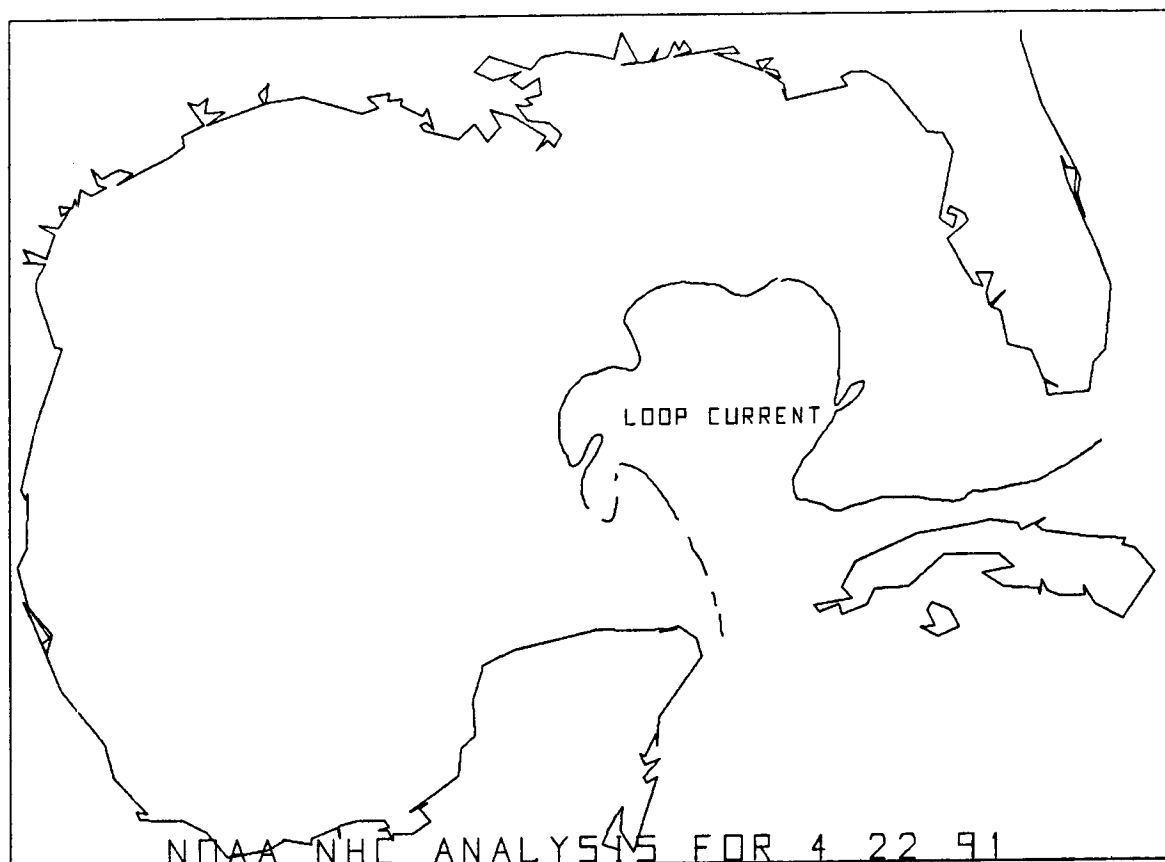


GULFPLOT: Oceanographic Charting Software for the Gulf of Mexico

Version 3.1

April 1991



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The computer code may be obtained by sending one high-density, formatted, 5 1/4-inch floppy diskette (or two double density diskettes) to the author (Attention: Environmental Studies Section MS 5430) at the above address.

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ABOUT THE COVER

This typical GULFPLOT chart shows the location of the Loop Current front on April 22, 1991. The analysis was posted on the GULF.MEX electronic bulletin board by Dr. Steve Baig of the National Hurricane Center, Miami.

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SECTION I INTRODUCTION

The GULFPLOT program is a simple marine charting utility written to be run with the GWBASIC Interpreter, primarily because of its wide availability on microcomputers. The program uses ASCII data files in standard formats (appendix A) to draw charts of the ocean. The charts contain notations and symbols depicting the locations of sampling sites or cruises, as well as ocean fronts, buoy trajectories, and other useful information. Since the ASCII files can be posted on electronic bulletin boards, the program offers a simple way to communicate marine research progress among the scientific community. GULFPLOT can also be compiled and run with the GWBASIC Compiler or the QUICKBASIC Compiler (as long as certain line substitutions clearly marked in the Labelling Subroutine are observed). The program, which draws drifting buoy trajectories, is loosely based on a code that was informally distributed in 1989 by Dr. Bob Pickett of the Naval Oceanographic & Atmospheric Research Laboratories.

The following system/software requirements apply:

- The program runs on a monochrome monitor in CGA simulation mode, on a CGA monitor, on an EGA monitor, or on a VGA monitor (but only in EGA mode).

2 Introduction

- As written, GULFPLOT and the required low-resolution coastline datafile, WDB345.DAT¹, must be placed in the subdirectory C:\GULFPLOT. This restriction can easily be changed in the program. If used, the high-resolution datafile, WDB1.DAT, must also be in the same subdirectory. The program also expects to find subdirectories BUOYS and FRONTS, which contain drifting buoy data and ocean frontal analyses, respectively.

This manual for the GULFPLOT Version 3.1 microcomputer program is actually a severely edited version of the program itself. Most of the program lines have been removed, leaving behind only the INPUT and PRINT lines, which result in user prompts on the screen. All of these lines are listed below in the order they appear in the program (and still numbered² accordingly), with instructions inserted immediately after each one. Some instructions refer to lines lower in the program exactly the same way the subroutines of the program are structured.

180 PRINT *	GULFPLOT PROGRAM, VERSION 3.1*
200 PRINT *	Indicate your screen type:
210 PRINT *	1 - Monochrome with memory-resident

¹The coastline data file WDB345.DAT is used for the entire northwestern Atlantic and Gulf of Mexico. Other versions of GULFPLOT, covering different portions of the oceans, may be issued in the future. These versions will require other coastline files, affecting this manual only with regard to the coastline file name.

²The line numbers used here are those in use on October 22, 1990. It is not necessary that they match the current version of the program exactly, so no attempt will be made to update them as the program evolves.

220 PRINT *	CGA simulation program
230 PRINT *	2 - True CGA (hi-res B&W)
240 PRINT *	3 - EGA (16 colors)

This initial screen requires the user to indicate which type of monitor should be supported. Choices 1 and 2 result in a black-and-white image in CGA "high resolution" mode. If the user has VGA, Choice 3 should be entered, since GWBASIC does not support the full VGA palette of colors.

```
370 INPUT "R-eplay,D-efn,P-lot,G-rld,T-ttle,S-ave,CLS,DOS,U-til,M-ark,E-nd";F$
```

This line appears at the top of the screen as the MAIN MENU. In response, you should enter a single letter or group of letters, as shown, then hit ENTER. The various options are as follows:

REPLAY: To recall to the screen a previously SAVED screen. Attempt to use the REPLAY command will result in an error message if no picture has previously been SAVED. It is much faster to REPLAY certain frequently used charts that have been SAVED than to re-draw them on the screen with the DEFINE command (see below). Further, a companion program, GULFSHOW, which lets the user REPLAY named sequences of SAVED pictures in "slideshow" fashion, is available. Additional input and instructions for the REPLAY command are given in line 530, below.

DEFINE: To set up the geographic dimensions of a chart to be drawn. Several defaults will be offered, as well as the ability to define nonstandard charts. Once the information has been entered, the base chart will be drawn on the screen. Further input and instructions are given in line 760, below.

PLOT: To name a particular GULFPLOT data file to be drawn on a chart. This command cannot be used until a base map has been drawn on the screen with either the DEFINE command or the REPLAY command. Further input and instructions are given in line 1880, below.

GRID: To draw a latitude-longitude graticule on a chart. The chart must already have been drawn. With no further user input, the lines are drawn and the MAIN MENU reappears.

TITLE: To write a title in a red rectangle at the bottom of the chart. When this option is chosen, the MAIN MENU disappears and a prompt appears. The title can be up to 45 characters in length, but only upper- and lower-case letters and the numbers 0-9 are actually printed; other ASCII characters appear as spaces.

SAVE: To save the chart on the screen to disk. (The REPLAY command can be used to recall the chart to the screen.) Further input and instructions are given in line 1530, below.

CLS: To clear the screen (of an existing chart) prior to beginning a new chart.

DOS: To leave the program temporarily in order to use the ordinary DOS utilities. Typing EXIT<ENTER> returns the user to GULFPLOT.

UTILITIES: A set of short, useful programs for creating, converting, or listing GULFPLOT files. Once a file has been created or altered through the use of a utility program, the user must exit UTILITIES and return to the main menu to draw the resulting chart on the screen. If the user selects UTILITIES, the screen is cleared and a UTILITIES MENU appears, i.e., the chart on the screen is erased. Therefore, if the chart is needed later, it should be SAVED before calling up UTILITIES. Further input and instructions begin at line 4130, below.

MARK: A set of routines that allows the user to place labels or user-specified figures in existing files or in new files. When a data file has been plotted to the screen, the user could, for instance, use MARK options to add more information to the same file. MARK, a powerful and flexible GULFPLOT command, can be used to increase the readability of various files or to enhance the resulting charts for purposes of publishing.

END: To exit the GULFPLOT program and return to your operating system.

SECTION II
COMMAND DOCUMENTATION

THE REPLAY COMMAND

530 INPUT "Name of picture file to replay"

"Pictures" of the charts drawn on the screen can be saved by the use of the SAVE command (below). The REPLAY command is used to recall them to the screen. Each "picture" is actually saved in 5 files, with the filename extensions .RED, .GRN, .BLU, .INT (for intensity), and .PTR (for parameters). When the name of the chart is entered (with no extension), the picture is recalled to the screen. Because the parameters (e.g., latitude and longitude ranges) have been loaded into memory, additional plotting can take place on the REPLAYed chart. Use of the REPLAY command is the quickest way to "bring up" a previously used (or often used) chart, since re-plotting the coastline takes some time.

THE DEFINE COMMAND

760 INPUT "G-ulf, A-tlantic, E-ntire area, or N-onstandard"

The GULF option draws the complete Gulf of Mexico; ATLANTIC draws the NW Atlantic from Newfoundland to Cuba; ENTIRE draws a combination of both GULF and ATLANTIC. The NONSTANDARD option is explained beginning at line 830.

830 INPUT "H-high resolution or L-low resolution"

The NONSTANDARD option allows the user to do two things: (1) choose the high-resolution coastline (WDB1.DAT) over the regular low-resolution coastline (WDB345.DAT), and (2) enter any coordinates for the chart, so long as the coordinates are within fixed limits for this version of GULFPLOT. NOTE: The coastline WDB1.DAT only covers the Gulf of Mexico. WDB345.DAT, on the other hand, covers the entire northwestern Atlantic and Gulf of Mexico.

870 INPUT "To plot an unstandard map, input top latitude"

910 INPUT "Bottom latitude"

950 INPUT "Right-hand longitude (-W,+E)"

990 INPUT "West-side longitude"

Once the resolution has been selected, the program will catch any user-specified coordinates that are outside the coastline and will prompt for re-entry. The above 4 lines (appearing on the screen one at a time) prompt the user for chart coordinates. The entries should be integral (i.e., whole number) values. Error traps are provided to prompt the user if unallowed values are entered.

1260 PRINT "Plotting the coastline. Hit ENTER to abort."

While the coastline is drawing, which may take some time for the high-resolution file, the user can terminate coastline plotting by hitting ENTER. This feature provides a shortcut in case the area being plotted is near the beginning of the coastline file, and the user does not wish to wait through much "off screen" plotting that follows.

THE SAVE COMMAND

1530 INPUT "Picture name to save (No EXT)"

This is the companion line to line 530 above. It prompts the user to enter a name under which the present screen image will be **SAVEd**.

THE PLOT COMMAND

1880 INPUT "Data file to display (NAME+EXT)"

This line prompts the user to name a GULFPLOT data file to be drawn on the chart. If the file is in a subdirectory under GULFPLOT, it must also be included; for example,

BUOYS/B999999.DAT<ENTER>

would be the proper response to initiate the charting of a file named B999999.DAT in subdirectory BUOYS. As indicated, the filename extension must be included.

There are two types of files that can be plotted with GULFPLOT: .DAT files (as in the example) and .GRD files. Both file types are described in appendix A. If the file selected for plotting was a .DAT type, then it will be drawn at this point, and the MAIN MENU returns so the user can select another option, including drawing other files on the same chart. If the file selected for plotting was a .GRD type, then the additional steps described at line 8890 occur.

THE UTILITIES MENU

```
4130 PRINT "1:Input from the keyboard a GULFPLOT file (but no vectors)"
4150 PRINT "2:Convert old GULFPLOT file (+longitude) to new (-longitude)"
4170 PRINT "3:Input from the keyboard a GULFPLOT file of current vectors"
4190 PRINT "4:List files by type"
4210 PRINT "5:Create synoptic drifter file from all drifter files"
4230 PRINT "6:List frontal charts within a given time period"
4250 PRINT "7:Slideshow program for SAVED charts"
4270 PRINT "8:Return to Main Menu"
4290 PRINT "[Note: Utilities 1 and 3 open files in APPEND mode, so the"
4310 PRINT "user can work on the same file using different utilities."
4330 PRINT "Keyboard entries will be added to the existing file.]"
4350 INPUT "Select a utility program: "
```

The above lines constitute the utilities menu. The options are as follows:

No. 1: Allows the user to compose a GULFPLOT file with any of the 'Z-flags' except V (for drawing vectors). (See the documentation for the GULFPLOT format for further explanation.) Lines may also be appended to existing files. If the user makes a mistake while entering data, the data-line should be completed and then repeated correctly. Subsequent editing with any ASCII editor deletes the mistaken data-line. Further input and instructions are given in lines 4480-4740 below.

No. 2: On November 1, 1990, the previous convention for longitude was changed (from +W,-E to -W,+E). This change provides uniformity between the GULFPLOT program and a companion program developed by NOAA/COAP in Monterey, California, called WRLDPLOT. This utility program permanently converts old GULFPLOT files to the new format. Further input and instructions are given in line 4830 below.

No. 3: Allows the user to compose a GULFPLOT file consisting entirely of vectors (signified by the Z-flag of V). Additional lines may be added to the file with Utility Program No. 1 above. Further input and instructions are given in lines 5040-5570 below.

No. 4: This utility program lists the different kinds of data files or other files associated with GULFPLOT, according to match criteria entered by the user. Further input and instructions are given in lines 8580-8730 below.

No. 5: This utility allows the user to create a new file that contains all of the drifting buoy data (contained in separate buoy files in subdirectory BUOYS) for a given time window. When plotted, this "quasi-synoptic" view of surface currents may be a valuable tool in identifying eddies. The new file is placed in the main GULFPLOT subdirectory. Further input and instructions are given in lines 5700-5750 below.

No. 6. This utility allows the user to create a screen listing of all frontal analysis charts (contained as separate files in subdirectory FRONTS). Further input and instructions are given in lines 6080-6090 below.

No. 7: This utility allows the user to set up sequential listings of SAVEd charts. These charts will be shown on the screen in rapid succession as if by a slide projector. Various sequences of charts are given separate names, so many different "slide shows" can be created. Further input and instructions are given in lines 6330-6980 below.

UTILITY NO. 1

4480 INPUT "Name of file to create (no EXT)."

Enter the name of the file. The extension .DAT will automatically be added.

4510 INPUT "Identifier (RETURN=default='D');-1 to quit."

The first field in each data line is encouraged to be an "identifier" of the source of the data, such as a station name, a vessel name, etc. If none is known, hit ENTER to use the default value of "D." If -1 is entered, the file is closed and the UTILITIES MENU reappears.

4540 INPUT "Date/time as YYYYMMDDhhmm (RETURN=default='T')."

The second field is a date/time identifier, such as 8910082115 for 9:15 p.m. on October 8, 1989. This can be shortened to date only if the time is unknown; or the default "T" can be used by hitting ENTER, if no date/time identifier is known.

4560 INPUT "Degrees of latitude (+N,-S)"

Enter the latitude in decimal-degrees format, e.g., +31.4567 or -18.4666, if you have that value already. If you also have minutes (and possibly seconds) of latitude, then enter only the whole degrees here. If you are within one degree of the equator, use +0 or -0, as appropriate.

4580 INPUT "Minutes of latitude"

Enter the minutes of latitude in decimal-minutes format, e.g., 55.8765, if you have that value already. If you also have seconds of latitude, enter only the whole minutes here.

4590 INPUT "Seconds of latitude"

Although such precision is rarely available, you can enter the seconds of latitude here, either in whole seconds or decimal-seconds format, e.g., 14.9998.

4650 INPUT "Degrees of longitude (+E,-W)"

4670 INPUT "Minutes of longitude"

4680 INPUT "Seconds of longitude"

For the above three inputs, which appear one at a time on the screen, follow the same directions as for lines 4560-4590 above, except that "longitude" is intended instead of "latitude." If you are within one degree of the prime meridian, use +0 or -0, as appropriate.

4740 INPUT "Enter the 'Z-flag' (and additional data if required)."

The fifth field in each line of a GULFPLOT data file contains the plotting instructions. It consists of either a single character (the 'Z-flag') or a Z-flag plus an additional string of ASCII characters. These are explained in the GULFPLOT file specifications. You can enter the entire contents of the fifth field here.

UTILITY NO. 2

4830 INPUT "Name and extension of existing file to convert"

Enter the name of the old-format GULFPLOT data file. This utility will multiply all longitudes by -1 so the new file is compatible with GULFPLOT version 3.1 and with other software programs.

UTILITY NO. 3

```
5040 INPUT "Enter the name of the file to create (no path or extension)"
5080 INPUT "Identifier (ENTER = default = 'D'); enter -1 to quit"
5110 INPUT "Date/time as YYYYDDhhmm (ENTER = default = 'T')"
5130 INPUT "Degrees of latitude (+N,-S)"
5150 INPUT "Minutes of latitude"
5160 INPUT "Seconds of latitude"
5220 INPUT "Degrees of longitude (+E,-W)"
5240 INPUT "Minutes of longitude"
5250 INPUT "Seconds of longitude"
```

All of the above lines are similar in meaning to lines 4480-4680 above. In this case, however, the Z-flag and additional string will be created by the program because the format for drawing current vectors must be exact. Further, the arithmetic to get the data into the right format is tricky. This program asks simple questions and uses the responses to write the fifth data field. As discussed in the GULFPLOT data file format specifications, only those questions relevant to the user's data should be answered, i.e., irrelevant questions should be ignored by just hitting ENTER. You will see that the user should only supply answers to ONE of the following groups of program lines:

5310 and 5330, or

5310 and 5330 and 5350, or

5370 and 5410, or

5390 and 5410

For all the other lines, just respond by hitting ENTER.

5310 INPUT "Enter U in cm/s"

The user should enter the current velocity component in the eastern "U" direction in centimeters per second. Sometimes U has been rotated away from true east by some angle; if this is so, line 5350 below must also be answered.

5330 INPUT "Enter V in cm/s"

The user should enter the current velocity component in the northern "V" direction in centimeters per second.

5350 INPUT "Enter the clockwise angle U has been rotated from true east"

The user may enter here the clockwise angle (in degrees) that the coordinate system may have been rotated from true east. If U in the user's original data set was oriented due south, for example, then the offset angle is +90.

5370 INPUT "Enter speed in cm/s"

If the user's data are in resultant vector format, then the correct response here is the current speed in centimeters per second.

5390 INPUT "Enter speed in knots"

If the user's data are in resultant vector format, but recorded in knots, then correct response here is the current speed in knots.

5410 INPUT "Enter direction (toward which) in true degrees"

If the user's data are in resultant vector format, as either knots or centimeters per second, then the true current direction should be entered here. North is 0 or 360; East is 90; South is +180; West is 270; etc.

5540 PRINT "Saved pictures are held in 5 files each, with extensions .INT,"

5550 PRINT ".RED, .BLU, .GRN, and .PTR (all with the same filename)."

5570 INPUT "Hit ENTER when ready to return to the utilities menu."

UTILITY NO. 4

8580 PRINT*1: List subdirectories under GULFPLOT

8590 PRINT*2: Select and search a subdirectory

8600 PRINT*3: List SAVED charts

8610 PRINT*4: List .HPG files

8620 PRINT*5: Return to Utilities Menu

8630 PRINT

8640 INPUT "Make your selection: "

This is the screen the user sees when Utility No. 4 has been selected. It allows the user to see (1) all the subdirectories under GULFPLOT, (2) all of the files in any subdirectory under GULFPLOT, (3) a list of all the SAVED charts that can be rapidly REPLAYed, or (4) a list of all HPG files that can be plotted on HPGL-compatible devices.

8710 INPUT "Which subdirectory; ENTER for none"

If the user has selected Option No. 2, this prompt asks for the name of the subdirectory files to be displayed. If ENTER is hit, all the .DAT files within the GULFPLOT directory itself will be displayed.

8730 INPUT "Enter the search criteria (* and ? allowed)"

This prompt allows the user to refine his search of the files by using * to indicate a variable-length string of any alphanumeric characters and by using ? to indicate a single variable alphanumeric character. These "wildcards" are used here exactly as they are employed with the DOS commands. The user enters a sequence of known and unknown alphanumeric characters, excluding the extension, which is assumed to be .DAT, followed by hitting ENTER.

UTILITY NO. 5

5700 INPUT "Date to start searching (In YYYYMMDD format)"

The user should input the begin date for the search. When Utility No. 5 is invoked, a special file named BLIST.DAT is created in the GULFPLOT subdirectory containing the sequential list of all the data files in the subdirectory BUOYS. The program uses BLIST.DAT to run through all the buoys data looking for records AFTER the date specified here.

5710 INPUT "Date to stop searching (In YYYYMMDD format)"

This question is answered similarly to the above question, but the date supplied is the end date for the search. Only data BEFORE the date specified here will be selected.

5750 INPUT "Name of the aggregate file to create (no EXT)"

All of the drifting buoy data that match the above two criteria, i.e., fit into the specified window, will be copied into a new file named by the response to this prompt. The name supplied should not be the same as any other known file; a typical response could be BJAN90, for example, to contain all drifter data from 900101 to 900201. When the file is created, the extension .DAT is automatically supplied by the program. The new file is placed in the GULFPLOT subdirectory, not the BUOYS subdirectory.

UTILITY NO. 6

6080 INPUT "Date to start searching (In YYYYMMDD format)"

6090 INPUT "Date to stop searching (In YYYYMMDD format)"

The sense of both these prompts is identical to lines 5700-5710 above; however, no new file is created. The names of any data files in FRONTS that fall within the time window specified are typed on the screen. The file-naming convention for frontal charts allows this search to happen because the date of the analysis is contained in the file name. (See appendix A for further information on file names.)

UTILITY NO. 7

6330 PRINT*1 - Create A Show File."

6340 PRINT*2 - Run A Show."

6350 PRINT*3 - Quit."

6370 INPUT "Make a selection--"

The above 4 lines constitute the main menu for the "Slideshow," or Utility No. 7. The utility allows the user to use SAVED charts exactly like photographic slides in a projector: they can be shown on the screen rapidly in any given order (forward or reverse). A "show" cannot be run until a "show file" has been created. The "show file" is merely a sequential list of SAVED chart names.

6430 PRINT "These SAVED charts are available:"

If the user selects No. 1 from Utility No. 7's main menu, this line appears together with a listing of all the SAVED charts that are available in the GULFPLOT subdirectory.

6450 INPUT "Name of .SHO file to create (No EXT)"

The user should enter a unique filename of up to 8 characters. The program will assign an extension of .SHO to the filename.

6480 INPUT "SAVED chartname to add to file (No EXT); Q-quit"

From the list of available charts, the user can enter up to 100 names, one at a time. Names can be repeated if the chart should appear more than once in the desired sequence. Hit Q to quit the selection process and close the "show file." (NOTE: The resulting .SHO file can be easily edited with any ASCII editor; in fact, the .SHO file can be created totally by any ASCII editor.)

6560 PRINT "The following .SHO files are available:"

If the user selects No. 2 from Utility No. 7's main menu, this line appears together with a listing of all the .SHO files that are available in the GULFPLOT subdirectory.

6580 INPUT "Show file to play"

Enter the name of the .SHO file without the extension.

6690 PRINT "No. ";I;" of ";J-1;" Set NumLock for PgDn=next, PgUp=previous."

When the "slideshow" is running, this line appears at the top of the screen. On the left the sequential number of the visible chart is given along with the total number of charts in the show. The text on the right reminds the user that NumLock must be set in order to use the PgDn and PgUp keys to move through the slides (actually the numbers 3 and 9 on

the numeric keypad). PgDn moves to the next slide in sequence; PgUp moves to the previous slide.

6980 INPUT "End of file. B-back up; E-end, S-start over."

When the end of the slide sequence is reached, the user sees the above information line. He can use entries B, E, or S, as shown.

THE MARK COMMAND

7110 INPUT 'File to create or append to (EXT required)'

The MARK command creates new GULFPLOT data lines that are either placed in a new file or placed in an existing file. These new datafile lines direct the program to do any of the following:

- Place an alphanumeric label (LABEL subcommand) on the chart. Only uppercase letters of the alphabet and the numbers 0-9 are recognized; other ASCII characters result in a space.
- Place a small circle on the chart and write a label directly to the right of it (CIRCLE W/ LABEL subcommand). This command is useful for locating stations of special interest.
- Place a rectangle of any size at any location (RECTANGLE subcommand). This command is useful for drawing charts of generalized areas for illustrative purposes.
- Drawing in a freehand manner any type of polygon or ensemble of GULFPLOT lines of any format (PLC subcommand). Essentially, the user can move over the chart, placing plotting instructions (the Z\$ portion of the GULFPLOT format; see appendix A) at any appropriate location. In this way irregular figures can be drawn.

7160 INPUT 'L-abel, C-ircle w/ label, R-ectangle, PLC, or END'

According to the need for file additions, the user inputs L, C, R, PLC, or END. If the response is L or C, then the user will see the prompts at lines 7770, 7530, and 7620. If the response is R, the user will see the prompts at 7270, 7330, and 7620. If the response is PLC, the user will see the prompts at 7770 and 7740.

7270 PRINT#'"Set NumLock;Use ARROWS to locate FIRST CORNER.'

During a session with the MARK command, the user moves around the screen with the use of a dot-cursor that will initially appear at the center of the screen. To move the cursor, the NumLock must be set, since the ARROWS mentioned in the prompt are actually the number-keys 4, 2, 6, and 8. On standard keyboards, these number-keys also usually have directional arrows on them. If the user's keypad has the arrows elsewhere, a simple change in the program can be made. At the appearance of this prompt, the user should use the arrows to move the cursor to one corner of the rectangle, and hit enter. While moving the cursor, the user will notice that it goes twice as far each time the same directional key is hit. If any other directional key is hit, the movements become very small again, increasing with the number of times the same direction is entered. This function allows the user to move quickly to the desired location. While the cursor moves over the screen, the current latitude and longitude are displayed on the top line. The accuracy of these values is roughly +/- 0.01 degrees.

This prompt directs the user to locate the first (of two) corners of any rectangle he wishes to draw. When that corner is located, the user should hit ENTER.

7330 PRINT#"Set NumLock;Use ARROWS to locate SECOND CORNER."

The prompt directs the user to locate the second corner of the desired rectangle **DIAGONALLY OPPOSITE** the previously located corner. When the user selects this second corner by hitting ENTER, the rectangle will be drawn.

7530 INPUT "Input text for label:"

If the user has selected the LABEL or CIRCLE WITH LABEL subcommands, this prompt will appear when a location has been selected (by moving the cursor and hitting ENTER). The user should now enter a label of alphanumeric characters (uppercase letters and numbers only), and then hit ENTER. The added feature will immediately appear on the screen for inspection by the user.

7620 INPUT "OK (Y or N)"

This prompt appears after the label is entered for either the LABEL or CIRCLE WITH LABEL subcommands. It allows the user to inspect the new addition to the screen and determine whether it is correct. The user should indicate acceptance by entering either Y or N.

7740 INPUT "Z-string, i.e. P, L, or C"

If the user has selected the PLC subcommand, this prompt will appear when a location is selected (by moving the cursor and hitting ENTER). The user should now enter a Z-string of any kind. The subcommand is named "PLC," but any correct Z-string is acceptable. (See appendix A for the format specifications.) For instance, the user can draw an irregular polygon by creating the following sequence of lines:

```
D,T,X,Y,P
D,T,X,Y,L
D,T,X,Y,L
.
.
.
D,T,X,Y,L
```

Where the X's and Y's are the respective locations of the cursor when ENTER is hit. The P and the L's are entered by the user as the Z-strings, and the program automatically supplies the D and T (dummy values explained in Appendix A). Remember that the final L (line continuation) must come back to the original point (the P) to close the polygon.

7770 PRINT "Set NumLock;Use ARROWS to locate;ENTER accepts point;ESC to quit."

This is the prompt line that appears for the LABEL, CIRCLE WITH LABEL, and PLC subcommands.

PROGRAM EXIT OPTIONS

```
8050 PRINT*You now have a working plotter file, named WORK.HPG. Here*
8060 PRINT*are your options:*
8070 PRINT
8080 PRINT* 1: Exit program. The file WORK.HPG could be lost.
8090 PRINT* 2: Rename WORK.HPG.
8100 PRINT* 3: Send WORK.HPG or any plot file to an HP 7475 plotter.
8110 PRINT*      (Caution: There is no overflow check, so the receiving
8120 PRINT*      device must have sufficient buffer to hold the file.)
8130 PRINT* 4: Return to main menu. The file WORK.HPG will be lost.
8140 PRINT
8150 INPUT *      Make your selection *
```

This is the screen the user sees when the END command has been entered in order to leave the program. During the entire GULFPLOT session, a separate file of HEWLETT-PACKARD GRAPHICS LANGUAGE (HPGL) plotting instructions has been created. This file can be used to plot the same figure seen on the screen with an HPGL-compatible plotter or any program or device that recognizes HPGL. The working file is named WORK.HPG, and it will be written over the next time GULFPLOT is run. To avoid this loss, the above options allow the user to rename the file. The new file name will automatically receive the extension .HPG.

Additionally, the program allows the user to send any .HPG file to a device connected to the serial port. This "plotter driver," however, is fairly simple and only works if the plotting device has a large enough buffer to hold the entire .HPG file without overflowing.

CONTOURING WITH .GRD FILES

Although the datafiles, which GULFPLOT can draw on charts, are usually constrained to have the filename extension .DAT, they can usually have any extension. One special class of datafiles, with the extension .GRD, contains gridded data arrays that can be contoured by GULFPLOT. Their file format is entirely different from other files, as explained in appendix A. Essentially, a .GRD file is a sequential list of gridded field values only. The X and Y locations of the data are derived by the program in one of two ways: (1) the user inputs critical information directly to the program, or (2) the .GRD file contains an initial data line that contains this information. The grid must be a "regular" grid, in that all the distances between rows must be equal and all distances between columns must be equal. Distances between rows, however, do not have to be equal to distances between columns.

Once the data have been read into computer memory in the proper locations, the user can direct the program to draw up to 14 contour lines (of any value and in any combination of colors) on the chart. The contours can be drawn in a batch or one at a time. After drawing the contours, the user must employ the MARK command to place labels on the contours, since automatic labeling is not supported by GULFPLOT.

8890 INPUT "The Input array has a header line (Y or N)"

The user must know beforehand how to answer this prompt. Visual inspection of any .GRD file easily reveals if the answer is Y, since the header line is very different in appearance from the data array lines. If the answer is N, the user will be prompted by the next 6 lines, in order.

8920 INPUT "How many columns of data"

This prompt asks the user to input the number of columns of data there are in the input array. This amounts to the number of different longitudes found in the array.

8930 INPUT "How many rows of data"

This prompt asks the user to input the number of rows of data there are in the input array. This amounts to the number of different latitudes found in the array.

8940 INPUT "First X value (-W,+E)"

8950 INPUT "First Y value"

These two prompts ask the user to enter the first longitude (X) and first latitude (Y), respectively, of the gridded array. That is to say, where should GULFPLOT begin placing the array in memory?

8960 INPUT "Distance between columns"

8970 INPUT "Distance between rows"

These two prompts ask the user to enter the longitudinal and latitudinal distance between columns and rows, respectively.

8980 INPUT "Begin: UL-up/left,UR-up/right,LL-low/left,LR-low/right"

There are 4 different ways that the program can begin placing the array values into memory. UL indicates that the values begin being placed into memory with the first value in the upper left corner (the northwest corner of the chart), and so on. The user should enter one of the above choices. LL, for instance, is a common format for model output.

8990 INPUT "Read file: R-rows, the columns, C-columns then rows"

For each of the above 4 ways that the array can begin being filled, there are two ways the data can be placed into the rows and columns. If the sequential array values begin with the same latitude values (rows) but changing longitudinal values (columns), then the response should be R. If the sequential array values begin with the same longitude values (columns), but changing latitude values (rows), then the response should be C.

9000 INPUT "Optional factor to adjust array values (ENTER=1)"

Some arrays may contain values that, for one reason or another, have been multiplied or divided by various factors to arrive at integral values. To correct for this handling, a factor can be entered here to return the array values to their correct magnitude. If, for instance, the array values have been multiplied by 10, then the factor to enter here would be 0.1. If the array values do not need to be "adjusted," hit ENTER, and a factor of 1.0 will be entered and used.

If the array is successfully input at this point, then the program will inform the user about the range of array values encountered, with the prompt seen in line 10730. Then, the user can continue to the contouring instructions in line 9540. If the array is too large for memory, the prompt in line 9150 will be displayed.

9150 PRINT"Array too large by about 'XS' elements. Hit ENTER."

Since GWBASIC and BASICA are restricted to a total memory space of about 64 kilobytes, the GULFPLOT program must check to see if the array might be too large for remaining memory. GULFPLOT takes up about 30 kilobytes, so this check is important. If this message appears, the user can

- (1) reduce the array by editing the file (for instance with LOTUS 1-2-3 or a similar spreadsheet program), or

- (2) remove the header line (if it exists) and manually enter the answers to the questions in lines 8890-9000. If the array is a C-type, the user should reduce the number of rows entered in response to line 8920. If the array is an R-type, the user should reduce the number of columns entered in response to line 8930.

9560 INPUT "No of contours"

Here, the user inputs any number (up to 10) to indicate the first batch of contours to draw. Later this line will reappear so the user can draw additional contours, but the total number of contours cannot exceed 14.

9580 INPUT "Value to contour, color code (1-15)"

Here the user is prompted for the specific contour line ("isopleth") to draw and the color to use. The user is referred to appendix B for a listing of colors available to the various versions of GULFPLOT. If the user's monitor is either CGA or monochrome operating in CGA mode, then the contour lines will be drawn in white, no matter what color is entered. The user should respond to this prompt similar to the following:

22.5,5<ENTER>

Where the 22.5 isopleth should be drawn in color 5 (magenta on EGA). The prompt reappears until each of the requested number of contours has been specified.

10660 INPUT "Draw more contours on this chart (Y or N)"

After the specified number of contours has been drawn, this line appears asking the user if additional contours should be drawn (up to a total maximum of 14).

10800 PRINT"Max Z="DMAX"; Min Z="DMIN"; Hit ENTER."

This is the informational line that appears after the data array has successfully been read by GULFPLOT. The maximum and minimum array values are displayed (ignoring the "blank" value of -9999).

BUGS AND GLITCHES

There will certainly be problems in the GULFPLOT code, because it is still an evolving program. Please report any problems or fixes to M.BROWN.MMS/OMNET or by calling Dr. Murray Brown at (504) 736-2901 or FTS 686-2901.

**APPENDIX A
THE GULFPLOT FILE FORMAT**

BACKGROUND

In 1990, the Minerals Management Service Gulf of Mexico OCS Region published and widely circulated the first version of a computer software program called "GULFPLOT." The program, written in BASIC (specifically GWBASIC), is a simple "electronic notepad" that draws charts of the Gulf of Mexico and overlays them with plots of near-real-time data displays, ocean fronts, station locations, and other features of interest to marine scientists. It is based on an earlier program informally distributed in 1989 by Dr. Bob Pickett of NOARL that draws drifting buoy trajectories. GULFPLOT is intended as a management tool to assist in the rapid, cost-effective dissemination of information about oceanographic research and ocean conditions in the Gulf. The data files used by GULFPLOT to draw the requisite charts are disseminated via electronic mail, as free-format ASCII files. BASIC software is available for both PC and Macintosh computers. This description serves as the specification for the format of GULFPLOT files.

MODIFICATION

Additions or updates to the specification will occur in two ways:

To the Gulf of Mexico oceanographic community:

- Announcements of GULFPLOT file format revisions will be announced via electronic mail prior to the commencement of any new usage. As necessary, simple revisions in the existing file formats will be described to users to minimize problems in change-over.

To contractor(s) observing this format as an MMS contract specification:

- As approved and directed by the Contracting Officer, in accordance with the subject Contract procedures.

BASIC STRUCTURE

There are 2 types of GULFPLOT files:

- .DAT files (or "data files") that contain complete sets of environmental information based on specific locations given in longitude and latitude. Each file consists of a variable number of ASCII lines, each containing five fields, separated by commas, for example

STATION,DATE/TIME, -82.0156 ,24.4468,P

STATION,DATE/TIME, -82.21236 ,24.433827,L

STATION,DATE/TIME, -82.38555 ,24.333091,L

STATION,DATE/TIME, -82.79521 ,24.578802,L

STATION,DATE/TIME, -83.09259 ,24.331513,L

STATION,DATE/TIME, -83.38129 ,24.171137,L

STATION,DATE/TIME, -83.69695 ,23.58423,L

STATION,DATE/TIME, -84.29994 ,23.254237,L

- .GRD files (or "grid files") that contain only a gridded array of values that can be assigned to geographic locations by the use of instructions to the program. The GULFPLOT program recognizes .GRD files and uses them to draw contours of environmental parameters. The special format of these files is discussed at the end of this Appendix. Most of the information that follows concerns .DAT files.

.DAT FILE FORMAT AND USAGE

COMMENT LINES. Alternately, the entire line can be any text string (without imbedded commas) followed by four commas, in which case the program ignores the line. This allows users to insert "comment lines."

FIELD DESCRIPTORS. The first field is provided for a string that identifies the source of the data, such as a "station number" or a vessel call-sign. The second field is provided for date/time information, preferably in YYMMDDhhmm format. (In early GULFPLOT files, these two fields were used for the date and time, respectively.)

The third field is the longitude of a location to be plotted, given as a positive number in "decimal-degrees" format. (In November 1990, to provide compatibility with other software programs, the sign of the longitude in the western hemisphere was changed to negative. The GULFPLOT files posted thereafter observed this convention, and a conversion program has been provided for users to change old files.)

The fourth field, similarly, is the latitude. It is positive in the northern hemisphere and negative in the southern hemisphere.

The fifth field is an ASCII string (called Z\$ in the program) that contains directions to the program and (sometimes) data. The very first position in the string is a "flag" to direct the screen plotting of GULFPLOT, as follows:

P denotes a single point; it is not followed by data.

L denotes the drawing of (or continuation of) a line; it is not followed by data. The above file example would begin a line at the point indicated by the first line and continue drawing until the end of the file. New lines can be started by replacing L with P at any point in the file.

C denotes a circle with a diameter of about 1/10th degree longitude; it is not followed by data.

S directs the program to write on the screen, in small-sized uppercase letters, the string of ASCII characters that follow an intervening space, for example

D,T,-90.3,25.6,S THIS IS A LABEL

The program writes the string "THIS IS A LABEL" beginning at longitude -90.3 and latitude 25.6. Only letters of the alphabet and the ten arabic numerals will be written to the screen; other ASCII characters are converted to blank spaces.

M directs the program to write a label on the screen in medium-sized uppercase letters.

B directs the program to write a label on the screen in large-sized uppercase letters.

V directs the program to draw a vector arrow on the screen that represents current velocity. The format for the entire line is as follows:

D,T,X,Y,V AAAA BBBB CCCC DDD EEE FFF

where AAAA = u in cm/s, BBBB = v in cm/s, CCCC = clockwise offset angle in degrees if u was not true east, DDD = scalar speed in cm/s, EEE = speed in knots, and FFF = true direction in degrees. Leave blanks for missing data. The data may be entered in any one (but only one) of the following combinations:

**AAAA and BBBB (and CCCC if applicable)
DDD and FFF
EEE and FFF**

According to the data supplied, the program selects the proper logic for drawing the vector arrows. The vector drawn is corrected for screen distortion, and it is scaled to equal 50 cm/s for each degree of longitude.

X directs the program to display information from IGOSS BATHY/TESAC messages. **X** directs the program to draw circles on the screen scaled to represent the depth of the 20-degree isotherm, given by temperature data in the ASCII string that follows. The following two lines illustrate the format of a file with the **X**-flag. (The first line is a standard "header" that explains the data in the next line.)

```
IRCS  DATETIME  LONG  LAT X SST 26 23 20 15 9 5 2 DEEP
DPT,,,,
```

```
A3BE ,90050804,-143.20, 31.88,X18.7 - - - 153 364 - - 459 7.3
```

In the data line, the International Radio Call Sign (IRCS) of the reporting vessel is A3BE, and the date is given in YYMMDDHH format. The **X** is immediately followed by the sea surface temperature (SST), then successively by the following: depths of 26-degree, 23-degree, 20-degree, 15-degree, 9-degree, 5-degree, and 2-degree isotherms; then the total depth (DEEP) and the bottom temperature (DPT). The isotherms were selected for their importance in identifying specific water masses worldwide.

D is a combination of **C** and **S** above. The **D**-flag directs the program to place a small circle at the indicated position and to write a label in small letters immediately to the right of the circle. The text of the label is taken from the first field in the data line, usually station information.

W directs the program to recognize the following string as data from a drifting buoy with a 100-m thermistor string (plus other sensors). The format of the entire string is as follows:

```
W AAAABBBBCCCCDDDDDEEEFFFFFFGGGGHHHHIIIIJJJ
```

where AAAA is the atmospheric pressure (millibars), BBBB is the air temperature, CCCC is the sea surface temperature, DDDD is the 5-m temperature, EEEE is the 10-m temperature, FFFF is the 20-m temperature, GGGG is the 30-m temperature, HHHH is the 50-m temperature, IIII is the 100-m temperature, and JJJJ is the pressure-derived depth of the (nominal) 100-m sensor. (Note: Other thermistor lengths or sensor configurations will occur, requiring other flags in the future or modification to the **W**-format.) Data in the **W**-format are drawn as trajectories (with the launch point identified) colored-coded to the temperature at 100 m. The colors and temperature intervals are arbitrarily set in the 100-M BUOY TRAJECTORY section and can easily be adjusted by the user.

CHART LABELS/TITLES

When a data line contains a longitude of 9999 (or -9999) the program recognizes this to be the left-hand margin of any chart. Similarly, a latitude of 9999 is recognized as the bottom margin. Using these two values and either the S, M, or B flags above, the user can place a label or title on any chart. No matter what user-defined limits are employed, the label will always appear in the bottom left-hand corner. Agency or source credits can be added to charts in this way, e.g.)

D,T,-9999,9999,M NOARL OCT 15 1990

for a frontal analysis provided by the NOARL Loop Group.

FILENAMES

Using the above flags, many different types of charts can be drawn with GULFPLOT. To identify common charts to be posted on the GULF.MEX bulletin board, a file-naming convention will often be used. The 3-letter extension of the filename is usually .DAT, but this is not mandatory. Some filetype names already in use are listed below:

CRUISES. The path of a survey cruise of interest. The filename begins with the letter "C" followed by a two-letter vessel identifier, two numbers denoting the year, and two numbers denoting the sequential cruise number in that year, e.g., "CGY9006.DAT." Further refinement will be developed under the LATEX Program. The file draws lines, points, and/or circles as appropriate to provide a simple, pragmatic chart of the cruise. Header lines should be provided to identify the scientific program, the chief scientist, and other pertinent information.

FRONTS. The reported alignments of any of a number of ocean fronts. The filename begins with the letter "F," followed by the date of the analysis in YYMMDD format, followed by a single character designating the source of the analysis, as follows:

- A** Naval Oceanographic Office, Stennis Space Center, Mississippi
- B** NOAA/National Hurricane Center, Miami, Florida
- C** NOAA/Ocean Products Center, Rockville, Maryland
- L** Louisiana State University, Center for Marine Science
- N** Naval Oceanographic Research and Development Activity, Stennis Space Center, Mississippi
- R** Roffer's Ocean Fishing Forecast Service (ROFFS), Miami, Florida
- T** University of Texas

The file draws a series of lines (as needed) corresponding to the fronts identified, e.g., "F900227A.DAT." Labels may be added with lines containing the S or M flags.

IGOSS CHART. The Integrated Global Ocean Services System is the international oceanographic equivalent of the WMO- GTS, in that it supports transmission of public domain ocean data. The Oceans Applications Group of NOAA in Monterey has agreed to post monthly GULFPLOT files of all IGOS XBT (X-flag format) data in the Gulf and northwestern Atlantic areas. The filename begins with "IGOS" followed by the month, designated in YYMM format, e.g. "IGOS9001.DAT".

ARGOS DRIFTERS. The trajectories of drifting buoys tracked by System ARGOS. The filename begins with "B," followed by the 5-digit ARGOS identifier, e.g., "B11328.DAT"; further refinement will be developed under the LATEX Program. The file draws a continuous line depicting the trajectory of the buoy during a specified period.

.GRD FILE FORMAT AND USAGE

With the possible exception of the first line, a .GRD file has no particular line format and can look like the following example:

```
1
2,3
4,5,6
7,8,9,10
11,12,13,14,15
16,17,18,19,20,21
22,23,24
25
```

The sequence of the data items (rather than the content of the lines) is all important, since the program inserts the values into an internal matrix according to rules specified in the program manual. Either commas or spaces serve to separate the items in any line that is not a "header" line.

The first line of the file may be a "header," meaning it contains special information used by GULFPLOT to insert the array values properly into computer memory. Header lines must use commas as delimiters between the items, and the mandatory format is as follows:

C,R,X1,Y1,DX,DY,CORNER,TYPE,FACTOR

Where **C** is the number of columns in the array, **R** is the number of rows, **X1** is the first longitude value (negative in the western hemisphere), **Y1** is the first latitude value, **DX** is the distance between columns, **DY** is the distance between rows, **CORNER** is one of 4 identifier strings to indicate where the array begins:

UL - upper left corner of the chart

UR - upper right corner of the chart

LL - lower left corner of the chart

LR - lower right corner of the chart

TYPE is one of 2 strings to indicate how the array is "filled in":

R - rows are filled in one at a time

C - columns are filled in one at a time

FACTOR is a multiplier that **GULFPLOT** will apply to all the array values needed in case the values have been increased or decreased (for various reasons). The **FACTOR** is 1.0 if the array values do not need changing. If a header line is given (which is optional) then **GULFPLOT** can immediately read the array into memory and use it for contouring.

If the header line is not given, then the user will be prompted to enter the same values that would be in the header line.

The following .GRD file is an example of a .GRD file with a header line. It contains gridded sea-surface temperature values (degrees centigrade) for the Gulf of Mexico:

```
13,9,-100,12.5,2.5,2.5,LL,R,.1
283,282,278,284,277,268,269,266,267,263,258,253,258
281,283,271,278,277,271,267,267,265,265,264,260,263
270,267,257,263,266,264,259,263,263,265,266,264,263
255,251,246,253,261,256,261,263,263,264,263,260,257
241,238,238,243,250,251,257,255,252,248,254,253,248
226,223,229,233,235,245,247,236,249,244,242,239,235
210,202,201,214,215,224,224,217,249,234,226,221,219
211,200,192,201,204,196,195,209,231,222,215,211,209
202,191,194,207,211,188,187,199,209,227,220,203,200
FNOG Sea Surface Temperature
```

In this example the temperatures have all been multiplied by 10, so the FACTOR is 0.1. Since C times R is 117, all the numerical values have been read before the text line at the end, so it is ignored by the program and serves as a "comment line."

APPENDIX B COLOR CODING IN GULFPLOT

CGA and Monochrome in CGA Mode: Black screen with white lines and lettering.

Color codes for contour lines all recognized as 1 (=white).

EGA:		VGA: Same as EGA (Screen mode 9)
0	Black	
1	Blue	
2	Green	
3	Cyan	
4	Red	
5	Magenta	
6	Brown	
7	White	
8	Gray	
9	Light Blue	
10	Light Green	
11	Light Cyan	
12	Light Red	
13	Light Magenta	
14	Yellow	
15	High-Intensity White	

APPENDIX C VERSION 3.1 OF THE GULFPLOT PROGRAM

```
10'          VERSION 3.1 OF THE GULFPLOT PROGRAM
20 'Written for an IBM PC-AT (or XT or clone of either). Should
30 'be run with BASICA or GWBASIC. This program should be placed
40 'in a Directory named GULFPLOT, with Subdirectories BUOYS and FRONTS.
50 'If used on a machine with a monochrome monitor, a "CGA simulation"
60 'program must be run first, in order to use graphics. Attempts to
70 'use VGA (in EGA mode) or QUICKBASIC may cause serious problems.
80 'Some substitution lines known to facilitate QUICKBASIC are shown.
90 KEY OFF:OPTION BASE 0:MARK=0:RES$="L"
100 DIM F(36,9):DIM DX(36,9):DIM DY(36,9)
110 FOR I=0 TO 36
120 FOR J=0 TO 9
130 READ F(I,J),DX(I,J),DY(I,J)
140 NEXT J
150 NEXT I
160 CLS
170 LOCATE 10
180 PRINT "          GULFPLOT PROGRAM, VERSION 3.1"
190 PRINT "
200 PRINT "          Indicate your screen type:
210 PRINT "          1 - Monochrome with memory-resident
220 PRINT "          CGA simulation program
230 PRINT "          2 - True CGA (hi-res B&W)
240 PRINT "          3 - EGA (16 colors)
250 CRT$=INKEY$
260 IF CRT$="" THEN GOTO 250 ELSE GOTO 270
270 IF VAL(CRT$)>0 AND VAL(CRT$)<4 THEN GOTO 290
280 GOTO 170
290 IF CRT$="1" THEN TLX=0:TLY=15:BRX=639:BRY=199:SCREEN=2
300 IF CRT$="2" THEN TLX=0:TLY=15:BRX=639:BRY=199:SCREEN=2
310 IF CRT$="3" THEN TLX=0:TLY=15:BRX=639:BRY=349:SCREEN=9
320 VIEW (TLX,TLY)-(BRX,BRY):VRT=BRY-TLY:HRZ=BRX-TLX
330 GOSUB 8850 'OPENS WORK.HPG
340 GOSUB 8470
350 CLOSE 1
360 IF CRT$="3" THEN COLOR 15
370 INPUT"R-eplay,D-efn,P-lot,G-rid,T-itle,S-ave,CLS,DOS,U-til,M-ark,E-nd";F$
380 IF F$="R" OR F$="r" THEN GOSUB 8860:GOSUB 500
390 IF F$="D" OR F$="d" THEN GOSUB 8860:GOSUB 730
400 IF F$="G" OR F$="g" THEN GOSUB 1310
410 IF F$="S" OR F$="s" THEN GOSUB 1510
420 IF F$="CLS" OR F$="cls" THEN CLOSE:CLS:GOTO 330
430 IF F$="DOS" OR F$="dos" THEN CLOSE:SHELL
440 IF F$="E" OR F$="e" THEN CLOSE:GOTO 8020
450 IF F$="P" OR F$="p" THEN GOSUB 1850
460 IF F$="T" OR F$="t" THEN GOSUB 3220
470 IF F$="U" OR F$="u" THEN CLOSE:GOSUB 4110
480 IF F$="M" OR F$="m" THEN CLOSE:GOSUB 7080
```

```
490 GOTO 340
500 *****PICTURE REPLAY SECTION
501 'The EGA portion of this section was provided by Mr. Robert Hughes
502 'of the Louisiana Universities Marine Consortium (LUMCON) in Cocodrie,
503 'Louisiana.
510 CLS: MARK=0
520 GOSUB 8470
530 INPUT 'Name of picture file to replay';ID$
540 GOSUB 8540
550 IF CRT$='3' THEN GOTO 600
560 DEF SEG=&HB800
570 ON ERROR GOTO 2660
580 BLOAD 'C:\GULFLOT\'"+ID$+'.PIC'
590 DEF SEG:GOTO 680
600 DEF SEG=&HA000
610 ON ERROR GOTO 2660
620 OUT &H3C4, 2: OUT &H3C5, 1: BLOAD 'C:\GULFLOT\'"+ID$+'.BLU',0
630 OUT &H3C4, 2: OUT &H3C5, 2: BLOAD 'C:\GULFLOT\'"+ID$+'.GRN',0
640 OUT &H3C4, 2: OUT &H3C5, 4: BLOAD 'C:\GULFLOT\'"+ID$+'.RED',0
650 OUT &H3C4, 2: OUT &H3C5, 8: BLOAD 'C:\GULFLOT\'"+ID$+'.INT',0
660 OUT &H3C4, 2: OUT &H3C5, 15
670 DEF SEG
680 OPEN 'c:\GULFLOT\'"+ID$+'.PTR'FOR INPUT AS #1
690 INPUT #1,MINLON,MINLAT,MAXLON,MAXLAT,MIDLON,MIDLAT,RADIUS,MARK
700 GOSUB 1710 *****BRANCH TO HOUSEKEEPING SECTION
710 CLOSE 1
720 RETURN 340
730 *****CHART DEFINITION SECTION
731 'The structure of this section is based on the buoy-trajectory software
732 'of Dr. Robert Pickett of NORDA/NOARL/NRL.
740 MARK=0
741 LONORTH=45:LOSOUTH=18:LOEAST=-55:LOWEST=-98These 4 lines completely
742 HINORTH=31:HISOUTH=18:HIEAST=-78:HIWEST=-98'define the geographic domain
743 LORES$='C:\GULFLOT\WDB345.DAT' 'of GULFLOT, and select
744 HIRES$='C:\GULFLOT\WDB1.DAT' 'the coastline files (low
750 GOSUB 8470 'resolution and high res.)
760 INPUT 'G-ulf, A-tlantic, E-ntire area, or N-onstandard';A$
770 CLS
780 IF A$='N' OR A$='n' THEN GOSUB 830
790 IF A$='G' OR A$='g' THEN GOSUB 1030 '1st preset area
800 IF A$='A' OR A$='a' THEN GOSUB 1050 '2nd preset area
810 IF A$='E' OR A$='e' THEN GOSUB 1070 '3rd preset area
820 GOTO 1090
830 GOSUB 8470:INPUT'H-high resolution or L-low resolution';RES$
840 IF RES$='L' OR RES$='l' THEN GOTO 850
841 E=HIEAST:N=HINORTH:W=HIWEST:S=HISOUTH:GOTO860 'These lines set bounds
850 E=LOEAST:N=LONORTH:W=LOWEST:S=LOSOUTH 'on nonstandard charts.
860 GOSUB 8470
870 INPUT 'To plot an unstandard map, input top latitude'; MAXLAT
880 IF MAXLAT <=N THEN GOTO 910
890 PRINT 'Limit is "N"; retry'
900 GOTO 870
910 INPUT 'Bottom latitude'; MINLAT
920 IF MINLAT >=S THEN GOTO 950
```

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```
930 PRINT "Limit is "S"; retry."
940 GOTO 910
950 INPUT "Right-hand longitude (-W,+E)"; MAXLON
960 IF MAXLON <=E THEN GOTO 990
970 PRINT "Limit is "E"; retry."
980 GOTO 950
990 INPUT "West-side longitude"; MINLON
1000 IF MINLON >=W THEN GOTO 1090
1010 PRINT "Limit is "W"; retry."
1020 GOTO 990
1030 MINLAT=18:MAXLAT=31:MINLON=-98:MAXLON=-79:1st preset area
1040 RETURN
1050 MINLAT=25:MAXLAT=45:MINLON=-82:MAXLON=-60:2nd preset area
1060 RETURN
1070 MINLAT=18:MAXLAT=45:MINLON=-98:MAXLON=-55:3rd preset area
1080 RETURN
1090 GOSUB 1710 '*****BRANCH TO HOUSEKEEPING SECTION
1100 CLS
1110 IF CRT$="3" THEN COLOR 2
1120 IF CRT$="1" THEN GOTO 1140
1130 LINE (MINLON,MINLAT)-(MAXLON,MAXLAT),,B:GOTO 1170
1140 LINE (MINLON,MINLAT)-(MINLON,MAXLAT):LINE -(MAXLON,MAXLAT)
1150 LINE -(MAXLON,MINLAT):LINE -(MINLON,MINLAT)
1170 PRINT#3,"PU;PA ";MINLON;MINLAT;";";"EA";MAXLON;MAXLAT;";PU;"
1180 IF RES$="L" OR RES$="I" THEN GOTO 1230
1190 ON ERROR GOTO 2660
1200 OPEN HIRES$ FOR RANDOM AS #1 LEN=19
1210 FIELD 1,1 AS A2$,1 AS T2$,8 AS X2$,8 AS Y2$,1 AS Z2$
1220 GOTO 1240
1230 OPEN LORES$ FOR INPUT AS #1
1240 OLDFLAG$=""
1260 GOSUB 8470:PRINT"Plotting the coastline. Hit ENTER to abort."
1270 GOSUB 2000
1280 IF CRT$="3" THEN PAINT (MIDLON,MIDLAT),1,2
1281 IF CRT$="3" THEN PAINT (-90.17528,30.16168),1,2
1290 CLOSE 1
1300 RETURN 340
1310 '*****GRIDDING SECTION
1320 IF CRT$="3" THEN COLOR 9
1330 MINLON%=MINLON:MAXLON%=MAXLON:MINLAT%=MINLAT:MAXLAT%=MAXLAT
1350 PRINT#3,"LT 2;"
1360 FOR I=1 TO MAXLON%-MINLON%
1370 IF CRT$="1" THEN GOTO 1390
1380 LINE (MINLON%+I,MINLAT) - (MINLON%+I,MAXLAT),,,&HAAA:GOTO 1400
1390 LINE (MINLON%+I,MINLAT) - (MINLON%+I,MAXLAT)
1400 PRINT#3,"PU;PA ";MINLON%+I;MINLAT;";PD;PA";MINLON%+I;MAXLAT;";PU;"
1410 NEXT I
1420 FOR J=1 TO MAXLAT% - MINLAT%
1430 IF CRT$="1" THEN GOTO 1450
1440 LINE (MAXLON, MINLAT%+J) - (MINLON, MINLAT%+J),,,&HAAA:GOTO 1460
1450 LINE (MAXLON, MINLAT%+J) - (MINLON, MINLAT%+J)
1460 PRINT#3,"PU;PA ";MAXLON;MINLAT%+J;";PD;PA";MINLON;MINLAT%+J;";PU;"
1470 NEXT J
1480 PRINT#3,"LT 0;"
```



```
1490 MARK=1
1500 RETURN 340
1510 '*****PICTURE SAVING SECTION
1511 'The EGA portion of this section was provided by Mr. Robert Hughes
1512 'of the Louisiana Universities Marine Consortium (LUMCON) in Cocodrie,
1513 'Louisiana.
1520 GOSUB 8470
1530 INPUT "Picture name to save (No EXT)";ID$
1540 GOSUB 8540:GOSUB 8470
1550 IF CRT$="3" THEN GOTO 1590
1560 DEF SEG=&HB800
1570 BSAVE "c:\GULFPLOT\"+ID$+".PIC",0,16384
1580 DEF SEG:GOTO 1670
1590 DEF SEG=&HA000
1600 S!=28000
1610 OUT &H3CE, 4: OUT &H3CF, 0: BSAVE "C:\GULFPLOT\"+ID$+".BLU",0,S!
1620 OUT &H3CE, 4: OUT &H3CF, 1: BSAVE "C:\GULFPLOT\"+ID$+".GRN",0,S!
1630 OUT &H3CE, 4: OUT &H3CF, 2: BSAVE "C:\GULFPLOT\"+ID$+".RED",0,S!
1640 OUT &H3CE, 4: OUT &H3CF, 3: BSAVE "C:\GULFPLOT\"+ID$+".INT",0,S!
1650 OUT &H3CE, 4: OUT &H3CF, 0
1660 DEF SEG
1670 OPEN "c:\GULFPLOT\"+ID$+".PTR"FOR OUTPUT AS #1
1680 PRINT #1,MINLON,MINLAT,MAXLON,MAXLAT,MIDLON,MIDLAT,RADIUS,MARK
1690 CLOSE 1
1700 RETURN 340
1710 '*****HOUSEKEEPING SECTION
1720 MARK=0
1730 MIDLON=(MAXLON+MINLON)/2
1740 MIDLAT=(MAXLAT+MINLAT)/2
1750 RADIUS=.1*((MAXLON-MINLON)/19)
1760 HPRAD=VAL(MID$(STR$(RADIUS*1000),1,4))/1000
1770 H=(MAXLAT-MINLAT)/25:W=(MAXLON-MINLON)/40
1780 WINDOW (MINLON,MINLAT)-(MAXLON,MAXLAT)
1790 PRINT#3, "DF;"
1800 PRINT#3, "PT 1;"
1810 PRINT#3, "SP 1;"
1820 PRINT#3, "PS A;"
1830 PRINT#3, "SC ";MINLON;MAXLON;MINLAT;MAXLAT;";"
1840 RETURN
1850 '*****PLOTTING SECTION
1860 GOSUB 8470
1870 IF CRT$="3" THEN COLOR 14
1880 INPUT ".DAT file to display (NAME+EXT)";ID$
1890 IF INSTR(ID$,".")<>0 THEN GOTO 1910
1900 GOSUB 8470:GOTO 1880
1910 ID$="c:\GULFPLOT\"+ID$
1920 ON ERROR GOTO 2660
1930 OPEN ID$ FOR INPUT AS 1:RES$="L"
1940 FTYPE$=MID$(ID$,INSTR(ID$,".")+1,3)
1950 IF FTYPE$="GRD" OR FTYPE$="grd" THEN GOTO 8870
1970 FLAG$="NOTIN":LABEL$="N"
1980 IF EOF(1) THEN GOTO 2730
1990 A$=INKEY$:IF A$=CHR$(13) THEN GOTO 2730
2000 IF RES$="L" OR RES$="I" THEN GOTO 2030
```

54 Appendixes

```
2010 GET 1
2020 D$=D2$:T$=T2$:X=CVD(X2$):Y=CVD(Y2$):Z$=Z2$:GOTO2040
2030 INPUT #1, D$, T$, X, Y, Z$
2040 IF T$="" THEN 2030
2050 IF X=9999 OR X=-9999 THEN X=(MINLON+.1*H)
2060 IF Y=9999 THEN Y=MINLAT+.1*H
2070 IF LEFT$(Z$,1)="P" OR LEFT$(Z$,1)="p" THEN PSET(X,Y) 'BEGIN LINE
2080 IF LEFT$(Z$,1)="L" OR LEFT$(Z$,1)="l" THEN LINE -(X,Y) 'CONTINUE LINE
2090 IF LEFT$(Z$,1)="C" OR LEFT$(Z$,1)="c" THEN CIRCLE (X,Y),RADIUS 'STATION
2100 IF X>=MINLON AND X<=MAXLON AND Y>=MINLAT AND Y<=MAXLAT THEN FLAG$="IN"
2105 IF Z$="P" OR Z$="p" THEN OLDX=X:OLDY=Y
2106 IF Z$="C" OR Z$="c" THEN OLDX=X:OLDY=Y
2110 IF FLAG$ <> "IN" THEN OLDX=X:OLDY=Y:GOTO 1980
2120 IF LEFT$(Z$,1)="S" OR LEFT$(Z$,1)="s" THEN GOSUB 3430 'SMALL LABEL
2130 IF LEFT$(Z$,1)="M" OR LEFT$(Z$,1)="m" THEN GOSUB 3430 'MEDIUM LABEL
2140 IF LEFT$(Z$,1)="B" OR LEFT$(Z$,1)="b" THEN GOSUB 3430 'LARGE LABEL
2150 IF LEFT$(Z$,1)="V" OR LEFT$(Z$,1)="v" THEN GOSUB 2750 'VECTOR
2160 IF LEFT$(Z$,1)="X" OR LEFT$(Z$,1)="x" THEN GOSUB 2440 'XBT/IGOSS
2170 IF LEFT$(Z$,1)="G" OR LEFT$(Z$,1)="g" THEN GOSUB 2300 'ALTIMETER
2180 IF LEFT$(Z$,1)="D" OR LEFT$(Z$,1)="d" THEN GOSUB 2560 'LABELED CIRCLE
2190 IF LEFT$(Z$,1)="W" OR LEFT$(Z$,1)="w" THEN GOSUB 5590 'BUOY W 100M TAIL
2200 IF Z$="P" OR Z$="p" THEN PRINT#3,"PU;PA ";X;Y;";CI";0;";PU;"
2210 IF Z$="L" OR Z$="l" GOTO 2220 ELSE GOTO 2250
2220 IF OLDFLAG$="NOTIN" THEN PRINT#3,"PU;PA ";X;Y;";PD;"
2230 IF OLDFLAG$="IN" THEN PRINT#3,"PD;PA ";X;Y;";"
2240 IF OLDFLAG$="" THEN PRINT#3,"PU;PA ";X;Y;";PD;"
2250 IF Z$="C" OR Z$="c" THEN PRINT#3,"PU;PA ";X;Y;";CI";HPRAD;";PU;"
2260 OLDFLAG$=FLAG$
2270 FLAG$="NOTIN"
2271 OLDX=X:OLDY=Y
2280 GOTO 1980
2290 *****ALTIMETER DATA
2300 IF VAL(T$) <=0 THEN HUE=4 ELSE HUE=14
2310 IF CRT$="3" THEN COLOR HUE
2320 IF CRT$="1" OR CRT$="2" THEN GOTO 2340
2330 CIRCLE (X,Y),(ABS(VAL(T$))*RADIUS*3):GOTO 2360 'EGA, COLORED CIR.
2340 IF VAL(T$) <=0 THEN PSET (X,Y):GOTO 2360 'MONO AND CGA: DOT FOR NEG.
2350 CIRCLE (X,Y),(VAL(T$)*RADIUS*3) 'MONO AND CGA: CIR. FOR POS.
2360 ALTHPRAD=(VAL(T$))*HPRAD*3
2370 IF ALTHPRAD <=0 THEN ALTHPRAD=0:GOTO 2400
2380 ALTHPRAD=VAL(MID$(STR$(ALTHPRAD*1000),1,4))/1000
2390 IF INSTR(STR$(ALTHPRAD),"E") <> 0 THEN ALTHPRAD=0
2400 PRINT#3,"PU;PA ";X;Y;";CI";ALTHPRAD;";PU;"
2410 IF VAL(T$) > 0 THEN GOTO 2430
2420 PRINT#3,"PD;WG ";ALTHPRAD;0;360;";PU;"
2430 RETURN 1970
2440 *****XBT's FROM IGROSS
2450 IF CRT$="3" THEN COLOR 4:GOTO 2470
2460 IF VAL(T$) <=0 THEN PSET (X,Y):GOTO 2490
2470 CIRCLE (X,Y),(VAL(MID$(Z$,14,4))/100)*RADIUS
2480 IF CRT$="3" THEN PAINT(X,Y)
2490 IGHPRAD=(VAL(MID$(Z$,14,4))/100)*HPRAD
2500 IGHPRAD=VAL(MID$(STR$(IGHPRAD*1000),1,4))/1000
2510 IF INSTR(STR$(IGHPRAD),"E") <> 0 THEN IGHPRAD=0
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2520 PRINT#3;.PU;PA.;X;Y;.:CI.;IGHPRAD;.:PU;
2530 IF CRT$ <> '3' THEN GOTO 2550
2540 PAINT (X,Y)
2550 RETURN 1970
2560 *****Labeled Station Section
2570 CIRCLE (X,Y),RADIUS      CIRCLE AT STATION
2580 PRINT#3;.PU;PA.;X;Y;.:CI.;HPRAD;.:PU;
2590 GOSUB 8810
2600 Z$='.'+D$
2610 LABLEN=LEN(Z$)-2
2620 LABEL$='Y'
2630 GOSUB 3490      GO TO SCREENWRITER
2640 RETURN 1970
2650 *****ERROR TRAP
2660 IF ERR=53 THEN RESUME 2690
2670 GOSUB 8470:PRINT'Error #'ERR' on line #'ERL'. Program Ended.'
2680 END
2690 GOSUB 8470
2700 INPUT'File not found. ENTER to continue.';EN$
2710 GOSUB 8470:RETURN 340
2720 *****END OF MAIN FILE-READING LOOP
2730 CLOSE 1
2740 RETURN
2750 *****VECTOR-DRAWING SECTION
2760 IF MID$(Z$,3,4)='.' GOTO 2780      IF NO U AND V
2770 GOTO 2830
2780 IF MID$(Z$,18,3)='.' GOTO 2800      IF NO SPD IN CM/S
2790 GOTO 2910
2800 SPD=VAL(MID$(Z$,22,3))*51.4456
2810 GEODIR=VAL(MID$(Z$,26,3))
2820 GOTO 2930
2830 SPD=SQR(VAL(MID$(Z$,3,4)) ^ 2+VAL(MID$(Z$,8,4)) ^ 2)
2840 MATHDIR=57.29578*ATN(VAL(MID$(Z$,8,4))/VAL(MID$(Z$,3,4)))
2850 IF VAL(MID$(Z$,3,4)) >=0 GOTO 2880
2860 GEODIR=270 - MATHDIR
2870 GOTO 2890
2880 GEODIR=450 - MATHDIR
2890 GEODIR=GEODIR+VAL(MID$(Z$,13,4))
2900 GOTO 2930
2910 SPD=VAL(MID$(Z$,18,3))
2920 GEODIR=VAL(MID$(Z$,26,3))
2930 PI=3.141593
2940 XPIX=640/(MAXLON-MINLON)
2950 DIR=-GEODIR+90
2960 IF DIR > -360 THEN DIR=DIR+360
2970 IF DIR > 360 THEN DIR=DIR - 360
2980 DIR1=DIR+135
2990 IF DIR1 > -360 THEN DIR1=DIR1+360
3000 IF DIR1 < 360 THEN DIR1=DIR1 - 360
3010 DIR2=DIR1 - 270
3020 IF DIR2 > -360 THEN DIR2=DIR2+360
3030 IF DIR2 < 360 THEN DIR2=DIR2 - 360
3040 SPD=(SPD/50)*XPIX
3050 SPD=SPD*(1+ABS(.15*SIN(DIR*PI/180)))      UNDISTORTED

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3060 LNG=SPD*.07           'LENGTH OF ARROWHEAD LINES
3070 CIRCLE (X,Y),RADIUS
3080 PRINT#3,"PU;PA ";X;Y;CI";HPRAD;";PU;"
3090 PRINT#3,"PA ";X;Y;";PD;"
3100 'DRAW *TA="+VARPTR$(DIR)           'QUICKBASIC ONLY
3110 'DRAW *R="+VARPTR$(SPD)           'QUICKBASIC ONLY
3120 'DRAW *TA="+VARPTR$(DIR1)        'QUICKBASIC ONLY
3130 'DRAW *NR="+VARPTR$(LNG)         'QUICKBASIC ONLY
3140 'DRAW *TA="+VARPTR$(DIR2)        'QUICKBASIC ONLY
3150 'DRAW *R="+VARPTR$(LNG)         'QUICKBASIC ONLY
3160 DRAW *TA=DIR;R=SPD;"           'GWBASIC
3170 DRAW *TA=DIR1;NR=LNG;TA=DIR2;NR=LNG;" 'GWBASIC
3180 Y=(MAXLAT-(POINT(1)/VRT)*(MAXLAT-MINLAT))
3190 X=(MINLON+(POINT(0)/HRZ)*(MAXLON-MINLON))
3200 PRINT#3,"PA ";X;Y;";PU;"
3210 RETURN 1970
3220 '*****SECTION TO WRITE A CENTERED TITLE ALONG CHART BOTTOM
3230 IF CRT$="3" THEN COLOR 4
3240 IF CRT$="1" OR CRT$="2" THEN GOTO 3270
3250 LINE (MINLON,MINLAT)-(MAXLON,MINLAT+H),,BF
3260 IF CRT$="3" THEN GOTO 3290
3270 LINE (MINLON,MINLAT)-(MINLON,MINLAT+H):LINE -(MAXLON,MINLAT+H)
3280 LINE -(MAXLON,MINLAT):LINE -(MINLON,MINLAT)
3290 GOSUB 8470
3300 IF CRT$="3" THEN COLOR 14
3310 INPUT "Title";TITLE$
3330 IF LEN(TITLE$) <= 45 THEN GOTO 3360
3340 GOSUB 8470:INPUT"Title too long; ENTER to continue.",EN$
3350 GOSUB 8470:GOTO 3310
3360 GOSUB 8820:X=MINLON+W*(40-LEN(TITLE$))/2
3370 Y=MINLAT+.1*H
3380 Z$=" "+TITLE$
3390 LABELN=LEN(Z$)-2
3400 LABEL$="Y"
3410 GOSUB 3490
3420 GOTO 340
3430 '*****SCREENWRITER
3440 IF CRT$ <> "3" AND LEFT$(Z$,1)="M" THEN RETURN
3450 IF LEFT$(Z$,1)="S" OR LEFT$(Z$,1)="s" THEN GOSUB 8810:LABEL$="Y"
3460 IF LEFT$(Z$,1)="M" OR LEFT$(Z$,1)="m" THEN GOSUB 8820:LABEL$="N"
3470 IF LEFT$(Z$,1)="B" OR LEFT$(Z$,1)="b" THEN GOSUB 8830:LABEL$="N"
3480 LABELN=LEN(Z$) - 2
3490 FOR I=0 TO LABELN - 1
3500 X2=X+I*W*(F/.07)
3510 LETT$=MID$(Z$,3+I,1)
3520 J=ASC(LETT$)-1
3530 IF J < 47 THEN J=0           'TTY ETC.
3540 IF J >=47 AND J <=56 THEN J=J-46 'NUMERALS
3550 IF J >=57 AND J <=63 THEN J=0 'ETC.
3560 IF J >=64 AND J <=89 THEN J=J-53 'CAPITAL LETTERS
3570 IF J >=90 AND J <=95 THEN J=0 'ETC.
3580 IF J >=96 AND J <=121 THEN J=J-85 'SMALL LETTERS
3590 IF J > 121 THEN J=0 'ETC.
3600 FOR K=0 TO 9

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3610 IF F(J,K)=0 THEN 3670
3620 IF F(J,K)=1 THEN PSET (X2+DX(J,K)*F*W,Y+DY(J,K)*F*H)
3630 IF F(J,K)=2 THEN LINE -(X2+DX(J,K)*F*W,Y+DY(J,K)*F*H)
3640 IF LABEL$<>"Y" THEN GOTO 3670
3650 IF F(J,K)=1 THEN PRINT#3,"PU;PA ";X2+DX(J,K)*F*W;Y+DY(J,K)*F*H;"PD;"
3660 IF F(J,K)=2 THEN PRINT#3,"PA ";X2+DX(J,K)*F*W;Y+DY(J,K)*F*H;"P;"
3670 NEXT K
3680 NEXT I
3690 IF LABEL$<>"Y" THEN GOTO 3710
3700 PRINT#3,"PU;"
3710 LABEL$="N"
3720 RETURN
3730 *****LETTER-GULFIC FONT
3740 DATA ,,,,,,,,,,,,,,,,,,,,,,
3750 DATA 1,0,0,2,7,0,2,7,10,2,0,10,2,0,0,1,7,10,2,0,0,,,,,,,,,
3760 DATA 1,3,8,2,4,10,2,4,0,,,,,,,,,,,,,,,,,,,,,
3770 DATA 1,0,8,2,1,10,2,6,10,2,7,8,2,7,6,2,0,0,2,7,0,,,,,,,,,
3780 DATA 1,0,8,2,1,10,2,7,10,2,7,0,2,1,0,2,0,1,1,3,5,2,7,5,,,,,
3790 DATA 1,4,0,2,4,10,2,0,4,2,6,4,,,,,,,,,,,,,,,,,
3800 DATA 1,0,1,2,1,0,2,6,0,2,7,2,2,7,5,2,5,6,2,0,6,2,0,10,2,7,10,,
3810 DATA 1,0,10,2,0,0,2,7,0,2,7,5,2,0,5,,,,,,,,,,,,,
3820 DATA 1,0,10,2,7,10,2,5,0,,,,,,,,,,,,,,,,,,,,,
3830 DATA 1,0,10,2,0,0,2,7,0,2,7,10,2,0,10,1,0,5,2,7,5,,,,,,,,,
3840 DATA 1,7,0,2,7,10,2,0,10,2,0,5,2,7,5,,,,,,,,,,,,,
3850 DATA 1,0,0,2,4,10,2,8,0,1,2,4,2,6,4,,,,,,,,,,,,,
3860 DATA 1,0,0,2,0,10,2,5,10,2,6,9,2,6,7,2,5,6,2,7,5,2,7,1,2,6,0,2,0,0
3870 DATA 1,7,0,2,0,0,2,0,10,2,7,10,,,,,,,,,,,,,
3880 DATA 1,0,0,2,0,10,2,6,10,2,7,8,2,7,2,2,5,0,2,0,0,,,,,,,,,
3890 DATA 1,7,0,2,0,0,2,0,10,2,7,10,1,0,5,2,5,5,,,,,,,,,,,,,
3900 DATA 1,0,0,2,0,5,2,0,10,2,7,10,1,0,5,2,5,5,,,,,,,,,,,,,
3910 DATA 1,7,8,2,6,10,2,0,10,2,0,0,2,7,0,2,7,4,1,6,4,2,8,4,,,,,
3920 DATA 1,0,0,2,0,10,1,7,10,2,7,0,1,0,5,2,7,5,,,,,,,,,,,,,
3930 DATA 1,5,0,2,5,10,1,4,0,2,6,0,1,4,10,2,6,10,,,,,,,,,,,,,
3940 DATA 1,7,10,2,7,0,2,2,0,2,2,2,,,,,,,,,,,,,
3950 DATA 1,0,0,2,0,10,1,6,10,2,0,6,2,6,0,,,,,,,,,,,,,
3960 DATA 1,7,1,2,7,0,2,0,0,2,0,10,,,,,,,,,,,,,
3970 DATA 1,0,0,2,0,10,2,4,7,2,8,10,2,8,0,,,,,,,,,,,,,
3980 DATA 1,0,0,2,0,10,2,7,0,2,7,10,,,,,,,,,,,,,
3990 DATA 1,0,0,2,8,0,2,8,10,2,0,10,2,0,0,,,,,,,,,,,,,
4000 DATA 1,0,0,2,0,10,2,7,10,2,7,5,2,0,5,,,,,,,,,,,,,
4010 DATA 1,0,0,2,0,10,2,7,10,2,7,0,2,0,0,1,5,3,2,7,0,,,,,,,,,
4020 DATA 1,0,0,2,0,10,2,7,10,2,7,5,2,0,5,1,3,5,2,7,0,,,,,,,,,
4030 DATA 1,0,0,2,8,0,2,8,6,2,0,6,2,0,10,2,8,10,,,,,,,,,,,,,
4040 DATA 1,4,0,2,4,10,1,0,10,2,8,10,,,,,,,,,,,,,
4050 DATA 1,0,10,2,0,0,2,8,0,2,8,10,,,,,,,,,,,,,
4060 DATA 1,0,10,2,4,0,2,8,10,,,,,,,,,,,,,
4070 DATA 1,0,10,2,0,0,2,4,3,2,8,0,2,8,10,,,,,,,,,,,,,
4080 DATA 1,0,10,2,8,0,1,0,0,2,8,10,,,,,,,,,,,,,
4090 DATA 1,0,10,2,4,6,2,8,10,1,4,6,2,4,0,,,,,,,,,,,,,
4100 DATA 1,0,10,2,8,10,2,0,0,2,8,0,,,,,,,,,,,,,
4110 *****UTILITIES SECTIONS
4120 CLS:GOSUB 8470:LOCATE 5,10
4130 PRINT "1:Input from the keyboard a GULFLOT file (but no vectors)"
4140 LOCATE 6,10

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4150 PRINT "2:Convert old GULFPLOT file (+longitude) to new (-longitude)"
4160 LOCATE 7,10
4170 PRINT "3:Input from the keyboard a GULFPLOT file of current vectors"
4180 LOCATE 8,10
4190 PRINT "4:List files by type"
4200 LOCATE 9,10
4210 PRINT "5:Create synoptic drifter file from all drifter files"
4220 LOCATE 10,10
4230 PRINT "6:List frontal charts within a given time period"
4240 LOCATE 11,10
4250 PRINT "7:Slideshow program for SAVED charts"
4260 LOCATE 12,10
4270 PRINT "8:Return to Main Menu"
4280 LOCATE 17,10
4290 PRINT "[Note: Utilities 1 and 3 open files in APPEND mode, so the"
4300 LOCATE 18,10
4310 PRINT "user can work on the same file using different utilities."
4320 LOCATE 19,10
4330 PRINT "Keyboard entries will be added to the existing file.]"
4340 LOCATE 21,10
4350 INPUT"Select a utility program: ",UTIL$
4360 IF UTIL$="1" THEN GOTO 4450
4370 IF UTIL$="2" THEN GOTO 4800
4380 IF UTIL$="3" THEN GOTO 5010
4390 IF UTIL$="4" THEN GOSUB 8570
4400 IF UTIL$="5" THEN GOTO 5670
4410 IF UTIL$="6" THEN GOTO 6050
4420 IF UTIL$="7" THEN GOTO 6300
4430 IF UTIL$="8" THEN CLS: GOTO 330
4440 GOTO 4110
4450 '*****Program to input GULFPLOT file (no vectors)
4460 CLS
4470 LOCATE 1,1
4480 INPUT "Name of file to create (no EXT). ";ID$
4490 GOSUB 8540
4500 OPEN"c:\GULFPLOT\"+ID$+".DAT"FOR APPEND AS #1
4510 INPUT "Identifier (RETURN=default='D');-1 to quit. ";D$
4520 IF D$="-1" THEN GOTO 4780
4530 IF D$="" THEN D$="D"
4540 INPUT "Date/time as YYYYMMDDhhmm (RETURN=default='T'). ";T$
4550 IF T$="" THEN T$="T"
4560 INPUT"Degrees of latitude (+N,-S)";LATDEG$
4570 IF LATDEG$<>" +0"ORLATDEG$<>"-0"THEN LATDEG=VAL(LATDEG$) ELSE LATDEG=0
4580 INPUT"Minutes of latitude";LATMIN
4590 INPUT"Seconds of latitude";LATSEC
4600 IF LATDEG < 0 OR LATDEG$="-0" THEN GOTO 4620
4610 GOTO 4640
4620 LATDEG=LATDEG -LATMIN/60- LATSEC/3600
4630 GOTO 4650
4640 LATDEG=LATDEG+LATMIN/60+LATSEC/3600
4650 INPUT"Degrees of longitude (+E,-W)";LNDG$
4660 IF LNDG$<>" +0"ORLNDG$<>"-0" THEN LNDG=VAL(LNDG$) ELSE LNDG=0
4670 INPUT"Minutes of longitude";LONGMIN
4680 INPUT"Seconds of longitude";LONGSEC
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4690 IF LNDG < 0 OR LNDG$="-0" THEN GOTO 4710
4700 GOTO 4730
4710 LNDG=LNDG - LONGMIN/60 - LONGSEC/3600
4720 GOTO 4740
4730 LNDG=LNDG+LONGMIN/60+LONGSEC/3600
4740 INPUT"Enter the 'Z-flag' (and additional data if required). ";Z$
4750 PRINT D$;" ";T$;" ";LNDG;" ";LATDEG;" ";Z$
4760 PRINT#1,D$;" ";T$;" ";LNDG;" ";LATDEG;" ";Z$
4770 GOTO 4510
4780 CLOSE 1
4790 GOTO 4110
4800 *****UTILITY TO NEGATE THE LONGITUDES IN OLD GULFPLOT FILES
4810 CLS
4820 LOCATE 1,1
4830 INPUT "Name and extension of existing file to convert";ID$
4840 ON ERROR GOTO 2660
4850 OPEN "C:\GULFPLOT\"+ID$FOR INPUT AS #1
4860 OPEN "C:\GULFPLOT\DUMMY.DAT" FOR OUTPUT AS #2
4870 IF EOF(1) THEN 4940
4880 INPUT #1, A$, B$, X, Y$, Z$
4890 IF B$="" GOTO 4910
4900 X=-X
4910 PRINT #2, A$;" ";B$;" ";X;" ";Y$;" ";Z$
4920 PRINT A$;" ";B$;" ";X;" ";Y$;" ";Z$
4930 GOTO 4870
4940 CLOSE 1
4950 CLOSE 2
4960 KILL "C:\GULFPLOT\"+ID$
4970 NAME "C:\GULFPLOT\DUMMY.DAT" AS "C:\GULFPLOT\"+ID$
4980 PRINT "GULFPLOT\"+ID$ has been converted to the new format."
4990 INPUT "Hit ENTER to continue.",EN$
5000 GOTO 4110
5010 *****UTILITY TO ENTER A VECTOR-DRAWING FILE
5020 CLS
5030 LOCATE 1,1
5040 INPUT"Enter the name of the file to create (no path or extension)";ID$
5050 GOSUB 8540
5060 OPEN "c:\GULFPLOT\"+ID$+".DAT"FOR APPEND AS #1
5070 Z$="V"
5080 INPUT "Identifier (RETURN=default='D');-1 to quit. ";D$
5090 IF D$="-1" THEN GOTO 5460
5100 IF D$="" THEN D$="D"
5110 INPUT "Date/time as YYMMDDhhmm (RETURN=default='T'). ";T$
5120 IF T$="" THEN T$="T"
5130 INPUT"Degrees of latitude (+north, - south)";LATDEG$
5140 IF LATDEG$<>" "+0"ORLATDEG$<>"-0"THEN LATDEG=VAL(LATDEG$) ELSE LATDEG=0
5150 INPUT"Minutes of latitude";LATMIN
5160 INPUT"Seconds of latitude";LATSEC
5170 IF LATDEG < 0 OR LATDEG$="-0" THEN GOTO 5190
5180 GOTO 5210
5190 LATDEG=LATDEG -LATMIN/60- LATSEC/3600
5200 GOTO 5220
5210 LATDEG=LATDEG+LATMIN/60+LATSEC/3600
5220 INPUT"Degrees of longitude (+east, - west)";LNDG$
```

```
5230 IF LNDG$ <> "0" OR LNDG$ <> "-0" THEN LNDG=VAL(LNDG$) ELSE LNDG=0
5240 INPUT "Minutes of longitude";LONGMIN
5250 INPUT "Seconds of longitude";LONGSEC
5260 IF LNDG < 0 OR LNDG$="-0" THEN GOTO 5280
5270 GOTO 5300
5280 LNDG=LNDG - LONGMIN/60 - LONGSEC/3600
5290 GOTO 5310
5300 LNDG=LNDG+LONGMIN/60+LONGSEC/3600
5310 INPUT "Enter U in cm/s";U$
5320 MID$(Z$,3,4)=U$
5330 INPUT "Enter V in cm/s";V$
5340 MID$(Z$,8,4)=V$
5350 INPUT "Enter the clockwise angle U has been rotated from true east";ROT$
5360 MID$(Z$,13,3)=ROT$
5370 INPUT "Enter speed in cm/s";SPDCMS$
5380 MID$(Z$,18,3)=SPDCMS$
5390 INPUT "Enter speed in knots";SPDKTS$
5400 MID$(Z$,22,3)=SPDKTS$
5410 INPUT "Enter direction (toward which) in true degrees";DIR$
5420 MID$(Z$,26,3)=DIR$
5430 PRINT #1,D$;" ";T$;" ";LNDG;" ";LATDEG;" ";Z$
5440 PRINT D$;" ";T$;" ";LNDG;" ";LATDEG;" ";Z$
5450 GOTO 5070
5460 CLOSE 1
5470 GOTO 4110
5480 *****SECTION TO LIST SAVED PICTURE FILES
5490 CLS
5500 LOCATE 1,1
5510 ON ERROR GOTO 2660
5520 FILES "C:\GULFLOT\*.INT
5530 PRINT
5540 PRINT "Saved pictures are held in 5 files each, with extensions .INT,"
5550 PRINT ".RED, .BLU, .GRN, and .PTR (all with the same filename)."
5560 PRINT
5570 INPUT "Hit ENTER when ready to return to the utilities menu.",EN$
5580 GOTO 4110
5590 *****TRAJECTORY OF BUOY WITH 100-M TAIL
5600 IF VAL(MID$(Z$,35,4))>22 THEN HUE=14
5610 IF VAL(MID$(Z$,35,4))>19 AND VAL(MID$(Z$,35,4))<=22 THEN HUE=4
5620 IF VAL(MID$(Z$,35,4))<=19 THEN HUE=5
5630 IF CRT$="3" THEN COLOR HUE
5640 LINE (OLDX,OLDY)-(X,Y)
5650 PRINT #3,"PD;PA ";X;Y;" "
5655 OLDX=X:OLDY=Y
5660 RETURN 1970
5670 *****SECTION TO CREATE QUASI-SYNOPTIC DRIFTING BUOY FILE
5680 CLS:SHELL"DIR C:\GULFLOT\BUOYS\B*.DAT|SORT>C:\GULFLOT\BLIST.DAT"
5690 LOCATE 1,1
5700 INPUT "Date to start searching (in YYMMDD format)";FIRST
5710 INPUT "Date to stop searching (in YYMMDD format)";SECOND
5720 IF SECOND > FIRST GOTO 5750
5730 PRINT "Dates may be reversed; try again."
5740 GOTO 5700
5750 INPUT "Name of the aggregate file to create (no EXT)";ID$
```



```
5760 GOSUB 8540
5770 OPEN "C:\GULFPLOT\'+ID$+'.DAT" FOR OUTPUT AS #3
5780 OPEN "C:\GULFPLOT\BLIST.DAT" FOR INPUT AS #1
5790 FOR I=1 TO 5
5800 LINE INPUT #1, A$
5810 NEXT I
5820 IF EOF(1) THEN 6030
5830 LINE INPUT #1, A$
5840 ID$=MID$(A$,1,8)
5850 OPEN "C:\GULFPLOT\BUOYS\'+ID$+'.DAT" FOR INPUT AS #2
5860 FLAG=1
5870 IF EOF(2) THEN GOTO 6010
5880 INPUT #2,A$,B$,C$,D$,E$
5890 IF MID$(E$,1,1)="D" THEN GOTO 5870
5900 IF MID$(E$,1,1)="S" THEN GOTO 5870
5910 IF MID$(E$,1,1)="M" THEN GOTO 5870
5920 IF FLAG=1 THEN E$="C"
5930 B=VAL(MID$(B$,1,6))
5940 IF B < FIRST OR B > SECOND THEN GOTO 5870
5950 IF MID$(E$,1,1)="D" THEN E$="C"
5960 PRINT #3,A$,"";B$,"";C$,"";D$,"";E$
5970 IF FLAG > 1 GOTO 5990
5980 PRINT A$,"";B$,"";C$,"";D$,"";E$
5990 FLAG=FLAG+1
6000 GOTO 5870
6010 CLOSE 2
6020 GOTO 5820
6030 CLOSE
6040 GOTO 4110
6050 '*****SECTION TO LIST F-FILES FOR A GIVEN TIME WINDOW
6060 CLS:SHELL"DIRC:\GULFPLOT\FRONT\F*.DAT;SORT>C:\GULFPLOT\FLIST.DAT"
6070 LOCATE 1,1
6080 INPUT "Date to start searching (in YYMMDD format)";FIRST$
6090 INPUT "Date to stop searching (in YYMMDD format)";SECONDS$
6100 IF VAL(SECONDS$)>=VAL(FIRST$) GOTO 6130
6110 PRINT "Dates may be reversed; try again."
6120 GOTO 6080
6130 CLS
6140 YR$=MID$(FIRST$,1,2)
6150 OPEN "C:\GULFPLOT\FLIST.DAT" FOR INPUT AS #1
6160 FOR I=1 TO 5
6170 LINE INPUT #1, A$
6180 NEXT I
6190 IF EOF(1) THEN GOTO 6260
6200 LINE INPUT #1, A$
6210 ID$=MID$(A$,2,6)
6220 B=VAL(ID$)
6230 IF B < VAL(FIRST$) OR B > VAL(SECONDS$) THEN GOTO 6190
6240 PRINT MID$(A$,1,8)
6250 GOTO 6190
6260 CLOSE 1
6270 INPUT "Do you want to select another listing";YN$
6280 IF YN$="Y" OR YN$="y" GOTO 6050
6290 GOTO 4110
```

```
6300 '*****SLIDESHOW SECTION FOR SAVED CHARTS
6310 CLS
6320 LOCATE 1,1
6330 GOSUB 8470:PRINT*1 - Create A Show File."
6340 PRINT*2 - Run A Show."
6350 PRINT*3 - Quit."
6360 PRINT
6370 INPUT "Make a selection--",C$
6380 IF C$="1" THEN GOSUB 8470:GOTO 6420
6390 IF C$="2" THEN GOSUB 8470:GOTO 6560
6400 IF C$="3" THEN GOSUB 8470:GOTO 4110
6410 GOTO 6310
6420 CLS
6430 LOCATE 1,1:PRINT*These SAVED charts are available: *:PRINT
6440 FILES "C:\GULFPLOT\*.INT":PRINT
6450 INPUT*Name of .SHO file to create (No EXT);ID$
6460 GOSUB 8540
6470 OPEN "C:\GULFPLOT\"+ID$+".SHO"FOR APPEND AS #1
6480 INPUT*SAVED chartname to add to file (No EXT); Q-quit";ID$
6490 IF ID$="Q" OR ID$="q" THEN GOTO 6540
6500 GOSUB 8540
6510 PRINT#1,ID$
6520 PRINT ID$
6530 GOTO 6480
6540 CLOSE 1
6550 GOTO 6310
6560 CLS:GOSUB 8470:PRINT*The following .SHO files are available: *:PRINT
6570 FILES"C:\GULFPLOT\*.SHO":PRINT
6580 INPUT*Show file to play";ID$
6590 GOSUB 8540
6600 OPEN "C:\GULFPLOT\"+ID$+".SHO"FOR INPUT AS #1
6610 DIM PIC$(100)
6620 I=1
6630 IF EOF(1) THEN GOTO 6670
6640 INPUT#1,PIC$(I)
6650 I=I+1
6660 GOTO 6630
6670 J=I : I=0
6680 GOSUB 8470
6690 PRINT*No. ";I;" of ";J-1;".    Set NumLock for PgDn=next, PgUp=previous."
6700 A$=INKEY$
6710 IF A$="" GOTO 6700
6720 IF ASC(A$)=27 GOTO 7030
6730 IF ASC(A$)=51 GOTO 6760
6740 IF ASC(A$)=57 GOTO 6770
6750 GOTO 6870
6760 I=I+1: GOTO 6780
6770 I=I-1: GOTO 6780
6780 IF I < 1 THEN GOTO 6680
6790 IF I > J THEN GOTO 6960
6800 CLS
6810 IF CRT$="3" THEN GOTO 6860
6820 DEF SEG &HB800
6830 ON ERROR GOTO 6950
```

```
6840 BLOAD 'c:\GULFPLOT\'*+PIC$+'.PIC',0
6850 DEF SEG:GOTO 6940
6860 DEF SEG=&HA000
6870 ON ERROR GOTO 6950
6880 OUT &H3C4, 2: OUT &H3C5, 1: BLOAD 'C:\GULFPLOT\'*+PIC$()+'.BLU',0
6890 OUT &H3C4, 2: OUT &H3C5, 2: BLOAD 'C:\GULFPLOT\'*+PIC$()+'.GRN',0
6900 OUT &H3C4, 2: OUT &H3C5, 4: BLOAD 'C:\GULFPLOT\'*+PIC$()+'.RED',0
6910 OUT &H3C4, 2: OUT &H3C5, 8: BLOAD 'C:\GULFPLOT\'*+PIC$()+'.INT',0
6920 OUT &H3C4, 2: OUT &H3C5, 15
6930 DEF SEG
6940 GOTO 6680
6950 IF ERR=53 THEN RESUME 6760
6960 CLS
6970 GOSUB 8470
6980 INPUT "End of file. B-back up; E-end, S-start over.",EN$
6990 IF EN$="B" OR EN$="b" THEN GOTO 7060
7000 IF EN$="E" OR EN$="e" THEN GOTO 7030
7010 IF EN$="S" OR EN$="s" THEN GOTO 7070
7020 GOTO 6960
7030 CLOSE
7040 ERASE PIC$
7050 GOTO 6310
7060 I=J-1:GOTO 6860
7070 CLOSE:ERASE PIC$:CLS:GOTO 6600
7080 '*****MARKING SECTION
7090 CLOSE
7100 GOSUB 8470
7110 INPUT "File to create or append to (EXT required)";ID$
7120 IF INSTR(ID$,".") <> 0 THEN GOTO 7140
7130 GOTO 7100
7140 OPEN 'C:\GULFPLOT\'*+ID$FOR APPEND AS #1
7150 GOSUB 8470
7160 INPUT"L-abel, C-ircle w/ label, R-ectangle, PLC, or END";MTYPE$
7170 IF MTYPE$="L" OR MTYPE$="l" THEN GOTO 7220
7180 IF MTYPE$="C" OR MTYPE$="c" THEN GOTO 7220
7190 IF MTYPE$="R" OR MTYPE$="r" THEN GOTO 7260
7200 IF MTYPE$="PLC" OR MTYPE$="plc" THEN GOTO 7710
7210 IF MTYPE$="END" OR MTYPE$="end" THEN CLS:RETURN 330
7220 GOSUB 8470 'CLEAR TOP LINE
7230 GOSUB 7770 'POINT LOCATOR
7240 GOSUB 8470 'CLEAR LINE
7250 GOSUB 7530 'WRITE AND CHECK LABEL
7260 GOSUB 8470 'BEGIN RECTANGLE
7270 PRINT"Set NumLock;Use ARROWS to locate FIRST CORNER."
7280 A$=INKEY$
7290 IF A$="8" OR A$="6" OR A$="2" OR A$="4" THEN GOSUB 8470:GOSUB 7770
7300 IF A$="" GOTO 7280
7310 FIRSTX=X:FIRSTY=Y
7320 GOSUB 8470
7330 PRINT"Set NumLock;Use ARROWS to locate SECOND CORNER."
7340 A$=INKEY$
7350 IF A$="8" OR A$="6" OR A$="2" OR A$="4" THEN GOSUB 8470:GOSUB 7770
7360 IF A$="" GOTO 7340
7370 SECONDX=X:SECONDY=Y
```

64 Appendixes

```
7380 IF CRT$="1" THEN GOTO 7400
7390 LINE (FIRSTX,FIRSTY)-(SECONDX,SECONDY),,B:GOTO 7430
7400 PSET (FIRSTX,FIRSTY)
7410 LINE -(FIRSTX,SECONDY):LINE -(SECONDX,SECONDY):LINE -(SECONDX,FIRSTY)
7420 LINE -(FIRSTX,FIRSTY)
7430 GOSUB 8470
7440 INPUT "OK (Y or N)":BOX$
7450 IF BOX$="Y" OR BOX$="y" THEN GOTO 7470
7460 GOTO 7260
7470 PRINT#1,"D,T,;",FIRSTX,"";FIRSTY,"P"
7480 PRINT#1,"D,T,;",FIRSTX,"";SECONDY,"L"
7490 PRINT#1,"D,T,;",SECONDX,"";SECONDY,"L"
7500 PRINT#1,"D,T,;",SECONDX,"";FIRSTY,"L"
7510 PRINT#1,"D,T,;",FIRSTX,"";FIRSTY,"L"
7520 GOTO 7150
7530 INPUT "Input text for label: ",LAB$
7540 GOSUB 8810
7550 Z$=" "+LAB$
7560 LABLEN=LEN(Z$)-2
7570 IF MTYPE$="L" OR MTYPE$="l" THEN GOTO 7600
7580 CIRCLE (X,Y),RADIUS
7590 X=X+F*W*10
7600 GOSUB 3490
7610 GOSUB 8470
7620 INPUT "OK (Y or N)":OK$
7630 IF OK$="Y" OR OK$="y" GOTO 7650
7640 RETURN 7220
7650 IF MTYPE$="C" OR MTYPE$="c" THEN GOTO 7680
7660 PRINT#1,"D,T,;X,;";Y,;S";LAB$
7670 RETURN 7150
7680 X=X-F*W*10
7690 PRINT#1,LAB$,"T,;X,;";Y,;D"
7700 RETURN 7150
7710 GOSUB 8470 'BEGIN PLC CONTROLLER
7720 GOSUB 7770 'POINT LOCATOR
7730 GOSUB 8470 'CLEAR LINE
7740 INPUT "Z-string, i.e. P, L, or C";Z$
7750 PRINT#1,"D,T,;X,;";Y,;";Z$
7760 GOTO 7710
7770 PRINT "Set NumLock;Use ARROWS to locate;ENTER accepts point;ESC to quit."
7780 I=1
7790 OLDA$=""
7800 PSET ((MINLON+MAXLON)/2,(MINLAT+MAXLAT)/2)
7810 A$=INKEY$
7820 IF A$="" GOTO 7810
7830 IF A$ <> OLDA$ THEN I=1
7840 IF A$="6" GOTO 7910
7850 IF A$="8" GOTO 7920
7860 IF A$="4" GOTO 7930
7870 IF A$="2" GOTO 7940
7880 IF A$=CHR$(13) THEN RETURN
7890 IF A$=CHR$(27) THEN RETURN 7150
7900 GOTO 7810
7910 DRAW "R=I,;":GOSUB 7950
```

```
7920 DRAW *U=I;*: GOSUB 7950
7930 DRAW *L=I;*: GOSUB 7950
7940 DRAW *D=I;*: GOSUB 7950
7950 I=I+1
7960 X=(MINLON+(POINT(0)/HRZ)*(MAXLON-MINLON))
7970 Y=(MAXLAT - (POINT(1)/VRT)*(MAXLAT-MINLAT))
7980 OLDA$=A$
7990 GOSUB 8470
8000 PRINT X;Y
8010 RETURN 7810
8020 *****PLOTTER UTILITY/PROGRAM EXIT
8030 CLS
8040 GOSUB 8470
8050 PRINT*You now have a working plotter file, named WORK.HPG. Here*
8060 PRINT*are your options:*
8070 PRINT
8080 PRINT* 1: Exit program. The file WORK.HPG could be lost.
8090 PRINT* 2: Rename WORK.HPG.
8100 PRINT* 3: Send WORK.HPG or any other plot file to an HP 7475 plotter.
8110 PRINT* (Caution: There is no overflow check, so the receiving
8120 PRINT* device must have sufficient buffer to hold the file.)
8130 PRINT* 4: Return to main menu. The file WORK.HPG will be lost.
8140 PRINT
8150 INPUT* Make your selection *;SEL$
8160 IF SEL$="1" THEN SYSTEM
8170 IF SEL$="2" THEN GOSUB 8210
8180 IF SEL$="3" THEN GOSUB 8330
8190 IF SEL$="4" THEN CLS:GOTO 330
8200 GOTO 8030
8210 INPUT* What is the new name for the plotter file (No EXT)*;ID$
8220 GOSUB 8540
8230 OPEN "C:\GULFPLOT\"+ID$+".HPG"FOR APPEND AS #1
8240 IF LOF(1)=<2 THEN CLOSE:GOTO 8300
8250 CLOSE
8260 INPUT* File exists. Replace (Y or N)*;REP$
8270 IF REP$="Y" OR REP$="y" THEN GOTO 8300
8280 IF REP$="N" OR REP$="n" THEN RETURN 8030
8290 GOTO 8260
8300 KILL "C:\GULFPLOT\"+ID$+".HPG"
8310 NAME "C:\GULFPLOT\WORK.HPG"AS "C:\GULFPLOT\"+ID$+".HPG"
8320 RETURN 8150
8330 *****PLOTTER PROGRAM
8340 CLOSE
8350 INPUT*Name of plot file (No EXT); or ENTER to plot WORK.HPG.*;ID$
8360 IF ID$="" THEN ID$="WORK"
8370 GOSUB 8540
8380 OPEN"C:\GULFPLOT\"+ID$+".HPG"FOR INPUT AS #1
8390 OPEN "COM1:9600,S,7,1,RS,CS65535,DS,CD"AS #2
8400 IF EOF(1) THEN GOTO 8450
8410 INPUT#1,INFO$
8420 IF LEFT$(INFO$,2)="XX" THEN GOTO 8400
8430 PRINT#2,INFO$
8440 GOTO 8400
8450 INPUT*Press ENTER to continue.*;EN$
```

```
8460 GOTO 8020
8470 LOCATE 1,1 '*****CLEANS UP TOP LINE
8480 PRINT*
8490 IF CRT$="3" THEN GOTO 8520
8500 LOCATE 2,1
8510 PRINT*
8520 LOCATE 1,1
8530 RETURN
8540 ID$=ID$+" " '*****CHOPS OFF UNNEEDED EXTENSIONS
8550 ID$=MID$(ID$,1,INSTR(ID$," ")-1)
8560 RETURN
8570 CLS:GOSUB 8470 '*****FILES LISTING SECTION
8580 PRINT*1: List subdirectories under GULFPLOT
8590 PRINT*2: Select and search a subdirectory
8600 PRINT*3: List SAVED charts
8610 PRINT*4: List .HPG files
8620 PRINT*5: Return to Utilities Menu
8630 PRINT
8640 INPUT*Make your selection: ",EN$
8650 CLS:GOSUB 8470:ON ERROR GOTO 8790
8660 IF EN$="1" THEN FILES "C:\GULFPLOT\*.*":GOSUB 8750
8670 IF EN$="2" THEN GOSUB 8710:GOSUB 8750
8680 IF EN$="3" THEN FILES"C:\GULFPLOT\*.INT":GOSUB 8750
8690 IF EN$="4" THEN FILES"C:\GULFPLOT\*.HPG":GOSUB 8750
8700 IF EN$="5" THEN GOSUB 8470:RETURN 4110
8710 INPUT*Which subdirectory; ENTER for none";DIR$
8720 IF DIR$<>" THEN DIR$=DIR$+"\
8730 INPUT*Enter the search criteria (* and ? allowed)",CRIT$
8740 FILES"C:\GULFPLOT\"+DIR$+CRIT$+*.DAT":RETURN
8750 PRINT
8760 INPUT*Do you want to see another file listing (Y or N)";EN$
8770 IF EN$="Y" OR EN$="y" THEN RETURN 8570
8780 IF EN$="N" OR EN$="n" THEN RETURN 4120
8790 CLS:GOTO 2650
8800 '*****LETTER SIZE SPECIFICATION
8810 F=.04:RETURN 'S FLAG
8820 F=.07:RETURN 'M FLAG
8830 F=.11:RETURN 'B FLAG
8840 '*****CONTROLS OPENING AND CLOSING OF WORK.HPG
8850 OPEN"C:\GULFPLOT\WORK.HPG"FOR OUTPUT AS #3:RETURN
8860 CLOSE:OPEN"C:\GULFPLOT\WORK.HPG"FOR OUTPUT AS #3:RETURN
8870 '*****SECTION TO CONTOUR A GRIDDED DATA ARRAY
8871 'The contouring algorithm is used with the kind permission of Mr.
8872 'P.D. Bourke at the Auckland University School of Architecture, from
8873 'his article, "CONREC, A Contouring Subroutine," published in BYTE
8874 'magazine, June 1987 (pp 143-150).
8880 TRUE=-1:FALSE=0
8890 GOSUB 8470:INPUT*The input array has a header line (Y or N)";YN$
8900 IF YN$="N" OR YN$="n" THEN GOTO 8920
8910 INPUT#1,NCOL,NROW,FX,FY,DELX,DELY,B$,M$,FCT:IUB=NCOL-1:JUB=NROW-1:GOTO 8930
8920 GOSUB 8470:INPUT*How many columns of data";NCOL:IUB=NCOL-1
8930 GOSUB 8470:INPUT*How many rows of data";NROW:JUB=NROW-1
8940 GOSUB 8470:INPUT*First X value (-W, +E)";FX
8950 GOSUB 8470:INPUT*First Y value";FY
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```
8960 GOSUB 8470:INPUT"Distance between columns";DELX
8970 GOSUB 8470:INPUT"Distance between rows";DELY
8980 GOSUB 8470:INPUT"Begin: UL-up/left,UR-up/right,LL-low/left,LR-low/right";B$
8990 GOSUB 8470:INPUT"Readfile: R-rows then columns, C-columns then rows";M$
9000 GOSUB 8470:INPUT"Optional factor to adjust array values (ENTER=1)";FCT$
9010 IF FCT$="" THEN FCT$='1'
9020 FCT=VAL(FACTOR$)
9030 GTYPE$=B$+M$
9040 IF GTYPE$='ULR' OR GTYPE$='ulr' THEN GTYPE=1
9050 IF GTYPE$='ULC' OR GTYPE$='ulc' THEN GTYPE=2
9060 IF GTYPE$='URR' OR GTYPE$='urr' THEN GTYPE=3
9070 IF GTYPE$='URC' OR GTYPE$='urc' THEN GTYPE=4
9080 IF GTYPE$='LLR' OR GTYPE$='llr' THEN GTYPE=5
9090 IF GTYPE$='LLC' OR GTYPE$='llc' THEN GTYPE=6
9100 IF GTYPE$='LRR' OR GTYPE$='lrr' THEN GTYPE=7
9110 IF GTYPE$='LRC' OR GTYPE$='lrc' THEN GTYPE=8
9120 SIZE=INT(1.1*((IUB*JUB+IUB+JUB)*4))
9130 IF SIZE<FRE(0) THEN GOTO 9180
9140 XS=INT((SIZE-FRE(0))/4)
9150 GOSUB 8470:PRINT"Array too large by about *XS* elements. Hit ENTER."
9160 A$=INKEY$:IF A$="" THEN GOTO 9160
9170 CLOSE 1:GOSUB 8470:RETURN 340
9180 DIM X(IUB),Y(JUB),D(IUB,JUB)
9190 IF GTYPE=3 OR GTYPE=4 OR GTYPE=7 OR GTYPE=8 THEN DELX=-DELX:DELY=-DELY
9200 ON GTYPE GOTO 9210,9220,9230,9240,9250,9260,9270,9280
9210 XINCR=1:YINCR=-1:XSTART=0:XSTOP=IUB:YSTART=JUB:YSTOP=0:GOTO 9390
9220 XINCR=1:YINCR=-1:XSTART=0:XSTOP=IUB:YSTART=JUB:YSTOP=0:GOTO 9290
9230 XINCR=-1:YINCR=-1:XSTART=IUB:XSTOP=0:YSTART=JUB:YSTOP=0:GOTO 9390
9240 XINCR=-1:YINCR=-1:XSTART=IUB:XSTOP=0:YSTART=JUB:YSTOP=0:GOTO 9290
9250 XINCR=1:YINCR=1:XSTART=0:XSTOP=IUB:YSTART=0:YSTOP=JUB:GOTO 9390
9260 XINCR=1:YINCR=1:XSTART=0:XSTOP=IUB:YSTART=0:YSTOP=JUB:GOTO 9290
9270 XINCR=-1:YINCR=1:XSTART=IUB:XSTOP=0:YSTART=0:YSTOP=JUB:GOTO 9390
9280 XINCR=-1:YINCR=1:XSTART=IUB:XSTOP=0:YSTART=0:YSTOP=JUB:GOTO 9290
9290 FOR I=XSTART TO XSTOP STEP XINCR
9300 X(I)=FX+I*DELX
9310 FOR J=YSTART TO YSTOP STEP YINCR
9320 Y(I)=FY+J*DELY
9330 INPUT#1,D(I,J)
9340 IF D(I,J)=-9999 THEN GOTO 9360
9350 D(I,J)=D(I,J)*FCT
9360 NEXT J
9370 NEXT I
9380 GOTO 9480
9390 FOR J=YSTART TO YSTOP STEP YINCR
9400 Y(J)=FY+J*DELY
9410 FOR I=XSTART TO XSTOP STEP XINCR
9420 X(I)=FX+I*DELX
9430 INPUT#1,D(I,J)
9440 IF D(I,J)=-9999 THEN GOTO 9460
9450 D(I,J)=D(I,J)*FCT
9460 NEXT I
9470 NEXT J
9480 CLOSE 1
9490 FOR J=YSTART TO YSTOP STEP YINCR
```

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9500 Y(J)=FY+J*DELY
9510 FOR I=XSTART TO XSTOP STEP XINCR
9520 X(I)=FX+I*DELX
9530 NEXT I
9540 NEXT J
9550 GOSUB 10710
9560 GOSUB 8470:INPUT*No of contours*;NC
9570 FOR I=0 TO NC-1
9580 GOSUB 8470:INPUT*Valuet to contour, color code (1-15)*;Z(I),COLR(I)
9590 NEXT I
9600 GOSUB 9640
9610 IF PRMERR=TRUE THEN GOSUB 8470:PRINT MSG$;
9620 WHILE LEN(INKEY$)=0:WEND
9630 CLOSE 1:GOSUB 8470:GOTO 330
9640 DIM H(4) 'Relative heights of the box above the contour
9650 DIM ISH(4) 'Sign of h( )
9660 DIM XH(4) 'X coordinates of box
9670 DIM YH(4) 'Y coordinates of box
9680 DIM IM(3) 'Mapping from vertex numbers to x offsets
9690 IM(0)=0:IM(1)=1:IM(2)=1:IM(3)=0
9700 DIM JM(3) 'Mapping from vertex numbers to y offsets
9710 JM(0)=0:JM(1)=0:JM(2)=1:JM(3)=1
9720 DIM CASTAB(2,2,2) 'Case switch table
9730 DATA 0,0,8,0,2,5,7,6,9,0,3,4,1,3,1,4,3,0,9,6,7,5,2,0,8,0,0
9740 FOR K=0 TO 2:FOR J=0 TO 2:FOR I=0 TO 2
9750 READ CASTAB(K,J,I)
9760 NEXT I:NEXT J:NEXT K
9770 'Check the input parameters for validity
9780 PRMERR=FALSE
9790 IF IUB=<0 OR JUB=<0 THEN PRMERR=TRUE
9800 IF NC<=0 THEN PRMERR=TRUE
9810 FOR K=1 TO NC-1:IF Z(K)<=Z(K-1) THEN PRMERR=TRUE:NEXT K
9820 IF PRMERR=TRUE THEN MSG$="Error in input parameters; Hit ENTER":RETURN
9830 'Scan the array, top down, left to right
9840 FOR J=JUB-1 TO 0 STEP -1
9850 FOR I=0 TO IUB-1
9860 IF D(I,J)=-9999.901 THEN GOTO 10650
9870 IF D(I+1,J)=-9999.901 THEN GOTO 10650
9880 IF D(I,J+1)=-9999.901 THEN GOTO 10650
9890 IF D(I+1,J+1)=-9999.901 THEN GOTO 10650
9900 'Find the lowest vertex
9910 IF D(I,J)<D(I,J+1) THEN DMIN=D(I,J) ELSE DMIN=D(I,J+1)
9920 IF D(I+1,J)<DMIN THEN DMIN=D(I+1,J)
9930 IF D(I+1,J+1)<DMIN THEN DMIN=D(I+1,J+1)
9940 'Find the highest vertex
9950 IF D(I,J)>D(I,J+1) THEN DMAX=D(I,J) ELSE DMAX=D(I,J+1)
9960 IF D(I+1,J)>DMAX THEN DMAX=D(I+1,J)
9970 IF D(I+1,J+1)>DMAX THEN DMAX=D(I+1,J+1)
9980 IF DMAX<Z(0) OR DMIN>Z(NC-1) THEN GOTO 10650 'NONEINBOX
9990 'Draw each contour within box
10000 FOR K=0 TO NC-1
10010 IF Z(K)<DMIN OR Z(K)>DMAX THEN GOTO 10640 'NONEINTRI
10020 FOR M=4 TO 0 STEP -1
10030 IF M<=0 THEN GOTO 10070
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10040 H(M)=D(I+IM(M-1),J+JM(M-1))-Z(K)
10050 XH(M)=X(I+IM(M-1))
10060 YH(M)=Y(J+JM(M-1))
10070 IF M<>0 THEN GOTO 10110
10080 H(0)=(H(1)+H(2)+H(3)+H(4))/4
10090 XH(0)=(X(I)+X(I+1))/2
10100 YH(0)=(Y(J)+Y(J+1))/2
10110 IF H(M)>0 THEN ISH(M)=2 ELSE IF H(M)<0 THEN ISH(M)=0 ELSE ISH(M)=1
10120 NEXT M
10130 'Scan each triangle in the box
10140 FOR M=1 TO 4
10150 M1=M:M2=0:M3=M+1:IF M3=5 THEN M3=1
10160 CASE=CINT(CASTAB(ISH(M1),ISH(M2),ISH(M3)))
10170 ON CASE+1 GOTO 10630,10180,10210,10240,10270,10320,10370,10420,10480,10540
10180 'Line between vertices m1 and m2
10190 X1=XH(M1):Y1=YH(M1):X2=XH(M2):Y2=YH(M2)
10200 GOTO 10590
10210 'Line between vertices m2 and m3
10220 X1=XH(M2):Y1=YH(M2):X2=XH(M3):Y2=YH(M3)
10230 GOTO 10590
10240 'Line between vertices m3 and m1
10250 X1=XH(M3):Y1=YH(M3):X2=XH(M1):Y2=YH(M1)
10260 GOTO 10590
10270 'Line between vertex m1 and side m2-m3
10280 X1=XH(M1):Y1=YH(M1)
10290 X2=(H(M3)*XH(M2)-H(M2)*XH(M3))/(H(M3)-H(M2))
10300 Y2=(H(M3)*YH(M2)-H(M2)*YH(M3))/(H(M3)-H(M2))
10310 GOTO 10590
10320 'Line between vertex m2 and side m1-m2
10330 X1=XH(M2):Y1=YH(M2)
10340 X2=(H(M1)*XH(M3)-H(M3)*XH(M1))/(H(M1)-H(M3))
10350 Y2=(H(M1)*YH(M3)-H(M3)*YH(M1))/(H(M1)-H(M3))
10360 GOTO 10590
10370 'Line between vertex m3 and side m1-m2
10380 X1=XH(M3):Y1=YH(M3)
10390 X2=(H(M2)*XH(M1)-H(M1)*XH(M2))/(H(M2)-H(M1))
10400 Y2=(H(M2)*YH(M1)-H(M1)*YH(M2))/(H(M2)-H(M1))
10410 GOTO 10590
10420 'Line between sides m1-m2 and m2-m3
10430 X1=(H(M2)*XH(M1)-H(M1)*XH(M2))/(H(M2)-H(M1))
10440 Y1=(H(M2)*YH(M1)-H(M1)*YH(M2))/(H(M2)-H(M1))
10450 X2=(H(M3)*XH(M2)-H(M2)*XH(M3))/(H(M3)-H(M2))
10460 Y2=(H(M3)*YH(M2)-H(M2)*YH(M3))/(H(M3)-H(M2))
10470 GOTO 10590
10480 'Line between sides m2-m3 and m3-m1
10490 X1=(H(M3)*XH(M2)-H(M2)*XH(M3))/(H(M3)-H(M2))
10500 Y1=(H(M3)*YH(M2)-H(M2)*YH(M3))/(H(M3)-H(M2))
10510 X2=(H(M1)*XH(M3)-H(M3)*XH(M1))/(H(M1)-H(M3))
10520 Y2=(H(M1)*YH(M3)-H(M3)*YH(M1))/(H(M1)-H(M3))
10530 GOTO 10590
10540 'Line between sides m3-m1 and m1-m2
10550 X1=(H(M1)*XH(M3)-H(M3)*XH(M1))/(H(M1)-H(M3))
10560 Y1=(H(M1)*YH(M3)-H(M3)*YH(M1))/(H(M1)-H(M3))
10570 X2=(H(M2)*XH(M1)-H(M1)*XH(M2))/(H(M2)-H(M1))

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70 Appendixes

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10580 Y2=(H(M2)*YH(M1)-H(M1)*YH(M2))/(H(M2)-H(M1))
10581 IF CRT$="3" THEN GOTO 10590
10582 LINE (X1,Y1)-(X2,Y2):GOTO 10600
10590 LINE (X1,Y1)-(X2,Y2),COLR(K)
10600 IF X1 >=MINLON AND X2 <=MAXLON AND Y1 <=MAXLAT AND Y2 >=MINLAT THEN 10620
10610 GOTO 10630
10620 PRINT#3,"PU;PA ";X1;Y1;" ;PD;PA";X2;Y2;" ;PU;"
10630 NEXT M          'CASE 0
10640 NEXT K          'NO CONTOURS IN TRIANGLE
10650 NEXT I:NEXT J   'NO CONTOURS IN GRID CELL
10660 GOSUB 8470:INPUT"Draw more contours on this chart (Y or N)";M$
10670 IF M$="N" OR M$="n" THEN GOTO 10690
10680 RESTORE 9730:ERASE H,ISH,XH,YH,IM,JM,CASTAB:GOTO 9560
10690 RESTORE 9730:ERASE D,X,Y,Z,COLR,H,ISH,XH,YH,IM,JM,CASTAB
10700 CLOSE 1:GOSUB 8470:RETURN 340
10710 'SECTION TO IDENTIFY THE RANGE OF Z VALUES
10720 DMIN=1000000!:DMAX=-1000000!
10730 FOR I=0 TO IUB-1
10740 FOR J=0 TO JUB-1
10750 IF D(I,J)=-9999 THEN GOTO 10780
10760 IF D(I,J)>DMAX THEN DMAX=D(I,J)
10770 IF D(I,J)<DMIN THEN DMIN=D(I,J)
10780 NEXT J
10790 NEXT I
10800 GOSUB 8470:PRINT"Max Z="DMAX"; Min Z="DMIN"; Hit ENTER."
10810 A$=INKEY$:IF A$="" THEN GOTO 10810
10820 RETURN
10830 GOSUB 8470:RETURN
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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration.

