

## CHAPTER 3

### GEMPAK Variables

#### 3.1 ADDSTN

ADDSTN is a logical variable which indicates whether stations which are in STNFIL, but not already included in the data file, should be added to the data file.

Enter YES to add stations. Enter NO to update current stations but not add new ones.

#### 3.2 AFOSFL

AFOSFL is the name of the AFOS graphics file to be displayed.

#### 3.3 AIRM

AIRM is the ending valid time for the airmet, the colors for the instrument flight rules, mountain obscuration, turbulence, icing and sustained winds, and flags for plotting symbols or airmet type, the end time, and the flight levels on the map.

**End time|IR;MO;TB;IC;SW clrs|TB color2|Flight lvl|low;upper filter lvl|  
Symbol flg|Time flg|Flight lvl flg**

Airmets that are valid at the ending time will be plotted on the map. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST or ALL. LAST will use the system time and plot all current airmets. ALL will plot all the airmets in the data files for the last ten days, whether they are active, cancelled, updated or expired.

The colors are separated by a semi-colon. If any color is set to 0, that type of symbol will not be plotted. If any color is missing, a default will be used. Defaults are red for instrument flight rules, magenta for mountain obscuration, light blue for turbulence, green for icing and dark pink for sustained winds.

TB color2 is the second color for turbulence. The color from the first list will be used to plot Turbulence AIRMETs below the specified level. The color listed as the second color will be for Turbulence AIRMETs above the specified level.

Flight lvl is the dividing level for the turbulence display. The value is in hundreds of feet.

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The lower and upper filter levels are flight level values used to filter the AIRM data display. If neither value is given, then all data is plotted. If only the lower level is present, then only data above that level is displayed. For the upper level only, data below this upper value are displayed. If both values are given, then the data is plotted for levels between the two boundary values.

The symbol flag is YES or NO and controls whether or not to plot a symbol or identifying text for the airmet on the map. The default is NO.

The time flag is YES or NO and controls whether or not to plot the end time of the airmet on the map. The default is NO.

The flight level flag is YES or NO and controls whether or not to plot the flight level(s) in hundreds of feet on the map. The default is NO.

### **3.4 ANLYSS**

ANLYSS is the average station spacing and the grid extend region separated by a slash:

**station spacing / grid extend region**

This information is retrieved from the grid file and used in the objective analysis programs.

The station spacing is in degrees of latitude and is used to compute the weighting functions in the Barnes analysis programs. The default for the station spacing is twice the grid spacing.

The grid extend area is specified by four integers, separated by semicolons, which are the numbers of grid points to extend the grid left, down, right, and up. Only data within the extended grid area is used after the first Barnes pass. The default for the grid extend region is 2;2;2;2.

### **3.5 AREA**

AREA is the data area. Only data within the area specified will be processed.

Areas may be defined containing subareas. Subareas must be separated by slashes. Each subarea is additive, +, or subtractive, -, depending on the first character following the slash, with + being the default. Additive subareas add stations to the list of valid stations; subtractive subareas eliminate stations which were previously valid.

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Subareas may be specified in the following ways:

1. lat1;lon1;lat2;lon2  
This defines a latitude/longitude range where (lat1, lon1) is the lower left corner and (lat2, lon2) is the upper right corner. West longitude is negative.  
  
#clat;clon;dlat;dlon  
This defines a latitude/longitude range by the center latitude and longitude. The lower left corner is (clat-dlat; clon-dlon); the upper right corner is (clat+dlat; clon+dlon). No corrections are made for the poles or the International Date Line.
2. GEOG  
This is an abbreviation for a geographic area defined in the GEMPAK geographic table which includes abbreviations for states, provinces, and countries, as well as other names. A suffixed + or \* will decrease the extent of the geographic area. A suffixed - will increase the extent of the geographic area.
3. STN  
This defines an area centered on a station found in the GEMPAK station table. A suffixed + or \* will decrease the extent of the geographic area. A suffixed - will increase the extent of the geographic area.
4. DSET  
This includes all the stations in the current data set.
5. @ST  
This area includes those stations located in the state, province or country defined by ST. Only some countries are recognized (US,CN,MX,CI,BW,AU); other countries may be specified using method 6.
6. @CN:C  
This area includes those stations located in the country defined by CN.
7. @STN1;STN2;...;STNn  
This area includes the stations listed, where STNi may be a station identifier or a station number.
8. SHDR:iloval:ihival  
This area defines a range of integer values for the station header, SHDR. Valid keywords for SHDR are:

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COUN	--	country
SELV	--	elevation (in meters)
SLAT	--	latitude (in degrees x 100)
SLON	--	longitude (in degrees x 100, West is negative)
SPRI	--	priority
STAT	--	state
STID	--	character identifier (6 digits for surface--usually the WMO 5-digit number followed by a 0)

where COUN, STAT and STID are not very useful, since the integer representation of characters is system dependent.

For example, SELV:0:2000 specifies stations whose elevations are less than 2000 meters.

### 9. GAREA

This area corresponds to a slightly larger area than that specified by GAREA. It will ensure that data will appear near the bounds of the view region.

## 3.6 ATCF

ATCF is the initial time for the ATCF forecast tracks, the colors for each model track, the model names, flags for plotting the time, the storm name or number, the forecast wind speeds and markers at each forecast time, and an optional specific storm identifier.

**Initial time|Model clr|Model names|Time flg|Id flg|Speed flg|  
Marker flg|Name**

ATCF forecast tracks valid for the initial time will be plotted on the map. Forecast tracks show points at 6 or 12 hour intervals from 0 through 126 hours, if available. The actual storm track will be plotted as a white line, solid up to the initial time and dashed after the initial time (when data is available). The initial time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The initial time may also be LAST. LAST will use the system time to plot the most recent tracks whose initial time is within 9 hours of the current time. ALL is not accepted as an initial time for ATCF data.

The colors are separated by a semi-colon, as are the four-character model names. If no colors or model names are given, all model tracks will be plotted at default colors. If specific model names are listed, only those model tracks will be plotted. Default colors will be used unless colors are explicitly given, with a one-to-one correspondence between model names and colors. Specifying colors without model names has no effect.

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The time flag is YES or NO and controls whether or not to plot the initial time of the ATCF forecast tracks on the map. The default is NO.

The storm id flag is YES or NO and controls whether or not to plot the storm name or number on the map. The default is NO.

The speed flag is YES or NO and controls whether or not to plot the speed in knots, when given, at each forecast time. The default is NO.

The marker flag is YES or NO and controls whether or not to plot a marker at each forecast time on the map. The default is NO.

The name or number of a tropical storm may be specified. If one is given, only tracks for that storm will be displayed for the date/time indicated. The default is all storms are plotted.

### 3.7 AWPSFL

AWPSFL is the name of the AWIPS graphics file to be displayed. These files can be viewed by using the debug option.

awpsfl | d

or

awpsfl | D

the output file is called awips.out.

### 3.8 BND

BND specifies the parameters needed for processing bounds areas:

**name[[tag]/color/fillsiz/fillpat/filt/minpts !**  
**lincol/linpat/linwid !**  
**mrksym/col/typ/siz/wid**

FILLING BOUNDS AREAS:

name - If name is "BG", then the entire background area in plot coordinates is filled with the given color, pattern, etc.

tag - The tag option allows specification of a precise subarea to fill, e.g., fill a particular state instead of filling all the states. See examples.

color - Additional help for color is available in COLORS.

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fillsiz, fillpat - The fill size is not yet implemented, however the fill pattern may be set to 1 (solid), 2 (slanted dash) or 3 (slanted line).

filt - The filter value is used to reduce the number of points used to draw the bound areas. Valid values for the filter flag are between 0 and 1. The default is 0.

minpts - The minpts variable allows plotting of only bounds with a number of points greater than a certain value, thus eliminating numerous small areas, such as islands. The overall effect is to increase performance. Care must be taken, however, since some large geographic areas may be described with just a few points (e.g., the state of Wyoming). Usually, a value of 100 or 200 will suffice.

### OUTLINING BOUNDS AREAS:

lincol - Color of bound outline. Additional help for color is available in COLORS.

linpat - Outline line pattern.

linwid - Outline line width.

Note that filt and minpts also apply to outlining.

### PLOTTING A MARKER OR WEATHER SYMBOL AT BOUNDS CENTROID:

mrksym - Either "MARK" or "WTHR" to plot either a marker or weather symbol.

col - Color of marker or symbol. Additional help for color is available in COLORS.

typ - Marker or weather symbol type (number).

siz, wid - Marker or symbol size and width.

NOTE: any or all plot options may be requested at the same time.

The attributes for multiple bounds may be set by separating the settings for each bound with a plus sign (+).

Examples:

BND = bg/4 + state\_bnds/23 + lakes/4

BND = state\_bnds/23 + great\_lakes/4

BND = state\_bnds|<STATE>FL/23

- fills only the state of Florida

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BND = state\_bnds|<STATE>FL/23 ! 2/2/5

- fills only the state of Florida and outlines the state of Florida with a dashed red line of width 5.

BND = state\_bnds|<STATE>FL/23 ! 2/2/5 ! wthr/3/65/5/3

- fills only the state of Florida and outlines the state of Florida with a dashed red line of width 5. Also plots a weather symbol at the centroid of the state of Florida. This symbol is a green heavy rain symbol of size 5 and width 3.

### 3.9 BORDER

BORDER is the color, line type and line width of the background and underground plot separated with slashes:

background color; station line color; fill color/  
background line type; station line type /  
background line width; station line width

If the color is 0, no background will be drawn. The defaults for color, line type and line width are each 1.

### 3.10 BOUNDS

BOUNDS specifies the bound area(s) to consider when performing the graph-to-grid procedure.

**name|<key>key\_name|mask\_flag**

More than one bounds area may be indicated via the '+' separator.

name - Name of the bounds area, eg., "SSA" for seamless surface analysis.

key - The specific bound area keyword, eg., "AREA".

key\_name - The specific bound area, eg., "HPC050".

mask\_flag - "true" to perform the graph-to-grid analysis inside the above specified bounds area, "false" to perform the analysis outside.

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Examples:

**BOUNDS = SSA|<AREA>HPC050|true**

Performs the graph-to-grid analysis only inside the HPC050 seamless surface analysis area.

### 3.11 BUFRFIL

BUFRFIL is the BUFR output file names in the format of

**BUFRFIL = ...;...;...  
or blank**

where the individual items are the BUFR output file names corresponding to the individual FXYTBL file name (e.g., JUBf99.YYYYMMDDHH;JUFf00.YYYYMMDDHH) and the blank means that the output file names are gotten from the master table based on the requested FXY file names.

### 3.12 CBTOP

CBTOP the user estimated cloud top height in meters. The default value is 8000 m. This is for "convective (CB)" only.

### 3.13 CENTER

CENTER allows the GD2NDFD user to specify the originating or generating center ID and sub-center ID. The input is given as follows:

**Center ID #/Sub-Center ID #**

Values may be omitted in specifying CENTER. For example, to omit the first value, specify only the second, enter the following:

**/Sub-Center ID #**

If values are omitted, the following defaults are inserted:

**ID # Default value Meaning**



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Center	7	Center # (7->NCEP)
Sub	5	Sub-center (5->HPC)

See NCEP OFFICE NOTE 388 for more information on how to set these parameters. Below is a table of center numbers that may be used.

### ID# NAME ABBREV

007 US Weather Svc - Nat. Cntrs for Envir. Prediction NCEP  
008 US Weather Svc - NWS Telecommunications Gateway NCEP  
009 US Weather Svc - Field Stations NCEP  
034 Japanese Meteorological Agency - Tokyo JMA  
052 US Weather Svc (NCEP/TPC) Nat. Hurricane Cntr - Miami NHC  
054 Canadian Meteorological Service - Montreal CMS  
057 US Air Force - Global Weather Central GWC  
058 US Navy - Fleet Numerical Oceanography Center FNOC  
059 NOAA Forecast Systems Laboratory - Boulder, CO FSL  
060 Nat. Center for Atmos. Research (NCAR) - Boulder, CO NCAR  
074 UK Meteorological Office - Bracknell UKMO  
085 French Weather Service - Toulouse FWS  
097 European Space Agency (ESA) ESA  
098 Eur. Cntr for Medium-range Wthr Frcsts - Reading ECMWF  
099 DeBilt, Netherlands DEBILT

## 3.14 CINT

CINT is the contour interval, minimum and maximum values separated by slashes:

**contour interval / minimum / maximum**

The contour interval may be any real number. If it is not specified or if the value is 0, the program will select an interval which will generate 5 to 10 contour levels.

The minimum and maximum values specify the range of data to use in selecting contour levels. If either value is not specified, the value will be obtained from the range of values in the dataset. If the minimum and maximum are equal, that value will be used and only one contour level will be selected.

A list of two or more contour levels may be entered using semicolons to separate the individual values. In this case, the minimum and maximum are ignored.

### 3.15 CLEAR

CLEAR is a logical variable which determines whether the graphics screen is cleared before plotting.

Enter YES to clear screen or NO to leave current graphics.

### 3.16 CLRBAR

CLRBAR specifies the characteristics of a color bar associated with contour fill. The attributes are separated by slashes:

**color / orientation / anchor / x;y / length;width /  
frequency | text\_info**

Color is the color of the labels and the bounding box around the color bar. If color is negative, the bounding box will not be drawn, and labels will be drawn in colors corresponding to the color bar. If the color is 0 or missing, no color bar is drawn.

Orientation specifies a vertical or horizontal orientation of the color bar where 'V' is a vertical bar and 'H' is a horizontal bar. The default is 'V'.

Anchor describes the location on the color bar corresponding to the location given in the next parameter. Valid inputs are LL, LC, LR, CL, CC, CR, UL, UC, and UR for lower-left, lower-center, lower-right, center-left, centered, center-right, upper-left, upper-center, and upper-right, respectively. For example, an 'LL' anchor point, with a x;y of .1,.1, will place the lower-left corner of the color bar at view coordinates .1, .1. The default anchor point is 'LL'.

x;y is the position for the anchor point of the color bar in view coordinates. The default is .005, .05.

Length;width are the length and width of the color bar, normalized to the view coordinates. The defaults are .5 for the length, and .01 for the width.

Frequency describes the levels to be labeled. If the frequency is positive, the labels are plotted on the right/top of the color bar. If it is negative, the labels are plotted on the left/bottom of the color bar. The default is -1.

Text\_info describes the color bar label attributes. These attributes are of the same format as the TEXT parameter. If any part of text\_info is missing, then default text information is used. The user may only change the font type, hardware/software flag, text size and text width. The default values are the bold courier hardware font and text size and text width of 1.

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To disable the color bar, set CLRBAR = 0 or leave it blank. If only contour lines are drawn (CTYPE = C), the CLRBAR variable is not used.

Examples:

CLRBAR = 1	text and bounding box in color 1; defaults for the rest of the input;
CLRBAR = 5/V/ /.25;.1/1	text and bounding box in color 5; color bar plotted vertically; length and width .25 and .1 of the view window; all intervals labeled along left side of the color bar; color bar anchor point at lower-left;
CLRBAR = 1//CL/.1;.5/.75;.1	text and bounding box in color 1; length and width .75 and .1 of the view window; center-left of the color bar positioned at .1;.5 in view coordinates;
CLRBAR = 1//CL/.1;.5/.75;.1 .55/2/111/1//hw	text and bounding box in color 1; length and width .75 and .1 of the view window; center-left of the color bar positioned at .1;.5 in view coordinates; text size of color bar .55; hardware helvetica font; text width 2; no box around text;left justified;

### 3.17 CNTR

CNTR specifies the plot attributes for Cell Centroid movement barbs (knots):

**color / size / width ; filter**

A value of 0 is used to turn off centroid plotting.

FILTER is a logical variable or real number which controls the filtering of data in order to eliminate plotting of overlapping data.

### 3.18 CNTRFL

CNTRFL is the name of the file containing contour information.

**filename**

### 3.19 CNTRPRM

CNTRPRM is the SFPARM to contour.

The parameter to contour must be one of the parameters listed in the SFPARM variable for plotting. The user may set the plotting COLOR to 0 if the station data values are not to be shown.

### 3.20 COLORS

COLORS specifies a list of color numbers which must be separated using semicolons:

**color 1 ; color 2 ; ... ; color n**

The last color in the list will be repeated, if necessary, to determine all colors required by the program.

Colors may be entered as a range in the form: first-last-increment. If the increment is not entered, 1 is assumed.

Color-coding of any parameter may be done based on its own value or on the value of any other computable parameter. There is a one-to-one correspondence between the elements in the color list and the elements in the parameter list (e.g., SFPARM). To color-code any parameter, replace its corresponding color number in the COLORS list with the form:

(v1;v2;...;vN-1/c1;c2;...;cN/PARM/E) or (v1-vN-1-vInc/c1-cN-cInc/PARM/E) or a combination of a list and a range

where the v's are parameter values, the c's are color numbers, and PARM is the parameter whose value determines the color. If PARM is omitted, the parameter will be color-coded based on its own value. The number of values must be one less than the number of colors. If a value range is used, an increment must be specified. If a color range is used and no increment is specified, 1 is assumed. For example, to color-code a marker based on the 3-hour flash flood guidance value, the color element corresponding to the parameter MARK could be specified as:

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**(0.5;1;1.5;2;3/2;19;21;22;6;4/FF03)**

meaning that values less than or equal to .5 inch would be plotted with color 2, values greater than .5 but less than or equal to 1 would be plotted with color 19, etc.

The E is a flag to indicate whether to include the break value with the lower range or the upper range of values. Valid values are L and U, respectively. The default is L for inclusion in the lower range of values. In the above example, the first data range is  $X \leq 0.5$ , the second is  $0.5 < X \leq 1.0$ , etc. If the U flag is added, the ranges change to  $X < 0.5$ ,  $0.5 \leq X < 1.0$ , etc.

If the input is blank, a default of 1 is used. If a color number of 0 is entered, that parameter or line will not be plotted.

New color assignments may be made by appending the following commands to the color number:

=INIT	--	all colors are initialized to device-dependent colors
=NAME	--	this color number is set to the color specified in NAME
=r:g:b	--	this color number is set using RGB components in r, g, and b which must be separated using colons. These components must be in the range 0 - 255.

Note that only =INIT may be appended to a range.

Color number 101 is the background color.

Note that the GIF driver does not accept NAME.

The following colors are the default colors for the given devices:

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XW,NC	PS,PSP	PSC	GEMPAK NAMES	X COLOR NAMES
1		31	VANILLA	bisque1
2		2	RED	red
3		3	GREEN	green
4		4	BLUE	blue
5		5	YELLOW	yellow
6		6	CYAN	cyan
7		7	MAGENTA	magenta
8		8	BROWN	sienna3
9		9	CORAL	sienna1
10		10	APRICOT	tan1
11		11	PINK	LightPink1
12		12	DKPINK	IndianRed1
13		13	MDVIOLET	firebrick2
14		14	MAROON	red4
15		15	FIREBRICK	red3
16		16	ORRED	OrangeRed2
17		17	ORANGE	DarkOrange1
18		18	DKORANGE	orange3
19		19	GOLD	gold1
20		20	DKYELLOW	yellow2
21		21	LWNGREEN	chartreuse1
22		22	MDGREEN	green3
23		23	DKGREEN	green4
24		24	GRPBLUE	DodgerBlue4
25		25	LTBLUE	DodgerBlue1
26		26	SKY	DeepSkyBlue2
27		27	MDCYAN	cyan2
28		28	VIOLET	MediumPurple3
29		29	PURPLE	purple2
30		30	PLUM	magenta4
31		32	WHITE	white
32	1	1	BLACK	black
	2		G95	gray95
	3		G90	gray90
	4		G85	gray85
	5		G80	gray80
	6		G75	gray75
	7		G70	gray70
	8		G65	gray65
	9		G60	gray60
	10		G55	gray55
	11		G50	gray50
	12		G45	gray45
	13		G40	gray40
	14		G35	gray35
	15		G30	gray30
	16		G25	gray25
	17		G20	gray20
	18		G15	gray15
	19		G10	gray10
	20		G05	gray5

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On the color devices, colors 8 through 30 will provide a range of colors from brown to red to orange to yellow to green to blue to violet. On the Postscript device, 20 gray shades are used.

### 3.21 COLUMN

COLUMN specifies the number of columns for plotting the contents of an ASCII text file specified by TXTFIL.

### 3.22 COMPRESS

COMPRESS is a flag to determine whether the output will be written in compressed format.

Enter YES to write in compressed format. NO to write in uncompressed.

### 3.23 CONTUR

CONTUR sets attributes for the contour algorithms:

**subbox factor / number of smoothing passes**

Each grid box will be subdivided into the number of subboxes specified by the subbox factor. Increasing this value will produce smoother contours, but will increase contouring times and make metafiles larger. The new default value in GEMPAK 5.2 is 0.

A simple three-point smoothing filter is used if the number of smoothing passes is greater than 0. The default is 0.

### 3.24 CPYFIL

FORM: Grid file whose navigation is to be used in new grid file | subarea

CPYFIL identifies the location of the grid navigation and analysis information to be stored in a grid file, as well as an optional subarea. Three options are available:

1. If CPYFIL is blank, the information is taken from the input for PROJ, GRDAREA, KXKY, and ANLYSS.

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2. If CPYFIL begins with a #, the information is read from the line in the grid navigation table which has the grid name or number corresponding to the rest of CPYFIL.
3. If CPYFIL is the name of a current grid file, the grid and navigation information will be copied from that file.

For cases 2) and 3), the information may be followed by a vertical bar and a specified subarea. This subarea has the same meaning as GAREA and may take on the same values. The grid file that gets created has the same navigation and grid spacing as that indicated by the first part except over a smaller area.

The input for CPYFIL may also be a file type (model alias). Valid aliases may be found in the table "datatype.tbl" with CATEGORY (column 4) equal to CAT\_GRD. When one of these file types is input, the program searches locally for the most recent file first, then locally for the previous file. If no files are found locally, the program searches remotely for the most recent file, then remotely for the previous file.

NOTE: If CPYFIL is not blank, the values of PROJ, GRDAREA, KXKY, and ANLYSS will be ignored.

### 3.25 CSIG

CSIG is the ending valid time for the convective sigmet and convective outlook, the colors for the initial hour (0-hr) CSIG, extrapolated 1-hr CSIG, extrapolated 2-hr CSIG, and outlook, and flags for plotting the 0-hr CSIG sequence number, end time, direction/speed, flight level, intensity, 1-hr CSIG sequence number, and 2-hr CSIG sequence number on the map.

**End time|0\_Hr;1\_Hr;2\_Hr;OL clrs|Seq0|Tm|Mv|FI|Insty|Seq1|Seq2**

Convective sigmets, extrapolated 1-hr and 2-hr CSIGs, and outlooks that are valid at the ending time will be plotted on the map. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST or ALL. LAST will use the system time and plot all current convective sigmets, extrapolated CSIGs, and outlooks. ALL will plot all the convective sigmets, extrapolated CSIGs and outlooks in the data files for the last ten days, whether they are active or expired.

The colors are separated by a semi-colon. If any color is set to 0, that line will not be plotted. If any color is missing, a default will be used. Defaults are red for 0-hour CSIG, blue for 1-hour CSIG, yellow for 2-hour CSIG, and green for outlooks.



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The sequence number ID flag (Seq0) is YES or NO and controls whether or not to plot the identifying text for the convective sigmets and outlooks on the map. The default is NO.

The time flag is YES or NO and controls whether or not to plot the end time of the convective sigmet and outlook on the map. The default is NO.

The movement flag is YES or NO and controls whether or not to plot the direction from north in degrees and the speed in knots on the map. The default is NO.

The flight level flag is YES or NO and controls whether or not to plot the flight level in hundreds of feet on the map. The default is NO.

The intensity flag is YES or NO and controls whether or not to plot the intensity of the area, line or isolated area on the map. The default is NO.

The sequence number ID flag (Seq1) is YES or NO and controls whether or not to plot the identifying text for the extrapolated 1-hr convective sigmets on the map. The default is NO.

The sequence number ID flag (Seq2) is YES or NO and controls whether or not to plot the identifying text for the extrapolated 2-hr convective sigmets on the map. The default is NO.

### **3.26 CTLFLG**

CTLFLG is a logical flag which indicates whether control characters are included in a raw surface data set to be decoded.

The raw surface data set must contain either bulletins from the Domestic Data Service or single station reports. If the data set contains bulletins, set CTLFLG = YES. Otherwise, it will be assumed that the file contains single station reports with one report per line.

If CTLFLG = YES, the input file must contain bulletins. If CTLFLG = NO, the file must have reports.

### **3.27 CTYPE**

CTYPE specifies the contouring algorithms to use separated by slashes:

**type 1 / type 2 / ... / type n**

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Valid inputs for type are:

C	the original GEMPAK contouring algorithm
L	GEMPAK contouring algorithm without subboxes
F	contour fill algorithm
B	box algorithm -- same as contour fill, but draws lines around the polygons rather than filling in polygons.

Note that contour attributes are specified in CONTUR. The contour interval and line characteristics for types C, L, S and B are read from CINT and LINE and for type F from FINT and FLINE.

Examples:

```
CTYPE = C      --      draws contour lines

CTYPE = C / F  --      draws filled contours overlaid with lines
```

### 3.28 CURVE

CURVE is a number corresponding to the method to be used to fit the curve. Generally, CURVE should be set to 2.

The curve types currently available are:

1	-	piecewise straight line
2	-	cubic spline
21	-	cubic spline with linear ends
22	-	cubic spline with parabolic ends
23	-	cubic spline with extrapolated ends

Note that types 2 and 21 are the same. Types 22 and 23 produce slightly different results at the ends of the splines.

### 3.29 CXSTNS

CXSTNS defines the x-axis for a cross-section plot.

In SNCROSS, CXSTNS is the list of stations, separated with semicolons, to be used for the cross section. Stations may be entered using either character or numeric identifiers.

In GDCROSS, CXSTNS contains the endpoints of the cross-section line separated using a >. Each endpoint may be defined as follows:

1. a station character or numeric identifier;

## GEMPAK Variables

2. a latitude and longitude pair separated by a semicolon;
3. an @ followed by a grid x and y coordinate pair separated using a semicolon, e.g., @1.5;2.3>@25.9;30.
4. graphically using the CURSOR command.

### 3.30 DATOUT

DATOUT is the date and time which will be assigned in the output file.

DATOUT is an 11-character string entered as YYMMDD/HHMM, where:

YY is the last two digits of the year  
MM is the month  
DD is the day of the month  
/ is the date and time separator  
HH is the hour  
MM is the minutes past the hour

The part before the / is the DATE; the part after the / is the TIME.

A list of times may be entered for DATOUT. Times in the list must be separated with semicolons. For example:

**940513/1100;940412/1300;940515/0600**

**or**

**13/11;0412/13;0515/6.**

In the above example, the times are:

940513/1100  
940412/1300 and  
940515/0600.

The options LAST, LIST, ALL and /ALL are not supported by DATOUT.

### 3.31 DATTIM

DATTIM is the date and time to be used by GEMPAK programs. DATTIM is an 11-character string entered as YYMMDD/HHMM, where:

## GEMPAK Variables

YY is the last two digits of the year  
MM is the month  
DD is the day of the month  
/ is the date and time separator  
HH is the hour  
MM is the minutes past the hour

The part before the / is the DATE; the part after the / is the TIME.

DATTIM may be abbreviated. If the input has no / , it is assumed to be the TIME part. An abbreviated version of either TIME or DATE is assumed to be the part closest to the /. The rest of the standard time is obtained from the last time in the file. For example, if the last time in the file is 940515/1200 the following translations will be done:

13/11	---->	940513/1100
13	---->	940515/1300
13/	---->	940513/1200
0412/1300	---->	940412/1300

A list of times may be entered for DATTIM. Times in the list must be separated with semicolons. For example:

**13/11;0412/13;0515/6**

In the above example, the times are:

940513/1100  
940412/1300 and  
940515/0600.

DATTIM may also be entered as a range. The first and last times must be separated by a minus sign. For example:

**13/11-15/14**

A range with an increment may also be entered using minus signs as separators. The format of the increment is hhhmm. If the increment is one or two digits, it is assumed to be in hours.

The following options are also valid for DATTIM:

LAST	--	the last time in the file
LIST	--	lists all times and waits for input
ALL	--	all the times in the file
/ALL	--	all the times for a single DATE.

If /ALL is entered, all the times for the most recent date are processed. If /ALL is appended to a specific date, then all the times for that date will be processed.

## **GEMPAK Variables**

### **3.32 DELTAN**

DELTAN is the average station spacing in degrees of latitude. The Barnes objective analysis programs use this number to compute weights for data interpolation.

### **3.33 DELTAX**

DELTAX is the spacing between grid points in the x direction on CED grids. This value is in degrees longitude.

### **3.34 DELTAY**

DELTAY is the spacing between grid points in the y direction on CED grids. This value is in degrees latitude.

### **3.35 DELZ**

DELZ is the user chosen average height difference between pressure levels to be used in the vertical interpolation. The default value is 500 m.

### **3.36 DEVICE**

DEVICE specifies the graphics device:

**device | name | xsize ; ysize | color type**

The following graphics devices are available:

XW	X Windows terminal
PS	PostScript
NC	NTRANS Computer Graphics Metafile
GF	GIF file using X-server
GIF	GIF file not using X-server
UTF	Universal Transmission Format (AFOS)
RBK	AWIPS RedBook Graphics
VG	Vector Graphics (N-AWIPS Product Generation)
XWP	Combination driver
FAX	Fax driver
TIFF	TIFF file

## **GEMPAK Variables**

The following three PostScript device names are included for backward compatibility only. The appropriate settings for the PS device are automatically selected based on the information below.

PS1	PostScript - Landscape / Letter / Monochrome
PSC	PostScript - Landscape / Letter / 32 Colors
PSP	PostScript - Portrait / Letter / 20 Grays

The XWP driver combines the capabilities of several drivers. Currently, it includes the XW and the PS drivers. XWP allows the user to display graphics to a window, then, without closing the window, a PostScript file may be created.

The UTF driver produces output for AFOS devices and the NAFOS product. Note that while both AFOS and NAFOS read files in universal transmission format, the exact file formats for are not compatible. The default output is to an AFOS formatted file. The color control (see below) is used to switch between output types.

The RBK driver produces output for AWIPS devices and OSO products. These products are created according to the Standard Formats for Weather Data Exchange format. However, the OSO format has an extra transmission header information section. The default file is of an OSO format. The color control (see below) is used to switch between output types.

The FAX driver produces an NMC 6 bit formatted file.

The TIFF driver produces a TIFF file that uses the Group 4 Fax compression scheme. It can also optionally create a file with no compression.

The VG driver produces a GEMPAK Vector Graphics file. This file can then be used in product generation for graphical editing of the elements. When producing a VG file, CLEAR has no effect, i.e., all elements are added to the output file regardless of the value of CLEAR.

NAME is the file or window name. In the NC driver, if the file already exists, new frames will be appended to it unless the default file name of Nmeta is used. In this case, the file is overwritten. The PS driver also uses the file name to generate plot files, however no appending is attempted. Files are always overwritten. In the XW or XWP drivers, up to five named windows may be opened.

If no file/window name is given, the following will be used:

## GEMPAK Variables

XWP	GEMPAK
XW	GEMPAK
PS	ps.plt
NC	Nmeta
GF	gempak.gif
GIF	gempak.gif
VG	vgf.vgf
FAX	999X;0167 (produces the file 999X.6bt)
UTF	T01
RBK	T01
TIFF	AAAA00
PS1	ps1.plt
PSC	psc.plt
PSP	psp.plt

The UTF driver defaults to an AFOS test product PIL if no entry is given. The file name may be the last three characters of a valid PIL, or a full file name. If the file name is a PIL, the product table is read for specific size and time attributes. If a regular file name is given, suitable defaults are chosen for the size and forecast time. The user may also give a base time for the product. This is added to the file name following a semi-colon, i.e., "T01;1200". This product would have a base time of 1200 GMT. The forecast hour read from the product table is added to the base time to give a valid time for the product.

The RBK driver defaults to an OSO formatted file if no entry is given. The file name must be the last three characters of a valid AFOS PIL, or the test PIL id, T01. The PIL id is used by the product table to find the specific size and time attributes. The difference between the AWIPS format and the OSO format is the information given at the beginning of the file and that the AWIPS format does not have any padding of spaces at the end of the file. Similar to the UTF driver, the user may also give a base time for the product. This is added to the file name following a semi-colon, i.e., "93E;311200". This product would have a base date of the 31st and a base time of 1200 GMT. The base date may also be given in the full GEMPAK date/time format, i.e., "9JH;000931/1200". The forecast hour read from the product table is added to the base time to give a valid time for the product. If the base date or time is not specified, then the system date or time will be used for the valid time.

The FAX file name entry equates to a wheel and subset for the output product. Every fax product must have an associated wheel and subset number. The driver uses the supplied wheel and subset number to determine the dimensions of the product. These dimensions are defined in the product table, faxprod.tbl. This file will be named "XXXX.6bt" where XXXX represents the wheel number of the product. The subset number is embedded in the compressed 6 bit image and is only meaningful to OSO systems that transmit products.

## GEMPAK Variables

The TIFF file name entry is the WMO ID of the product. The driver uses the supplied ID to determine the dimensions of the product. These dimensions are defined in the product table, tiffprod.tbl. The output file will be named "AAAAIL.tiff" where AAAAIL represents the 4 character and 2 digit WMO ID of the product.

XSIZE and YSIZE are the device dimensions. The specification of their values is a function of the device driver.

For XW or XWP, xsize and ysize may be (1) the number of pixels in the corresponding direction if the values are specified as integers, or (2) a fraction of the screen size if the values are specified as reals  $> 0$  and  $\leq 1$ .

For the PS driver, xsize and ysize are the paper dimensions in inches. If xsize is greater than ysize, then a landscape orientation is used. For xsize less than ysize, the plot orientation is portrait.

For UTF driver, xsize and ysize have no meaning, as the dimensions for the display are determined by the entry on the product table (product.tbl) that matches the user supplied pil.

For the NC driver, xsize and ysize are fractions of the maximum dimension of a NTRANS CGM file. Their values must be  $> 0$  and  $\leq 1$ . If both values are less than 1, then the larger value is set to 1 and the smaller value is increased proportionally to maintain the aspect value of the user input values.

If xsize and ysize are not specified the following defaults will be used:

XWP	.7;.7	(70 percent of the screen size)
XW	.7;.7	(70 percent of the screen size)
PS	11;8.5	(Standard letter size paper in landscape)
NC	1.0;1.0	(Standard square CGM plotting space)

COLOR TYPE is a flag for specifying the color scheme to use for the driver. Currently, only PS will use the color type. Color type may have the following values:

C	32 Colors
G	20 Grays
M	Monochrome lines with color fills

The default is to use 20 grays. The exceptions to this are noted below.

For UTF (which is a monochrome device), a value of C is used to switch the output to an NAFOS formatted file. Any other value for color type results in an AFOS formatted file.



## GEMPAK Variables

For RBK (which is a monochrome device), a value of C is used to switch the output to an AWIPS formatted file. Any other value for color type results in an OSO formatted file.

For TIFF, the default is monochrome output with a white background and all graphics drawn in black. This type of output will be compressed using the Group 4 Fax compression scheme. A value of G will create an output file that has a black background with all graphics drawn in white. It will also allow a grayscale image to be written to the output file. This type of output will not be compressed.

The GF driver has the same options as the XW driver. The differences in execution are that the GF device will not display a graphics window, and will create a separate file for each active frame either when the device is closed or a new file name is given. The file names are based on the user supplied file name, with the frame number appended to the name after the initial file has been created. That is, given the default name, the first GF file created will be named "gempak.gf", the following file will be named "gempak.gf.001".

### 3.37 DITHER

DITHER is used to specify the plotting behavior of the reflectivity intensities. A value of 0 specifies no dithering, the grid box is completely filled. Values 1-4 increase the number of dither points per grid box, approaching an increasingly opaque value. Dither can be used to overlay image data with radar reflectivity in order to simulate transparency. A dither value  $\geq 5$  will outline the grid box.

### 3.38 DTAAREA

DTAAREA defines the area over which station data will be input to the Barnes objective analysis. Since data must be interpolated from the first pass grid back to stations, only data within the EXTEND area will be used after the first pass. If the DTAAREA is not specified by the user, it will default to the EXTEND area in OAGRID or to the data area stored in the grid file analysis block in OABSFC and OABSND.

DTAAREA can be specified in three ways:

1. lat1;lon1;lat2;lon2  
This defines a latitude/longitude range where (lat1, lon1) is the lower left corner and (lat2, lon2) is the upper right corner. West longitude is negative.

#clat;clon;dlat;dlon  
This defines a latitude/longitude range by the center latitude

## GEMPAK Variables

and longitude. The lower left corner is (clat-dlat; clon-dlon); the upper right corner is (clat+dlat; clon+dlon). No corrections are made for the poles or the International Date Line.

### 2. GEOG

This is an abbreviation for a geographic area defined in the GEMPAK geographic table which includes abbreviations for states, provinces, and countries, as well as other names. A suffixed + or \* will decrease the extent of the geographic area. A suffixed - will increase the extent of the geographic area.

### 3. STN

This defines an area centered on a station found in the GEMPAK station table, which currently contains US, Canadian and Mexican stations. A suffixed + or \* will expand, and - will reduce the area.

Note that the other ways of specifying AREA are not valid for DTAAREA in OAGRID but are valid in both OABSFC and OABSND.

For all projections, the lat/lon corners defined will be used exactly. For projections which include the pole, if lat1 = lat2 and lon1 = lon2, then lat1 will specify the range of data from the pole and lon1 will specify the central longitude. West longitude is negative.

Note that the stations actually used for the data area may be changed in the objective analysis programs using DTAAREA.

## 3.39 ECHO

ECHO specifies whether to plot the grid box intensities. A value of 0 specifies no plotting of echoes; 1 specifies plotting only those echoes from radars in precipitation mode; 2 specifies plotting of echoes from radars in both precipitation and clear air mode.

## 3.40 EXTEND

EXTEND specifies the numbers of grid points beyond the GRDAREA which define the grid extend area in the Barnes objective analysis. The first pass is computed on the extend area to reduce edge effects on the GRDAREA.

EXTEND is specified as four integers, which are the number of grid points to extend the grid left, down, right, and up. The values are separated by semicolons. The default for EXTEND is 2;2;2;2.

### 3.41 FAXFIL

FAXFIL is the name of a 6-bit FAX product.

### 3.42 F HOUR

F HOUR is the forecast hour, e.g., 18, or 24, which defines the "f" value in the BUFRFIL name, as follows:

F HOUR	f
----	---
0	A
6	B
12	C
18	D
24	E
30	F
36	G
42	H
48	I
60	J
72	K

It also defines the forecast hour for the ASCII intermediate input/output file, UKAFIL.

### 3.43 FILTER

FILTER is a logical variable or real number which controls the filtering of data in order to eliminate plotting of overlapping data.

If FILTER is YES, the data will be filtered.

If FILTER is NO, 0, or blank, all data will be plotted.

If FILTER is set to a real number, the default filter will be scaled by that number. FILTER = 1 corresponds to FILTER = YES.  $0 < \text{FILTER} < 1$  allows some data overlap. FILTER > 1 causes data to be more widely spaced.

### 3.44 FILTYP

FILTYP is the filter type. Valid input are NONE, LIGHT and HEAVY.

## **GEMPAK Variables**

A LIGHT filter will smooth the data to allow a mesoscale analysis. A HEAVY filter will smooth the data to only a large scale analysis. A filter of NONE will not smooth the data.

Only the wind data and the virtual potential temperature are filtered to aid in the computation of the derivatives needed for the shear and Scorer parameter calculations.

### **3.45 FINT**

FINT is the contour fill interval, minimum and maximum values separated by slashes:

**fill interval / minimum / maximum**

The contour fill interval may be any real number. If it is not specified or if the value is 0, the program will select an interval which will generate 5 to 10 contour fill levels.

The minimum and maximum values specify the range of data to use in selecting the fill levels. If either value is not specified, the value will be obtained from the range of values in the dataset. If the minimum and maximum are equal, that value will be used and only one contour fill level will be selected; however, since the number of colors is one greater than the number of fill levels, two colors will be needed--the first for filling regions with values less than the input value and the second for filling regions of greater value.

A list of two or more fill levels may be entered using semicolons to separate the individual values. In this case, the minimum and maximum are ignored.

### **3.46 FLINE**

FLINE is the color and fill type to be used for contour fill:

**colr1;...;colrn/type1;...;typen**

The number of fill colors and types needed is one greater than the number of fill levels in FINT. The number of fill colors may be entered as a list of color numbers separated by semicolons or a range of colors. The number of fill types may be entered as a list of numbers separated by semicolons. More information on color selection can be found in the help for COLORS.

The fill type may be set any of the following values:

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1	Solid
2	Slanted Dash
3	Wide-spaced Slanted Line
4	Medium-spaced Slanted Line
5	Zig-Zag Line
6	Dots
7	Thin-spaced Slanted Line

If fill type is set to 0, solid fill is used. If the fill type is set to a single negative number, negative values will use the absolute value of the fill type, and positive values will be solid.

### 3.47 FXYTBL

FXYTBL is the the FXY table file names in the format of

**FXYTBL = ...;...;...**  
**or SWH**

where the individual items are the FXY file names (e.g., fxyswhcld;fxyswhfrt) and the SWH is an alias which refers to all FXY files for the high level sigwx message as listed in the master table.

### 3.48 GAMMA

GAMMA, the convergence parameter, is a multiplier for the weight and search radius for passes after the first pass of the Barnes analysis programs. GAMMA must be within the range 0 - 1. Any value outside this range will default to a value of 0.3. If GAMMA is 0, the number of passes will be set to 1. The recommended value for GAMMA is 0.3.

### 3.49 GAREA

GAREA is the graphics area. This is the area which will be displayed on a graphics device.

GAREA can be specified in the following:

1. lat1;lon1;lat2;lon2  
This defines a latitude/longitude range where (lat1, lon1) is the lower left corner and (lat2, lon2) is the upper right corner.  
West longitude is negative.

## GEMPAK Variables

#clat;clon;dlat;dlon

This defines a latitude/longitude range by the center latitude and longitude. The lower left corner is (clat-dlat; clon-dlon); the upper right corner is (clat+dlat; clon+dlon). No corrections are made for the poles or the International Date Line.

2. GEOG

This is an abbreviation for a geographic area defined in the GEMPAK geographic table which includes abbreviations for states, provinces, and countries, as well as other names. A suffixed + or \* will decrease the extent of the geographic area. A suffixed - will increase the extent of the geographic area.

3. STN

This defines an area centered on a station found in the GEMPAK station table, which currently contains US, Canadian and Mexican stations. A suffixed + or \* will expand, and - will reduce the area.

4. Graphically using the CURSOR command.

Note that the other ways of specifying AREA are not valid for GAREA.

For all projections, the lat/lon corners defined will be used exactly. (If GAREAX is used with the CURSOR command, the display area attempts to fill the entire view area, extending the area defined by the selected lat/lon). For projections which include the pole, if lat1 = lat2 and lon1 = lon2, then lat1 will specify the range of data from the pole and lon1 will specify the central longitude. If the projection has been rotated so that a geographic pole is no longer at the center and lat1 = lat2 and lon1 = lon2, then lat1 will determine the range of data from the rotated pole and lon1 specifies the central longitude as before. If a cylindrical equidistant projection has been rotated for any angle1 between 90 and -90 degrees, then the entire world can be displayed by entering GAREA=0;0;0;0. The central longitude is taken from the PROJ specification for angle2. This works for angle1 = 0 as well.

West longitude is negative.

For overlay on satellite and radar imagery, PROJ must be set to SAT and RAD, respectively.

### 3.50 GBDIAG

GBDIAG allows for detailed GRIB message section information, byte-by-byte, to be printed out for selected GRIB messages. Simply list those GRIB sections to be examined (IDS, PDS, GDS, BMS, BDS, END or ALL for all sections), e.g., pds;gds. Selected GRIB messages for examination may also be identified by number in list and/or range format, e.g., 2;4;5-9, immediately following the section specification

## GEMPAK Variables

separated by a "|". For example, GBDIAG=pds;gds|2;4;6-12 . Please note that the BMS section will be listed only if it exists and that the sections BDS and END will be listed only if the GRIB data is actually being decoded and written into the GEMPAK file.

### 3.51 GBFILE

GBFILE is the name of the file which contains gridded data in GRIB messages.

### 3.52 GBTBLS

GBTBLS allows for specification of the GRIB decoding tables. The format is GBTBLS=W;N;V;C, where W is the WMO decoding table for parameters 1-127, N is the NCEP decoding table for parameters 128-255, V is the vertical coordinate table and C is the originating center table. The defaults are

```
$GEMTBL/grid/wmogribX.tbl,  
$GEMTBL/grid/ncepgribX.tbl,  
$GEMTBL/grid/vcrdgribX.tbl,  
$GEMTBL/grid/cntrgribX.tbl,
```

where X is the version number of the GRIB message.

### 3.53 GCENTER

GCENTER sets the center latitude-longitude on the ETA model domain

**GCENTER = TPH0D;TLM0D**

TPH0D and TLM0D are the center latitude (W is negative) and longitude (E is positive) of the computational domain. Note that it is not necessary to recompile the model if you change the areal coverage of the model domain as long as the number of grid points remains the same.

For a grid centered at 108 W, 39 N (Centered over Colorado)

```
TPH0D = 39.0  
TLM0D = -108.0 Note the Negative for W
```

set GCENTER = 39.0;-108.0

## GEMPAK Variables

### 3.54 GDATTIM

GDATTIM is the date/time for the grid.

Grids may contain two date/time fields, in which case the fields must be separated using a colon. If the grid to be selected contains only one time, the colon and second time may be omitted.

The standard format for a grid time is a character string

YYMMDD/HHMMthhhmm

where:

YYMMDD is the year, month, day  
/ is the date and time separator  
HHMM is the hour, minute  
t is the type  
( F=forecast A=analysis G=guess V=valid )  
hhmm is the forecast hour, minute

If t is blank, an analysis grid is assumed. If hhhmm is blank, 00000 is assumed. If hhhmm has one, two, or three digits, they represent hours. With four or more digits, zeros will be added at the beginning of the field.

The field YYMMDD is called the date; HHMM is the time; t is the type; hhhmm is the forecast time. The fields may be abbreviated. If the input has no /, it is assumed to be the time part. Any abbreviated version of either date or time is assumed to be the part closest to the /. The rest of the date and time is obtained from the last time in the file. If the type is missing, then A is assumed, and a missing forecast time is replaced by 00000.

The type and forecast time fields are used with forecast model data. If GDATTIM is 940831/0000F24, the grid to be found is the 24-hour forecast from the model run at 00Z on Aug 31. If GDATTIM is 940831/0000V24, the grid to be found is the 24 hour forecast valid for 00Z on Aug 31 from the model run at 00Z on Aug 30.

Examples (with the last time = 941205/1600 ):

GDATTIM	TIME1	TIME2
-----	-----	-----
941205/1200	941205/1200	
12:15	941205/1200	941205/1500
LAST	941205/1600	
/00F24	941205/0000F24	
FALL	all forecast hours	
ALLF24	24 h forecast of all forecast cycles	



## GEMPAK Variables

The value in GDATTIM may be overridden by specifying ^GDATTIM with the grids to be found. For example, GFUNC = SUB (TMPF^28/12,TMPF^27/12) will compute the same time difference as GFUNC = TDF (TMPF) with GDATTIM=28/12:27/12.

Note that a grid from an objective analysis will have forecast type and time A00000, which is the default for a blank forecast type and time.

### 3.55 GDEFIL

GDEFIL is the name of the grid edit file which will be used to update a grid file. The edit file must contain only complete grids.

GDEFIL is a text file which may be created using the program GDLIST with F as an output device and GAREA = DSET. A text editor may be used to create or change the grid edit file.

GDEFIL must contain the following information before the complete grid data:

The time, level, vertical coordinate and parameter name **MUST** appear on the same line in the order given. The time must be a fully qualified GEMPAK time. The parameter name is the name of the grid.

The first and last row and column information must appear on one line. Column information must be preceded by the word COLUMNS:. Row information must be preceded by the word ROW:. The first row and column must be 1. The last row and column must be the same as the grid size in the file. For example:

**COLUMNS: 1 8 ROWS: 1 6**

If the string FACTOR:, appears and is followed by an integer, the data will be divided by 10\*\*SCALE before being stored in the grid file. In the following example, the data will be divided by 10\*\*5.

**SCALE FACTOR: 10\*\*5**

The string COLUMN: signals the beginning of the grid data. If the required grid information has not already been found, an error will result.

The data for the grid follows the grid keywords. The data for a grid is listed from the top (last) row to the bottom row in the grid. The beginning of each row of data must be preceded by the string ROW. Data consists of numeric values for each data point; missing data should be entered as -9999.0.

### 3.56 GDFILE

GDFILE is the name of the file which contains gridded data.

The input for GDFILE may contain more than one file name separated by +. Up to three file names may be entered. Individual operands in GFUNC or GVECT can be accessed from a specific file by placing +n after the operand name, where n is the number corresponding to the placement of the file name in the GDFILE input. In the example below, the temperature from the third file is advected by winds from the first file:

```
GDFILE = file1.grd + file2.grd + file3.grd
GFUNC  = ADV ( TMPK+3, WND )
```

The input for GDFILE may also be a file type. The following file types are examples of the possible input. See the table, datatype.tbl, for the actual file types that can be used.

ETA	ETA model grid
NGM	NGM model grid
GFS	GFS model grid
MRF	MRF model grid
ECMWFG	ECMWF model grid (global)
ECMWFT	ECMWF model grid (tropical)
FNL	Final analysis
RUC2	Rapid update cycle
RUCS	Rapid update cycle surface
UKMET	UKMET model grid

When one of these file types is input, the program searches locally for the most recent file first. If no files are found locally, the program searches remotely for the most recent file. The remote directories are specified in the table DATA.TBL.

An optional base time may be included with the file type name, following a bar (|). For example:

```
GDFILE = eta | 00
```

This will attempt to find the most recent run of the ETA model at, or prior to, 00Z. The base time may be any valid format for a GEMPAK date/time. Any missing parts of the date/time will be supplied by the system time. For GDPLLOT2, the base time is the cycle time. It will attempt to find the most recent run of the ETA model at 00Z cycle.

### 3.57 GDNUM

GDNUM allows the user to select grids by number in the following ways:

## **GEMPAK Variables**

**GDNUM = range**

The first and last grid numbers in the range are separated by a -. If an increment is included, it will be ignored.

**GDNUM = list**

The grid numbers in the list are separated using semicolons.

**GDNUM = ALL**

All the grids in the file will be included.

**GDNUM = LIST**

All the grids in the file will be listed. The user will be prompted to select the grids to be included.

### **3.58 GDOUTF**

GDOUTF is the output grid data file name.

GDOUTF is used in programs which create a new grid data file. It is also used in programs that move data from an input file to an output file. In that case, GDFILE is the original file.

The file types that can be used for GDFILE cannot be used to specify the GDOUTF value.

### **3.59 GDPFUN**

GDPFUN specifies a grid diagnostic function which yields either a scalar or vector quantity. For more information, see the GPARM documentation.

### **3.60 GFUNC**

GFUNC specifies a grid diagnostic function which yields a scalar quantity. For more information, see the GPARM documentation.

### **3.61 GGLIMS**

GGLIMS is the parameter which controls the grid value limits and values.

## GEMPAK Variables

**lochk;loval | hichk;hival | default**

Grid values less than lochk are set to loval. Grid values greater than hichk are set to hival.

If no contours are available in the CNTRFL file, the output grid is assigned "default" at all grid point locations.

Example: for a precipitation grid, set all negative values to zero:

**GGLIMS 0;0**

Example: in previous example, if no contours are provided, set all grid point values to zero:

**GGLIMS 0;0 || 0.0**

### 3.62 GLEVEL

GLEVEL is the vertical level for the grid.

Grids may contain two levels separated by a colon. If the grid to be selected contains only one level, the colon and second level may be omitted. In this case, the second level is stored in the grid file as -1.

Note that the vertical coordinate system for GLEVEL is specified by GVCORD.

The value in GLEVEL may be overridden by specifying @GLEVEL with the grids to be found. For example, the following two computations are identical:

**GFUNC = SUB (TMPF@850,TMPF@500)**

**GFUNC = LDF (TMPF) and GLEVEL = 850:500.**

### 3.63 GPACK

GPACK is the packing type and the number of bits (or data precision) to be used to pack the grid data, separated with a slash:

**packing type / number of bits (NONE, GRIB, DIF)**

**packing type / precision (DEC)**

The valid packing types are:

## GEMPAK Variables

NONE	No packing
GRIB	Data is packed in GEMPAK GRIB format
DEC	Data is packed in GEMPAK GRIB format
DIF	Data is packed in GEMPAK DIF format

If the packing type is DEC, the number of bits is replaced by the data precision. The data will be scaled by  $10^{\text{precision}}$  and rounded to the nearest integer. The number of bits used to store the data will be the minimum number required to store the resulting integers.

If the number of bits is less than 32, the packing type specified will be used. If no packing type is given, the data will be packed using the GEMPAK GRIB scheme.

In general, data should be stored using packing type GRIB with 16 bits, by specifying the precision in DEC or with no packing using type NONE. Care should be taken using the other packing options.

Pack Type	Minimum	Maximum	Default
NONE	32	32	32
DEC	-5	5	2
DIF	2	32	16
GRIB	2	32	16

The default data packing when GPACK is blank is GRIB/16.

### 3.64 GPARM

GFUNC and GVECT are the scalar and vector grid functions. They are input as nested strings of operators and operands. The operand list for an operator is enclosed in parentheses or square brackets, with operands separated by semicolons or commas.

If the entire grid is small enough (less than LLMXGD grid points) and GAREA is set to GRID, then the computations below are done over the entire grid; otherwise, the computations are done over a subset of the grid. This subset grid is large enough to cover the display area.

The following grids will be computed automatically from grids in the grid file, if possible:

TMPK	DWPK	TVRK	MIXR	THTA	DRCT	TMWK
TMPC	DWPC	TVRC	SMXR	STHA	SPED	TMWC
TMPF	DWPF	TVRF	MIXS	THTE	RELH	TMWF
		THES	SMXS	STHE		

## GEMPAK Variables

Mixing ratios will be computed automatically from dewpoint temperatures, specific humidity, or vapor pressure if a pressure grid exists.

The stability indices will be computed automatically from temperature, dewpoint temperature, and wind speed and direction. These special scalar parameters are:

### CTOT VTOT TOTL KINX SWET

Haines Indices for fire weather detection will be computed automatically from temperature and dewpoint at three different levels. These scalar parameters are:

LHAN	Low elevation Haines Index
MHAN	Middle elevation Haines Index
HHAN	High elevation Haines Index

The Heat Index, HEAT, will also be automatically computed from the temperature and relative humidity.

In addition, precipitation will be converted from inches (I) to millimeters (M) and vice versa, if the grids are named P\_\_M or P\_\_I. The middle characters are numbers giving the time interval over which the precipitation accumulated. For example, P24M is a 24-hour precipitation total.

The units for sea surface temperature (SSTx), maximum temperature (TMXx), and minimum temperature (TMNx) will be converted automatically. (x may be K, C, or F.)

These special scalar parameter names denote constant value grids:

DTR	Conversion factor for degrees to radians = $\text{PI} / 180$
E	Base of natural logarithms = 2.71828182
GRAVITY	Gravitational constant = 9.80616 (note spelling)
KAPPA	Gas constant/specific heat = 2/7
PI	3.14159265
RTD	Conversion factor for radians to degrees = $180 / \text{PI}$
nnn	Any number (e.g., 2, -10.2)

Another class of special parameter names depends on the grid navigation:

CORL	Coriolis force = $2. * \text{OMEGA} * \text{SIN} ( \text{LATR} )$
LATR	Latitude in radians
LONR	Longitude in radians
XVAL	Value of the x coordinate in graph coordinates
YVAL	Value of the y coordinate in graph coordinates
MSFX	Map scale factor in the x direction
MSFY	Map scale factor in the y direction
LAND	Land array; land=1, sea=RMISSD
SEA	Sea array; sea=1, land=RMISSD
BETA	Derivative of Coriolis force with respect to y direction

## GEMPAK Variables

Note: This only works correctly for cylindrical grids.

A grid may be identified by its number in the grid file by prefixing the number with the symbol #, e.g., #5.

Standard vector grids are:

WND	Total wind
GEO	Geostrophic wind
AGE	Ageostrophic wind
ISAL	Isallobaric wind
THRM	Thermal wind

Time, level, and vertical coordinate as specified through the user interface may be overridden by in-line parameters:

`^time      @level    %ivcord`

appended to an operand in any combination.

If more than one file is opened, +n may also be used as an in-line parameter, where "n" is the number corresponding to the position of the file list entered in GDFILE. If +n is omitted, the first file is used. For example, to advect temperature from file 3 using winds from file 1:

```
GDFILE =file1.grd + file2.grd + file3.grd
GFUNC  =ADV ( TMPK+3, WND )
```

Grid operators may be nested. Note that layer and time range operators expect operands read directly from the grid file.

GFUNC may include a name for the computed grid. This name may be used in later diagnostic functions in an application. The grid is stored in an internal, circular grid list and will eventually be overwritten. It will never be available after exiting the application. The name is specified after two slashes at the end of GFUNC. For example,

**GFUNC = DIV ( WND ) // DVRG**

permits the divergence to be used in a later calculation as DVRG, as in this example:

**GFUNC = LAP ( DVRG )**

This name will also be the default name used in the title. If a computed grid is given the same name as one computed in a previous GFUNC specification, then the earlier grid is replaced by the one most recently computed, even if the grids have different level or time identifiers. Use different names to preserve both grids. To recall saved grids,

## GEMPAK Variables

it may be necessary to use in-line identifiers following the name if the inputs for GDATIM, GLEVEL, or GVCORD have been changed.

In the following list of diagnostic operators, scalar operands are named Si, and vector operands are Vi. Vector components are denoted by u and v. All meteorological grids are in MKS units, except as noted. POL following the description indicates that the computation currently can only be performed on polar (R, THETA) grids. In the trigonometric functions, the angles are expressed in radians.

The scalar constants used as arguments for the radial and tangential wind computations are defined as follows:

**LAT = latitude of storm center**  
**LON = longitude of storm center**  
**D = direction of storm motion**  
**ST = speed of storm motion**

The second input in each of the filter functions GWFS and GWFV is an integer N. N gives the wavelength in units of the grid spacing for which the theoretical response of a filter with normally distributed weights is  $1/e = .3679$ . In practice, the actual response function will exceed the theoretical values at all wavelengths. The larger N is, the stronger the filtering will be.

### SCALAR OUTPUT GRID

ABS	(S)	Absolute value
ACOS	(S)	Arc cosine function
ASIN	(S)	Arc sine function
ATAN	(S)	Arc tangent function
ATN2	(S1,S2)	Arc tangent function
COS	(S)	Cosine function
EXP	(S1,S2)	Exponential to real
EXPI	(S1,S2)	Exponential to integer [uses NINT(S2)]
INT	(S)	Convert to an integer
LN	(S)	Natural logarithm
LOG	(S)	Base 10 logarithm
NINT	(S)	Round to nearest integer
SIN	(S)	Sine function
SQRT	(S)	Square root
TAN	(S)	Tangent function
NCDF	(S1,S2,S3)	Cumulative normal distribution function for value, mean, and std dev
PAUB	(S1,S2,S3)	Combine probabilities (S1 OR S2) with dependency parameter S3
ADD	(S1,S2)	Addition
MUL	(S1,S2)	Multiplication
QUO	(S1,S2)	Division
SUB	(S1,S2)	Subtraction



## **GEMPAK Variables**

BOOL	(S)	Boolean function
SLT	(S1,S2)	Less than function
SLE	(S1,S2)	Less than or equal to function
SGT	(S1,S2)	Greater than function
SGE	(S1,S2)	Greater than or equal to function
SBTW	(S1,S2,S3)	Between two values function
SMAX	(S1,S2)	Maximum of S1 and S2
SMIN	(S1,S2)	Minimum of S1 and S2
MASK	(S1,S2)	Mask S1 based on S2
MISS	(S1,S2)	Set missing values in S1 to S2

## GEMPAK Variables

ADV	(S,V)	Advection
AVG	(S1,S2)	Average
AVOR	(V)	Absolute vorticity
BVSQ	(THTA)	Brunt-Vaisala frequency squared in a layer
CROS	(V1,V2)	Vector cross product magnitude
DDEN	(PRES,TMPC)	Density of dry air (kg / m**3)
DDR	(S)	Partial derivative with respect to R (POL)
DDT	(S)	Time derivative
DDX	(S)	Partial derivative with respect to X
DDY	(S)	Partial derivative with respect to Y
DEF	(V)	Total deformation
DIRN	(V)	Direction relative to north
DIRR	(V)	Direction relative to grid
DIV	(V)	Divergence
DIVT	(S,V)	Divergence Tendency (only for cylindrical grids)
DOT	(V1,V2)	Vector dot product
DTH	(S)	Partial deriv. with respect to THETA (POL)
FCNT	(S)	Coriolis force at grid center (POL)
FOSB	(TMPC,RELH, SPED)	Fosberg index, also called Fire Weather Index
FRNT	(THTA,V)	Frontogenesis
GWFS	(S,N)	Filter with normal distribution of weights
HIGH	(S,RADIUS)	Relative maxima over a grid (RADIUS is expressed in grid points)
JCBN	(S1,S2)	Jacobian determinant
KNTS	(S)	Convert meters / second to knots
LAP	(S)	Laplacian operator
LAV	(S)	Layer average (2 levels)
LDF	(S)	Layer difference (2 levels)
LOWS	(S,RADIUS)	Relative minima over a grid (RADIUS is expressed in grid points)
MAG	(V)	Magnitude of a vector
MASS		Mass per unit volume in a layer from PRES
MDIV	(V)	Layer-average mass divergence
MIXR	(DWPC,PRES)	Mixing ratio kg/kg internally, g/kg on output
MRAD	(V,LAT,LON, D,ST)	Magnitude of radial wind
MSDV	(S,V)	Layer-avg. mass-scalar flux divergence
MSFC	(V)	Pseudo angular momentum (for cross sections)
MTNG	(V,LAT,LON, D,ST)	Magnitude of tangential wind
NORM	(V)	Normal component (for cross sections)
PLAT	(S)	Latitude at each point (POL)
PLON	(S)	Longitude at each point (POL)
PLCL	(PRES,TMPC, DWPC)	Pressure of the lifting condensation level
POIS	(S1,S2)	Solve Poisson equation of forcing function with boundary conditions
POLF	(S)	Coriolis force at each point (POL)
PVOR	(S,V)	Potential vorticity in a layer
RELH	(TMPC,DWPT)	Relative humidity
RICH	(V)	Richardson stability number in a layer
ROSS	(V1,V2)	Rossby number

## GEMPAK Variables

SAVS	(S)	Average over display subset area of grid
SDIV	(S,V)	Flux divergence of a scalar
SHR	(V)	Shearing deformation
SM5S	(S)	5-point smoother
SM9S	(S)	9-point smoother
STAB	(TMPC)	Lapse rate over a layer in K/km
STR	(V)	Stretching deformation
TANG	(V)	Tangential component (for cross sections)
TAV	(S)	Time average
TDF	(S)	Time difference
THES	(PRES,TMPC)	Saturated equivalent potential temperature in Kelvin
THTA	(TMPC,PRES)	Potential temperature
THTE	(PRES,TMPC, DWPC)	Equivalent potential temperature
THWC	(PRES,TMPC, DWPC)	Wet bulb potential temperature in Celsius
TLCL	(TMPC,DWPC)	Temperature of the lifting condensation level
TMST (THTE,PRES)		Parcel temperature in Kelvin along a moist adiabat
TMWK	(PRES,TMPK, RMIX)	Wet bulb temperature in Kelvin
DSUB	(V1,V2)	DIRN (V1) - DIRN (V2)
UN	(V)	North relative u component
UR	(V)	Grid relative u component
VN	(V)	North relative v component
VOR	(V)	Vorticity
VR	(V)	Grid relative v component
WNDX	(S1,S2,S3,S4)	WINDEX (index for microburst potential)
WSHR	(V)	Magnitude of the vertical wind shear in a layer
XAV	(S)	Average along a display subset grid row
XSUM	(S)	Sum along a display subset grid row
YAV	(S)	Average along a display subset grid column
YSUM	(S)	Sum along a display subset grid column

## VECTOR OUTPUT GRID

## GEMPAK Variables

AGE	(S)	Ageostrophic wind
CIRC	(V,S)	Circulation (for cross section)
DVDX	(V)	Partial x derivative of V
DVDY	(V)	Partial y derivative of V
GEO	(S)	Geostrophic wind
GRAD	(S)	Gradient of a scalar
GWFB	(V,N)	Filter with normal distribution of weights
INAD	(V1,V2)	Inertial advective wind
ISAL	(S)	Isallobaric wind
KCRS	(V)	Curl of V
KNTV	(V)	Convert meters/second to knots
LTRN	(S,V)	Layer-averaged transport of a scalar
NORMV	(V)	Vector normal wind (for cross sections)
QVEC	(S,V)	Q-vector at a level
QVCL	(S,V)	Q-vector of a layer
RAD	(V,LAT,LON, D,ST)	Radial wind
ROT	(angle,V)	Coordinate rotation
SMUL	(S,V)	Multiply a vector's components by a scalar
SM5V	(V)	5-point smoother
SQUO	(S,V)	Vector division by a scalar
TANGV	(V)	Vector tangential wind (for cross sections)
THRM	(S)	Thermal wind over a layer
TNG	(V,LAT,LON, D,ST)	Tangential wind
VADD	(V1,V2)	Add the components of two vectors
VASV	(V1,V2)	Vector component of V1 along V2
VAVS	(V)	Average vector over display subset grid
VECN	(S1,S2)	Create vector from north relative components
VECR	(S1,S2)	Create vector from grid relative components
VLAV	(V)	Layer average for a vector
VLDF	(V)	Layer difference for a vector
VMUL	(V1,V2)	Multiply the components of two vectors
VQUO	(V1,V2)	Divide the components of two vectors
VSUB	(V1,V2)	Subtract the components of two vectors
VL	(V,S)	Less than function
VLE	(V,S)	Less than or equal to function
VGT	(V,S)	Greater than function
VGE	(V,S)	Greater than or equal to function
VB	(V,S1,S2)	Between two values function
VMSK	(V,S)	Mask V based on S

### 3.65 GPOINT

GPOINT is the grid location to be used for the plot. The value can be entered in the following ways:

1. station numeric or character identifier
2. a latitude and longitude pair separated with a semicolon

## GEMPAK Variables

3. @ followed by a grid x and y coordinate pair separated with a semicolon.
4. Graphically using the CURSOR command.

If necessary, the grid data will be interpolated using a bilinear interpolation to the point specified.

Examples:

GPOINT = @1;1.5	Grid point (1,1.5)
GPOINT = 30;-120	Grid point at 30 latitude and -120 longitude
GPOINT = 5;5	Grid point at 5 latitude and 5 longitude. Note that this is probably an error and the input should have been @5;5
GPOINT = BWI	Point located at Baltimore-Washington International Airport.

### 3.66 GRDAREA

GRDAREA specifies the area to be covered by the grid. This area is combined with PROJ to define the region over which the grid is evenly spaced.

GRDAREA can be specified in three ways:

1. lat1;lon1;lat2;lon2  
This defines a latitude/longitude range where (lat1, lon1) is the lower left corner and (lat2, lon2) is the upper right corner. West longitude is negative.  
  
#clat;clon;dlat;dlon  
This defines a latitude/longitude range by the center latitude and longitude. The lower left corner is (clat-dlat; clon-dlon); the upper right corner is (clat+dlat; clon+dlon). No corrections are made for the poles or the International Date Line.
2. GEOG  
This is an abbreviation for a geographic area defined in the GEMPAK geographic table which includes abbreviations for states, provinces, and countries, as well as other names. A suffixed + or \* will decrease the extent of the geographic area. A suffixed - will increase the extent of the geographic area.

## GEMPAK Variables

### 3. STN

This defines an area centered on a station found in the GEMPAK station table, which currently contains US, Canadian and Mexican stations. A suffixed + or \* will expand, and - will reduce the area.

Note that the other ways of specifying AREA are not valid for GRDAREA.

For all projections, the lat/lon corners defined will be used exactly. For projections which include the pole, if lat1 = lat2 and lon1 = lon2, then lat1 will specify the range of data from the pole and lon1 will specify the central longitude. West longitude is negative.

## 3.67 GRDHDR

GRDHDR is a list of the valid grid header flags, separated by slashes.

### **Horizontal Remap Type / Directional Grid Type**

The values in GRDHDR are set in the header array of the grid stored in a GEMPAK data file. The values for horizontal remap type define how the grid is to be interpolated to a new navigation. The directional grid type flag identifies grids that are direction grids and therefore must be handled differently when interpolated from one navigation to another.

The Horizontal Remap Type has values 0, 1 or 2 defined as the following:

- 0 = Regular area averaging for continuous grids**
- 1 = Discrete field, use nearest neighbor**
- 2 = Force bilinear interpolation**

The Directional Grid Type has values 0, 1, or 2 defined as the following:

- 0 = NOT a directional field**
- 1 = IS a directional field in degrees**
- 2 = IS a directional field in radians**

If any flag is not given by the user, the value is set to a default of 0.

## 3.68 GRDLBL

GRDLBL is the color number to be used in plotting the grid index numbers. If GRDLBL = 0 or blank, grid index numbers are not plotted.

### 3.69 GRDNAM

GRDNAM is the parameter name for the grid. In GDDIAG, this is the output name of the grid to be created. Time, level, and vertical coordinate for the grid may be overridden by in-line parameters:

**`^time @level %ivcord`**

appended to the output name of the grid in any combination. If the name is blank, the default name generated by the grid diagnostics package will be used.

### 3.70 GSKIP

GSKIP allows the NDFDG2 user to specify a skip factor in order to reduce the resolution of the resulting GEMPAK grid.

Any positive integer may be specified. This skip factor will be applied to both the I and J dimensions.

A warning will be issued if no value is specified and the resulting grid is too large.

### 3.71 GSPACE

GSPACE sets the grid spacing of the ETA model domain where:

**`GSPACE = DLHD`**

from the eta\_run.csh script.

GSPACE is the grid spacing of the computational model domain in degrees longitude respectively. A VERY rough conversion to km over the central US would be:

**`km/150 = delta degrees`**

Thus from above:

10km grid spacing: GSPACE = 0.067  
15km grid spacing: GSPACE = 0.098  
32km grid spacing: GSPACE = 0.213

GSPACE is the same as the values for DLMD and DLHD in eta\_run.csh.

### 3.72 GUESS

GUESS contains the information to use as a first guess for objective analysis programs. The name of the grid file containing the guess field and the time to be used to extract the field must be entered using \* as a separator:

**guess file \* grid time**

### 3.73 GVCORD

GVCORD is the vertical coordinate of the grid to be selected.

The standard values are:

NONE	for surface data
PRES	data in pressure coordinates (millibars)
THTA	data in isentropic coordinates (Kelvin)
HGHT	data in height coordinates (meters)
SGMA	data in sigma coordinates

The value in GVCORD may be overridden by specifying %GVCORD with the grids to be found. For example:

**GFUNC = SUB ( TMPC @850 %PRES, TMPC @1500 %HGHT )**

will compute the difference between temperatures on the 850-mb level and the 1500-meter level.

### 3.74 GVECT

GVECT specifies a grid diagnostic function which yields a vector quantity. For more information, see the GPARM documentation.

### 3.75 HILO

HILO contains the information for plotting relative highs and lows in the following format:

**colorh;colorl/symbolh;symbol/rangeh;rangel/radius/counth;countl/interp**



## GEMPAK Variables

Colorh and colorl are the colors for the high and low symbols to be plotted. If only a single number is entered, it will be used for both highs and lows. The default for this entry is 0.

Symbolh and symboll specify the symbols to be plotted. The format for the symbol input is:

**character # precision**

where the character is the character to be plotted. If the character is an integer, markers corresponding to that number will be plotted. If the character is an integer preceeded by the character 'S', special symbols corresponding to that number will be plotted. Information about markers can be found in the help for MARKER. The # is a flag to plot values beneath the marker. The integer following the # is the number of decimal places to display in the value. If a # is present without the following number, integer values are printed. The default for the symbols is H;L.

Rangeh and rangel are ranges for highs and lows specified as:

**minval - maxval**

where minval and maxval are integers which specify the range of values to be considered for designation as a high or low. The default is to consider all data.

The search radius is a square region of grid points. The region is a moving search area in which all points are compared to derive relative extrema. The default is 3, which is generally the most effective. To find more concentrated areas of highs and lows, use a smaller radius. A large radius, such as 10 or higher, is not very effective.

Counth and countl are integer values for the maximum number of high and low values to be displayed. The default is 20;20.

Interp is an interpolation flag which specifies whether the values and locations of the highs and lows will be at grid points, or will be interpolated between grid points. The default is NO.

In general, the above defaults are used if there is no entry for a part. For the parts which have values for both relative highs and lows, a single entry will be used for both highs and lows.

Examples:

**HILO = 1/H#;L#/1020-1040;980-1000/2/30;20**

**Color 1 for highs and lows.**

**H and L characters with numeric values plotted below.**

**Plot highs from 1020 to 1040; plot lows from 980 to 1000.**

**Search radius of 2.**

**Plot the 30 highest highs and the 20 lowest lows in the specified**

## GEMPAK Variables

range.

**HILO = 2;4/X#;Y#/30/yes**

**Colors 2 and 4 for highs and lows.**

**X and L characters with numeric values plotted below.**

**Plot the 30 highest highs and 30 lowest lows.**

**Locations of highs and lows interpolated between grid points.**

**HILO = 2;4/S12#;S13#/30/yes**

**Same as previous example except use special symbols 12 and 13 for indicating relative minima and maxima.**

### 3.76 HISTGRD

HISTGRD toggles the writing of the graph-to-grid history grid to the GEMPAK grid file. The history grid contains integral values which indicate which method was used to assign the data grid value. The grid is primarily a diagnostic tool and is usually not saved.

**yes - save history grid**

**anything else - do not save history grid**

The name of the history grid will be the name of the data grid concatenated with "HIST", e.g., data P06I will be P06IHIST. The vertical coordinate and level will be the same as the data grid.

### 3.77 HLSYM

HLSYM defines the characteristics for the HILO symbols specified in HILO. The text sizes, value position, fonts, text widths and hardware/software flags are specified for the symbols (s) and plotted values (v) as:

**sizes;sizev/position/fonts;fontv/widths;widthv/hwflgs;hwflgv**

The size, font, width, and hw flag are the same as the TEXT variable. If only one value is given, it is used for both the symbol and value.

The value plotting position may be 1, 2, or 3 where 2 is the default. The number selects the position of the value string beneath the symbol string. The three positions are shown below:

## GEMPAK Variables

H  
1 2 3

It is common for HILO symbols near the edge of the display to be hidden when hardware text font is used. Therefore, when using hardware text font, the number of HILO symbols displayed may be slightly less than what the user specifies.

Examples:

```
HLSYM = 2;1/3/2//HW  --  symbol text size = 2
                        value text size = 1
                        plot value in position 3
                        hardware text font 2 applies to both
```

```
HLSYM = 2/1/1;2/      --  symbol text size = 2
                        value text size = 2
                        plot value in position 1
                        symbol text font = 1
                        value text font = 2
```

### 3.78 HRCN

HRCN is the ending valid time for the tropical disturbance, the colors for the hurricanes, tropical storms, tropical depressions and directional arrows, the symbols for the hurricanes, tropical storms and tropical depressions, and flags for plotting the center located time, the name and minimum central pressure, the speed, the wind and sea quadrant radii, and the forecast track on the map.

**End time|HU;TS;TD;DA clrs|HU;TS;TD syms|Time flg|Label flg|  
Speed flg|Quad Wind flg|Fcst track flg|Name**

Locations that are valid less than 24 hours before the ending time, given as a GEMPAK date/time string, will be plotted on the map. Any missing items from the date/time string will be filled in by the system time. The ending time may also be LAST or ALL. LAST will use the system time and plot all current tropical weather. ALL will plot all the tropical weather in the data files for the last ten days.

The colors are separated by a semi-colon. If any color is set to 0, that type of symbol will not be plotted. If any color is missing, a default will be used. Defaults are red for hurricane, yellow for tropical storm, green for tropical depression, and magenta for directional arrow.

The symbols are separated by a semi-colon. If they are not given, the default symbols will be used. The defaults are Northern Hemisphere hurricane, Northern Hemisphere tropical storm and tropical depression.

## **GEMPAK Variables**

The time flag is YES or NO and controls whether or not to plot the location time of the tropical disturbance on the map. The default is NO.

The label flag is YES or NO and controls whether or not to plot the name of the disturbance and the minimum central pressure on the map. The default is NO.

The speed flag is YES or NO and controls whether or not to plot the speed in knots of the disturbance. The default is NO.

The quad wind flag is YES or NO and controls whether or not to plot the 64, 50 and 34 kts wind and 12 foot seas quadrant arcs. Only the most recent time period of each storm will have the arcs drawn. The default is NO.

The fcst track flag is YES or NO and controls whether or not to plot the valid forecasted latitudes and longitudes for all available forecast estimated positions for the disturbance. Only the most recent time period of each storm will have the track drawn. The default is NO. If both the quad wind flag and the fcst track flag are YES, the wind and sea quadrant arcs will be plotted for the most recent forecast positions as well as for the most recent current position.

The name of a tropical storm may be specified. If a name is declared, then only that storm will be displayed for the date/time indicated. The default is all storms are plotted. ALL will also plot all storms within the given time range.

### **3.79 IDNTYP**

IDNTYP sets character or numeric station identifiers to be used for input or output. The valid values are STID and STNM. STID specifies station character identifiers; STNM specifies station numbers.

If the value in IDNTYP is not STNM, the default of STID will be used.

For example, to update station headers in SFSTNS:

```
IDNTYP =          STID -- compares character ids in file with those
                        in the station table
```

```
IDNTYP =          STNM -- compares numeric ids in file with those
                        in the station table
```

### 3.80 IJSKIP

IJSKIP is used to control subsetting of the internal grid by declaring bounding index values and numbers of points to skip in each index direction, I and J. Input is entered as follows:

	<b>Iskp;Istrt;Istp/Jskip;Jstrt;Jstp</b>
or	
	<b>Yes</b>
or	
	<b>No</b>

where Iskp and Jskip are the number of grid points to skip in the I and J grid index directions, respectively; Istrt and Istp are the beginning and ending I index values, respectively; and Jstrt and Jstp are the beginning and ending J index values, respectively. GEMPAK grids have (I,J) = (1,1) at the lower left corner, with I increasing in the X (horizontal or east-west) direction. J increases in the Y (vertical or north-south) direction. The internal grid navigation is determined from the GDFILE entry.

The defaults for Iskp and Jskip are zero. The other parameters default to missing values so that they will be determined automatically, depending on the area of the grid required by the map display.

If only Iskp is given, then Jskip = Iskp, and the bounds are determined automatically. The skip values thin the grid by skipping over the number of points specified.

If IJSKIP = NO, then the results are the same as for IJSKIP set to blank or zero. If IJSKIP = YES, then all the skipping values are computed automatically. When IJSKIP = YES, skipping is only done if the number of grid points required to cover the display area is too large. The automatic number of points skipped is the same in each index direction, and it will be the minimum number required to make the internal computational grid fit in allocated memory.

IJSKIP and SKIP are functionally independent. If SKIP is also specified, IJSKIP operates first to create the subset grid, then the SKIP information is applied to that subset grid, which has already been thinned by IJSKIP. Since IJSKIP and SKIP are done in series, the combined effect is multiplicative. IJSKIP determines the internal computational grid; therefore, changing it changes the results of computations involving derivatives. The SKIP parameter is applied to the internal grid after computations and affects only the display. SKIP and IJSKIP results, when done separately and compared, will not always yield coincident points for the same skipping values, because IJSKIP creates a computational halo of grid points around the display region resulting in different initial indexes for IJSKIP vis-a-vis SKIP.

## GEMPAK Variables

In programs like GDPLLOT2, which allows different specifications of IJSKIP for different GDPFUN entries, IJSKIP must be the same for all fields if the // grid naming feature is used in GDPFUN. This is because IJSKIP determines the navigation of the internal grid, which must remain the same if saved grids are to be kept for reuse.

If user-supplied index bounds are not consistent with the given number to skip, then the bounds will be reset, taking into account any nearby grid boundaries. The reset values will be close to what the user intended. For best results, provide consistent bounding index values. If the full range of the index is required, then the unit (1) value of the index is the starting point.

If the grid is a global grid and the "seam" falls within the display area, then if Istrt is given, Istp must also be given; otherwise, an error message is generated. If both Istrt and Istp are given in the case of the global grid, the grid "seam" will not be shifted out of the display area.

If a start value (strt) exceeds a stop value, an error message appears.

Some examples follow:

### Example Action

IJSKIP = YES Skip only if necessary, skipping as few points  
as possible; if the subset area is reduced fewer  
points will be skipped

IJSKIP = 5 Skip 5 points in both index directions; beginning and ending indexes are  
automatically determined

IJSKIP = 5/3 Skip 5 points in the I index direction; skip 3  
points in the J index direction; beginning and  
ending indexes are automatically determined

IJSKIP = 5;3/2 Skip 5 points in the I index direction; skip 2  
points in the J index direction; beginning I  
index is 3; all other indexes are determined  
automatically

## 3.81 IMCBAR

IMCBAR specifies the characteristics of a color bar for images. The attributes are separated by slashes:

**color / orientation / anchor / x;y / length;width / frequency**

## GEMPAK Variables

Color is the color of the labels and the bounding box around the color bar. If color is negative, the bounding box will not be drawn, and labels will be drawn in colors corresponding to the color bar. If the color is 0 or missing, no color bar is drawn.

Orientation specifies a vertical or horizontal orientation of the color bar where 'V' is a vertical bar and 'H' is a horizontal bar. The default is 'V'.

Anchor describes the location on the color bar corresponding to the location given in the next parameter. Valid inputs are LL, LC, LR, CL, CC, CR, UL, UC, and UR for lower-left, lower-center, lower-right, center-left, centered, center-right, upper-left, upper-center, and upper-right, respectively. For example, an 'LL' anchor point, with a x;y of .1,.1, will place the lower-left corner of the color bar at view coordinates .1, .1. The default anchor point is 'LL'.

x;y is the position for the anchor point of the color bar in view coordinates. The default is .005, .05.

Length;width are the length and width of the color bar, normalized to the view coordinates. The defaults are .5 for the length, and .01 for the width.

Frequency describes the levels to be labeled. If the frequency is positive, the labels are plotted on the right/top of the color bar. If it is negative, the labels are plotted on the left/bottom of the color bar. The default is -1.

Examples:

IMCBAR = 1	text and bounding box in color 1; defaults for the rest of the input;
IMCBAR = 5/V/ /.25;.1/1	text and bounding box in color 5; color bar plotted vertically; length and width .25 and .1 of the view window; all intervals labeled along left side of the color bar; color bar anchor point at lower-left;
IMCBAR = 1//CL/.1;.5/.75;.1	text and bounding box in color 1; length and width .75 and .1 of the view window; center-left of the color bar positioned at .1;.5 in view coordinates;

## **GEMPAK Variables**

### **3.82 IMJM**

IMJM sets the number of grid points for workstation eta in the N-S and E-W direction where,

**IMJM = IM;JM**

IM and JM are the number of grid points over the computational domain where:

**IM is the number of grid points in the E-W (roughly) direction**  
**JM is the number of grid points in the N-S (roughly) direction**

IMPORTANT: The horizontal grid dimensions MUST be an ODD integer!

BINARY DISTRIBUTION USERS: The IM and JM values must be set to the dimensions of your compiled distribution. LM should be 45.

For a grid with 71 grid points in the E-W and 121 points in the N-S direction:

**IMJM = 71;121**

Note that during creating on the Arakawa-E grid the IM dimension becomes IM\*2-1. This is the value that is used in etamap for display of the workstation Eta computational domain.

### **3.83 INDXFL**

INDXFL is the name of the file which contains the GRIB message header information.

If this parameter is left blank, the header information will be read from the GRIB data file specified in GBFILE.

### **3.84 INFO**

The location of the object is defined in LOCI.



## GEMPAK Variables

TEXT	size/font/width/border/rotation/justify/text_string
POLYGON	line type
REGPOLY	line type/radius/number points/rotation
ARC	line type/radius/number points/start ang/end ang
CURVE	line type/curve type
LINE	line type
ARROW	line typ/arrw typ/arrw siz/head siz/ head ang mult/rotation
COLDFRONT	number pips/pip size/line type/# smoothing passes
WARMFRONT	number pips/pip size/line type/# smoothing passes
OCCLFRONT	number pips/pip size/line type/# smoothing passes
STATFRONT	number pips/pip size/line type/# smoothing passes
WEATHER	symbol code/size
CLOUD	symbol code/size
SKY	symbol code/size
TURB	symbol code/size
ICNG	symbol code/size
SPCL	symbol code/size
MARKER	symbol code/size
PRESTEND	symbol code/size
PASTWTHR	symbol code/size

### Special notes:

- For fronts, a positive value for the number of pips will plot on one side of the curve, and negative values will plot on the opposite side.
- The symbol codes can be found in the users' manual.

## 3.85 INTERP

INTERP is a logical variable which determines whether interpolation between sweeps will occur. If INTERP=NO, only values within the beam scan volume will be displayed. If INTERP=yes, data values between scan tilts will be interpolated using bilinear interpolation.

## 3.86 ISIG

ISIG is the ending valid time for the international SIGMET, the colors for the thunderstorms, turbulence, hurricanes, tropical storms, tropical depressions, volcanic ash clouds, marked mountain waves, tropical cyclones, squall lines, CAT, icing, hail, duststorms, sandstorms, cumulonimbus, and low level wind shear, flags for plotting symbols or storm names, the start and end times, the message id, the direction and speed, and the flight level or the central pressure and maximum wind speed associated with a tropical cyclone on the map.

End time|TS;TB;HU;TR;TD;VA;MW;TC;SQ;CT;IC;GR;DS;SS;CB;WS clr|Symbol flg|

## GEMPAK Variables

### Time flg|Id flg|Motion flg|Flight lvl flg

SIGMETs that are valid at the ending time will be plotted on the map. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST or ALL. LAST will use the system time and plot all current SIGMETs. ALL will plot all the SIGMETs in the data files for the last ten days, whether they are active, cancelled, or expired.

The colors are separated by a semi-colon. If any color is set to 0, that type of symbol will not be plotted. If any color is missing, a default will be used. Defaults are cyan for thunderstorm, yellow for turbulence, red for hurricane, red for tropical cyclone, yellow for tropical storm, green for tropical depression, orange for volcanic ash cloud, magenta for marked mountain wave, magenta for squall line, yellow for CAT, green for icing, red for hail, orange for duststorm, orange for sandstorm, and red for cumulonimbus.

The symbol flag is YES or NO and controls

**(1) for thunderstorms and turbulence: whether or not to plot the symbol at the center of the defined area.**

**(2) for volcanic ash clouds: whether or not to plot the symbol at the volcano location, if given, or at the center of the defined area.**

**(3) for named storms: whether or not to display the storm name.**

The default is NO.

The time flag is YES or NO and controls whether or not to plot the start and end times of the SIGMET on the map. The default is NO.

The message id flag is YES or NO and controls whether or not to plot the SIGMET message identification and sequence number on the map. The default is NO.

The motion flag is YES or NO and controls whether or not to plot the direction in degrees and the speed in knots of the SIGMET. The default is NO.

The flight level flag is YES or NO and controls whether or not to plot the SIGMET flight level in hundreds of feet on the map. Or if a tropical cyclone is the phenomenon, this position controls whether or not to plot the central pressure in mb and the maximum winds in kts. The default is NO.

## 3.87 KEYCOL

KEYCOL indicates which contour lines to process.

KEYCOL = 0      - process all lines  
KEYCOL = n      - process all lines whose color is n

## **GEMPAK Variables**

### **3.88 KXKY**

KXKY specifies the size of a grid as two numbers separated by a semicolon:

**kx ; ky**

These numbers are KX and KY, which represent the number of grid points in the x- and y- directions.

If the projection is CED, these numbers may be DELTAX and DELTAY, the grid spacing in degrees in the x and y directions. If the spacing is input, the first character in KXKY must be #. For example:

**KXKY = #2.5;2.0**

will create a grid with 2.5 degree spacing in x (longitude) and 2.0 degree spacing in y (latitude).

### **3.89 LAT**

LAT specifies the latitude grid lines to be drawn. It is set to 10 degrees.

### **3.90 LATLON**

LATLON specifies the latitude and longitude grid lines to be drawn. The line color, line type, line width, label frequency and increment are separated by slashes:

**color/line\_type/line\_width/x-freq;y-freq/x-inc;y-inc/lt\_label;ln\_label/format**

The label frequency specification contains the latitude and longitude label frequencies separated by a semicolon. The increment specification contains the latitude and longitude increments in degrees separated by a semicolon.

If the color is 0 or LATLON is blank, grid lines are not drawn. The latitude and longitude increments will default to 10 degrees. The label frequency defaults to 1.

The latitude and longitude labels refer to the latitude at which to label the longitudes lines and the longitude at which to label the latitude lines. The defaults for the latitude and longitude value placements if either or both are not specified are usually the left side for latitude labeling and the bottom for longitude labeling.

The format value specifies the current format of the labels. If format is equal to 1, the latitude and longitude labels have a '-' prepended to the southern and western number

## GEMPAK Variables

labels. If the format is equal to 2, 'N', 'S', 'E' and 'W' are appended to the latitude and longitude labels. The default is that the '-' will be prepended to the southern latitudes and western longitudes.

Examples:

**LATLON = 1**

Lat/lon grid lines are drawn every 10 degrees in color 1 using line type 1 and line width 1.

**LATLON = 4/8/3/2/5;5**

Lat/lon grid lines are drawn every 5 degrees in color 4 using line type 8 and line width 3. Every other line is labelled.

**LATLON = 24/12/1/2;2/4;4/48.;-100./2**

Lat/lon grid lines are drawn every 4 degrees in color 24 using line type 12 and line width 1. Every other line is labelled. The latitude labels appear on 100.0 W longitude and the longitude labels appear on 48 N latitude appended to the numerical labels.

### 3.91 LEVELS

LEVELS specifies the vertical levels to be extracted from the data set. The coordinate system for the levels is specified in the variable VCOORD as PRES, HGHT or THTA.

LEVELS may be a list separated by semicolons. The following items may be included in the list:

- a single level;**
- MAN for the mandatory levels below 100 mb;**
- VAS for the standard VAS levels;**
- a range of levels with an increment separated by - .**

The following items are also valid, provided they are not part of a list:

- ALL for all levels;**
- a range of levels without an increment.**

SFC or 0 may be entered for surface data. TOP or -1 is the top level at the station. These values may not be entered for a range with an increment.

The flag /MAN may be used after any specification of LEVELS so that any application will use only mandatory level data with no interpolation.

### 3.92 LINE

LINE is the color, line type, line width, line label frequency and smoothing separated by slashes. The individual values in each group are separated by semicolons:

**colr1;...;colrn/type1;...;typen/width1;...;widthn/lab1;...;labln/smith/fltr**

For example:

**LINE = 1;2 / 7;8 / 4;5 / 2 / 2**

assigns colors 1 and 2 to alternate lines, dashing patterns 7 and 8 to alternate lines, line widths 4 and 5 to alternate lines, and labels every other line. Smoothing level 2 is used on all lines.

If any specification is missing, a default of 1 is used. Except for the smoothing, which defaults to 0, or no smoothing. If a color number of 0 is given, no plotting will be done.

Information on color selection can be found in the help for COLORS.

There are ten distinct line types:

1	-	solid
2	-	short dashed
3	-	medium dashed
4	-	long dash short dash
5	-	long dash
6	-	long dash three short dashes
7	-	long dash dot
8	-	long dash three dots
9	-	medium dash dot
10	-	dotted

These patterns can be expanded or compressed by prefixing the single digit with a number from 1 to 9. A prefix of 1 compresses the pattern, 2 is the default and prefixes 3 -- 9 expand the basic pattern. For example, 32 expands line type 2 while 12 compresses the same pattern.

If the line type is set to a single negative number, negative contour values will use the absolute value of the line type, and positive values will be solid.

If the label information is a single number, n, then every nth line will be labelled. If the label information is a single number, -n, then every nth line will be labelled, however, there will not be a break in the line for the label. If a label is a sequence of numbers separated by semicolons, lines corresponding to values other than 0 will be labelled. The pattern established will be repeated to accommodate all lines.

## GEMPAK Variables

The smoothing level is an integer which specifies the amount of smoothing to apply using a parametric curve function. The current values are 0, 1 and 2 which correspond to no smoothing and two levels of increasing smoothing.

The filter is a real value that specifies the amount of filtering of the points on a line. Smaller values allow for more points, while larger values reduce the number of points on the line. Valid values are in the range of 0.0 to 1.0. The default is 0.0 which means that no reduction in the number of points will occur.

### 3.93 LOCI

TEXT	x;y
POLYGON	x1;y1/x2;y2/x3;y3/.../xN;yN
REGPOLY	x;y
ARC	x;y
CURVE	x1;y1/x2;y2/x3;y3/.../xN;yN
LINE	x1;y1/x2;y2/x3;y3/.../xN;yN
ARROW	x;y
COLDFRONT	x1;y1/x2;y2/x3;y3/.../xN;yN
WARMFRONT	x1;y1/x2;y2/x3;y3/.../xN;yN
OCCLFRONT	x1;y1/x2;y2/x3;y3/.../xN;yN
STATFRONT	x1;y1/x2;y2/x3;y3/.../xN;yN
WEATHER	x;y
CLOUD	x;y
SKY	x;y
TURB	x;y
ICNG	x;y
SPCL	x;y
MARKER	x;y
PRESTEND	x;y
PASTWTHR	x;y

If LOCI is preceded by a '#' then the x and y values should be latitudes and longitudes. If the first character is a '@' then all points will be grid point columns and rows.

### 3.94 LON

LON specifies the longitude grid lines to be drawn. It is set to 10 degrees.

### 3.95 LSTALL

LSTALL is a flag indicating whether the full contents of a file are to be listed. For example, in GDINFO, if LSTALL=YES, the grid identifiers will be listed; if LSTALL=NO, grid identifiers will not be listed.

### 3.96 LTNG

LTNG is the ending valid time for lightning data, the time increments (in minutes going back from the ending time) and the corresponding colors for the lightning data, and the positive and negative markers to display.

**End time|time increments/colors|positive marker/negative marker**

The ending time is the latest time for which lightning data will be plotted. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST. LAST will use the system time and plot all lightning data for the preceding times as defined by the time increments. ALL is not accepted as an ending time for lightning data.

The time increments and colors may each be specified using either a list separated by semicolons or a range in the form first-last-increment. Time increments are given in minutes going back sequentially from the ending time. The number of time increments must be the same as the number of colors. If no time increment and color are given, a single time increment of 5 minutes with a default color of red will be used. If the range format is used for the time, an increment must be specified. If the range format is used for the color and an increment is not specified, an increment of one is used.

The marker data includes the marker type, size and width, separated by semicolons. The default marker for positive strikes is a plus sign, and for negative strikes a minus sign. Default marker size multiplier is one, as is default width.

Examples:

**LTNG = 991130/2315|1/5**

All lightning data will be plotted in yellow for times 2314Z and 2315Z. Default marker values will be used.

**LTNG = LAST**

All lightning data for the preceding five minutes will be plotted in red.

**LTNG = ltng=991201/0000|10;20;30;90/2;17;5;3|4;1.5;2/6;2;3**

Lightning data for 991130/2350 to 991201/0000 will be plotted in red; for 2330 to 2349 in orange; for 2300 to 2329 in yellow; and for 2130 to 2259 in green. Positive strikes will be plotted as squares with a size multiplier of 1.5 and a line width of 2; negative markers will be plotted as diamonds with a size multiplier of 2 and a line width of 3.

## GEMPAK Variables

### 3.97 LUTFIL

LUTFIL specifies a lookup table file name used to enhance the colors for satellite or radar images. Color enhancement allows certain features in a satellite or radar image to be highlighted.

Keywords may be specified for LUTFIL with the following definitions:

LUTFIL = DEFAULT	(Use the color enhancement specified for this image type in the table IMGTYPE.TBL)
LUTFIL =	(Same as DEFAULT)
LUTFIL = GRAY	(Image gray values, no enhancement)
LUTFIL = GREY	(Image gray values, no enhancement)
LUTFIL = RADAR	(Standard radar colors for reflectivity)
LUTFIL = NONE	(Use the current look up table with no changes)

### 3.98 MAP

MAP is the map color, line type and line width separated by slashes:

**map color / line type / line width / filter flag**

If the color is 0, the map is not drawn. If the map color, line type, or line width is blank, a default of 1 is used.

Additional help for colors is available in COLORS; help on line types can be found in LINE.

The filter flag is used to reduce the number of points used to draw the map lines. Valid values for the filter flag are YES and NO. The default is NO.

The attributes for multiple maps may be set by separating the settings for each map with a plus sign (+). If the number of attribute groups is less than the number of map files, the last group of settings is used for the remaining maps.

Examples:

```
MAP      = 1//2 + 2//3
$MAPFIL = hicnus.nws + hipowo.cia

MAP      = 17
$MAPFIL = hipowo.cia + lorvwo.cia + lakes.cia
```



## GEMPAK Variables

### 3.99 \$MAPFIL

\$MAPFIL is the name(s) of the map file(s) to be used for maps drawn by GEMPAK programs. If no directory is specified, the GEMPLT map files in GEMMAPS will be used.

Multiple maps may be drawn at one time by separating the names with a plus sign (+).

The map files in GEMMAPS are named by concatenating the resolution, map boundaries, and area with the three-letter source file type. For example, the medium-resolution political world map from GSFC is called MEPOWO.GSF.

#### RESOLUTIONFEATURESAREASOURCE

ToP	POlitical	WOrld	GSFc
Hgh	COastline	NW quadrant	NWS
MEdium	REgional	NE quadrant	CIA
LOw	CouNty	SE quadrant	USGeol survey
MiXed	CountrY	SW quadrant	NCeP
	RiVers	North Hemisphere	RFC
	InterState highways	South Hemisphere	CPC
	U.s. Highways	US	
	State Highways	Us Oceans	
	RoaDs	North America	
	River Forecast Cntrs	Atlantic North	
	County Watch Areas	Atlantic1	
	ZoNes	Atlantic2	
	High Seas	Atlantic3	
	OffShore	Pacific North	
	Forecast Bounds	Pacific East	
	AViation	Pacific Surface	
	Flight Info region	Pacific1	
	Convective Sigmet Reg	Pacific2	
	Tpc High seas	Pacific3	
	Tpc Sigmets	MarylanD	
	Tpc surface Bounds	Basic Weather	
	Tpc surface Analysis	Medium Range	
	Tpc aViation bounds	Qpf Verification	
	Continental Divide	Western Region	
	Mar pred ctr Offshore	Arkansas-Red Basin	
	River fcst ctr Basins	Lower Mississippi	
	Climate Zones	Middle Atlantic	
	Palmer climate Zones	Missouri Basin	
	STates	North Central	
	LaKes	NorthEast	
		OHio	
		SouthEast	
		West Gulf	
		AlasKa	

The default map is \$GEMMAPS/HIPOWO.CIA.

## **GEMPAK Variables**

The following map files are currently available:

## GEMPAK Variables

TPSTUS.NWS HISTUS.NWS MESTUS.NWS LOSTUS.NWS  
TPCNUS.NWS HICNUS.NWS MECNUS.NWS LOCNUS.NWS  
TPCWA.NWS HICWA.NWS MECWA.NWS LOCWA.NWS  
TPZNUS.NWS HIZNUS.NWS MEZNUS.NWS LOZNUS.NWS  
TPCSUS.NWS HIPOWO.GSF MEPOWO.GSFLOPOWO.GSF  
TPCDUS.USG HICDUS.USG MECDUS.USGLOCDUS.USG  
HIRVUS.USG MERVUS.USG LORVUS.USG  
HIISUS.NWSLOISUS.NWS  
HIUHUS.NWSLOUHUS.NWS  
HISHUS.NWSLOSHUS.NWS  
HIRDUS.NWSLORDUS.NWS  
HIOSUO.NWSLOOSUO.NWS  
HIPOWO.CIA  
HICOWO.CIA  
HICYWO.CIA  
HIAVUS.NWS  
HIPONE.CIA  
HIPONW.CIA  
HIPOSE.CIA  
HIPOSW.CIA  
HICNMD.GSF  
HIFIWO.NCP  
HIFIWO.NCP  
BW1224.NCP  
BW3648.NCP  
ISLANDS.CIA  
LAKES.CIA  
RFC.NWS  
TECTONIC.CIA  
TPCZUS.CPC  
TPPZUS.CPC  
TPFBWR.NCP  
TPTANA.NCP  
TPTBNA.NCP  
TPTHNA.NCP  
TPTSNA.NCP  
TPTVNA.NCP  
TPRBAB.RFC  
TPRBLM.RFC  
TPRBMA.RFC  
TPRBMB.RFC  
TPRBNC.RFC  
TPRBNE.RFC  
TPRBOH.RFC  
TPRBSE.RFC  
TPRBWG.RFC  
MEFBNA.NCP  
TPHSUO.NWS HIHSUO.NWS MEHSUO.NWS LOHSUO.NWS  
MEHSUO.NCP  
MEREUO.NCP  
MEFBAN.NCP  
MEFBPE.NCP  
MEFBPN.NCP

## GEMPAK Variables

```

MEFBBW.NCP
MEFBMR.NCP
MEFBPS.NCP
MEFBQV.NCP
MEFBA1.NCP
MEFBA2.NCP
T PFBA3.NCP HIFBA3.NCP MEFBA3.NCP LOFBA3.NCP
  MEFBP1.NCP
  MEFBP2.NCP
  TPFBP3.NCP HIFBP3.NCP MEFBP3.NCP LOFBP3.NCP
  TPMOUO.NWS HIMOUO.NWS MEMOUO.NWS LOMOUO.NWS
    LOCONH.GSF
    LOCOSH.GSF
    LOCOWO.GSF
    LORVWO.CIA
  MXPOWO.NCP
  TPLKUS.NWS HILKUS.NWS MELKUS.NWS LOLKUS.NWS
    HIFIAK.NCP
    HIZNAK.NCP

```

The maps from GSFC were obtained for GEMPAK Version 1.0. The history of these maps is unknown. The maps from the University of Wisconsin were digitized there. The CIA map files were created from a subset of the CIA map database. The United States Geological Survey maps were converted from the USGS databases. The NWS maps were obtained from the National Weather Service/Modernization Systems Implementation Group. The NCEP map files were developed at the National Centers for Environmental Prediction. The RFC map files were provided by the Arkansas-Red Basin River Forecast Center.

There are 5 maps designed to be used for the seamless surface analysis which shows the area of responsibility for the Tropical Prediction Center, Marine Prediction Center and the Hydrometeorological Prediction Center. Also, these maps have the numbers 050 and 215 in their names which refer to the amount of time after the analysis time; 50 minutes past and 2 hours and 15 minutes past the analysis time.

The capability to use map alias names is available. This makes it easier to use the map files without previously knowing the long file name. The following is a list of alias definitions.

bwx1224	Basic Weather 12 & 24hr	bwx1224.ncp
bwx3648	Basic Weather 36 & 48hr	bwx3648.ncp
bwxgif	Basic Weather GIF	meffbbw.ncp
medrange	Medium Range Weather	meffbmr.ncp
cwa	County Warning Areas	hicwa.nws
rfc	River Forecast Centers	rfc.nws
abrfc	AR-Red Basin RFC Basins	tprbab.rfc
lmrfc	Lower MS RFC Basins	tprblm.rfc
marfc	Mid Atlantic RFC Basins	tprbma.rfc
mbrfc	MO Basin RFC Basins	tprbmb.rfc
ncrfc	North Central RFC Basins	tprbnc.rfc
nerfc	Northeast RFC Basins	tprbne.rfc

## GEMPAK Variables

ohrfc	Ohio RFC Basins	tprbwh.rfc
serfc	Southeast RFC Basins	tprbse.rfc
wgrfc	West Gulf RFC Basins	tprbwg.rfc
states	US states, NWS	histus.nws
county	US counties, NWS	hicnus.nws
zones	US zones, NWS	hiznus.nws
climate	US CPC Climate Zones	tpczus.cpc
palmer	US Palmer Climate Zones	tppzus.cpc
coast	World Coasts	hicowo.cia
country	Hi-res World Countries	hicywo.cia
inter	US Interstates	loisus.nws
base	Polcal Bndry,World,CIA	hipowo.cia
nmap	Polcal Bndry,World,CIA	hipowo.cia
nsat	Polcal Bndry,World,CIA	hipowo.cia
roads	US Roads	lordus.nws
rivers	Rivers	lorvwo.cia
hirivers	Hi-res US Rivers	hirvus.usg
state	State Highways	loshus.nws
ushwy	US Highways	louhus.nws
islands	Islands	islands.cia
lakes	Lakes	lakes.cia
nafos	Mix-res Pol Bndry,World	mxpowo.ncp
hiseas	High Seas Forecast Areas	mehsuo.ncp
rseas	Regional Sea Fcst Areas	mereuo.ncp
offshore	Offshore Forecast Areas	hiosuo.nws
offsh2	Offshore Forecast OPC	himouo.nws
sigwx	Significant AVN Areas	sigwx.ncp
nam	North America Fcst Bnds	mefbna.ncp
epacprod	East Pacific Products	mefbpe.ncp
npacprod	North Pacific Products	mefbpn.ncp
natlprod	North Atlantic Products	mefban.ncp
pacsfcprod	Pacific Surface Products	mefbps.ncp
pacpart1	Pacific SFC Anal Part 1	mefbp1.ncp
pacpart2	Pacific SFC Anal Part 2	mefbp2.ncp
atlp1	Atlantic SFC Anal Part 1	mefba1.ncp
atlp2	Atlantic SFC Anal Part 2	mefba2.ncp
qpfver	QPF Verification	mefbqv.ncp
fir	Flight Information Regn	hifiwo.ncp
convsigmet	Convective Sigmet Bounds	tpcsus.ncp
wregion	Western Region Boundary	tpfbwr.ncp
tpcsfc	TPC Surface Analysis	tptana.ncp
tpcsfcbnd	TPC Surface Boundary	tptbna.ncp
tpchsf	TPC High Seas	tpthna.ncp
tpcsig	TPC SigMets	tptsna.ncp
tpcavn	TPC Aviation	tptvna.ncp
dcvaac	DC VAAC Boundary	dcvaac.ncp
hpcsf	HPC SFC Anl Boundary	hpcsf.ncp

The alias names are specified in the table: \$GEMPAK/tables/config/mapfil.tbl.

## GEMPAK Variables

### 3.100 MARKER

MARKER specifies the marker color, type, size, line width and hardware/software flag separated by slashes:

**marker color / marker type / size / width / hw flag**

If the marker color is 0, no markers will be drawn. If the marker color is not specified, a default of 1 will be used.

The marker type specifies the shape of the marker to be drawn. If the type is unspecified or zero, the current marker type (usually 1) will be used. The software marker types are:

1	plus sign	13	hourglass X
2	octagon	14	star
3	triangle	15	dot
4	box	16	large X
5	small X	17	filled octagon
6	diamond	18	filled triangle
7	up arrow	19	filled box
8	X with top bar	20	filled diamond
9	Z with bar	21	filled star
10	Y	22	minus sign
11	box with diagonals	23	tropical storm
12	asterisk	24	hurricane

Hardware marker types may differ.

The marker size is a real number multiplier for the default marker size. If the size is zero or unspecified, the current size will be used.

The hardware/software marker flag must be HW or SW. Otherwise, the current value is assumed.

### 3.101 MAXGRD

MAXGRD is the maximum number of grids that can be stored in the grid file being created.

### 3.102 MAXTOP

MAXTOP specifies the color and filter attributes for cell top annotations (feet):

**color ; filter**

## **GEMPAK Variables**

A color value of 0 is used to turn off cell top annotations.

FILTER is a logical variable or real number which controls the filtering of data in order to eliminate plotting of overlapping data.

### **3.103 MESO**

MESO specifies the plot symbol and filter attributes for mesocyclones:

**color / marker / size / width / hw ; filter**

A color value of 0 is used to turn off mesocyclone plotting.

Marker attributes behave as MARKER for other plotting programs.

FILTER is a logical variable or real number which controls the filtering of data in order to control plotting of overlapping data.

### **3.104 MIXRLN**

MIXRLN specifies the color, line type, line width, minimum, maximum, and increment for the background mixing ratio lines on thermodynamic diagrams:

**line color / line type / width / minimum / maximum / increment**

The values should be separated by slashes. If the color is 0, or MIXRLN is blank, no lines will be drawn.

### **3.105 MRGDAT**

MRGDAT is a logical variable indicating whether sounding data is to be merged or unmerged. The type of unmerged data follows a slash:

**merge flag / unmerged data type**

The valid unmerged data types are:

## GEMPAK Variables

- |   |   |  |
|---|---|--|
| 1 | = | mandatory data below 100 mb ( TTAA, PPAA, TRPA, MXWA )   |
| 2 | = | mandatory and significant level data below 100 mb ( TTAA, PPAA, TRPA, MXWA, TTBB, PPBB )   |
| 3 | = | mandatory and significant level data below and above 100 mb ( TTAA, PPAA, TRPA, MXWA, TTBB, PPBB, TTCC, PPCC, TRPC, MXWC, TTDD, PPDD ) |

The default is 3. If the data is merged, the data type is ignored.

When MRGDAT is used to create a sounding file, it indicates whether the file is to contain merged or unmerged data. Unmerged datasets will store the data as separate parts. Merged data sets contain values for each parameter at each level.

If MRGDAT is used in a program to list data, the data will be merged if MRGDAT = YES. If MRGDAT = NO, the separate parts requested by the type will be listed.

### 3.106 MXDPTH

MXDPTH is the user estimated mixed layer depth in meters. The default value is 0 m, this uses surface values as the average for the mixed layer.

### 3.107 NCON

NCON is the ending valid time for the non-convective sigmet, the colors for the icing, turbulence, duststorm and sandstorm, and volcanic ash, and flags for plotting symbols, the end time, the message id, and the flight levels on the map.

**End time|IC;TB;DU;VA clrs|Symbol flg|Time flg|ld flg|Flight lvl flg|  
ld1 flg|ld2 flg| ... .. |ld10 flg|**

Non-convective sigmets that are valid at the ending time will be plotted on the map. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST or ALL. LAST will use the system time and plot all current non-convective sigmets. ALL will plot all the non-convective sigmets in the data files for the last ten days, whether they are active, cancelled, updated or expired.

The colors are separated by a semi-colon. If any color is set to 0, that type of symbol will not be plotted. If any color is missing, a default will be used. Defaults are green for icing, light blue for turbulence, gold for duststorm and sandstorm and orange for volcanic ash.



## **GEMPAK Variables**

The symbol flag is YES or NO and controls whether or not to plot a symbol for the non-convective sigmet on the map. The default is NO.

The time flag is YES or NO and controls whether or not to plot the end time of the non-convective sigmet on the map. The default is NO.

The message id flag is YES or NO and controls whether or not to plot the message identification and sequence number on the map. The default is NO.

The flight level flag is YES or NO and controls whether or not to plot the flight level(s) in hundreds of feet on the map. The default is NO.

The Id1~10 flags are YES or NO and controls whether or not to plot the NCON data in corresponding names. The defaults are YES. The Id names are:

1	NOVEMBER
2	OSCAR
3	PAPA
4	QUEBEC
5	ROMEO
6	UNIFORM
7	VICTOR
8	WHISKEY
9	XRAY
10	YANKEE

### **3.108 NDVAL**

NDVAL is the data value to be used where NIDS product report "ND" (none detected). By default, tis is the RMISSD value of -9999. For certain products, the user may wish to change this for later computations..

### **3.109 NPASS**

NPASS controls the number of passes for the Barnes objective analysis. Valid values are in the range 1 - 5. Note that two passes are **STRONGLY RECOMMENDED**.

### **3.110 NTRACE**

NTRACE is the number of traces to be drawn in SFGRAM.

If NTRACE is less than 5, the user input for TRACE<sub>x</sub> where x is greater than NTRACE will be ignored.

## GEMPAK Variables

The default value for NTRACE is 5.

### 3.111 OUTFIL

OUTFIL is the name of an output satellite image file.

### 3.112 OUTPUT

OUTPUT determines the output devices. The valid devices are the terminal (T), a file (F) or none (N).

Specify the output devices desired by entering the appropriate letters with no separators.

If output is sent to a file, the file name may be specified after a slash. If no file name is entered, the output will be written to "program.fil", where "program" is the name of the program being executed.

If N appears anywhere in the output string other than in the file name, no output will be generated.

Examples:

OUTPUT =	f / data.dat	--	output will be written to data.dat
OUTPUT =		--	when no output device is specified, is sent to the terminal
OUTPUT =	tf	--	output sent to the terminal and to the file program.fil where program is the GEMPAK program being run.

### 3.113 PANEL

PANEL specifies the panel location, panel outline color, line type and width separated with slashes:

**panel location / outline color / line type / width / region**

## GEMPAK Variables

The panel location determines the location of the view region on the graphics device. It may be specified using a number or abbreviation as follows:

NUMBER	ABBREVIATION	DESCRIPTION
0	ALL	Entire device
1	UL	Upper left quadrant
2	UR	Upper right quadrant
3	LL	Lower left quadrant
4	LR	Lower right quadrant
5	L	Left half
6	R	Right half
7	T	Top half
8	B	Bottom half

An easy 9-panel capability uses abbreviations M1,...,M9 which will be laid out on the page as:

M1	M2	M3
M4	M5	M6
M7	M8	M9

Horizontal or vertical panels which divide the screen into thirds or fourths may be created using the syntax Tij where T is either V for vertical or H for horizontal, i is 3 for thirds or 4 for fourths, and j is the actual panel counting from the top or left.

The view region may also be specified as four numbers separated with semicolons, giving the lower left and upper right corners in fractions of the graphics display area. The origin is in the lower left of the display. For example, the lower left quadrant can be given as:

**0;0;.5;.5**

If the panel location is unspecified, the current location is unchanged.

The panel outline color, line type and line width specify the values used to draw a box around the specified region. The valid regions are VIEW, PLOT and DEVICE. If the color is 0 or unspecified, no box is drawn.

### 3.114 PDSEXT

PDSEXT is a logical flag which only becomes applicable when a PDS extension exists in the GRIB message.

**YES or NO**

## GEMPAK Variables

If PDSEXT is YES, then a sequence of characters specifying the extension information will be appended onto the standard GEMPAK parameter name. If PDSEXT is NO, then the append will not be performed. For instance, if the parameter is HGHT and the PDS extension is an ensemble extension indicating that this particular height field is an ensemble mean average, then the PDS extension suffix will be "ENMA". The final GEMPAK parameter name will be "HGHTENMA" and must be referenced as such in any GEMPAK program.

### 3.115 PDSVAL

PDSVAL provides a way to enter explicitly PDS numbers identifying a grid by parameter, level, vertical coordinate type, and time. None, some, or all of them may be entered. Default values are determined from the GEMPAK grid label information and the GEMPAK grid GRIB lookup tables.

The input has the following form:

parameter # %vertical coordinate type # @level # ^time

or

parm name %vertical coordinate name @level # ^time

The parameter number or name, if given, must appear first. It is not preceded by any marking delimiter. The parameter number will be assigned to PDS byte 9. After the parameter number, the entries may be given in any order. The parameter may be entered as a name to be found and matched to a number using the GEMPAK grid GRIB lookup tables.

The vertical coordinate type number is preceded by % as a marking delimiter. The number entered will be assigned to byte 10. The vertical coordinate may be entered as a name to be found and matched to a number using the GEMPAK grid GRIB lookup tables.

The level information is preceded by @. A single level value or two level values separated by a colon may be entered following the @ symbol. This information is assigned to bytes 11 and 12.

The time information is entered following the ^ symbol in the form YYYYMMDD/HHMMFhhmm. This is a standard GEMPAK time, except that the year must have four digits. This information is assigned to bytes 13 through 25, with forecast time units assumed to be hours. Any accumulation period must come from information imbedded within the GEMPAK parameter name.

### 3.116 PIXRES

PIXRES is the input for how many pixels and lines to include in the new image. If PIXRES is 4, then every 4th pixel and line will be used in the new image.

### 3.117 PLUS

PLUS specifies the size and width of a plus sign:

**plus sign size / width**

The plus sign size is a real number multiplier for the default size. If the size is zero or unspecified, the current size will be used.

### 3.118 POSN

POSN is the position number to be used to plot data in GDMAP.

If the position number is 0, the data will be plotted centered at the station.

The position numbers are:

	7	
1		3
2	0	4
5		6
	8	

### 3.119 PRECSN

PRECSN is the binary or decimal precision to be preserved in the packing of the gridded data.

Binary precision is entered as a B/n, where B indicates binary precision and n is an integer indicating the nearest power of 2 to which to pack the data. Power of 10 scaling of the data is NOT done when binary precision is specified. The following table relates values of n to the precision retained.

**n Binary Precision Description**

## GEMPAK Variables

-4	Data values are rounded to the nearest 1/16.
-3	Data values are rounded to the nearest 1/8.
-2	Data values are rounded to the nearest 1/4.
-1	Data values are rounded to the nearest 1/2.
0	Data values are rounded to the nearest 1.
1	Data values are rounded to the nearest 2.
2	Data values are rounded to the nearest 4.
3	Data values are rounded to the nearest 8.
4	Data values are rounded to the nearest 16.

Decimal precision is entered as D/r, where D indicates decimal precision and r is a positive floating point number indicating the number of decimal significant digits to preserve. The fractional part of r is retained in the calculation of the number of packing bits required and may be used to enhance precision in cases where binary precision might require too many bits. The necessary power of 10 scaling is determined automatically.

### 3.120 PROJ

PROJ is the map projection, projection angles, and margins separated by slashes and an optional image drop flag separated from the rest by a bar:

**map proj / ang1;ang2;ang3 / l;b;r;t (margins) | image drop flag**

For all map projections, the lower left and upper right corners of the graphics area should be specified in GAREA.

The following simple map projections may be specified:

MER	Mercator
NPS	North Polar Stereographic
SPS	South Polar Stereographic
LCC	Northern Hemisphere Lambert Conic Conformal
SCC	Southern Hemisphere Lambert Conic Conformal
CED	Cylindrical Equidistant
MCD	Modified Cylindrical Equidistant
NOR	North Orthographic
SOR	South Orthographic

The following full map projections may also be specified:

## GEMPAK Variables

MER	(CYL)	Mercator
CED	(CYL)	Cylindrical Equidistant
MCD	(CYL)	Modified Cylindrical Equidistant
STR	(AZM)	Polar Stereographic
AED	(AZM)	Azimuthal Equidistant
ORT	(AZM)	Orthographic
LEA	(AZM)	Lambert equal area
GNO	(AZM)	Gnomonic
LCC	(CON)	Northern Hemisphere Lambert Conic Conformal
SCC	(CON)	Southern Hemisphere Lambert Conic Conformal

In addition for full map projections, three angles **MUST** be specified in PROJ. The angles have the following meanings for the different projection classes:

CYL      angle1 -- latitude of origin on the projection cylinder  
                    0 = Equator  
angle2 -- longitude of origin on the projection cylinder  
                    0 = Greenwich meridian  
angle3 -- angle to skew the projection by rotation of  
                    the cylindrical surface of projection about  
                    the line from the Earth's center passing  
                    through the origin point. This results in  
                    curved latitude and longitude lines.

If angle3 is greater than 360 or less than -360 degrees, then the rectangular Cartesian coordinate system on the projection plane is rotated +/- |angle3|-360 degrees. This results in latitude and longitude lines that are skewed with respect to the edge of the map.

The difference between |angle3| < 360 and |angle3| > 360 is that, in the former case, the rotation is applied to the developable cylindrical surface before projection and subsequent development; while, in the latter case, the rotation is applied to the Cartesian coordinate system in the plane after development. Development here refers to the mathematical flattening of the surface of projection into a planar surface.

Exception:

MCD      angle1 -- scaling factor for latitude  
                    0 = default scaling (1/cos(avglat))  
angle2 -- longitude of origin (center longitude) angle3 -- not used  
  
AZM      angle1 -- latitude of the projection's point of tangency

## GEMPAK Variables

angle2 -- longitude of the projection's point of tangency angle3 -- angle to skew the projection by rotation about  
the line from the Earth's center passing through the point of tangency

CON angle1 -- standard latitude 1  
angle2 -- polon is the central longitude angle3 -- standard latitude 2

The angles for the full map projection types are given as three numbers separated with semicolons. Note that THREE angles must be entered even if some angles are not used.

Note that transverse projections may be obtained using a cylindrical projection with the first angle set to either 90 or -90. The second angle is the longitude at which the cylinder axis intersects the equator. This will be the transformed location of the "south" pole when the first angle is 90 or the "north" pole when the first angle is -90. For example, if angle1 = 90 and angle2 = 0, the axis of the cylinder of projection is perpendicular to the earth's axis and enters the earth at 0N 0E and emerges at 0N 180E. The great circle formed by 90E and 90W becomes the "equator" on the cylinder. This cylinder is ideal for a transverse cylindrical projection of locations on the continent of North America.

Satellite and radar projections are available:

SAT specifies remapped or nonremapped satellite projections.

RAD specifies the radar projection.

Currently, the McIDAS area format is supported for satellite and radar images. NIDS radar images from WSI may also be displayed.

The image drop flag may be specified as a D or an ND, and is valid for SAT and RAD only. A value of D causes the image to be dropped before any additional graphics are drawn. Conversely, a value of ND does not drop the image. When the image drop flag is undefined, the image is dropped when CLEAR is set to YES, and is not dropped when CLEAR is set to NO.

If the projection is DEF or is blank, a default projection will be obtained from the geographic table for the specified GAREA. If no default projection has been defined for the specified GAREA and the projection is DEF, the current map projection will be used.

In the grid programs the following graph projections are also available:



## GEMPAK Variables

LIN	linear x, linear y
LOG	linear x, logarithmic y
KAP	linear x, y ** KAPPA
POL	polar coordinates ( R, THETA )

Margins may be input as four numbers separated with semicolons. The four numbers represent the left, bottom, right, and top margin sizes in character widths. If no margins are specified, the default will be (0,3,0,0) in map mode and (6,4,4,1) in graph mode. If the input for the margins is NM, all four margins will be set to 0.

### 3.121 PTYPE

PTYPE is the type of y axis plot to be used, the height-to-width ratio of the plot, and the margins, separated by slashes.

The valid inputs for type for the y axis are:

LIN	linear
LOG	logarithmic
STUVE	scaled by raising to KAPPA, 2/7, power
KAP	same as STUVE
SKEWT	logarithmic y-axis; skewed x-axis
SKEW	same as SKEWT

If the height-to-width ratio is 0, the entire screen will be used. This is also the default when ratio is not specified.

The margins are specified as: left;bottom;right;top. The values are multiples of the current character size. If the margin specification is missing or incomplete, a default appropriate to the program will be used. The default in the profile programs is: 10;3;(6 times wind barb size);5. The right margin allows room for plotting winds and typically has a value around 20.

### 3.122 QCNTL

QCNTL is the quality control threshold values. It is used only when the first-guess field exists. If the difference between the original data and the interpolated values from the first guess is greater than the threshold values, the data will be discarded. Only positive threshold values are used. The default value is 0.

### 3.123 QSCT

QSCT is the ending valid time for the QuikScat wind data, the speed intervals and colors, the wind barb size and width and plotting flags. Skip is a value that indicates how many rows and data points to skip when plotting. The flags include High Wind Speed, Low Wind Speed, Rain, Sensor Availability.

Data type | End time | Speed intervals | colors1 | colors2 | Arrow/Barb shaft size; Arrow/Barb width; Arrow head size; Type of wind vector | Skip | Time stamp interval | Time stamp color | Line Width | High Spd | Low Spd | Rain | Availability | Rain Colors

The data type is a selection to plot QSCT or QSCT\_HI data.

The ending time is the latest time for which QuikScat data will be plotted. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST. LAST will use the system time and plot all QuikScat data for the preceding 4 hours. ALL is not accepted as an ending time for QuikScat data.

The speed intervals and colors may each be specified using either a list separated by semicolons or a range in the form first-last-increment. Speed intervals are given in knots. The number of intervals must be the same as the number of colors. If no interval and color are given, a single speed interval of 200 knots will be used. This means that any wind speed less than 200 knots will be plotted. The default color is green. If the rain flag in the data is true, and the rain colors flag is true, the wind barb is plotted in the second colors for that wind speed. If the rain flag is false or the rain colors flag is false, then the first color is used.

The wind arrow/barb attributes are the shaft size of the arrow or barb, width of the arrow or barb, size of the arrow head, and the type of wind vector separated by a semicolon. The default shaft size is 0.2, the default width is 1, the default arrow head size is .4, and the default type of wind vector is 5 for wind barb. The other values for type of wind vector is 1 or 3 for directional arrow and 4 for regular arrow. If no value is given for the type of wind vector, then if the arrow head size is greater than 0, directional arrows will be plotted, otherwise wind barbs will be plotted.

The Skip value is an integer used for skipping rows and columns of data when plotting the winds.

The time stamp interval is the time interval in minutes. Line width is the width of the time stamp. The default value is 30 time stamp interval and 1 for line width.

The flags correspond to flags in the QuikScat data. The High Speed, Low Speed, Rain present and Sensor Availability flags allow the user to display wind data that has any of these attributes. The default for all flags is NO.

### **3.124 RADDUR**

RADDUR is the length of time (in minutes) prior to RADTIM for which data will be used in composites.

### **3.125 RADFIL**

RADFIL is the name of a radar image file.

For animation programs, a list of radar image files, separated by semicolons, may be entered. For long image names, part of the first name may be separated by backslashes ( \ ); the following values in the list will be substituted for the characters within the backslashes,

i.e.

**\$RADAR/REF\_941017\_1200;05;10;15**

is interpreted as

**\$RADAR/REF\_941017\_1200;\$RADAR/REF\_941017\_1205;\$RADAR/  
REF\_941017\_1210; \$RADAR/REF\_941017\_1215**

### **3.126 RADFRQ**

RADFRQ is the update frequency for RADAR composites.

RADFRQ is a time, in seconds, for which the program will wait before creating the next composite.

### **3.127 RADINFO**

RADINFO specifies the color for radar site operational status annotations. NA, data not available; OM, out for maintenance; NE, no echoes.

### **3.128 RADIUS**

RADIUS is the search radius (in meters) for which data will be considered.

### **3.129 RADMODE**

RADMODE allows the user to select whether to include radar data from sites operating in (P) precipitation/storm mode, (C) clear air mode, and/or (M) maintenance mode. The default, if none are specified is data from all 3 modes (PCM). Multiple modes may be specified.

### **3.130 RADPARM**

RADPARM is the Radar parameter to be displayed. Valid values are dz (reflectivity), vr (radial velocity), sw (spectrum width).

### **3.131 RADTIM**

RADTIM is the date and time to be used for RADAR composites.

RADTIM may either be an 11-character string entered as YYMMDD/HHMM following the format of DATTIM, or the word "current" which refers to the current SYSTEM time.

### **3.132 RCMFIL**

RCMFIL is the RCM data file. Bulletins with radar observation times in the RCM file will be plotted if the observation time is within the range specified by the starting and ending times.

RCMFIL may be a file alias defining a file template.

### **3.133 REFVEC**

REFVEC specifies the size and location on the screen of the reference arrow using the following format:

**Magnitude; x; y; text size/font/width/HW; string**

Magnitude refers to the size of the reference wind arrow to be plotted. For example, using 10.0 results in a reference arrow of 10.0 units being plotted.

If the magnitude specified is 0, no reference arrow is plotted. The default is 0.

## **GEMPAK Variables**

The user specifies the location of the reference arrow by entering values between 0.0 and 1.0 for x-location and y- location. These values are normalized to the display so, for example, the center of the display is 0.5;0.5. If no values are entered, the reference arrow is plotted in the lower left hand corner: 0.05;0.05.

The text attributes: size, font, width and HW flag; are applied only to the text displayed with the reference vector. See the TEXT help for further details on these attributes.

The string specifies the label for the reference vector. This text may contain any keyboard character. If the string is empty, an appropriate label will be generated.

### **3.134 REGION**

REGION specifies an areal location.

In GPBOX, REGION may be VIEW, PLOT or DEVICE where:

**VIEW corresponds to the view region (includes margins);**

**PLOT corresponds to the plot region (excludes margins);**

**DEVICE corresponds to the entire device space.**

In OABOX, the region must be GRID, DATA, or EXTEND where:

**GRID corresponds to the area over which the objective analysis is performed;**

**DATA corresponds to the area from which data will be extracted for the objective analysis;**

**EXTEND corresponds to the extended grid area over which the first pass of the objective analysis is performed.**

### **3.135 \$RESPOND**

\$RESPOND is a logical variable indicating whether the user will respond interactively to GEMPAK programs. If set to NO, programs will not wait for input from the user.

### **3.136 ROTATE**

ROTATE is the angle of rotation for the coordinate axes. This is used to determine the wind component in a user defined plane. Default = 'blank' or 270 means no rotation.

### 3.137 RTRAJ

RTRAJ is a logical variable which determines whether the trajectory will start or end at the specified GPOINT.

Enter YES for the trajectory to end at GPOINT (reverse trajectory). Enter NO to begin at the specified GPOINT.

### 3.138 SATFIL

SATFIL is the name of a satellite image file.

For animation programs, a list of satellite image files, separated by semicolons, may be entered. For long image names, part of the first name may be separated by backslashes ( \ ); the following values in the list will be substituted for the characters within the backslashes,

i.e.

**\$GOES7/VIS\_941017\_1201;13;14**

is interpreted as

**\$GOES7/VIS\_941017\_1201;\$GOES7/VIS\_941017\_1301;\$GOES7/VIS\_941017\_1401**

### 3.139 SCALE

SCALE is the scaling factor for the data. All data will be multiplied by  $10^{**}SCALE$ . The user specifies the scaling factor for scalar grids and/or vector grids by entering:

**scalar / vector**

If SCALE is not specified, an appropriate scaling will be selected. In the grid programs, a data-dependent scaling will be selected. In the surface, sounding and the grid to station interpolation programs, a default of 0 will be used. If no vector scale is specified the scalar scaling factor will be used in its place.

If the absolute value of SCALE is greater than 5 in a surface or sounding program, a value of 0 will be used. If the absolute value is greater than 20, a default will be computed in a grid program. In the grid to station interpolation program, a default of 0 will be used.

Note that scaling data may create integer overflow problems in programs, such as SFMAP, which round data to the nearest integer. Valid integers must be in the range  $-2 \times 10^{**9}$  to  $2 \times 10^{**9}$ , approximately.

### 3.140 SEARCH

SEARCH controls the search radius in an objective analysis program. The radius is the maximum distance that a station may be from a grid point to be used in the analysis for that point. The search radius is set so that stations whose weighting factor is less than EXP (-SEARCH) are not used. SEARCH must have a value in the range 1 - 50. If the value is outside this range, a default value of 20 is used. If SEARCH is given a very small value, many grid points will not have three stations within the search area, and consequently will be set to the missing data value.

SEARCH may also be used to set a flag to allow extrapolation of data values to grid points on the periphery of the data area. To do this, follow the value of SEARCH with /EX; for example, SEARCH = 20/EX will result in data extrapolation.

### 3.141 SFEFIL

SFEFIL is the name of the surface edit file to be used to update a surface file.

SFEFIL is a text file which may be created using the program SFLIST with F as an output device. A text editor may be used to create or change the surface edit file.

The parameters to be edited must be specified at the beginning of the surface edit file. For example:

**PARM = TMPF;DWPF**

Parameters that have character values, such as WTHR, cannot be edited. Instead, the numeric value must be used, e.g., WSYM in the case of WTHR. All the parameters which are to be edited must already exist in the surface data file, since no parameter transformations will be done. Station information, such as latitude, longitude and elevation, cannot be changed with SFEFIL. Use GEMPAK program, SFSTNS, to update station information in a surface file.

The data follow the parameter list.

Stations and times which do not already exist in the surface data file will be added.

### 3.142 SFFILE

SFFILE is the name of the surface data file to be accessed.

The input for SFFILE may also be a file type. The following file types may be input:

## GEMPAK Variables

METAR	Surface observations
SYNOP	Synoptic observations
ACFT	Aircraft observations
SHIP	Ship/Buoy observations
SHIP6HR	6-hour ship observations
SCD	Supplemental Climatological Data
FFG	Flash flood guidance
NGMMOS	NGMMOS model
GFSMOS	GFSMOS model
GFSXMOS	GFSXMOS model

When one of these file types is input, the program searches locally for the most recent file first. If no files are found locally, the program searches remotely for the most recent file. The remote directories are specified in the table DATATYPE.TBL.

An optional base time may be included with the file type name, following a bar (|). For example:

**SFFILE = hrly | base time**

The base time may be any valid format for a GEMPAK date/time. Any missing parts of the date/time will be supplied by the system time.

SFFILE may also be entered as a file template for the SFGRAM program. The program searches for all the files with the specified path and template.

### 3.143 SFFSRC

SFFSRC is the surface file source. With this parameter, the type of data that can be contained in the file is specified.

SFFSRC may be set to either decoded data (including UNKN, AIRW, METR, SHIP, BUOY, and SYNP) or TEXT. If both types are requested, they are separated by a '|'.

The decoded file type **MUST** be specified first, otherwise a default to a text only file will be created.

### 3.144 SFOUTF

SFOUTF is the output surface data file.



## GEMPAK Variables

SFOUTF is used in programs which create a new surface data file. It is also used in programs in which data is moved from an input file to an output file, in which case, SFFILE is the original file.

When used with program NAMSND, SFOUTF can be used to specify two output surface files. This is done by appending a + to the output file name. In this case, the second file will have the same name as the first, with the suffix \_aux. The second file will contain surface data for the diagnostic or overflow parameters listed in the auxiliary surface packing file (described in SFPRMF). For example,

**SFOUTF = new.sfc+**

will create output files new.sfc and new.sfc\_aux, if both a primary and an auxiliary surface packing file have been provided.

### 3.145 SFPARM

SFPARM is a list of surface parameters to be used in a surface program.

The four-character parameter names must be separated by semicolons. For example:

**SFPARM = TMPF;DWPF;WTHR**

If a parameter is not present in a data set, the program will attempt to derive it from those parameters which are present. For example, relative humidity can be computed from the temperature and dewpoint temperature. Note that STHA, STHE, and SMXR are computed from PALT.

In plotting programs, the position of the parameter determines where it will appear with respect to the station location. The first position is centered on the station. The other positions are shown below:

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

In the example above, WTHR is plotted in position 3.

Functions can be used to modify/qualify the output parameters. These functions must follow the parameter name and are applied in the order given; however, arithmetic operators must precede the other operators. The function symbols must precede the qualifying value and are defined as follows:

## GEMPAK Variables

*	multiply	=	equal to
/	divide	\$	direction
+	add	<	less than or equal to
-	subtract	>	greater than or equal to

In the case of weather symbols, the size, line width and other information needed to draw the symbol may be specified following a colon after the symbol name and after the function specifications if any exist. The drawing attributes are separated by colons. For all the symbols, the information is entered as: size:width; for arrows and barbs the information is entered as :size:width:type:headsiz, where the headsiz applies only to arrows. The type is a three-digit number, ABC, interpreted digit by digit as follows:

A	B	C
1 = plot calm wind	1 = start at stn	1 = not filled
2 = ignore calm wind	2 = center at stn	2 = filled
	3 = start on sky symbol	3 = not filled with box
		4 = filled with box

Calm winds are plotted as a circle or an arrowhead for barbs and arrows, respectively. Arrowheads and 50-unit barb flags are filled if C=2 or 4. A box is plotted with background color if C = 3 or 4. For example, if TYPE=132, a barb will be plotted as a circle if the wind is calm; it will begin on the edge of the cloud cover symbol, and 50-unit flags will be filled. The default is 111 unless sky symbols are being plotted in which case it is 131.

For all symbols ( weather, cloud, pressure tendency, sky cover, past weather, icing, combination, etc. ) and wind barbs and arrows, the area immediately surrounding the symbol may be blanked out. The resulting effect allows the object to be more easily identified. This capability may be invoked by adding the additional blank-out width (\*100) to the object width. For example, to blank-out an extra 8 width units around the weather symbols of size 2 and width 3, specify the SFPARM as WSYM:2:803.

A special value of M may be used for the = function to denote a missing value, so that values will be plotted only when a specific parameter is missing. For example, to plot an X when the visibility is missing, specify SFPARM=MARK:16;VSBY=M.

Aliases are available to make it easier for the user to plot typical surface data by using pre-set parameters and colors. To use an alias, enter the alias name for SFPARM and leave COLORS blank. If the user does not leave COLORS blank, the selected colors will be used instead of the pre-set alias colors.

See PRMLST.TBL for a list of current aliases for surface data.

The GEMPAK surface parameters and the corresponding four-character abbreviations are:

## **GEMPAK Variables**

### **TEMPERATURE**

TMPC - Temperature in Celsius  
TMPF - Temperature in Fahrenheit  
TMPK - Temperature in Kelvin  
STHA - Surface potential temperature in Kelvin  
STHK - Surface potential temperature in Kelvin  
STHC - Surface potential temperature in Celsius  
STHE - Surface equivalent potential temperature in Kelvin  
STHS - Surface saturation equiv. pot. temp. in Kelvin  
TVRC - Virtual temperature in Celsius  
TVRF - Virtual temperature in Fahrenheit  
TVRK - Virtual temperature in Kelvin  
THTV - Virtual potential temperature in Kelvin  
TDXC - Maximum 24-hour temperature in Celsius  
TDNC - Minimum 24-hour temperature in Celsius  
TDXF - Maximum 24-hour temperature in Fahrenheit  
TDNF - Minimum 24-hour temperature in Fahrenheit  
T6XC - Maximum 6-hour temperature in Celsius  
T6NC - Minimum 6-hour temperature in Celsius  
T6XF - Maximum 6-hour temperature in Fahrenheit  
T6NF - Minimum 6-hour temperature in Fahrenheit  
DMAX - Daily weather map maximum temperature in Fahrenheit  
DMIN - Daily weather map minimum temperature in Fahrenheit  
SSTC - Sea surface temperature in Celsius  
SSTF - Sea surface temperature in Fahrenheit  
LTMP - Temp. in Celsius of surface air lifted to 500 or 1x mb

### **MOISTURE**

DWPC - Dewpoint in Celsius  
DWPF - Dewpoint in Fahrenheit  
DWPK - Dewpoint in Kelvin  
DPDC - Dewpoint depression Celsius  
DPDF - Dewpoint depression Fahrenheit  
DPDK - Dewpoint depression Kelvin  
SMXR - Surface mixing ratio in g/kg  
SMXS - Surface saturated mixing ratio in g/kg  
RELH - Relative humidity in percent  
TMWK - Wet bulb temperature Kelvin  
TMWC - Wet bulb temperature Celsius  
TMWF - Wet bulb temperature Fahrenheit  
VAPR - Vapor pressure in millibars  
VAPS - Saturation vapor pressure in millibars

### **PRESSURE AND ALTIMETER**

PRES - Station pressure in millibars  
PMSL - Mean sea level pressure in millibars  
PALT - Pressure in millibars from altimeter  
ALTI - Altimeter setting in inches of mercury  
ALTM - Altimeter setting converted to millibars  
SALT - Abbreviated altimeter in millibars

## **GEMPAK Variables**

**SMSL** - Abbreviated mean sea level pressure  
**SALI** - Abbreviated ALTI  
**RMSL** - First 3 digits left of decimal of PMSL \* 10  
**RSLI** - First 3 digits left of decimal of ALTI \* 100  
**RSLT** - First 3 digits left of decimal of ALTM \* 10  
**PTND** - Complete pressure tendency with symbol  
**PTSY** - Pressure tendency symbol only  
**P03C** - Pressure change over 3 hours  
**P03D** - Pressure tendency and change group, appp  
**P24C** - Pressure change over 24 hours  
**ZMSL** - Estimated height at PMSL  
**Z000** - Estimated height at 1000 mb  
**Z850** - Estimated height at 850 mb  
**Z800** - Estimated height at 800 mb  
**PANY** - Returns PMSL, if available, if not, returns ALTM  
**RANY** - Computes the 3 digit display of pressure  
**SANY** - Creates a 3 character string from integral part of PMSL or ALTM

### **WIND**

**ARRW** - Wind arrow (m/s)  
**ARRM** - Wind arrow (m/s)  
**ARRK** - Wind arrow (knots)  
**BARB** - Wind barb (m/s)  
**BRBM** - Wind barb (m/s)  
**BRBK** - Wind barb (knots)  
**BRBS** - Wind barb (mi/hr)  
**DARR** - Wind arrows of uniform length  
**UWND** - U component of the wind in meters/second  
**VWND** - V component of the wind in meters/second  
**UKNT** - U component of the wind in knots  
**VKNT** - V component of the wind in knots  
**DRCT** - Wind direction in degrees  
**SPED** - Wind speed in meters/second  
**SKNT** - Wind speed in knots  
**SMPH** - Wind speed in miles/hour  
**PSPD** - Packed speed and direction (ddfff) in meters/second  
**PKNT** - Packed speed and direction (ddfff) in knots  
**GUST** - Wind gusts in knots  
**GUMS** - Wind gusts in meters/second  
**PWDR** - Peak wind direction in degrees  
**PWSP** - Peak wind speed in meters/sec  
**PWHR** - Hour of peak wind  
**PWMN** - Minutes of peak wind

### **CLOUD**

For the following parameters, the character x may be replaced by L, M, or H, indicating low, middle or high clouds. The character T indicates the value of the parameter at the level of maximum cloud coverage.

## **GEMPAK Variables**

**xCLD** - Character cloud coverage  
**TCLD** - Character maximum cloud coverage  
**xCLO** - Fractional cloud coverage  
**TCLO** - Fractional maximum cloud coverage  
**CLCx** - Numeric cloud coverage  
**CLCT** - Numeric maximum cloud cover  
**CLDS** - Combined cloud coverage from three levels  
**CMBC** - Numeric combined cloud coverage from three levels  
**CLHx** - Cloud height in hundreds of feet  
**CLDx** - Combined cloud height and coverage  
**CLDT** - Maximum value of CLDx  
**COMx** - Numeric combined cloud height and coverage  
**COMT** - Maximum value of COMx  
**CEIL** - Ceiling in hundreds of feet

For the next two cloud parameters the x can be replaced by 1, 2, or 3 and represents the cloud report number.

**CHCx** - Numeric combined cloud height and coverage  
**CHDx** - Combined cloud height and short code

The following numeric cloud parameters are WMO standard codes.

**CFRT** - Fraction of celestial dome covered by cloud from WMO Code 2700  
**CFRL** - Fraction of celestial dome covered by low or mid clouds from WMO Code 2700  
**CTYL** - Low-level cloud genera from WMO Code 0513  
**CTYM** - Mid-level cloud genera from WMO Code 0515  
**CTYH** - High-level cloud genera from WMO Code 0509  
**CBAS** - Cloud base height from WMO Code 1600  
**CSYL** - Low cloud type symbol  
**CSYM** - Middle cloud type symbol  
**CSYH** - High cloud type symbol  
**CSYT** - Cloud type symbol on first reported level  
**SKYC** - Sky coverage symbol  
**SKYM** - Sky coverage symbol with wind barbs in m/s  
**SKYK** - Sky coverage symbol with wind barbs in knots

The following numeric parameter follows the guidelines in the National Weather Service Operations Manual, Chapter D-31.

**XVFR** - **Categorical identification of flight rules**  
0 = Low Instrument Flight Rules (LIFR)  
1 = Instrument Flight Rules (IFR)  
2 = Marginal Visual Flight Rules (MVFR)  
3 = Visual Flight Rules (VFR)

### **WEATHER**

**WTHR** - Character weather code from any numeric code  
**WCOD** - Character weather code  
**WNUM** - Numeric weather code

## **GEMPAK Variables**

**WSYM** - Present weather symbol  
**WTMO** - Character weather code from WMO  
**WWMO** - Numeric WMO weather code  
**PWTH** - Past weather symbol  
**PWWM** - Numeric past weather in WMO code

### **STATION VARIABLES**

**STID** - Character station identifier  
**STNM** - 5-digit station identifier  
**SLAT** - Station latitude in degrees  
**SLON** - Station longitude in degrees, West is negative  
**SELV** - Station elevation in meters  
**SPRI** - Station priority

### **MODEL OUTPUT STATISTICS**

**MXMN** - Maximum or minimum temperature in Fahrenheit  
**TNTF** - Night temperature fcst in Fahrenheit  
**TNCF** - Night temperature climatology in Fahrenheit  
**TNAF** - Night temperature anomaly in Fahrenheit  
**TDYF** - Day temperature fcst in Fahrenheit  
**TDCF** - Day temperature climatology in Fahrenheit  
**TDAF** - Day temperature anomaly in Fahrenheit  
**CL12** - Prevailing total sky cover fcst for a 12-hr period  
    1 = CL = mostly clear  
    4 = OV = mostly overcast  
    7 = PC = mixed clouds and clear skies  
**SK12** - Maximum sustained surface wind speed fcst for a 12-hr period  
    5 = light 0 - 12 knots  
    15 = Moderate 13 - 21 knots  
    25 = Strong 22 - 33 knots  
    40 = High greater than or equal to 34 knots  
**PP06** - Probability of precipitation fcst in a 6-hr period  
**PP12** - Probability of precipitation fcst in a 12-hr period  
**PP1C** - Probability of precipitation climatology in a 12-hr period  
**PP1A** - Probability of precipitation anomaly in a 12-hr period  
**PP24** - Probability of precipitation fcst in a 24-hr period  
**PP2C** - Probability of precipitation climatology in a 24-hr period  
**PP2A** - Probability of precipitation anomaly in a 24-hr period  
**QPX2** - Maximum amount of precipitation in inches fcst in a 12-hr period. Values are same as QP12  
**QP06** - Quantitative precipitation fcst in a 6-hr period  
    1 = 0.01 - 0.09 inches  
    2 = 0.10 - 0.24 inches  
    3 = 0.25 - 0.49 inches  
    4 = 0.50 - 0.99 inches  
    5 = 1.00 - 1.99 inches  
**QP12** - Quantitative precipitation fcst in a 12-hr period  
    0 = no precipitation expected  
    1 through 5 same as QP06  
    6 = greater than or equal to 2.00 inches  
**QP24** - Quantitative precipitation fcst in a 24-hr period

## **GEMPAK Variables**

0 through 5 same as QP12

6 = 2.00 - 2.99 inches

7 = greater than or equal to 3.00 inches

**TS06 - Unconditional probability of thunderstorms occurring in a 6-hr period**

**TS12 - Unconditional probability of thunderstorms occurring in a 12-hr period**

**TS24 - Unconditional probability of thunderstorms occurring in a 24-hr period**

**TC06 - Conditional probability of severe weather occurring in a 6-hr period**

**TC12 - Conditional probability of severe weather occurring in a 12-hr period**

**PCPT - Categorical forecast of precipitation**

0 = R = rain

1 = S = snow

2 = Z = freezing

**POZP - Conditional probability of freezing precipitation (not included during the warm season)**

**POSN - Conditional probability of snow (not included during the warm season)**

**SN06 - Categorical forecast of snow amount falling in a 6-hr period**

0 = no snow

1 = trace to less than 2 inches

2 = greater than or equal to 2 inches

**SN12 - Categorical forecast of snow amount falling in a 12-hr period**

0 and 1 same as SN06

2 = 2 to less than 4 inches

4 = 4 to less than 6 inches

6 = greater than 6 inches

**(not included during the warm season)**

**SN24 - Categorical forecast of snow amount falling in a 24-hr period**

0 = no snow or a trace

1 = greater than a trace to less than 2 inches

2 = 2 to less than 4 inches

4 = 4 to less than 6 inches

6 = 6 to less than 8 inches

8 = greater than 8 inches

**(not included during the warm season)**

**PZ12 - Conditional probability of freezing precipitation in a 12-hr period**

**PS12 - Conditional probability of snow in a 12-hr period**

**PR12 - Conditional probability of mixed liquid/frozen precipitation in a 12-hr period**

**PC12 - Categorical forecast of precipitation type in a 12-hr period**

0 = R = liquid

1 = S = frozen

2 = Z = freezing

3 = RS = mixed liquid and frozen precipitation

4 = RZ

5 = SZ

6 = RSZ

**FCIG - Categorical forecast of ceiling height conditions**

1 = less than 200 feet

2 = 200 - 400 feet

3 = 500 - 900 feet

4 = 1000 - 1900 feet

5 = 2000 - 3000 feet

6 = 3100 - 6500 feet

7 = 6600 - 12,000 feet

8 = greater than 12,000 feet or unlimited

**FVIS - Categorical forecast of visibility conditions**

## **GEMPAK Variables**

- 1 = less than 0.5 miles
- 2 = 0.5 - 0.875 miles
- 3 = 1.0 - 2.75 miles
- 4 = 3.0 - 5.0 miles
- 5 = greater than 5.0 miles

### **FVSA - Categorical forecast of visibility conditions (for new MOS)**

- 1 = less than 0.5 miles
- 2 = 0.5 mile to less than 1.0 mile
- 3 = 1.0 to less than 2.0 miles
- 4 = 2.0 to less than 3.0 miles
- 5 = 3.0 to 5.0 miles
- 6 = 6.0 miles
- 7 = greater than 6.0 miles

### **OVIS - Categorical forecast in plain language of obstructions to vision**

- 0 = N = none of the following
- 1 = FG or F = fog or ground fog (vis. less than .625 mile)
- 2 = HZ or H = haze, smoke, dust
- 3 = BR = mist (fog with visibility greater than .625 mile)
- 4 = BL = blowing dust, sand, snow

### **WXPB - Categorical weather precipitation probability or areal coverage determined by the precipitation parameter having the highest probability or areal coverage in WNUM.**

#### **For probability:**

- 1 = slight chance
- 2 = chance
- 3 = likely
- 4 = occasional
- 5 = definite

#### **For areal coverage:**

- 1 = isolated
- 2 = widely scattered
- 3 = scattered
- 4 = numerous
- 5 = widespread

## **TERMINAL AERODROME FORECAST (TAF)**

**TDRC - Temporary/probability wind direction in degrees**

**TSKN - Temporary/probability wind speed in knots**

**TGST - Temporary/probability wind gusts in knots**

**BRGK - Gust barb feathered in knots**

**TCHx - Temporary/probability numeric combined cloud height and coverage, as for CHCx**

**TCEL - Temporary/probability ceiling in hundreds of feet, as for CEIL**

**TSKC - Temporary/probability cloud coverage graphics symbol, as for SKYC**

**TXVF - Temporary/probability categorical identification of flight rules, as for XVFR**

**TWNM - Temporary/probability numeric weather code, as for WNUM**

**TWSY - Temporary/probability graphics weather symbol corresponding to TWNM, as for WSYM**

**TVSB - Temporary/probability visibility in statute miles**

**PPRB - Probability for TAF forecast change indicator**



## **GEMPAK Variables**

30 = PROB30 - 30 percent probability condition

40 = PROB40 - 40 percent probability condition

50 = TEMPO - temporary condition

**VWNM** - Vicinity numeric weather code, as for WNUM

**VWSY** - Vicinity graphics weather symbol corresponding to VWNM, as for WSYM

**TVWN** - Temporary/probability vicinity numeric weather code, as for WNUM

**WSKC** - Worst case cloud coverage graphics symbol, as for SKYC

**WXVF** - Worst case categorical identification of flight rules, as for XVFR

**TPWN** - Temporary/probability/vicinity numeric weather code, as for WNUM

**TPWS** - Temporary/probability/vicinity graphics weather symbol corresponding to TPWN, as for WSYM

**AWNM** - Prevailing/temporary/probability/vicinity numeric weather code, as for WNUM

**AWSY** - Prevailing/temporary/probability/vicinity graphics weather symbol corresponding to AWNM, as for WSYM

**LLWS** - Low level wind shear forecast flag

**MOTV** - Mountain obscuration threshold value in hundreds of feet

**CMSL** - Ceiling converted to mean sea level in hundreds of feet

**MOBS** - Mountain obscuration threshold met indicator

**TCMS** - Temporary/probability ceiling converted to mean sea level in hundreds of feet

**TMOB** - Temporary/probability mountain obscuration threshold met indicator

**WCMS** - Worst case ceiling converted to mean sea level in hundreds of feet

**WMOB** - Worst case mountain obscuration threshold met indicator

### **MARINE**

**WHGT** - Wave height in meters

**WHFT** - Wave height in feet

**WPER** - Wave period in seconds

**HOWW** - Height of wind wave in meters

**POWW** - Period of wind wave in seconds

**HOSW** - Height of predominant swell wave in meters

**POSW** - Period of predominant swell wave in seconds

**DOSW** - Direction of predominant swell wave in degrees

**HOS2** - Height of secondary swell wave in meters

**POS2** - Period of secondary swell wave in seconds

**DOS2** - Direction of secondary swell wave in degrees

**WAV2** - Combined wind wave period and height in feet ("2 group")

**WAV3** - Combined predominant and secondary swell wave direction in tens of degrees ("3 group")

**WAV4** - Combined predominant swell wave period and height in feet ("4 group")

**WAV5** - Combined secondary swell wave period and height in feet ("5 group")

**WPHM** - Combined wave period and height in half meters

**WVSW** - Combined swell wave direction, period and height in half meters

**SWEL** - Character combined swell wave direction, period and height in half meters

**DAWV** - Swell wave direction arrows of uniform length

**IDTH** - Thickness of ice on ship in meters

**ROIA** - Rate of ice accretion on ship from WMO code table 3551

**IGRO** - Rate of ice accretion on vessel in salt water in inches per 3 hours

**DIGR** - Character rate of ice accretion in inches per three hours

**SHPD** - True direction from which ship is moving (for 3 hours before obs) in degrees

**SHPK** - Ship's average speed (for 3 hours before obs) in knots

**DASH** - Ship's true direction arrows of uniform length

## **GEMPAK Variables**

### **AIRCRAFT**

**TURB** - Amount of turbulence  
**TBSE** - Base of turbulence in feet  
**TTOP** - Top of turbulence in feet  
**HBOT** - Base of turbulence in meters  
**HTOT** - Top of turbulence in meters  
**FQOT** - Frequency of turbulence  
**TPOT** - Type of turbulence  
**TBSY** - Turbulence symbol  
**ICNG** - Amount of airframe icing  
**IBSE** - Base of icing in feet  
**ITOP** - Top of icing in feet  
**HBOI** - Base of icing in meters  
**HTOI** - Top of icing in meters  
**TPOI** - Type of icing  
**ICSY** - Icing symbol  
**WBSE** - Base of weather in feet  
**WTOP** - Top of weather in feet  
**HBWX** - Base of weather in meters  
**HTWX** - Top of weather in meters  
**CLC1** - Numeric cloud coverage 1  
**CBS1** - Cloud base 1 in feet  
**CTP1** - Cloud top 1 in feet  
**CB1M** - Cloud base 1 in meters  
**CT1M** - Cloud top 1 in meters  
**CLC2** - Numeric cloud coverage 2  
**CBS2** - Cloud base 2 in feet  
**CTP2** - Cloud top 2 in feet  
**CB2M** - Cloud base 2 in meters  
**CT2M** - Cloud top 2 in meters  
**ACRT** - Aircraft report type  
**SELV** - Flight level in meters  
**FELV** - Flight level in hundreds of feet  
**ITSY** - Icing type symbol  
**TTSY** - Turbulence type symbol  
**TFSY** - Turbulence frequency symbol  
**ACTP** - Character aircraft type  
**ATP1** - Numeric aircraft type

### **MISCELLANEOUS**

**DDEN** - Density of dry air in kg/(m\*\*3)  
**VSBY** - Visibility in statute miles  
**VSBK** - Visibility in kilometers  
**VSBN** - Visibility in nautical miles  
**VSBF** - Character visibility in fractions of statute miles for visibilities between 0. and 1.  
**VSBC** - Character visibility in fractions of statute miles for all visibility numbers  
**PnnI** - Precipitation over last nn hours in inches  
nn = 01, 03, 06, 09, 12, 18 or 24  
**PnnM** - Precipitation over last nn hours in millimeters  
nn = 01, 03, 06, 09, 12, 18 or 24

## GEMPAK Variables

DPRC - Character daily weather map precipitation in inches  
PR24 - Precipitation over last 24 hours in inches, as sum of four successive 6-hour precip amounts  
SNOW - Snow depth in inches  
SNEW - Amount of new snow in inches  
SNRT - Forecast snow and ice pellet accumulation to watch threshold ratio  
SI12 - Forecast snow and ice pellet 12-h accumulation in inches  
SNIP - Snow and ice pellet watch threshold in inches  
FZRT - Forecast freezing rain accumulation to watch threshold ratio  
FZ12 - Forecast Freezing rain 12-h accumulation in inches  
FZRN - Freezing rain watch threshold in inches  
WEQS - Water equivalent of snow on the ground in inches  
HAIL - Hail flag  
HLSZ - Hail size in centimeters  
HEAT - Heat index in Fahrenheit  
HMTR - Humiture (apparent temperature) in Fahrenheit  
WCEQ - Wind chill equivalent temperature in Fahrenheit  
WCHT - Revised wind chill temperature in Fahrenheit  
MSUN - Duration of sunshine in minutes  
FFnn - Flash flood guidance for next nn hours in inches  
    nn = 01, 03, 06, 12 or 24  
TOST - Type of station (manned or automatic)  
    0 = automatic  
    1 = manned  
STIM - Report hour and minutes as hhmm  
TEXT - Undecoded data  
SPCL - Undecoded special reports  
MARK - Markers  
DTNM - Sea ice drifting distance in nautical miles  
FOSB - Fosberg index, also called fire weather index

### SPACING

SPAC - Plot a space, accounted for in FILTER  
BLNK - Plot a blank, not accounted for in FILTER

## 3.146 SFPRMF

SFPRMF specifies the packing information for the surface file to be created. It may be the name of a surface parameter packing file or the information itself entered as follows:

**SFPRMF=PRM1/MIN1-MAX1-RES1;PRM2/MIN2-MAX2-RES2; ...**

where each PRMi, MINi, MAXi, and RESi is the parameter name, minimum, maximum and resolution for a parameter to be included in the file.

If SFPRMF specifies a file name, then each line of the file must contain the following information separated by blanks or tabs:

## GEMPAK Variables

parameter name	CHAR*4
minimum data value	REAL
maximum data value	REAL
resolution	REAL

The resolution should be an integral power of 10; otherwise the next smaller resolution will be used. For example,  $\text{res} = .5$  will become  $.1$ .

If the data are not to be packed, the minimum and maximum data values and the resolution should not be included. Note that either all of the parameters or none of them must have packing information.

METAR.PACK is a typical table used to pack surface data. This file may be used as an example when creating a packing file.

When SFPRMF is used with program NAMSND, the user must supply the parameter packing file name. In this case, a fifth entry is required for each line of the file, containing a real conversion factor used to scale from BUFR to GEMPAK. Diagnosed or extra computed parameters may be added at the end of the parameter list in the packing file. If diagnosed parameters are to be added, or if there is not enough room in the packing file for all the primary parameters, an auxiliary packing file must be used. This file will have the same name as that specified for SFPRMF, with the suffix `_aux`. The auxiliary file is not specified explicitly in SFPRMF. Rather, the presence of the auxiliary file is indicated by suffixing the output surface file name given in SFOUTF with a `+`. Note that the order of the parameters in the packing file(s) must be the same as the order of the surface parameters listed in the NAMSND output file `bufr_table.dump`. The parameter names themselves do not have to be the same as those in the `bufr_table.dump` file, but the order must be preserved.

### 3.147 SHAPE

SHAPE is the object that the user wishes to plot on the current graphics device. Valid shapes include:

## GEMPAK Variables

TEXT	A string of text.
POLYGON	An irregular polygon.
REGPOLY	A regular polygon.
ARC	An arc connected to the center point (pie).
CURVE	A smooth curve, or piecewise line.
LINE	A line segment.
ARROW	Two types of arrows.
COLDFRONT	A cold front.
WARMFRONT	A warm front.
OCCLFRONT	An occluded front.
STATFRONT	A stationary front.
WEATHER	Weather symbols.
CLOUD	Cloud type symbols.
SKY	Sky cover symbols.
TURB	Turbulence symbols.
ICNG	Icing symbols.
SPCL	Special symbols.
MARKER	Marker symbols.
PRESTEND	Pressure tendency symbols.
PASTWTHR	Past weather symbols.

For all SHAPES the INFO, LOCI and FILL parameters must also be specified.

### 3.148 SHIPFL

SHIPFL is a logical variable which indicates whether the surface file contains stations which are not at a fixed location, such as moving ships, aircraft, or floating buoys.

A ship file will store and write data differently from a standard GEMPAK surface file. However, these files can be read using the surface library and all programs which access data in surface files can be used unchanged.

Note that station information cannot be added to these files, since the station information must be stored with the data.

### 3.149 SKIP

SKIP is a variable which determines the contour points or plot points to skip. Input is entered as:

**skip\_contour / skip\_plot\_x ; skip\_plot\_y**

The defaults for skip\_contour and skip\_plot are 0.

Skip\_contour thins the input grid before computing the contours to be drawn.

## GEMPAK Variables

Skip\_plot\_x and \_y specify the points at which data is to be displayed. If skip\_plot\_x is positive and skip\_plot\_y is not specified, skip\_plot\_y is set to skip\_plot\_x.

If skip\_plot\_x is negative, the x plot locations on alternate rows are indented by half the skip\_plot\_x value. In this case, the absolute value of skip\_plot\_x must be odd. If not, the absolute value minus 1 is used. If no value for skip\_plot\_y is specified, half the skip\_plot\_x value is used.

Examples:

SKIP	SKIP_CNTR	SKIP_PLOT_X	SKIP_PLOT_Y	STAGGER
' '	0	0	0	no
2	2	0	0	no
-1	0	0	0	no
2;3	2	0	0	no
/3	0	3	3	no
/2;3	0	2	3	no
/;1	0	0	1	no
/-1	0	1	0	yes
/-3	0	3	1	yes
/-1;1	0	1	1	yes

Winds may be thinned by latitude by setting skip\_plot\_y to a negative value. This feature is most useful when plotting winds on a cylindrical grid on a projection with converging meridians. In this case, ABS(skip\_plot\_y) determines how often rows are plotted. The variable skip\_plot\_x is not used.

Examples:

SKIP	SKIP_CNTR	SKIP_PLOT_X	SKIP_PLOT_Y	LAT THIN
/1;-1	0	1	1	yes
-- every row is plotted with winds thinned along each row.				
/1;-2	0	1	2	yes
-- every other row is plotted with winds thinned.				

### 3.150 SKPMIS

SKPMIS is a logical variable which indicates whether non-reporting stations will be listed.

If SKPMIS is YES, nonreporting stations will not be listed. Otherwise, all stations will be listed.

## GEMPAK Variables

In SFMAP, markers can be plotted at nonreporting stations when SKPMIS is NO.

### 3.151 SNBUFR

SNBUFR is the name of the BUFR model sounding file to be used as input to create GEMPAK sounding and surface data files using program NAMSND.

The first message of the BUFR file must be a table of information about the file contents.

If the BUFR sounding file name is followed by |sss=#####, where sss is a 3-character station ID and ##### is the corresponding station number, then an ASCII file named prof.sss is generated. This file will contain only the output for station #####. For example,

```
SNBUFR = eta.T00Z.class1.bufr|pit=72520
```

creates an ASCII file prof.pit containing sounding data for station 72520.

The number of stations and times which may be written to the output files is determined by TIMSTN.

### 3.152 SNEFIL

SNEFIL is the name of the sounding edit file to be used to update a sounding data file.

SNEFIL is a text file which may be created using the program SNLIST with F as an output device. A text editor may be used to create or change the edit file.

The parameters to be edited must be specified at the beginning of the edit file. For example:

```
SNPARM = PRES;TMPF;DWPF
```

If the output sounding file exists, the data set parameters must be the same as those listed in the edit file. Station information, such as latitude, longitude, and elevation, cannot be changed with SNEFIL. Use GEMPAK program SNSTNS to update station information in a sounding file.

If the file does not exist, a new, unpacked file with these parameters will be created.

## GEMPAK Variables

The data follows the parameter list. Only level data will be added to the file. Stability indices from STNDEX will be ignored. The data should not include undecoded text (raw reports), although the output sounding file, if it exists, may include undecoded text.

Stations and times which do not already exist in the surface data file will be added.

### 3.153 SNFILE

SNFILE is the filename for an upper air data set.

The input for SNFILE may also be a file type. The following file type may be input:

UAIR	observed upper air
------	--------------------

When this file type is input, the program searches locally for the most recent file. If no files are found locally, the program searches remotely for the most recent file. The remote directories are specified in the table DATA.TBL.

An optional base time may be included with the file type name, following a bar (|). For example:

**SNFILE = uair | base time**

The base time may be any valid format for a GEMPAK date/time. Any missing parts of the date/time will be supplied by the system time.

### 3.154 SNOUTF

SNOUTF is the output sounding data file.

SNOUTF is used in programs which create a new sounding data file. It is also used in programs in which data is moved from an input file to an output file, in which case SNFILE is the original file.

### 3.155 SNPARM

SNPARM is a list of upper air parameters to be used in an upper-air program.

The four-character parameter names must be separated by semicolons. For example:

**SNPARM = PRES;TMPC;DWPC;THTA**



## GEMPAK Variables

If a parameter is not present in a data set, the program will attempt to derive it from those parameters which are present. For example, if pressure, temperature and dewpoint are present in a data set, then relative humidity can be derived.

In plotting programs, the position of the parameter determines where it will appear with respect to the station location. The first position is centered on the station. The other positions are shown below:

	8	
2	10	4
3	1	5
6	11	7
	9	

In the example above, DWPC is plotted in position 3.

The layer parameters are computed over a default layer between the specified level and the next level upward in the sounding. The depth of the layer for layer averages may be specified preceded by ! in the user input. The shear and RICH calculations can be done relative to a direction by specifying the direction preceded by \$ in the user input.

In-line functions can be used to modify/qualify the output parameters. These functions are applied in the order given; however, arithmetic operators must precede other operators. The function symbols must precede the qualifying value and are defined as follows:

*	multiply	=	equal to
/	divide	\$	direction
+	add	%	vertical coordinate
-	subtract	!	depth
<	less than or equal to		
>	greater than or equal to		

In the case of wind symbols, the size, line width, type and headsiz (arrows) for drawing the symbol may be specified following a colon after the symbol name and after the function specifications if any exist. The drawing attributes are separated by colons. The type is a three-digit number, ABC, interpreted digit by digit as follows:

A	B	C
1 = plot calm wind	1 = start at stn	1 = not filled
2 = ignore calm wind	2 = center at stn	2 = filled
	3 = start on sky symbol	3 = not filled with box
		4 = filled with box

Calm winds are plotted as a circle or an arrowhead for barbs and arrows, respectively. Arrowheads and 50-unit barb flags are filled if C=2 or 4. A box is plotted with background color if C = 3 or 4. For example, if TYPE=122, a barb will be plotted as a

## **GEMPAK Variables**

circle if the wind is calm; it will be centered on the station location, and 50-unit flags will be filled. The default is 111.

Aliases were created to make it easier for the user to plot typical sounding data by using pre-set parameters and colors. To use an alias, enter the alias name for SNPARM and leave COLORS blank. If the user does not leave COLORS blank, the selected colors will be used instead of the pre-set alias colors.

See PRMLST.TBL for a list of current aliases for sounding data.

The GEMPAK sounding parameters and the corresponding four-character abbreviations are:

### **TEMPERATURES**

TMPC - Temperature in Celsius  
TMPF - Temperature in Fahrenheit  
TMPK - Temperature in Kelvin  
THTA - Potential temperature in Kelvin  
THTE - Equivalent potential temperature in Kelvin  
THTS - Saturation equiv. pot. temp. in Kelvin  
THTV - Virtual potential temperature in Kelvin  
TVRK - Virtual temperature in Kelvin  
TVRC - Virtual temperature in Celsius  
TVRF - Virtual temperature in Fahrenheit

### **MOISTURE PARAMETERS**

DWPC - Dewpoint in Celsius  
DWPF - Dewpoint in Fahrenheit  
DWPK - Dewpoint in Kelvin  
DPDC - Dewpoint depression in Celsius  
DPDF - Dewpoint depression in Fahrenheit  
DPDK - Dewpoint depression in Kelvin  
MIXR - Mixing ratio in g/kg  
MIXS - Saturation mixing ratio in g/kg  
PWTR - Precipitable water (mm) up to the specified level  
RELH - Relative humidity in percent  
TMWK - Wet bulb temperature in Kelvin  
TMWC - Wet bulb temperature in Celsius  
THWC - Wet bulb potential temperature in Celsius  
TMWF - Wet bulb temperature in Fahrenheit  
VAPR - Vapor pressure in millibars  
VAPS - Saturation vapor pressure in millibars  
LHVP - Latent heat of vaporization in J/kg

### **HEIGHT**

HGHT - Height in meters  
HGTM - Height in meters (alternate name)  
HGTK - Height in kilometers

## **GEMPAK Variables**

**HGTD** - Height in decameters  
**HGFT** - Height in feet  
**HGFH** - Height in hundreds of feet  
**HGFK** - Height in thousands of feet  
**HGML** - Height in miles  
**STDZ** - Character standard height convention used on upper air charts  
**RSTZ** - Numeric standard height convention used on upper air charts  
**DHGT** - Dry hydrostatic height in meters  
**MHGT** - Moist hydrostatic height in meters

### **PRESSURE AND ALTIMETER**

**PRES** - Station pressure in millibars  
**PMSL** - Mean sea level pressure in millibars  
**ALTI** - Altimeter setting in inches from PRES

### **WINDS**

**ARRW** - Wind arrow (m/s)  
**ARRM** - Wind arrow (m/s)  
**ARRK** - Wind arrow (knots)  
**BARB** - Wind barb (m/s)  
**BRBM** - Wind barb (m/s)  
**BRBK** - Wind barb (knots)  
**DARR** - Wind direction arrows of uniform length  
**UWND** - U component of the wind in meters/second  
**VWND** - V component of the wind in meters/second  
**UKNT** - U component of the wind in knots  
**VKNT** - V component of the wind in knots  
**DRCT** - Wind direction in degrees  
**SPED** - Wind speed in meters/second  
**SKNT** - Wind speed in knots  
**PSPD** - Packed speed and direction (ddfff) in meters/second  
**PKNT** - Packed speed and direction (ddfff) in knots  
**WCMP** - Wind component toward a specific direction  
**WNML** - Wind component toward 90 deg from a specific direction

### **LIFTED CONDENSATION LEVEL**

**TLCL** - Temperature in Kelvin of parcel raised to LCL  
**PLCL** - Pressure in millibars of parcel raised to LCL

### **STABILITY INDICES**

Note: Default depths are enclosed in parentheses.

**SHOW** - Showalter Index  
**LIFT** - Lifted Index (100 mb)  
**LFTV** - LIFT computed by using virtual temperature  
**SWET** - Sweat Index  
**KINX** - K Index  
**CTOT** - Cross Totals Index

## **GEMPAK Variables**

**VTOT** - Vertical Totals Index  
**TOTL** - Total Totals Index  
**CAPE** - Convective Available Potential Energy (500 m)  
**CAPV** - CAPE computed by using virtual temperature  
**CINS** - Convective Inhibition (500 m)  
**CINV** - CINS computed by using virtual temperature  
**EQLV** - Equilibrium Level (500 m)  
**EQTV** - EQLV computed by using virtual temperature  
**LFCT** - Level of Free Convection  
**LFCV** - LFCT computed by using virtual temperature  
**BRCH** - Bulk Richardson Number (500 m, 6000 m)  
**BRCV** - BRCH computed by using CAPV  
**MLTH** - Mixed layer mean potential temperature (500 m)  
**MLMR** - Mixed layer mean mixing ratio (500 m)  
**LCLT** - Temperature in Kelvin of the LCL  
**LCLP** - Pressure in millibars of the LCL  
**PWAT** - Precipitable water (mm) for the whole sounding

### **LAYER QUANTITIES**

Note: Default depths are the layer depths in the sounding except for SEPA for which the layer depth is 5 K.

**RICH** - Richardson number  
**BVFQ** - Brunt-Vaisala frequency  
**BVSQ** - Brunt-Vaisala frequency squared  
**BVPD** - Brunt-Vaisala period  
**LAPS** - Temperature lapse rate  
**STAB** - Potential temperature lapse rate  
**STAP** - Stability with respect to pressure in k/mb  
**SHRM** - Wind shear magnitude  
**SHRD** - Wind shear direction  
**SEPA** - Vertical separation in mb between isentropes

### **STATION VARIABLES**

**STID** - Character station identifier  
**STNM** - 5-digit station identifier  
**SLAT** - Station latitude in degrees  
**SLON** - Station longitude in degrees, West is negative  
**SELV** - Station elevation in meters  
**RANG** - Range (specialized data)  
**AZIM** - Azimuth (specialized data)  
**LATI** - Latitude in degrees  
**LONG** - Longitude in degrees, West is negative  
**DELT** - Delta time (specialized data)

### **MISCELLANEOUS**

**DDEN** - Density of dry air in kg/(m\*\*3)  
**PSYM** - Montgomery stream function  
**MARK** - Markers

## GEMPAK Variables

**TEXT** - Undecoded data  
**LHAN** - Low level Haines Index  
**MHAN** - Middle level Haines Index  
**HHAN** - High level Haines Index

### SPACING

**SPAC** - Plot a space, accounted for in FILTER  
**BLNK** - Plot a blank, not accounted for in FILTER

## 3.156 SNPRMF

SNPRMF specifies the packing formation for the sounding file to be created. It may be the name of a sounding parameter packing file or the information itself entered as follows:

**SNPRMF = PRM1/MIN1-MAX1-RES1;PRM2/MIN2-MAX2-RES2; ...**

where each PRMi, MINi, MAXi, and RESi is the parameter name, minimum, maximum and resolution for a parameter to be included in the file.

If SNPRMF specifies a file name, then each line of the file must contain the following information separated by blanks or tabs:

parameter name	CHAR*4
minimum data value	REAL
maximum data value	REAL
resolution	REAL

The resolution should be an integral power of 10; otherwise the next smaller resolution will be used ( e.g., res = .5 will become .1).

If the data are not to be packed, the minimum and maximum data values and the resolution should not be included. Note that either all of the parameters or none of them must have packing information.

It is important to remember to include the vertical coordinate in the parameter packing list.

SNMERG.PACK is a typical table used to pack sounding data. This file may be used as an example when creating a packing file.

Note that if MRGDAT is NO, the data will be packed using the standard packing for unmerged data, and the value of SNPRMF will be ignored.

## **GEMPAK Variables**

When SNPRMF is used with program NAMSND, the user must supply the parameter packing file name. In this case, two more entries are required for lines of the file, in addition to the four listed above. These entries must contain the GEMPAK names corresponding to the BUFR sounding data parameters listed in the NAMSND output file bufr\_table.dump. The order of the GEMPAK names must be the same as the order of the BUFR parameters, although the names themselves do not have to be the same. The fifth column is the real conversion factor to be applied to the GEMPAK parameter named in the sixth (last) column. Note that the last two columns of data are independent of the first four, and are used only for BUFR to GEMPAK conversion. The parameter named in column one does not necessarily have any relationship to the one referenced in columns five and six. Diagnosed or extra computed parameters may be added anywhere in the packing file for profile data.

### **3.157 SOURCE**

SOURCE indicates whether the data used to compute the average station spacing are to be read from a surface or sounding file. Use SF to read from a surface file and SN to read from a sounding file.

### **3.158 SPLINE**

SPLINE is a logical for using splines to interpolate the data to height levels. Valid input are YES and NO. If NO is selected for SPLINE, linear interpolation, with respect to log pressure, is used.

### **3.159 SQUALL**

SQUALL is the length of the squall line used for the air and moisture flux calculations. The default value is 20000 m. The coordinate rotation is implied in the calculation of the fluxes, since only the V component of the wind is used in the equations. Therefore, ROTATE should be set such that the long axis of the squall line is along X-axis.

### **3.160 STATION**

STATION is the station to use in SFGRAM. Either a station character identifier or station number may be entered.

## **GEMPAK Variables**

If a single station is entered, all traces will use data from that station. If a list of stations is entered, trace 1 will be for station 1, trace 2 for station 2, ... Stations in the list must be separated using semicolons.

### **3.161 STNCOL**

STNCOL specifies the color for the station identifier, time and the parameters specified in STNDEX. These parameters are written at the top of the plot.

### **3.162 STNDEX**

STNDEX is the list of stability indices or station parameters for upper-air data. The items in the list must be separated using semicolons. The depth for the layer averages may be specified preceded by a ! in the user input. For example, BRCH!1000!8000 instructs the program to average over a mixed layer 1000 meters deep and lower tropospheric layer 8000 meters deep. Similarly MLTH!750 results in an average potential temperature over a mixed layer 750 meters deep while the default is 500 meters.

The following is a list of valid names:

## GEMPAK Variables

SHOW	Showalter index
LIFT	Lifted index
LFTV	LIFT computed by using virtual temperature
SWET	SWEAT index
KINX	K index
CTOT	Cross totals index
VTOT	Vertical totals index
TOTL	Total totals index
CAPE	Convective Available Potential Energy
CAPV	CAPE computed by using virtual temperature
CINS	Convective Inhibition
CINV	CINS computed by using virtual temperature
EQLV	Equilibrium Level
EQTV	EQLV computed by using virtual temperature
LFCT	Level of Free Convection
LFCV	LFCT computed by using virtual temperature
BRCH	Bulk Richardson Number
BRCV	BRCH computed by using CAPV
LCLT	Temperature in Kelvin of the LCL
LCLP	Pressure in millibars of the LCL
MLTH	Mean mixed layer potential temperature
MLMR	Mean mixed layer mixing ratio
STID	Station identifier
STNM	Station number
SLAT	Station latitude
SLON	Station longitude
SELV	Station elevation
TEXT	Undecoded data
LHAN	Low level Haines Index
MHAN	Middle level Haines Index
HHAN	High level Haines Index

### 3.163 STNFIL

STNFIL is the name of a file which contains station information which includes the character identifier, number, name, state, country, latitude, longitude and elevation for each station.

All this information, except the station name, is stored as station header information in surface and sounding data files.

The file SFSTNS.TBL is a surface station table. SNSTNS.TBL is an upper-air table.

Information in the files must be stored using the exact format used in current tables, since they are read with a FORTRAN FORMAT statement. They may be changed using a text editor.



## GEMPAK Variables

WARNING: The variable STNFIL is used for both surface and upper-air programs. Care should be taken that the correct file is specified.

### 3.164 STNPLT

STNPLT allows the user to plot station markers and station information.

**text color / text attributes | marker attributes | stnfile # column**

Text color is the color of the station information. If the text color is set to 0, no station information will be plotted. Text attributes are text size, font, width, border, rotation, justification, and hw flag.

Marker attributes are color, type, size, width, and hw flag. If the marker color is 0, no markers will be drawn and the station information will be centered on the station. If the marker color is not specified, a default of 1 will be used.

Stnfile is the station table from which the station information is read.

Column refers to the station table and is the column number from which to get the information to display. The following shows the columns for a station table:

1	ID
2	Number
3	Name
4	State
5	Country
6	Latitude
7	Longitude
8	Elevation
9	Priority
10	Extra information (not always present)

If no column number is given, the station ID will be displayed.

Multiple files with differing colors, types, etc. may be processed by listing the parameters individually separated with a '+' sign. See the third example.

Examples:

```
STNPLT = 5/1|3/12/1.25/2|sfstns.tbl
```

The text color of the station ID is color 5. The text size 1 is used. The marker color is 3. The marker type is 12. The marker size is 1.25 times larger than the default size and the marker width is 2 times larger than the default width. The station table filename from which the station information is read is sfstns.tbl.

## GEMPAK Variables

STNPLT = 17/1|0|snstns.tbl

The text color of the station ID is color 17. The text size is 1. The marker color is 0. No markers appear and the station ID will be centered on the station. Other marker values are set to the defaults. The station table filename from which the station information is read is snstns.tbl.

STNPLT = 17/1|0|snstns.tbl#3

Same as the previous example, but displays the station name instead of the ID.

STNPLT = 5/1|3/12/1.25/2|sfstns.tbl + 17/1|0|snstns.tbl

Combine and plot the first two examples.

### 3.165 STNTYP

STNTYP is used to select the data reporting characteristic of a station. Stations will only be listed if they meet the selected characteristic(s).

The valid types are as follows:

- A = list all stations
- R = list reporting stations
- M = list missing stations
- U = list stations not in station table
- L = list stations in station table

The characteristics may be combined. For example, STNTYP = ML will list missing stations that are in the station table.

It is necessary to set AREA = DSET in order to view any unlisted stations.

IF STNTYP is blank, the default value of 'A' is used.

### 3.166 STREAM

STREAM lines/arrows/stop/slow/scale

The STREAM parameter controls several parameters dealing with the overall streamline calculation and display. "Lines" is a real number multiplier which controls the number (density) of streamlines drawn (default 1.0); "arrows" is a real number multiplier which controls the number of arrowheads displayed (default 1.5\*lines);

## GEMPAK Variables

"stop" is a real number multiplier which controls how close a streamline comes to another streamline before drawing is discontinued (default 0.5); "slow" is a real number multiplier which controls the minimum vector speed threshold for stopping a streamline (default 0.67); "scale" is a real number multiplier which controls how much the input vector field is scaled prior to streamline calculation (default 0.33).

### 3.167 STRMID

STRMID specifies the storm identifier used by programs GPTPC, GPKGRF and GPTCWW:

**Storm id / advisory num / device / num fcst days / text flag**

The storm id is the six or eight character storm identifier given for each particular storm, for example, AL0300 or EP072001. The inclusion of the 2-digit century is optional.

The advisory num is the number of the advisory that the user wishes to see displayed. Both the storm id and the advisory num must be specified in order to view a particular storm. If either or both of these fields are blank, the program will get the storm(s) to be displayed by comparing the contents of the storm history file to the files in the storm advisory directory. Each storm id and advisory number in the history file is checked against the storms in the directory. If a storm advisory is found in the directory which has a higher number than the advisory number given in the history file for that storm, the new advisory is displayed and the history file is updated. If more than one new storm advisory is in the directory for a specific storm, only the latest advisory will be displayed. If new advisories for multiple storms are in the directory, the latest new advisory for each storm will be displayed. (If a storm id and advisory number are explicitly specified using the STRMID parameter, the history file is neither referenced or updated.) The history file must be a local file named 'history.YYYY' for program GPTPC, 'history\_kg.YYYY' for program GPKGRF, and 'history\_tc.YYYY' for program GPTCWW, where YYYY is the 4-digit year. It looks like this:

```
      n
stormid1_adv1
stormid2_adv2
.
.
.
stormidn_advn
```

where n is the number of storm identifiers in the file (in I4 format), and where stormid# is the 8-character storm identifier (e.g., al892001) and adv# is the 3-character storm advisory number (e.g., 009) for the most recently displayed advisory for stormid#.

## **GEMPAK Variables**

The device is the device driver to which the graphics will be sent. The current choices are limited to XW, GF, PSC and, for GPTPC and GPKGRF only, TEST. If TEST is chosen, the program will display the graphics in an XW window only, but the program becomes more interactive than if XW were specified. With TEST, the user has the option of which graphics to see, and is prompted to move from one graphic to the next. XW will create four graphics in successive windows for GPTPC with no user intervention, and a single graphic for GPKGRF with no user intervention except for the possible entering of breakpoints. If no device is specified, the default is GF. For GPKGRF, regardless of the device specified, the track error watch/warn graphic will be shown initially in XW, to allow for confirmation of user-specified breakpoints, if any.

The num fcst days is the number of forecast days of data to display. (This field is not used by program GPTPC.) Permissible values are 3 and 5. The default is 5.

The text flag is Y or N and controls whether or not the watch/ warning breakpoint text product will be created. (This field is only used by program GPKGRF.) The default is Y (yes).

### **3.168 SVRL**

SVRL is the ending valid time for the SLS watches, the colors for the severe thunderstorm and tornado (SLS) watches, a flag for plotting the start and stop times, a flag for plotting the county names for the watches on the map, and a flag to outline the county.

**End time|SVRL colors|Time flag|Label flag|Outline flag|Color code**

SLS watches that are valid at the ending time will be plotted on the map. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST and ALL. LAST will use the system time and plot all current SLS watches. ALL will plot all the watches in the data files, whether they are active, cancelled or expired.

The colors are separated by a semi-colon. If any color is set to 0, that type of symbol will not be plotted. If any color is missing, a default will be used. Defaults are cyan for thunderstorm and red for tornado.

The time flag is YES or NO and controls whether or not to plot the start and stop times of the SLS watch on the map. The default is NO.

The label flag is YES or NO and controls whether or not to plot the county name of the SLS watch on the map. The default is NO.

## GEMPAK Variables

The outline flag is YES or NO and controls whether to outline the SLS watch county instead of plotting a marker. The default is NO. The outline colors are those specified previously. If a watch is a "test" only, a hollow marker will be plotted at the county centroid to indicate this, and no outlining will be done.

The color code flag is YES or NO, if YES, the colors are associated with the last digit of the watch number, otherwise, based on the weather type ( tornado or thunderstorm ).

### 3.169 SYSTEM

SYSTEM is the system (storm) speed (m/s) and direction separated by a "/". These are used to compute the winds relative to the system.

### 3.170 TAXIS

TAXIS contains the range, increment and location for labels on a time axis input as:

**start-stop-inc;lb;gl;tm**

START and STOP are GEMPAK date/times which may be abbreviated. If the values are omitted, the data range will be used. The time axis will be reversed if the TAXIS specification begins with R or if the times are input with a later time first.

INC is the time increment in hours and minutes. The form for INC is HHMM. If one or two digits are entered, hours will be assumed. If INC is omitted, a default appropriate for the range will be used. If the time range exceeds 720 days, the increment is ignored, and an appropriate labelling interval is selected automatically.

LB, GL, and TM are the frequencies for labels, grid lines, and tick marks.

Examples:

5/12-6/18-6

Draw the axis from 5/12 to 6/18 with labels at 6-hour increments.

17/12-20/12-3;2;4;1

Draw the axis from 17/12 to 20/12 with labels at 6-hour increments, grid lines at 12-hour increments, and tic marks at 3-hour increments.

### 3.171 TCMG

TCMG is the ending valid time for the tropical disturbance, the colors for the disturbance symbol, the arrows, and the storm danger area, and the name of the center issuing the graphic.

**End time|SY;AR;DA colors|center name**

Tropical disturbances that are valid at the ending time will be plotted on the map. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST. LAST will use the system time and plot all current tropical disturbances. ALL is not valid for TCMG.

The colors are separated by a semi-colon. If any color is set to 0, the color will not be changed. If any color is missing, a default will be used. Defaults are red for the tropical disturbance symbols, orange for the track arrows, and magenta, yellow, green, purple, cyan, blue, coral, pink, dark green and dark orange for the danger areas for tropical systems 1 through 10, respectively, in either the Atlantic or Pacific.

The name of the center is either TPC or CPHC. If anything other than CPHC is specified, the center will default to TPC. TPC will plot Atlantic tropical disturbances and Pacific tropical disturbances east of the dateline. CPHC will only plot Pacific tropical disturbances east of the dateline.

Recommended values of GAREA for use with TCMG are GAREA = -4;-104;61;-2 for TPC Atlantic disturbances GAREA = -4;-180;41;-80 for TPC Pacific disturbances GAREA = -4;180;41;-140 for CPHC Pacific disturbances

### 3.172 TEXT

TEXT is the size, font, text width and hardware/software flag for graphics text separated with slashes:

text size / font / width / border /  
rotation / justification / hw flag

The size may be a real number multiplier for the default text size. If the size is zero or unspecified, the current size will be used.

The size may also be a name, or the first character of a name. The name is converted to a real number multiplier. For hardware text, the named sizes correspond to discrete point sizes. Sizes other than the named sizes will be rounded to the nearest point size. Any size may be given for software text. The standard names and size values are given in the table FONTSZ.TBL:

## GEMPAK Variables

Name	Size	HW Point
----	----	-----
Tiny	0.714	10
Small	0.857	12
Medium	1.000	14
Large	1.286	18
Huge	1.714	24
Giant	2.429	34

The text width is the integer line width to be used in generating software text. If the text size, font or width is not specified, the current value is used.

The text border is a border/blank fill flag. If the input value is less than or equal to zero, the current value is used. Border is a three digit number, ABC, where:

A - Border	B - Blank Fill	C - Border Type
-----	-----	-----
1 = No	1 = No	1 = Regular Box
2 = Yes	2 = Yes	2 = Low Pressure Box
		3 = High Pressure Box
		4 = Freezing Level Box
		5 = Underline
		6 = Overline

Low and high border types refer to the low and high outlines for use on aviation forecast products.

The text rotation is a character input that specifies whether the text is aligned with the screen (S) or with north (N) on a given image. If the choice is invalid or not specified, the current value will be used.

The text justification is a character input that specifies whether the text is justified to the center (C), right (R), or left (L). If the choice is invalid or not specified, the current value will be used.

The hardware/software selector must be HW or SW to change to hardware- or software-generated text. This selector can appear anywhere in the string.

The font number must be specified by using the HW selector and choosing a font number from the list below.

	REGULAR	ITALIC	BOLD	ITALIC-BOLD
Courier	1	11	21	31
Helvetica	2	12	22	32
Times	3	13	23	33

There are also two software fonts. Font 1 has the full set of upper and lower case letters. Font 2 has only the upper case letters. Both fonts also contain all symbols and

## GEMPAK Variables

numerals. If the font number, 1 or 2, is preceded by a digit greater than or equal to 2, then the line width of the characters is increased to emulate a bold font. If a particular device driver does not support hardware fonts, the requested font is emulated using the software fonts.

Examples:

TEXT = 1/21/SW	--	text size = 1; bold software font 1
TEXT = 1/2/HW	--	text size = 1; hardware text font 2
TEXT = 2.5	--	text size = 2.5; current text font
TEXT = 1.24///221/s/c	--	text size = 1.24; current text font; current text width; Border = yes, Blank fill = yes, Border type = box; screen relative; center justified

### 3.173 THTALN

THTALN specifies the color, line type, line width, minimum, maximum, and increment for the background dry adiabats (potential temperature lines) on thermodynamic diagrams:

**line color / line type / width / minimum / maximum / increment**

The values should be separated by slashes. If THTALN is blank, no lines will be drawn.

### 3.174 THTELN

THTELN specifies the color, line type, line width, minimum, maximum, and increment for the background moist adiabats (equivalent potential temperature lines) on thermodynamic diagrams:

**line color / line type / width / minimum / maximum / increment**

The values must be separated by slashes. If THTELN is blank, no lines will be drawn.

### 3.175 TILT

TILT is the Radar beam elevation/tilt angle. The tilt angle can be a real number. The sweep with the closest mean elevation angle will be used.



### 3.176 TIMSTN

TIMSTN contains the maximum number of times to include in a file and the number of stations to be included in addition to the stations in STNFIL.

### 3.177 TITLE

TITLE is the title color, title line, and title string separated by slashes:

**title color / title line location / title string | short title**

If the title color is 0, a title is not plotted.

The title line specifies the line on which the title will be written. The value of the title line has the following meanings:

0	bottom line
-n	n lines from bottom
+n	n lines from top

If the line is not specified, the default is program dependent.

The title string is the title to be written. If no title string is specified, a default title will be determined by the program.

In the grid display programs, special characters will be replaced as follows:

^	Forecast date/time
~	Valid date/time
@	Vertical level
_	Grid function
\$	Nonzero scaling factor
#	Grid point location
?	Day of the week flag

If the information for which a character stands is not applicable to the program, nothing is output in its place. Zero values of the scaling factor are not displayed.

If the "?" is included the abbreviated day of the week is added to the beginning of the date/time string. The day of the week flag must always be used in combination with either special character for specifying the date/time string. The result is the day of the week for the valid date/time.

A short title may also be input by the user after a |. This is used to label the metafile frame in the NC device driver. If the short title is blank, a suitable label is generated for the frame. The day of the week is not included in the short title.

## GEMPAK Variables

### 3.178 TOPOFL

TOPOFL is topographic input file. A topography file is 2 byte little endian (LSB) raster of elevation data prepended by an 80 byte header that describes the navigation bounds.

TOPOFL can be either a file name, or a known abbreviation (current abbreviations are DEM30 and DEM5 as described below).

If TOPOFL is DEM30, the source terrain file is the 30 second topographic data set obtained from NGDC's GLOBE data set:

**<http://www.ngdc.noaa.gov/seg/topo/globe.shtml>**

Note that this data set does not contain bathymetry. Sea floor is set to constant -500m.

If TOPOFL is DEM5, the source file is the 5 minute topographic and bathymetric data set from NGDC's ETOP terrainbase set:

**<http://www.ngdc.noaa.gov/seg/fliers/se-1104.shtml>**

Topography files can be obtained from:

**5 minute dataset (aka DEM5):**

**[http://my.unidata.ucar.edu/downloads/168/world\\_topo.5min.gz](http://my.unidata.ucar.edu/downloads/168/world_topo.5min.gz)**

**30 second dataset (aka DEM30):**

**[http://my.unidata.ucar.edu/downloads/169/world\\_topo.30s.gz](http://my.unidata.ucar.edu/downloads/169/world_topo.30s.gz)**

Topography files can be placed in \$GEMTBL/unidata/.

### 3.179 TRACE

TRACE parameters contain specifications for each trace on the meteogram in the following format:

**parameters/colors/range/witnes!parameters/colors/range/witnes**

The parameters before the ! will be plotted on the left of the plot; those after the ! will be plotted on the right. The parameters may be any GEMPAK surface parameter. Real-valued parameters will be drawn as a graph. Character valued parameters will be rotated 90 degrees and written on the plot. Symbol parameters will be drawn as symbols.

For GUST and GUMS, the character G will be plotted. Up to four parameters may be plotted along each axis. The parameters must be separated using semicolons. Character and weather symbol data may only be plotted in positions 1, 2 or 3.

Each parameter name may be followed by a colon, the size or line type, a second colon and the width. For example, WSYM:.5:5 will draw weather symbols half the default

## **GEMPAK Variables**

size with a line width of 5. For example, TMPF:3 will plot a temperature line using dash pattern 3.

The colors for the parameters must also be separated using semicolons. If a single number is entered, all parameters are drawn in that color. If a zero is entered, the current default color is used.

The range specifies the scaling of the y axis. The format is: start;stop;increment. Note that in this program, the parts of range must be separated using semicolons. If no range is given, it is selected using the data values.

Witness lines are specified in WITNES. These are horizontal dotted lines. A list of y values may be entered separated by semicolons. If the value of witnes is YES, a witness line will be centered on the plot.

### **3.180 TROPHT**

TROPHT is the user estimated tropopause height in meters. The default value is 10000 m.

### **3.181 TRPINT**

TRPINT is the user chosen distance above (and below) the tropopause which is used for layer calculations. The default value is 1000 m.

### **3.182 TSTEP**

TSTEP specifies the time step, in minutes, for the calculation of updated position of the parcel within the grid domain.

### **3.183 TVS**

TVS specifies the plot symbol and filter attributes for tornado vortex signatures:

**color / marker / size / width / hw ; filter**

A color value of 0 is used to turn off TVS plotting

FILTER is a logical variable or real number which controls the filtering of data in order to eliminate plotting of overlapping data.

### 3.184 TXTFIL

TXTFIL specifies an ASCII text file to be read and displayed to the the current device driver.

If the input file is LOGO, the NOAA logo is plotted. To specify plotting of the NOAA LOGO enter:

LOGO | size | mode

or

NOAA | size | mode

The NWS logo can be plotted by entering:

NWS | size | mode

The size is a real number that specifies the size of the logo. The default size is 1.

The mode is a character that specifies the color mode of the logo. The options are 'M' for monochrome or 'C' for full color. The default is set for 'M'.

### 3.185 TXTLOC

TXTLOC specifies the start location for plotting the contents of an ASCII text file specified by TXTFIL. The X and Y coordinates are separated by a semi-colon:

**x ; y**

The X and Y are given in normalized-type coordinates for the given panel. They range from 0.0 to 1.0 in each dimension. The origin is at the lower left corner of the panel. For example,

**TXTLOC = .25 ; 1**

The values are treated as a percentage of the panel size in each dimension. Therefore, in this example, the text starts at a point 25% of the X direction panel size and at the top of the panel in the Y direction.

TXTLOC can also specify the location in map coordinates. The map coordinates start with a # and are separated by a semicolon:

**#lat ; lon**

### 3.186 TYPE

TYPE specifies the processing type for the GDPLLOT2 GDPFUN parameter. The TYPE list does not need separators, however slashes could be used for clarity:

**type 1 / type 2 / ... / type n**

Valid inputs for type are:

**SCALAR TYPEs:**

C	the original GEMPAK contouring algorithm
L	GEMPAK contouring algorithm without subboxes
F	contour fill algorithm
X	box algorithm -- same as contour fill, but draws lines around the polygons rather than filling in polygons.
P	plot grid point values
D	plot scaler as a directional arrow

**VECTOR TYPEs:**

A	wind arrows
B	wind barbs
S	streamlines

**OTHER TYPEs:**

M	plot grid point markers
G	plot grid indices (row/column numbers)

Note that contour attributes are specified in CONTUR. The contour interval and line characteristics for types C, L, S and X are read from CINT and LINE and for type F from FINT and FLIN. The wind arrow and barb characteristics are read from WIND. The streamline characteristics are read from STREAM. The marker characteristics are read from MARKER. The grid point index characteristics are read from GRDLBL.

Examples:

TYPE = C	--	draws contour lines
TYPE = C / F	--	draws filled contours overlaid with lines
TYPE = A	--	plots wind arrows
TYPE = BS	--	plots wind barbs and streamlines
TYPE = CFMP	--	draws contour lines and fill, plots a marker at all grid point locations and the grid point values at all locations

## GEMPAK Variables

### 3.187 UKAFIL

UKAFIL is the intermediate input/output ASCII file, e.g., SIGWXHI.txt.

### 3.188 VCOORD

VCOORD specifies the vertical coordinate system of the levels to process. Currently, there are four coordinates:

NONE	=	surface data only
PRES	=	pressure
THTA	=	theta (isentropic)
HGHT	=	height

A list or range of levels will be based on the vertical coordinate type, with the exception of MAN or VAS which always refer to a pressure coordinate system.

Note that data are ignored within superadiabatic layers found working upwards from the surface when interpolations are performed to isentropic coordinates.

### 3.189 VERCEN

VERCEN allows the GDGRIB user to specify the contents of bytes 4, 5, 6, and 26 of the GRIB PDS. The input is given as follows:

**byte\_4/byte\_5/byte\_6/byte\_26**

Values may be omitted in specifying VERCEN. For example, to omit the first and third values, specifying only the second and fourth, enter the following:

**/byte\_5/byte\_26**

If values are omitted, the following defaults are inserted:

#### **BYTE Default value Meaning**

4	2	Parameter Table Version #
5	7	CENTER # (7->NCEP)
6	0	Generating Process ID
26	5	Sub-center (5->HPC)

See NCEP OFFICE NOTE 388 for more information on how to set these parameters. Below is a table of center numbers that may be used in byte number 7 of the PDS.

## GEMPAK Variables

ID# NAME ABBREV

007 US Weather Svc - Nat. Cntrs for Envir. Prediction NCEP  
008 US Weather Svc - NWS Telecommunications Gateway NCEP  
009 US Weather Svc - Field Stations NCEP  
034 Japanese Meteorological Agency - Tokyo JMA  
052 US Weather Svc (NCEP/TPC) Nat. Hurricane Cntr - Miami NHC  
054 Canadian Meteorological Service - Montreal CMS  
057 US Air Force - Global Weather Central GWC  
058 US Navy - Fleet Numerical Oceanography Center FNOC  
059 NOAA Forecast Systems Laboratory - Boulder, CO FSL  
060 Nat. Center for Atmos. Research (NCAR) - Boulder, CO NCAR  
074 UK Meteorological Office - Bracknell UKMO  
085 French Weather Service - Toulouse FWS  
097 European Space Agency (ESA) ESA  
098 Eur. Cntr for Medium-range Wthr Frcts - Reading ECMWF  
099 DeBilt, Netherlands DEBILT

### 3.190 VGFILE

VGFILE is the name of the Vector Graphics File (VGF) to be displayed or processed. It also specifies the name of the scale file and attribute file that are used by GPMAP to alter objects in the VGF when displayed or stored in the output device, e.g., XW, FAX, GIF, etc. These files allow the VGF object attributes to be tailored to meet the display requirements of FAX, GIF, and other supported product formats. The scale and attribute file names are specified using the "|" character as a delimiter in the following format:

**vgfile | scale file | attribute file**

Specifying the scale file allows a limited set of object attributes in the VGF to be changed in the output device by multiplying their values by numbers defined in the scale file. The following parameters can be scaled:

Parameter Name	Description
-----	-----

## GEMPAK Variables

PIPSIZE	Front Pip Size
FRONTSTRENGTH	Frontal strength
SYMWIDTH	Symbol width
SYMSIZE	Symbol size
WINDWIDTH	Wind barb/arrow width
WINDSIZE	Wind barb/arrow size
WINDHDSIZ	Wind barb head size
LINEWIDTH	Line width
SPLWIDTH	Special line width
SPLSIZE	Special line pattern size
TEXTSIZE	Text size
TEXTWIDTH	Text width
SPTXTSIZE	Special text size
SPTXTWIDTH	Special text width

The parameter name must appear in the scale file followed by an equal sign, "=", and a real value. See the table \$GEMTBL/pgen/scale.fax for examples.

Specifying the attribute file allows VGF object attributes to be modified for output devices by setting their values. Attributes such as color, size, thickness, etc. can be changed for particular object sub-types, e.g., cold fronts. Also, sub-types can be eliminated from the output device by setting their major color number to -1.

The value of the attribute for an object in the attribute file overrides the value in the VGF with the following exceptions:

1. If the value for an attribute is set to 0, then it is not changed except in the case of smoothing.
2. If the attribute file value for smoothing is -1, then smoothing remains unchanged.
3. Rotation values in the attribute file are ignored.

The attribute file can also be used to change the object sub-type. For example, all underlined text objects can be changed to non-underlined text objects.

The attribute file uses a similar format as the table \$GEMTBL/pgen/setting.tbl. The file, \$GEMTBL/pgen/uattribd.tbl provides a sample template for the attribute file and additional instructions.

### 3.191 WARN

WARN is the ending valid time for the warnings, the colors for the severe thunderstorm, tornado and flash flood warnings, a flag for plotting the start and stop times, a flag for plotting the county names for the warning on the map, and a flag to outline the county.



## GEMPAK Variables

**End time|T-storm color;Tornado color;Flash flood color|Time flag|  
Label flag|Outline flag**

Warnings that are valid at the ending time will be plotted on the map. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST and ALL. LAST will use the system time and plot all current warnings. ALL will plot all the warnings in the data files, whether they are active, cancelled or expired.

The colors are separated by a semi-colon. If any color is set to 0, that type of symbol will not be plotted. If any color is missing, a default will be used. Defaults are cyan for thunderstorm, red for tornado, and green for flash flood.

The time flag is YES or NO and controls whether or not to plot the start and stop times of the warning on the map. The default is NO.

The label flag is YES or NO and controls whether or not to plot the county name of the warning on the map. The default is NO.

The outline flag is YES or NO and controls whether to outline the warned county instead of plotting a marker. The default is NO. The outline colors are those specified previously. If a warning is a "test" only, a hollow marker will be plotted at the county centroid to indicate this, and no outlining will be done.

### 3.192 WATCH

WATCH is the ending valid time for the watches, the colors for the severe thunderstorm and tornado watches and a flag for plotting the start and stop times for the watch on the map.

**End time | Watch colors | Time flag | Label flag | Color code**

Watches that are valid at the ending time will be plotted on the map. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST and ALL. LAST will use the system time and plot all current watches. ALL will plot all the watches in the data files, whether they are active, cancelled or expired.

If a status message was issued for the watch, a line will be plotted dividing the expired portion of the watch from the active portion.

The colors are separated by a semi-colon. If any color is set to 0, that type of line will not be plotted. If any color is missing, a default will be used. Defaults are cyan for thunderstorm, red for tornado, and yellow for status line.

## **GEMPAK Variables**

The time flag is YES or NO and controls whether or not to plot the start and stop times of the watch on the map. The default is NO.

The label flag is YES or NO and controls whether or not to plot the watch box number on the map. The default is NO.

The color code flag is YES or NO, if YES, the colors are associated with the last digit of the watch number, otherwise, based on the weather type ( tornado or thunderstorm ).

### **3.193 WAVLEN**

WAVLEN is the wavelength for the gravity or lee wave in kilometers. If no wavelength is required, use 99999.

### **3.194 WAVSPD**

WAVSPD is the wave speed in m/s. This is used for calculating the SCORER parameter.

### **3.195 WCN**

WCN is the ending valid time for the watch county notification(WCN), the colors for the county bounds, a flag for plotting the start and stop times, a flag for plotting the county names for the WCN on the map, and a flag to outline the county.

**End time | county bounds color | Time flag | Label flag |  
Watch number | Outline flag | Color code flag**

WCNs that are valid at the ending time will be plotted on the map. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST and ALL. LAST will use the system time and plot all current WCNs. ALL will plot all the WCN in the data files, whether they are active, cancelled or expired.

The colors are separated by a semi-colon. If any color is set to 0, that type of symbol will not be plotted. If any color is missing, a default will be used. Defaults are cyan for thunderstorm, red for tornado.

The time flag is YES or NO and controls whether or not to plot the start and stop times of the WCNs on the map. The default is NO.

## GEMPAK Variables

The label flag is YES or NO and controls whether or not to plot the county name of the WCNs on the map. The default is NO.

The watch number flag is YES or NO and controls whether or not to plot the watch number of the WCNs on the map. The default is NO.

The outline flag is YES or NO and controls whether to outline the county instead of plotting a marker. The default is NO. The outline colors are those specified previously. If a WCN is a "test" only, and markers are selected, then a hollow marker will be plotted at the county centroid to indicate this. If the outline flag is YES, there is no difference when plotting regular reports and test reports.

The color code flag is YES or NO, if YES, the colors are associated with the last digit of the watch number, otherwise, based on the weather type ( tornado or thunderstorm ).

### 3.196 WEIGHT

WEIGHT is the Barnes weighting parameter. Typical values are between 20 and 50. A value of 20 is the default.

### 3.197 WIND

WIND specifies the wind symbol, size, width, type, and head size separated by slashes:

**wind symbol / size / width / type / arrow head size**

The wind symbol contains a letter for symbol type, a letter for symbol units and a color number with no separators. The character meanings are:

TYPE:	B = BARB	A = ARROW	D = DIRECTIONAL
ARROW			

UNITS:	K = KNOTS	M = m/s
--------	-----------	---------

COLOR:	Color number	0 = no wind plotted
--------	--------------	---------------------

The default is BM1, i.e., barbs in meters/sec plotted in color number 1. If a partial specification is given, the remaining characteristics will be taken from the default.

The wind size is a real number which will be used as a multiplier for the default wind symbol size. If this number is negative, zero, or missing, the current size will be used. The sizes for barbs and arrows are independent.

The width is an integer specifying the line width to use in drawing the arrows or barbs.

## GEMPAK Variables

The type is a four-digit number, FABC, interpreted digit by digit as follows:

A	B	C
1 = plot calm wind	1 = start at stn	1 = not filled
2 = ignore calm wind	2 = center at stn	2 = filled
	3 = start on sky symbol	3 = not filled with box
		4 = filled with box

F is a flag which specifies whether to plot the wind barb on the opposite side from where it would normally occur. If, F is not equal to zero, the wind barb is flipped.

Calm winds are plotted as a circle or an arrowhead for barbs and arrows, respectively. Arrowheads and 50-unit barb flags are filled if C=2 or 4. A box is plotted with background color if C = 3 or 4. For example, if TYPE=132, a barb will be plotted as a circle if the wind is calm; it will begin on the edge of the cloud cover symbol, and 50-unit flags will be filled. The default is 111.

The head size is a real valued multiplier used for the length of the arrow head. This variable is not used for wind barbs.

### 3.198 WINPOS

WINPOS specifies the position for plotting winds for vertical profile plots. Up to three separate wind profiles may be plotted. The stability indices will also be positioned at the top of the plot according to WINPOS. Position 1 is the leftmost position. The value of WINPOS will be incremented modulo 3 until the screen is cleared or the program is run again.

### 3.199 WMOHDR

WMOHDR allows specification of a WMO header for a GRIB message.

#### **WMO\_ID / Origin\_ID / DDHHMM**

The first six bytes of the header (WMO\_ID) must be given. The four-character originating center identifier (Origin\_ID) defaults to KWBC. The six-character reference day, hour, and minute (DDHHMM) defaults to values from the reference time in the GRIB PDS (bytes 15, 16, and 17, respectively).

Bytes 7 and 12 of the WMO header are always blank.

Only the 21-byte version of the WMO header is generated.

## **GEMPAK Variables**

### **3.200 WOU**

WOU is the ending valid time for the watch outline update(WOU), the colors for the county bounds, a flag for plotting the start and stop times, a flag for plotting the county names for the WOU on the map, and a flag to outline the county.

**End time | county bounds color | Time flag | Label flag |  
Watch number | Outline flag | Color code flag**

WOUs that are valid at the ending time will be plotted on the map. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST and ALL. LAST will use the system time and plot all current WOUs. ALL will plot all the WOU in the data files, whether they are active, cancelled or expired.

The colors are separated by a semi-colon. If any color is set to 0, that type of symbol will not be plotted. If any color is missing, a default will be used. Defaults are cyan for thunderstorm, red for tornado.

The time flag is YES or NO and controls whether or not to plot the start and stop times of the WOUs on the map. The default is NO.

The label flag is YES or NO and controls whether or not to plot the county name of the WOUs on the map. The default is NO.

The watch number flag is YES or NO and controls whether or not to plot the watch number of the WOUs on the map. The default is NO.

The outline flag is YES or NO and controls whether to outline the county instead of plotting a marker. The default is NO. The outline colors are those specified previously. If a WOU is a "test" only, and markers are selected, then a hollow marker will be plotted at the county centroid to indicate this. If the outline flag is YES, there is no difference when plotting regular reports and test reports.

The color code flag is YES or NO, if YES, the colors are associated with the last digit of the watch number, otherwise, based on the weather type ( tornado or thunderstorm ).

### **3.201 WSTM**

WSTM is the ending valid time for the winter storms, the colors for the storm warning, watch and advisory, a flag for plotting the start and stop times, a flag for plotting the zone names for the storms on the map, and a flag to outline the zone.

**End time|Warn color;Watch color;Advisory color|Time flag|Label flag|  
Outline flag**

## **GEMPAK Variables**

Winter storms that are valid at the ending time will be plotted on the map. The ending time is given as a GEMPAK date/time string. Any missing items from the string will be filled in by the system time. The ending time may also be LAST and ALL. LAST will use the system time and plot all current storm messages. ALL will plot all the messages in the data files, whether they are active, cancelled or expired.

The colors are separated by a semi-colon. If any color is set to 0, that type of symbol will not be plotted. If any color is missing, a default will be used. Defaults are red for warning, orange for watch, and yellow for advisory.

The time flag is YES or NO and controls whether or not to plot the start and stop times of the storm message on the map. The default is NO.

The label flag is YES or NO and controls whether or not to plot the zone name of the storm message on the map. The default is NO.

The outline flag is YES or NO and controls whether to outline the storm zone instead of plotting a marker. The default is NO. The outline colors are those specified previously. If a message is a "test" only, a hollow marker will be plotted at the zone centroid to indicate this, and no outlining will be done.

### **3.202 XAXIS**

XAXIS contains the left bound, right bound, label increment, and frequency information separated by slashes in the form:

**left/right/increment/lbfq:gdfq;tkfq**

The frequencies for labels, grid lines, and tick marks follow the last slash and are separated with semicolons. Appropriate defaults are provided if values are not specified. If the increment is positive, all the label values will be divisible by the increment. If it is negative, the label values will begin with the left value and be separated by the increment. The bounds and increment are for the scaled data.

### **3.203 YAXIS**

YAXIS contains the lower bound, upper bound, label increment, and frequency information separated by slashes in the form:

**lower/upper/increment/lbfq:gdfq;tkfq**

## GEMPAK Variables

The frequencies for labels, grid lines, and tick marks follow the last slash and are separated with semicolons. If the increment is positive, all the label values will be divisible by the increment. If it is negative, the label values will begin with the lower value and be separated by the increment. The bounds and increment are for the scaled data.

Defaults will be supplied if no specification is given. The following defaults will be used when appropriate:

vcoord	lower	upper	defaults
-----	-----	-----	-----
PRES	1020	100	Mandatory levels
THTA	270	400	10
HGHT	0	20000	1000

## **GEMPAK Variables**