOTTING DEVICE: 41

ACTIVITY? STOP

ENTER NUMBER OF COPIES (0 TO 5), DEVICE NAME FOR PS DEVICE: 0
YOUR PLOT FILE HAS BEEN SAVED AS PSPL005
```

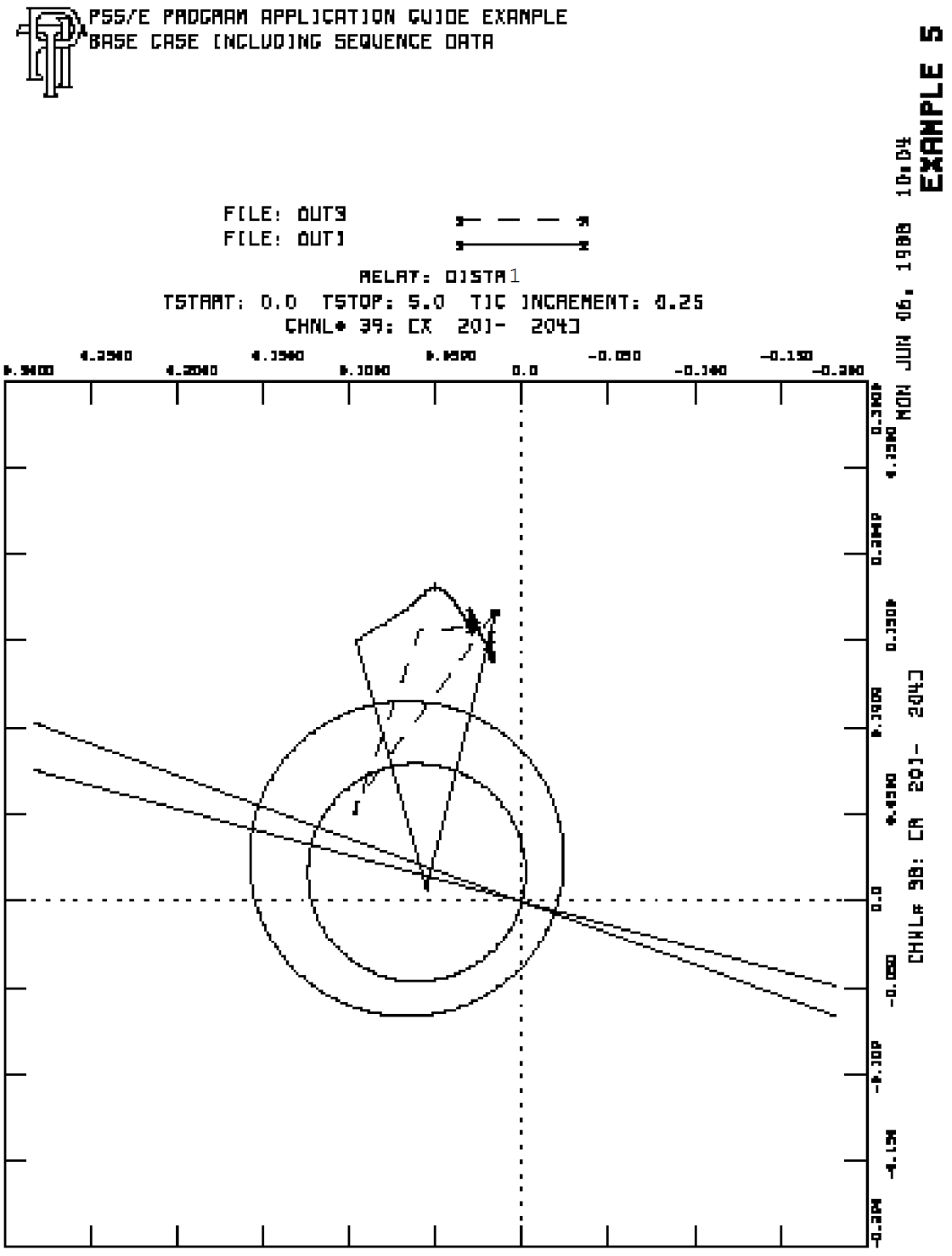


Figure 6.5. Example 5 Plot

6.6. Example 6

Generate an FFT plot. Channels 1, 2, and 3 are plotted followed by the composite of the 3 channels. The Hanning function is performed on channel 4 and plotted. The FFT is performed on channel 4, the composite, and a new frequency range is selected for the FFT plot.

```
$ pssplt
POWER TECHNOLOGIES INCORPORATED
CHANNEL OUTPUT FILE PLOTTING PROGRAM -- PSSPLT-18.0
INITIATED ON MON APR 24, 1989 09:03
ACTIVITY? chnf fft
FFT TEST CASE
1HZ + 3HZ + 5HZ
ACTIVITY? rang
OPTIONS ARE
0 - NO MORE 1 - GENERATE ACTUAL & ADJUSTED SCALES
2 - WRITE SCALE FILE 3 - READ SCALE FILE
4 - DISPLAY SCALES 5 - OVERRIDE SCALES
6 - GENERATE ACTUAL SCALES 7 - READ DYPRN4 FILE
8 - GENERATE SCALED ACTUAL SCALES
SELECT DESIRED OPTION: 1
OPTIONS ARE
0 - NO MORE 1 - GENERATE ACTUAL & ADJUSTED SCALES
2 - WRITE SCALE FILE 3 - READ SCALE FILE
4 - DISPLAY SCALES 5 - OVERRIDE SCALES
6 - GENERATE ACTUAL SCALES 7 - READ DYPRN4 FILE
8 - GENERATE SCALED ACTUAL SCALES
SELECT DESIRED OPTION:
ACTIVITY? tint
CURRENT VALUE FOR TSTART = 0.0000, TSTOP = 9.0000
ENTER STARTING TIME, ENDING TIME : 0 5
ACTIVITY? slct
ENTER CHANNEL NUMBER (0 FOR NO MORE): 1
CHANNEL 1 [FUNDAMENTAL ] ACTUAL MIN = -1.000 MAX = 1.000
CMINA = -3.500 CMAXA = 1.500
ENTER CMIN, CMAX (OR 'R' TO RE-SELECT CHANNEL): -8 2
ENTER CHANNEL NUMBER (0 FOR NO MORE): 2
CHANNEL 2 [THIRD ] ACTUAL MIN = -1.000 MAX = 1.000
CMINA = -3.500 CMAXA = 1.500
ENTER CMIN, CMAX (OR 'R' TO RE-SELECT CHANNEL): -5 5
```

```
ENTER CHANNEL NUMBER (0 FOR NO MORE): 3
CHANNEL 3 [FIFTH ] ACTUAL MIN = -1.000 MAX = 1.000
CMINA = -3.500 CMAXA = 1.500
ENTER CMIN, CMAX (OR 'R' TO RE-SELECT CHANNEL): -2 8
ENTER CHANNEL NUMBER (0 FOR NO MORE):
ACTIVITY? plot
ENTER 25 CHARACTER LABEL :
************************
: example 6
SUPPORTED PLOTTING DEVICES ARE:
0 = NONE 2 = HP 7221A
3 = TEKTRONIX 4010 4 = TEKTRONIX 4014
5 = TEKTRONIX 4014 W/EGM 6 = TEKTRONIX 4662
7 = TEKTRONIX 4663 10 = CALCOMP
15 = APOLLO - FRAME WINDOW 16 = APOLLO - BORROW MODE
17 = TEKTRONIX 4105/04/06 18 = TEKTRONIX 4107/09
20 = TEKTRONIX 4112 21 = TEKTRONIX 4113
22 = TEKTRONIX 4114 23 = TEKTRONIX 4115/4125
27 = HP 7470A 28 = HP 7475A
31 = QMS LASERGRAFIX 33 = TEKTRONIX 4111
34 = APOLLO - DIRECT WINDOW 35 = APOLLO - BITMAP FILE
37 = TEKTRONIX 41XX FILE 38 = HP-GL FILE
40 = TEKTRONIX 4010/4014 FILE 41 = POSTSCRIPT
99 = INDE. PLOT FILE
ENTER DESIRED PLOTTING DEVICE: 41
ACTIVITY? slct
ENTER CHANNEL NUMBER (0 FOR NO MORE): 4
CHANNEL 4 [COMPOSITE ] ACTUAL MIN = -3.000 MAX = 3.000
CMINA = -13.00 CMAXA = 7.000
ENTER CMIN, CMAX (OR 'R' TO RE-SELECT CHANNEL): -5 5
ENTER CHANNEL NUMBER (0 FOR NO MORE):
ACTIVITY? plot
ENTER 25 CHARACTER LABEL :
************************
: example 6
ACTIVITY? pty,fft
FAST FOURIER PLOT FORMAT SELECTED.
PRESENT OPTION SETTINGS ARE:
1=PERFORM FFT FUNCTION.....YES
2=PERFORM DC FUNCTION.....NO
```

```
3=PERFORM HANNING FUNCTION.........NO
4=NUMBER OF SKIPPED TIME STEPS.....00
ENTER CODE OF OPTION TO BE CHANGED: 3

DEFAULT HANNING FUNCTION OPTION IS NO
ENTER <CR> TO TOGGLE, 0 FOR NO FUNCTION , 1 FOR HANNING FUNCTION:
PRESENT OPTION SETTINGS ARE:
1=PERFORM FFT FUNCTION............YES
2=PERFORM DC FUNCTION..............NO
3=PERFORM HANNING FUNCTION........YES
4=NUMBER OF SKIPPED TIME STEPS.....00
ENTER CODE OF OPTION TO BE CHANGED: 1

DEFAULT FFT FUNCTION OPTION IS YES
ENTER <CR> TO TOGGLE, 0 FOR FFT FUNCTION 1 FOR NO FUNCTION:
PRESENT OPTION SETTINGS ARE:
1=PERFORM FFT FUNCTION.............NO
2=PERFORM DC FUNCTION..............NO
3=PERFORM HANNING FUNCTION........YES
4=NUMBER OF SKIPPED TIME STEPS.....00
ENTER CODE OF OPTION TO BE CHANGED: P

The channel file has 601 data points from TSTART= 0.0000
TSTOP= 5.0000
Giving a 1024 point FFT...

ACTIVITY? popt

PRESENT OPTION SETTINGS ARE:
1=GRAPHICS OUTPUT DEVICE.............41 2=PLOT LINE TYPE...PATTERN+SYMBOLS
3=COLOR OPTION...................COLORS 4=MAXIMUM PLOTS.................6
5=NUMBER OF TIME INTERVALS...........10 6=TIC MARK DELTA............ 0.250
7=RELAY CLIP BOUNDARY............ 0.250 8=LINE PRINTER PLOT WIDTH......100
9=GRID LINES OPTION.................0 10=CRT REPLOT OPTION.............ON
11=TIME AXISANNOT.................TIME 12=MIN & MAX CALCULATION.....APPROX
13=FUNCTION DELIMITER OPTION.........[] 14=PRINT CHANNEL #S FROM SLCT...YES
15=PLOTS PER PAGE.....................1 16=DELTA TIME INTERVAL... 0.0000
17=FILE OVERWRITE OPTION............YES 18=CHANGE PLOT TITLES............NO
LINES PER PAGE:
19=FILE OUTPUT.......................60 20=CRT TERMINAL.................24
21=PRINTER-1.........................58 22=PRINTER-2.....................60
ENTER CODE OF OPTION TO BE CHANGED: 12

DEFAULT MIN & MAX CALCULATION IS APPROX
ENTER <CR> TO TOGGLE, 0 APPROXIMATE, 1 FOR ACTUAL:

PRESENT OPTION SETTINGS ARE:
1=GRAPHICS OUTPUT DEVICE.............41 2=PLOT LINE TYPE...PATTERN+SYMBOLS
```

```
3=COLOR OPTION.................COLORS 4=MAXIMUM PLOTS.................6
5=NUMBER OF TIME INTERVALS.........10 6=TIC MARK DELTA..... 0.250
7=RELAY CLIP BOUNDARY..... 0.250 8=LINE PRINTER PLOT WIDTH......100
9=GRID LINES OPTION.................0 10=CRT REPLOT OPTION.............ON
11=TIME AXIS ANNOT.................TIME 12=MIN & MAX CALCULATION.....ACTUAL
13=FUNCTION DELIMITER OPTION........[ ] 14=PRINT CHANNEL #S FROM SLCT...YES
15=PLOTS PER PAGE.....................1 16=DELTA TIME INTERVAL... 0.0000
17=FILE OVERWRITE OPTION............YES 18=CHANGE PLOT TITLES............NO
LINES PER PAGE:
19=FILE OUTPUT.....................60 20=CRT TERMINAL.................24
21=PRINTER-1.......................58 22=PRINTER-2.....................60
ENTER CODE OF OPTION TO BE CHANGED:

ACTIVITY? slct

FUNCTION = HANNING FUNCTION

ENTER 1 CHANNEL NUMBERS (0 FOR NO MORE): 4

CHNL# 4: HANNING FUNCTION
CMIN = -3.000 CMAX = 2.711
ENTER CMIN, CMAX (OR 'R' TO RE-SELECT CHANNEL): -5 5

ACTIVITY? plot

ENTER 25 CHARACTER LABEL :
*************************
: example 6

ACTIVITY? pty,fft

FAST FOURIER PLOT FORMAT SELECTED.

PRESENT OPTION SETTINGS ARE:
1=PERFORM DC FUNCTION..............NO 2=PERFORM HANNING FUNCTION........YES
3=PERFORM FFT FUNCTION.............NO 4=NUMBER OF SKIPPED TIME STEPS....0
ENTER CODE OF OPTION TO BE CHANGED: 2

DEFAULT HANNING FUNCTION OPTION IS YES
ENTER <CR> TO TOGGLE, 0 FOR NO FUNCTION , 1 FOR HANNING FUNCTION:
PRESENT OPTION SETTINGS ARE:
1=PERFORM DC FUNCTION..............NO 2=PERFORM HANNING FUNCTION........NO
3=PERFORM FFT FUNCTION.............NO 4=NUMBER OF SKIPPED TIME STEPS... 0
ENTER CODE OF OPTION TO BE CHANGED: 3

DEFAULT FFT FUNCTION OPTION IS NO
ENTER <CR> TO TOGGLE, 0 FOR FFT FUNCTION 1 FOR NO FUNCTION:
PRESENT OPTION SETTINGS ARE:
1=PERFORM DC FUNCTION..............NO 2=PERFORM HANNING FUNCTION........NO
3=PERFORM FFT FUNCTION.............YES 4=NUMBER OF SKIPPED TIME STEPS... 0
ENTER CODE OF OPTION TO BE CHANGED:
```

```
The channel file has 601 data points from TSTART= 0.0000
STOP= 5.0000
Giving a 1024 point FFT...
ACTIVITY? popt
PRESENT OPTION SETTINGS ARE:
1=GRAPHICS OUTPUT DEVICE.............41 2=PLOT LINE TYPE...PATTERN+SYMBOLS
3=COLOR OPTION...................COLORS 4=MAXIMUM PLOTS.................6
5=NUMBER OF TIME INTERVALS...........10 6=TIC MARK DELTA............ 0.250
7=RELAY CLIP BOUNDARY............ 0.250 8=LINE PRINTER PLOT WIDTH......100
9=GRID LINES OPTION...................0 10=CRT REPLOT OPTION.............ON
11=TIME AXIS ANNOT.................TIME 12=MIN & MAX CALCULATION.....ACTUAL
13=FUNCTION DELIMITER OPTION.........[ ] 14=PRINT CHANNEL #S FROM SLCT...YES
15=PLOTS PER PAGE.....................1 16=DELTA TIME INTERVAL... 0.0000
17=FILE OVERWRITE OPTION.............YES 18=CHANGE PLOT TITLES............NO
LINES PER PAGE:
19=FILE OUTPUT.......................60 20=CRT TERMINAL.................24
21=PRINTER-1.........................58 22=PRINTER-2.....................60
ENTER CODE OF OPTION TO BE CHANGED: 11
DEFAULT TIME AXIS ANNOTATIONS IS TIME
ENTER DESIRED TIME AXIS ANNOTATION: FREQUENCY (HZ)
PRESENT OPTION SETTINGS ARE:
1=GRAPHICS OUTPUT DEVICE.............41 2=PLOT LINE TYPE...PATTERN+SYMBOLS
3=COLOR OPTION...................COLORS 4=MAXIMUM PLOTS.................6
5=NUMBER OF TIME INTERVALS...........10 6=TIC MARK DELTA............ 0.250
7=RELAY CLIP BOUNDARY............ 0.250 8=LINE PRINTER PLOT WIDTH......100
9=GRID LINES OPTION...................0 10=CRT REPLOT OPTION.............ON
11=TIME AXIS ANNOT........FREQUENCY (HZ) 12=MIN & MAX CALCULATION.....ACTUAL
13=FUNCTION DELIMITER OPTION.........[ ] 14=PRINT CHANNEL #S FROM SLCT...YES
15=PLOTS PER PAGE.....................1 16=DELTA TIME INTERVAL... 0.0000
17=FILE OVERWRITE OPTION.............YES 18=CHANGE PLOT TITLES............NO
LINES PER PAGE:
19=FILE OUTPUT.......................60 20=CRT TERMINAL.................24
21=PRINTER-1.........................58 22=PRINTER-2.....................60
ENTER CODE OF OPTION TO BE CHANGED:
ACTIVITY? slct
FUNCTION = MAG. OF FAST FOURIER
ENTER 1 CHANNEL NUMBERS (0 FOR NO MORE): 4
CHNL# 4: MAG. OF FAST FOURIER
CMIN = 0.5662E-06 CMAX = 0.9994
ENTER CMIN, CMAX (OR 'R' TO RE-SELECT CHANNEL): 0 2
```

```
CHNL# 4: PHASE OF FAST FOURIER
CMIN = -179.9 CMAX = 180.0
ENTER CMIN, CMAX (OR 'R' TO RE-SELECT CHANNEL): -900 270
ACTIVITY? plot
CURRENT VALUE FOR FSTART = 0.0000, FSTOP = 102.4000
ENTER STARTING FREQUENCY (HZ), ENDING FREQUENCY (HZ) : 0 10
ENTER 25 CHARACTER LABEL :
************************
: example 6
ACTIVITY? stop
ENTER NUMBER OF COPIES (0 TO 5), DEVICE NAME FOR PS DEVICE: 0
YOUR PLOT FILE HAS BEEN SAVED AS PSPL001
```

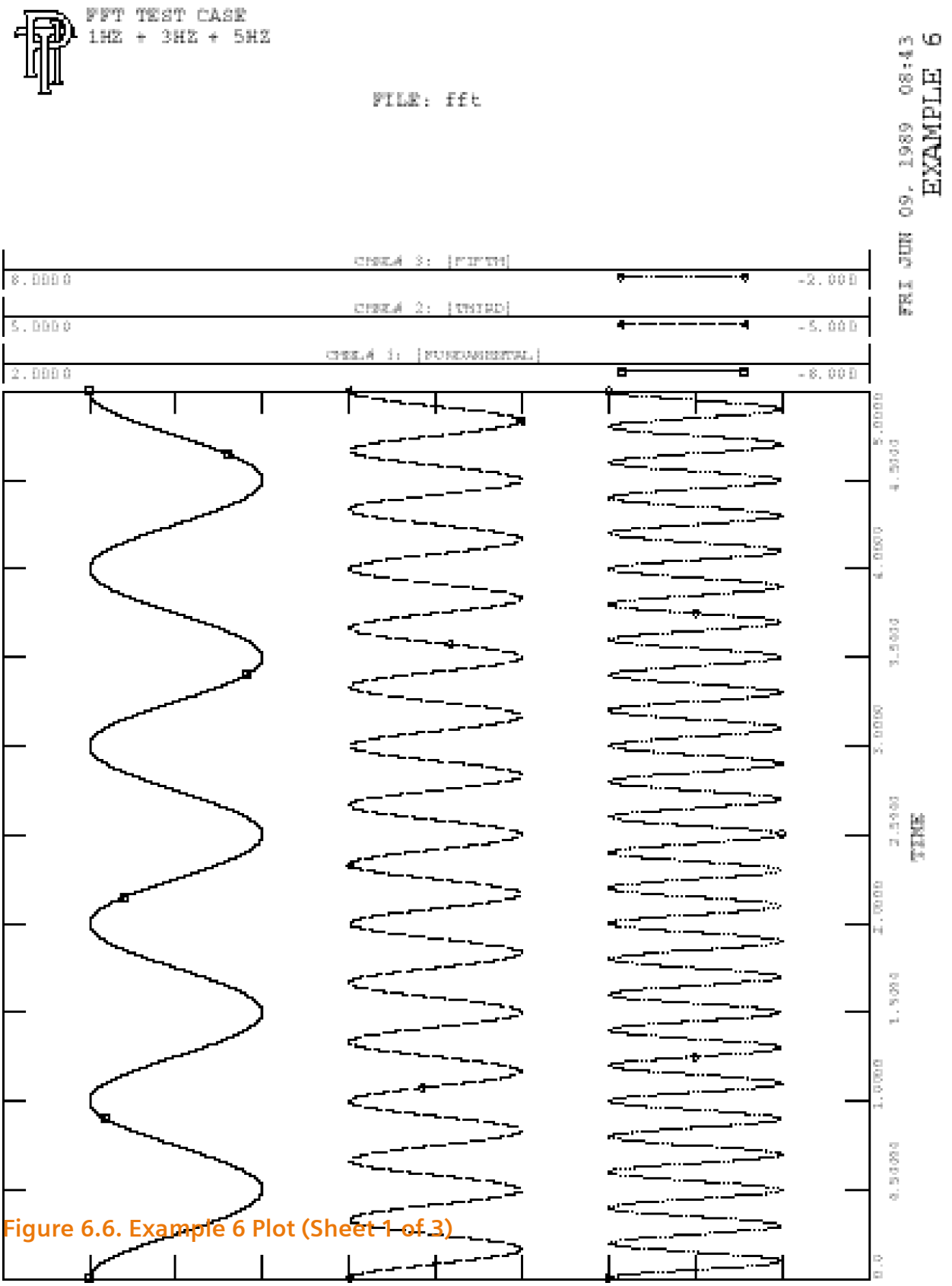


Figure 6.6. Example 6 Plot (Sheet 1 of 3)

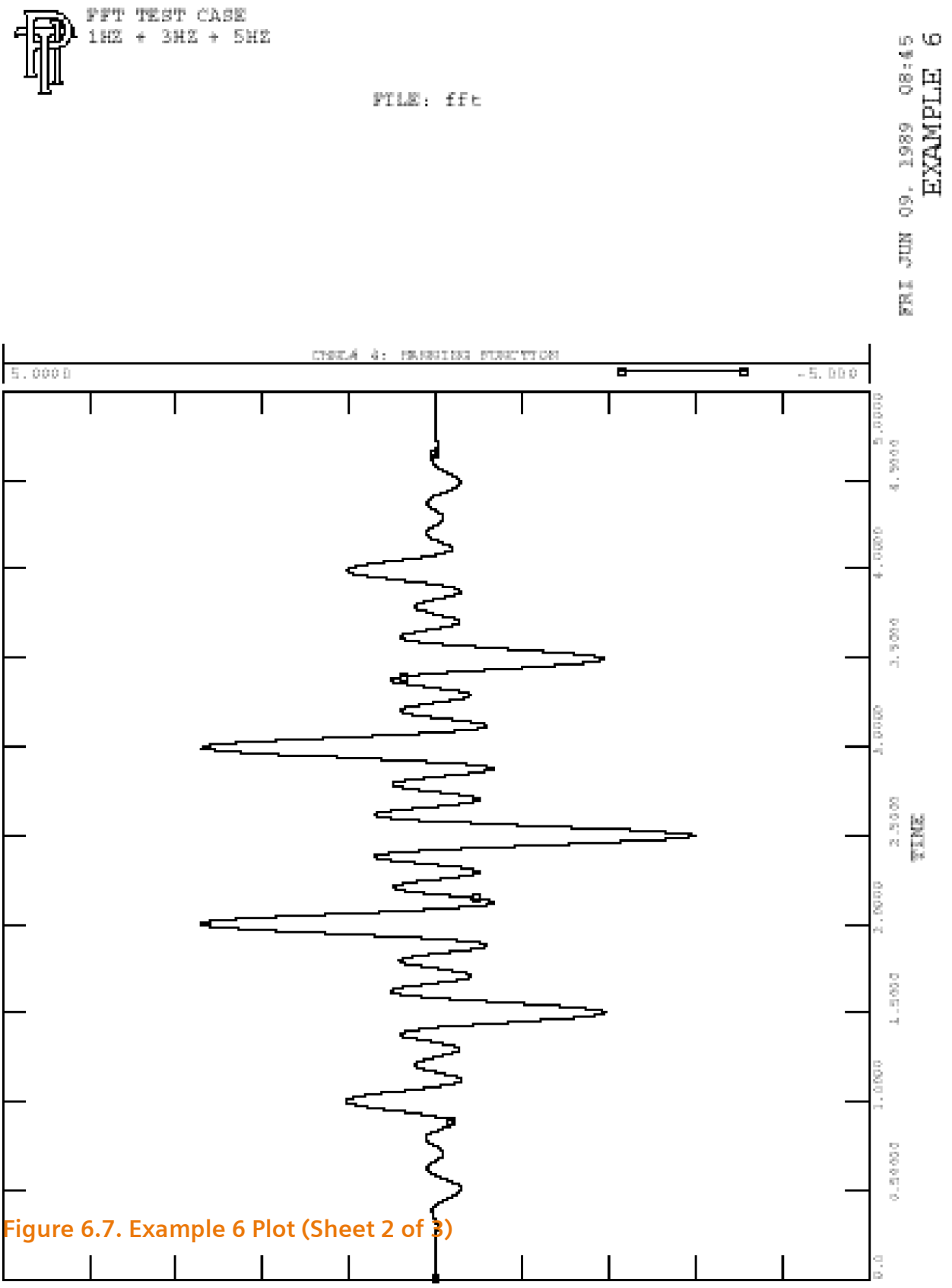


Figure 6.7. Example 6 Plot (Sheet 2 of 3)

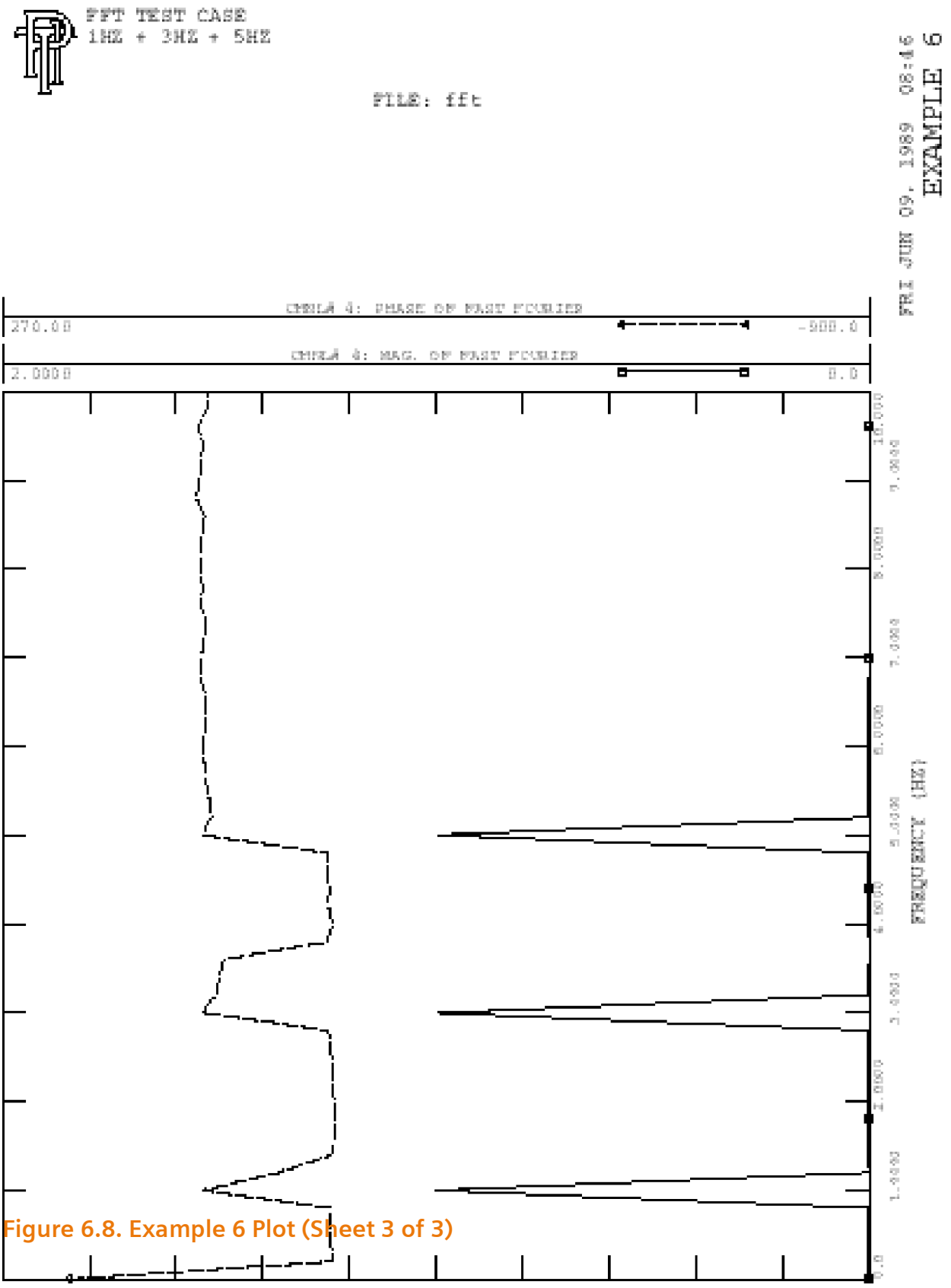


Figure 6.8. Example 6 Plot (Sheet 3 of 3)

6.7. Example 7

Generate log and semi-log plots. The first is a plot of the LOG(X) versus LOG(Y). The second is a plot of the LOG(X) versus Y.

```
$ pssplt
POWER TECHNOLOGIES INCORPORATED
CHANNEL OUTPUT FILE PLOTTING PROGRAM -- PSSPLT-18.0
INITIATED ON THU MAY 25, 1989 11:08
ACTIVITY? chnf cheb.out
LOG PLOT EXAMPLE
4TH ORDER CHEBYSHEV FILTER
ACTIVITY? ptyp,log
OPTIONS ARE:
1 - LOG(X) VS LOG(Y)
2 - LOG(TIME) VS LOG(Y)
ENTER LOG TYPE (0 TO EXIT): 1
LOG(X) VS LOG(Y) PLOT FORMAT SELECTED.
ACTIVITY? rang
OPTIONS ARE
0 - NO MORE 1 - GENERATE ACTUAL & ADJUSTED SCALES
2 - WRITE SCALE FILE 3 - READ SCALE FILE
4 - DISPLAY SCALES 5 - OVERRIDE SCALES
6 - GENERATE ACTUAL SCALES 7 - READ DYPRN4 FILE
8 - GENERATE COMMON SCALE
SELECT DESIRED OPTION: 1
OPTIONS ARE
0 - NO MORE 1 - GENERATE ACTUAL & ADJUSTED SCALES
2 - WRITE SCALE FILE 3 - READ SCALE FILE
4 - DISPLAY SCALES 5 - OVERRIDE SCALES
6 - GENERATE ACTUAL SCALES 7 - READ DYPRN4 FILE
8 - GENERATE COMMON SCALE
SELECT DESIRED OPTION:
ACTIVITY? popt
PRESENT OPTION SETTINGS ARE:
1=GRAPHICS OUTPUT DEVICE..... 0 2=PLOT LINE TYPE...PATTERN+SYMBOLS
3=COLOR OPTION.....COLORS 4=MAXIMUM PLOTS.....6
5=NUMBER OF TIME INTERVALS.....10 6=TIC MARK DELTA..... 0.250
7=RELAY CLIP BOUNDARY..... 0.250 8=LINE PRINTER PLOT WIDTH.....100
9=GRID LINES OPTION.....0 10=CRT REPLOT OPTION.....ON
```

```
11=TIME AXIS ANNOT.................TIME 12=MIN & MAX CALCULATION.....APPROX
13=FUNCTION DELIMITER OPTION.........[ ] 14=PRINT CHANNEL #S FROM SLCT...YES
15=PLOTS PER PAGE.....................1 16=DELTA TIME INTERVAL... 0.0000
17=FILE OVERWRITE OPTION.............YES 18=CHANGE PLOT TITLES............NO
LINES PER PAGE:
19=FILE OUTPUT.......................60 20=CRT TERMINAL.................24
21=PRINTER-1.........................58 22=PRINTER-2.....................60
ENTER CODE OF OPTION TO BE CHANGED: 9

DEFAULT GRID LINE OPTIONS IS 0
ENTER 0 FOR NONE, 1 FOR THICK GRID LINES, 2 FOR MED , 3 FOR LIGHT: 3

PRESENT OPTION SETTINGS ARE:
1=GRAPHICS OUTPUT DEVICE.............. 0 2=PLOT LINE TYPE...PATTERN+SYMBOLS
3=COLOR OPTION...................COLORS 4=MAXIMUM PLOTS.................6
5=NUMBER OF TIME INTERVALS...........10 6=TIC MARK DELTA............ 0.250
7=RELAY CLIP BOUNDARY............ 0.250 8=LINE PRINTER PLOT WIDTH......100
9=GRID LINES OPTION..................3 10=CRT REPLOT OPTION.............ON
11=TIME AXIS ANNOT.................TIME 12=MIN & MAX CALCULATION.....APPROX
13=FUNCTION DELIMITER OPTION.........[ ] 14=PRINT CHANNEL #S FROM SLCT...YES
15=PLOTS PER PAGE.....................1 16=DELTA TIME INTERVAL... 0.0000
17=FILE OVERWRITE OPTION.............YES 18=CHANGE PLOT TITLES............NO
LINES PER PAGE:
19=FILE OUTPUT.......................60 20=CRT TERMINAL.................24
21=PRINTER-1.........................58 22=PRINTER-2.....................60
ENTER CODE OF OPTION TO BE CHANGED:

ACTIVITY? slct

ENTER "X" CHANNEL NUMBER (0 TO EXIT): 1
CHANNEL 1 [FREQUENCY ] ACTUAL MIN = 4.000 MAX = 0.4000E+05
CMINA = -0.5000E+05 CMAXA = 0.5000E+05
ENTER CMIN, CMAX AS A POWER OF 10 (OR 'R' TO RE-SELECT CHANNEL): 1 100000

ENTER "Y" CHANNEL NUMBER (0 TO EXIT): 2
CHANNEL 2 [4-40000 ] ACTUAL MIN = 0.2225E-02 MAX = 1.000
CMINA = 0.0000 CMAXA = 2.000
ENTER CMIN, CMAX AS A POWER OF 10 (OR 'R' TO RE-SELECT CHANNEL): .001 10

ACTIVITY? plot

ENTER 25 CHARACTER LABEL :
*************************
: example 7

SUPPORTED PLOTTING DEVICES ARE:
0 = NONE 2 = HP 7221A
3 = TEKTRONIX 4010 4 = TEKTRONIX 4014
```

```
5 = TEKTRONIX 4014 W/EGM 6 = TEKTRONIX 4662
7 = TEKTRONIX 4663 10 = CALCOMP
15 = APOLLO - FRAME WINDOW 16 = APOLLO - BORROW MODE
17 = TEKTRONIX 4105/04/06 18 = TEKTRONIX 4107/09
20 = TEKTRONIX 4112 21 = TEKTRONIX 4113
22 = TEKTRONIX 4114 23 = TEKTRONIX 4115/4125
27 = HP 7470A 28 = HP 7475A
31 = QMS LASERGRAFIX 33 = TEKTRONIX 4111
34 = APOLLO - DIRECT WINDOW 35 = APOLLO - BITMAP FILE
37 = TEKTRONIX 41XX FILE 38 = HP-GL FILE
40 = TEKTRONIX 4010/4014 FILE 41 = POSTSCRIPT
99 = INDE. PLOT FILE
ENTER DESIRED PLOTTING DEVICE: 41

ACTIVITY? ptyp,slog

OPTIONS ARE:
1 - LOG(X) VS Y
2 - LOG(TIME) VS Y
3 - TIME VS LOG(Y)
ENTER SEMI-LOG TYPE (0 TO EXIT): 1

LOG(X) VS Y PLOT FORMAT SELECTED.

ACTIVITY? slct

ENTER "X" CHANNEL NUMBER (0 TO EXIT): 1
CHANNEL 1 [FREQUENCY ] ACTUAL MIN = 4.000 MAX = 0.4000E+05
CMINA = 1.000 CMAXA = 0.1000E+06
ENTER CMIN, CMAX AS A POWER OF 10 (OR 'R' TO RE-SELECT CHANNEL):

ENTER "Y" CHANNEL NUMBER (0 TO EXIT): 2
CHANNEL 2 [4-40000 ] ACTUAL MIN = 0.2225E-02 MAX = 1.000
CMINA = 0.1000E-02 CMAXA = 10.00
ENTER CMIN, CMAX (OR 'R' TO RE-SELECT CHANNEL): 0 2

ACTIVITY? plot

ENTER 25 CHARACTER LABEL :
*************************
: example 7

ACTIVITY? stop

ENTER NUMBER OF COPIES (0 TO 5), DEVICE NAME FOR PS DEVICE: 0
YOUR PLOT FILE HAS BEEN SAVED AS PSPL002
```

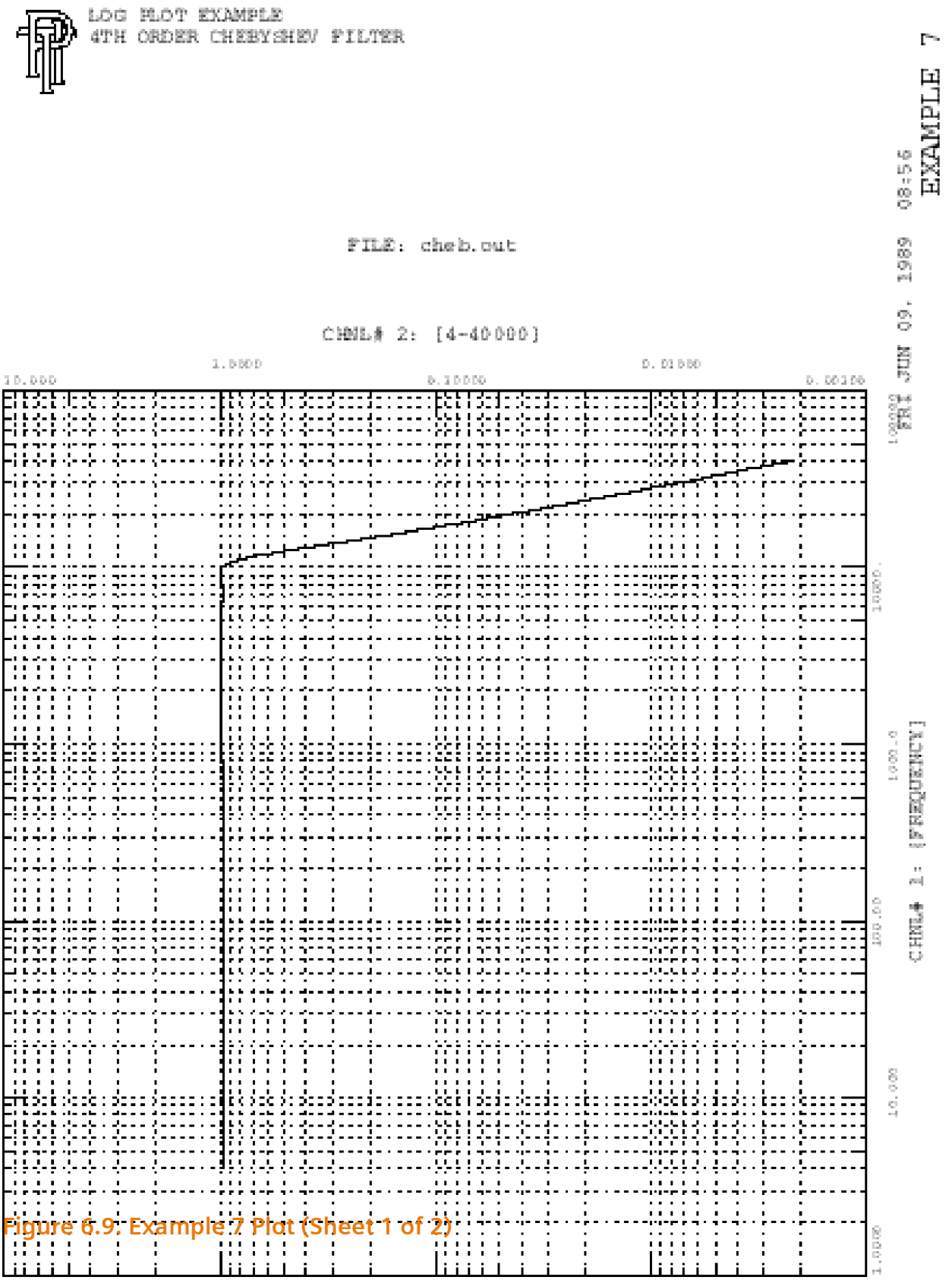


Figure 6.9: Example 7 Plot (Sheet 1 of 2)

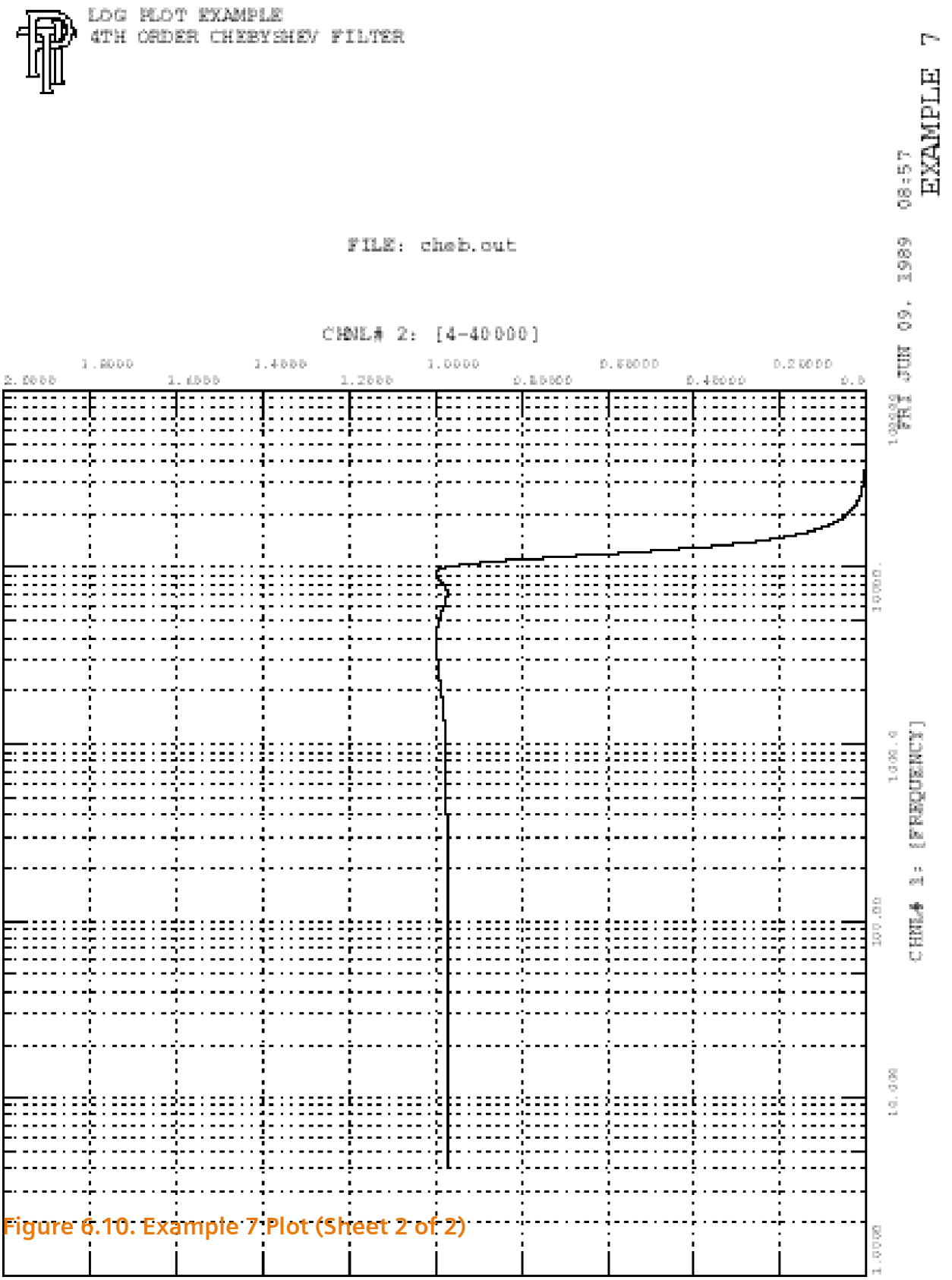


Figure 6.10: Example 7 Plot (Sheet 2 of 2)

Chapter 7
Appendix A - Alphabetical Summary of PSSPLT Activities

7.1. CATA

Activity:

CATA CATA,string

Function:

Activity CATA, section 5.1 tabulates an alphabetical listing of files contained in the current directory. When no suffix is specified in invoking activity CATA, a listing of all files is printed.

Otherwise, "string" is treated as a partial file name specification and all files in the directory whose filename appropriately contains "string" are listed. "String" may contain imbedded asterisks, which are treated as "wild" characters matching zero, one or more characters. For example, specifying the suffix *.SAV in selecting activity CATA will produce a tabulation of all files whose names end with the string ".SAV". Similarly, specifying the suffix CASE1 results in a listing of all files whose names start with the string "CASE1".

Interrupt control codes:

None

Prerequisite:

None

7.2. CHID

Activity:

CHID

Function:

Activity CHID, section 4.20 allows the user to change channel identifiers.

Interrupt control codes:

None

Prerequisite:

A valid plot file must have been previously selected.

7.3. CHNF

Activity:

CHNF CHNF,filename

Function:

Activity CHNF, section 4.1 allows the user to select a plot file to be used. If another plot file had been previously selected, that file is automatically closed.

Interrupt control codes:

None

Prerequisite:

None

7.4. CLOS

Activity:

CLOS

Function:

Activity CLOS, section 5.12 terminates output to the previous selection specified to activity OPEN, section 5.11, and returns to the operating mode in which each output reporting activity requests the user to select the destination for its report.

Interrupt control codes:

None

Prerequisite:

None

7.5. CLSP

Activity:

CLSP

Function:

Activity CLSP, section 4.15 allows the user to close a plotting job without exiting PSSPLT. The normal end of plotting information, such as number of copies and queue or device name, is requested. Activity CLSP is automatically called when activity STOP, section 5.8 is executed. Activity CLSP has no effect if the plots are being directed only to the user's graphics CRT.

Interrupt control codes:

None

Prerequisite:

A plot must have been initiated.

7.6. CRLY

Activity:

CRLY

Function:

Activity CRLY, section 4.19 is used to change the relay data characteristics. The user is able to first list the relays and then choose a relay to alter its characteristics.

Interrupt control codes:

None

Prerequisite:

A valid relay data file must have been previously selected.

7.7. ECHO

Activity:

ECHO ECHO,filename

Function:

Activity ECHO, section 5.2 is used to control the recording of the user's portion of part or all of an interactive work session.

When a filename is specified as a suffix when invoking activity ECHO, subsequent user dialogue input is copied to the designated file. This results in a Response File that may be specified to activity IDEV, section 5.4 at a later time to reproduce the series of user responses.

When no file name is appended to the ECHO activity command, output to the previously specified ECHO file is terminated.

Interrupt control codes:

None

Prerequisite:

None

7.8. FUNC

Activity:

FUNC

Function:

Activity FUNC, section 4.11 allows the user to specify a function to be applied to the plot channels selected for subsequent time plots, X-Y or X-M plots.

Interrupt control codes:

None

Prerequisite:

None

7.9. HELP

Activity:

HELP HELP,activity name HELP,ALL HELP,PL HELP,MS HELP,NEW

Function:

Activity HELP, section 5.3 tabulates a brief summary description of the PSSPLT activity that is specified as a suffix in invoking activity HELP.

When invoked with one of the other optional suffixes, activity HELP, section 5.3 tabulates a listing of activities as follows:

ALL

All PSSPLT activities by type of function performed.

PL

Only plot file processing activities.

MS

Miscellaneous activities.

NEW

List of new and modified activities at this release.

With each of these special optional suffixes except NEW, designating the additional suffix ",FULL" causes a single line activity description to be printed along with each activity listed.

Interrupt control codes:

None

Prerequisite:

None

7.10. IDEV

Activity:

IDEV IDEV,filename

Function:

Activity IDEV, section 5.4 is used to change the source from which PSSPLT is to accept user dialogue input. When a filename is specified as a suffix, PSSPLT accepts subsequent dialogue input from the specified Response File. When no file name is appended to the IDEV activity command, subsequent user input is taken from the user's terminal.

Interrupt control codes:

None

Prerequisite:

When a file name is specified, the file must be in the form of a PSSPLT Response File.

7.11. IDNT

Activity:

IDNT

Function:

Activity IDNT, section 4.7 creates tabular output of channel numbers and their alphanumeric identifiers. Output can be controlled by entering a range of channel numbers and also by entering an identifier mask, which may include asterisks (*) to represent wild card characters.

Interrupt control codes:

None

Prerequisite:

A valid plot file must have been previously selected.

7.12. LFTI

Activity:

LFTI LFTI,RSTR LFTI,CUR LFTI,FILE

Function:

Activity LFTI, section 4.5 allows the user to change the plot title read in from the plot file. These are two 60-character strings that are displayed on reports and plots.

The suffix, RSTR, will restore the original output plot file's original two-line plot title. If activity MCHN, section 4.10 is used, the first plot file's title will be restored.

The suffix, CUR, will set the two-line plot title to the two-line plot title of the currently opened plot file.

Interrupt control codes:

None

Prerequisite:

A valid plot file must have been previously selected.

7.13. MCHN

Activity:

MCHN

Function:

Activity MCHN, section 4.10 allows the user to select a maximum of six plot files to be used to plot the same channels or functions from different files.

Interrupt control codes:

None

Prerequisite:

None

7.14. MENU

Activity:

MENU MENU,ON MENU,OFF

Function:

Activity MENU, section 5.5 changes the method of user activity selection to either the menu mode or the brief mode.

When no suffix is specified in selecting activity MENU, section 5.5, PSSPLT is switched from its current mode of operation to its other mode. When activity MENU is selected with the suffix *ON*, the menu mode is enabled; the suffix *OFF* disables the menu mode of operation.

Interrupt control codes:

None

Prerequisite:

None

7.15. ODEV

Activity:

ODEV

Function:

Activity ODEV, section 5.6 is used to assign the destination of the dialogue output (questions and instructions from PSSPLT to the user) to either the user's terminal, a file in the user's directory, or a hard copy printing device.

Interrupt control codes:

None

Prerequisite:

None, although in practice, activity ODEV, section 5.6 would only be executed from a Response File.

7.16. OPEN

Activity:

OPEN

Function:

Activity OPEN, section 5.11 allows the user to preselect the destination for output reports generated by the PSSPLT output reporting activities. They may be directed to either the user's terminal, a file in the user's directory, or a high-speed printing device.

Interrupt control codes:

None

Prerequisite:

None

7.17. PATH

Activity:

PATH

Function:

Activity PATH, section 5.13 is used to designate a pathname (i.e., a directory or disk) to be used as a prefix for all user-specified filenames that are entered with an ampersand (&) preceding them.

Interrupt control codes:

None

Prerequisite:

None

7.18. PDEV

Activity:

PDEV

Function:

Activity PDEV, section 5.7 is used to assign the destination of PSSPLT's progress report output to either the user's terminal, a file in the user's directory, or a hard copy printing device.

Interrupt control codes:

None

Prerequisite:

None

7.19. PLID

Activity:

PLID PLID,IN

Function:

Activity PLID, section 4.14 performs the plotting of a range of channels. The plotting may be in time plot or line printer time plot format: XY, RD, FFT, LOG, SLOG, and XM plots are not allowed. Activity PLID allows a function of a single channel to be applied to all channels plotted.

If activity PLID, section 4.14 is invoked with the optional suffix *IN*, it enters an interactive mode in which the user may add notes and pointers to the plots.

The user is given the opportunity of having all plots on a page plotted to a common scale, which is determined from the scales of the channels involved. A separate scale is calculated for each page.

If plotting is directed to a graphic CRT, the displayed plot can be copied to another device, allowing for previewing of plots.

Interrupt control codes:

AB - terminates the plot on graphic CRTs, and then continues with the next plot, if any.

Prerequisite:

A valid plot file must have been previously selected.

7.20. PLOT

Activity:

PLOT PLOT,IN

Function:

Activity PLOT, section 4.13 performs the plotting of selected channels. The plotting may be in time: MA, XY, RD, FFT, LP, TIME, LOG, SLOG, and XM plot format. By default, time plots are assumed. Activity PTYP, section 4.9 can be used to change the plotting format.

If activity PLOT, section 4.13 is invoked with the optional suffix *IN*, it enters an interactive mode in which the user may add notes and pointers to the plots.

If plotting is directed to a graphic CRT, the displayed plot can be copied to another device, allowing for previewing of plots.

Interrupt control codes:

AB - terminates the plot on graphic CRTs and leaves activity PLOT, section 4.13.

Prerequisite:

At least one channel must have been selected for plotting via activity SLCT, section 4.12. In the case of "XY" plots, both the X and Y channels must have been selected.

7.21. POPT

Activity:

POPT POPT,SAVE

Function:

Activity POPT, section 4.2 allows the user to modify any of the program option settings currently in effect. The new option settings remain in effect until they are changed again with activity POPT. When activity POPT is selected with the suffix *SAVE*, the program option settings currently in effect are saved in the binary file PSSPLT.OPT. If this file exists on the user's directory or the master directory when starting PSSPLT, then these options are read in and override the default PSSPLT options.

Interrupt control codes:

None

Prerequisite:

None

7.22. PRNT

Activity:

PRNT

Function:

Activity PRNT, section 4.16 creates a tabular listing of plot data. The user can select the channels for which tabular data is desired.

Interrupt control codes:

None

Prerequisite:

A valid plot file must have been previously opened.

7.23. PTYP

Activity:

PTYP PTYP,TIME PTYP,LP PTYP,XY PTYP,XM PTYP,RD PTYP,FFT PTYP,LOG PTYP,SLOG PTYP,MA

Function:

Activity PTYP, section 4.9 allows the user to set or change the plotting format. The valid suffixes and corresponding plotting types are:

None

Channel values versus time.

TIME

Channel values versus time.

LP

Line printer plot of channel values versus time.

XY

Single "Y" channel value versus "X" channel value.

XM

Multiple "Y" channel values versus "X" channel value.

RD

Time derivative of a channel versus the channel value.

FFT

Fast Fourier Transform of a channel.

LOG

LOG-LOG time, XY or XM plots.

SLOG

Time or "X" channel value versus log of "Y" channel value.

MA

Modal decomposition of simulation results.

If an invalid suffix is entered, the plotting format is not changed.

Interrupt control codes:

None

Prerequisite:

None

7.24. RANG

Activity:

RANG

Function:

Activity RANG, section 4.3 allows the user to determine channel ranges (or scales). The user is able to generate scales based on the current plot file. Optionally, the generated scale data can be saved in a file that can be used with subsequent PSSPLT sessions. Activity RANG allows the user to read in a scale data file created by the auxiliary program DYPRN4.

Interrupt control codes:

None

Prerequisite:

A valid plot file must have been previously selected.

7.25. RAWC

Activity:

RAWC

Function:

Activity RAWC, section 4.21 allows the user to read a source format plot file and output it in the form of a binary plot file. Also a binary plot file can be read and either all channels or selected channels are output to source format plot files.

Interrupt control codes:

None

Prerequisite:

None

7.26. RELY

Activity:

RELY RELY,filename

Function:

Activity RELY, section 4.17 reads source data records that contain relay characteristic data. This data can be used to superimpose relay zones over XY, XM, or RD plots. Every time activity RELY is used, the new relay data read in is appended to the previous data.

Interrupt control codes:

None

Prerequisite:

None

7.27. SCAN

Activity:

SCAN

Function:

Activity SCAN, section 4.8 creates a tabular output of various channel characteristics. The user can choose to list channel minimums, channel maximums, maximum channel spreads, channel deviations, channels that lie outside a specified band, or the largest percent deviations. Output can be controlled by entering a range of channel numbers and also by entering an identifier mask which may include asterisks (*) to represent wild card characters.

Interrupt control codes:

None

Prerequisite:

The actual minimum and maximum channel ranges must have been previously calculated with activity RANG, section 4.3.

7.28. SLCT

Activity:

SLCT SLCT,CHANGE SLCT,NEW

Function:

Activity SLCT, section 4.12 is used to select channels to be plotted. If no option or an invalid option is entered, selected channels are added to the list of channels previously selected for plotting.

The time, line printer, X-Y and X-M plotting types prompt the user for the number of channels required for any function to be applied. The TIME, LP and XM plotting types allow up to six plots per page. The X-Y plotting type then prompts for the channels required for the y-axis; X-Y plots allow one plot per page.

The RD and FFT plotting types prompt for a single channel; the use of functions is not allowed and only one channel per page is plotted.

Whenever activity SLCT, section 4.12 is invoked with the suffix *NEW*, or activity PLOT, section 4.13 is completed, the number of selected channels is reset to zero. If the suffix *CHANGE* is entered, the list of selected channels is displayed and user is able to change the minimum and maximum scales.

Interrupt control codes:

None

Prerequisite:

None

7.29. SORT

Activity:

SORT

Function:

Activity SORT, section 4.22 allows the user to read a binary output file and sort the file by time steps in ascending order. The sorted plot file is written to another binary output file.

Interrupt control codes:

None

Prerequisite:

None

7.30. STOP

Activity:

STOP

Function:

Activity STOP, section 5.8 provides an orderly exit from PSSPLT and returns the user to operating system level. All PSSPLT files are closed.

Interrupt control codes:

None

Prerequisite:

None

7.31. SUBT

Activity:

SUBT

Function:

Activity SUBT, section 4.6 allows the user to change the plotting subtitle. These are two 60-character strings that are displayed on reports and plots along with the two-line plot file title.

Interrupt control codes:

None

Prerequisite:

None

7.32. TEXT

Activity:

TEXT,message

Function:

Activity TEXT, section 5.9 is a null activity that is used to have a message printed on the device specified by activities ODEV, section 5.6 and/or PDEV, section 5.7, or echoed into an active terminal session logging file.

Interrupt control codes:

None

Prerequisite:

None

7.33. TIME

Activity:

TIME TIME,INIT

Function:

Activity TIME, section 5.10 allows the user to obtain execution time statistics during a PSSPLT work session. When invoked with the suffix INIT, or on the first selection of activity TIME, the timers are initialized. On subsequent executions of activity TIME, a summary of elapsed, CPU and disc channel times are printed. They are tabulated both from the previous execution of activity TIME and from the time at which the timers were last initialized.

Interrupt control codes:

None

Prerequisite:

None

7.34. TINT

Activity:

TINT

Function:

Activity TINT, section 4.4 allows the user to change the time scale for subsequent plots. The time scale is initialized to -9999 to +9999 when PSSPLT is invoked. The time scale is reset to the actual run time for the current plot file when activity RANG, section 4.3 is invoked and scale data is generated.

For log-log plots, the time scale must be entered as powers of 10.

Interrupt control codes:

None

Prerequisite:

None

7.35. WRLY

Activity:

WRLY

Function:

Activity WRLY, section 4.18 writes the relay characteristic data to a file. This data can then be read in at a later time using activity RELY, section 4.17.

Interrupt control codes:

None

Prerequisite:

A valid relay data file must have been previously selected.

Chapter 8
Appendix B - Functional Summary of PSSPLT Activities

This appendix summarizes all standard PSSPLT activities, grouping them by type of function performed.

8.1. PSSPLT Activity Selector

Several PSSPLT activities tabulated in this section recognize optional suffixes by which the user may specify a specific action to be taken when invoking the activity.

8.1.1. Plotting Data Input

CHNF, file - Select simulation output quantities plot file. CHNF, section 4.1

IDNT - Print channel identifiers. IDNT, section 4.7

MCHN - Select a maximum of six simulation plot files. MCHN, section 4.10

RAWC - Read and write source plot files. RAWC, section 4.21

RELY, file - Read a relay characteristics file for X-Y plots. RELY, section 4.17,

SORT - Write a binary plot file sorted by time steps. SORT, section 4.22

8.1.2. Plotting Output

CLSP - Close plot file (for spooled graphic output devices). CLSP, section 4.15

FUNC - Establish function values for channel arithmetic. FUNC, section 4.11

SLCT - Select plot channel(s) for plotting. SLCT, section 4.12

PLID - Perform plot on a range of channels. PLID, section 4.14

PLID, IN - Perform interactive plot on a range of channels. PLID, section 4.14

PLOT - Perform plot on selected channels. PLOT, section 4.13

PLOT, IN - Perform interactive plot on selected channels. PLOT, section 4.13

PTYP - Select time plotting format. PTYP, section 4.9

PTYP, TIME - Select time plotting format. PTYP, section 4.9

PTYP, XY - Select X-Y plotting format. PTYP, section 4.9

PTYP, LP - Select line printer plotting format. PTYP, section 4.9

PTYP, RD - Select R-RDOT plotting format. PTYP, section 4.9

PTYP, FFT - Select Fast Fourier Transform format. PTYP, section 4.9

PTYP, LOG - Select log-log plotting format. PTYP, section 4.9

PTYP, SLOG - Select semilog plotting format. PTYP, section 4.9

PTYP, XM - Select X versus multiple Y plotting format. PTYP, section 4.9

PTYP, MA - Select modal analysis plotting format. PTYP, section 4.9

8.1.3. Plotting Data Reporting

PRNT - List simulation output quantities in tabular form. PRNT, section 4.16

RANG - Determine minimum/maximum range for plot channel(s). RANG, section 4.3

SCAN - List various channel characteristics in tabular form. SCAN, section 4.8

WRLY - Write relay data to a file. WRLY, section 4.18

8.1.4. Plotting Data/Parameter Changes

CHID - Change channel identifier names. CHID, section 4.20

CRLY - Change relay data characteristics. CRLY, section 4.19

FUNC - Establish function values for channel arithmetic. FUNC, section 4.11

LFTI - Change plot title from plot file. LFTI, section 4.5

LFTI, CUR - Set plot title to two-line plot title of channel file currently opened. LFTI, section 4.5

LFTI, RSTR - Restore original plot title from plot file. LFTI, section 4.5

POPT - Change default program options. POPT, section 4.2

POPT, SAVE - Save program options in effect. POPT, section 4.2

PTYP - Select time plotting format. PTYP, section 4.9

PTYP, RD - Select R-RDOT plotting format. PTYP, section 4.9

PTYP, FFT - Select Fast Fourier Transform format. PTYP, section 4.9

PTYP, TIME - Select time plotting format. PTYP, section 4.9

PTYP, XY - Select X-Y plotting format. PTYP, section 4.9

PTYP, LP - Select line printer plotting format. PTYP, section 4.9

PTYP, XM - Select X versus multiple Y plotting format. PTYP, section 4.9

PTYP, MA - Select modal analysis plotting format. PTYP, section 4.9

SUBT - Change subtitle (lines 3 and 4 of plotting title). SUBT, section 4.6

TINT - Select time interval for plotting. TINT, section 4.4

8.1.5. I/O Device Selection

IDEV - Assign interactive input to the terminal. IDEV, section 5.4

IDEV, file - Assign interactive input to the file "file." IDEV, section 5.4

ODEV - Reassign dialogue output destination. ODEV, section 5.6

PDEV - Reassign progress report output destination. PDEV, section 5.7

OPEN - Select "global" output report destination. OPEN, section 5.11

CLOS - Close "global" output report destination. CLOS, section 5.12

ECHO - Control recording of user input dialogue to a file. ECHO, section 5.2

PATH - Select directory, UFD, or disk path to read from or write to. PATH, section 5.13

8.1.6. Miscellaneous

CATA - List names of files in the current directory. CATA, section 5.1

HELP - Print summary PSSPLT help information at the terminal. HELP, section 5.3

HELP, actv - Print summary information about activity "actv". HELP, section 5.3

HELP, sufx - List the names of a subgroup of PSSPLT activities. Valid suffixes are: ALL, PL, and MS. Using one of these suffixes (including the additional suffix "FULL") causes a single line description to be printed with each activity listed. HELP, section 5.3

MENU, ON - Enable the menu mode of PSSPLT activity selection. MENU, section 5.5

MENU, OFF - Disable the menu mode of PSSPLT activity selection. MENU, section 5.5

MENU - Toggle menu mode switch. MENU, section 5.5

TEXT - Echo this command at dialogue and progress output devices. TEXT, section 5.9

TIME - Tabulate timing statistics. TIME, section 5.10

TIME, INIT - Initialize timer. TIME, section 5.10

8.1.7. PSSPLT Termination

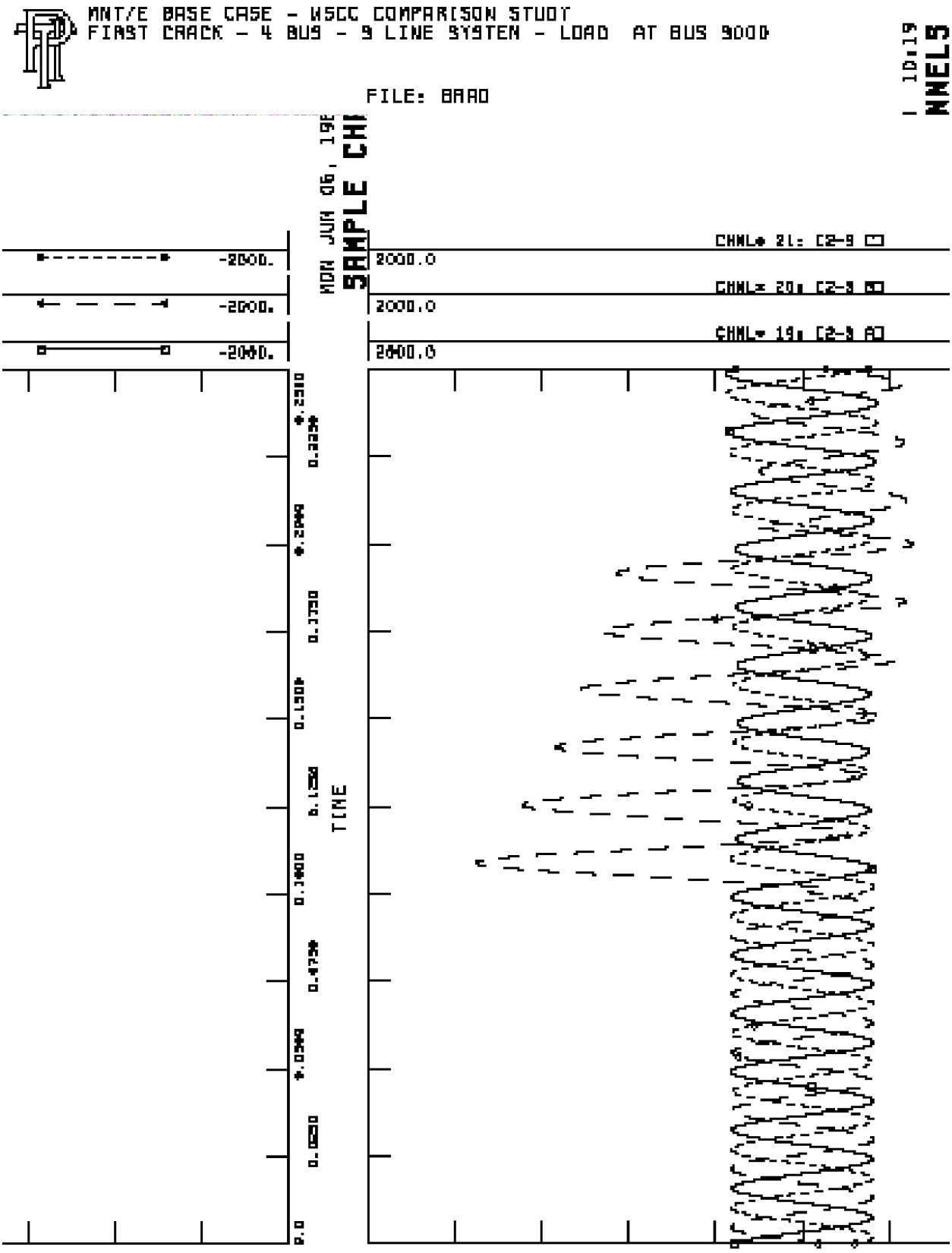
STOP - Terminate PSSPLT. STOP, section 5.8

Chapter 9
Appendix C - Description and Examples of Various Functions

9.1. Introduction

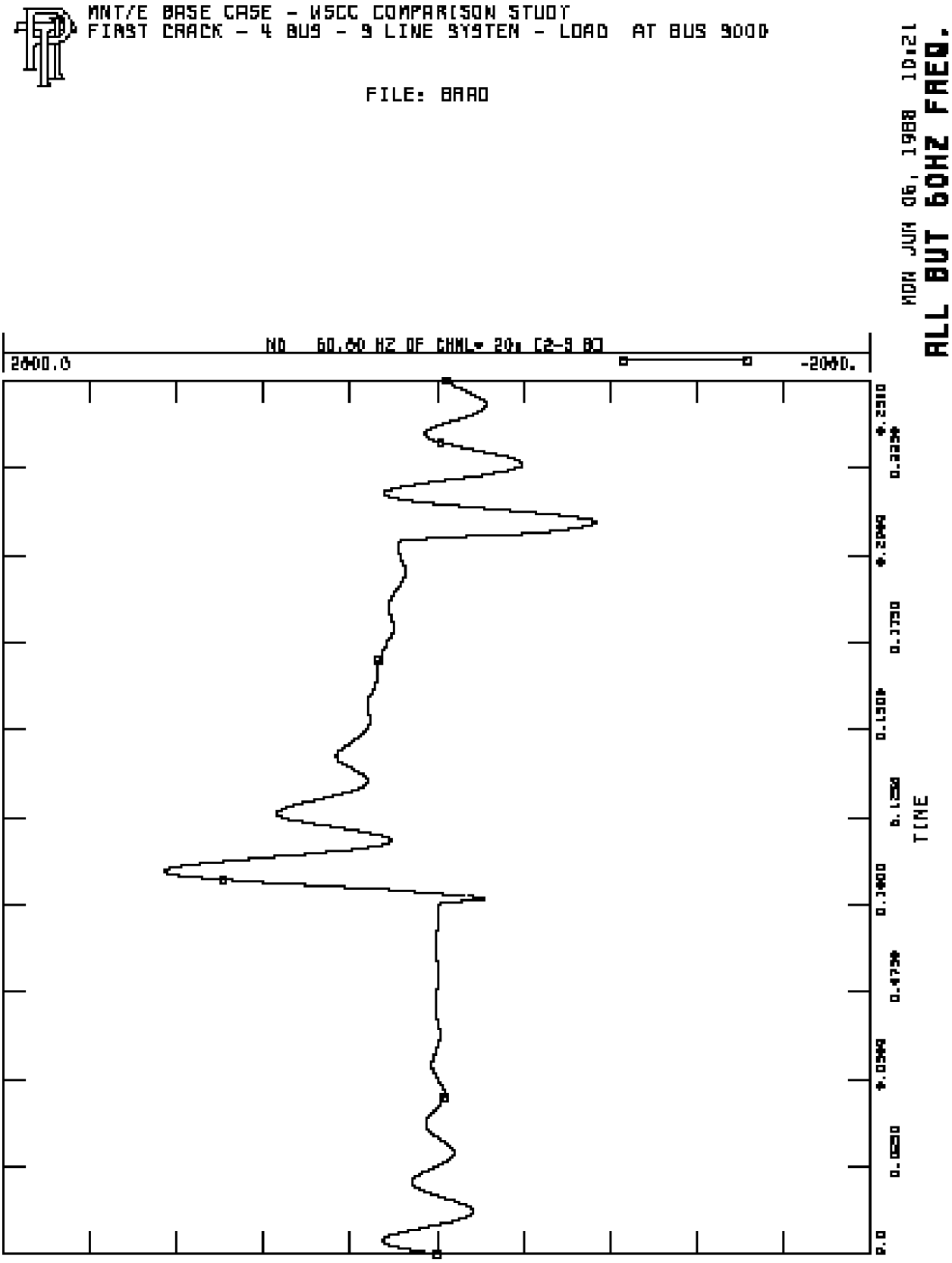
The following are example PSSPLT runs for reference.

The All But Specified Frequency Component function through the Negative Sequence Component Function are explained in the following pages. The three channels (19, 20, and 21) are plotted followed by an example of each function using one or more of the channels.



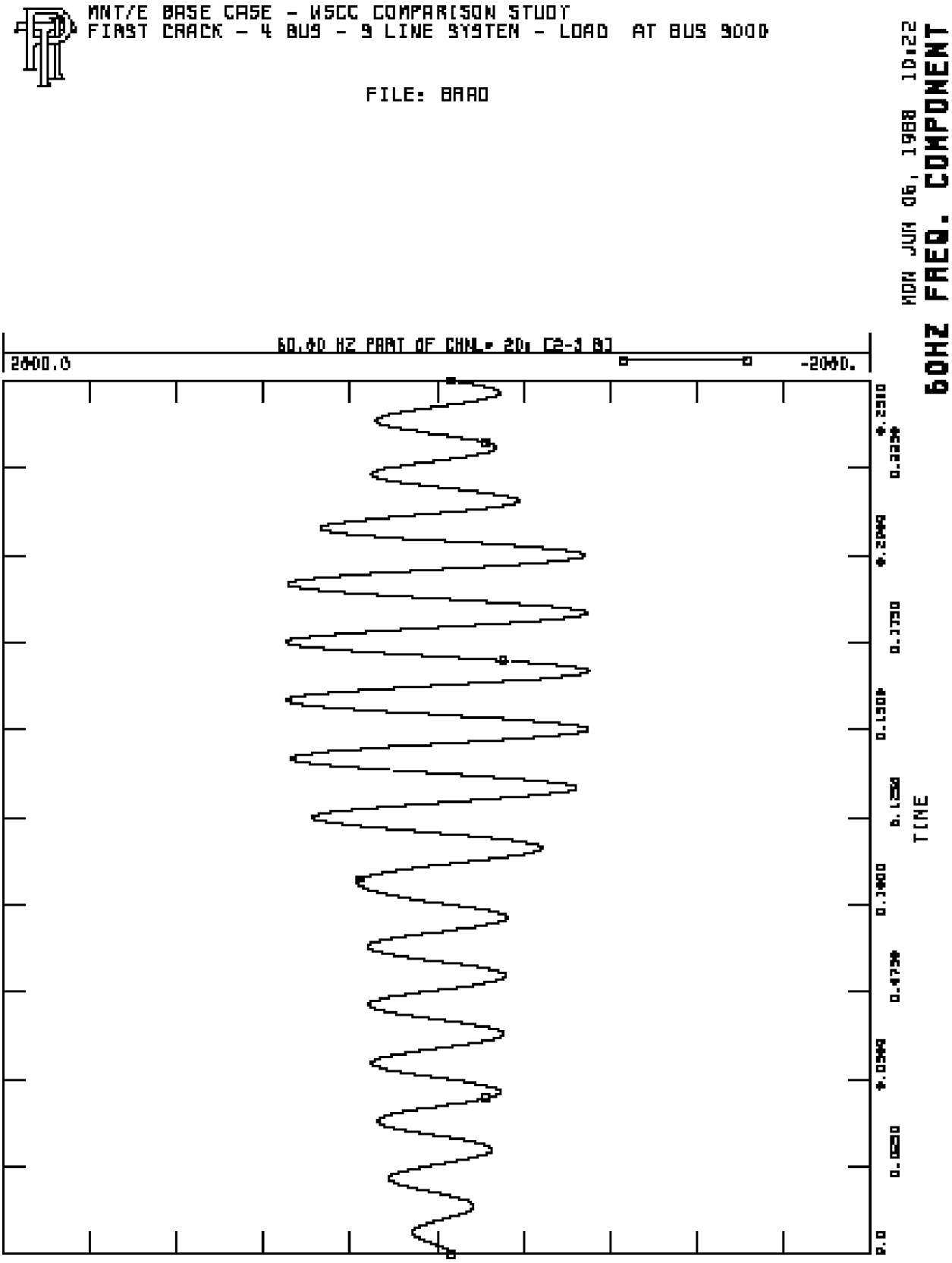
9.2. Function 3: All But Specified Frequency Component

This function filters out oscillations of a specified frequency. If a plot channel contains a time-varying waveform that has several frequency components such that the dominant component makes it difficult to identify the frequencies of the other components, this function could be used to filter out most of the dominant waveform so that the plotted wave form clearly indicates the character of the other frequency components. As with any filter there will be some attenuation and phase shift over the entire frequency spectrum.



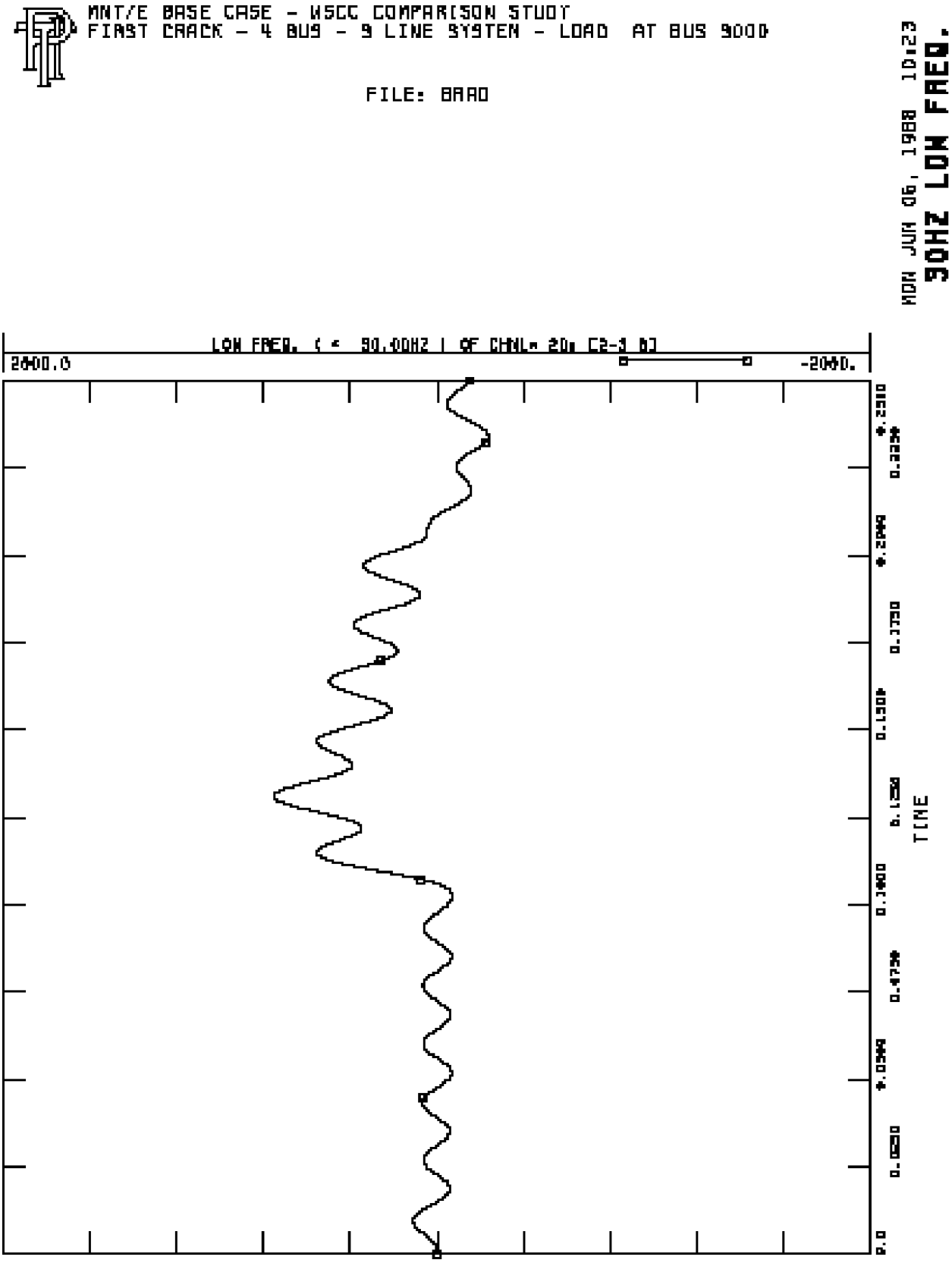
9.3. Function 4: Specified Frequency Component

This function filters out oscillations that are not of a specified frequency. If a plot channel contains a time-varying waveform that has several frequency components that obscure the frequency of interest, this function could be used to suppress the other frequency components so that the plotted waveform clearly indicates the character of the frequency of interest. As with any filter there will be some attenuation of the resulting waveform. This function has a gain to compensate for the expected attenuation at the frequency of interest but if the waveform oscillates at a frequency slightly different from that specified some attenuation and phase shift will occur.



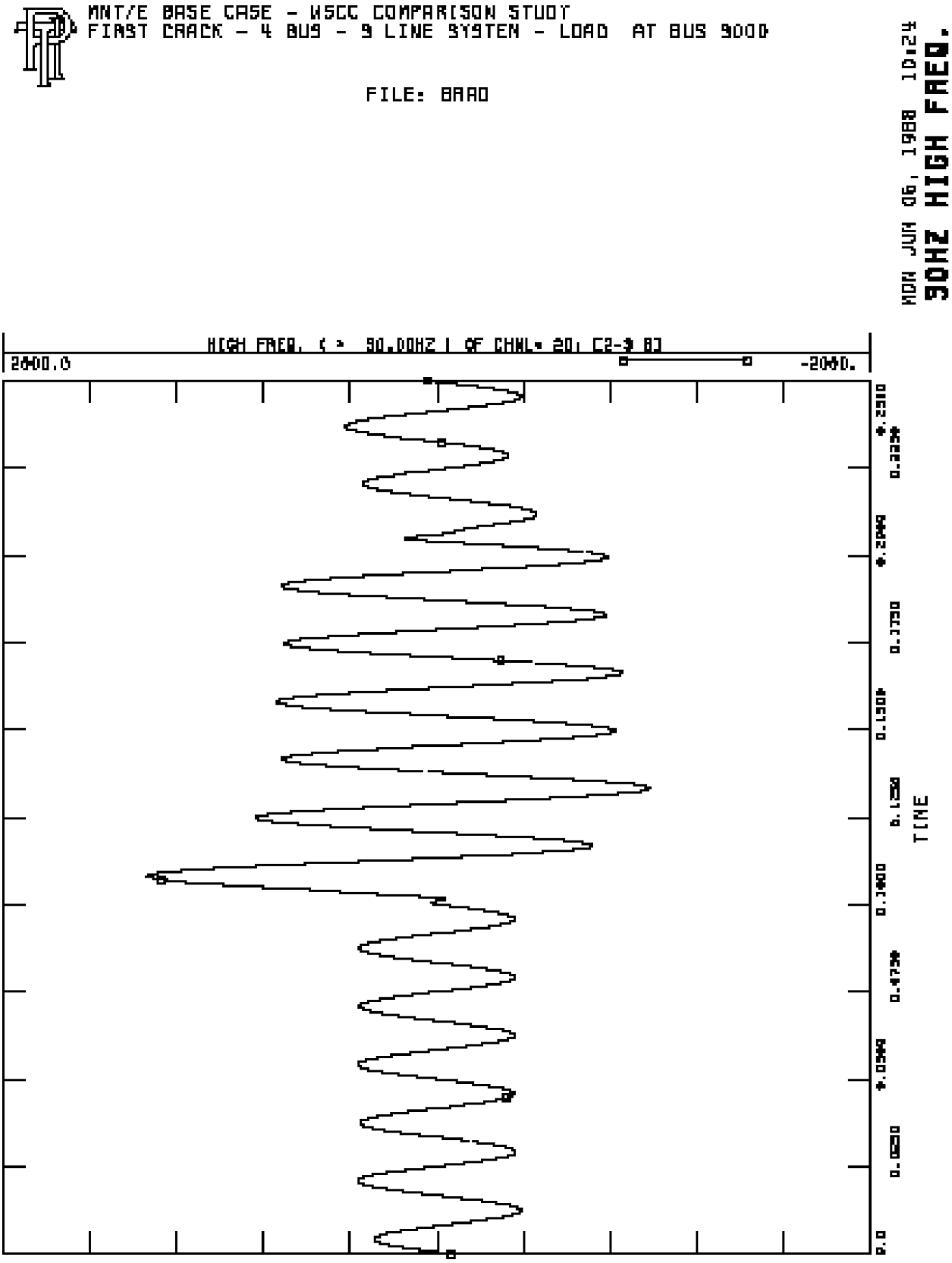
9.4. Function 5: Low-Frequency Component

This function filters out oscillations above a specified cut-off frequency so only the low-frequency components of the time varying waveform from a plot channel will be plotted. There will, of course, be some attenuation and phase shift even for the low-frequency components (particularly those close to the cut-off frequency).



9.5. Function 6: High-Frequency Component

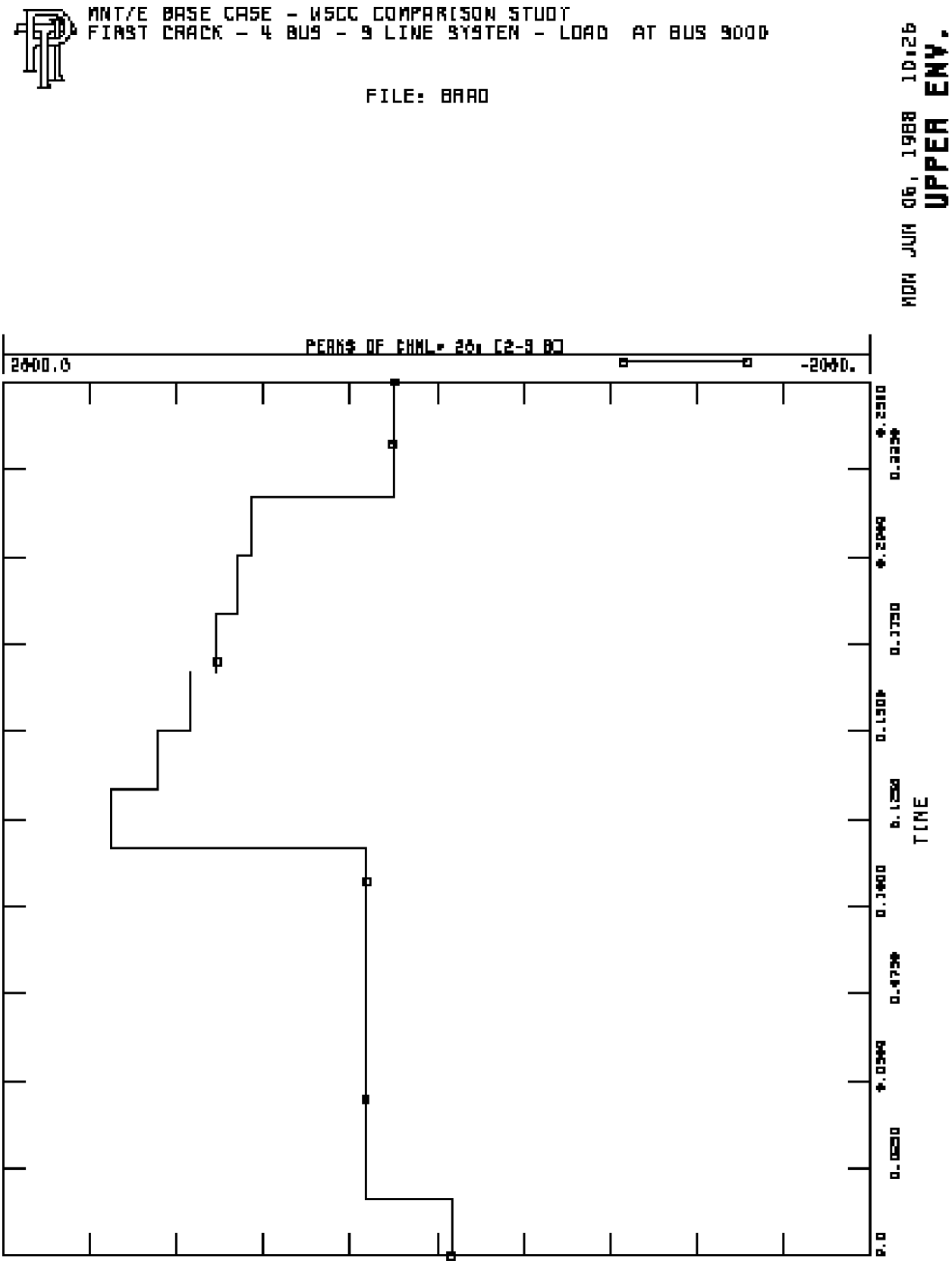
This function filters out oscillations below a specified cut-off frequency so only the high-frequency components of the time-varying waveform from a plot channel will be plotted. There will, of course, be some attenuation and phase shift even for the high-frequency components (particularly those close to the cut-off frequency).



9.6. Function 7: Upper Envelope

This function follows the peaks of a time varying waveform so the plotted results consist of the upper envelope of the waveform. The user must specify the approximate frequency of the peaks that are to be considered so that higher frequency reversals in the waveform, which are not of interest, can be ignored.

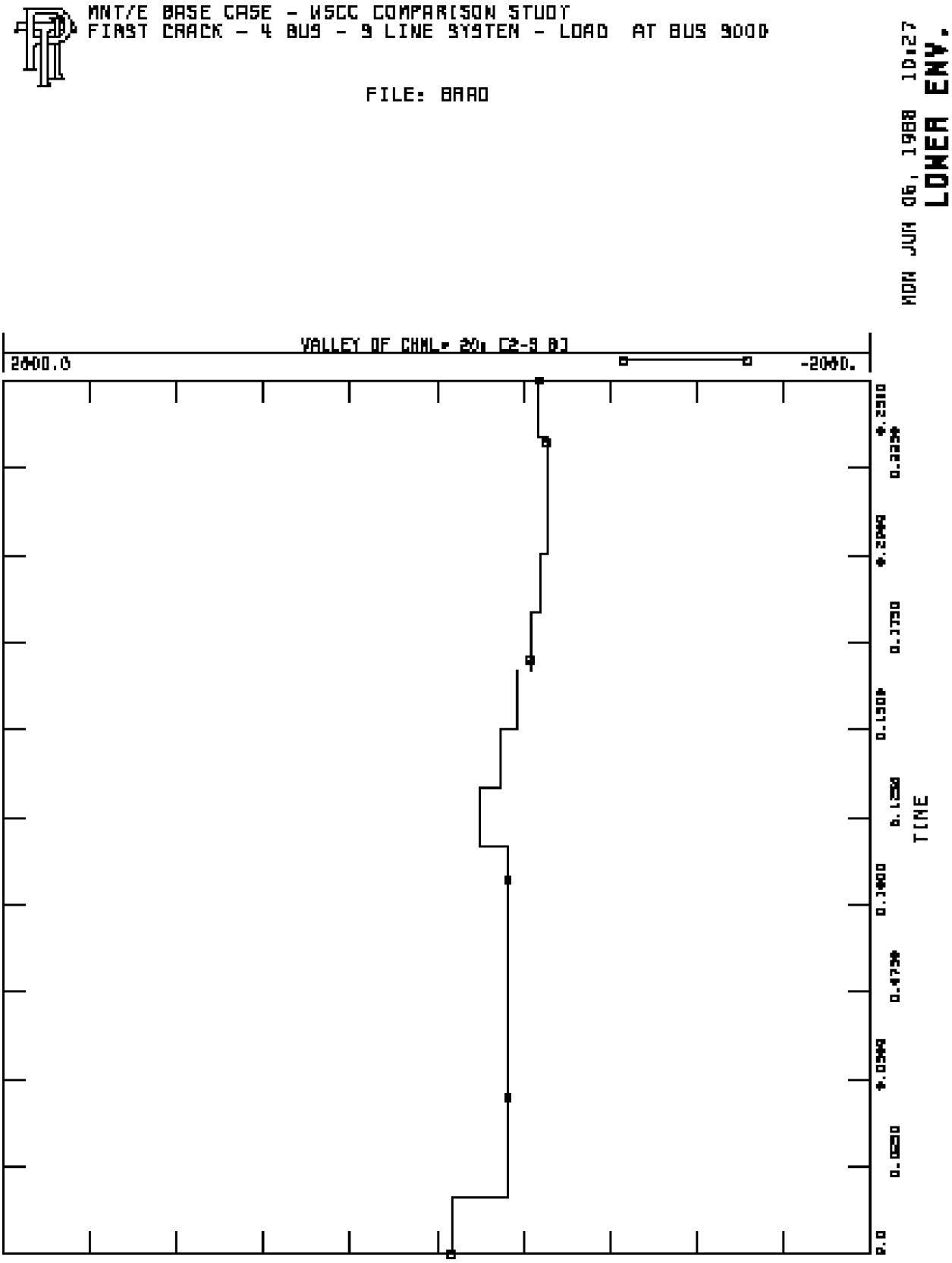
This function might be used when only the peak values of a time varying waveform are of interest and greater resolution is required than can be obtained by plotting the entire waveform.



9.7. Function 8: Lower Envelope

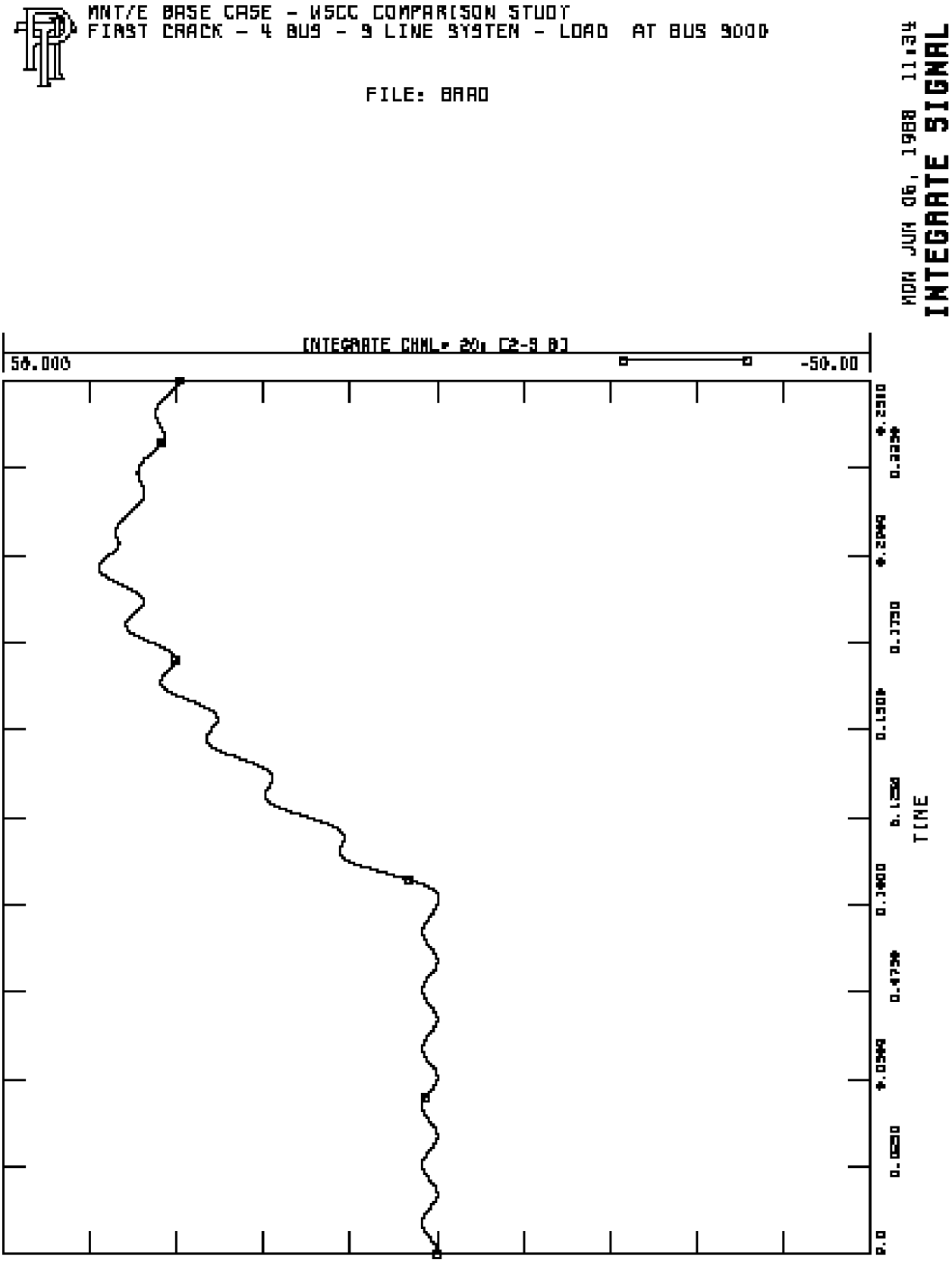
This function follows the lowest excursions of a time varying waveform so the plotted result consists of the lower envelope of the waveform. The user must specify the approximate frequency of the valleys that are to be considered so that higher frequency reversals on the waveform, which are not of interest, can be ignored.

This function might be used when only the lowest values of a waveform are of interest and greater resolution is required than can be obtained by plotting the entire waveform.



9.8. Function 9: Integrate

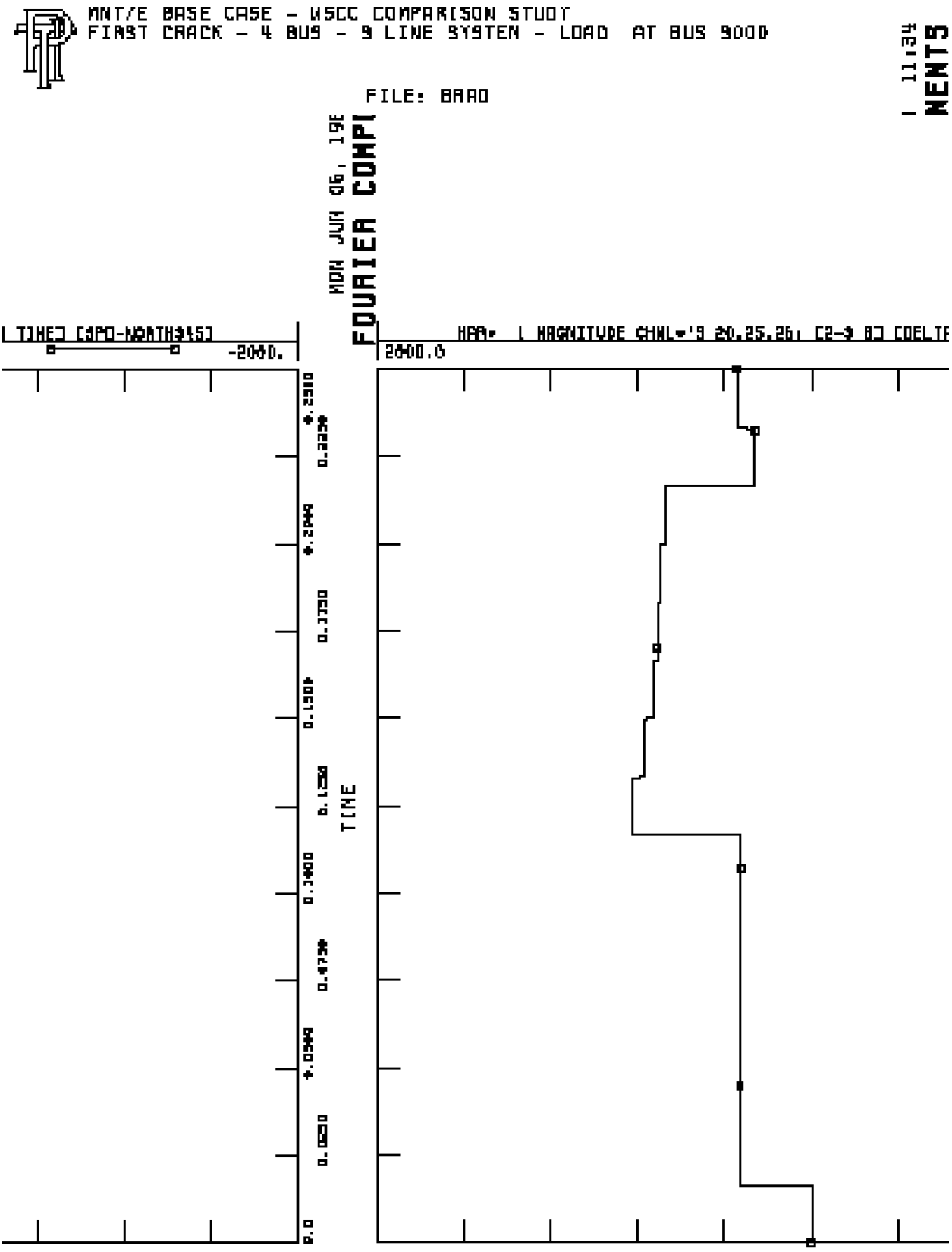
This function integrates the time varying waveform from a plot channel. The plotted result at each point in time will be the waveform integrated from the first time point stored in the plot file to the time in question. For integration the time increment between points in the plot file must be known. The time increment between plotting points can be saved in one of the plot channels. This additional channel can be specified when the function is selected. If such a channel is not provided, the time increment will be found by subtracting the times stored in the plot file for two successive points. Round off errors will cause loss of precision.



9.9. Function 10: Fourier Components

This function calculates the Fourier component of the time varying waveform from a plot channel. Both the magnitude and angle of the component may be plotted. The user must specify the fundamental frequency (frequency at which the waveform repeats itself) and the number of the harmonic to be plotted. If the frequency of the waveform is increasing or decreasing over the interval in question the place of the Fourier components will change. This change will be more rapid for the higher harmonics. To compensate for this effect the user may elect to plot the relative angle of the harmonic. To do this he must enter the expected rate of change of fundamental frequency. Precise integration of the Fourier function is required to obtain accurate results. To integrate it is necessary to know the time increment between points in the plot file. The time increment between plotting points can be saved in one of the plot channels. If a channel with this information is provided, the most accurate Fourier components will be obtained. If such a channel is not provided the time increment will be found by subtracting the times stored in the plot file for two successive plot points and round off errors will cause a loss of precision.

The most accurate Fourier components will of course be obtained when there are a large number of data points available. If a user anticipates plotting the Fourier components of his simulation results he should therefore store the results in the plot file at each simulation time even if this resolution is not required for normal plots.

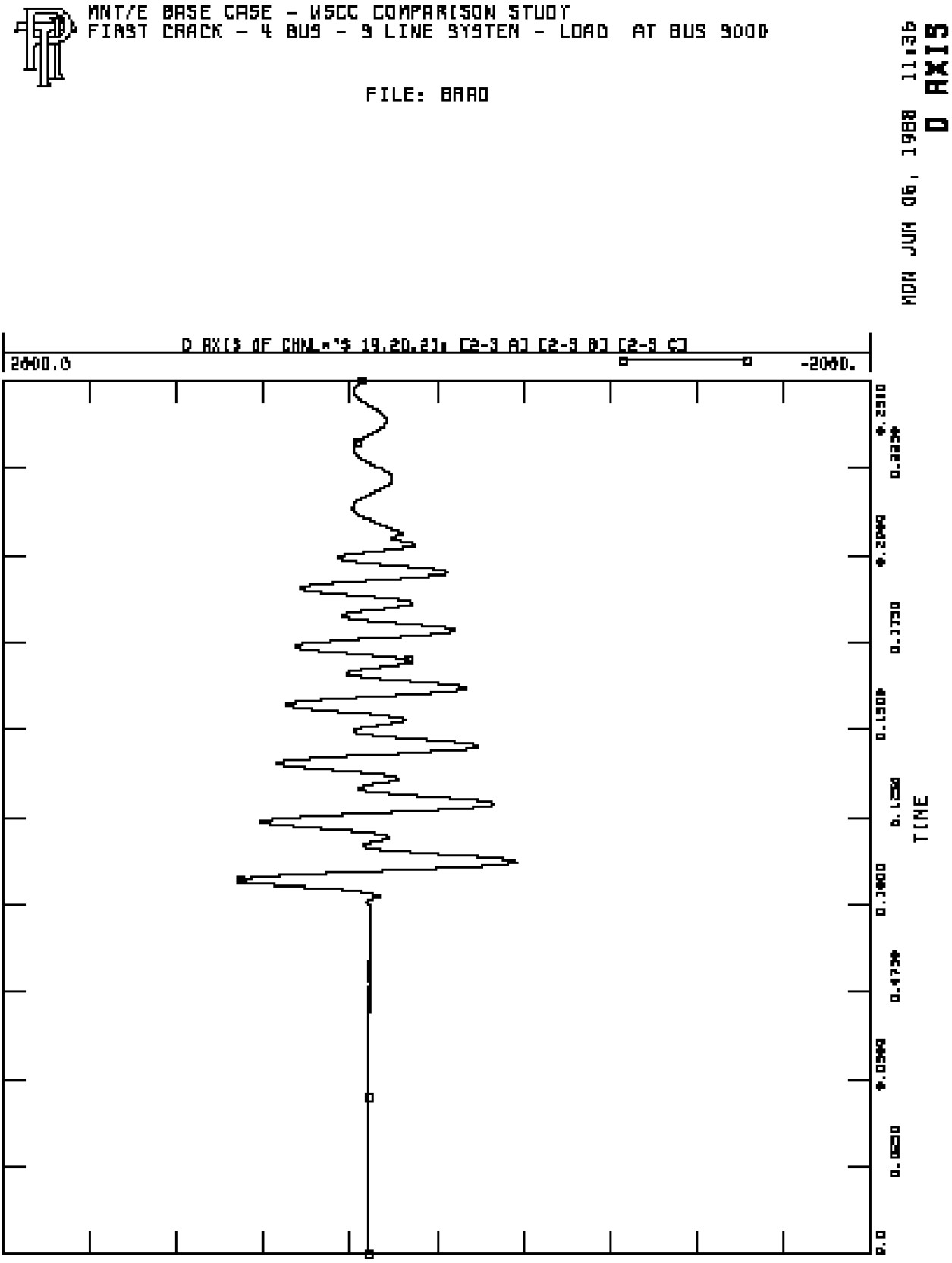


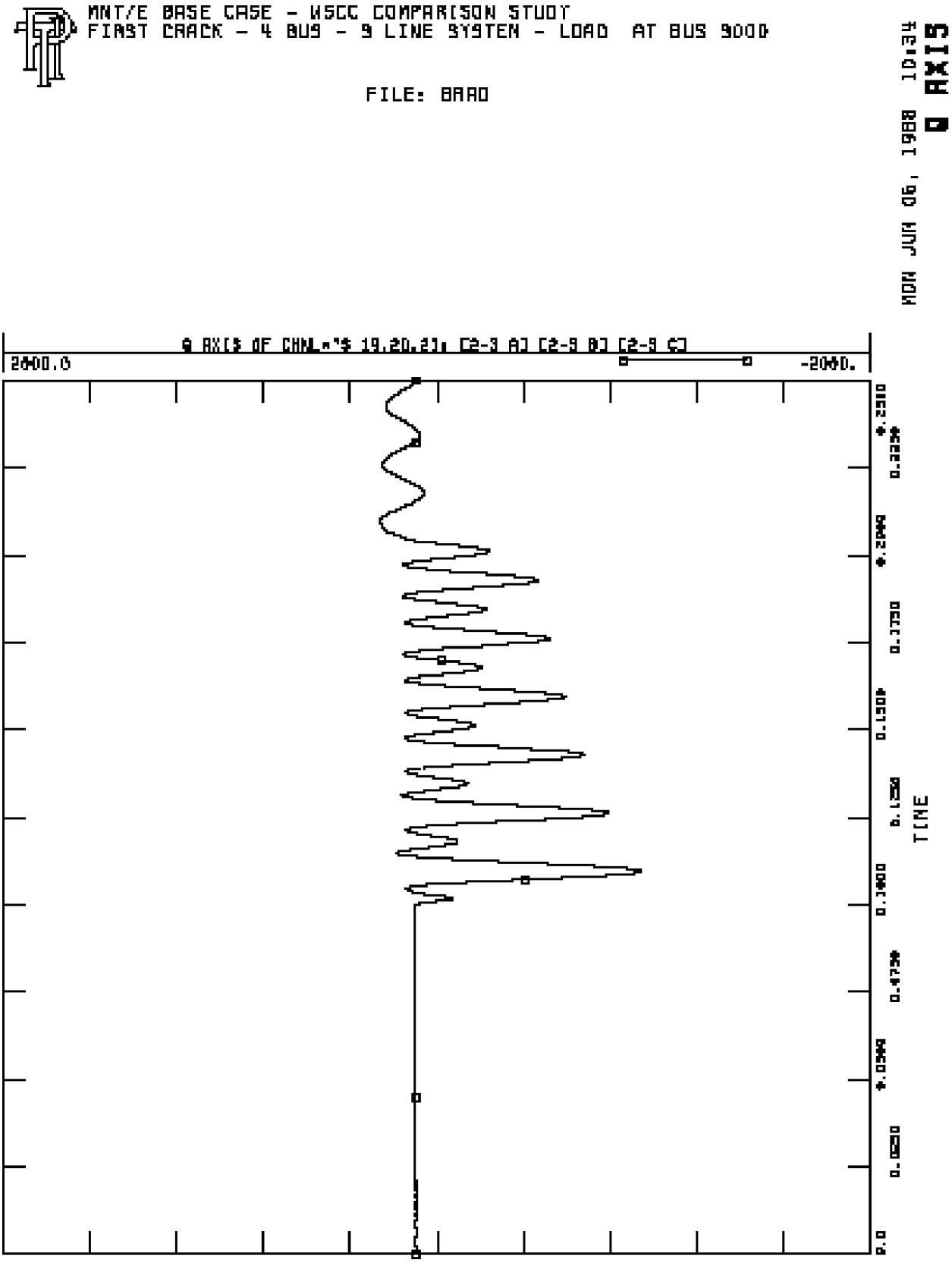
9.10. Function 11: Peak of Three-Phase Rectified Signal

This function finds the maximum absolute value of the waveforms from three plot channels. This will be useful mostly for processing the results from programs that output voltage and current waveform for three-phase power systems. The peak value can of course be plotted with much greater resolution than the entire waveform.

9.11. Functions 12 and 13: d-Axis Component and q-Axis Component

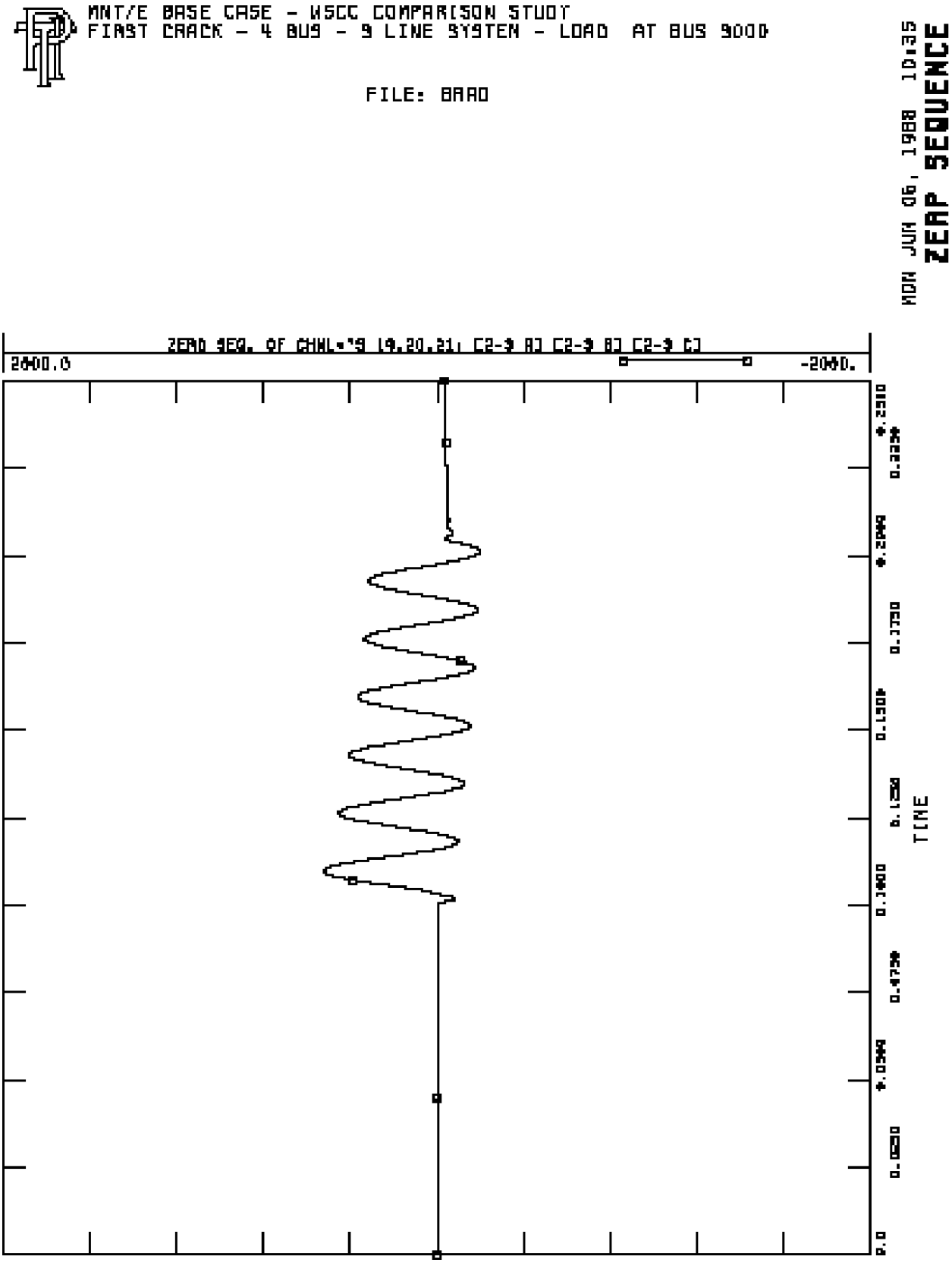
These functions may be used for processing the results of programs that output voltage and current waveforms for three-phase power systems. These functions find the d- or q-axis component of three waveforms for a reference, which is rotating at a specified frequency.





9.12. Function 14: Zero-Sequence Component

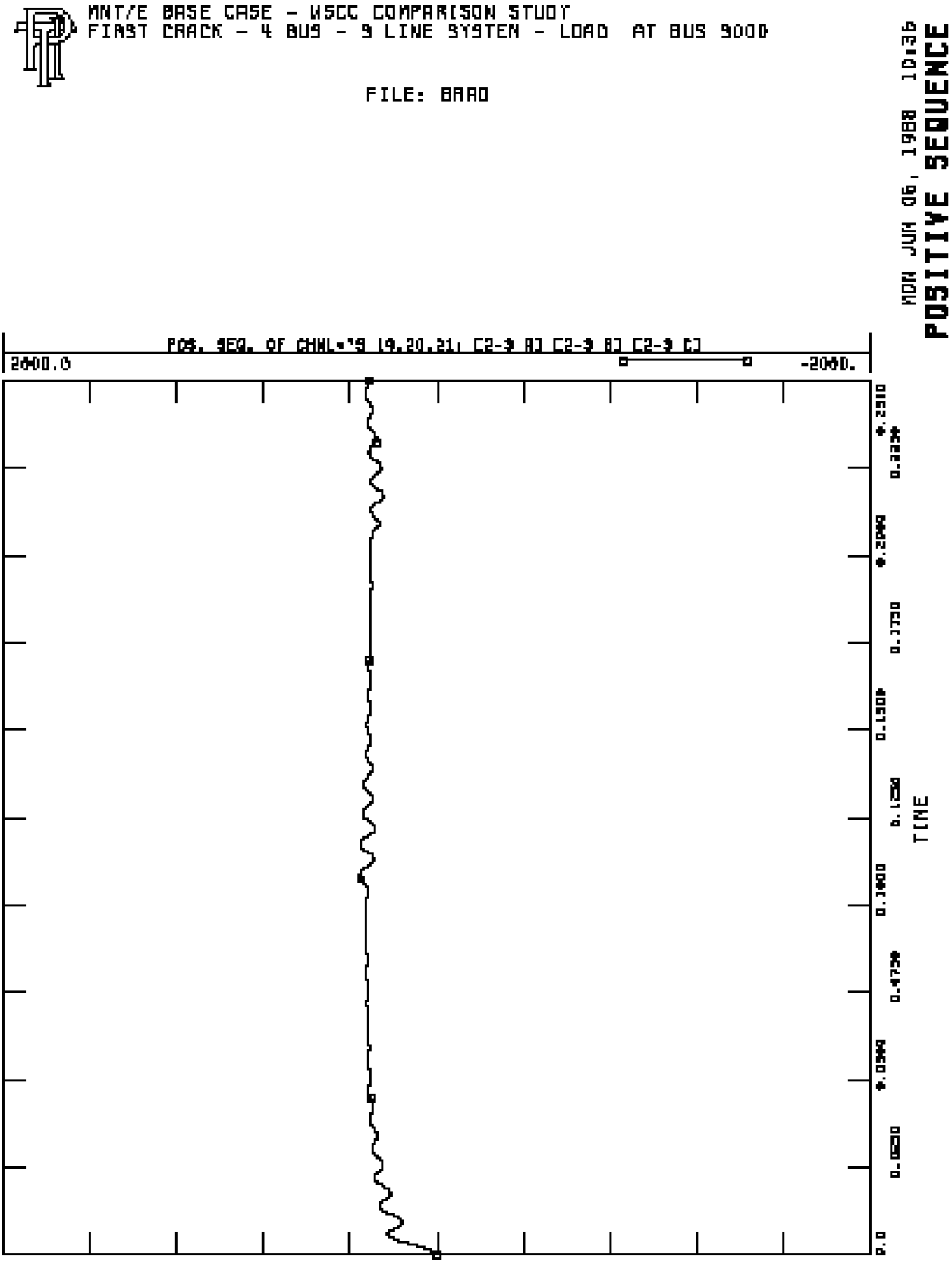
This function sums the instantaneous values of the waveforms from three plot channels and divides by three. It is intended mostly for processing the results of programs that output voltage and current waveforms for three-phase power systems. The results from this function are of course equal to the zero-sequence component of the three-phase output.



9.13. Function 15: Positive-Sequence Component

This function is also used for processing the results of programs that output voltage and current waveforms for three-phase power systems. The positive-sequence component of three waveforms is measured by:

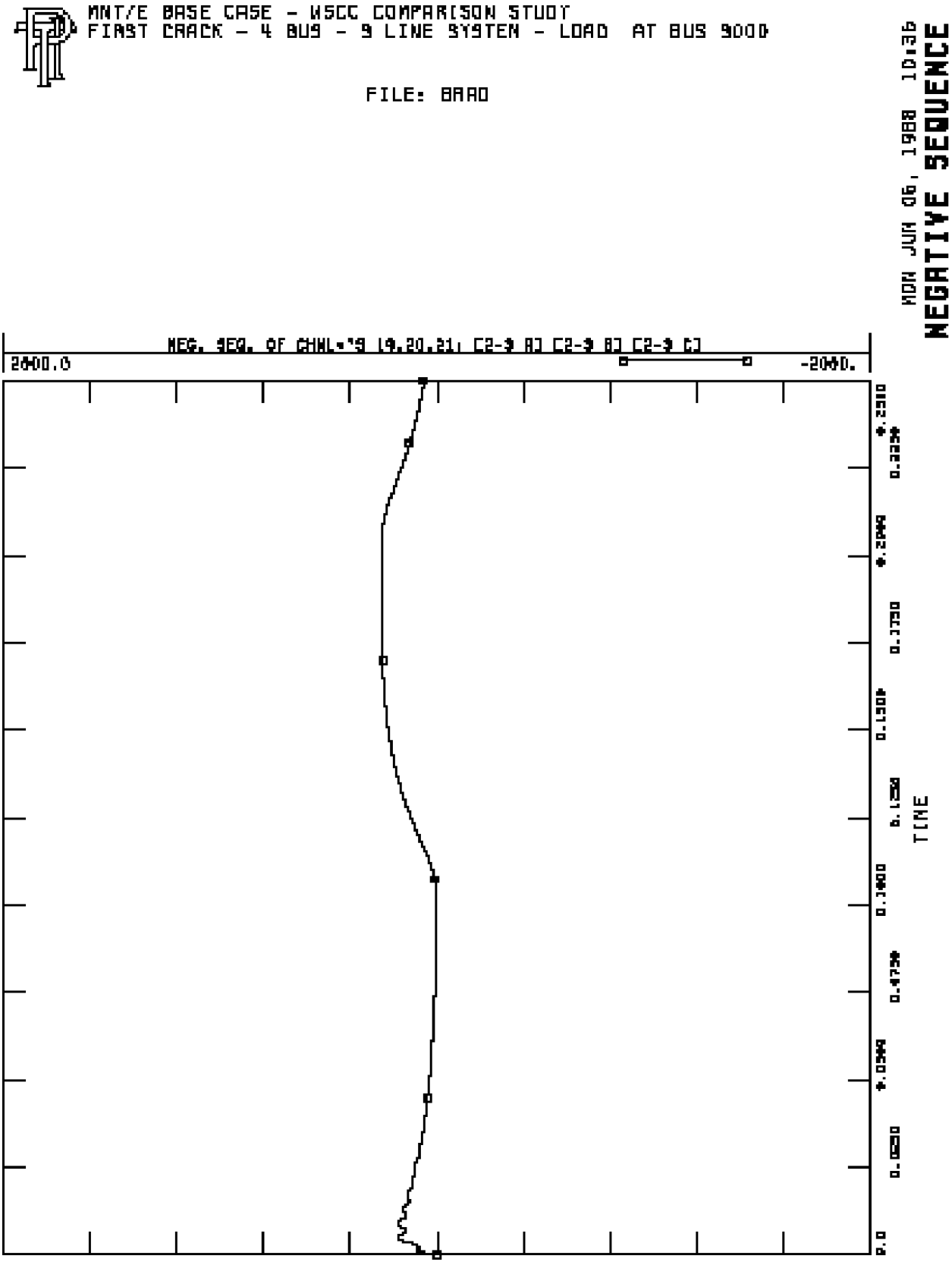
1. Filtering out all but the fundamental frequency components of the waveform.
2. Finding the d- and q-axis components of the filtered waveforms.
3. Filtering out the second harmonic content of these components.
4. Summing the filtered d- and q-axis components vectorially.



9.14. Function 16: Negative-Sequence Component

This function is also used for processing the results of programs that output voltage and current waveforms for three-phase power systems. The negative-sequence component of three waveforms is measured by

1. Filtering out all but the fundamental frequency components.
2. Finding the d- and q-axis components of the filtered waveform.
3. Extracting the second harmonics from the d- and q-axis components.
4. Adding the extracted second harmonic components vectorially.



Chapter 10
Appendix D - Changing PSSPLT Options

10.1. POPT

Activity POPT, section 4.2 enables the user to override the default plotting option settings. As stated in the POPT description, if the file PSSPLT.OPT does not exist in the user's directory, the program checks to see if the file exists on the master PSS®E directory. The master PSS®E directory is different for different computers. The following lists where the PSSPLT.OPT file can be placed by the system or program administrator:

The PSSLIB directory under the PSS®E master directory. (For definition of master directory, see PATH= in PSSE32.INI.)	Windows 2000, Windows XP

If the file PSSPLT.OPT does exist on the master PSS®E account, PSSPLT will use these default options. A user can override these options by creating his own PSSPLT.OPT file in their directory by using the 'SAVE' suffix when invoking activity POPT.