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VGRAF PRIMER

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Sandia National Laboratories

SF 2900-Q(3-80)

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Printed in the United States of America

Available from
National Technical Information Service
U. S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
Price: Printed Copy $4.50; Microfiche $3.00

SAND80-1866
Unlimited Release
Printed September 1980

VGRAF PRIMER

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ABSTRACT

VGRAF is a powerful FORTRAN program which is designed to produce professional-quality color slides, viewgraphs, posters, and data plots for presentations or reports. The program is easy to use and requires no *a priori* knowledge of a programming language and little or no previous programming experience.

This report describes a subset of the VGRAF commands which will enable the user to make very simple plots. For enhanced plotting, the user is referred to SAND79-2147.

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1-0 INTRODUCTION

VGRAF is a plotting program which has been developed for use in preparing high-quality visual aids (viewgraphs, color slides, tables, charts) for presentations or reports. The program uses the RSCORS plot system.*,[1] It reads a command file which is generated by the user. Each command is free-formatted and does not require a priori knowledge of any of the RSCORS plot routines. Consequently, users with little or no previous programming experience should be able to use VGRAF.

The basic utilities of the program provide the user with many text-writing capabilities including variable sizing, rotation, slanting, subscripting, superscripting, and underlining of text. The user also has the capability of selecting characters from four different vector-character sets (upper case, lower case, Greek, and script characters) and two block-character sets. If other characters are needed, the user may define his own symbols. Another valuable feature is the use of color and color shading routines to produce color slides and plots. Other features include variable point/line width and intensity selection, selective merging of plot files, and fraction and integral definition.

Because VGRAF is such a flexible code, there are a large number of commands (approximately 100) available to the user.[2] Only a small subset of these commands is necessary for producing very simple plots. This report is therefore intended as an introduction to VGRAF and illustrates only a few basic commands.

*RSCORS is a revised version of the SCORS plot system. RSCORS is portable in the sense that it can be interfaced to other graphics systems with drivers for available hardware. Versions exist for CDC and CRAY systems.

2-0 VGRAF OPERATION

VGRAF is able to generate a plot by reading a list of commands (referred to as a command file) which describes the desired plot. These commands are translated into appropriate FORTRAN calls, which in turn, are used to produce an output data file. The data file is then sent to a plotting device which outputs the physical plot. The user, therefore, needs to concern himself with three steps:

(1) describing the desired plot to VGRAF (i.e., generating the user-command file),

(2) accessing and executing VGRAF, and

(3) sending the output file to a plotting device (i.e., executing the RSCORS post-option-processor).

The last two items are trivial and are accomplished by issuing computer operating system commands. The interesting part of the process is in describing the desired plot. The next section discusses the user command file and gives examples of VGRAF generated plots.

3-0 THE USER-GENERATED COMMAND FILE

3-1 Command Naming Conventions and Command Structure

Since there are many commands from which to select, each command has been given a name which is easy to remember and which describes the command function. For example, if the user desires to write a text string, the command to do this is TEXT. The command for varying the size of text is SIZE. For those who prefer shorter names, there is an abbreviated form for almost all of the commands. TEXT and SIZE commands are T and S, respectively.

Each command has the same basic structure. The command name is followed by its argument list (if any). A comma is used as a delimiter between the command name and each argument. The only time that a command name is not followed by a comma is when it has no argument list. Each command is free-formatted. The term "free-formatted" is used in the FORTRAN sense, i.e., the command and each of its arguments are not restricted to appear in specific columns. However, for those commands with argument lists, the arguments must appear in the indicated order and all argument values must be included to obtain the desired result. VGRAF will produce error messages if the argument list is improper.

Following is a list of commands which will be discussed in the next section. The abbreviated name for the command is listed in square brackets.

Command Name and Argument List	Abbreviated Command Name
POSITION,x,y	[P]
TEXT,text	[T]
COMMENT,comment	[COM]
FRAME	[F]
ASET,x,dy	[AS]
AUTO,text	[A]
CENTER,text	[CT]
CENTERBLK,text	[CBT]
SIZE,size	[S]
COLOR,color number	[COL]
BACKCOLOR,color number	[BGCOL]
BACKGROUND	[BG]
ABACK	[ABG]
NOBACK	[NOBG]
GRAF	[GRAF]
GSET,grid,number of points,logx,logy	[GST]
GRAFGO	[GGO]

3-2 Plot Generation -- Command File and Corresponding Plots

The user generates a plot in much the same way as he would if he were drawing or writing on a piece of paper. The user decides where he wants to write (positions the pointer) and then writes the desired text. To position the pointer, the user should think of the plot area in terms of a user-coordinate system ranging from 0.0 to 1.0 in both the x and y directions as shown in Figure 1. The POSITION,x,y [P]

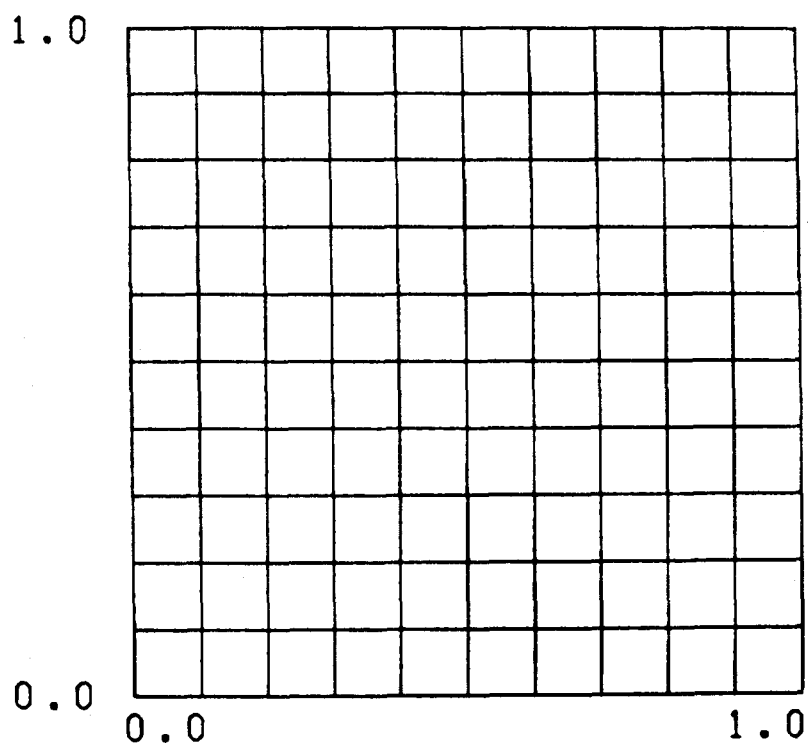

FIGURE 1
USER-COORDINATE SYSTEM

command positions the pointer.* The TEXT,text [T] command writes the desired text. These two commands are sufficient for generating simple plots. The following command file generates Figure 2.[3]

```
COMMENT,COMMAND FILE FOR FIGURE 2.
COMMENT,POSITION AND TEXT COMMANDS.
P,.1,.9
T,    ...IN SO MANY WORDS
P,.1,.75
T,ADSCITITIOUS
P,.1,.7
T,AUSCULTATION
P,.1,.65
T,BOUSTROPHEDON
P,.1,.6
T,CRAPULOUS
P,.1,.55
T,LALLATION
P,.6,.75
T,LUCUBRATION
P,.6,.7
T,MANSUETUDE
P,.6,.65
T,OBSEQUY
P,.6,.6
T,TITIVATE
P,.6,.55
T,THERSITICAL
P,.4,.2
T,FIGURE 2
P,.1,.1
T,  POSITION AND TEXT COMMANDS
FRAME
```

*As indicated in Section 3-1, most of the commands have an abbreviated form. These will be given in this text enclosed by [ ] following the long form. P,.1,.1 is the same as POSITION,.1,.1.

...IN SO MANY WORDS

ADSCITITIOUS	LUCUBRATION
AUSCULTATION	MANSUETUDE
BOUSTROPHEDON	OBSEQUY
CRAPULOUS	TITIVATE
LALLATION	THERSITICAL

FIGURE 2

POSITION AND TEXT COMMANDS

There are two commands in the command file for generating Figure 2 which have not yet been discussed. These are the COMMENT [COM] and FRAME [F] commands. The COMMENT command allows the user to insert comments in his command file. These comments are for the user's use only and never appear on the plot itself. The FRAME command advances the plot frame (i.e., the user has finished one plot and is ready to generate a new plot). Its purpose is to allow the user to produce several plots during one VGRAF execution. Each figure in this report was generated by using one contiguous command file; therefore, the FRAME command appears between each set of commands for generating the included figures.

Examination of the above command file shows that the user has to POSITION before each TEXT command. After each TEXT command the pointer is positioned and ready to write at the next character space beyond the last written text character. Since the user normally wants to move downward on the page, the process can be automated. The user selects an x-coordinate position for all subsequent lines of text and a dy distance for moving the pointer downward. The command form is ASET,x,dy. In this automated mode, text is generated via the AUTO command rather than the TEXT command. When the AUTO command is issued, the text string begins at the x-coordinate value specified by the x parameter of ASET. Its y-coordinate value is the current pointer's y value minus the dy parameter of the ASET command. Following are the commands for generating Figure 2 in AUTO mode.

The CENTER,text [CT] command centers text in the x direction at the current y position. The program calculates the x-coordinate value according to the number of printable characters in the text string. CENTERBLK,text [CBT] centers block character text.

```
COMMENT,COMMAND FILE FOR FIGURE 2.
COMMENT,        AUTO MODE.
P,.1,.95
ASET,.1,.05
A,     ...IN SO MANY WORDS
A,
A,
A,ADSCITITIOUS       LUCUBRATION
A,AUSCULTATION       MANSUETUDE
A,BOUSTROPHEDON      OBSEQUY
A,CRAPULOUS          TITIVATE
A,LALLATION          THERSITICAL
A,
A,
A,
A,
A,
A,
A,            FIGURE 2
A,
A,  POSITION AND TEXT COMMANDS
FRAME
```

The SIZE,size [S] command allows for variable sizing of text. The size is relative to the user-coordinate system. For example, SIZE,.01 produces text characters which are one-hundredth of the plot area in height. For most plots, aesthetically-pleasing sizes range from .015 to .08. Figure 3 shows the use of centering and sizing commands.[4,5] The command file for generating Figure 3 is listed below.

```
COMMENT,COMMAND FILE FOR FIGURE 3.
COMMENT,CENTER AND SIZE COMMANDS.
P,.1,.95
S,.032
CT,ALBERT EINSTEIN
ASET,.15,.035
S,.02
A,
A,GREAT SPIRITS HAVE ALWAYS ENCOUNTERED
A,VIOLENT OPPOSITION FROM MEDIOCRE MINDS.
A,
A,
A,
S,.03
CBT,LOST
A,
ASET,.2,.03
S,.02
A,LOST, YESTERDAY, SOMEWHERE
A,      BETWEEN SUNRISE AND SUNSET
A,TWO GOLDEN HOURS, EACH
A,      SET WITH SIXTY DIAMOND MINUTES.
A,NO REWARD IS OFFERED
A,      FOR THEY ARE GONE FOREVER.
A,
A,--HORACE MANN
A,
A,
A,
A,
A,
A,
S,.025
CT,FIGURE 3
A,
A,
CT,CENTER AND SIZE COMMANDS
FRAME
```

ALBERT EINSTEIN

GREAT SPIRITS HAVE ALWAYS ENCOUNTERED
VIOLENT OPPOSITION FROM MEDIOCRE MINDS.

LOST

LOST, YESTERDAY, SOMEWHERE
BETWEEN SUNRISE AND SUNSET
TWO GOLDEN HOURS, EACH
SET WITH SIXTY DIAMOND MINUTES.
NO REWARD IS OFFERED
FOR THEY ARE GONE FOREVER.

--HORACE MANN

FIGURE 3

CENTER AND SIZE COMMANDS

Figure 4 illustrates color plot generation.[6,7,8] Colors are selected by number. For example, COLOR,1 [COL] selects red for text characters. There are 256 color choices which are listed in [2]. Figure 4 uses BACKCOLOR,4 [BGCOL] (blue) for background shading and COLOR,2 (green) for text. Please note that the overlaying of colors results in color mixing thus giving the text a turquoise blue appearance. Selecting a background color is not sufficient to obtain a shaded background. The user must also issue the BACKGROUND [BG] command. This shades the background of the current frame with the color selected by BACKCOLOR. There is another background shading command ABACK [ABG] which initiates color background shading of the

REFRANES

UNOS CARDAN LA LANA
Y OTROS AGARRAN LA FAMA.

EN BOCA CERRADA, NO ENTRA MOSCA.

NO HAY MAL QUE POR BIEN NO VENGA.

EL QUE HAMBRE TIENE,
EN TORTILLA PIENSA.

RUBEN DARIO

JUVENTUD, DIVINO TESORO,
YA TE VAS PARA NO VOLVER.
CUANDO QUIERO LLORAR, NO LLORO,
Y A VECES LLORO SIN QUERER ...

FIGURE 4
COLOR COMMANDS

current frame and all subsequent plot frames. The NOBACK [NOBG] command disables any subsequent background shading which has been initiated by either the BACKGROUND or ABACK command. If the user selects color background shading and tries to view his plot on a black/white plotting device (example, TEKTRONIX 4014-1 or VERSATEC plotter), he will see nothing more than a black square. To avoid this problem, the user can insert the NOBACK command at the beginning of his command file, preview his plots and make necessary changes. Once the plots are considered correct, the user can remove the NOBACK command, generate the color plots and send them to a color plotting device. The command file for generating Figure 4 is listed below.

```
COMMENT,COMMAND FILE FOR FIGURE 4.
COMMENT,        COLOR COMMANDS.
BG
BGCOL,4
COL,2
P,.15,.95
S,.028
CBT,REFRANES
ASET,.15,.03
S,.020
A,
A,
A,UNOS CARDAN LA LANA
A,     Y OTROS AGARRAN LA FAMA.
A,
A,EN BOCA CERRADA, NO ENTRA MOSCA.
A,
A,NO HAY MAL QUE POR BIEN NO VENGA.
A,
A,EL QUE HAMBRE TIENE,
A,       EN TORTILLA PIENSA.
A,
A,
A,
A,
S,.025
ASET,.18,.028
CT,RUBEN DARIO
S,.018
```

```
A,
A,
A,JUVENTUD, DIVINO TESORO,
A,      YA TE VAS PARA NO VOLVER.
A,CUANDO QUIERO LLORAR, NO LLORO,
A,      Y A VECES LLORO SIN QUERER ...
A,
A,
A,
A,
A,
S,.03
CT,FIGURE 4
A,
A,
CT,COLOR COMMANDS
FRAME
```

To produce an x,y data plot, the user needs exactly three commands: GRAF, GSET [GST] and GRAFGO [GGO]. The GRAF command tells VGRAF that an x,y data plot is desired. The GSET command is used to indicate how many points are to be plotted. Its form is GSET,grid,number of points,logx,logy where grid selects the type of grid desired and logx, logy indicates linear and/or logarithmic scales. GRAFGO tells the program that all instructions are completed and the x,y data points follow. Figure 5 uses GSET in the form GSET,0,number of points,0,0 which selects that ticmarks be drawn on the linear scale with grid lines omitted. The user may also issue the GXLABEL,text [GX] and GYLABEL,text [GY] commands for labelling of the x and y axes. The command file for generating Figure 5 is listed below.

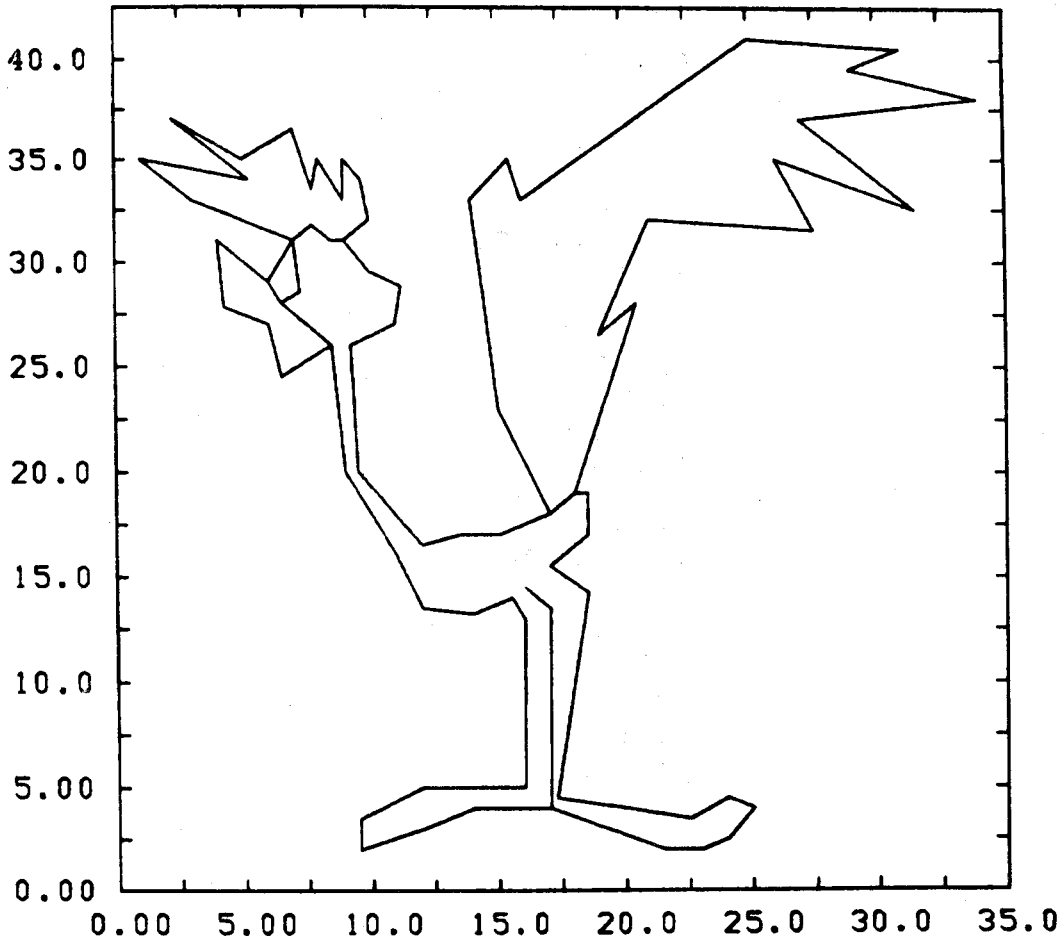

FIGURE 5
DATA PLOT

```
COMMENT,COMMANDS FOR FIGURE 5.
COMMENT,       DATA PLOT.
GRAF
GSET,0,89,0,0
GRAFGO
17,4
21.5,2
23,2
24,2.5
25,4
24,4.5
22.5,3.5
20,4
17.25,4.5
18.5,14.25
17,15.5
18.5,17
18.5,19
18,19
20.5,28
19,26.5
21,32
27.5,31.5
26,35
31.5,32.5
27,37
34,38
29,39.5
31,40.5
25,41
16,33
15.5,35
14,33
15,23
17,18
18,19
17,18
15,17
13.5,17
12,16.5
9.5,20
9.25,26
11,27
11.25,28.8
10,29.5
9,31
10,32
9.7,34
9,35
```

```
9,33
8,35
7.75,33.5
7,36.5
5,35
2.25,37
5.25,34
1,35
3,33
7,31
7.75,31.75
8.5,31
9,31
8.5,31
7.75,31.75
7,31
6,29
4,31
4.25,27.8
6,27
6.5,24.5
8.5,26
7,27.5
6.5,28
6,29
7,31
7.25,28.5
6.5,28
7,27.5
8.5,26
9,20
11,16
12,13.5
14,13.25
15.5,14
16,13
16,5
12,5
9.5,3.5
9.5,2
12,3
14,4
17,4
17,13.5
16,14.5
POSITION,.1,.08
CENTER,FIGURE 5
POSITION,.1,.04
CENTER,DATA PLOT
```

4-0 SYSTEM COMMANDS FOR ACCESSING AND USING VGRAF

VGRAF is available on both the BATCH operating system and the NOS timesharing system at SNLA. It uses the RSCORS plot system in the post-processing mode to allow the user to direct the output file to several output devices with many different film formats. These are the DICOMED D48 (Models B and C), RJET VERSATEC Hardcopy, SD4020, DX4460, NOS TEXTRONIX Graphics Terminals, BATCH line printers, and NOS non-graphic terminals. The method of accessing and using the VGRAF program is system dependent and, therefore, subject to change. NOS and BATCH system commands as related to VGRAF are discussed below.

4-1 NOS Access and Use

The control stream for accessing and using VGRAF is as follows:

```
ATTACH,VGRAF,POP/UN=SLTHOMP.
VGRAF,namel.
POP.
```

The namel parameter is the filename for the user-generated command file which describes the desired plot. Following is a more detailed description of the above control stream.

The VGRAF program on NOS produces an output file which must be post-processed by using the RSCORS post-option-processor program, POP. Both of these program files are direct access permanent files which are stored under user number SLTHOMP. To access these files, the user types the following NOS commands;

```
ATTACH,VGRAF,POP/UN=SLTHOMP.
```

Once the above two files have been attached during one NOS terminal session, they are available throughout that terminal session. That is, the user needs to issue the ATTACH command only once per NOS terminal session.

As stated above, the VGRAF program expects to read a user-generated command file from which it will generate a plot output file This user-generated command file contains the VGRAF commands as described in this document. The default command file name is CVGIN and the default output file name is POPIN. After the VGRAF program has finished executing, the POPIN file is submitted to the RSCORS post-option-processor POP. If the user chooses to use the default file names for VGRAF, he types the following NOS commands to process his job.

```
RA.
VGRAF.
POP.
```

If the user chooses to provide his own names for the command file and the plot output file, he will need to include these names as parameters when he issues the NOS commands. The NOS commands would be as follows:

```
RA.
VGRAF,name1,name2.
POP,name2.
```

If the user executes VGRAF or POP more than once during one NOS session, the RA (rewind all) command should always be reissued. This ensures that processing of all files will be at the beginning of the file.

The post-option-processor, POP, asks the user interactively which processing options are desired for his output file. Should the user select the DICOMED or RJET VERSATEC option, POP will produce a file named POPOUT which will have to be given to the COMQ system for routing to the DICOMED D48 or VERSATEC.* This is done via the NOS command,

*Please note that the COMQ command is used only when the DICOMED or RJET VERSATEC option is specified during POP execution.

COMQ.† POPOUT is the default output file name used by the post-option-processor. If the user desires to use some other name for this output, the NOS command listed above would be modified as follows:

```
POP,name2,name3.
```

The form of the COMQ statement for routing of the POP output file to a DICOMED is:

```
COMQ,POPOUT,DIC,option1,option2.
```

or

```
COMQ,name3,DIC,option1,option2.
```

The form of the command again depends on whether or not the user has chosen to use the default output file name for the post-option-processor when he issued the POP command. The option1 parameter can be any of the following and should correspond to the option selected during the post-processing interactive mode, i.e., during the execution of POP.

APERT for 35 mm aperture card

FICHE for black and white microfiche (24X)

MOVIE for 16 mm movie

SLIDE for 35 mm slides

STRIP for 35 mm strip, comic orientation

The option2 parameter can be either COL or REV. The COL parameter will provide color film processing. The REV parameter will provide black and white film, reversal processing, i.e., the background will be black. Color processing is available only with the MOVIE and SLIDE options.

---

†The user should follow current COMQ instructions as supplied by the Computer Graphics Division.

RJET VERSATEC hardcopy is obtained by selecting the proper option during POP execution. As before, an output file is produced (default name is POPOUT) which must be sent to the VERSATEC plotter via COMQ. The form of the COMQ statement for routing of the POP output file is

```
COMQ,POPOUT,HC1,CS=sitecode.
```

or

```
COMQ,name3,HC1,CS=sitecode.
```

The sitecode parameter is required for hardcopy output which can be produced only at remote sites.[9] If the parameter is omitted, the output will be printed at central site on microfiche and returned to the user's standard distribution box.

4-2 BATCH Access and Use

The VGRAF program is available only on the CDC 7000 machines. The control stream for accessing and using VGRAF is as follows:

```
Jobname,MC7.                          Name and Box
Account Card
ATTACH,VGRAF,VGRAF.
VGRAF.
ATTACH,POP,SCORPOP-7600,CY=*.
POP,POPIN,POPOUT,Fmopt,               Eye-readable fiche title.
COMQ,POPOUT,Device,Options.           This card is used only if
                                      CY=1 above.
7/8/9
User-generated input command file
.
.
.
6/7/8/9
```

In order to generate an output plot file, VGRAF expects to read a user-generated command file. This is the file which contains the VGRAF commands as described in this document. It appears as INPUT in the control stream.

The VGRAF execution produces an output file (named POPIN) which must be post-processed by the post-option-processor, POP. The user must select the correct version of POP via the CY=* parameter on the ATTACH,POP,...control card. This selection depends on which plotting device is desired.

CY=1 is for DICOMED D48-B, DICOMED D48-C, or RJET VERSATEC Hardcopy

CY=3 is for BATCH Line Printer

CY=4 is for SD4020 or DX4460

If the user selects CY=1 and also selects the DICOMED as the graphics device, he must select a film format option on the POP, POPIN,... control card. This information is passed to POP via the Fmopt field. He must also include the control card

COMQ,POPOUT,DIC,Options.*

The Options parameter must correspond to the Fmopt parameter selected during POP execution as indicated in the following table.

Fmopt	Film Type	Options
APERT	Aperture Card (35 mm nonperf)	APERT
SLIDE	35 mm with space for mounting	SLIDE,REV
NP16S	16 mm nonperforated	FLM=16N
MOVIE	16 mm movie	MOVIE,REV
MOV35	35 mm movie	FLM=35P,REV
STRIP	35 mm frame abutment	STRIP

*The user should follow current COMQ instructions as supplied by the Computer Graphics Division.

FICHE	24X fiche	FICHE
FIC48	48X fiche	FICHE,48X

Please note that the COMQ parameter REV indicates black and white film processing (i.e., reversal processing, black background). For color film processing, the REV should be changed to COL.

If either fiche option is selected, an eye-readable title must be supplied. This information is passed to the system via the comment field of the POP execution card. The user should therefore write the desired title in columns 31 through 80 of the POP,POPIN,... control card.

If the user selects CY=1 and also selects the RJET VERSATEC as the hardcopy device, the control card stream would be changed as follows:

```
POP,POPIN,POPOUT,FULLF.
COMQ,POPOUT,HC1.
```

If the user selects CY=3 or CY=4, his control stream should not include the COMQ control card.

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4004 B. J. Mathis
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4216 M. J. Kushner
4220 T. J. Burgess
4231 C. N. Vittitoe
4231 L. Kissel
4241 B. G. Epstein
4241 J. R. Freeman
4242 L. P. Mix
4247 M. M. Widner
4247 L. Baker
4251 R. A. White
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