CHAPTER 4

GEMPAK Programs

4.1 ACPROF

ACPROF draws profiles of ACARS data

INPUT PARAMETERS

SFFILE	Surface data file
DATTIM	Date/time
AREA	Data area
SNPARM	Sounding parameter list
LINE	Color/type/width/label/smth/fltr
PTYPE	Plot type/h:w ratio/margins
VCOORD	Vertical coordinate type
STNDEX	Stability indices
STNCOL	Stability index color
WIND	Wind symbol/siz/wdth/typ/hdsz
WINPOS	Wind position
MARKER	Marker color/type/size/width/hw
BORDER	Background color/type/width
TITLE	Title color/line/title
DEVICE	Device|name|x size;y size|color type
YAXIS	Ystrt/ystop/yinc/lbl;gln;tck
XAXIS	Xstrt/xstop/xinc/lbl;gln;tck
FILTER	Filter data factor
CLEAR	Clear screen flag
PANEL	Panel loc/color/dash/width/regn
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
THTALN	THTA color/dash/width/mn/mx/inc
THTELN	THTE color/dash/width/mn/mx/inc
MIXRLN	MIXR color/dash/width/mn/mx/inc

PROGRAM DESCRIPTION

ACPROF draws profiles of ACARS data. The program is derived from SNPROF to use ACARS data stored in ship format files. If AREA is given as a single tail number (eg @FSL0001) then only data from that aircraft will be used. If AREA is given as a region (eg DEN) then all aircraft in vicinity of that location will be used. AREA can be expanded/contracted as usual with +,*/-. All observations in the given time range will be used. Once data is obtained, program behavior is similar to SNPROF.

Any two parameters that can be computed from the data set can be plotted. These parameters are specified in SNPARM. The profiles' colors, line types, and widths are specified in LINE. Markers identifying the data points can be plotted by setting a color

in MARKER. A different MARKER number is assigned to each aircraft. If marker numbers overlap, the marker color is incremented.

The type of y axis is specified in PTYPE. LIN, LOG, STUVE, and SKEW are all valid. Note that SKEW is only valid when plotting temperature vs. pressure. The bottom and top of the axis, along with an increment for labels, are set in YAXIS. If the panel is changed to be less than the full screen, the default margins will often be too large. The margins can be set explicitly in PTYPE.

Winds are plotted in the right margin and can be specified in WIND. There are three positions available for plotting winds. They are numbered 1 to 3, with 1 being the left-most position. The location for the wind to be plotted is specified in WINPOS. The positions also apply to the station identifier, date/time and stability indices which are plotted above the diagram.

Dry adiabats, moist adiabats and mixing ratio background lines can be added to the diagram. The attributes of these lines are specified in THTALN, THTELN, and MIXRLN.

If the color is set to 0, no lines will be plotted. If the start, stop and increment are not set, defaults will be supplied. Note that these lines can only be drawn on plots of pressure versus temperature.

FILTER in this program determines whether the wind barbs are filtered.

EXAMPLES

1. Plot a Skew T chart using ACARS observations in the vicinity of DEN.

```
SFFILE    =  acars.gem
DATTIM    =  all
AREA      =  den
SNPARM    =  tmpc;dwpc
LINE      =  2;4
PTYPE     =  skewt
VCOORD    =  PRES
STNDEX    =
STNCOL    =  1
WIND      =  BM1
WINPOS    =  1
MARKER    =  0
BORDER    =  1
TITLE     =  1
DEVICE    =  XW
YAXIS     =
XAXIS     =
FILTER    =  N
CLEAR     =  YES
```

PANEL = 0
TEXT = 1
THTALN = 8/1/1
THTELN = 6/10/1
MIXRLN = 5/2/1

ERROR MESSAGES

[ACPROF+6] Background lines cannot be drawn.

[ACPROF+5] Stability indicies are specified with color = 0

[ACPROF+4] Parameter ... was requested with color set to 0.

[ACPROF+3] Winds cannot be computed.

[ACPROF+2] Parameter ... is a character type.

[ACPROF+1] Parameter ... cannot be computed.

[ACPROF-1] Fatal error initializing TAE.

[ACPROF-2] Fatal error reading TAE parameters.

[ACPROF-3] Fatal error initializing GEMPLT.

[ACPROF-4] The plot type ... is invalid.

[ACPROF-5] The the x-axis range must be specified in XAXIS.

[ACPROF-6] The two parms use different temperature units.

[ACPROF-7] The vertical coordinate ... cannot be computed.

[ACPROF-8] The range along the x or y axis is invalid.

[ACPROF-9] No valid stations were found.

[ACPROF-10] SNPARM has not been specified.

4.2 CPCGSTN

CPCGSTN searches for stations located inside specified areas from a Vector Graphics File.

INPUT PARAMETERS

VGFILE	Vgfile | scale file | attribute file
DATTIM	Date/time
STNFIL	Station information file
OUTPUT	Output device/filename

PROGRAM DESCRIPTION

CPCGSTN lists all stations in a given station table, and indicates which stations are located inside areas drawn in the Vector Graphics File. The areas must be drawn using the "tick mark" special line. The file may contain multiple areas that do not overlap.

If the given polygon is not closed, then the appropriate portion of the U.S. border is used to construct a closed polygon.

The DATTIM is only used to fill in the format of the output listing. In this way the output listing may be used as input to SFEDIT.

The output includes the station number, GEMPAK time, the flag indicating if the station is inside (1) or outside (0) of the polygon and the polygon color.

EXAMPLES

1. Identify the stations located in the polygons in the VG file vgf.vgf. Use the current system time and the station table stns_ll90.tbl. The output is displayed to the terminal.

```
VGFILE  =  vgf.vgf
DATTIM  =  last
STNFIL  =  stns_ll90.tbl
OUTPUT  =  t
```

2. As in example 1, except the output is written to the file data.dat.

```
VGFILE  =  vgf.vgf
DATTIM  =  last
STNFIL  =  stns_ll90.tbl
OUTPUT  =  f/data.dat
```

EXAMPLE OUTPUT

PARM = FLAG;ICLR

STN	YYMMDD/HHMM	FLAG	ICLR
69002	010831/1822	1	17
69007	010831/1822	1	17
69008	010831/1822	1	17
69012	010831/1822	0	0
69013	010831/1822	0	0
69014	010831/1822	0	0
69016	010831/1822	0	0
69017	010831/1822	0	0
69019	010831/1822	0	0
70026	010831/1822	0	0

....

ERROR MESSAGES

[CPCGSTN-1] Fatal error initializing TAE.

[CPCGSTN-2] Fatal error reading TAE parameters.

[CPCGSTN-3] Error initializing GEMPLT.

[CPCGSTN]

4.3 GD2NDFD

GD2NDFD converts a GEMPAK grid to an NDFD GRIB2 file.

INPUT PARAMETERS

GDFILE	Grid file
GFUNC	Scalar grid
GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GBFILE	GRIB data file name
CENTER	Originating Center ID #/Sub-Center ID #
WMOHDR	WMO_ID/Origin_ID/DDHHMM

PROGRAM DESCRIPTION

GD2NDFD converts a GEMPAK grid to an NDFD GRIB2 file.

The input grids for the computation must be in GDFILE. The converted GRIB2 message is added to the output file, GBFILE. If GBFILE does not exist, it will be created.

The parameter CENTER allows the GD2NDFD user to specify the originating or generating center ID and sub-center ID of the GRIB2 message.

A World Meteorological Organization (WMO) header may be prefixed to the GRIB2 message by giving at least the first six bytes of the header in the WMOHDR input parameter. Default values will be supplied for the originating center (KWBC) and reference time.

EXAMPLES

Convert all times for paramter TMPK from GEMPAK grid format to NDFD GRIB2 format. The output is written to file hrcbob.ndfd.

```
GDFILE   = $GEMDATA/hrcbob.grd
GFUNC    = tmpk
GDATTIM  = all
GLEVEL   = 0
GVCORD   = none
GBFILE   = hrcbob.ndfd
CENTER   = 7/5
WMOHDR   = HTRE50
```

ERROR MESSAGES

[GD2NDFD+6] WMO header center ID inconsistent with PDS byte 5.

[GD2NDFD-1] Fatal error initializing TAE.

[GD2NDFD-2] Fatal error reading TAE parameters.

[GD2NDFD-3] Error initializing GEMPLT.

[GD2NDFD-4] Grid file could not be opened.

[GD2NDFD-5] Grid navigation could not be set in GEMPLT.

[GD2NDFD-6] Grid diagnostics package initialization failed.

[GD2NDFD-7] Error interpolating to output grid.

[GD2NDFD-8] GRIB message is too long.

[GD2NDFD-9] First 6 characters of WMO header must be given.

[GD2NDFD-10] User supplied WMO header is too long.

[GD2NDFD-11] Invalid grid navigation set in PROJ.

[GD2NDFD-12] Invalid grid area set in GRDAREA or CPYFIL.

[GD2NDFD-13] Invalid grid size.

[GD2NDFD-14] (i,j) -> lat/lon transformation failed.

[GD2NDFD-15] lat/lon -> (i,j) transformation failed.

[GD2NDFD-16] Cannot set output grid navigation.

[GD2NDFD-17] Cannot set input grid navigation.

[GD2NDFD-18] Invalid horizontal interpolation type.

[GD2NDFD] BDS errors:

[GD2NDFD-21] BDS section is too long.

[GD2NDFD-22] Number of packing bits is invalid.

[GD2NDFD-23] Data range is not valid.

[GD2NDFD-24] Binary scaling is invalid.

[GD2NDFD-25] Computation of the reference value failed.

[GD2NDFD-26] BDS array accomodation is too small.

[GD2NDFD-27] The calculation of the # of bits needed failed.

[GD2NDFD-28] All data is missing -- no GRIB message made.

[GD2NDFD] BMS errors:

[GD2NDFD-41] BMS section is too long.

[GD2NDFD-42] BMS array allocation is too small.

[GD2NDFD] GDS errors:

[GD2NDFD-61] Not enough bytes for the GDS.

[GD2NDFD-62] Number in i direction is too large.

[GD2NDFD-63] Number in j direction is too large.

[GD2NDFD-64] Latitude 1 is invalid.

[GD2NDFD-65] Longitude 1 is invalid.

[GD2NDFD-66] Latitude 2 is invalid.

[GD2NDFD-67] Longitude 2 is invalid.

[GD2NDFD-68] Rotated CED projection is not supported.

[GD2NDFD-69] Rotated STR projection is not supported.

[GD2NDFD-70] DX grid increment is invalid.

[GD2NDFD-71] DY grid increment is invalid.

[GD2NDFD-72] Central longitude is invalid.

[GD2NDFD-73] True latitudes are invalid.

[GD2NDFD-74] Rotated MER projection is not supported.

[GD2NDFD-75] Grid projection is not supported.

[GD2NDFD] PDS errors:

[GD2NDFD-83] Cannot find parameter in tables.

[GD2NDFD-84] Parameter # found is not valid in GRIB.

[GD2NDFD-85] Vertical coordinate not found in table.

[GD2NDFD-86] Vertical coordinate is not valid in GRIB.

[GD2NDFD-87] Level value is too large for GRIB.

[GD2NDFD-88] Level is less than zero.

[GD2NDFD-89] Dual GEMPAK times not supported.

[GD2NDFD-90] 4-digit year required in in-line (^) DATTIM.

[GD2NDFD-91] Forecast must be in hours.

[GD2NDFD-92] Array allocation for PDS is too small.

[GD2NDFD-93] Decimal scale factor is too large.

[GD2NDFD-94] Parameter name is too long to be in table.

4.4 GDBIINT

GDBIINT interpolates grids from one projection to another

INPUT PARAMETERS

GDFILE	Grid file
GDOUTF	Output grid file
GFUNC	Scalar grid
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GDATTIM	Grid date/time
GDNUM	Grid numbers

PROGRAM DESCRIPTION

GDBIINT uses bi-linear interpolation to convert grid point data from one projection to another.

The output file must be created first using GDCFIL. The program determines the location of the output grid point locations withing the input grid file domain. Each grid in the input file is interpolated to the output file.

If GDNUM is ALL, all grids from the input file will be interpolated to the output file. Otherwise, the single grid specified by GFUNC, GDATTIM, GLEVEL and GVCORD will be interpolated.

EXAMPLES

1. Convert a data set from grid 211 to grid 87. First create a new grid file with gdcfil using CPYFIL = #87.

```
GDFILE    =  $HDS/98033112_grid211.gem
GDOUTF    =  $HDS/98033112_grid87.gem
GDNUM     =  all
```

2. Convert the LAND mask from grid projection 212 to grid projection 211.

```
GDFILE    =  $HDS/98033112_grid211.gem
GDOUTF    =  $HDS/98033112_grid87.gem
GFUNC     =  mask
GDATTIM   =  f000
GLEVEL    =  0
GVCORD    =  none
GDNUM     =
```

ERROR MESSAGES

[GDBIINT-1] Fatal error initializing TAE.

[GDBIINT-2] Fatal error reading TAE parameters.

4.5 GDCFIL

GDCFIL creates a GEMPAK grid file.

INPUT PARAMETERS

GDOUTF	Output grid file
PROJ	Map projection/angles/margins|drop flag
GRDAREA	Area covered by grid
KXKY	Number of grid points in x;y
MAXGRD	Maximum number of grids
CPYFIL	Grid file whose navigation is to be used in new grid file |
ANLYSS	Grid analysis block

PROGRAM DESCRIPTION

This program creates a GEMPAK grid file. Information about the file to be created is received from the input values, from the grid navigation table, or from an existing grid file.

Each grid file must contain navigation information. It may also contain analysis block information which is used when an objective analysis program writes to the grid file.

If the value in CPYFIL begins with a #, the rest of the string specifies a grid number or name contained in the grid navigation table. Any other non-blank entry in CPYFIL is taken as the name of an existing grid file, whose navigation and analysis blocks will be copied to the new grid file.

If CPYFIL is blank, the navigation and analysis information will be obtained from PROJ, GRDAREA, KXKY, and ANLYSS. KXKY contains the number of points in the x and y directions. The two integers must be separated with a semicolon. If the grid projection type specified in PROJ is CED, the grid spacing consisting of deltax and deltay may be entered in KXKY by prefixing the numbers with a #. DELTAX and DELTAY are in degrees longitude and degrees latitude, respectively. The analysis information specifies DELTAN, which is the station spacing, and the extend area separated by a slash. The extend area is four integers separated by semicolons. If ANLYSS is blank, default values will be assigned. If there is no analysis block in the file to be copied, ANLYSS is used to create one.

MAXGRD is the maximum number of grids which will be allowed in the grid file.

EXAMPLES

1. Create a grid file called lfm.grd from the information in the grid navigation table, allowing up to 1000 grids in the file. PROJ, GRDAREA and KXKY are ignored since this information will be obtained from the grid navigation table.

```
GDOUTF    =  lfm.grd
PROJ      =
GRDAREA   =
KXKY      =
MAXGRD    =  1000
CPYFIL    =  #lfm
ANLYSS    =
```

2. Create a grid file called sound.grd with a maximum of 15 grids. The grid dimensions are 20 by 30; the area is US in a Mercator projection. The station spacing is 5 degrees of latitude and the grid extension for objective analysis is 3 grid points in each direction.

```
GDOUTF    =  sound.grd
PROJ      =  mer
GRDAREA   =  us
KXKY      =  20;30
MAXGRD    =  15
CPYFIL    =
ANLYSS    =  5/3;3;3;3
```

3. Create a file for evenly spaced lat/lon grids over area IL- using a grid spacing of .75 degrees in each direction. Compute reasonable values for the analysis block.

```
GDOUTF    =  il.grd
PROJ      =  ced
GRDAREA   =  il-
KXKY      =  #.75;.75
MAXGRD    =  100
CPYFIL    =
ANLYSS    =
```

4. Create a grid file called new.grd from the information within grid file old.grd.

```
GDOUTF    =  new.grd
PROJ      =
GRDAREA   =
KXKY      =
MAXGRD    =  100
CPYFIL    =  old.grd
ANLYSS    =
```

ERROR MESSAGES

[GDCFIL+1] WARNING: This grid is too large for GEMPAK programs.

[GDCFIL-1] Fatal error initializing TAE.

[GDCFIL-2] Fatal error reading TAE parameters.

[GDCFIL-3] Fatal error initializing GEMPLT.

[GDCFIL-4] Navigation information is invalid.

[GDCFIL-5] Grid area ... is invalid.

[GDCFIL-6] Grid size is invalid.

[GDCFIL-7] The grid file name may not be blank.

[GDCFIL-8] Navigation table cannot be read.

[GDCFIL-9] Grid name ... cannot be found in grid table.

[GDCFIL-10] Extend region is invalid. Try 2;2;2;2.

4.6 GDCNTR

GDCNTR draws contour lines through a scalar grid.

INPUT PARAMETERS

GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GFUNC	Scalar grid
GDFILE	Grid file
CINT	Contour interval/min/max
LINE	Color/type/width/label/smth/fltr
MAP	Map color/dash/width/filter flag
TITLE	Title color/line/title
DEVICE	Device|name|x size;y size|color type
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
PROJ	Map projection/angles/margins|drop flag
GAREA	Graphics area
IJSKIP	Iskp;Istrt;Istp/Jskp;Jstrt;Jstp
CLEAR	Clear screen flag
PANEL	Panel loc/color/dash/width/regn
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
SCALE	Scalar scale / vector scale
LATLON	Line color/dash/width/freq/inc/label/format
HILO	Color/symbol/rng/rad/cnt/intp
HLSYM	HILO txt size/posn/font/wdth/hw
CLRBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
CONTUR	Subbox/smooth
SKIP	Skip_cntr/skip_plt_x;skip_plt_y
FINT	Fill interval/min/max
FLINE	Fill colors/fill types
CTYPE	Contour type: C/F
LUTFIL	Enhancement lookup table filename
STNPLT	Txtc/txt attr|marker attr|stnfil#col
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info

PROGRAM DESCRIPTION

GDCNTR draws contour lines through a scalar grid computed using the GEMPAK grid diagnostic functions. Contours may be drawn in any valid GEMPAK projection and may be overlaid on images.

A list of times may be given in GDATTIM allowing animation of the contours.

Contours may be plotted in different display windows by specifying a name for the XW driver in DEVICE.

Contours may be displayed as lines or as a color fill. If CTYPE is C, contour lines are drawn using input from CINT and LINE. If CTYPE is F, filled contours are drawn us-

ing specifications from FINT and FLINE. Both contour lines and filled contours are drawn if CTYPE is F/C.

The attributes of the contour lines, including the color, line type, line width, and label frequency are specified in LINE. The four attributes must be separated with slashes; semicolons separate the values for each attribute. If the line type is set to a single negative number, negative contour values will have the absolute value of the line type and positive values will be solid. If the label frequency is set to a single number, n, then every nth value will be labeled.

CINT specifies the contour interval, minimum value, and maximum value separated with slashes. A scaling factor may be entered in SCALE. The data in the grid file will be multiplied by 10 ** SCALE before the contour levels are selected. If no contour interval is entered, a default value which will generate 5 to 10 contour levels will be selected.

The contour fill intervals are specified in FINT; the attributes for the fill are specified in FLINE. The first color specified in FLINE fills values less than the first level; while the last color fills values greater than the last level. Therefore, n levels require n+1 colors.

A range of colors may be specified in either FLINE or LINE by specifying starting, ending and increment values in that order separated by dashes. If the increment is missing, a default of 1 is used.

The fill type may be set to 1 (solid), 2 (slanted dash) or 3 (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.

The HILO and HLSYM parameters control marking and labeling the values of relative maxima and minima. CLRBAR allows a color bar to be added for color fill contours.

The SKIP parameter specifies the number of grid points to skip in generating contours. For example, if SKIP = 1, every other point is used to generate the contours.

EXAMPLES

1. Draw contours every 2 degrees through the 700 mb temperature field for all of the forecast times. Negative values will be dashed using line type 3; every other contour line will be labeled; all the contour lines will be drawn in color number 3. The display area will be a enlarged Mercator map centered on New York. The contours are drawn on a clear screen with a map in dash pattern 7, dotted lat/lon lines every 5 degrees and no title.

   GDATTIM = all

```
GLEVEL    =  700
GVCORD    =  pres
GFUNC     =  tmpc
GDFILE    =  $GEMDATA/hrcbob.grd
CINT      =  2
LINE      =  3/-3/1/2
MAP       =  1/7
TITLE     =  0
DEVICE    =  xw
SATFIL    =
RADFIL    =
PROJ      =  mer
GAREA     =  ny-
CLEAR     =  yes
PANEL     =  0
TEXT      =  1
SCALE     =  999
LATLON    =  2/10/1/1/5;5
HILO      =
HLSYM     =
CLRBAR    =
CONTUR    =  3
SKIP      =  0
FINT      =  0
FLINE     =  10-20
CTYPE     =  C
LUTFIL    =
STNPLT    =
```

2. Now overlay dewpoint lines on the above plots. The contour interval is set to 5. The lines will be drawn in color 17, with labeling and line types as above. The map and lat/lon lines will not be drawn for the overlay. The title, which includes the date, level and the string "TEMPERATURE AND DEWPOINT", is added in color 1.

```
GDATTIM   =  all
GLEVEL    =  700
GVCORD    =  pres
GFUNC     =  dwpc
GDFILE    =  $GEMDATA/hrcbob.grd
CINT      =  5
LINE      =  17/-3/1/2
MAP       =  0
TITLE     =  1//~ @ TEMPERATURE AND DEWPOINT
DEVICE    =  xw
SATFIL    =
RADFIL    =
PROJ      =  mer
GAREA     =  ny-
CLEAR     =  no
PANEL     =  0
TEXT      =  1
SCALE     =  999
```

```
LATLON  =  0
HILO    =
HLSYM   =
CLRBAR  =
CONTUR  =  3
SKIP    =  0
FINT    =  0
FLINE   =  10-20
CTYPE   =  C
LUTFIL  =
STNPLT  =
```

3. Now clear the screen and draw a color fill of the divergence of the gridded wind, alternating between color 23 and 19, for the 24 hour forecast time. Scale the data by 10**5 and use a contour interval of 0.5. Draw contour lines in color 2 using heavy, solid lines, labeling every contour level. Draw a color bar of the fill colors using the default conditions. The display area is changed to Missouri and the lat/lon lines are plotted at 5 degree intervals.

```
GDATTIM  =  f24
GLEVEL   =  700
GVCORD   =  pres
GFUNC    =  div(wnd)
GDFILE   =  $GEMDATA/hrcbob.grd
CINT     =  .5
LINE     =  2/1/7/1
MAP      =  1
TITLE    =  1
DEVICE   =  xw
SATFIL   =
RADFIL   =
PROJ     =  mer
GAREA    =  mo
CLEAR    =  yes
PANEL    =  0
TEXT     =  1
SCALE    =  5
LATLON   =  0
HILO     =
HLSYM    =
CLRBAR   =  1
CONTUR   =  3
SKIP     =  0
FINT     =  .5
FLINE    =  23;19
CTYPE    =  f/c
LUTFIL   =
STNPLT   =
```

4. Clear the screen and draw contours of absolute vorticity. Label vorticity maxima with a red X and minima with a cyan N. Plot the values of the

extrema. Exclude minima less than 4 * 10 ** -5. The search radius for finding extrema is 5 grid points. Interpolate the extrema to off-grid point locations. Plot the values in font number 2 on the right beneath the marking symbol. Plot the marking label in size 1.5, the values in size 1.

```
GDATTIM   =  f24
GLEVEL    =  700
GVCORD    =  pres
GFUNC     =  avor(wnd)
GDFILE    =  $GEMDATA/hrcbob.grd
CINT      =  2
LINE      =  2/1/2
MAP       =  1
TITLE     =  1
DEVICE    =  xw
SATFIL    =
RADFIL    =
PROJ      =  mer
GAREA     =  ri
CLEAR     =  yes
PANEL     =  0
TEXT      =  1
SCALE     =  5
LATLON    =  0
HILO      =  2;6/X#;N#/;4-28/5//yes
HLSYM     =  1.5;1/3/1;2
CLRBAR    =  1
CONTUR    =  3
SKIP      =  0
FINT      =  2
FLINE     =  23;19
CTYPE     =  f/c
LUTFIL    =
STNPLT    =
```

ERROR MESSAGES

[GDCNTR+1] WARNING. There are no contour levels.

[GDCNTR-1] Fatal error initializing TAE.

[GDCNTR-2] Fatal error reading TAE parameters.

[GDCNTR-3] Fatal error initializing GEMPLT.

[GDCNTR-4] Grid requested is not available.

[GDCNTR-5] Error setting grid navigation for file ....

[GDCNTR-6] There are no grids in grid file.

[GDCNTR-13] There are no times in the grid file

4.7 GDCROSS

GDCROSS displays a vertical cross section of scalar and/or vector grids.

INPUT PARAMETERS

CXSTNS	Cross-section station line
GDATTIM	Grid date/time
GVCORD	Grid vertical coordinate
GFUNC	Scalar grid
GVECT	Vector grid
GDFILE	Grid file
WIND	Wind symbol/siz/wdth/typ/hdsz
REFVEC	Mag;x;y;txtsiz/font/wdth/HW;labl
PTYPE	Plot type/h:w ratio/margins
YAXIS	Ystrt/ystop/yinc/lbl;gln;tck
IJSKIP	Iskp;Istrt;Istp/Jskp;Jstrt;Jstp
CINT	Contour interval/min/max
SCALE	Scalar scale / vector scale
LINE	Color/type/width/label/smth/fltr
BORDER	Background color/type/width
TITLE	Title color/line/title
CLEAR	Clear screen flag
DEVICE	Device|name|x size;y size|color type
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
PANEL	Panel loc/color/dash/width/regn
CLRBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
CONTUR	Subbox/smooth
FINT	Fill interval/min/max
FLINE	Fill colors/fill types
CTYPE	Contour type: C/F

PROGRAM DESCRIPTION

GDCROSS draws a vertical cross section between two points in a grid field. The cross-section path is a line segment on the grid projection plane joining the two points. Gridded data are interpolated to the cross-section plane at intervals corresponding to approximately one grid increment.

CXSTNS specifies the beginning and ending points of the cross section. Each point may be entered as a latitude and longitude separated by a semicolon, as station identifiers or numbers or as x and y grid coordinates separated by a semicolon and preceded by @. The two points are separated by >. The cross section end points may also be selected graphically by setting CXSTNS with the CURSOR command. The end points are then selected by clicking on a horizontal map displayed in another GEMPAK XW window.

The vertical coordinate, set in GVCORD, can be PRES, THTA, HGHT, or SGMA. The data must be stored in that vertical coordinate in the grid file. No automatic vertical interpolation is included. The vertical axis scaling, set in PTYPE, can be LIN, LOG,

KAP or STUVE. STUVE and KAP are the same; SKEWT may not be entered. The plot aspect ratio and margins may also be entered in PTYPE.

Both scalar and vector fields can be displayed in the cross-section plane. Contour lines are drawn through the scalar field. Contours may be color filled. The line contours and filled contours are specified as in GDCNTR. CLRBAR allows a color bar to be added for color fill contours. Vector fields may be depicted using arrows or barbs.

If M is entered in WIND, winds will be displayed in meters per second unless the KNOTV operator has been specified in GVECT, in which case the winds will be displayed in knots. IF K is entered in WIND, the wind is displayed in knots.

Circulations can be displayed in the cross-section plane by specifying GFUNC = CIRC (V, W), where V is a vector field and W is the scalar vertical motion in the GVCORD coordinate. The horizontal component of the circulation is the tangential component of V. The vertical component is W scaled up to account for the exaggerated aspect ratio of the display relative to that of the real atmosphere. For the CIRC operator, W is assumed to be pressure velocity in mb/s for PRES and THTA coordinates and cm/s for the HGHT coordinate. If the vertical component does not require scaling, the circulation can be specified explicitly in the form GVECT = VECR (TANG (V), W)/VERT, where VERT is a flag indicating that the vector components should not be rotated to be north-relative.

EXAMPLES

1. Plot temperature in Celsius on a log-P chart along the cross section from LAX to BWI. Plot the filled contours using every other color from 30 to 8. Plot the contour lines in color number 32, using solid lines. Plot wind barbs for the wind. Plot a horizontal color bar centered under the cross section.

```
CXSTNS    =  lax>bwi
GDATTIM   =  f06
GVCORD    =  pres
GFUNC     =  tmpc
GVECT     =  wnd
GDFILE    =  $GEMDATA/hrcbob.grd
WIND      =  bm6//2
REFVEC    =  10
PTYPE     =  log
YAXIS     =
CINT      =
SCALE     =
LINE      =  32/1/3
BORDER    =  1
TITLE     =  1
CLEAR     =  yes
DEVICE    =  xw
```

```
TEXT     =  1
PANEL    =  0
CLRBAR   =  1/h/cc/.5;.03/.6;.01
CONTUR   =  3
FINT     =
FLINE    =  30-8-2
CTYPE    =  c/f
```

2. Now, using the same file, plot a log pressure cross section of the vorticity advection, scaled by 10**9. Also, plot the ageostrophic circulation using arrows. Use a cross-section line from grid point (1,1) to grid point (10,20). Use a height-to-width plot ratio of 0.25.

```
CXSTNS   =  @1;1>@10;20
GDATTIM  =  f06
GVCORD   =  pres
GFUNC    =  adv(avor(wnd),wnd)
GVECT    =  circ(age;omeg)
GDFILE   =  $GEMDATA/hrcbob.grd
WIND     =  am6//2//.75
REFVEC   =  5;.05;.2
PTYPE    =  log/.25
YAXIS    =
CINT     =  .5
SCALE    =  9
LINE     =  32/1/2
BORDER   =  1
TITLE    =  1
CLEAR    =  yes
DEVICE   =  xw
TEXT     =  1
PANEL    =  0
CLRBAR   =  1/h/cc/.5;.2/.1;.01
CONTUR   =  3
FINT     =  0/0/0
FLINE    =  4;2
CTYPE    =  c/f
```

ERROR MESSAGES

[GDCROSS+2] Surface value of GVCORD is not available.

[GDCROSS+1] WARNING. There are no contour levels.

[GDCROSS-1] Fatal error initializing TAE.

[GDCROSS-2] Fatal error reading TAE parameters.

[GDCROSS-3] Fatal error initializing GEMPLT.

[GDCROSS-4] Input for CXSTNS is invalid.

[GDCROSS-5] Input for GDATTIM is invalid.

[GDCROSS-6] Input for GVCORD is invalid.

[GDCROSS-7] Input for PTYPE is invalid.

[GDCROSS-8] Graph coordinates are incorrectly defined.

[GDCROSS-9] No points found for cross section.

[GDCROSS-10] LOG is not possible for this vertical coordinate.

[GDCROSS-11] Cross-section coordinates are invalid.

[GDCROSS-12] No levels--check input for GDATTIM and GVCORD.

[GDCROSS-13] @LEVEL in-line parameter is not allowed.

[GDCROSS-14] %VCORD in-line parameter is not allowed.

[GDCROSS-18] GVECT cannot be evaluated.

[GDCROSS-19] GFUNC cannot be evaluated.

[GDCROSS-20] Input for YAXIS is invalid.

4.8 GDDELT

GDDELT deletes grids from GEMPAK grid files.

INPUT PARAMETERS

GDFILE	Grid file
GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GFUNC	Scalar grid

PROGRAM DESCRIPTION

GDDELT deletes grids from GEMPAK grid files.

The user can specify a particular grid by making appropriate inputs for GVCORD, GLEVEL, GDATTIM, and GFUNC.

GDATTIM allows several different input options. If LIST is entered, a list of dates/times will be provided after running the program. Upon choosing one of these times, a data search will be conducted. Entering ALL will allow the program to match data pertaining to all of the dates/times in the file.

GLEVEL also has several options unique to matching grid headers. Entering ALL will match data pertaining to all of the levels in the file. If two levels are entered separated by a dash, this gives all of the levels within that range, including the bounding levels. Entering MAN will match and copy all of the mandatory pressure levels into the output file.

GVCORD controls the vertical coordinate search. One vertical coordinate can be entered for the search, or ALL may be entered which will match all of the vertical coordinates in the file.

GFUNC specifies the grid parameter name. If one parameter is entered, the program searches for that parameter only. If ALL is entered, the program will match all of the parameters in its search. Entering several parameters separated by semicolons will match those parameters only.

EXAMPLES

1. Delete the temperature in Kelvin at the 500-millibar level after choosing from a list of times within NGM.GRD.

```
GDFILE   = ngm.grd
GVCORD   = pres
GLEVEL   = 500
GDATTIM  = list
```

```
GFUNC     =  tmpk
```

2. Delete the relative humidity value at 950 millibars from SFC.GRD.

```
GDFILE    =  sfc.grd
GVCORD    =  pres
GLEVEL    =  950
GDATTIM   =  961031/0000f000
GFUNC     =  relh
```

3. Delete all of the relative wind values on the sigma coordinate from all levels from TODAY.GRD.

```
GDFILE    =  today.grd
GVCORD    =  sgma
GLEVEL    =  all
GDATTIM   =  all
GFUNC     =  urel;vrel
```

4. Delete the 500-millibar height grid for forecast hour 00 from the file MRF.GRD.

```
GDFILE    =  mrf.grd
GVCORD    =  pres
GLEVEL    =  500
GDATTIM   =  f00
GFUNC     =  hght
```

ERROR MESSAGES

[GDDELT-1] Fatal error initializing TAE.

[GDDELT-2] Fatal error reading TAE parameters.

[GDDELT-3] Invalid grid range entered.

[GDDELT-4] Grid number ... is invalid.

[GDDELT-5] There are no grids in file ....

[GDDELT-6] No valid grids in list.

[GDDELT-7] Input grid ... cannot be found.

4.9 GDDIAG

GDDIAG computes a scalar diagnostic grid and adds it to the grid file.

INPUT PARAMETERS

GDFILE	Grid file
GDOUTF	Output grid file
GFUNC	Scalar grid
GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GRDNAM	Grid parameter name
GPACK	Packing type/number of bits

PROGRAM DESCRIPTION

GDDIAG computes a diagnostic grid and saves the result in a GEMPAK grid file.

The input grids for the computation must be in GDFILE. The resulting grid is added to the output file, GDOUTF. The input and output files may be the same.

The name of the output grid is given in GRDNAM. If this value is blank, the name generated by the grid diagnostic package will be used. The time, level, and vertical coordinate associated with the grid may also be set in GRDNAM using the inline parameter specifications: ^time, @level, %coordinate name. These specifications follow the grid name.

GPACK defines grid packing. If GPACK is blank, no packing will be done. Grid packing details are documented in the GPACK variable documentation.

EXAMPLES

1. Compute the divergence of the gridded wind at 850 mb from the 48-h forecast for the last model run and save the result in MYFILE.GRD. Use the default name for the grid. Do not pack the grid.

```
GDFILE   = ngm.grd
GDOUTF   = myfile.grd
GFUNC    = div [wnd]
GDATTIM  = f48
GLEVEL   = 850
GVCORD   = pres
GRDNAM   =
GPACK    = none
```

2. Compute the magnitude of the gradient of the dewpoint depression at 500 mb for the last time in the grid file and store the result in the input

file. Name the output grid DEWGRAD. Use GRIB packing with 16 bits per grid point.

```
GDFILE    =  ngm.grd
GDOUTF    =  ngm.grd
GFUNC     =  mag ( grad ( sub ( tmpc, dwpt ) ) )
GDATTIM   =  last
GLEVEL    =  500
GVCORD    =  pres
GRDNAM    =  dewgrad
GPACK     =  grib/16
```

3. Compute the 12-h time change of the layer difference of potential temperature between 700 and 500 mb. Assign the difference to 600 mb at a time between the two difference times. Name the grid DTHTDP.

```
GDFILE    =  ngm.grd
GDOUTF    =  ngm.grd
GFUNC     =  sub ( ldf ( thta ), ldf ( thta^F06 ) )
GDATTIM   =  f18
GLEVEL    =  500:700
GVCORD    =  pres
GRDNAM    =  dthtdp^f12@600
GPACK     =  grib/16
```

ERROR MESSAGES

[GDDIAG-1] Fatal error initializing TAE.

[GDDIAG-2] Fatal error reading TAE parameters.

[GDDIAG-3] Error initializing GEMPLT.

[GDDIAG-4] There is no input file specified.

[GDDIAG-5] Navigation in input and output files differs.

[GDDIAG-6] Error opening input files.

[GDDIAG-7] Error writing output grid.

[GDDIAG-8] Only one output file is permitted.

[GDDIAG-9] Output file open failure.

[GDDIAG-10] Grid files have different navigations.

[GDDIAG-11] Output level is invalid.

[GDDIAG-12] Output time is invalid.

[GDDIAG-13] Output vertical coordinate is invalid.

4.10 GDEDIT

GDEDIT reads grids from a sequential edit file and adds them to a GEMPAK grid file.

INPUT PARAMETERS

GDEFIL	Grid edit file
GDFILE	Grid file
GPACK	Packing type/number of bits

PROGRAM DESCRIPTION

GDEDIT reads grids from a sequential text edit file and adds them to a GEMPAK grid file. The input edit file can be created using a text editor or using the OUTPUT = F option in GDLIST.

Certain header information must be included before the grid data. Required information includes the grid size and the grid identifier. Scaling information may also be included.

The grid size must be included on a line:

```
COLUMNS:  1  33              ROWS:  1  14
```

The edit grid must begin at column = 1 and row = 1 and include the entire grid. WARNING: the edit grid size must match the size specified in the grid file. Otherwise, a fatal error is generated.

The grid identifier is found on a line such as:

```
921027/1200F48              850       PRES      DIVWND
```

The first line containing a slash (/) is assumed to be a grid identifier. The order of values is: time 1, time 2 (optional), level 1, level 2 (optional), vertical coordinate, parameter name.

If the data were scaled before being listed, scaling information must be included.

This is of the form:

Scale factor: 10**5

The scaling information is found by searching for "factor" and "**".

Data follow this header information. The rows are assumed to read from the last (top) to the first. Each row of data contains:

```
ROW  14  0.27   .   .   .
```

The word ROW and the row number must be included. The row number is NOT checked to see that this is the correct row. Data for each row may wrap to the next line.

An example of a grid edit file follows:

Grid file: SMALL.GRD

GRID:	TIME1	TIME2	LEVEL1	LEVEL2	VCORD	PARM
	921025/0000		0		PRES	TMPC
AREA:	DSET		GRID SIZE:		7	6
COLUMNS:	1	7	ROWS:	1	6	

Scale factor : 10**0

COLUMN:	1	2	3	4	5	6	7
ROW 6	-12.81	-12.40	-11.98	-11.30	-10.82	-11.18	-12.25
ROW 5	-9.89	-9.90	-9.41	-8.26	-7.00	-6.43	-6.80
ROW 4	-2.14	-2.94	-3.66	-3.43	-2.36	-1.29	-0.92
ROW 3	4.12	4.25	3.23	2.35	2.63	3.51	3.98
ROW 2	6.39	7.35	7.03	6.29	6.31	6.85	7.14
ROW 1	7.26	7.95	7.80	7.57	7.87	8.49	8.96

EXAMPLES

1. Add the grids in the edit file GDLIST.FIL to the grid file 25DEC12Z.GRD. Do not pack the data.

```
GDEFIL      =  gdlist.fil
GDFILE      =  25dec12z.grd
GPACK       =
```

2. Add the grid in TMPC.FIL to the grid file NMC.GRD. Pack the data using the GRIB format. Select the number of bits so that precision to two digits after the decimal place will be retained.

```
GDEFIL      =  tmpc.fil
GDFILE      =  nmc.grd
GPACK       =  +2/dec
```

ERROR MESSAGES

[GDEDIT-1] Fatal error initializing TAE.

[GDEDIT-2] Fatal error reading TAE parameters.

[GDEDIT-3] Valid grid identifier not found.

[GDEDIT-4] Grid size cannot be determined.

[GDEDIT-5] The grid size in the edit file is incorrect.

[GDEDIT-6] Error reading grid data.

[GDEDIT-7] The edit file ... is invalid.

[GDEDIT-8] The output grid file ... is invalid.

4.11 GDGRIB

GDGRIB computes a scalar diagnostic grid and adds it to a GRIB file.

INPUT PARAMETERS

GDFILE	Grid file
GFUNC	Scalar grid
GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GBTBLS	Input GRIB decoding tables
GBFILE	GRIB data file name
VERCEN	PDS byte_4/byte_5/byte_6/byte_26
PDSVAL	GRIB PDS grid identifier overrides
PRECSN	Packing precision
WMOHDR	WMO_ID/Origin_ID/DDHHMM
CPYFIL	Grid file whose navigation is to be used in new grid file |
PROJ	Map projection/angles/margins|drop flag
GRDAREA	Area covered by grid
KXKY	Number of grid points in x;y

PROGRAM DESCRIPTION

GDGRIB computes a diagnostic grid and saves the result in a GRIB file.

The input grids for the computation must be in GDFILE. The resulting GRIB message is added to the output file, GBFILE. If GBFILE does not exist, it will be created.

The parameters PDSVAL and VERCEN allow control over how the grid is identified in the Product Definition Section (PDS) of the GRIB message. The PRECSN parameter allows the user to specify the precision of the data packing in two different ways: either in terms of binary precision with rounding to the nearest power of two or decimal precision in terms of the number of significant digits to preserve.

A World Meteorological Organization (WMO) header may be prefixed to the GRIB message by giving at least the first six bytes of the header in the WMOHDR input parameter. Default values will be supplied for the originating center (KWBC) and reference time.

GDGRIB will interpolate scalar fields horizontally to a different output grid. The navigation for the output grid is specified using CPYFIL (see below) or by setting the PROJ, GRDAREA, and KXKY parameters. The Grid Description Section (GDS) in the GRIB message will represent this navigation.

Do not attempt to interpolate grid-relative vector components to another grid because this requires a rotation of a vector, which cannot be done without both vector components and is beyond the capability of the current version of GDGRIB. North- relative

components may be interpolated. Wind direction should NOT be interpolated in any case. GDS byte 17 is currently set for north-relative (meteorological coordinate) wind components if the output grid navigation (specifically, the projection type, central longitude, and true latitudes) is different from that of the input grid. If the output grid navigation is not changed, always specify grid-relative wind components in GFUNC when writing wind components to GRIB messages.

CPYFIL provides the only means of setting PDS byte number 7 (grid identification number) to something other than 255, which indicates that the grid is defined in the GDS. CPYFIL may be set to the name of a GEMPAK grid file (other than the file specified in GDFILE), in which case the output grid is interpolated to the grid whose navigation is defined in the GEMPAK grid file; however, byte number 7 will be set to 255 and the navigation will be available only from the GDS. If CPYFIL is set to #NNN, grid number NNN is found in grdnav.tbl, and NNN is less than 255, then PDS byte number 7 will be set to NNN. Even in this case, a GDS is provided.

The CPYFIL parameter supersedes PROJ, GRDAREA, and KXKY input. If CPYFIL is valid, PROJ, GRDAREA, and KXKY are ignored. If CPYFIL is invalid, PROJ, GRDAREA, and KXKY will be used if they are valid.

GBTBLS allows for specification of the GRIB decoding tables. The defaults are:

$GEMTBL/grid/wmogribX.tbl, $GEMTBL/grid/ncepgribX.tbl, $GEMTBL/grid/vcrdgrib1.tbl,

where X is replaced by the value of byte 4 of the PDS, which, if not specified in VERCEN, defaults to 2.

EXAMPLES

1. Compute the average absolute vorticity of the 250- and 300- mb wind for the 24-h forecast. Assign this to the 275-mb level in the GRIB message PDS. Also assign the appropriate parameter number for absolute vorticity (AVOR). Use decimal precision to pack the data so as to preserve 4 decimal significant digits. Change PDS bytes 6 and 26 to reflect that the data source is from a high resolution eta model run diagnosed at the Storm Prediction Center (sub-center number 9). Interpolate the grid to standard AWIPS grid 212, without using CPYFIL so that PDS byte 7 will be 255. Do not make a WMO header. The output is written to file hrcbob.pgrb.

```
GDFILE    =  $GEMDATA/hrcbob.grd
GFUNC     =  avg(avor(wind@300),avor(wind@250))
GDATTIM   =  f24
GLEVEL    =  300
GVCORD    =  pres
```

```
GBTBLS    =
GBFILE    =  hrcbob.pgrb
VERCEN    =  //110/9
PDSVAL    =  AVOR@275
PRECSN    =  d/4
WMOHDR    =
CPYFIL    =
PROJ      =  lcc/25;-95;25
GRDAREA   =  12.190;-133.459;57.290;-49.385
KXKY      =  185;129
```

2. Transfer the 24-h forecast of the 500-mb temperature grid into a GRIB file. Use binary precision to pack the data to the nearest 1/8 K. The output GRIB message is to be added to existing file hrcbob.pgrb. Accept default entries for the PDS, with the parameter number coming from a specific lookup table (wmogrib3.tbl) in $GEMTBL. Also, add the WMO header for 500-mb temperature destined for Family of Services, and interpolate to grid 212 using CPYFIL so that PDS byte 7 is set to 212.

```
GDFILE    =  $GEMDATA/hrcbob.grd
GFUNC     =  tmpk
GDATTIM   =  f24
GLEVEL    =  500
GVCORD    =  pres
GBTBLS    =  wmogrib3.tbl
GBFILE    =  hrcbob.pgrb
VERCEN    =
PDSVAL    =
PRECSN    =  b/-3
WMOHDR    =  HTRE50
CPYFIL    =  #212
PROJ      =
GRDAREA   =
KXKY      =
```

3. Transfer the tropopause temperature from a 24-h model forecast into a GRIB file. Reassign the parameter and the vertical coordinate name properly to treat this as a tropopause temperature. Use the default parameter lookup table for the GRIB parameter (TMPK) identification number. Use the vertical coordinate table named vcrdgrib1.tbl in $GEMTBL to lookup the vertical coordinate identification number. Do not do horizontal interpolation, but make sure that PDS byte 7 denotes that this is grid number 6. Since hrcbob.grd data is already on grid #6, GDGRIB will detect this and not do interpolation.

```
GDFILE    =  $GEMDATA/hrcbob.grd
GFUNC     =  tmpktpps
GDATTIM   =  f24
GLEVEL    =  0
GVCORD    =  none
GBTBLS    =  ;;vcrdgrib1.tbl
```

```
GBFILE    =  tmpk_trop.grb
VERCEN    =
PDSVAL    =  tmpk%trop
PRECSN    =  b/-3
WMOHDR    =
CPYFIL    =  #6
PROJ      =
GRDAREA   =
KXKY      =
```

4. Transfer the 12-hour precipitation at forecast hour 18 to a GRIB file. Specifically denote the generating process identifier as 84. Interpolate to 1- by 1-degree resolution global grid #3. Note that many points on this grid will have missing values. Pack the grid to a precision of 1/4 millimeter.

```
GDFILE    =  $GEMDATA/hrcbob.grd
GFUNC     =  p12m
GDATTIM   =  f18
GLEVEL    =  0
GVCORD    =  none
GBTBLS    =
GBFILE    =  p12m.grb
VERCEN    =  //84
PDSVAL    =
PRECSN    =  b/-2
WMOHDR    =
CPYFIL    =  #3
PROJ      =
GRDAREA   =
KXKY      =
```

5. Compute an "off-time" 6-hour precipitation amount using the average of two accumulations. Use the PDSVAL in-line time specification given after ^ to assign the GRIB time properly as a 21-hour forecast. Note the use of the 4-digit year in the in-line specification in PDSVAL. Interpolate to high- resolution grid 215 so that PDS byte 7 is set to 215. Use default packing precision.

```
GDFILE    =  $GEMDATA/hrcbob.grd
GFUNC     =  avg(P06M^F24,P06M^F18)
GDATTIM   =  f18
GLEVEL    =  0
GVCORD    =  none
GBTBLS    =
GBFILE    =  p06m.grb
VERCEN    =
PDSVAL    =  P06M^19910819/0000F21
PRECSN    =
WMOHDR    =
CPYFIL    =  #215
PROJ      =
```

```
GRDAREA  =
KXKY     =
```

6. Transfer the 12-hour forecast of the 850-mb grid-relative U-wind component to a GRIB file. Pack the data to the nearest 1/8 m/s. DO NOT INTERPOLATE!

```
GDFILE   =  $GEMDATA/hrcbob.grd
GFUNC    =  urel
GDATTIM  =  f12
GLEVEL   =  850
GVCORD   =  pres
GBTBLS   =
GBFILE   =  wind1.grb
VERCEN   =
PDSVAL   =
PRECSN   =  b/-3
WMOHDR   =
CPYFIL   =
PROJ     =
GRDAREA  =
KXKY     =
```

7. Complete the transfer of the 850-mb wind by transfering the grid-relative V-wind component.

```
GDFILE   =  $GEMDATA/hrcbob.grd
GFUNC    =  vrel
GDATTIM  =  f12
GLEVEL   =  850
GVCORD   =  pres
GBTBLS   =
GBFILE   =  wind1.grb
VERCEN   =
PDSVAL   =
PRECSN   =  b/-3
WMOHDR   =
CPYFIL   =
PROJ     =
GRDAREA  =
KXKY     =
```

8. Transfer the 12-hour forecast of the 850-mb north-relative U-wind component to a GRIB file. Interpolate to grid 212. Make sure that it is labeled as a u-wind component in the GRIB PDS. Pack the data to the nearest 1/8 m/s.

```
GDFILE   =  $GEMDATA/hrcbob.grd
GFUNC    =  un(wind)
GDATTIM  =  f12
GLEVEL   =  850
GVCORD   =  pres
```

```
GBTBLS   =
GBFILE   =  wind2.grb
VERCEN   =
PDSVAL   =  33
PRECSN   =  b/-3
WMOHDR   =
CPYFIL   =  #212
PROJ     =
GRDAREA  =
KXKY     =
```

9. Complete the transfer of the 850-mb wind by transfering the north-relative V-wind component. Note that this wind will not be handled correctly by NAGRIB because NAGRIB disregards GDS byte 17 and always assumes grid relative vectors. To display these winds correctly after running NAGRIB, use the following specification in grid diagnostic programs: VECN(UREL,VREL).

```
GDFILE   =  $GEMDATA/hrcbob.grd
GFUNC    =  vn(wind)
GDATTIM  =  f12
GLEVEL   =  850
GVCORD   =  pres
GBTBLS   =
GBFILE   =  wind2.grb
VERCEN   =
PDSVAL   =  34
PRECSN   =  b/-3
WMOHDR   =
CPYFIL   =  #212
PROJ     =
GRDAREA  =
KXKY     =
```

ERROR MESSAGES

[GDGRIB+6] WMO header center ID inconsistent with PDS byte 5.

[GDGRIB+5] CPYFIL not used to determine GRIB GDS navigation.

[GDGRIB+4] Warning: grid not found in grdnav.tbl...continuing.

[GDGRIB+3] Warning: decoding error in grdnav.tbl...continuing.

[GDGRIB+2] Warning: error reading grdnav.tbl...continuing.

[GDGRIB+1] Warning: cannot open grdnav.tbl...continuing.

[GDGRIB-1] Fatal error initializing TAE.

[GDGRIB-2] Fatal error reading TAE parameters.

[GDGRIB-3] Error initializing GEMPLT.

[GDGRIB-4] Grid file could not be opened.

[GDGRIB-5] Grid navigation could not be set in GEMPLT.

[GDGRIB-6] Grid diagnostics package initialization failed.

[GDGRIB-7] Error interpolating to output grid.

[GDGRIB-8] GRIB message is too long.

[GDGRIB-9] First 6 characters of WMO header must be given.

[GDGRIB-10] User supplied WMO header is too long.

[GDGRIB-11] Invalid grid navigation set in PROJ.

[GDGRIB-12] Invalid grid area set in GRDAREA or CPYFIL.

[GDGRIB-13] Invalid grid size.

[GDGRIB-14] (i,j) -> lat/lon transformation failed.

[GDGRIB-15] lat/lon -> (i,j) transformation failed.

[GDGRIB-16] Cannot set output grid navigation.

[GDGRIB-17] Cannot set input grid navigation.

[GDGRIB-18] Invalid horizontal interpolation type.

[GDGRIB-19] CPYFIL entry is not valid.

[GDGRIB] BDS errors:

[GDGRIB-21] BDS section is too long.

[GDGRIB-22] Number of packing bits is invalid.

[GDGRIB-23] Data range is not valid.

[GDGRIB-24] Binary scaling is invalid.

[GDGRIB-25] Computation of the reference value failed.

[GDGRIB-26] BDS array accomodation is too small.

[GDGRIB-27] The calculation of the # of bits needed failed.

[GDGRIB-28] All data is missing -- no GRIB message made.

[GDGRIB] BMS errors:

[GDGRIB-41] BMS section is too long.

[GDGRIB-42] BMS array allocation is too small.

[GDGRIB] GDS errors:

[GDGRIB-61] Not enough bytes for the GDS.

[GDGRIB-62] Number in i direction is too large.

[GDGRIB-63] Number in j direction is too large.

[GDGRIB-64] Latitude 1 is invalid.

[GDGRIB-65] Longitude 1 is invalid.

[GDGRIB-66] Latitude 2 is invalid.

[GDGRIB-67] Longitude 2 is invalid.

[GDGRIB-68] Rotated CED projection is not supported.

[GDGRIB-69] Rotated STR projection is not supported.

[GDGRIB-70] DX grid increment is invalid.

[GDGRIB-71] DY grid increment is invalid.

[GDGRIB-72] Central longitude is invalid.

[GDGRIB-73] True latitudes are invalid.

[GDGRIB-74] Rotated MER projection is not supported.

[GDGRIB-75] Grid projection is not supported.

[GDGRIB] PDS errors:

[GDGRIB-83] Cannot find parameter in tables.

[GDGRIB-84] Parameter # found is not valid in GRIB.

[GDGRIB-85] Vertical coordinate not found in table.

[GDGRIB-86] Vertical coordinate is not valid in GRIB.

[GDGRIB-87] Level value is too large for GRIB.

[GDGRIB-88] Level is less than zero.

[GDGRIB-89] Dual GEMPAK times not supported.

[GDGRIB-90] 4-digit year required in in-line (^) DATTIM.

[GDGRIB-91] Forecast must be in hours.

[GDGRIB-92] Array allocation for PDS is too small.

[GDGRIB-93] Decimal scale factor is too large.

[GDGRIB-94] Parameter name is too long to be in table.

[GDGRIB-95] GRID # in CPYFIL does not match navigation.

[GDGRIB-96] GRID # in CPYFIL is an invalid PDS entry.

4.12 GDGSFC

GDGSFC computes grid data and interpolates to stations in a GEMPAK surface file.

INPUT PARAMETERS

GDFILE	Grid file
GDATTIM	Grid date/time
GVCORD	Grid vertical coordinate
GLEVEL	Grid level
GFUNC	Scalar grid
SCALE	Scalar scale / vector scale
SFFILE	Surface data file
SFPARM	Surface parameter list

PROGRAM DESCRIPTION

This program interpolates computed grid data to stations in a GEMPAK surface file.

The program computes the requested grid data from the given grid file. GFUNC can be any valid GEMPAK grid function. The other grid related parameters are used to specify the grid to calculate.

The output surface file, SFFILE, must already exist. The output parameter, SFPARM, must also exist in the surface file. The program reads each successive station from the surface file and overwrites the existing data with the interpolated data from the grid.

EXAMPLES

1. Read the surface temperature in Celsius from the 12 hour forecast from the latest ETA model and interpolate the values to the stations in the surface file new.sfc. The scaling fator is defaulted to 0.

```
GDFILE    =  eta
GDATTIM   =  f12
GVCORD    =  none
GLEVEL    =  0
GFUNC     =  tmpc
SCALE     =
SFFILE    =  new.sfc
SFPARM    =  tmpc
```

2. Read the 500 mb vorticity from the 24 hour forecast from the latest AVN model and interpolate the values to the stations in the surface file vort.sfc with the scaling factor equal to 5.

```
GDFILE    =  avn
GDATTIM   =  f24
GVCORD    =  pres
```

```
GLEVEL    =  500
GFUNC     =  vor(wnd)
SCALE     =  5
SFFILE    =  vort.sfc
SFPARM    =  v500
```

ERROR MESSAGES

[GDGSFC-1] Fatal error initializing TAE.

[GDGSFC-2] Fatal error reading TAE parameters.

[GDGSFC-3] Fatal error initializing GEMPLT.

[GDGSFC-4] Cannot find SFPARM "..." in this surface file.

4.13 GDINFO

GDINFO lists information about GEMPAK grid files.

INPUT PARAMETERS

GDFILE	Grid file
LSTALL	Full list flag
OUTPUT	Output device/filename
GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GFUNC	Scalar grid

PROGRAM DESCRIPTION

GDINFO lists information about GEMPAK grid files.

The user can specify a particular grid by making appropriate inputs for GVCORD, GLEVEL, GDATTIM, and GFUNC.

GDATTIM allows several different input options. If LIST is entered, a list of dates/times will be provided after running the program. Upon choosing one of these times, a data search will be conducted. Entering ALL will allow the program to match data pertaining to all of the dates/times in the file.

GLEVEL also has several options unique to matching grid headers. Entering ALL will match data pertaining to all of the levels in the file. If two levels are entered separated by a dash, this gives all of the levels within that range, including the bounding levels. Entering MAN will match and copy all of the mandatory pressure levels into the output file.

GVCORD controls the vertical coordinate search. One vertical coordinate can be entered for the search, or ALL may be entered which will match all of the vertical coordinates in the file.

GFUNC specifies the grid parameter name. If one parameter is entered, the program searches for that parameter only. If ALL is entered, the program will match all of the parameters in its search. Entering several parameters separated by semicolons will match those parameters only.

The navigation information and grid analysis information will be listed. If requested, the grids in the file will also be listed. If LSTALL = YES, all the grids in the file will be listed. If LSTALL = NO, only the navigation and analysis information will be displayed.

EXAMPLES

1. List all of the latest NGM Model information to the screen for the 500-millibar temperature in Kelvin from the 00 time period.

```
GDFILE   = ngm
LSTALL   = YES
OUTPUT   = t
GDATTIM  = f00
GLEVEL   = 500
GFUNC    = TMPK
GVCORD   = PRES
```

ERROR MESSAGES

[GDINFO-1] Fatal error initializing TAE.

[GDINFO-2] Fatal error reading TAE parameters.

4.14 GDLIST

GDLIST lists data from a scalar grid.

INPUT PARAMETERS

GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GFUNC	Scalar grid
GDFILE	Grid file
GAREA	Graphics area
PROJ	Map projection/angles/margins|drop flag
SCALE	Scalar scale / vector scale
OUTPUT	Output device/filename

PROGRAM DESCRIPTION

GDLIST lists a diagnostic grid computed from the grids in a GEMPAK grid file.

The data may be listed over a subgrid. The variables GAREA and PROJ specify the data subset area. This area is only approximate; the subgrid selected will cover the subset area. GAREA must be specified as a geographic area, as an area centered on a station, as latitude/longitude bounds or as DSET or GRID. If DSET or GRID is chosen, the entire grid will be printed.

Output to the terminal or to a file will be 80 columns wide. If the output is sent to a file, the file will be named gdlist.fil if no name is specified.

EXAMPLES

1. List the 850 mb dewpoint temperature for the 24 hour forecast time. The data subset area is a zoomed area centered on New York.

```
GDATTIM   =  /f24
GLEVEL    =  850
GVCORD    =  PRES
GFUNC     =  dwpc
GDFILE    =  $GEMDATA/HRCBOB.GRD
GAREA     =  ny*
PROJ      =  lcc
SCALE     =  999
OUTPUT    =  T
```

2. Compute the divergence at 300 mb and list the output over the Eastern US. Write the output to a file called div.east.

```
GDATTIM   =  /f24
GLEVEL    =  300
```

```
GVCORD      =  PRES
GFUNC       =  div(wnd)
GDFILE      =  $GEMDATA/HRCBOB.GRD
GAREA       =  east
PROJ        =  lcc
SCALE       =  999
OUTPUT      =  f/div.east
```

ERROR MESSAGES

[GDLIST-1] Fatal error initializing TAE.

[GDLIST-2] Fatal error reading TAE parameters.

4.15 GDMAP

GDMAP plots data from a scalar grid.

INPUT PARAMETERS

GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GFUNC	Scalar grid
GDFILE	Grid file
GAREA	Graphics area
IJSKIP	Iskp;Istrt;Istp/Jskp;Jstrt;Jstp
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
SKIP	Skip_cntr/skip_plt_x;skip_plt_y
POSN	Position
COLORS	Color list
MARKER	Marker color/type/size/width/hw
MAP	Map color/dash/width/filter flag
LATLON	Line color/dash/width/freq/inc/label/format
PANEL	Panel loc/color/dash/width/regn
CINT	Contour interval/min/max
TITLE	Title color/line/title
SCALE	Scalar scale / vector scale
DEVICE	Device|name|x size;y size|color type
PROJ	Map projection/angles/margins|drop flag
CLEAR	Clear screen flag
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
GRDLBL	Grid point label color
LUTFIL	Enhancement lookup table filename
STNPLT	Txtc/txt attr|marker attr|stnfil#col
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info

PROGRAM DESCRIPTION

GDMAP plots data computed from GEMPAK grid files on a map. Data may be plotted in any valid GEMPAK projection and may be overlaid on images.

A list of times may be given in GDATTIM allowing animation of the data plots.

The variable, POSN, is used to select the position for the data relative to the grid point using the following position numbers:

```
        7
1               3
2       0       4
5               6
        8
```

Position 0 will plot data centered at the station. If an invalid position number is entered, position 0 will be used.

The variable, SCALE, is used to scale the data by 10 ** SCALE. The data will be scaled and then rounded to the nearest integer before it is plotted.

SKIP specifies the number of grid points to skip when displaying the data. For example, SKIP = 1 displays data at every other grid point in each coordinate direction. SKIP = 0 displays all points.

If GRDLBL is not 0, the grid point row and column numbers will be displayed using the color number specified. The grid rows and columns will be centered on the plot area.

A map and title may also be included.

EXAMPLES

1. Plot the dewpoint depression at 850 mb in color 3 at position 0. The data will be plotted at every point for an area centered on Nebraska. The row and column labels will be plotted in color 17. The title will be written in color 1.

```
GDATTIM   =  f18
GLEVEL    =  850
GVCORD    =  pres
GFUNC     =  sub(tmpc,dwpc)
GDFILE    =  $GEMDATA/hrcbob.grd
GAREA     =  ne
SATFIL    =
RADFIL    =
SKIP      =  0
POSN      =  0
COLORS    =  3
MARKER    =  0
MAP       =  1/7
LATLON    =  2/10/1/1/5;5
PANEL     =  0
CINT      =
TITLE     =  1/-3/~ @ DEWPOINT DEPRESSION
SCALE     =  0
DEVICE    =  xw
PROJ      =  nps
CLEAR     =  yes
TEXT      =  1
GRDLBL    =  17
LUTFIL    =
STNPLT    =
```

2. Do not clear the screen and replot the same function in color 7, for the same area. The minimum value to plot is set to 10 in CINT. The text of the title is changed to reflect the colored values.

```
GDATTIM   =  f18
GLEVEL    =  850
GVCORD    =  pres
GFUNC     =  sub(tmpc,dwpc)
GDFILE    =  $GEMDATA/hrcbob.grd
GAREA     =  ne
SATFIL    =
RADFIL    =
SKIP      =  0
POSN      =  0
COLORS    =  7
MARKER    =  0
MAP       =  1/7
LATLON    =  2/10/1/1/5;5
PANEL     =  0
CINT      =  /10
TITLE     =  1/-2/(MAGENTA >10; GREEN <10)
SCALE     =  0
DEVICE    =  xw
PROJ      =  nps
CLEAR     =  no
TEXT      =  1
GRDLBL    =  17
LUTFIL    =
STNPLT    =
```

ERROR MESSAGES

[GDMAP-1] Fatal error initializing TAE.

[GDMAP-2] Fatal error reading TAE parameters.

[GDMAP-3] Fatal error initializing GEMPLT.

4.16 GDMOD

GDMOD moves grids from one GEMPAK grid file to another.

INPUT PARAMETERS

GDFILE	Grid file
GDOUTF	Output grid file
GDATTIM	Grid date/time
GLEVEL	Grid level
GFUNC	Scalar grid
GVCORD	Grid vertical coordinate
GPACK	Packing type/number of bits

PROGRAM DESCRIPTION

GDMOD moves grids from an input grid file to an output file. The input grid file name is specified in GDFILE. The output grid file name is specified in GDOUTF. The input and output grid files must have the same navigation information.

GDATTIM allows several different input options. If LIST is entered, a list of dates/times will be provided after running the program. Upon choosing one of these times, a data search will be conducted. Entering ALL will allow the program to match data pertaining to all of the dates/times in the file.

GLEVEL also has several options unique to matching grid headers. Entering ALL will match data pertaining to all of the levels in the file. If two levels are entered separated by a dash, this gives all of the levels within that range, including the bounding levels. Entering MAN will match and copy all of the mandatory pressure levels into the output file.

GVCORD controls the vertical coordinate search. One vertical coordinate can be entered for the search, or ALL may be entered which will match all of the vertical coordinates in the file.

GFUNC specifies the grid parameter name. If one parameter is entered, the program searches for that parameter only. If ALL is entered, the program will match all of the parameters in its search. Entering several parameters separated by semicolons will match those parameters only.

The output grids will be packed using the information in GPACK.

EXAMPLES

1. Adds grids for lifted index value for the layer between 1000 millibars and 500 millibars from model file $MODEL/ngm/ngm_96100200, to file

NEW.GRD. Only grids at the analysis time are added. Pack the data using 16 bits for each data value.

```
GDFILE   =  $MODEL/ngm/ngm_96100200
GDOUTF   =  new.grd
GDATTIM  =  961002/0000F000
GLEVEL   =  500:1000
GFUNC    =  lift
GVCORD   =  pres
GPACK    =  16/grib
```

2. Copy grids with the temperature in Kelvin for all of the pressure levels from TODAY.GRD to DEC.GRD. Do not pack any data.

```
GDFILE   =  today.grd
GDOUTF   =  dec.grd
GDATTIM  =  961002/0000F000
GLEVEL   =  all
GFUNC    =  tmpk
GVCORD   =  pres
GPACK    =
```

3. For all of the times in the grid file, copy grids with the u- and v-components of the wind using sigma coordinates matching the 8967 level from OLD.GRD to NEW.GRD. Do not pack any data.

```
GDFILE   =  old.grd
GDOUTF   =  new.grd
GDATTIM  =  all
GLEVEL   =  8967
GFUNC    =  urel;vrel
GVCORD   =  sgma
GPACK    =
```

4. Add grids from the latest AVN model file to OUT.GRD from 1000 to 500 millibars and the 250-millibar levels matching all possible parameters. A list of grid times is displayed for user selection. Do not pack any data.

```
GDFILE   =  avn
GDOUTF   =  out.grd
GDATTIM  =  list
GLEVEL   =  1000-500;250
GFUNC    =  all
GVCORD   =  pres
GPACK    =
```

ERROR MESSAGES

[GDMOD-1] Fatal error initializing TAE.

[GDMOD-2] Fatal error reading TAE parameters.

[GDMOD-3] Invalid grid range entered.

[GDMOD-4] Grid number ... is invalid.

[GDMOD-5] There are no grids in file ....

[GDMOD-6] No valid grids in list.

[GDMOD-7] Error reading input grid.

[GDMOD-8] Error writing output grid.

[GDMOD-9] Error opening files.

[GDMOD-10] Files contain different navigations.

[GDMOD-11] Too many grids to transfer.

[GDMOD-12] Cannot parse user input.

[GDMOD-13] Cannot match user input.

4.17 GDOBSCNT

GDOBSCNT creates a gridded sampling of the number of surface observations within a specified radius of each grid point.

INPUT PARAMETERS

SFFILE	Surface data file
DATTIM	Date/time
GDFILE	Grid file
RADIUS	Radius (in meters) to search

PROGRAM DESCRIPTION

GDOBSCNT produces a grid for each time found in a surface file.

SFFILE specifies the input surface file. Each station in the surface file will be checked to see if it is within the specified radius of every grid point in the output grid file.

GDFILE specifies the output grid file. It must already exist.

RADIUS is the distance in meters for which a surface station will contribute to the observed density at a grid point.

EXAMPLES

1. Create a grid for each time within the NLDN lightning file showing the number of strikes within 50km of each grid point. The grid file (obs.grd) has already been created with GDCFIL.

```
SFFILE  = nldn
DATTIM  = all
GDFILE  = obs.grd
RADIUS  = 50000
```

ERROR MESSAGES

[GDOBSCNT0] Using: ...

4.18 GDOMEG

GDOMEG computes grids of vertical motion and adds them to the grid file.

INPUT PARAMETERS

GDFILE	Grid file
GDATTIM	Grid date/time
GPACK	Packing type/number of bits

PROGRAM DESCRIPTION

GDOMEG computes kinematic vertical motions from gridded wind data by vertically integrating the continuity equation in pressure coordinates. An O'Brien correction is applied to assure zero vertical motion at the top pressure level.

The O'Brien correction is based on the solution of a variational problem which is formulated to minimize the squared difference between the observed divergence and the adjusted divergence while simultaneously satisfying the isobaric continuity equation with zero vertical motion at the top. The error in the divergence is assumed to increase linearly with decreasing pressure. The effect of the correction is to adjust the OMEG values at every level by a fraction of the excess OMEG at the top pressure level. The fraction increases from nearly zero at the bottom to one at the top.

The boundary condition at the surface is:

$$OMEG = - G * RHO * DOT (V, GRAD (Z))$$

where, G is the acceleration of gravity, RHO is density, V is either the surface wind or an estimated surface wind and Z is the terrain elevation. If there is insufficient data, the surface OMEG is set to zero.

The values of omega are computed on the existing pressure levels. A weighted average in ln p of divergence in the layer is used in the vertical integration.

The computed grids are in mb/s and are named OMEG.

EXAMPLES

1. Create vertical motion grids in file obs.grd at the last time using GRIB packing.

   ```
   GDFILE   = obs.grd
   GDATTIM  = last
   GPACK    = grib/16
   ```

2. Create vertical motion grids in file model.grd at the 12-h forecast time.

```
GDFILE    =  model.grd
GDATTIM   =  f12
GPACK     =  grib/16
```

ERROR MESSAGES

[GDOMEG+2] No correction pass will be done.

[GDOMEG+1] WARNING--no surface pressure grid exists.

[GDOMEG-1] Fatal error initializing TAE.

[GDOMEG-2] Fatal error reading TAE parameters.

[GDOMEG-3] Error initializing GEMPLT.

[GDOMEG-4] Requested time is not available.

[GDOMEG-5] No pressure levels exist.

[GDOMEG-6] The packing information is erroneous.

[GDOMEG-7] Could not write output grid to the file.

4.19 GDPLOT

GDPLOT draws contour lines through scalar grids and/or wind barbs or arrows through vector grids. Multiple sets of contours and vectors can be generated for each frame.

INPUT PARAMETERS

GDFILE	Grid file
GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
PANEL	Panel loc/color/dash/width/regn
SKIP	Skip_cntr/skip_plt_x;skip_plt_y
SCALE	Scalar scale / vector scale
GFUNC	Scalar grid
CTYPE	Contour type: C/F
CONTUR	Subbox/smooth
CINT	Contour interval/min/max
LINE	Color/type/width/label/smth/fltr
FINT	Fill interval/min/max
FLINE	Fill colors/fill types
HILO	Color/symbol/rng/rad/cnt/intp
HLSYM	HILO txt size/posn/font/wdth/hw
CLRBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
GVECT	Vector grid
WIND	Wind symbol/siz/wdth/typ/hdsz
REFVEC	Mag;x;y;txtsiz/font/wdth/HW;labl
TITLE	Title color/line/title
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
CLEAR	Clear screen flag
GAREA	Graphics area
IJSKIP	Iskp;Istrt;Istp/Jskp;Jstrt;Jstp
PROJ	Map projection/angles/margins|drop flag
MAP	Map color/dash/width/filter flag
LATLON	Line color/dash/width/freq/inc/label/format
DEVICE	Device|name|x size;y size|color type
STNPLT	Txtc/txt attr|marker attr|stnfil#col

PROGRAM DESCRIPTION

GDPLOT draws contours through scalar grids and wind barbs or arrows at grid points for vector grids. Plots are generated for any field computed using the GEMPAK grid diagnostic functions. The program can generate multiple sets of contours and vector plots for each frame. It can also generate plots for multiple times.

A list of times may be given in GDATTIM allowing animation.

Exclamation points are used in GFUNC and GVECT to delimit multiple sets of contours and vectors, respectively. GLEVEL, GVCORD, PANEL, SKIP, SCALE, GFUNC, CTYPE, CONTUR, CINT, TITLE, LINE, FINT, FLINE, GVECT, WIND, REFVEC, HILO, and HLSYM may contain exclamation points to delimit specifica-

tions for the fields defined by GFUNC and GVECT. If any parameter contains more specifications than the number of plots specified in GFUNC or GVECT, they will be ignored. Positions between exclamation points may be left blank. A trailing exclamation point will be treated as a blank. If there is no trailing exclamation point, the last specification will be repeated for subsequent plots.

Contours may be displayed as lines or as a color fill. If CTYPE is C, contour lines are drawn using input from CINT and LINE. If CTYPE is F, filled contours are drawn using specifications from FINT and FLINE. Both contour lines and filled contours are drawn if CTYPE is F/C.

The attributes of the contour lines, including the color, line type, line width, and label frequency are specified in LINE. The four attributes must be separated with slashes; semicolons separate the values for each attribute. If the line type is set to a single negative number, negative contour values will have the absolute value of the line type and positive values will be solid. If the label type is set to a single number, n, then every nth value will be labeled.

The contour fill intervals are specified in FINT; the attributes for the fill are specified in FLINE. The first color specified in FLINE fills values less than the first level; while the last color fills values greater than the last level. Therefore, n levels require n+1 colors.

A range of colors may be specified in either FLINE or LINE by specifying starting, ending and increment values in that order separated by dashes. If the increment is missing, a default of 1 is used.

The fill type may be set to 1 (solid), 2 (slanted dash) or 3 (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.

If M is entered in the wind symbol specification of WIND, winds will be displayed in m/s, unless the KNOTV operator has been specified in GVECT, in which case the winds will be displayed in knots. If K is entered in WIND, the wind is displayed in knots.

For contours, SKIP specifies the number of grid points to skip in generating contours. For example, if SKIP = 1, every other point is used to generate the contours.

For vectors, SKIP specifies the number of points to skip in both coordinate directions. For example, SKIP = /1;2 will display winds at every other grid point in the x direction and every third grid in the y direction. SKIP = /0 displays winds at every grid point. Wind barbs or arrows can also be staggered by specifying negative values for SKIP.

The HILO and HLSYM parameters control marking and labeling the values of relative maxima and minima. CLRBAR allows a color bar to be added for color fill contours.

EXAMPLES

1. Plot the 700 mb temperature, dewpoint and wind barbs. Plot the temperature in color 3 and the dewpoint in color 17. For both sets of contours, the lines of negative value are drawn in pattern 3 and the those of positive value are solid. Every other contour is labeled. The wind barbs are plotted in m/s in color 6. The display area is an enlarged area centered on New York.

```
GDFILE    =  $GEMDATA/hrcbob.grd
GDATTIM   =  f24
GLEVEL    =  700
GVCORD    =  pres
PANEL     =  0
SKIP      =  0
SCALE     =  0
GFUNC     =  tmpc ! dwpc
CTYPE     =  C
CONTUR    =  3
CINT      =  2 ! 5
LINE      =  3/-3/3/2 ! 17/-3/2/2
FINT      =  0
FLINE     =  10-20
HILO      =
HLSYM     =
CLRBAR    =
GVECT     =  wnd
WIND      =  bm6//2
REFVEC    =  10
TITLE     =  1/-2/~ @ TEMPERATURE, DEWPOINT AND WIND ! 0
TEXT      =  1/22//hw
CLEAR     =  yes
GAREA     =  ny-
PROJ      =  mer
MAP       =  1/7
LATLON    =  2/10/1/1/5;5
DEVICE    =  xw
STNPLT    =
```

2. Draw fills and contours of the magnitude of the wind (knots), contours of height and wind barbs (knots) at 250 mb. The contour and fill intervals are specified in CINT and FINT. The display area is the entire grid on a stereographic map.

```
GDFILE    =  $GEMDATA/hrcbob.grd
GDATTIM   =  f24
GLEVEL    =  250
GVCORD    =  pres
PANEL     =  0
SKIP      =  0/1
```

```
SCALE     =  0 ! -1
GFUNC     =  knts(mag(wnd)) ! hght
CTYPE     =  c/f ! c
CONTUR    =  1
CINT      =  30;50;70;90;110;130;150 ! 12
LINE      =  27/5/2/1 ! 20/1/2/1
FINT      =  70;90;110;130;150
FLINE     =  0;25;24;29;7;15
HILO      =
HLSYM     =
CLRBAR    =  1
GVECT     =  kntv(wnd)
WIND      =  bk18//1
REFVEC    =
TITLE     =  5/-2/~ @ HEIGHTS, ISOTACHS AND WIND (KTS) ! 0
TEXT      =  1/21//hw
CLEAR     =  yes
GAREA     =  grid
PROJ      =  str/90;-105;0
MAP       =  1
LATLON    =  0
DEVICE    =  XW
STNPLT    =
```

ERROR MESSAGES

[GDPLOT+2] The requested scalar/vector cannot be computed.

[GDPLOT+1] WARNING. There are no contour levels.

[GDPLOT-1] Fatal error initializing TAE.

[GDPLOT-2] Fatal error reading TAE parameters.

[GDPLOT-3] Fatal error initializing GEMPLT.

[GDPLOT-4] Grid requested is not available.

[GDPLOT-5] Error setting grid navigation for file ....

[GDPLOT-6] There are no grids in grid file.

4.20 GDPLOT2

GDPLOT2 draws contour lines through scalar grids and/or wind barbs or arrows or streamlines through vector grids. Multiple sets of contours, vectors and/or streamlines can be generated for each frame.

INPUT PARAMETERS

GDFILE	Grid file
GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
PANEL	Panel loc/color/dash/width/regn
SKIP	Skip_cntr/skip_plt_x;skip_plt_y
SCALE	Scalar scale / vector scale
GDPFUN	Scalar grid or vector grid function
TYPE	GDPLOT2 function processing type
CONTUR	Subbox/smooth
CINT	Contour interval/min/max
LINE	Color/type/width/label/smth/fltr
FINT	Fill interval/min/max
FLINE	Fill colors/fill types
HILO	Color/symbol/rng/rad/cnt/intp
HLSYM	HILO txt size/posn/font/wdth/hw
CLRBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
WIND	Wind symbol/siz/wdth/typ/hdsz
REFVEC	Mag;x;y;txtsiz/font/wdth/HW;labl
TITLE	Title color/line/title
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
CLEAR	Clear screen flag
GAREA	Graphics area
IJSKIP	Iskp;Istrt;Istp/Jskp;Jstrt;Jstp
PROJ	Map projection/angles/margins|drop flag
MAP	Map color/dash/width/filter flag
LATLON	Line color/dash/width/freq/inc/label/format
DEVICE	Device|name|x size;y size|color type
STNPLT	Txtc/txt attr|marker attr|stnfil#col
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
LUTFIL	Enhancement lookup table filename
STREAM	lines/arrows/stop/slow/scale
POSN	Position
COLORS	Color list
MARKER	Marker color/type/size/width/hw
GRDLBL	Grid point label color
FILTER	Filter data factor
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info

PROGRAM DESCRIPTION

GDPLOT2 draws contours through scalar grids and streamlines wind barbs or arrows at grid points for vector grids. Plots are generated for any field computed using the

GEMPAK grid diagnostic functions. The program can generate multiple sets of scalar and vector plots for each frame.

GDPLOT2 can also generate plots for multiple times. The list of times may be given in GDATTIM allowing animation.

Exclamation points are used in GDPFUN to delimit multiple overlays of scalar and vector fields, respectively. All other parameters (except DEVICE, CLEAR and LUTFIL) may contain exclamation points to delimit specifications for the fields defined by GDPFUN. If any parameter contains more specifications than the maximum number of plots specified in GDPFUN or GDFILE, they will be ignored. Positions between exclamation points may be left blank. Most parameters will replace the blank with the previous value (repeat). A trailing exclamation point will be treated as a blank. If there is no trailing exclamation point, the last specification will be repeated for subsequent plots.

SCALAR QUANTITIES

Scalar contours may be displayed as lines or as a color fill. If TYPE is C, contour lines are drawn using input from CINT and LINE. If TYPE is F, filled contours are drawn using specifications from FINT and FLINE. Both contour lines and filled contours are drawn if TYPE is F/C or C/F.

Scalar grid point values may also be plotted by specifying TYPE to be P. If TYPE M is also specified, then markers will be plotted at the grid point locations according to the MARKER parameter. The value's location relative to the actual grid point location is set by the POSN parameter.

All scalar types (C, F and P) may be requested at one time, e.g., TYPE=C/F/P. The order is irrelevant, however, contour fills (F) will be done first followed by contour lines (C), the map background, grid point indices (M), markers (G) and values (P).

The attributes of the contour lines, including the color, line type, line width, and label frequency are specified in LINE. The four attributes must be separated with slashes; semicolons separate the values for each attribute. If the line type is set to a single negative number, negative contour values will have the absolute value of the line type and positive values will be solid. If the label type is set to a single number, n, then every nth value will be labeled.

The contour fill intervals are specified in FINT; the attributes for the fill are specified in FLINE. The first color specified in FLINE fills values less than the first level; while the last color fills values greater than the last level. Therefore, n levels require n+1 colors.

A range of colors may be specified in either FLINE or LINE by specifying starting, ending and increment values in that order separated by dashes. If the increment is missing, a default of 1 is used.

The fill type may be set to 1 (solid), 2 (slanted dash) or 3 (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.

For contours, SKIP specifies the number of grid points to skip in generating contours. For example, if SKIP = 1, every other point is used to generate the contours.

The HILO and HLSYM parameters control marking and labeling the values of relative maxima and minima. CLRBAR allows a color bar to be added for color fill contours.

VECTOR QUANTITIES

Vector grids may be displayed as either a field of wind barbs or arrows, or as a streamline display. If TYPE is A, wind arrows will be displayed; if TYPE is B, wind barbs will be displayed. If both A and B are specified, B will prevail. If TYPE is N and neither A nor B is also indicated, then non-unit wind barbs will be assumed. If TYPE is N in combination with either A or B, then non-unit arrows or barbs, respectively, will be plotted. If TYPE is S, streamlines will be drawn.

As with scalar functions, the order of the TYPE values is irrelevant. The order of plotting is the map background, grid point indices (G), markers (M), vector arrows/barbs (A or B) and streamlines (S).

Winds will be displayed in m/s, unless the KNTV operator has been specified in GDPFUN, in which case the winds will be displayed in knots.

For vectors, SKIP specifies the number of points to skip in both coordinate directions. For example, SKIP = /1;2 will display winds at every other grid point in the x direction and every third grid in the y direction. SKIP = /0 displays winds at every grid point. Wind barbs or arrows can also be staggered by specifying negative values for SKIP.

The FILTER parameter filters gridded wind arrows/barbs in the same way as it filters station models in the program SFMAP. If FILTER=yes, the default filter value is set to 1.0. If FILTER=no, then the SKIP parameter is used to filter the winds. Otherwise FILTER is expected to be a numeric value greater than zero which controls the density of plotted winds.

MISCELLANEOUS

Grid point markers may be plotted by setting TYPE=M along with either a scalar TYPE or vector TYPE and valid GDPFUN. Marker attributes will be determined via the MARKER parameter.

Grid index values (row and column numbers) may be plotted by setting TYPE=G along with either a scalar TYPE or vector TYPE and valid GDPFUN. Attributes will be determined via the GRDLBL parameter.

Station locations and identifiers may be plotted using the STNPLT parameter.

EXAMPLES

1. Plot the 700 mb temperature, dewpoint and wind barbs. Plot the temperature in color 3 and the dewpoint in color 17. For both sets of contours, the lines of negative value are drawn in pattern 3 and the those of positive value are solid. Every other contour is labeled. The wind barbs are plotted in m/s in color 6 and are filtered according to the FILTER value. The display area is an enlarged area centered on New York.

```
GDFILE    =  $GEMDATA/hrcbob.grd
GDATTIM   =  f24
GLEVEL    =  700
GVCORD    =  pres
PANEL     =  0
SKIP      =  0
SCALE     =  0
GDPFUN    =  tmpc ! dwpc ! wnd
TYPE      =  C ! ! B
CONTUR    =  3
CINT      =  2 ! 5
LINE      =  3/-3/3/2 ! 17/-3/2/2
FINT      =  0
FLINE     =  10-20
HILO      =
HLSYM     =
CLRBAR    =
WIND      =  bm6//2
REFVEC    =  10
TITLE     =  1/-2/~ @ TEMPERATURE, DEWPOINT AND WIND ! 0
TEXT      =  1/22//hw
CLEAR     =  yes
GAREA     =  ny-
PROJ      =  mer
MAP       =  1/7
LATLON    =  2/10/1/1/5;5
DEVICE    =  xw
STNPLT    =
FILTER    =  1.2
```

2. Draw fills and contours of the magnitude of the wind (knots), contours of height and wind barbs (knots) at 250 mb and plots the value of the wind magnitude at the grid points. Winds are filtered according to the

FILTER value. The contour and fill intervals are specified in CINT and FINT. The display area is the entire grid on a stereographic map.

```
GDFILE    =  $GEMDATA/hrcbob.grd
GDATTIM   =  f24
GLEVEL    =  250
GVCORD    =  pres
PANEL     =  0
SKIP      =  0/1
SCALE     =  0 ! -1
GDPFUN    =  knts(mag(wnd)) ! hght ! kntv(wnd)
TYPE      =  c/f/p ! c ! b
CONTUR    =  1
CINT      =  30;50;70;90;110;130;150 ! 12
LINE      =  27/5/2/1 ! 20/1/2/1
FINT      =  70;90;110;130;150
FLINE     =  0;25;24;29;7;15
HILO      =
HLSYM     =
CLRBAR    =  1
WIND      =  bk18//1
REFVEC    =
TITLE     =  5/-2/~ @ HEIGHTS, ISOTACHS AND WIND (KTS) ! 0
TEXT      =  1/21//hw
CLEAR     =  yes
GAREA     =  grid
PROJ      =  str/90;-105;0
MAP       =  1
LATLON    =  0
DEVICE    =  XW
STNPLT    =
FILTER    =  yes
```

ERROR MESSAGES

[GDPLOT2+2] The requested scalar/vector cannot be computed.

[GDPLOT2+1] WARNING. There are no contour levels.

[GDPLOT2-1] Fatal error initializing TAE.

[GDPLOT2-2] Fatal error reading TAE parameters.

[GDPLOT2-3] Fatal error initializing GEMPLT.

[GDPLOT2-4] Grid requested is not available.

[GDPLOT2-5] Error setting grid navigation for file ....

[GDPLOT2-6] There are no grids in grid file.

4.21 GDPROF

GDPROF draws profiles of a scalar grid and/or a vector grid.

INPUT PARAMETERS

GPOINT	Grid point
GDATTIM	Grid date/time
GVCORD	Grid vertical coordinate
GFUNC	Scalar grid
GVECT	Vector grid
GDFILE	Grid file
LINE	Color/type/width/label/smth/fltr
MARKER	Marker color/type/size/width/hw
BORDER	Background color/type/width
PTYPE	Plot type/h:w ratio/margins
SCALE	Scalar scale / vector scale
XAXIS	Xstrt/xstop/xinc/lbl;gln;tck
YAXIS	Ystrt/ystop/yinc/lbl;gln;tck
WIND	Wind symbol/siz/wdth/typ/hdsz
REFVEC	Mag;x;y;txtsiz/font/wdth/HW;labl
WINPOS	Wind position
FILTER	Filter data factor
TITLE	Title color/line/title
PANEL	Panel loc/color/dash/width/regn
CLEAR	Clear screen flag
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
DEVICE	Device|name|x size;y size|color type
OUTPUT	Output device/filename
THTALN	THTA color/dash/width/mn/mx/inc
THTELN	THTE color/dash/width/mn/mx/inc
MIXRLN	MIXR color/dash/width/mn/mx/inc

PROGRAM DESCRIPTION

GDPROF draws vertical profiles at a point. Data from each level in the grid file are interpolated to the point.

GPOINT specifies the location for the profile. It may be entered as a latitude and longitude separated with a semicolon, as a station character identifier or station number, or as a set of x and y grid points separated with a semicolon and preceded with an @. The profile location may also be selected graphically with the CURSOR command. The location of the profile is then selected by clicking on a horizontal map in another GEMPAK XW window.

Profiles are plotted in an animation sequence by specifying more than one time in GDATTIM.

The vertical coordinate, set in GVCORD, can be PRES, THTA, or HGHT. The vertical axis type, set in PTYPE, can be LIN, LOG, KAP, or SKEW. Only temperatures vs.

pressure may be plotted on a skew t plot. The height-to-width ratio of the plot may be specified in PTYPE following a /. If no value is entered, a value of 0 will be used.

GFUNC is computed at every level in the data set. No errors are returned if the function cannot be computed at any level, except at the surface. If data at the surface cannot be computed, a warning message is written and plotting continues. GVECT specifies a vector to be plotted in the right margin.

If GFUNC is a temperature or dewpoint temperature, background lines of potential temperature, equivalent potential temperature and mixing ratio can be displayed by specifying THTALN, THTELN, and MIXRLN. If these background lines are requested and GFUNC is not a temperature, an error message is generated.

GVECT specifies a vector grid to be displayed as arrows or barbs in one of three display columns on the right of the profile plot. For a wind vector field, the default is north relative direction. A "/G" indicates grid relative direction. The number of the column is specified in WINPOS.

If M is entered in WIND, winds will be displayed in m/s unless the KNOTV operator has been specified in GVECT, in which case the winds will be displayed in knots. If K is entered in WIND, the wind is displayed in knots.

EXAMPLES

1. Plot temperature in Celsius on a log P chart at IAD for the latest time in the file. Label the Y axis from 1000 mb to 100 mb in increments of 100 mb. Label the X axis from -40 degrees to +40 degrees in increments of 10 degrees. Add all the background lines. Plot wind barbs in the right margin.

```
GPOINT    =  iad
GDATTIM   =  last
GVCORD    =  pres
GFUNC     =  tmpc
GVECT     =  wnd
GDFILE    =  $GEMDATA/hrcbob.grd
LINE      =  2//3
MARKER    =  5//1.25
BORDER    =  1
PTYPE     =  skewt
SCALE     =  0
XAXIS     =  -40/40/10
YAXIS     =  1000/100/100/;1
WIND      =  bm6//2
REFVEC    =  10
WINPOS    =  1
FILTER    =  no
TITLE     =  1/3
```

```
PANEL     =  0
CLEAR     =  yes
TEXT      =  1
DEVICE    =  xw
OUTPUT    =  n
THTALN    =  8/3/1
THTELN    =  23/1/1
MIXRLN    =  16/10/2
```

2. Overlay the dewpoint for IAD. Do not redraw the background lines. Plot the wind in grid relative direction.

```
GPOINT    =  iad
GDATTIM   =  last
GVCORD    =  pres
GFUNC     =  dwpc
GVECT     =  wnd/G
GDFILE    =  $GEMDATA/hrcbob.grd
LINE      =  3//3
MARKER    =  5//1.25
BORDER    =  1
PTYPE     =  skewt
SCALE     =  0
XAXIS     =  -40/40/10
YAXIS     =  1000/100/100/;1
WIND      =  0
REFVEC    =  10
WINPOS    =  1
FILTER    =  no
TITLE     =  0
PANEL     =  0
CLEAR     =  no
TEXT      =  1
DEVICE    =  xw
OUTPUT    =  n
THTALN    =  0
THTELN    =  0
MIXRLN    =  0
```

3. Clear the screen and plot the vorticity at BWI in color number 2 using a dashed line. Do not plot any winds. Have the graph plot in a second window named "profile2".

```
GPOINT    =  bwi
GDATTIM   =  last
GVCORD    =  pres
GFUNC     =  vor(wnd)
GVECT     =
GDFILE    =  $GEMDATA/hrcbob.grd
LINE      =  2/2/3
MARKER    =  0
BORDER    =  1
PTYPE     =  log
```

```
SCALE     =  5
XAXIS     =
YAXIS     =  1000/300/100
WIND      =
REFVEC    =  10
WINPOS    =  1
FILTER    =  no
TITLE     =  1/3
PANEL     =  0
CLEAR     =  yes
TEXT      =  1
DEVICE    =  xw|profile2
OUTPUT    =  t
THTALN    =  0
THTELN    =  0
MIXRLN    =  0
```

ERROR MESSAGES

[GDPROF+1] Invalid parameter for background lines.

[GDPROF-1] Fatal error initializing TAE.

[GDPROF-2] Fatal error reading TAE parameters.

[GDPROF-3] Fatal error initializing GEMPLT.

[GDPROF-4] Input for GPOINT is invalid.

[GDPROF-5] Input for GDATTIM is invalid.

[GDPROF-6] Input for GVCORD is invalid.

[GDPROF-7] Input for PTYPE is invalid.

[GDPROF-8] Error defining graph coordinates.

[GDPROF-9] No points found for profile.

[GDPROF-10] There are no levels at this time.

[GDPROF-11] Input ... for YAXIS is invalid.

[GDPROF-12] Input ... for XAXIS is invalid.

4.22 GDRADR

GDRADR creates a gridded composite of NEXRAD level III products.

INPUT PARAMETERS

GRDAREA	Area covered by grid
PROJ	Map projection/angles/margins|drop flag
KXKY	Number of grid points in x;y
GDPFUN	Scalar grid or vector grid function
GDFILE	Grid file
RADTIM	Radar composite current/dattim
RADDUR	Radar time window (minutes prior to RADTIM)
RADFRQ	Update Frequency
CPYFIL	Grid file whose navigation is to be used in new grid file |
STNFIL	Station information file
MAXGRD	Maximum number of grids
RADMODE	Radar operational mode
NDVAL	Replacement value for "ND" (default RMISSD)

PROGRAM DESCRIPTION

GDRADR samples NEXRAD Level III (NIDS) products to a common grid projection.

GDFILE specifies the output grid file. If the file does not already exist, the file is created using the grid defined by CPYFIL, or if CPYFIL is not defined then by PROJ, GRDAREA, and KXKY.

CPYFIL may provide either an existing grid file to read the projection information from, or a grid number (#nnn) defined in grdnav.tbl.

PROJ, GRDAREA, and KXKY define a grid navigation as in GDCFIL if the output file does not already exist, and CPYFIL is blank.

STNFIL is the station table which supplies radar IDs to be searched for the composite. If STNFIL is blank, then 'nexrad.tbl' is used by default.

GDPFUN is a list of data parameters for which composites are created. The NEXRAD file naming is assumed to be such that the site identifier and the product type are both present in the directory/file naming structure. The datatype.tbl template NEXRIII is used to provide the file naming convention used. If NEXRIII is not found in the template database, a default directory structure for NEXRAD data is assumed where the root directory $RAD/NIDS contains a tree structure supporting %SITE%/%PROD%/%PROD%_YYYYMMDD_HHNN file names. The %SITE% template will be replaced by the site IDs in the STNFIL table. The %PROD% will be replaced by the GDPFUN product name. The GEMPAK data/time template will be used with RADTIM and RADDUR to determine which NEXRAD products are in the valid time range.

RADTIM determined the output grid time for the radar composite. The value of RADTIM may either be 'current', or a GEMPAK dattim. If 'current' is selected for RADTIM, then the current system clock time is used. No data files later than RADTIM will be included in the composite. RADDUR provides the time window previous to RADTIM in order to include data for each site. The time closest to RADTIM will be used. A default RADDUR of 30 minutes is used if RADDUR is blank.

RADFRQ is the frequency in minutes at which the program will run. When RADFRQ is defined, GDRADR will wait for the specified time before rerunning. This option is most useful when RADTIM is set to 'current'. When the program is sleeping, ctrl-c can be used to exit the loop and return to the dynamic tutor. If RADFRQ is not set, the dynamic tutor will be re-entered at the end of processing the radar mosaic.

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) maintainence mode. The default, if none are specified is data from all 3 modes (PCM). Multiple modes may be specified.

EXAMPLES

1. Create a 4km National composite of NEXRAD base reflectivity (N0R) and echo tops (NET). Use the current time with a 30 minute window for data. Rerun the mosaic creation continuously with a 5 minute wait period between each update. Use the nexrad.tbl station table. Create the grid output file using the YYYYMMDD_radar.gem file name template. Accept data only from radars operating in precipitation mode.

```
PROJ      =  lcc/25;-103;60
GRDAREA   =  23.0;-120.0;47.0;-65.0
KXKY      =  720;500
GDPFUN    =  n0r ! net
GDFILE    =  YYYYMMDD_radr.gem
RADTIM    =  current
RADDUR    =  30
RADFRQ    =  5
CPYFIL    =
STNFIL    =  nexrad.tbl
MAXGRD    =  1000
RADMODE   =  P
```

2. Create a radar mosaic using grid #218 for the total precipitation nexrad product (NTP). Use the default radar station table. Use a 15 minute time window ending at to 010302/1200.

```
PROJ      =
GRDAREA   =
KXKY      =
GDPFUN    =  ntp
```

```
GDFILE    =  YYYYMMDD_ntp.gem
RADTIM    =  010302/1200
RADDUR    =  15
RADFRQ    =
CPYFIL    =  #218
STNFIL    =
MAXGRD    =  500
RADMODE   =
```

ERROR MESSAGES

[GDRADR+5] Mode rejected: ...

[GDRADR+4] Write grid ...

[GDRADR+3] Using default station file ...

[GDRADR+2] NEXRIII template not found using ...

[GDRADR+1] Too old: ...

[GDRADR0] Using: ...

[GDRADR-1] Fatal error initializing TAE.

[GDRADR-2] Fatal error reading TAE parameters.

[GDRADR-3] Fatal error initializing GEMPLT.

[GDRADR-4] Failed to read grid projection ...

[GDRADR-5] Could not create grid file ...

[GDRADR-6] Could not open grid file ...

[GDRADR-7] Warning: navigation block does not match file

[GDRADR-8] Station table ... not found

4.23 GDSTAT

GDSTAT computes statistics on a time series of scalar grids.

INPUT PARAMETERS

GDFILE	Grid file
GDOUTF	Output grid file
GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GFUNC	Scalar grid
GRDNAM	Grid parameter name

PROGRAM DESCRIPTION

GDSTAT computes the maximum, minimum, average, standard deviation, and number of reporting times at each grid point for a time series of grids. The output grids will be written to the output grid file.

The input grid files are specified in GDFILE. The output file is specified in GDOUTF. The output file may be one of the input files. A total of three files may be entered.

GFUNC specifies the grid diagnostic function to be computed. GDATTIM must be a time range. The output grid names will be the name in GRDNAM prefixed by MAX, MIN, AVG, STD, and CNT. If GRDNAM is blank, the default name from the grid diagnostic computation will be used.

EXAMPLES

1. Compute the grid statistics for the 850 mb vorticity field using all the times in the grid file. Name the output grids MAXVOR, MINVOR, AVGVOR, STDVOR and CNTVOR and write them into the same file. Write the output grids into the same file.

```
GDFILE   = ngm.grd
GDOUTF   = ngm.grd
GFUNC    = vor(wnd)
GVCORD   = pres
GLEVEL   = 850
GDATTIM  = all
GRDNAM   = vor
```

2. Compute the grid statistics for the surface temperature data using the data for every 12 hours from Jan 1 to Jan 15. The input and output files are different. The default names will be used.

```
GDFILE   = jan90sfc.grd
GDOUTF   = stat.grd
```

```
GFUNC     =  tmpc
GVCORD    =  none
GLEVEL    =  0
GDATTIM   =  920101/0000-920115/0000-12
GRDNAM    =
```

ERROR MESSAGES

[GDSTAT-1] Fatal error initializing TAE.

[GDSTAT-2] Fatal error reading TAE parameters.

[GDSTAT-3] Fatal error initializing GEMPLT.

[GDSTAT-4] No valid times found in grid file.

[GDSTAT-6] There are fewer than four grids.

[GDSTAT-7] Error writing grid ... to output file.

[GDSTAT-8] Grid navigation has changed.

4.24 GDSTREAM

GDSTREAM draws streamlines through a vector grid.

INPUT PARAMETERS

GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GVECT	Vector grid
GDFILE	Grid file
GAREA	Graphics area
IJSKIP	Iskp;Istrt;Istp/Jskp;Jstrt;Jstp
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
LINE	Color/type/width/label/smth/fltr
MAP	Map color/dash/width/filter flag
LATLON	Line color/dash/width/freq/inc/label/format
TITLE	Title color/line/title
PANEL	Panel loc/color/dash/width/regn
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
DEVICE	Device|name|x size;y size|color type
PROJ	Map projection/angles/margins|drop flag
CLEAR	Clear screen flag
WIND	Wind symbol/siz/wdth/typ/hdsz
LUTFIL	Enhancement lookup table filename
STNPLT	Txtc/txt attr|marker attr|stnfil#col
STREAM	lines/arrows/stop/slow/scale
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info

PROGRAM DESCRIPTION

GDSTREAM draws streamlines through any vector grid computed by the grid diagnostics package. The vector grid is specified in GVECT.

Streamlines are plotted in an animation sequence by specifying more than one time in GDATTIM.

The line color, dash pattern and line width are set in LINE. A map, title and latitude/longitude lines may also be included. The size of the arrow heads may be controlled by specifying the fifth value in WIND.

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); "stop" is a real number multiplier which controls how close a streamline comes to another streamline before it is stopped being drawn (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).

EXAMPLES

1. Draw streamlines through the gridded wind field at 850 mb using color 3. Add a North Polar Stereographic map in color 1 and line type 7 and a title in color 5. Center the graphics area on Ohio.

```
GDATTIM   =  f24
GLEVEL    =  850
GVCORD    =  pres
GVECT     =  wnd
GDFILE    =  $GEMDATA/hrcbob.grd
GAREA     =  oh-
SATFIL    =
RADFIL    =
LINE      =  3//2
MAP       =  1/7
LATLON    =  2/10/1/1/5;5
TITLE     =  5
PANEL     =  0
TEXT      =  1
DEVICE    =  xw
PROJ      =  nps
CLEAR     =  yes
WIND      =
LUTFIL    =
STNPLT    =
```

2. Similar to 1), except for a global 1x1 degree dataset over the Pacific Ocean, specifying the STREAM parameter to properly thin and display the field given the overall density of grid boxes.

```
GDFILE    =  $MODEL/fnl/fnl_96052800
GDATTIM   =  f00
GLEVEL    =  250
GAREA     =  -25;-180;55;-45
PROJ      =  mer
LATLON    =  31/12/2//10
STREAM    =  0.4/0.8/3//
WIND      =  am1/2/3//0.8
TITLE     =  31/-2/@ FNL ANALYSIS VALID ~ NHC MIAMI FLA
```

3. Clear the screen and draw the streamlines of the thermal wind. Make the arrowheads 0.75 of the default size. Plot the streamlines in a second window named "window2".

```
GDATTIM   =  f24
GLEVEL    =  500:850
```

```
GVCORD    =  pres
GVECT     =  thrm
GDFILE    =  $GEMDATA/hrcbob.grd
GAREA     =  oh-
SATFIL    =
RADFIL    =
LINE      =  3//2
MAP       =  1/7
LATLON    =  2/10/1/1/5;5
TITLE     =  5
PANEL     =  0
TEXT      =  1
DEVICE    =  xw|window2
PROJ      =  nps
CLEAR     =  yes
WIND      =  an3////.75
LUTFIL    =
STNPLT    =
```

ERROR MESSAGES

[GDSTREAM-1] Fatal error initializing TAE.

[GDSTREAM-2] Fatal error reading TAE parameters.

[GDSTREAM-3] Fatal error initializing GEMPLT.

4.25 GDTHGT

GDTHGT draws contours and wind barbs or arrows on a time section at a point within a grid.

INPUT PARAMETERS

GPOINT	Grid point
GDATTIM	Grid date/time
GVCORD	Grid vertical coordinate
GFUNC	Scalar grid
GVECT	Vector grid
GDFILE	Grid file
PTYPE	Plot type/h:w ratio/margins
TAXIS	Time1-time2-tinc;lbl;gln;tck
YAXIS	Ystrt/ystop/yinc/lbl;gln;tck
BORDER	Background color/type/width
LINE	Color/type/width/label/smth/fltr
CINT	Contour interval/min/max
WIND	Wind symbol/siz/wdth/typ/hdsz
TITLE	Title color/line/title
CLEAR	Clear screen flag
SCALE	Scalar scale / vector scale
PANEL	Panel loc/color/dash/width/regn
DEVICE	Device|name|x size;y size|color type
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg

PROGRAM DESCRIPTION

GDTHGT is a user contributed program that draws a vertical time section at a location in a grid field. The location is specified by setting GPOINT. Gridded data are interpolated to the time-section plane at regular intervals of time specified in GDATTIM.

The grid vertical coordinate (GVCORD) may be PRES, THTA, or HGHT, depending on what is available in the grid file. The vertical axis scaling, set in PTYPE, can be LIN, LOG, KAP or STUVE. STUVE and KAP are the same; SKEWT may not be entered. The plot aspect ratio and margins may also be entered in PTYPE.

Vector fields may be specified in GVECT and displayed as arrows or barbs. For a wind vector field, the default is north relative direction. A "/G" indicates grid relative direction. The vector function CIRC cannot be computed for time sections.

If M is entered in WIND, winds will be displayed in meters per second unless the KNOTV operator has been specified in GVECT, in which case the winds will be displayed in knots. IF K is entered in WIND, the wind is displayed in knots.

EXAMPLES

1. Plot temperature in Celsius on a log-P chart on a time section for all times at BWI. Plot the contours in color number 2, using thick, solid lines. Plot wind barbs for the forecast wind. Plot the chart to 50 millibars using the default labels.

```
GPOINT    =  bwi
GDATTIM   =  all
GVCORD    =  PRES
GFUNC     =  temp
GVECT     =  wnd
GDFILE    =  $GEMDATA/HRCBOB.GRD
PTYPE     =  log
TAXIS     =
YAXIS     =  /50
BORDER    =  1
LINE      =  2/2/3/1
CINT      =  5
WIND      =  bm1
TITLE     =  1
CLEAR     =  YES
SCALE     =  999
PANEL     =  0
DEVICE    =  xw
TEXT      =  1/21//hw
```

2. Now, using the same file, plot a log pressure time section of the vorticity advection. Positive values are contoured with solid lines, negative values are contoured with dashed lines. Plot the wind in grid relative direction.

```
GPOINT    =  bwi
GDATTIM   =  all
GVCORD    =  PRES
GFUNC     =  adv(avor(obs);obs)
GVECT     =  wnd/G
GDFILE    =  $GEMDATA/HRCBOB.GRD
PTYPE     =  log
TAXIS     =
YAXIS     =  /50
BORDER    =  1
LINE      =  2/-2/3/1
CINT      =  5
WIND      =  bm1
TITLE     =  1
CLEAR     =  YES
SCALE     =  999
PANEL     =  0
DEVICE    =  xw
TEXT      =  1/21//hw
```

ERROR MESSAGES

[GDTHGT-1] Fatal error initializing TAE.

[GDTHGT-2] Fatal error reading TAE parameters.

[GDTHGT-3] Fatal error initializing GEMPLT.

[GDTHGT-4] Invalid vertical coordinate.

[GDTHGT-7] Invalid axis type.

[GDTHGT-8] Invalid vertical coordinate type.

[GDTHGT-20] Input for YAXIS is invalid.

4.26 GDTSER

GDTSER draws a time series of a scalar at a single level.

INPUT PARAMETERS

GPOINT	Grid point
GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GFUNC	Scalar grid
GDFILE	Grid file
PTYPE	Plot type/h:w ratio/margins
TAXIS	Time1-time2-tinc;lbl;gln;tck
YAXIS	Ystrt/ystop/yinc/lbl;gln;tck
BORDER	Background color/type/width
LINE	Color/type/width/label/smth/fltr
MARKER	Marker color/type/size/width/hw
TITLE	Title color/line/title
CLEAR	Clear screen flag
SCALE	Scalar scale / vector scale
PANEL	Panel loc/color/dash/width/regn
DEVICE	Device|name|x size;y size|color type
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg

PROGRAM DESCRIPTION

GDTSER draws a time series of a scalar parameter at a fixed level. The variable may be any scalar computed by the grid diagnostics package.

GPOINT specifies the location for the time series. It may be entered as a latitude and longitude separated with a semicolon, as a station character identifier or station number, or as a set of x and y grid points separated with a semicolon and preceded with an @. The location may also be selected graphically by setting GPOINT using the CURSOR command. The location of the time series is then selected by clicking on a horizontal map in another GEMPAK XW window.

The times to plot are specified in GDATTIM. Only those times specified will be plotted. Lines will be drawn connecting the data points provided no more than two points are missing between segments. Note that the times may represent a series of base times with the same or no forecast time, or a series with the same base time and a list of forecast times.

The time axis is specified in TAXIS using the usual GEMPAK date/time conventions, including FIRST and LAST. If TAXIS has no increment, a reasonable value is chosen. If TAXIS is blank, the limits are taken from the first and last valid times set in GDATTIM.

If the user desires multiple lines on the same graph, TAXIS and YAXIS should be explicitly set; then LINE, MARKER, and TITLE can be varied for successive combinations of GLEVEL, GVCORD, GPOINT, and GFUNC.

The axis type, height-to-width ratio of the plot and the margins may be specified in PTYPE.

EXAMPLES

1. Plot the BWI 500 mb temperature for the all of the forecast times in the file. Label the Y axis from -15 to 15 in increments of 3 degrees. Label the time axis from 18/21 to 20/03 in increments of 12 h. Make the plot half as high as wide.

```
GPOINT   =  bwi
GDATTIM  =  all
GLEVEL   =  500
GVCORD   =  pres
GFUNC    =  tmpc
GDFILE   =  $GEMDATA/hrcbob.grd
PTYPE    =  lin/.5
TAXIS    =  18/21-20/03
YAXIS    =  -15/15/3
BORDER   =  1
LINE     =  3//3
MARKER   =  2/13/1.25/2
TITLE    =  5//^ _ @ #
CLEAR    =  yes
SCALE    =  0
PANEL    =  0
DEVICE   =  xw
TEXT     =  1
```

2. Overlay the 700 mb temperature for all of the forecast times in the file. Use the above specifications for the other parameters.

```
GPOINT   =  bwi
GDATTIM  =  all
GLEVEL   =  700
GVCORD   =  pres
GFUNC    =  tmpc
GDFILE   =  $GEMDATA/hrcbob.grd
PTYPE    =  lin/.5
TAXIS    =  18/21-20/03
YAXIS    =  -15/15/3
BORDER   =  1
LINE     =  2//3
MARKER   =  3/13/1.25/2
TITLE    =  5/-2/^ _ @ #
CLEAR    =  no
```

```
SCALE     =  0
PANEL     =  0
DEVICE    =  xw
TEXT      =  1
```

ERROR MESSAGES

[GDTSER-1] Fatal error initializing TAE.

[GDTSER-2] Fatal error reading TAE parameters.

[GDTSER-3] Fatal error initializing GEMPLT.

[GDTSER-4] Input for GPOINT is invalid.

[GDTSER-5] Input for GLEVEL is invalid.

[GDTSER-6] Input for GVCORD is invalid.

[GDTSER-7] Input for PTYPE is invalid.

[GDTSER-8] Error defining graph coordinates.

[GDTSER-9] No points found for plot of ....

[GDTSER-10] Some points missing for plot of ....

[GDTSER-11] Input for ... in TAXIS is invalid.

[GDTSER-12] Time range is size zero.

[GDTSER-13] No grids found with times in GDATTIM.

4.27 GDVINT

GDVINT performs interpolation between vertical coordinates.

INPUT PARAMETERS

GDFILE	Grid file
GDOUTF	Output grid file
GDATTIM	Grid date/time
GVCORD	Grid vertical coordinate
GLEVEL	Grid level
MAXGRD	Maximum number of grids
GAREA	Graphics area
VCOORD	Vertical coordinate type

PROGRAM DESCRIPTION

This program performs vertical interpolations from one input vertical coordinate to another. The output grid file may be the same as the input file or be a separate file. If areal subsetting is specified, output must be to another GEMPAK file.

The input file is specified in GDFILE and the output file in GDOUTF. If GDOUTF does not exist, then a new file will be created with the maximum number of grids given in MAXGRD. GDATTIM specifies the time at which to perform the interpolation.

GVCORD specifies the input and output vertical coordinates separated by a slash. The coordinates supported are:

PRES	--	pressure
THTA	--	potential temperature
HGHT	--	height above sea level
SGMA	--	sigma p
ETA	--	eta
ZAGL	--	height above ground level

When SGMA is specified, the pressure on SGMA=0 is given following a semicolon. For example, if the pressure at SGMA=0 is 50 mb, the specification in GVCORD is

```
SGMA:50
```

GLEVEL specifies the vertical coordinate levels to interpolate. This may be a single level, a list of levels separated by semicolons or a range with an increment separated by dashes.

GAREA specifies areal subsetting. It can be specified as either lower-left and upper-right grid coordinates, separated by semicolons and preceded by a single @, or as lower-left and upper-right latitude and longitude coordinates separated by semicolons. In the latter case, the locations are rounded to the nearest grid points. The navigation projection and its parameters are used along with the specified corner points to set the nav-

igation in the output grid file. If areal subsetting is used, the output file must be different from the input file.

VCOORD specifies a list of GEMPAK coordinate names. All grids at the specified time having one of these coordinate names will be transfered to the output file. This allows surface grids with vertical coordinate types NONE or ESFC to be transfered into the output file. It also allows subsetting of grids in other vertical coordinates to be put into the output file. VCOORD is also used to specify the Lorenz condition for interpolation into THTA coordinate. To specify the Lorenz condition, conclude the VCOORD input with /L.

If the output vertical coordinate is THTA and the Lorenz condition is specified, underground isentropic surfaces are assigned surface values, and PSYM is built down hydrostatically using the surface pressure in the Exner function. In all other cases, underground surfaces are assigned missing values.

If the output vertical coordinate is PRES, underground pressure levels are assigned a height value computed by extrapolating downward using the surface values of pressure, temperature, and height. A constant lapse rate atmosphere with the standard lapse rate of 6.5 K / 1000 m is assumed.

If surface values of the interpolated parameters are not available, GDVINT extrapolates values to the surface from two levels above the surface. These values are used in the interpolation and are placed in the output file where they are assigned the output vertical coordinate and GLEVEL=0.

If heights are not available in the input grid file, a hydrostatic integration is done in the input coordinate to generate values for the interpolation.

EXAMPLES

1. Interpolate from sigma, with P(SGMA=0) = 0 to theta over a subgrid defined by the latitude and longitude bounds. The actual subgrid will be defined by the grid points closest to the latitude longitude bounds. Also transfer all grids with vertical coordinates NONE, MSLV and ESFC into the output file. Apply the Lorenz condition for underground surfaces.

```
GDFILE   =  z00jun16.ngmsgm
GDOUTF   =  z00jun16.ngmtht
GDATTIM  =  f24
GLEVEL   =  256-412-4
GVCORD   =  sgma:0/thta
MAXGRD   =  2000
GAREA    =  30;-100;45;-70
VCOORD   =  none;mslv;esfc/L
```

2. Interpolate from pressure to the height above ground coordinate over a subset of the grid specified by grid index bounds.

```
GDFILE   =  z00jun16.ngmprs
GDOUTF   =  z00jun16.ngmzag
GDATTIM  =  f36
GLEVEL   =  500-15000-500
GVCORD   =  pres/zagl
MAXGRD   =  3200
GAREA    =  @12;23;34;78
VCOORD   =  mslv;esfc
```

3. Interpolate from isentropic coordinates to sigma (ptop=50) over the entire grid. Put the output in the same file as the input. Note that sigma values are scaled by 10000. In this example, maxgrd is ignored.

```
GDFILE   =  z00jun16.ngm
GDOUTF   =  z00jun16.ngm
GDATTIM  =  f48
GLEVEL   =  9500-500-500
GVCORD   =  thta/sgma:50
MAXGRD   =  3200
GAREA    =  grid
VCOORD   =  none;esfc
```

ERROR MESSAGES

[GDVINT+4] Warning--no surface elevation grid exists.

[GDVINT+3] No pressure on this level.

[GDVINT+2] No output vertical coordinate value on this level.

[GDVINT+1] All values are missing.

[GDVINT-1] Fatal error initializing TAE.

[GDVINT-2] Fatal error reading TAE parameters.

[GDVINT-3] Fatal error initializing GEMPLT.

[GDVINT-4] No thermodynamic data in the input file.

[GDVINT-5] Navigation blocks are different.

[GDVINT-6] Required surface pressure is absent.

[GDVINT-7] Required surface elevation is absent.

[GDVINT-8] Too few levels to interpolate this parameter.

[GDVINT-9] No parameters to interpolate -- check GVCORD, GDATTIM.

[GDVINT-10] Top pressure for SGMA or ETA missing.

[GDVINT-11] Subset region is invalid.

[GDVINT-12] File ... cannot be opened.

[GDVINT-13] User specified coordinates are invalid.

[GDVINT-14] Levels not correctly specified.

[GDVINT-15] Grid size is too large.

4.28 GDWIND

GDWIND displays a vector grid using wind barbs or arrows.

INPUT PARAMETERS

GDATTIM	Grid date/time
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GVECT	Vector grid
GDFILE	Grid file
GAREA	Graphics area
IJSKIP	Iskp;Istrt;Istp/Jskp;Jstrt;Jstp
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
SKIP	Skip_cntr/skip_plt_x;skip_plt_y
WIND	Wind symbol/siz/wdth/typ/hdsz
REFVEC	Mag;x;y;txtsiz/font/wdth/HW;labl
MAP	Map color/dash/width/filter flag
LATLON	Line color/dash/width/freq/inc/label/format
PANEL	Panel loc/color/dash/width/regn
TITLE	Title color/line/title
DEVICE	Device|name|x size;y size|color type
PROJ	Map projection/angles/margins|drop flag
CLEAR	Clear screen flag
SCALE	Scalar scale / vector scale
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
LUTFIL	Enhancement lookup table filename
STNPLT	Txtc/txt attr|marker attr|stnfil#col
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info

PROGRAM DESCRIPTION

GDWIND draws wind barbs or arrows at each grid point of a vector grid. Vector plots can be drawn for any vector field computed using the GEMPAK grid diagnostic functions. Vectors may be drawn in any valid GEMPAK projection and may be overlaid on images.

A list of times may be given in GDATTIM allowing animation of the plots.

SKIP specifies the number of points to skip in both coordinate directions. For example, SKIP = /1;2 will display winds at every other grid point in the x direction and every third grid point in the y direction. SKIP = /0 displays winds at every grid point. Wind barbs or arrows can also be staggered by specifying negative values for SKIP.

IF M is entered as part of the wind symbol, winds will be displayed in m/s, unless the KNOTV operator has been specified in GVECT, in which case the winds will be displayed in knots. If K is entered in WIND, the wind is displayed in knots.

EXAMPLES

1. Draw wind barbs in m/s in a staggered array. The vector field is the gridded wind at 850 mb for the 18 hour forecast. The barbs are plotted as an overlay on the entire visible satellite image for 18Z.

```
GDATTIM   =  f18
GLEVEL    =  850
GVCORD    =  pres
GVECT     =  wnd
GDFILE    =  $GEMDATA/hrcbob.grd
GAREA     =  dset
SATFIL    =  $GEMDATA/VIS_910819_1801
RADFIL    =
SKIP      =  /-1
WIND      =  bk6/1.5/3
REFVEC    =  10
MAP       =  1/7
LATLON    =  2/10/1/1/5;5
PANEL     =  0
TITLE     =  1
DEVICE    =  xw
PROJ      =  sat
CLEAR     =  yes
SCALE     =
TEXT      =  1
LUTFIL    =
STNPLT    =
```

2. Using the values of the variables supplied above, change the GAREA to Rhode Island. The satellite image is subset for the given area and the data is replotted.

```
GDATTIM   =  f18
GLEVEL    =  850
GVCORD    =  pres
GVECT     =  wnd
GDFILE    =  $GEMDATA/hrcbob.grd
GAREA     =  ri
SATFIL    =  $GEMDATA/VIS_910819_1801
RADFIL    =
SKIP      =  0
WIND      =  bk6/1.5/3
REFVEC    =  10
MAP       =  1/7
LATLON    =  2/10/1/1/5;5
PANEL     =  0
TITLE     =  1
DEVICE    =  xw
PROJ      =  sat
CLEAR     =  yes
SCALE     =
```

```
TEXT      =  1
LUTFIL    =
STNPLT    =
```

3. Plot arrows for the temperature gradient at 850 mb. Scale the data by 10**6. Also, plot a reference vector with the label "degrees C / meter". The display area is centered on New York.

```
GDATTIM   =  f18
GLEVEL    =  850
GVCORD    =  pres
GVECT     =  grad(tmpc)
GDFILE    =  $GEMDATA/hrcbob.grd
GAREA     =  ny-
SATFIL    =
RADFIL    =
SKIP      =  0
WIND      =  am7//3
REFVEC    =  10;;;;degrees C / meter
MAP       =  1/7
LATLON    =  2/10/1/1/5;5
PANEL     =  0
TITLE     =  1
DEVICE    =  xw
PROJ      =  nps
CLEAR     =  yes
SCALE     =  /6
TEXT      =  1
LUTFIL    =
STNPLT    =
```

ERROR MESSAGES

[GDWIND-1] Fatal error initializing TAE.

[GDWIND-2] Fatal error reading TAE parameters.

[GDWIND-3] Fatal error initializing GEMPLT.

[GDWIND-13] No times in grid file.

4.29 GPANOT

GPANOT will allow the user to place objects at any location on the current graphic device.

INPUT PARAMETERS

GDFILE	Grid file
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
PROJ	Map projection/angles/margins|drop flag
GAREA	Graphics area
PANEL	Panel loc/color/dash/width/regn
DEVICE	Device|name|x size;y size|color type
CLEAR	Clear screen flag
SHAPE	Object to draw
INFO	Shape information
LOCI	Point(s) associated with SHAPE
LINE	Color/type/width/label/smth/fltr
CTYPE	Contour type: C/F

PROGRAM DESCRIPTION

This program will plot an object at any location on the graphic device. It uses Normal, Map and Grid coordinates. See the help file on the specific parameters, since the definitions change for each shape specified.

EXAMPLES

1. Plot the text string "This is plot 1" centered at normal coordinates .5;.5, in color 15, with a filled box of color 25 around the text.

```
DEVICE  =  xw
PANEL   =  0
SHAPE   =  text
INFO    =  1/3//hw/c/This is plot 1
LOCI    =  .5;.5
LINE    =  15///25
CTYPE   =  f
```

2. Plot a square centered at grid location 40;23, with radius 2 grid points, and rotated 45 degrees. Use color 8 for the unfilled square, and use line type 5.

```
SHAPE   =  regpoly
INFO    =  5/2/4/45
LOCI    =  @40;23
LINE    =  8
CTYPE   =  c
```

ERROR MESSAGES

[GPANOT-1] Fatal error initializing TAE.

[GPANOT-2] Fatal error reading TAE parameters.

[GPANOT-3] Fatal error initializing GEMPLT.

[GPANOT-4] No symbol specified.

[GPANOT-5] No front type specified.

[GPANOT-6] Must have at least 2 pips.

4.30 GPBOX

GPBOX draws a box around a region.

INPUT PARAMETERS

LINE	Color/type/width/label/smth/fltr
REGION	Region type
DEVICE	Device|name|x size;y size|color type

PROGRAM DESCRIPTION

This program draws a box around a region on the current graphics device. REGION can be specified as VIEW, PLOT, or DEVICE. VIEW is the view region of the graphics device. The view region may be changed in GEMPAK programs using the parameter PANEL. The PLOT region is the area used for the data plot, excluding margins. DEVICE is the entire device space.

Note that a box may also be drawn around the VIEW region using the PANEL variable.

EXAMPLES

1. Draw a solid line of width 1 around the view region on the xw device.

```
LINE     = 1
REGION   = view
DEVICE   = xw
```

2. Draw a line around the device region in color 2, using line type 3 and width 5.

```
LINE     = 2/3/5
REGION   = device
```

ERROR MESSAGES

[GPBOX-1] Fatal error initializing TAE.

[GPBOX-2] Fatal error in reading the TAE parameters.

[GPBOX-3] Fatal error initializing GEMPLT.

4.31 GPCLEAR

GPCLEAR clears the current graphics device.

INPUT PARAMETERS

DEVICE Device|name|x size;y size|color type

PROGRAM DESCRIPTION

This program clears the graphics device. On an interactive device, the screen is erased. On a hardcopy device, the next plot will be on a new page.

ERROR MESSAGES

[GPCLEAR-1] Fatal error initializing TAE.

[GPCLEAR-2] Fatal error reading TAE parameters.

[GPCLEAR-3] Fatal error initializing GEMPLT.

4.32 GPCLOSE

GPCLOSE closes the specified graphics output window or file.

INPUT PARAMETERS

DEVICE Device|name|x size;y size|color type

PROGRAM DESCRIPTION

GPCLOSE closes the graphics output window or file specified in the DEVICE parameter.

EXAMPLES

1. Close the window named "window2".
   DEVICE = xw|window2

ERROR MESSAGES

[GPCLOSE1] Cannot close window. Blank name is invalid.

[GPCLOSE-1] Fatal error initializing TAE.

[GPCLOSE-3] Fatal error initializing GEMPLT.

4.33 GPCOLOR

GPCOLOR changes the colors on a color device.

INPUT PARAMETERS

COLORS	Color list
DEVICE	Device|name|x size;y size|color type

PROGRAM DESCRIPTION

This program changes the color components of color numbers on color devices where the components can be set. See the help information on COLORS for more information.

EXAMPLES

1. Set color number 4 to violet.
   COLORS = 4=violet

2. Set color number 2 to yellow by specifying the red, green, and blue components.
   COLORS = 2=1:1:0

ERROR MESSAGES

[GPCOLOR-1] Fatal error initializing TAE.

[GPCOLOR-2] Fatal error reading TAE parameters.

[GPCOLOR-3] Fatal error initializing GEMPLT.

4.34 GPEND

GPEND terminates the GEMPLT subprocesses.

INPUT PARAMETERS

None

PROGRAM DESCRIPTION

This program terminates the GEMPLT plotting package. It stops the GEMPLT subprocesses and should be run at the end of each GEMPAK plotting session.

ERROR MESSAGES

[GPEND-1] Fatal error initializing TAE.

[GPEND-3] Fatal error initializing GEMPLT.

4.35 GPFAX

GPFAX creates a Postscript, GIF, or TIFF file, or an X Windows display from a 6-bit fax file.

INPUT PARAMETERS

DEVICE	Device|name|x size;y size|color type
FAXFIL	6-bit FAX product filename

PROGRAM DESCRIPTION

GPFAX reads a 6-bit FAX file and creates an output product in either the PostScript, GIF, or TIFF format. The program can also display the 6-bit FAX product as image using XW device driver.

Only one 6-bit FAX product can be processed at a time. If there are multiple products in a single file, then only the first product is read.

The output product size, specified in the DEVICE parameter, should be properly set to correctly scale the FAX product. For the GIF and TIFF devices, the xsize and ysize should be obtained from the entries in the table $GEMTBL/pgen/faxprod.tbl that correspond to the input FAX product identification number. For example, the x and y dimensions for the 411X FAX product are 1728 and 864, respectively. These are obtained from the fourth and fifth columns corresponding to the 411X entry in the table.

For the TIFF device driver, the output file is always named as FAX.tiff. The output file must be renamed, otherwise it will be overwritten by subsequent executions of the program.

EXAMPLES

1. Create a GIF file of 5-Day MRF MOS Mean chart, (6-bit FAX ID 411X).

```
DEVICE    =  gif|411X.gif|1728;864
FAXFIL    =  411X.6bt
```

2. Create a TIFF file of the four panel low-level significant weather chart, (6-bit FAX ID 501X).

```
DEVICE    =  tiff||1728;1133
FAXFIL    =  501X.6bt
```

ERROR MESSAGES

[GPFAX-1] Fatal error.

[GPFAX-3] Fatal error initializing GEMPLT.

4.36 GPFRONT

GPFRONT is a version of GPMAP that plots map symbols interpreted from the ASUS1 bulletins. Forecast front positions from FSUS2 bulletins can be plotted by specifying the forecast hour desired from the bulletin (typically a bulletin contains 12 and 24 hour forecast positions).

INPUT PARAMETERS

MAP	Map color/dash/width/filter flag
GAREA	Graphics area
PROJ	Map projection/angles/margins|drop flag
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
LATLON	Line color/dash/width/freq/inc/label/format
PANEL	Panel loc/color/dash/width/regn
TITLE	Title color/line/title
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
CLEAR	Clear screen flag
DEVICE	Device|name|x size;y size|color type
LUTFIL	Enhancement lookup table filename
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info

PROGRAM DESCRIPTION

GPFRONT is derived from the standard GEMPAK program GPMAP. The behaviour is similar to gpmap, with the addition of plotting map symbols defined in an ASUS bulletin, with the map area specified. Satellite and radar data may be used as backgrounds. For ASUS1 bulletins which contain a single analysis time, ASHR is ignored. For FSUS2 bulletins that contain forecast positions for 12 and 24 hour progs, ASHR should be the desired forecast hour (eg 12 or 24). ASATT can be used to specify the scaling of symbols drawn (default is 1.0), and whether to label High and Low values (default is Y).

EXAMPLES

1. Draw a Lambert Conformal map of the US. Display frontal position from the file 98032016_frt.wmo.

```
GAREA    =  uslcc
PROJ     =  lcc
SATFIL   =
RADFIL   =
LATLON   =  0
PANEL    =  0
TITLE    =  2/-1/Frontal Positions
TEXT     =  3/31/2/hw
CLEAR    =  yes
DEVICE   =  xw
ASFIL    =  98032016_frt.wmo
```

ASHR =
ASATT =
LUTFIL = default
IMBAR =

ERROR MESSAGES

[GPFRONT-1] Fatal error initializing TAE.

[GPFRONT-2] Fatal error reading TAE parameters.

[GPFRONT-3] Fatal error initializing GEMPLT.

[GPFRONT-4] Frontal position file not found

4.37 GPKGRF

GPKGRF generates the track error watch/warn plot for the TPC.

INPUT PARAMETERS

STRMID Storm id / Advisory num / Device / Num fcst days

PROGRAM DESCRIPTION

GPKGRF will plot the track error watch/warn plot for each tropical system specified. The system(s) to be plotted may be specified in one of two ways:

(1) A storm identifier and advisory number may be explicitly specified using the STRMID parameter.

(2) Storm identifiers and advisory numbers may be gotten by checking the storm history file against the contents of the storm advisory directory. Only the latest advisory for each storm in the directory (which is not found in the history file) will be processed. This method of running is specified by leaving the storm id and/or advisory number blank in the STRMID parameter, and is the default mode. See the help for STRMID for further details.

The track error watch/warn plot displays the current location and the forecasted track for the tropical system. It also shows the track error envelope. Active hurricane watches and warnings and tropical storm watches and warnings, if any, will be displayed. If the advisory watch/warn text is identical to that of the immediately preceding advisory, the breakpoints from the previous advisory will be used. If the text differs, the user is given the option of entering new breakpoints, using the previous breakpoints, or showing no breakpoints.

The program can generate XW, GIF, or PostScript files, depending on the value of the third field of the STRMID parameter. The default is GIF files (with an XW display of the track error watch/warn file to aid in confirming breakpoints). See the help for STRMID for further details.

The program will display either a 3 day or a 5 day forecast, depending on the value of the fourth field of the STRMID parameter. See the help for STRMID for further details.

EXAMPLES

1. Use the history file to determine which new advisories are to be plotted. GIF files will be created, preceded by an XW display of the track error watch/warn file. A 5 day forecast is displayed.
   STRMID =

2. Plot the graphic for advisory number 8 of storm al892001. Display the graphic in XW only, prompting the user to select the plot for display. A 5 day forecast is displayed.
   STRMID = al892001/8/test

3. Plot the graphic for advisory number 1 of storm al882001 in an XW window. Processing is automatic unless breakpoints are to be entered. A 3 day forecast is displayed.
   STRMID = al882001/1/xw/3

4. Plot the graphic for advisory number 20 of storm ep1900 (which could also have been specified as ep192000). A GIF file will be created, preceded by an XW display of the track error watch/warn file. A 5 day forecast is displayed.
   STRMID = ep1900/20/gf

ERROR MESSAGES

[GPKGRF3] Too few points in track error table.

[GPKGRF2] Cannot change ... in color table.

[GPKGRF1] No new storms to process.

[GPKGRF-1] Fatal error initializing TAE.

[GPKGRF-2] Fatal error reading TAE parameters.

[GPKGRF-3] Error in reading advisory.

[GPKGRF-5] Error in opening history_kg file.

[GPKGRF-6] No advisories found in directory.

[GPKGRF-7] Error in opening breakpoint file.

[GPKGRF-8] Error in opening average track error table.

[GPKGRF-9] Error in opening breakpoint station plotting table.

[GPKGRF-10] Invalid storm identifier in advisory message.

[GPKGRF-12] Error in opening file name table.

4.38 GPLTLN

GPLTLN draws a map, latitude/longitude lines with a selected marker, and various image and graphic products.

INPUT PARAMETERS

MAP	Map color/dash/width/filter flag
GAREA	Graphics area
PROJ	Map projection/angles/margins|drop flag
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
LAT	Latitude
LON	Longitude
PANEL	Panel loc/color/dash/width/regn
MARKER	Marker color/type/size/width/hw
TITLE	Title color/line/title
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
CLEAR	Clear screen flag
DEVICE	Device|name|x size;y size|color type
LUTFIL	Enhancement lookup table filename
STNPLT	Txtc/txt attr|marker attr|stnfil#col
VGFILE	Vgfile | scale file | attribute file
PLUS	Plus sign size/width

PROGRAM DESCRIPTION

GPLTLN draws a map and/or latitude/longitude lines in every 10 degrees with a selected marker for a specified graphics area. A plus sign is placed at the latitude/longitude intersections. Plots may be drawn in any GEMPAK projection and may be overlaid on images. GPLTLN also post-processes NMAP Vector Graphics Files (VGFs) to create products in any format supported by GEMPAK device drivers.

Images are animated if more than one image file is specified in SATFIL or RADFIL. Images are sampled to correspond to the geographic area specified by GAREA. The geographic area may be defined graphically by setting GAREA using the CURSOR command. This command allows for interactive zooming of images and the corresponding map and latitude/longitude plots.

GPLTLN can post-process NMAP VGFs to create products in different formats including AFOS, AWIPS Redbook, GIF, TIFF, 6 bit FAX, and PostScript. The VGFILE variable specifies the input VGF and the DEVICE variable specifies the desired output format. VGF object attributes may be modified when creating products by specifying a table (attribute file) in the VGFILE variable. This table uses the same format as the $GEMTBL/pgen/setting.tbl to alter object attributes. For example, the color, width, and smoothing flag attributes can be changed for a solid line by setting them in the attribute file. The table, $GEMTBL/pgen/uattribd.tbl, provides a template for this capability. Refer to this table for additional details. GPLTLN can also scale attributes for

an entire class of objects by specifying a table (scale file) in the VGFILE variable. Refer to the scale.fax table in $GEMTBL/pgen for additional information.

EXAMPLES

1. Draw a Polar Stereographic map of the Northern Hemisphere. Draw the map in color 1. Draw lat/lon lines with marker 15 in color 3. Place a plus sign on lat/lon intersections every 10 degrees in size 1 and width 3. The color is same with the marker.

```
MAP      =  1
GAREA    =  -10;-130;-10;50
PROJ     =  str/90;-80;0
SATFIL   =
RADFIL   =
LAT      =
LON      =
PANEL    =  0
MARKER   =  3/15
TITLE    =  1
TEXT     =  1
CLEAR    =  yes
DEVICE   =  xw
LUTFIL   =
STNPLT   =
VGFILE   =
PLUS     =  1/3
```

ERROR MESSAGES

[GPLTLN-1] Fatal error initializing TAE.

[GPLTLN-2] Fatal error reading TAE parameters.

[GPLTLN-3] Fatal error initializing GEMPLT.

4.39 GPMAP

GPMAP draws a map, latitude/longitude lines, and various image and graphic products.

INPUT PARAMETERS

MAP	Map color/dash/width/filter flag
GAREA	Graphics area
PROJ	Map projection/angles/margins|drop flag
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
LATLON	Line color/dash/width/freq/inc/label/format
PANEL	Panel loc/color/dash/width/regn
TITLE	Title color/line/title
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
CLEAR	Clear screen flag
DEVICE	Device|name|x size;y size|color type
LUTFIL	Enhancement lookup table filename
STNPLT	Txtc/txt attr|marker attr|stnfil#col
VGFILE	Vgfile | scale file | attribute file
AFOSFL	AFOS Graphics File
AWPSFL	AWIPS Graphics File
LINE	Color/type/width/label/smth/fltr
WATCH	End time|Wtch clrs|Tm|Lb|Clr
WARN	End time|TS;TN;FF clrs|Tm|Lb|Outline
HRCN	End time|colors|syms|Tm|Lb|Mt|Qw|Ft|Name
ISIG	End time|colors|Sym|Tm|Id|Mv|Fl
LTNG	End time|time ints/colors|markers
ATCF	Time|colors|models|Tm|Id|Mv|Mkr|Name
AIRM	Airmet Plotting Attributes
NCON	NCON attributes
CSIG	End time|AR;LN;IS;OL clrs|Seq|Tm|Mv|Fl|Insty
SVRL	End time|TS;TN clrs|Tm|Lb|Outline
BND	Bnd name/color/fillsiz/fillpat/filt/minpts!lincol/linpat/lin
ATCO	Time|colors|models|Tm|Id|Mv|Mkr|Name
TCMG	End time|colors|center
QSCT	QuickScat Plotting Attributes
WSTM	End time|WN;WT;AD clrs|Tm|Lb|Outline
WOU	End time|Cnty bnds clrs|Tm|Lb|Wt|Otln|Clr
WCN	End time|Cnty bnds clrs|Tm|Lb|Wt|Otln|Clr
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info

PROGRAM DESCRIPTION

GPMAP draws a map and/or latitude/longitude lines for a specified graphics area. Plots may be drawn in any GEMPAK projection and may be overlaid on images. GPMAP also post-processes NMAP Vector Graphics Files (VGFs) to create products in any format supported by GEMPAK device drivers. In addition, GPMAP displays various types of graphics products including AWIPS, AFOS, watches, warnings, tropical or hurricane storm tracks, international SIGMETs, lightning, ATCF tracks, airmets, non-

convective sigmets, severe local storm watches, winter storm warning, watch and advisory, and convective sigmets.

Images are animated if more than one image file is specified in SATFIL or RADFIL. Images are sampled to correspond to the geographic area specified by GAREA. The geographic area may be defined graphically by setting GAREA using the CURSOR command. This command allows for interactive zooming of images and the corresponding map and latitude/longitude plots.

GPMAP can post-process NMAP VGFs to create products in different formats including AFOS, AWIPS Redbook, GIF, TIFF, 6 bit FAX, and PostScript. The VGFILE variable specifies the input VGF and the DEVICE variable specifies the desired output format. VGF object attributes may be modified when creating products by specifying a table (attribute file) in the VGFILE variable. This table uses the same format as the $GEMTBL/pgen/setting.tbl to alter object attributes. For example, the color, width, and smoothing flag attributes can be changed for a solid line by setting them in the attribute file. The table, $GEMTBL/pgen/uattribd.tbl, provides a template for this capability. Refer to this table for additional details. GPMAP can also scale attributes for an entire class of objects by specifying a table (scale file) in the VGFILE variable. Refer to the scale.fax table in $GEMTBL/pgen for additional information.

GPMAP can also plot the current thunderstorm and tornado watches. The parameter WATCH sets the ending time and the colors for plotting the watches. The parameter WARN sets the ending time and the colors for plotting warnings. The parameter WSTM sets the ending time and the colors for plotting winter storm warning, watch, and advisory. The parameter CSIG sets the ending time and the colors for plotting convective sigmets. The parameter HRCN sets the ending time and the colors for plotting tropical depressions, storms, and hurricane positions. Optionally, a specific storm name may be entered to display only that specific tropical disturbance. The parameter ISIG sets the ending time and the colors for plotting international SIGMETs. The parameter LTNG sets the ending time, time increments, colors and markers for plotting lightning data. The parameter ATCF sets the time, models and colors for plotting ATCF (Automated Tropical Cyclone Forecast) tracks. As with HRCN, a specific storm name may be entered. The parameter AIRM sets the ending time and the colors for plotting airmets. The parameter NCON sets the ending time and the colors for plotting non- convective sigmets. The parameter SVRL sets the ending time and the colors for plotting severe local storms watches. The parameter WOU sets the ending time and the colors for plotting the watch outline update (WOU). The parameter WCN sets the ending time and the colors for plotting the watch county notificatioin(WCN).

EXAMPLES

1. Draw a Polar Stereographic map of the Northern Hemisphere. Draw the map in color 1 and lat/lon lines in color 2 every 15 degrees.

```
MAP             =  1
```

```
GAREA     =  -10;-130;-10;50
PROJ      =  str/90;-80;0
SATFIL    =
RADFIL    =
LATLON    =  2/10/1/1/15;15
PANEL     =  0
TITLE     =  1
TEXT      =  1
CLEAR     =  yes
DEVICE    =  xw
LUTFIL    =
STNPLT    =
VGFILE    =
AFOSFL    =
AWPSFL    =
LINE      =
WATCH     =
WARN      =
HRCN      =
ISIG      =
LTNG      =
ATCF      =
AIRM      =
NCON      =
CSIG      =
SVRL      =
WSTM      =
WOU       =
WCN       =
```

2. Display two infrared satellite images in a second window named "IR". Overlay the VGF test.vgf. In addition, display the latest watches, warnings, international SIGMETs, lightning, ATCF tracks, airmets and non-convective and convective sigmets, SLS watches, winter storm messages, and all tropical disturbances.

```
MAP       =  1/7
GAREA     =  dset
PROJ      =  sat
SATFIL    =  $GEMDATA/IR_910819_1801;19
RADFIL    =
LATLON    =  2/10/1/1/10;10
PANEL     =  0
TITLE     =  1
TEXT      =  1
CLEAR     =  yes
DEVICE    =  xw|IR
LUTFIL    =
STNPLT    =
VGFILE    =  test.vgf
AFOSFL    =
AWPSFL    =
LINE      =
```

```
WATCH     =  last
WARN      =  last
HRCN      =  all
ISIG      =  last
LTNG      =  last
ATCF      =  last
AIRM      =  last
NCON      =  last
CSIG      =  last
SVRL      =  last
WSTM      =  last
WOU       =
WCN       =
```

3. Display two visible satellite images in a third window named "VIS". Overlay the AFOS test product T01 in color 6 with line width 2.

```
MAP       =  1/7
GAREA     =  dset
PROJ      =  sat
SATFIL    =  $GEMDATA/VIS_910819_1801;19
RADFIL    =
LATLON    =  2/10/1/1/10;10
PANEL     =  0
TITLE     =  1
TEXT      =  1
CLEAR     =  yes
DEVICE    =  xw|VIS
LUTFIL    =
STNPLT    =
VGFILE    =
AFOSFL    =  NMCGPHT01
AWPSFL    =
LINE      =  6//2
WATCH     =
WARN      =
HRCN      =
ISIG      =
LTNG      =
ATCF      =
AIRM      =
NCON      =
CSIG      =
SVRL      =
WSTM      =
WOU       =
WCN       =
```

4. Postprocess an NMAP VGF to create an AWIPS Redbook Graphics file. Change selected object attributes by using the table attrib.xmp

```
MAP       =  1
GAREA     =  us
```

```
PROJ     =
SATFIL   =
RADFIL   =
LATLON   =  1
PANEL    =  0
TITLE    =  1
TEXT     =  1
CLEAR    =  y
DEVICE   =  RBK
LUTFIL   =  grey
STNPLT   =
VGFILE   =  symbols_big.vgf||attrib.xmp
AFOSFL   =
AWPSFL   =
LINE     =  3
WATCH    =
WARN     =
HRCN     =
ISIG     =
LTNG     =
ATCF     =
AIRM     =
NCON     =
CSIG     =
SVRL     =
WSTM     =
WOU      =
WCN      =
```

Where attrib.xmp contains:

```
CLASS_SYMBOLS   -99    -99      3    3       0      2.0
CLASS_SYMBOLS   SPSYM_ELM    12  0  0    0      5.0
```

which means set all symbols to GEMPAK color 3 and size 2.0 except for symbol type SPSYM_ELM, sub-type 12 (High symbol) which will retain default color and be size 5.

ERROR MESSAGES

[GPMAP-1] Fatal error initializing TAE.

[GPMAP-2] Fatal error reading TAE parameters.

[GPMAP-3] Fatal error initializing GEMPLT.

4.40 GPNEXR2

GPNEXR2 displays NEXRAD level II products.

INPUT PARAMETERS

MAP	Map color/dash/width/filter flag
GAREA	Graphics area
PROJ	Map projection/angles/margins|drop flag
RADFIL	Radar image filename(s)
LATLON	Line color/dash/width/freq/inc/label/format
PANEL	Panel loc/color/dash/width/regn
TITLE	Title color/line/title
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
CLEAR	Clear screen flag
DEVICE	Device|name|x size;y size|color type
LUTFIL	Enhancement lookup table filename
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
TILT	Radar beam elevation/tilt number
RADPARM	Radar parameter (dz, vr, sw)
RADTIM	Radar composite current/dattim

PROGRAM DESCRIPTION

GPNEXR2 displays NEXRAD Level II products in ARCHIVE2 format.

RADFIL specifies the input level II file. A template may be specified, with an optional site name (eg NEXRII|KDDC). If a site name is provided, it will be used to replace the %SITE% alias in the template name. The NEXRII template is provided for ARCHIVE2 format files.

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

TILT is the Radar beam elevation/tilt number.

RADTIM is a valid GEMPAK date/time string or abbreviation. A time range may be specified.

LUTFIL specifies the color enhancement table.

EXAMPLES

1. Display the most recent base reflectivity for KDDC.

```
MAP     = 6/1/1+3/1/2
GAREA   = dset
PROJ    = rad
RADFIL  = NEXRII|KDDC
```

```
LATLON  =  0
PANEL   =  0
TITLE   =  31
TEXT    =  1
CLEAR   =  YES
DEVICE  =  xw
LUTFIL  =  default
IMBAR   =  31/V/LL/.005;.05/.85;.01|.7/1/1/hw
TILT    =  0
RADPARM =  dz
RADTIM  =  last
```

2. Create an animation sequence for KDDC using data from 2330Z yesterday (July 29th) to 0030Z today (July 30th).

```
GAREA   =  dset
PROJ    =  rad
RADFIL  =  NEXRII|KDDC
LATLON  =  0
PANEL   =  0
TITLE   =  31
TEXT    =  1
CLEAR   =  YES
DEVICE  =  xw
LUTFIL  =  default
IMBAR   =  31/V/LL/.005;.05/.85;.01|.7/1/1/hw
TILT    =  0
RADPARM =  dz
RADTIM  =  29/2330-30/0030
```

ERROR MESSAGES

[GPNEXR2-1] Fatal error initializing TAE.

[GPNEXR2-2] Fatal error reading TAE parameters.

[GPNEXR2-3] Fatal error initializing GEMPLT.

4.41 GPRCM

GPRCM is a version of GPMAP that plots Radar Coded Message (RCM) bulletins.

INPUT PARAMETERS

MAP	Map color/dash/width/filter flag
GAREA	Graphics area
PROJ	Map projection/angles/margins|drop flag
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
LATLON	Line color/dash/width/freq/inc/label/format
PANEL	Panel loc/color/dash/width/regn
TITLE	Title color/line/title
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
CLEAR	Clear screen flag
DEVICE	Device|name|x size;y size|color type
RCMFIL	RCM data file
RADTIM	Radar composite current/dattim
RADDUR	Radar time window (minutes prior to RADTIM)
DITHER	dither level
MESO	meso color/marker/size/width/hw;filter
TVS	tvs color/marker/size/width/hw;filter
CNTR	Centroid barb color/size/width;filter
MAXTOP	Maxtop color;filter
RADINFO	Radar status color
ECHO	Plot radar echoes (0,1,2)
CLRBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
LUTFIL	Enhancement lookup table filename
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
OUTPUT	Output device/filename

PROGRAM DESCRIPTION

GPRCM is derived from the standard GEMPAK program GPMAP. The behavior is similar to gpmap, with the addition of reading Radar Coded Message (RCM) bulletins and optionally plotting radar echoes and/or annotations from the remarks included within the RCM bulletin.

RCM bulletins contain digitized reflectivity values derived from the 2.2 x 2.2 nmi NIDS Composite reflectivity product over the radar area of coverage out to 248 nmi based on grid squares approximately 5.4 nmi on a side. The reflectivity intensity value for each grid box is determined by assigning the maximum value of all Composite Reflectivity boxes whose centers are contained within the grid square. The RCM message comprises 9 intesity categories as follows:

Code		Color Plotted
0	ND	
1	15-30 dBZ	23
2	30-40 dBZ	22
3	40-45 dBZ	21
4	45-50 dBZ	20
5	50-55 dBZ	17
6	>= 55 dBZ	15
7	data beyond 124 nmi that are above threshold	
8	data beyond 124 nmi that are below threshold	

RCM data within a user specified time range are plotted.

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.

RADTIM (current or dattim) specifies the ending time for accepted data. RADDUR is the number of minutes prior to the ending time to begin accepting data.

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 >= 5 will outline the grid box.

MESO specifies the color/marker/size/width/hw for mesocyclones to be marked. A color value of 0 is used to turn off mesocyclone plotting. Marker attributes behave as MARKER for other plotting programs.

TVS specifies the color/marker/size/width/hw for tornado vortex signatures to be marked. A color value of 0 is used to turn off TVS plotting.

CNTR specifies the color/size/width for Cell Centroid movement barbs (knots). A value of 0 is used to turn off centroid plotting.

MAXTOP specifies the color for cell top annotations (feet). A value of 0 is used to turn off cell top annotations.

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

ECHO specifies whether to plot the grid box intesities. 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.

RCM summary information is directed to OUTPUT. Summary information includes the station ID, reorting time, operational mode, and mesocyclone and tornado vortex signature locations (if present).

GPRCM utilizes the nexrad.tbl station table to determine the radar location (not all RCM bulletins contain radar location as of Nov. 1999). The radars listed in the station table are also used to determine which locations are missing (Not Available: NA).

EXAMPLES

1. Draw a Lambert Conformal map of the US. Display RCM data from the file rcm.dat. Plot radar observations for the past 60 minutes. Display the echo intensities (no dithering), maxtop values in yellow, and radar status in red. Do not plot mesocyclone, or TVS locations. Plot the cell centroid motion barbs in white. Use echoes from radar sites operating in precipitation mode only. Use the default CLRBAR positioning.

```
GAREA     =  us
PROJ      =  str/90;-105;0
SATFIL    =
RADFIL    =
LATLON    =  0
PANEL     =  0
TITLE     =  1/-1/Radar Summary
TEXT      =  1.3/22/1/hw
CLEAR     =  yes
DEVICE    =  xw
RCMFIL    =  rcm.dat
RADTIM    =  current
RADDUR    =  60
DITHER    =  0
MESO      =  0
TVS       =  0
CNTR      =  1/1/1
MAXTOP    =  5
RADINFO   =  2
ECHO      =  1
CLRBAR    =  1
LUTFIL    =
IMBAR     =
OUTPUT    =  T
```

2. Overlay the IR satellite imagery with RCM data for the US west coast. Use a DITHER value of 2 to for moderate transparency. Plot the radar CLRBAR horizontally above title. Satellite CLRBAR will be vertical along the left side of the image (default location from IMBAR).

```
GAREA     =  ca-
PROJ      =  sat
```

```
SATFIL   =  $SAT/GOES-10/4km/IR/IR_991108_1600
RADFIL   =
LATLON   =  0
PANEL    =  0
TITLE    =  1/-1/Satellite and Radar Composite
TEXT     =  1/22/1/hw
CLEAR    =  yes
DEVICE   =  xw
RCMFIL   =  rcm.dat
RADTIM   =  current
RADDUR   =  60
DITHER   =  2
MESO     =  0
TVS      =  0
CNTR     =  0
MAXTOP   =  0
RADINFO  =  0
ECHO     =  1
CLRBAR   =  1/h/cc/.46;.06
LUTFIL   =  default
IMBAR    =  1
OUTPUT   =  T
```

3. Display the current RCM data using the RCMDAT file template and allow searching back 90 minutes. Do not filter TVS plotting, use a filter of .3 for MESO plotting, a filter of .5 for CNTR, and 1.0 (aka YES) for MAXTOP plotting. Send summary output to the terminal as well as to a file named rcm.summary.

```
MAP      =  8
GAREA    =  us
PROJ     =  str/90;-105;0
SATFIL   =
RADFIL   =
LATLON   =  0
PANEL    =  0
TITLE    =  1/-1/Radar Summary
TEXT     =  .9/22/1/hw
CLEAR    =  YES
DEVICE   =  xw
RCMFIL   =  rcmdat
RADTIM   =  current
RADDUR   =  90
DITHER   =  0
MESO     =  2/1/1/1/hw;.3
TVS      =  2/2/1/2/hw;n
CNTR     =  1/.7/1;.5
MAXTOP   =  6;y
RADINFO  =  5
ECHO     =  1
CLRBAR   =  0
LUTFIL   =
IMBAR    =
```

OUTPUT = tf/rcm.summary

ERROR MESSAGES

[GPRCM-1] Fatal error initializing TAE.

[GPRCM-2] Fatal error reading TAE parameters.

[GPRCM-3] Fatal error initializing GEMPLT.

4.42 GPTEXT

GPTEXT draws the contents of a text file to the output device.

INPUT PARAMETERS

PANEL	Panel loc/color/dash/width/regn
COLORS	Color list
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
CLEAR	Clear screen flag
DEVICE	Device|name|x size;y size|color type
TXTFIL	Text filename or LOGO|size|mode
TXTLOC	Text location
COLUMN	Number of columns

PROGRAM DESCRIPTION

GPTEXT draws text read from an ASCII text file to the output device driver. If the input file is LOGO, the NOAA logo will be plotted. The logo can be plotted in either full color or monochrome. The NOAA logo is also plotted if "NOAA" is entered for the file name. The NWS logo is plotted if "NWS" is entered.

The text location TXTLOC is given as the X and Y values in the Normalized coordinate system or Map coordinate system if a '#' is prefixed before the X and Y values. To use map coordinates, the map projection must be defined by another GEMPAK application such as GPMAP.

COLUMN is the number of columns the text will be divided into within a panel.

EXAMPLES

1. Draw the contents of the text file mytext.txt to the XW device. Display the text at the location .1;.8. Display in a single column.

```
PANEL     =  0
COLORS    =  1
TEXT      =  1
CLEAR     =  yes
DEVICE    =  xw
TXTFIL    =  mytext.txt
TXTLOC    =  .1;.8
COLUMN    =  1
```

ERROR MESSAGES

[GPTEXT-1] Fatal error initializing TAE.

[GPTEXT-2] Fatal error reading TAE parameters.

[GPTEXT-3] Fatal error initializing GEMPLT.

[GPTEXT-4] File ... does not exist.

[GPTEXT-5] Map projection is not set.

4.43 GPTPC

GPTPC generates four hurricane graphics for the TPC. They are:

(1) Wind swath plot
(2) Strike probability plot (Atlantic storms only)
(3) Wind intensity graph
(4) Wind speed table

INPUT PARAMETERS

STRMID	Storm id / Advisory num / Device / Num fcst days

PROGRAM DESCRIPTION

GPTPC will plot up to four graphics for each tropical system specified. The system(s) to be plotted may be specified in one of two ways:

1) A storm identifier and advisory number may be explicitly specified using the STRMID parameter.

2) Storm identifiers and advisory numbers may be gotten by checking the storm history file against the contents of the storm advisory directory. Only the latest advisory for each storm in the directory (which is not found in the history file) will be processed. This method of running is specified by leaving the storm id and/or advisory number blank in the STRMID parameter, and is the default mode. See the help for STRMID for further details.

The wind swath plot shows the cumulative radius of the 34 knot (tropical storm force) and the 64 knot (hurricane force) winds over the life of the storm.

The strike probability plot displays contours of the strike probability percentage using ranges of 10 to 19 percent, 20 to 49 percent, 50 to 99 percent, and 100 percent.

The wind intensity graph shows maximum one-minute wind speed forecast and probabilities in miles per hour vs. forecast time, out to 72 hours. Category information is also displayed.

The wind speed table shows the wind speed forecast expressed as a percentage probability of reaching a given strength and category, out to 72 hours.

The program can generate XW, GIF, or PostScript files, depending on the value of the third field of the STRMID parameter. The default is GIF files. See the help for STRMID for further details. (GPTPC does not use the fourth field of the STRMID parameter.)

EXAMPLES

1. Use the history file to determine which new advisories are to be plotted. GIF files will be created.
   STRMID =

2. Plot the graphics for advisory number 8 of storm al892001. Display the graphics in XW only, prompting the user to select which plots will be displayed and when to move on to the next plot.
   STRMID = al892001/8/test

3. Plot the graphics for advisory number 1 of storm al882001. Each of the four graphics will be displayed in its own XW window (the windows are tiled and may be raised as desired). Processing is automatic.
   STRMID = al882001/1/xw

4. Plot the graphics for advisory number 20 of storm ep1900 (which could also have been specified as ep192000). GIF files will be created.
   STRMID = ep1900/20/gf

ERROR MESSAGES

[GPTPC2] Cannot change ... in color table.

[GPTPC1] No new storms to process.

[GPTPC-1] Fatal error initializing TAE.

[GPTPC-2] Fatal error reading TAE parameters.

[GPTPC-3] Error in reading advisory.

[GPTPC-4] Error in reading strike probability grid.

[GPTPC-5] Error in opening history file.

[GPTPC-6] No advisories found in directory.

[GPTPC-9] Error in contour fill.

[GPTPC-10] Error in coordinates for wind intensity plot.

[GPTPC-11] Error in opening intensity probability table.

[GPTPC-12] Error in opening file name table.

4.44 GPTRAJ

GPTRAJ computes trajectories for gridded data files.

INPUT PARAMETERS

MAP	Map color/dash/width/filter flag
GAREA	Graphics area
PROJ	Map projection/angles/margins|drop flag
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
LUTFIL	Enhancement lookup table filename
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
LATLON	Line color/dash/width/freq/inc/label/format
PANEL	Panel loc/color/dash/width/regn
TITLE	Title color/line/title
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
CLEAR	Clear screen flag
DEVICE	Device|name|x size;y size|color type
GDFILE	Grid file
GVECT	Vector grid
GPOINT	Grid point
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
GDATTIM	Grid date/time
TSTEP	Time step (minutes)
MARKER	Marker color/type/size/width/hw
LINE	Color/type/width/label/smth/fltr
RTRAJ	Back/Reverse trajectory flag

PROGRAM DESCRIPTION

GPTRAJ computes horizontal trajectories from user supplied vector functions on constant grid level/coordinates.

Trajectories are computed using a user specified GPOINT as the starting or ending location (see RTRAJ). The advected GPOINT location is determined by interpolating the gridded vector components to the trajectory location using the nearest data time. The trajectory location is updated iteratively through the forecast times using TSTEP over the time range specified in GDATTIM.

TSTEP is the time step of integration (in minutes).

GPOINT may be specified using the traditional methods for denoting a single point, or may be intered as a semicolon separated lat/lon pair of min/max/increment.

MARKER is used to define the marker characteristics used to locate the trajectory point at times matching the available grid fields.

LINE is used to define the line type which connects the computed trajectory locations.

RTRAJ is a logical flag to specify whether a reverse/back trajectory will be computed. If RTRAJ is NO, a forward trajectory is computed. If RTRAJ is YES, a backwards trajectory will be computed from GPOINT.

The direction of the last data point is marked with a directional arrow.

EXAMPLES

1. Draw a Lambert Conformal map of the US. Using the most recent ETA model output, display a trajectory starting at DEN using the 10m wind for the time range F024-F060.

```
MAP      =  1
GAREA    =  uslcc
PROJ     =  lcc
SATFIL   =
RADFIL   =
LATLON   =  0
PANEL    =  0
TITLE    =  1/-1/Trajectory from DEN
TEXT     =  1/22/1/hw
CLEAR    =  yes
DEVICE   =  xw
GDFILE   =  eta
GVECT    =  wnd
GPOINT   =  den
GLEVEL   =  10
GVCORD   =  hght
GDATTIM  =  f024-f060
MARKER   =  6/15/6/1
LINE     =  7
RTRAJ    =  no
TSTEP    =  1
```

2. Repeat the map above using all forecast times in the ETA model run for a back trajectory.

```
MAP      =  1
GAREA    =  uslcc
PROJ     =  lcc
SATFIL   =
RADFIL   =
LATLON   =  0
PANEL    =  0
TITLE    =  1/-1/Backward Trajectory for DEN
TEXT     =  1/22/1/hw
CLEAR    =  yes
DEVICE   =  xw
GDFILE   =  eta
```

```
GVECT    =  wnd
GPOINT   =  den
GLEVEL   =  10
GVCORD   =  hght
GDATTIM  =  fall
MARKER   =  6/15/6/1
LINE     =  7
RTRAJ    =  yes
TSTEP    =  1
```

3. Display all 700mb backward trajectories for points ending at lat/lon pairs every 10 degrees across the domain using all forecast times in the ETA model run. Set the time step to 30 minutes.

```
MAP      =  1
GAREA    =  uslcc
PROJ     =  lcc
SATFIL   =
RADFIL   =
LATLON   =  0
PANEL    =  0
TITLE    =  1/-1
TEXT     =  1/22/1/hw
CLEAR    =  yes
DEVICE   =  xw
GDFILE   =  eta
GVECT    =  wnd
GPOINT   =  30/50/10;-120/-70/10
GLEVEL   =  700
GVCORD   =  pres
GDATTIM  =  fall
MARKER   =  6/15/6/1
LINE     =  7
RTRAJ    =  yes
TSTEP    =  30
```

ERROR MESSAGES

[GPTRAJ-1] Fatal error initializing TAE.

[GPTRAJ-2] Fatal error reading TAE parameters.

[GPTRAJ-3] Fatal error initializing GEMPLT.

4.45 GPWARN

GPWARN is a version of GPMAP that plots filled county/zone regions from reports which use the univeral generic county/zone identifier lines.

INPUT PARAMETERS

MAP	Map color/dash/width/filter flag
GAREA	Graphics area
PROJ	Map projection/angles/margins|drop flag
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
LATLON	Line color/dash/width/freq/inc/label/format
PANEL	Panel loc/color/dash/width/regn
TITLE	Title color/line/title
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
CLEAR	Clear screen flag
DEVICE	Device|name|x size;y size|color type
SVRL	End time|TS;TN clrs|Tm|Lb|Outline
LUTFIL	Enhancement lookup table filename
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
OUTPUT	Output device/filename

PROGRAM DESCRIPTION

GPWARN is derived from the standard GEMPAK program GPMAP. The behaviour is similar to gpmap, with the addition of plotting filled county/zones defined in a UGC specifier with the map area specified. Satellite and radar data may be used as backgrounds.

NWSTG Products which use the UGC identifier line include:

	PIL
Tornado Warnings	TOR
Severe Thunderstorm Warnings	SVR
Flood Watches	FLA|FFA
Flood Warnings	FLW|FFW
Winter Weather Bulletins	WSW
Non-precipitation Bulletins	NPW
Special Weather Statements	SPS

GPWARN finds the UGC line following the pil line in the bulletin which looks like: ALC129-131-MSC041-046>052-281030-

The program determines the counties/zone which are included in the bulletin, along with the expiration time. The map information for the county or zone to be plotted is read from the $GEMTBL/bounds files. Each county is filled and outlined with a color code based on bulletin type and expiration time.

The following gempak color codes are used:

Type	Current fill/outline	Expired fill/outline
Tornado	2/5	13/10
Tstorm	14/5	13/10
Flood Watch	21/5	19/18
Flood Warn	23/5	19/18
Winter	4/5	26/10
Non-precip	7/5	29/10
Special	6/5	24/26

The bulletins are read from the text bulletins which are also used with NWX. These bulletins are stored under the $TEXT_DATA tree under watch_warn/torn_warn, watch_warn/tstrm_warn, watch_warn/winter, watch_warn/noprcp, watch_warn/special, fflood/watch, fflood/warn.

The program allows the user to specify an input file list using the WWFIL parameter. Multiple file names or template aliases may be entered by separating each entry with a semicolor (;). File templates should be defined in $GEMTBL/config/datatype.tbl.

GPWARN will search for the files by checking for a template, and then using the file name given, as well as relative to $TEXT_DATA, eg.:

WWFIL = tstrmwarn
WWFIL = $TEXT_DATA/watch_warn/tstrm_warn/1997012800.warn
WWFIL = watch_warn/tstrm_warn/1997012800.warn
WWFIL = /fullpath/nwx/watch_warn/tstrm_warn/1997012800.warn

each of the above entries are valid.

The time for the plot may be spacified as current or a valid GEMPAK format YYMMDD/HHMM time using the parameter WWS, eg:

WWS = cur WWS = 970128/0000

GPWARN will use the time in WWS to determine if a bulletin has expired by comparing against the time on the UGC line.

The time range for plotted bulletins is set using the WWATT parameter. This parameter allows the user to specify how long after the bulletin has expired that it will still be plotted, and how far in the future bulletins will be viewed. The format is WWATT = min_prior/min_future, where min_prior and min_future are integers in minutes. No display will occure for bulletins which have expired greater than min_prior minutes before the time in WWS.

For bulletins which have not yet expired, min_future will determine if the bulletin is to be plotted. This feature is useful when plotting historical data, where products exist at

later times than were available at the time which the plot represents, or in the case of advisories such as winter storm bulletins which may be issued well in advance of the expected conditions.

If min_future is negative (eg -60), then no display will occur for bulletins which expire greater than 60 minutes in the future. If min_future is positive (eg 60), then bulletins that expire greater than 60 minutes in the future will be displayed in white, so that they are not confused with those regions which are more immenent.

For product generation scripts, you may which to cat each of the desired file types to be plotted into a single input file, otherwise, you may run the program a sperate time for each input file desired.

The default it WWATT is blank is 1440/1440. If only one value is specified, it is used for both.

In addition to plotting warnings, GPWARN also provides the option of plotting counties included within watched using the SVRL parameter as used in GPMAP. The files for SVRL are generated by the dcsvrl decoder.

Color and line types for the areas drawn by GPWARN are specified in the gpwarn.config file. If the file does not exist, a default set of colors will be used. The config file will be searched for in the standard locations, including the current working directory in order to allow the user to tailor colors for the individual application.

EXAMPLES

1. Draw a Lambert Conformal map of the US. Display current tornado, severe thunderstorm, flood, winter weather and non-precipitation warnings. Show counties/zones for up to 120 minutes after tha warning has expired. Begin to show warnings 1440 minutes before they take affect.

```
GAREA     =  uslcc
PROJ      =  lcc
SATFIL    =
RADFIL    =
LATLON    =  0
PANEL     =  0
TITLE     =  2/-2/Current Warnings
TEXT      =  1.3/22/1/hw
CLEAR     =  yes
DEVICE    =  xw
SVRL      =
WWFIL     =  nonpcpwarn;winterwarn;floodwarn;tstormwarn;tornadowarn
WWS       =  current
WWATT     =  120/1400
OUTPUT    =  t
```

ERROR MESSAGES

[GPWARN-1] Fatal error initializing TAE.

[GPWARN-2] Fatal error reading TAE parameters.

[GPWARN-3] Fatal error initializing GEMPLT.

4.46 GRPHGD

GRPHGD generates a grid from contours drawn via NMAP product generation.

INPUT PARAMETERS

GDOUTF	Output grid file
PROJ	Map projection/angles/margins|drop flag
GRDAREA	Area covered by grid
KXKY	Number of grid points in x;y
MAXGRD	Maximum number of grids
CPYFIL	Grid file whose navigation is to be used in new grid file |
ANLYSS	Grid analysis block
CNTRFL	Contour file
GDATTIM	Grid date/time
GFUNC	Scalar grid
GLEVEL	Grid level
GVCORD	Grid vertical coordinate
KEYCOL	Key color
GGLIMS	Grid value limitations and control
HISTGRD	Toggle writing history grid (y/n)
BOUNDS	BOUNDS name|<key>key_name|mask_flag

PROGRAM DESCRIPTION

GRPHGD generates a grid from contours drawn via NMAP product generation. A two-step process is involved:

1) Contours must be drawn via NMAP and the coordinates saved, 2) The saved coordinates are passed into GRPHGD for
conversion into gridded data.

NMAP Procedure

To generate contours, invoke NMAP and enter product generation. Contours are defined as a simple solid line grouped with a numeric text value using 'LABEL' grouping. The label may be located anywhere. Any number of equal-valued labels may be grouped with any number of lines. When drawing, labeling and grouping have been completed, a text file containing the geographical contour coordinates must be created. Click 'PROD' then 'GRAPH GRID'. A popup will appear with a listing of all properly grouped contours and their associated value and coordinates. Click 'SAVE' to save this text to the ASCII file CNTRFL. This is the file which will be passed into GRPHGD.

Note that NMAP now invokes the GRPHGD program directly when the user selects "MAKE GRID".

GRPHGD Procedure

To generate a gridded field from contour data, use the program GRPHGD. The following parameters are used:

```
GDOUTF   = Output grid file
PROJ     = Map projection/angles/margins|dr
GRDAREA  = Area covered by grid
KXKY     = Number of grid points in x;y
MAXGRD   = Maximum number of grids
CPYFIL   = File to be copied
ANLYSS   = Grid analysis block
CNTRFL   = Contour file (ASCII data generated via NMAP)
GDATTIM  = Grid date/time
GFUNC    = GEMPAK parameter name
GLEVEL   = GEMPAK vertical level value
GVCORD   = GEMPAK vertical coordinate
KEYCOL   = Key color
BOUNDS   = Bound area(s) to exclude or include
```

Several parameters (PROJ, GRDAREA, KXKY, MAXGRD, CPYFIL, ANLYSS) are intended to be used identically as in the programs GDCFIL and NAGRIB. These define the grid (and gridfile) to create the data. The grid is written to file GDOUTF with parameter name GFUNC valid at GDATTIM. GLEVEL and GVCORD may be assigned accordingly. KEYCOL indicates which lines actually get processed; =0 processes all lines, =n processes only lines with color n. BOUNDS determines whether to assign missing values to gridpoints inside (BOUNDS=...|...|false) or outside (BOUNDS=...|...|true) a bounded area. Up to ten bounds areas may be specified by separating with '+'.

GRPHGD loosely follows an algorithm originally described in TDL OFFICE NOTE 92-14 "The Systematic Interpolative Radial Search (SIRS) -- A Method to Compute Gridpoint Values from Contours". Some changes were incorporated to improve data consistency, to increase execution efficiency and for added capability:

The program performs several methodologies to assign values at gridpoints: 1) bounds check w/ appropriate missing value assignments, 2) exact value assignment when a contour lies directly on a gridpoint, 3) radial search/assignment for grid points between different valued contours, 4) grid points within closed contours, with and without relative minima/maxima, 5) grid points surrounded by like-valued contours, without relative minima/maxima, 6) a weighted search and assignment where neither 1) thru 5) could be applied. A 9-point smoother is applied as a final step.

EXAMPLES

1. Create a grid from the NMAP ASCII file qpf.info. Use the same grid as found in the RUC2 model. Identify the grid as 'prcp' valid at 980903/1200.

```
GDOUTF      =  qpf.98090312
```

```
PROJ      =
GRDAREA   =
KXKY      =
MAXGRD    =  10
CPYFIL    =  $MODEL/ruc2/ruc2_98090312
ANLYSS    =
CNTRFL    =  qpf.info
GDATTIM   =  980903/1200
GFUNC     =  prcp
```

2. Same as example 1, except assign missing values outside the SSA bounded area HPC050, i.e., assign values only to those grid points inside the bounds area.

```
GDOUTF    =  qpf.98090312
PROJ      =
GRDAREA   =
KXKY      =
MAXGRD    =  10
CPYFIL    =  $MODEL/ruc2/ruc2_98090312
ANLYSS    =
CNTRFL    =  qpf.info
GDATTIM   =  980903/1200
GFUNC     =  prcp
BOUNDS    =  SSA|<AREA>HPC050|true
```

ERROR MESSAGES

[GRPHGD+3] WARNING. Maximum number of intersections exceeded.

[GRPHGD+2] WARNING. This grid dimension is too large.

[GRPHGD+1] WARNING. This grid is too large.

[GRPHGD-1] Fatal error initializing TAE.

[GRPHGD-2] Fatal error reading TAE parameters.

[GRPHGD-3] Fatal error initializing GEMPLT.

[GRPHGD-4] Navigation information is invalid.

[GRPHGD-5] Grid area ... is invalid.

[GRPHGD-6] Grid size is invalid.

[GRPHGD-7] The grid file name may not be blank.

[GRPHGD-8] Cannot create file ....

[GRPHGD-9] Grid name ... cannot be found in grid table.

[GRPHGD-10] Incompatible grid navigation in ....

[GRPHGD-11] Cannot open file ....

4.47 NAGRIB

NAGRIB converts gridded data in GRIB files to GEMPAK gridded data.

INPUT PARAMETERS

GBFILE	GRIB data file name
INDXFL	GRIB index file name
GDOUTF	Output grid file
PROJ	Map projection/angles/margins|drop flag
GRDAREA	Area covered by grid
KXKY	Number of grid points in x;y
MAXGRD	Maximum number of grids
CPYFIL	Grid file whose navigation is to be used in new grid file |
GAREA	Graphics area
OUTPUT	Output device/filename
GBTBLS	Input GRIB decoding tables
GBDIAG	GRIB diagnostic elements
PDSEXT	PDSEXT Y or N, add PDS extension if found

PROGRAM DESCRIPTION

NAGRIB will convert gridded data which is in GRIB files to gridded data in a GEMPAK file.

The GRIB input file is specified in GBFILE, and the index file associated with the GRIB file is in INDXFL.

The GEMPAK output file is given in GDOUTF. This file will be opened if it exists and the projection information matches the GRIB message projection. If the file does not exist, it will be created using information given by the user. If the output filename is "LIST", the GRIB file will be scanned and the decoded GEMPAK header information will be printed out.

The navigation information given by the user may take several forms. The first possibility is for the user to enter CPYFIL=#NNN, where NNN is a grid projection number listed in GRDNAV.TBL. Second, the user may enter CPYFIL=GDS. This will read the navigation from the Grid Definition Section of the first GRIB message. Third, the user could enter CPYFIL=OLDFILE, where OLDFILE is the name of an existing GEMPAK file from which to copy the navigation information. Last, the user may choose to use the PROJ, GRDAREA, and KXKY parameters to specify the navigation.

GAREA is used to subset the grid. It may be specified as any valid input for GAREA which are equivalent to lat/lon bounds or as a single @ followed by the lower-left and upper-right grid point coordinates separated by semicolons. In the former case, the locations are rounded to the nearest grid points. The projection type and angles entered as described above along with the lat/lon coordinates of the corners of the subset define a new grid navigation different from that of the full grid. The navigation entered as de-

scribed in the preceding paragraph is always that of the full grid. To get the full grid, set GAREA to blank, GRID or DSET.

OUTPUT defines the direction and destination of printed output.

GBTBLS allows the user to override the default GRIB decoding tables by listing the filenames of the WMO and NCEP parameter tables, the vertical coordinate table and the originating center table.

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, BDS, BMS, 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.

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

EXAMPLES

1. Convert the data in the NGM GRIB file for 2 Sep 1993. Create the GEMPAK file using projection #105 from the grid navigation table. Define a subset using lat/lon.

```
GBFILE   =  ngm_930902_00_000.grib
INDXFL   =
GDOUTF   =  ngm_930902_00.grd
PROJ     =
GRDAREA  =
KXKY     =
MAXGRD   =  3000
CPYFIL   =  #105
GAREA    =  ks-
OUTPUT   =  t
```

2. Convert the data in the MRF GRIB and INDEX files for 2 Sep 1993. Create the GEMPAK file using the navigation information given the Grid Definition Section of the GRIB message. Define a subset using grid coordinates.

```
GBFILE   =  mrf_930902_00_000.grib
```

```
INDXFL      =  mrf_930902_00_000.indx
GDOUTF      =  mrf_930902_00.grd
PROJ        =
GRDAREA     =
KXKY        =
MAXGRD      =  3000
CPYFIL      =  gds
GAREA       =  @230;110;290;140
OUTPUT      =  t
```

3. Convert the data in the GRIB file for North America. Create the GEMPAK file using the user input for PROJ, GRDAREA and KXKY. Do not do a subset, use the full grid.

```
GBFILE      =  north_amer.grib
INDXFL      =
GDOUTF      =  north_amer.grd
PROJ        =  ced
GRDAREA     =  0;-180;90;0
KXKY        =  181;91
MAXGRD      =  3000
CPYFIL      =
GAREA       =  grid
OUTPUT      =  t
```

4. Convert the data in the GRIB file for the MESO model. Override the default decoding tables.

```
GBFILE      =  /tmp/model/meso.mdl
INDXFL      =
GDOUTF      =  /tmp/model/meso.mdl.gem
PROJ        =
GRDAREA     =
KXKY        =
MAXGRD      =  3000
CPYFIL      =  gds
GAREA       =  grid
OUTPUT      =  t
GBTBLS      =  /tmp/wmogrib2.tbl;/tmp/nmcgrib2.tbl;/tmp/vcrdgrib1.tbl
GBDIAG      =
```

5. Scan a GRIB file and print out the PDS and GDS sections for GRIB messages 1, 2, 6 through 12, and 88.

```
GBFILE      =  ensemble.grib
INDXFL      =
GDOUTF      =  LIST
PROJ        =  ced
GRDAREA     =  0;-180;90;0
KXKY        =  181;91
MAXGRD      =  3999
CPYFIL      =
```

```
GAREA      =  grid
OUTPUT     =  t
GBTBLS     =
GBDIAG     =  pds;gds|1;2;6-12;88
```

ERROR MESSAGES

[NAGRIB+5] GRIB version 0 cannot be decoded.

[NAGRIB+4] Invalid parameter code table version.

[NAGRIB+3] No valid parameter found for ....

[NAGRIB+2] No valid vertical coordinate found for ....

[NAGRIB+1] WARNING: This grid is too large for GEMPAK programs.

[NAGRIB-1] Fatal error initializing TAE.

[NAGRIB-2] Fatal error reading TAE parameters.

[NAGRIB-3] Fatal error initializing GEMPLT.

[NAGRIB-4] Navigation information is invalid.

[NAGRIB-5] Grid area ... is invalid.

[NAGRIB-6] Grid size is invalid.

[NAGRIB-7] The grid file name may not be blank.

[NAGRIB-8] Navigation table cannot be read.

[NAGRIB-9] Grid name ... cannot be found in grid table.

[NAGRIB-10] Input for GEMPAK output file is blank.

[NAGRIB-11] Error opening GEMPAK grid file.

[NAGRIB-12] Error creating GEMPAK grid file.

[NAGRIB-13] Cannot open GRIB vertical coordinate table.

[NAGRIB-14] Cannot open GRIB parameter table.

[NAGRIB-15] Error opening GRIB file.

[NAGRIB-16] Error getting next message.

[NAGRIB-17] Error setting date/time.

[NAGRIB-18] Invalid bitmap specification.

[NAGRIB-19] Error reading GRIB file.

[NAGRIB-20] Invalid input for GAREA.

[NAGRIB-21] Grid is too large.

[NAGRIB-22] Length of BDS section less than or equal to 0

4.48 NAMSND

NAMSND transfers model profile output in BUFR to GEMPAK sounding and surface data files.

INPUT PARAMETERS

SNBUFR	BUFR model sounding file
SNOUTF	Output sounding file
SFOUTF	Output surface file
SNPRMF	Sounding parameter packing file
SFPRMF	Surface parameter packing file
TIMSTN	Times/additional stations

PROGRAM DESCRIPTION

NAMSND transfers model profile output in BUFR to GEMPAK sounding and surface data files. The input BUFR file must be a Jack Woollen type BUFR file whose first message is a table of information about the file contents. Note that both a GEMPAK sounding file and a surface file are created by this program.

NAMSND reads the table from the first BUFR message to get information on the parameters in the file. A print out of this information to a local file called bufr_table.dump is done if SNPRMF and SFPRMF are both set to blank. No GEMPAK files or other output files are created in this case.

If the surface file name SFOUTF is followed by +, then a second surface file is opened. Its name is that of the first with the suffix _aux. The packing table for this auxiliary file is expected to have the name of that specified in SFPRMF with the suffix _aux. The auxiliary file contains any primary parameters for which there is no space in the primary surface data file, followed by diagnosed parameters. The parameter table entries for the auxiliary file must reflect this requirement. So, the parameter file for the auxiliary file starts with a continuation of the list of primary parameters in the order expected from the BUFR data file followed by any diagnosed parameters. If there is no overflow of primary parameters, then only diagnosed parameters are found in the auxiliary file. When an auxiliary file is used, any diagnosed parameters that are desired in the primary file must be listed in the parameter table file for both the primary and the auxiliary file. A list of diagnosed parameters is given below.

If the BUFR data file name is followed by lsss=#####, where sss is a 3-character station ID and ##### is the corresponding station number, then an ASCII file name prof.sss is generated. This file will contain the output for only station #####. If no GEMPAK files are needed, set SNOUTF and SFOUTF to blank. The parameter files are required for both the GEMPAK files and the ASCII file.

NOTE ABOUT THE PARAMETER TABLE ENTRIES:

Diagnosed or extra computed parameters are added at the end of the parameter list for surface data. They may be added anywhere for profile data, but the last two columns must contain the GEMPAK names of the actual BUFR parameters in correct order (as shown in the file bufr_table.dump). The penultimate column is the scaling factor to be applied to the parameter named in the last column. Note that the names in the last column need not agree with the names in the first column for sounding parameter files. Thus, in the sounding parameter file, the last two columns are essentially independent of the first four columns. Surface parameter files do not have the extra last column of names.

None of the parameter names in the GEMPAK parameter file have to be the same as the names found in the file bufr_table.dump. The file bufr_table.dump gives the order in which the parameters must be present in the GEMPAK parameter files. The replication of surface parameters is not indicated in bufr_table.dump. Currently, the only replicated surface parameters are the soil layer parameters in the sequence SLYR (class 1 Eta file only).

MODEL Sounding/Surface GEMPAK Parameter Names

Name	TYP	C	Definition	Units
PRES#	SND	2	Pressure	mb
TMPC#	SND	2	Temperature	C
DWPC#	SND	2	Dewpoint temperature	C
SPED#	SND	2	Speed	m/s
DRCT#	SND	2	Direction	degrees
OMEG#	SND	2	Omega	pa/s
HGHT#	SND	2	Height	m
DTCP	SND	1	Temp tndncy from conv phase change	K / day
DTGP	SND	1	Temp tndncy from grd-scl phase change	K / day
DTSW#	SND	1	Temp tndncy from short-wave rad	K / day
DTLW#	SND	1	Temp tndncy from long-wave rad	K / day
DTAR#*	SND	1	Temp tndncy from all rad	K / day
CFRL#	SND	1	Cloud fraction in layer	%
CWTR#	SND	1	Cloud water	Kg / Kg
TKEL#	SND	1	Turbulent kinetic energy	J / Kg
RADH	SND	-	Net radiative heating rate	K/day

- - - - - - - - - - -

PMSL#	SFC	2	Mean sea-level pressure	mb
PRES#	SFC	2	Surface pressure	mb
TMPC#@	SFC	2	First level temperature	C
DWPC#@	SFC	2	First level dewpoint temperature	C
SPED#@	SFC	2	First level wind speed	m/s
DRCT#@	SFC	2	First level wind direction	degrees
SKTC#	SFC	2	Earth surface temperature	C
SBTC#	SFC	1	Bottom soil temperature	C
SLTC#	SFC	0	Layer 1 soil temperature	C
TMIN	SFC	1	Min lowest layer air temp over 1 hr	C
TMAX	SFC	1	Max lowest layer air temp over 1 hr	C
FXLH	SFC	1	Flux of latent heat (evaporation)	W / m**2
FXLP	SFC	1	Potential flux of latent heat	W / m**2
FXSH	SFC	1	Flux of sensible heat	W / m**2
FXSS	SFC	1	Flux of sub-surface heat	W / m**2
FXSN	SFC	1	Flux of snow phase change heat	W / m**2
SWRD	SFC	1	Short-wave radiation downward flux	W / m**2
SWRU	SFC	1	Short-wave radiation upward flux	W / m**2
LWRD	SFC	1	Long-wave radiation downward flux	W / m**2
LWRU	SFC	1	Long-wave radiation upward flux	W / m**2
NDRF*	SFC	1	Net downward rad flux at the surface	W / m**2
RNET*	SFC	1	Net radiative flux at the surface	W / m**2
FXTT*	SFC	1	Total surface energy budget residual	W / m**2
P01M	SFC	2	Total precip over 1 hr	mm (kg/m**2)
P06M	SFC	-	Total precip over 6 hr	mm (kg/m**2)
P12M	SFC	-	Total precip over 12 hr	mm (kg/m**2)
C01M	SFC	2	Convective precip over 1 hr	mm (kg/m**2)
S01M*	SFC	2	Stable precip over 1 hr	mm (kg/m**2)
WTNS#	SFC	2	Sfc moisture availability (fraction)	unitless
EVAP	SFC	0	Evaporation over 1 hr	mm (kg/m**2)
SNFL	SFC	1	Accumulated snowfall over 1 hr	mm (kg/m**2)
SNRA#	SFC	1	Snow ratio	%
SLMM#	SFC	1	Soil moisture	mm (kg/m**2)
SWEM#	SFC	2	Snow water equivalent	mm (kg/m**2)
N01M	SFC	1	Total snow melt over 1 hr	mm (kg/m**2)
R01M	SFC	2	Storm sfc runoff over 1 hr	mm (kg/m**2)
BFGR	SFC	2	Baseflow-groundwater runoff over 1 hr	mm (kg/m**2)
SLLH*	SFC	1	Surface evaporation over 1 hr	mm (kg/m**2)
SLLP*	SFC	1	Potential sfc evaporation over 1 hr	mm (kg/m**2)
SWBL*	SFC	1	Total water budget residual	mm (kg/m**2)
LWRT	SFC	1	Long-wave radiation at top	W / m**2
SWRT	SFC	1	Short-wave radiation at top	W / m**2
WXTS#	SFC	2	Categorical weather type snow	0,1
WXTP#	SFC	2	Categorical weather type ice pellets	0,1
WXTZ#	SFC	2	Categorical weather type frzng rain	0,1
WXTR#	SFC	2	Categorical weather type rain	0,1
WSYM#*	SFC	2	Weather type symbol number	-

LCLD#	SFC	2	Low-cloud amount	%
MCLD#	SFC	2	Middle-cloud amount	%
HCLD#	SFC	2	High-cloud amount	%
CLPL	SFC	-	Low-level cloud pressure level	mb
CLPM	SFC	-	Mid-level cloud pressure level	mb
CLPH	SFC	-	Hgh-level cloud pressure level	mb
UWND#	SFC	2	10 m u component	m/s
VWND#	SFC	2	10 m v component	m/s
TH10#	SFC	1	10 m potential temperature	K
Q10M#	SFC	1	10 m specific humidity	g/kg
HLCY#	SFC	2	Estimated storm-relative helicity	m*m/s*s
USTM#	SFC	2	Estimated storm motion u component	m/s
VSTM#	SFC	2	Estimated storm motion v component	m/s
T2MS#	SFC	2	2 m temperature	C
TD2M#*	SFC	2	Estimated 2 m dewpoint temperature	C
Q2MS#	SFC	2	2 m specific humidity	g/kg
SRLM	SFC	1	Surface roughness length	m
SEXC#	SFC	1	Surface exchange coefficient	m/s
VEGF	SFC	1	Green vegetation cover	%
CNPW	SFC	1	Canopy water	mm (kg/m**2)
SMCx#	SFC	1	Layer x=1,4 volumetric soil moisture	-
STCx#	SFC	1	Layer x=1,4 soil temperature	K
SMSK	SFC	2	Land/water mask (0=land, 1=water)	-
SELV	SFC	2	Surface elevation (model terrain)	m
SLAT	SFC	2	Station latitude	degrees
SLON	SFC	2	Station longitude	degrees
STNM	SFC	2	Station number	-

* Parameter is derived during data reformatting. # Parameter is an instantaneous value. ? Parameter is currently undefined (meaningless or missing value). @ Parameter derived from first level profile data.

Column C has the following meaning:

0 = Parameter is in class 0 Eta output only
1 = Parameter is in class 1 Eta output only
2 = Parameter is in both class 0 and class 1 Eta output
- = Parameter is not in the Eta output

Note that any of these parameters may be found in the output from other NCEP models.

Derived Parameter Definitions

DTAR = DTLW + DTSW

NDRF = SWRD + SWRU + LWRD

RNET = SWRD + SWRU + LWRD + LWRU

FXTT = FXLH + FXSH + FXSS + FXSN + RNET

S01M = P01M - C01M

SLLH = dt * FXLH / HEATVP

SLLP = dt * FXLP / HEATVP

SWBL = - (SLMM (t) - SLMM (t-dt))
- (SWEM (t) - SWEM (t-dt))
+ P01M - R01M + SLLH

WSYM = weather symbol number from standard symbol table

TD2M = saturation temperature for mixing ratio Q2MS at pressure PRES

HEATVP = 2.834E06 if SWEM (t) > 0. or HEATVP = 2.5E06 if SWEM (t) = 0.

NOTE:

If UWND and VWND (the 10 m wind) are in the BUFR file, then do not request SPED and DRCT in the parameter file for the primary surface data set. These may be requested in the auxiliary surface data parameter file. Only one piece of wind data can be accessed from a surface data file. ----------

EXAMPLES

1. Create sounding and surface data files from the BUFR output file name 950612.bufr containing hourly profiles and surface data from a 48-h eta model forecast. This is a standard class 0 BUFR output file.

```
SNBUFR  =  950612.bufr
SNOUTF  =  950612.snd
SFOUTF  =  950612.sfc
SNPRMF  =  snclass0.prm
SFPRMF  =  sfclass0.prm
TIMSTN  =  49/500
```

2. Create only an ASCII text file from the BUFR data.

```
SNBUFR  =  950612.bufr|pit=72520
SNOUTF  =
SFOUTF  =
SNPRMF  =  snclass0.prm
SFPRMF  =  sfclass0.prm
TIMSTN  =  49/500
```

3. Create only the ASCII parameter list file bufr_table.dump.

```
SNBUFR  =  950612.bufr
SNOUTF  =
SFOUTF  =
SNPRMF  =
SFPRMF  =
TIMSTN  =  49/500
```

ERROR MESSAGES

[NAMSND+3] Done -- just wrote out bufr_table.dump.

[NAMSND+2] Creating GEMPAK file ... .

[NAMSND+1] End of input file -- all done.

[NAMSND-1] Fatal error initializing TAE.

[NAMSND-2] Fatal error reading TAE parameters.

[NAMSND-3] Error opening model sounding file ... .

[NAMSND-4] Error opening sounding parameter file.

[NAMSND-5] Wrong number of sounding parms in output file.

[NAMSND-6] Wrong sounding parameters in output file.

[NAMSND-7] Cannot create a new sounding data file.

[NAMSND-8] Error opening surface parameter file.

[NAMSND-9] Wrong number of surface parms in output file.

[NAMSND-10] Wrong surface parameters in output file.

[NAMSND-11] Cannot create a new surface data file.

[NAMSND-12] Error reading input file.

[NAMSND-13] Packing file not opened.

[NAMSND-14] Different SND parm count in input file.

[NAMSND-15] Different SFC parm count in input file.

[NAMSND-16] Cannot add SND time.

[NAMSND-17] Cannot add SFC time.

[NAMSND-18] Cannot add SND station.

[NAMSND-19] Cannot add SFC station.

[NAMSND-20] Sequence name not found in input file.

[NAMSND-21] No input parameter names were requested.

[NAMSND-22] Forecast time is missing.

[NAMSND-23] Station number is missing.

[NAMSND-24] Station latitude is missing.

[NAMSND-25] Station longitude is missing.

[NAMSND-26] Station elevation is missing.

[NAMSND-27] No surface data for a station.

[NAMSND-28] No data in output array.

[NAMSND-29] Sounding has only one level.

[NAMSND-30] Error opening auxiliary parameter file.

[NAMSND-31] Wrong number of auxiliary parms in output file.

[NAMSND-32] Wrong auxiliary parameters in output file.

[NAMSND-33] Cannot create a new auxiliary surface data file.

[NAMSND-34] Error assigning unit number to BUFR file.

[NAMSND-35] Must use all snd parms if not using one profile.

[NAMSND-36] Maximum number of profiles exceeded.

[NAMSND-41] Missing packing information---defective BUFR file.

[NAMSND-42] Too many TABLE B entries found in BUFR file.

[NAMSND-43] A sequence has no member parameters.

[NAMSND-44] Table is too long---MXTBLN is too small.

[NAMSND-45] No TABLE B entries found.

[NAMSND-46] Too many TABLE D entries found.

[NAMSND-47] Too many parameters in a sequence.

[NAMSND-48] No TABLE D entries found---defective BUFR file.

[NAMSND-49] The sequence ... was not found.

[NAMSND-50] The parameter ... was not found in table.

[NAMSND-51] Cannot open BUFR file ... .

[NAMSND-52] BUFR file name is blank.

[NAMSND-53] Cannot open bufr_table.dump file.

[NAMSND-54] 6th column entry in SND packing table is missing.

[NAMSND-55] Error opening sounding output file.

[NAMSND-56] Error opening surface output file.

[NAMSND-57] Error opening surface auxiliary output file.

4.49 NDFDG2

NDFDG2 converts NDFD gridded data in GRIB2 files to GEMPAK gridded data.

INPUT PARAMETERS

GBFILE	GRIB data file name
GDOUTF	Output grid file
MAXGRD	Maximum number of grids
GAREA	Graphics area
GSKIP	Skip factor for GRIB2 files
OUTPUT	Output device/filename

PROGRAM DESCRIPTION

NDFDG2 will convert NDFD gridded data which is in GRIB2 files to gridded data in a GEMPAK file.

The GRIB2 input file is specified in GBFILE.

The GEMPAK output file is given in GDOUTF. This file will be opened if it exists and the projection information matches the GRIB2 message projection. If the output filename is "LIST", the GRIB file will be scanned and the decoded GEMPAK header information will be printed out.

GAREA is used to subset the grid. It may be specified as any valid input for GAREA which are equivalent to lat/lon bounds or as a single @ followed by the lower-left and upper-right grid point coordinates separated by semicolons. In the former case, the locations are rounded to the nearest grid points. The projection type and angles entered as described above along with the lat/lon coordinates of the corners of the subset define a new grid navigation different from that of the full grid. The navigation entered as described in the preceding paragraph is always that of the full grid. To get the full grid, set GAREA to blank, GRID or DSET.

GSKIP is used to reduce the resolution of a grid. This may be required if the GRIB2 full resolution grid exceeds the GEMPAK maximum grid size.

OUTPUT defines the direction and destination of printed output.

EXAMPLES

1. Convert the data in the GRIB2 file for the MESO model.

```
GBFILE   =  /tmp/model/meso.mdl
GDOUTF   =  /tmp/model/meso.mdl.gem
MAXGRD   =  3000
GAREA    =  KY
GSKIP    =
```

```
OUTPUT    =  t
```

2. Scan a GRIB2 file and print out the message info.

```
GBFILE    =  ensemble.grib
GDOUTF    =  LIST
MAXGRD    =  3999
GAREA     =  KY
GSKIP     =
OUTPUT    =  t
```

3. Skip every two grid points in X and Y for whole grid.

```
GBFILE    =  /tmp/model/meso.mdl
GDOUTF    =  /tmp/model/meso.mdl.gem
MAXGRD    =  3000
GAREA     =
GSKIP     =  2
OUTPUT    =  t
```

4. Skip every other grid point in X and Y for GAREA.

```
GBFILE    =  ensemble.grib
GDOUTF    =  ensemble.grib.gem
MAXGRD    =  3000
GAREA     =  MD
GSKIP     =  1
OUTPUT    =  t
```

ERROR MESSAGES

[NDFDG2+5] GRIB version 0 cannot be decoded.

[NDFDG2+4] Parameter not found in table.

[NDFDG2+3] GRIB2 unpacking warning ... returned from unpk_grib2.

[NDFDG2+2] Vertical coordinate ... not supported.

[NDFDG2+1] WARNING: This grid is too large for GEMPAK programs.

[NDFDG2-1] Fatal error initializing TAE.

[NDFDG2-2] Fatal error reading TAE parameters.

[NDFDG2-3] Fatal error initializing GEMPLT.

[NDFDG2-4] Grid Definition Template number ... not supported.

[NDFDG2-5] Grid area ... is invalid.

[NDFDG2-6] Grid size is invalid.

[NDFDG2-7] The grid file name may not be blank.

[NDFDG2-8] Source of Grid Definition ... not supported.

[NDFDG2-9] Fatal GRIB2 unpacking error ... returned from unpk_grib2.

[NDFDG2-10] Input for GEMPAK output file is blank.

[NDFDG2-11] Error opening GEMPAK grid file.

[NDFDG2-12] Error creating GEMPAK grid file.

[NDFDG2-13] Discipline number ... not supported.

[NDFDG2-14] Data type ... not supported.

[NDFDG2-15] Error opening GRIB file.

[NDFDG2-16] Error getting next message.

[NDFDG2-17] Error setting date/time.

[NDFDG2-18] Invalid bitmap specification.

[NDFDG2-19] Error reading GRIB file.

[NDFDG2-20] Invalid input for GAREA.

[NDFDG2-21] Grid is too large.

[NDFDG2-22] Local section present, but not supported.

[NDFDG2-23] No data present in grib message.

[NDFDG2-24] GSKIP too large for size of grid.

4.50 NEX2GINI

NEX2GINI creates a GINI format image composite of NEXRAD level III products.

INPUT PARAMETERS

GRDAREA	Area covered by grid
PROJ	Map projection/angles/margins|drop flag
KXKY	Number of grid points in x;y
CPYFIL	Grid file whose navigation is to be used in new grid file |
GFUNC	Scalar grid
RADTIM	Radar composite current/dattim
RADDUR	Radar time window (minutes prior to RADTIM)
RADFRQ	Update Frequency
STNFIL	Station information file
RADMODE	Radar operational mode
SATFIL	Satellite image filename(s)
COMPRESS	Write output in compressed format

PROGRAM DESCRIPTION

NEX2GINI samples NEXRAD Level III (NIDS) products to a common grid projection. Then creates a GINI format image with appropriate header information using the grid as the image raster. NEX2GINI is not limited by the traditional LLMXGD limitation for grid files.

NEX2GINI uses a suplemental table $GEMTBL/unidata/nex2gini.tbl to specify configurations for product identifiers so that the generated images are correctly identified for enhancement tables in $GEMTBL/sat/imgtyp.tbl.

SATFIL specifies the output GINI file. If the file already exists, it is overwritten.

CPYFIL may provide either an existing grid file to read the projection information from, or a grid number (#nnn) defined in grdnav.tbl.

PROJ, GRDAREA, and KXKY define a grid navigation as in GDCFIL if CPYFIL is blank. The GINI format has additional restrictions which limit which GEMPAK projections may be used. These are, LCC tangent projection (eg la1 and la2 are the same), STR, and CED.

STNFIL is the station table which supplies radar IDs to be searched for the composite. If STNFIL is blank, then 'nexrad.tbl' is used by default.

GFUNC is the data parameter which the composite is created for. The NEXRAD file naming is assumed to be such that the site identifier and the product type are both present in the directory/file naming structure. The datatype.tbl template NEXRIII is used to provide the file naming convention used. If NEXRIII is not found in the template database, a default directory structure for NEXRAD data is assumed where the root directory $RAD/NIDS contains a tree structure supporting %SITE%/%PROD%/

%PROD%_YYYYMMDD_HHNN file names. The %SITE% template will be replaced by the site IDs in the STNFIL table. The %PROD% will be replaced by the GFUNC product name. The GEMPAK data/time template will be used with RADTIM and RADDUR to determine which NEXRAD products are in the valid time range.

RADTIM determined the output grid time for the radar composite. The value of RADTIM may either be 'current', or a GEMPAK dattim. If 'current' is selected for RADTIM, then the current system clock time is used. No data files later than RADTIM will be included in the composite. RADDUR provides the time window previous to RADTIM in order to include data for each site. The time closest to RADTIM will be used. A default RADDUR of 30 minutes is used if RADDUR is blank.

RADFRQ is the frequency in minutes at which the program will run. When RADFRQ is defined, NEX2GINI will wait for the specified time before rerunning. This option is most useful when RADTIM is set to 'current'. When the program is sleeping, ctrl-c can be used to exit the loop and return to the dynamic tutor. If RADFRQ is not set, the dynamic tutor will be re-entered at the end of processing the radar mosaic.

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) maintainence mode. The default, if none are specified is data from all 3 modes (PCM). Multiple modes may be specified.

COMPRESS allows the user to optionally write the GINI file using PNG compression for the image raster. The GINI header will identify the image as a compressed product.

EXAMPLES

1. Create a 1km National composite of NEXRAD base reflectivity (N0R). Use the current time with a 30 minute window for data. Rerun the mosaic creation continuously with a 5 minute wait period between each update. Use the nexrad.tbl station table. Create the GINI output file using the rad_YYYYMMDD_HHNN file name template. Accept data from radars operating in precipitation and clear air mode. Do not write the GINI output using compression.

```
GRDAREA   =  23;-120;47.2634;-63.5664
PROJ      =  lcc/40;-100;40
KXKY      =  4736;3000
CPYFIL    =
GFUNC     =  n0r
RADTIM    =  current
RADDUR    =  30
RADFRQ    =  5
STNFIL    =  nexrad.tbl
RADMODE   =  PC
SATFIL    =  rad_YYYYMMDD_HHNN
```

COMPRESS = no

ERROR MESSAGES

[NEX2GINI+5] Mode rejected: ...

[NEX2GINI+4] Write image ...

[NEX2GINI+3] Using default station file ...

[NEX2GINI+2] NEXRIII template not found using ...

[NEX2GINI+1] Too old: ...

[NEX2GINI0] Using: ...

[NEX2GINI-1] Fatal error initializing TAE.

[NEX2GINI-2] Fatal error reading TAE parameters.

[NEX2GINI-3] Fatal error initializing GEMPLT.

[NEX2GINI-4] Failed to read grid projection ...

[NEX2GINI-8] Station table ... not found

4.51 NEX2IMG

NEX2IMG creates a GIF format image composite of NEXRAD level III products.

INPUT PARAMETERS

GRDAREA	Area covered by grid
PROJ	Map projection/angles/margins|drop flag
KXKY	Number of grid points in x;y
CPYFIL	Grid file whose navigation is to be used in new grid file |
GFUNC	Scalar grid
RADTIM	Radar composite current/dattim
RADDUR	Radar time window (minutes prior to RADTIM)
RADFRQ	Update Frequency
STNFIL	Station information file
RADMODE	Radar operational mode
RADFIL	Radar image filename(s)
LUTFIL	Enhancement lookup table filename

PROGRAM DESCRIPTION

NEX2IMG samples NEXRAD Level III (NIDS) products to a common grid projection, and then creates a GIF format image raster. NEX2IMG is not limited by the traditional LLMXGD limitation for grid files.

NEX2IMG uses a suplemental table $GEMTBL/unidata/nex2gini.tbl to specify configurations for data to pixel mappings.

RADFIL specifies the output file. If the file already exists, it is overwritten.

CPYFIL may provide either an existing grid file to read the projection information from, or a grid number (#nnn) defined in grdnav.tbl.

PROJ, GRDAREA, and KXKY define a grid navigation as in GDCFIL if CPYFIL is blank.

STNFIL is the station table which supplies radar IDs to be searched for the composite. If STNFIL is blank, then 'nexrad.tbl' is used by default.

GFUNC is the data parameter which the composite is created for. The NEXRAD file naming is assumed to be such that the site identifier and the product type are both present in the directory/file naming structure. The datatype.tbl template NEXRIII is used to provide the file naming convention used. If NEXRIII is not found in the template database, a default directory structure for NEXRAD data is assumed where the root directory $RAD/NIDS contains a tree structure supporting %SITE%/%PROD%/%PROD%_YYYYMMDD_HHNN file names. The %SITE% template will be replaced by the site IDs in the STNFIL table. The %PROD% will be replaced by the GFUNC product name. The GEMPAK data/time template will be used with RADTIM and RADDUR to determine which NEXRAD products are in the valid time range.

RADTIM determined the output grid time for the radar composite. The value of RADTIM may either be 'current', or a GEMPAK dattim. If 'current' is selected for RADTIM, then the current system clock time is used. No data files later than RADTIM will be included in the composite. RADDUR provides the time window previous to RADTIM in order to include data for each site. The time closest to RADTIM will be used. A default RADDUR of 30 minutes is used if RADDUR is blank.

RADFRQ is the frequency in minutes at which the program will run. When RADFRQ is defined, NEX2IMG will wait for the specified time before rerunning. This option is most useful when RADTIM is set to 'current'. When the program is sleeping, ctrl-c can be used to exit the loop and return to the dynamic tutor. If RADFRQ is not set, the dynamic tutor will be re-entered at the end of processing the radar mosaic.

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) maintainence mode. The default, if none are specified is data from all 3 modes (PCM). Multiple modes may be specified.

LUTFIL specifies the color table to be used for the output GIF file.

EXAMPLES

1. Create a National composite of NEXRAD base reflectivity (N0R). Use the current time with a 30 minute window for data. Rerun the mosaic creation continuously with a 5 minute wait period between each update. Use the nexrad.tbl station table. Create the GIF output file using the YYYYMMDD_HHNN.gif file name template. Accept data from radars operating in precipitation and clear air mode.

```
GRDAREA   =  25;-125;50;-65
PROJ      =  CED
KXKY      =  6000;2500
CPYFIL    =
GFUNC     =  n0r
RADTIM    =  current
RADDUR    =  30
RADFRQ    =  5
STNFIL    =  nexrad.tbl
RADMODE   =  PC
SATFIL    =  YYYYMMDD_HHNN.gif
LUTFIL    =  upc_rad24.tbl
```

ERROR MESSAGES

[NEX2IMG+5] Mode rejected: ...

[NEX2IMG+4] Write image ...

[NEX2IMG+3] Using default station file ...

[NEX2IMG+2] NEXRIII template not found using ...

[NEX2IMG+1] Too old: ...

[NEX2IMG0] Using: ...

[NEX2IMG-1] Fatal error initializing TAE.

[NEX2IMG-2] Fatal error reading TAE parameters.

[NEX2IMG-3] Fatal error initializing GEMPLT.

[NEX2IMG-4] Failed to read grid projection ...

[NEX2IMG-5] Error writing to ...

[NEX2IMG-8] Station table ... not found

4.52 NEXR2RHI

NEXR2RHI displays NEXRAD level II vertical cross sections.

INPUT PARAMETERS

CXSTNS	Cross-section station line
GVCORD	Grid vertical coordinate
PTYPE	Plot type/h:w ratio/margins
YAXIS	Ystrt/ystop/yinc/lbl;gln;tck
SKIP	Skip_cntr/skip_plt_x;skip_plt_y
CINT	Contour interval/min/max
SCALE	Scalar scale / vector scale
LINE	Color/type/width/label/smth/fltr
BORDER	Background color/type/width
TITLE	Title color/line/title
CLEAR	Clear screen flag
DEVICE	Device|name|x size;y size|color type
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
PANEL	Panel loc/color/dash/width/regn
CLRBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
CONTUR	Subbox/smooth
FINT	Fill interval/min/max
FLINE	Fill colors/fill types
CTYPE	Contour type: C/F
RADFIL	Radar image filename(s)
RADTIM	Radar composite current/dattim
RADPARM	Radar parameter (dz, vr, sw)
INTERP	Interpolation flag

PROGRAM DESCRIPTION

NEXR2RHI displays NEXRAD Level II vertical cross sections for data in ARCHIVE2 format. This program is adopted from GDCROSS to create a volume rendering of NEXRAD data along a specified axis.

RADFIL specifies the input Level II file. A template may be specified, with an optional site name (eg NEXRII|KDDC). If a site name is provided, it will be used to replace the %SITE% alias in the template name. The NEXRII template is provided for ARCHIVE2 format files.

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

RADTIM is a valid GEMPAK date/time string or abbreviation. A time range may be specified.

INTERP is a logical variable which determines whether interpolation between sweeps will occur.

CXSTNS is the cross section axis (as in GDCROSS). A grid coordinate can be used with row and colums 1 to 460.

GVCORD is the vertical coordinate of the radar data (always HGHT).

PTYPE is the plot type. A value of "LIN" is generally the only useful setting.

Other parameters as in GDCROSS.

EXAMPLES

1. Display an East-West RHI which passes through the radar location for reflectivity data from KLVX. Display the RHI from 0 to 20KM using color filled contours. Use a contour interval of 4 dBZ with a minimum value of -12 dBZ. Grid point 230;230 is the radar center. Interpolate contours between beam scans.

```
CXSTNS   =  @1;230>@460;230
GVCORD   =  hght
PTYPE    =  lin
YAXIS    =  0/20000
CINT     =  0
SCALE    =  0
LINE     =  1
BORDER   =  1
SKIP     =  0
TITLE    =  1/-2/RHI Base Reflectivity Level II ^
CLEAR    =  YES
DEVICE   =  xw
TEXT     =  .8/1/1/111/hw
PANEL    =  0
CLRBAR   =  1
CONTUR   =  3/2
FINT     =  4
FLINE    =  0;30-7
CTYPE    =  f
RADFIL   =  NEXRII|KLVX
RADPARM  =  dz
RADTIM   =  last
INTERP   =  y
```

2. Display a cross section of radial velocity from 38.6N;86.8W to 37.4N;84.8W. Plot filled contours at 4 m/s intervals. Display data from 0 to 20km. Allow interpolation between beam scans. Use line countours, with negative values contoured by a dotted line, positive values contoured with a solid line.

```
CXSTNS   =  38.6;-86.8>37.4;-84.8
GVCORD   =  hght
```

```
PTYPE    =  lin
YAXIS    =  0/20000
CINT     =  4
SCALE    =  0
LINE     =  5/-10
BORDER   =  1
SKIP     =  0
TITLE    =  1/-2/RHI Radial Velocity Level II ^
CLEAR    =  YES
DEVICE   =  xw
TEXT     =  .8/1/1/111/hw
PANEL    =  0
CLRBAR   =
CONTUR   =  3/2
FINT     =
FLINE    =
CTYPE    =  c
RADFIL   =  NEXRII|KLVX
RADPARM  =  vr
RADTIM   =  last
INTERP   =  y
```

ERROR MESSAGES

[NEXR2RHI-1] Fatal error initializing TAE.

[NEXR2RHI-2] Fatal error reading TAE parameters.

[NEXR2RHI-3] Fatal error initializing GEMPLT.

4.53 OABOX

OABOX draws a box around an objective analysis region.

INPUT PARAMETERS

LINE	Color/type/width/label/smth/fltr
DEVICE	Device|name|x size;y size|color type
REGION	Region type
GAREA	Graphics area
PROJ	Map projection/angles/margins|drop flag
GDFILE	Grid file

PROGRAM DESCRIPTION

This program draws a box around a region defined for the objective analysis programs. REGION can be specified as GRID, DATA, or EXTEND. The default is GRID.

The GRID region is the area used for the objective analysis. The DATA region is the area over which data for the analysis is extracted. The EXTEND region is the grid area extended in each direction for the first pass analysis.

EXAMPLES

1. Draw a solid line around the grid area in color 1 using a solid line of width 1.

```
LINE     = 1
REGION   = grid
GDFILE   = sample.grd
DEVICE   = xw
GAREA    = us
PROJ     = mer
```

2. Draw a line around the data region using color 2, line type 3, and line width 5.

```
LINE     = 2/3/5
REGION   = data
```

ERROR MESSAGES

[OABOX-1] Fatal error initializing TAE.

[OABOX-2] Fatal error reading TAE parameters.

[OABOX-3] Fatal error initializing GEMPLT.

[OABOX-4] No box will be drawn since the color is 0.

[OABOX-5] Invalid input for REGION.

4.54 OABSFC

OABSFC performs a Barnes objective analysis on surface data.

INPUT PARAMETERS

SFFILE	Surface data file
GDFILE	Grid file
SFPARM	Surface parameter list
DATTIM	Date/time
DTAAREA	Data area for OA
GUESS	Guess file*time
GAMMA	Convergence parameter
SEARCH	Search radius/Extrapolation
NPASS	Number of passes
QCNTL	Quality control threshold

PROGRAM DESCRIPTION

OABSFC performs a Barnes objective analysis on surface data. Multiple parameters may be analyzed at the same time. If more than one time is entered, the analyses will be performed sequentially.

The input surface file is specified in SFFILE. Up to three files may be entered by separating the names with a plus, +. If the time is set to FIRST or LAST, the first or last time from the first file will be used.

The projection and area for the grid are read from the navigation block in the output grid file. The extend grid area, the station spacing and the data subset area are read from the analysis block. The extend area is used to define a larger grid for the first pass, allowing data to be interpolated back to stations outside the final grid area. The average station spacing is used to compute the weighting functions. The data subset area specifies which data will be used in the analysis. If DTAAREA is blank or set to DATA, the data area defined in the analysis block will be used. This is the recommended procedure. However, DTAAREA may be specified in the same way as the AREA parameter used in other programs. This is especially useful to eliminate stations which are known to have bad data.

A first-guess field can be used in the analysis. The name of the grid file containing the guess field must be entered in GUESS. In addition, the time to be used to extract the guess field from the file must be entered as the second value in GUESS following a *. If a guess field is entered, the navigation information in the guess grid file must be identical to that in the output grid file. When a guess field is used, it is inserted into the grid as the zeroth pass.

Each pass of the analysis interpolates data from stations to grid points using the weighting function:

WTFUNC = EXP [-DIST ** 2 / WEIGHT]

where:

DIST ** 2 = [(lat (grid) - lat (stn)) ** 2 +
(lon (grid) - lon (stn)) ** 2 * coslsq (grid)]
COSLSQ = COS (lat (grid)) ** 2 WEIGHT = 5.051457 * (DELTAN * 2 / PI) ** 2
DELTAN = Station spacing read from grid file analysis block

Near the poles, an approximate calculation of the distance along a great circle arc is used.

GAMMA, the convergence parameter, multiplies the weights for passes after the first pass. GAMMA must be within the range 0 - 1. Any value outside this range will default to a value of .3. If GAMMA is 0, the number of passes will be set to 1. The recommended value for GAMMA is .3.

SEARCH is used to control the search radius, which 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 will be set so that stations whose weighting function would be less than EXP (-SEARCH) will not be used. SEARCH must be in the range 1 - 50. If it is not, a default value of 20 will be used. If a very small value is used, many grid points will not have 3 stations within the search area and will be set to the missing data value. Entering /EX after the SEARCH value allows data extrapolation to assign values to grid points on the periphery of the data region. This will reduce the number of grid points with missing values in data void regions.

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

QCNTL is the quality control threshold values. It is used only when the first-guess field exists.

EXAMPLES

1. Analyze 15Z temperature, dewpoint, wind components and mean sea level pressure in two surface files for the area of us-. The first-guess field is from the 3hr forecast of NGM. The output grid is sfc.grd. If the difference between the original temperature and pressure data and the interpolated first-guess values is greater than 5 C and 10 mb, the original data will be discarded.

```
SFFILE   =  $OBS/hrly/990219.hrly + $OBS/ship/99021915.ship
GDFILE   =  sfc.grd
SFPARM   =  tmpc;dwpc;uwnd;vwnd;pmsl
```

```
DATTIM      =  15
DTAAREA     =  us-
GUESS       =  $MODEL/ngm/ngm_99021912*990219/1200F03
GAMMA       =  0.3
SEARCH      =  20
NPASS       =  2
QCNTL       =  5;;;;10
```

2. Repeat the analysis eliminating the data at stations DCA and BUF.

```
DTAAREA =  data/-@dca;buf
```

ERROR MESSAGES

[OABSFC+11] Surface file ... cannot be opened.

[OABSFC+10] There are no times in file ....

[OABSFC+9] No data from ... will be used.

[OABSFC+8] Parameter ... is a character parameter.

[OABSFC+7] Parameter ... cannot be computed.

[OABSFC+6] WARNING: Area is not DATA area in file.

[OABSFC+5] WARNING: The recommended number of passes is 2.

[OABSFC+4] ... is invalid for NPASS. It is set to 2.

[OABSFC+3] ... is invalid for search. It is set to 20.

[OABSFC+2] WARNING: GAMMA is 0. There will be only 1 pass.

[OABSFC+1] ... is invalid for GAMMA. It is set to .3.

[OABSFC-1] Fatal error initializing TAE.

[OABSFC-2] Fatal error reading TAE parameters.

[OABSFC-3] Fatal error initializing GEMPLT.

[OABSFC-4] Grid size is too large.

[OABSFC-5] Not enough buffer space; reduce number of grids.

[OABSFC-6] There are too many stations in data subset area.

[OABSFC-7] There are too few stations in data subset area.

[OABSFC-8] There are no times in the surface files.

[OABSFC-9] No valid parameters have been entered.

[OABSFC-10] No surface file could be opened.

[OABSFC-11] Time cannot be found in ....

4.55 OABSND

OABSND performs a Barnes objective analysis on upper air data.

INPUT PARAMETERS

SNFILE	Sounding data file
GDFILE	Grid file
SNPARM	Sounding parameter list
STNDEX	Stability indices
LEVELS	Vertical levels
VCOORD	Vertical coordinate type
DATTIM	Date/time
DTAAREA	Data area for OA
GUESS	Guess file*time
GAMMA	Convergence parameter
SEARCH	Search radius/Extrapolation
NPASS	Number of passes
QCNTL	Quality control threshold

PROGRAM DESCRIPTION

OABSND performs a Barnes objective analysis on upper air data. Multiple parameters and levels may be analyzed at the same time. If more than one time is entered, the analyses will be performed sequentially.

The input sounding file is specified in SNFILE. Up to three files may be entered by separating the names with a plus, +. If the time is set to FIRST or LAST, the first or last time from the first file will be used.

The projection and area for the grid are read from the navigation block in the output grid file. The extend grid area, the station spacing and the data subset area are read from the analysis block. The extend area is used to define a larger grid for the first pass, allowing data to be interpolated back to stations outside the final grid area. The average station spacing is used to compute the weighting functions. The data subset area specifies which data will be used in the analysis. If DTAAREA is blank or set to DATA, the data area defined in the analysis block will be used. This is the recommended procedure. However, DTAAREA may be specified in the same way as the AREA parameter used in other programs. This is especially useful to eliminate stations which are known to have bad data.

A first-guess field can be used in the analyses. The name of the grid file containing the guess field must be entered in GUESS. In addition, the time to be used to extract the guess field from the file must be entered as the second value in GUESS following a *. If a guess field is entered, the navigation information in the guess grid file must be identical to the that in the output grid file. When a guess field is used, it is inserted into the grid as the Zeroth pass.

Each pass of the analysis interpolates data from stations to grid points using the weighting function:

WTFUNC = EXP [-DIST ** 2 / WEIGHT]

where:

DIST ** 2 = [(lat (grid) - lat (stn)) ** 2 +
(lon (grid) - lon (stn)) ** 2 * coslsq (grid)]
COSLSQ = COS (lat (grid)) ** 2 WEIGHT = 5.051457 * (DELTAN * 2 / PI) ** 2
DELTAN = Station spacing read from grid file analysis block

Near the poles, an approximate calculation of the distance along a great circle arc is used.

GAMMA, the convergence parameter, is a multiplies the weights for passes after the first pass. GAMMA must be within the range 0 - 1. Any value outside this range will default to a value of .3. If GAMMA is 0, the number of passes will be set to 1. The recommended value for GAMMA is .3.

SEARCH is used to control the search radius, which 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 will be set so that stations whose weighting function would be less than EXP (-SEARCH) will not be used. SEARCH must be in the range 1 - 50. If it is not, a default value of 20 will be used. If a very small value is used, many grid points will not have 3 stations within the search area and will be set to the missing data value. Entering /EX after the SEARCH value allows data extrapolation to assign values to grid points on the periphery of the data region. This will reduce the number of grid points with missing values in data void regions.

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

QCNTL is the quality control threshold values. It is used only for level parameters when the first-guess field exists.

EXAMPLES

1. Analyze temperature, dewpoint, height and wind components at the mandatory levels at all time periods. Also analyze the lifted and Showalter indices. If the difference between the original temperature and height data and the interpolated first-guess values is greater than 5 C and 50 meters, the original data will be discarded.

```
SNFILE      =  $GEMDATA/hrcbob.snd
GDFILE      =  hbobsnd.grd
```

```
SNPARM    =  tmpc;dwpc;hght;uwnd;vwnd
STNDEX    =  lift;show
LEVELS    =  man
VCOORD    =  pres
DATTIM    =  all
DTAAREA   =  us-
GUESS     =
GAMMA     =  0.3
SEARCH    =  20
NPASS     =  2
QCNTL     =  5;;50
```

ERROR MESSAGES

[OABSND+10] No data from ... will be used.

[OABSND+9] Station parameter ... cannot be computed.

[OABSND+8] Parameter ... is a character parameter.

[OABSND+7] Parameter ... cannot be computed.

[OABSND+6] WARNING: Area is not DATA area in file.

[OABSND+5] WARNING: The recommended number of passes is 2.

[OABSND+4] ... is invalid for NPASS. It is set to 2.

[OABSND+3] ... is invalid for search. It is set to 20.

[OABSND+2] WARNING: GAMMA is 0. There will be only 1 pass.

[OABSND+1] ... is invalid for GAMMA. It is set to .3 .

[OABSND-1] Fatal error initializing TAE.

[OABSND-2] Fatal error reading TAE parameters.

[OABSND-3] Fatal error initializing GEMPLT.

[OABSND-4] Grid size is too large.

[OABSND-5] Not enough buffer space; reduce number of grids.

[OABSND-6] There are too many stations in data subset area.

[OABSND-7] There are too few stations in data subset area.

[OABSND-8] There are no times in the sounding file.

[OABSND-9] No valid parameters have been entered.

[OABSND-10] LEVELS cannot contain a range.

[OABSND-11] Sounding file could not be opened.

[OABSND-12] Time cannot be found in ... .

4.56 OAGRID

OAGRID creates a GEMPAK grid file which can be used in a Barnes objective analysis program.

INPUT PARAMETERS

GDFILE	Grid file
DELTAN	Station spacing
DELTAX	X spacing
DELTAY	Y spacing
GRDAREA	Area covered by grid
EXTEND	Points to extend grid
DTAAREA	Data area for OA
SOURCE	Data source (SN or SF)
SNFILE	Sounding data file
SFFILE	Surface data file
SNPARM	Sounding parameter list
SFPARM	Surface parameter list
DATTIM	Date/time
LEVELS	Vertical levels
MAXGRD	Maximum number of grids

PROGRAM DESCRIPTION

This program allows the user to create a GEMPAK grid file which contains the information required to perform a Barnes objective analysis.

The output grids will be evenly spaced latitude/longitude (CED) grids. Three areas used by the objective analysis programs are defined in this program. GRDAREA defines a region for the output grid. The upper right corner specified will be moved toward the lower left in order to align it on a grid point.

The second area, defined by EXTEND, is used to extend the grid area outward by some number of grid points. This area is used as a first-pass grid area in the objective analysis. The default EXTEND values are 2,2,2,2.

DTAAREA defines the area over which station data will be input to the analysis. Only data within the EXTEND area are used for the second pass. If a value for DTAAREA is not specified, the EXTEND area will be used.

If values for the station spacing and grid spacings, DELTAN, DELTAX, and DELTAY, are all specified by the user, they are stored in the grid file for use by the analysis programs. If any of these numbers is 0, a suggested station spacing is computed using the station data from the file specified. This station spacing will be used to compute values for DELTAX and DELTAY. The computed station spacing is the average of the average minimum station spacing and the uniform station spacing. These station spacing values are computed using the stations reporting data for the first DATTIM. The average minimum station spacing is the average of the distances from each

station to its closest station. The uniform spacing is the spacing that would be found between stations if they were evenly spaced over the data area.

GDCFIL can also be used to create grid files. OAGRID creates only CED grids, but values for the grid spacing and station spacing are estimated from the input surface or upper air file. GDCFIL creates grid files for grids in any projection, but the grid spacing and station spacing must be input directly.

EXAMPLES

1. Create a surface grid file called hbobsfc.grd. Use the temperature and dewpoint in the surface file hrcbob.sfc to compute the station spacing. The grid area is US; use defaults for the remaining parameters. Create a file which can contain up to 200 grids.

```
GDFILE   =  hbobsfc.grd
DELTAN   =  0
DELTAX   =  0
DELTAY   =  0
GRDAREA  =  us
EXTEND   =  2;2;2;2
DTAAREA  =
SOURCE   =  sf
SNFILE   =  $GEMDATA/hrcbob.snd
SFFILE   =  $GEMDATA/hrcbob.sfc
SNPARM   =
SFPARM   =  tmpc;dwpc
DATTIM   =  last
LEVELS   =  850
MAXGRD   =  200
```

2. Create a upper-air grid file called hbobsnd.grd. Use the temperature and dewpoint at 500 mb from the upper-air file hrcbob.snd to compute the station spacing. Create a file which can contain up to 2000 grids.

```
GDFILE   =  hbobsnd.grd
DELTAN   =  0
DELTAX   =  0
DELTAY   =  0
GRDAREA  =  us
EXTEND   =  2;2;2;2
DTAAREA  =  us
SOURCE   =  sn
SNFILE   =  $GEMDATA/hrcbob.snd
SFFILE   =  $GEMDATA/hrcbob.sfc
SNPARM   =  tmpc;dwpc
SFPARM   =  tmpc;dwpc
DATTIM   =  last
LEVELS   =  500
MAXGRD   =  2000
```

ERROR MESSAGES

[OAGRID+1] WARNING : This grid is too large for GEMPAK programs.

[OAGRID-1] Fatal error initializing TAE.

[OAGRID-2] Fatal error reading TAE parameters.

[OAGRID-3] ... is invalid for GRDAREA.

[OAGRID-4] ... is invalid for DTAAREA.

[OAGRID-5] No data file name specified.

[OAGRID-6] Parameter input is invalid.

[OAGRID-7] Parameter ... cannot be calculated.

[OAGRID-8] Invalid value for DELTAX or DELTAY.

[OAGRID-9] Too few stations to calculate DELTAN.

[OAGRID-10] Source must be set to SN or SF.

[OAGRID-11] Station data file is invalid.

[OAGRID-12] Invalid time requested.

[OAGRID-13] Invalid level requested.

4.57 SECTOR

SECTOR subsets a GINI satellite image in area and pixel resolution.

INPUT PARAMETERS

SATFIL	Satellite image filename(s)
OUTFIL	Output satellite image filename
GAREA	Graphics area
PIXRES	Resolution of output image

PROGRAM DESCRIPTION

SECTOR subsets a GINI satellite image in area and pixel resolution. The input satellite file MUST be an AWIPS/GINI file. The new file is created with an updated header based on the subset area or the new number of pixels and lines.

If GAREA is DSET the entire image is used, otherwise a subset specified by GAREA is obtained from the image. 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.

EXAMPLES

1. Create a subset image over Kansas, that uses all pixels.

```
SATFIL  =  IR_960723_1200
OUTFIL  =  IR_960723_1200_ks
GAREA   =  ks
PIXRES  =  1
```

2. Create a new image that is for the entire area but uses every 4th pixel and line.

```
SATFIL  =  IR_960723_1200
OUTFIL  =  IR_960723_1200_4
GAREA   =  dset
PIXRES  =  4
```

ERROR MESSAGES

[SECTOR-1] Fatal error initializing TAE.

[SECTOR-2] Fatal error reading TAE parameters.

[SECTOR-3] Error initializing GEMPLT.

[SECTOR-4] Input file is not a GINI image.

[SECTOR-5] File ... does not exist.

[SECTOR-6] Too few points in the requested image.

[SECTOR-7] Requested image has no points from the original.

[SECTOR-8] Bad bounds for the requested image.

[SECTOR-9] Pixel resolution, ..., is invalid

4.58 SFCFIL

SFCFIL creates a new GEMPAK surface file.

INPUT PARAMETERS

SFOUTF	Output surface file
SFPRMF	Surface parameter packing file
STNFIL	Station information file
SHIPFL	Ship data file flag
TIMSTN	Times/additional stations
SFFSRC	Surface file source

PROGRAM DESCRIPTION

SFCFIL creates a GEMPAK surface file. The file may be a standard file or a ship format file. The file may have two data types -- decoded data and/or text data.

SFFSRC is the surface file source and may be set to either decoded data (including AIRW, METR, SHIP, BUOY, and SYNP) or TEXT.

If both types are requested, they are separated by a 'l'. SFFSRC may be entered as:

SFFSRC =	==> create a file for unknown (UNKN) decoded data
SFFSRC = AIRW	==> create a file for decoded airways data
SFFSRC = TEXT	==> create a file for text data
SFFSRC = AIRW|TEXT	==> create a file for both

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

If SHIPFL is set to YES, a ship format file is created. In this case, both station location and time are stored with each data entry. This capability is useful when the station location varies in time, such as for moving ships, aircraft or free-floating buoys.

If a standard file is to be created, the maximum number of times to be included in the file must be entered as the first value in TIMSTN. If a ship format file is being created, the maximum number of entries in the file is given by the first value in TIMSTN.

If STNFIL is not blank, information about all the stations in STNFIL will be added to the data set. Space will be left in the file for the additional number of stations specified

as the second parameter in TIMSTN. Note that an error will result if STNFIL is blank and TIMSTN does not request more stations.

SFPRMF contains information about the parameters to be included in the file. SFPRMF may be either a list of parameters or the name of a packing file. If a list is entered, the parameters must be separated with semicolons; packing information may also be included after a slash with the minimum and maximum values and the resolution separated by dashes. For example, to include temperature and dewpoint in a file without packing, SFPRMF may be entered as :

```
SFPRMF = TMPC;DWPC
```

To pack the data, use:

```
SFPRMF = TMPC/-127-63-.1;DWPC/-63-63-.1
```

SFPRMF may also contain the name of a packing file. A packing file for data which is not to be packed contains a list of parameters with one parameter per line. In a file for packed data, each line must include the parameter name, the minimum and maximum data values and the resolution, all separated with spaces. The default packing file for surface data is SF51.PACK.

EXAMPLES

1. Create a surface file which can contain both decoded and text data called SURF.DAT with a maximum of 15 times using the default station and parameter files. Leave room in the file for 100 stations in addition to the stations in STNFIL. Use the GEMPAK standard packing file and table file.

```
SFOUTF  =  surf.dat
SFPRMF  =  sf51.tbl
STNFIL  =  stations.tbl
SHIPFL  =  no
TIMSTN  =  15/100
SFFSRC  =  AIRW|TEXT
```

2. Create a ship file which can contain decoded data only and a maximum of 1000 ship reports. Use a locally developed parameter file named SHIP.PRM for packing.

```
SFOUTF  =  ship.dat
SFPRMF  =  ship.prm
STNFIL  =
SHIPFL  =  yes
TIMSTN  =  1000
SFFSRC  =  SHIP
```

3. Create a surface file which can contain text data only called SURF.DAT. Use a locally developed parameter file named SURF.PRM for packing.

```
SFOUTF    =  ship.dat
SFPRMF    =  surf.prm
STNFIL    =
SHIPFL    =  no
TIMSTN    =
SFFSRC    =  TEXT
```

ERROR MESSAGES

[SFCFIL+2] WARNING! ADDSTN was negative -- set to 0.

[SFCFIL+1] Cannot add stn to a ship file; STNFIL ignored.

[SFCFIL-1] Fatal error initializing TAE.

[SFCFIL-2] Fatal error reading TAE parameters.

[SFCFIL-3] Error opening station file ... .

[SFCFIL-4] File does not include room for any stations.

[SFCFIL-5] File does not include room for any times.

[SFCFIL-6] SFPRMF is incorrectly specified.

[SFCFIL-7] The output file name is blank.

4.59 SFCHCK

SFCHCK reads a GEMPAK surface data file and produces a table of stations and an indicator showing whether each station reported data at each time in the file.

INPUT PARAMETERS

SFFILE	Surface data file
AREA	Data area
DATTIM	Date/time
OUTPUT	Output device/filename
IDNTYP	STNM or STID
STNTYP	STN reporting type

PROGRAM DESCRIPTION

SFCHCK can be used to quickly determine which stations report data in an individual GEMPAK surface data file. It is useful for determining which stations do not report data as well as new stations that are not in the data file.

The header of the table prints out each hour in the file.

Each station's listing appears as a separate row in the table. For each time, a "+" indicates that the station reported data, while a "-" indicates that the station did not report data. The total number of times that the station reported data appears at the end of the row.

If the station did not report at any time in the file, its listing will be prepended with an "N". If the station is not in the station table, its listing will be prepended by a "#".

The DATTIM and AREA parameters can be modified to specify a range of times and / or regions. Note that AREA must be set to DSET for unlisted stations to appear.

The STNTYP parameter can be modified to specify the reporting characteristics of the stations. For more information, please consult the STNTYP documentation.

EXAMPLES

1. Generate a table for the most recent decoded surface METAR file. List all stations in the file. Output the table to the file "sfchck.fil".

```
SFFILE   = hrly
AREA     = dset
DATTIM   = all
OUTPUT   = f
IDNTYP   = stid
STNTYP   = A
```

2. Do the same as above, but only list those stations that ARE in the station table and do NOT report any data.

```
SFFILE  = hrly
AREA    = dset
DATTIM  = all
OUTPUT  = f
IDNTYP  = stid
STNTYP  = ML
```

3. Do the same as above, but only list those stations that are NOT in the station table and DO report data.

```
SFFILE  = hrly
AREA    = dset
DATTIM  = all
OUTPUT  = f
IDNTYP  = stid
STNTYP  = RU
```

4. Do the same as (3), but use flash flood guidance data from 4/3/97.

```
SFFILE  = $OBS/ffg/970403.ffg
AREA    = dset
DATTIM  = all
OUTPUT  = f
IDNTYP  = stid
STNTYP  = RU
```

5. List only stations in Vermont for the hours 0300 - 0900 UTC. Output the table to the screen. Use the current METAR file.

```
SFFILE  = hrly
AREA    = @VT
DATTIM  = /03-09
OUTPUT  = T
IDNTYP  = stid
STNTYP  = A
```

ERROR MESSAGES

[SFCHCK-1] Fatal error initializing GEMPAK.

[SFCHCK-2] Fatal error reading GEMPAK parameters.

[SFCHCK-3] No valid stations could be found.

4.60 SFCNTR

SFCNTR plots surface station data on a map and optionally contours one of the fields being plotted.

INPUT PARAMETERS

AREA	Data area
GAREA	Graphics area
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
SFPARM	Surface parameter list
DATTIM	Date/time
SFFILE	Surface data file
COLORS	Color list
MAP	Map color/dash/width/filter flag
LATLON	Line color/dash/width/freq/inc/label/format
TITLE	Title color/line/title
CLEAR	Clear screen flag
PANEL	Panel loc/color/dash/width/regn
DEVICE	Device|name|x size;y size|color type
PROJ	Map projection/angles/margins|drop flag
FILTER	Filter data factor
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
LUTFIL	Enhancement lookup table filename
STNPLT	Txtc/txt attr|marker attr|stnfil#col
CLRBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
CNTRPRM	Parameter to contour
GAMMA	Convergence parameter
WEIGHT	Barnes Weighting parameter
LINE	Color/type/width/label/smth/fltr
CONTUR	Subbox/smooth
NPASS	Number of passes
CINT	Contour interval/min/max
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info

PROGRAM DESCRIPTION

SFCNTR is a special version of SFMAP which optionally allows the user to select one of the parameters specified in SFPARM to be contoured using Barnes objective analysis.

SFCNTR uses the mean station spacing as provided in OAGRID in order to define a suitable number of gridpoints for the analysis. Objective analysis is accomplished using the Barnes method as given in OABSFC. Finally, contours are drawn as in the GDCNTR program.

SFMAP plots data at station locations on a map. Any parameter that can be computed from the parameters in the data set can be displayed. Conditions can be specified for the parameters. The conditions are documented in the SFPARM documentation. Data may be plotted in any valid GEMPAK projection and may be overlaid on images.

A list of times may be given in DATTIM allowing animation of surface plots.

The order of the input parameters determines their location on the plot. Parameters are separated by semicolons. A position may be skipped by entering two consecutive semicolons or entering the name SPAC or BLNK. A parameter will be plotted centered at the station if it is the first parameter in the list, for example, if SFPARM = SKYC, the sky cover symbol will be plotted centered on the station location. If no parameter is to be displayed centered on the station location, a semicolon must appear before the first parameter listed. SPAC or BLNK may also be entered. The following chart shows the location on the model of each position.

```
          8
2         10        4
3         1         5
6         11        7
          9
```

Note that wind symbols and markers are always plotted at the center of the station model.

If FILTER is set to YES, the stations will be filtered so that overlapping stations will not be plotted. FILTER may also be entered as a number greater than or equal to zero. FILTER = NO has the same effect as FILTER = 0. FILTER = 1 has the same effect as FILTER = YES. Values less than 1 allow more crowding of stations, values exceeding 1 less crowding. If a position is skipped using two semicolons or if the parameter is BLNK, the filter will not allocate the space. The parameter SPAC may be used to reserve the space with the filter option. Then later plots will plot the same stations after filtering, provided that the same parameter locations are specified.

If certain stations are not to be removed by the filter, these stations are listed first following an @. The area over which filtering is to occur is specified after a slash. For example,

```
AREA    = @bwi;iad;dca/md
FILTER  = YES
```

will display a filtered array of stations over the area corresponding to MD, but BWI, IAD and DCA will be shown regardless of the filtering.

Weather symbols can also be plotted. The size and width of the symbols can be specified by appending the numbers to the parameter name using a colon as a separator. For example, WSYM:2:5 will plot weather symbols with size of 2. and line width of 5.

Other symbols can be specified in a similar way. The names for the pressure tendency, sky cover, cloud type, weather and wind symbols and how their characteristics are set are given in the SFPARM documentation.

Parameters can be color-coded based on their own value or on the value of any other computable parameter. Refer to the COLORS documentation for details. If one or more parameters are color-coded, a color bar will be displayed for the first color-coded parameter.

CNTRPRM is the name of one of the parameters specified in SFPARM which will be contoured from objective analysis of the data. The parameter must be one listed in SFPARM. If the used does not want the data values displayed, set COLOR=0 for that SFPARM value.

GAMMA is the Barnes objective analysis convergence parameter.

WEIGHT is the Barnes weighting parameter. Typical values range from 20 to 50. A value of 20 is the default.

LINE provides the settings for contour lines used in the display.

CONTUR is the grid sub-box and number of smoothing passes used by the contouring algorithm.

NPASS is the number of passes in the Barnes scheme.

CINT is the contour interval for the display.

EXAMPLES

1. Plot the 12Z observerd surface temperatures (tmpf) on a US map and contour the data using a contour interval of 5 degrees.

```
AREA     =  dset
GAREA    =  nj
SATFIL   =
RADFIL   =
SFPARM   =  tmpf
DATTIM   =  1200
SFFILE   =  metar
COLORS   =  6
MAP      =  3/1/1
LATLON   =  0
TITLE    =  1
CLEAR    =  yes
PANEL    =  0
DEVICE   =  xw
PROJ     =  lcc
FILTER   =  n
TEXT     =  1/22//hw
LUTFIL   =
```

```
STNPLT     =
CLRBAR     =
CNTRPRM    =  tmpf
GAMMA      =  .3
WEIGHT     =  50
LINE       =  5/1/1
CONTUR     =  3/3
NPASS      =  2
CINT       =  5
```

ERROR MESSAGES

[SFCNTR-1] Fatal error initializing TAE.

[SFCNTR-2] Fatal error reading TAE parameters.

[SFCNTR-3] Fatal error initializing GEMPLT.

[SFCNTR-4] Parameter ... is not calculable.

[SFCNTR-5] Winds are not calculable.

4.61 SFDELT

SFDELT deletes data from a surface data file.

INPUT PARAMETERS

SFFILE	Surface data file
DATTIM	Date/time
AREA	Data area

PROGRAM DESCRIPTION

SFDELT deletes data from a surface data file. The stations to be deleted may be specified in AREA; the times to be deleted are given in DATTIM.

If AREA is set to DSET or ALL, all the data present at the times in DATTIM will be deleted, along with the headers for those times.

EXAMPLES

1. Delete all the data at time 920722/1200.

```
SFFILE  = 92jul.sfc
DATTIM  = 920722/1200
AREA    = dset
```

2. Delete data at BWI for the most recent time in the file.

```
SFFILE  = realtime.sfc
DATTIM  = last
AREA    = @bwi
```

ERROR MESSAGES

[SFDELT-1] Fatal error initializing TAE.

[SFDELT-2] Fatal error reading TAE parameters.

[SFDELT-3] Error deleting data at time ....

4.62 SFEDIT

SFEDIT adds or changes data in a surface file using a sequential text file.

INPUT PARAMETERS

SFEFIL	Surface edit file
SFFILE	Surface data file

PROGRAM DESCRIPTION

SFEDIT adds information from a sequential text file to an existing GEMPAK surface file. The program may be used to add new data to a file or to change existing values. The output file must already exist.

The data to be added must reside in a text file, SFEFIL. This file can be created by specifying F as the output device in GEMPAK program SFLIST or by generating the file with a text editor. A text editor may be used to change the file.

The parameters to be edited must be specified at the beginning of the edit file, for example: PARM=TMPF;DWPF. Only parameters stored in the output file can be edited. Parameters that have character values, such as WTHR, are actually stored as real numbers. Thus, the numeric weather code must be used. Station information, such as the latitude, SLAT, cannot be changed using this program. Rather, these changes can be made using the GEMPAK program, SFSTNS.

The data follow the parameter list. Each data listing must include the time, followed by the station character or numeric identifier followed by the data. If data are missing, the current missing data value, -9999., must be used. Blank fields will not be recognized.

If a station or time does not exist in the output file it will be added to the file. If stations are added, the GEMPAK program SFSTNS can be used to add station latitudes, longitudes and elevations.

EXAMPLES

1. Change values of TMPF and DWPF in the file SFCDATA.DAT.

```
SFEFIL  = sflist.fil
SFFILE  = sfcdata.dat
```

The file SFLIST.FIL follows. Note that the title line is ignored. PARM = TMPF;DWPF

```
STN   YYMMDD/HHMM        TMPF     DWPF
BWI   850426/0400        55.40    42.80
SBY   850426/0400        62.62    55.40
BGJ   850426/0400        55.40    42.80
```

The program replaces the temperature and dewpoint for stations BWI, SBY and NHK at the given time values in output file SFCDATA.DAT.

ERROR MESSAGES

[SFEDIT+2] Station ... cannot be added to the file.

[SFEDIT-1] Fatal error initializing TAE.

[SFEDIT-2] Fatal error reading TAE parameters.

[SFEDIT-3] Edit file ... cannot be opened.

[SFEDIT-5] PARM keyword not found.

[SFEDIT-6] Too many parameters to edit.

[SFEDIT-7] Time ... cannot be added to data set.

[SFEDIT-8] Parameter ... is not in the data set.

[SFEDIT-9] SFEDIT cannot continue with invalid parameters.

[SFEDIT-10] Missing lat/lon pair for ship file

4.63 SFGRAM

SFGRAM draws a meteogram for surface data.

INPUT PARAMETERS

SFFILE	Surface data file
DATTIM	Date/time
STATION	Stations
TRACE1	Parms/colors/range/witness
TRACE2	Parms/colors/range/witness
TRACE3	Parms/colors/range/witness
TRACE4	Parms/colors/range/witness
TRACE5	Parms/colors/range/witness
NTRACE	Number of traces
TAXIS	Time1-time2-tinc;lbl;gln;tck
BORDER	Background color/type/width
MARKER	Marker color/type/size/width/hw
TITLE	Title color/line/title
CLEAR	Clear screen flag
DEVICE	Device|name|x size;y size|color type
PANEL	Panel loc/color/dash/width/regn
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg

PROGRAM DESCRIPTION

SFGRAM draws a time series plot for surface data. Up to five traces may be drawn in a single plot. NTRACE determines the number of traces to draw. If NTRACE is 5, the plot area will be divided into fifths; if NTRACE is 4, the plot area will be divided into fourths, etc. If STATION is a single station, all the traces will be for that station. If STATION is a list of stations, TRACE1 will plot data from the first station, TRACE2 will plot data from the second station, etc.

Each TRACE parameter contains specifications for the parameters to be plotted in the corresponding trace. The format for each trace is:

parms/colors/range/witness!parms/colors/range/witness

The parameters before the ! will be labeled on the left of the plot; those after the ! will be labeled on the right. Any GEMPAK surface parameter may be entered. Real valued parameters will be drawn as a graph. Character valued parameters will be rotated 90 degrees and written on the plot. Symbols are plotted for the symbol parameters. 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 symbols may only be plotted in positions 1, 2 or 3, where position 1 is at the bottom of the trace, position 2 is in the middle and position 3 is at the top.

Each parameter name may be followed by a colon, the size or line dash type, a second colon, and the width. For example, WSYM:.5:5 will draw weather symbols half the default size with a line width of 5. 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. If start = stop, then the y-axis range is from the mean of the data minus this value to the mean plus the start = stop value. If the start or the stop value (or both) is preceded by a + sign, then the y-axis range is determined by that value unless the data actually goes past it, in which case, the y-axis is extended to plot all of the data.

Witness lines may be specified for each TRACE. These are horizontal dotted lines. A list of y values, separated by semicolons, may be entered. Alternatively, if WITNESS = YES, a witness line will be centered on the plot.

The time axis is specified in TAXIS as a minimum time, a maximum time, and a time increment separated with dashes. If any or all of the parts of TAXIS is blank, reasonable values will be selected by the program.

EXAMPLES

1. Plot the meteogram for PWM for all the times available in the data set. Plot the time axis from 19/03 to 20/09. TRACE1 plots TMPF and DWPF in colors 2 and 3. TRACE2 plots PMSL in color 4. TRACE3 plots the wind barbs and gusts in knots. TRACE4 plots the visibility in miles in color 7. TRACE5 plots the cloud cover codes at the bottom and the weather symbols at the top in color 6.

```
SFFILE    =  $GEMDATA/HRCBOB.SFC
DATTIM    =  all
STATION   =  pwm
TRACE1    =  tmpf;dwpf:3/2;3
TRACE2    =  pmsl/4
TRACE3    =  gust;brbk
TRACE4    =  vsby/7
TRACE5    =  clds;;wsym/6
NTRACE    =  5
TAXIS     =  19/03-20/09
BORDER    =  1
```

```
MARKER    =  3/12
TITLE     =  1
CLEAR     =  y
DEVICE    =  xw
PANEL     =  0
TEXT      =  1///sw
```

2. Plot TMPF and DWPF for stations PWM, BWI and HAT. TMPF is plotted with a solid line using color 2 and DWPF is plotted with a dashed line using color 3.

```
SFFILE    =  $GEMDATA/HRCBOB.SFC
DATTIM    =  all
STATION   =  pwm;bwi;hat
TRACE1    =  tmpf;dwpf:3/2;3
TRACE2    =  tmpf;dwpf:3/2;3
TRACE3    =  tmpf;dwpf:3/2;3
TRACE4    =
TRACE5    =
NTRACE    =  3
TAXIS     =  19/03-20/09
BORDER    =  1
MARKER    =  3/12
TITLE     =  1
CLEAR     =  y
DEVICE    =  xw
PANEL     =  0
TEXT      =  1///sw
```

ERROR MESSAGES

[SFGRAM+3] Hardware text cannot generally be rotated.

[SFGRAM-1] Fatal error initializing TAE.

[SFGRAM-2] Fatal error reading TAE parameters.

[SFGRAM-3] Fatal error initializing GEMPLT.

[SFGRAM-4] No stations have been entered.

[SFGRAM-5] ... cannot be plotted in position 4.

[SFGRAM-6] The time range along the x axis is 0.

[SFGRAM-7] The parameter ... cannot be computed.

[SFGRAM-8] The graph coordinates are invalid.

[SFGRAM-9] There is no data at station ....

[SFGRAM-10] Station ... is invalid.

[SFGRAM-11] There are no times in the file.

[SFGRAM-12] The time ... is invalid.

[SFGRAM-14] The file ... cannot be opened.

[SFGRAM-15] There are no parameters specified.

[SFGRAM-16] Error in specifying TAXIS.

[SFGRAM-17] No valid time or file found.

4.64 SFL604

SFL604 lists data from a GEMPAK surface file in a fixed format.

INPUT PARAMETERS

SFFILE	Surface data file
AREA	Data area
DATTIM	Date/time
OUTPUT	Output device/filename
SKPMIS	Skip missing data flag
IDNTYP	STNM or STID
SFPARM	Surface parameter list

PROGRAM DESCRIPTION

SFL604 lists data from a surface file in a format designed to display airways data.

Data will be listed for the stations and times requested in AREA and DATTIM. If SKPMIS is YES, stations that are within the area requested, but have not reported data, will not be listed. If SKPMIS is set to NO, then only the date and station identifier will be listed for nonreporting stations.

Stations may be identified in the output listing by character or numeric identifier. This is accomplished by setting IDNTYP to STID or STNM.

This program will list predefined parameters only. However, stations may be selected using conditions in SFPARM. For example, if SFPARM = WTHR=S+, then only those stations reporting heavy snow will be listed. The conditions specified in SFPARM can be for any computable parameter, not just those to be listed.

EXAMPLES

1. List the data for all stations in Pennsylvania at the most recent time.

```
SFFILE    =  $GEMDATA/HRCBOB.SFC
AREA      =  @pa
DATTIM    =  last
OUTPUT    =  t
SKPMIS    =  yes
IDNTYP    =  stid
SFPARM    =
```

2. List the data for all times at PHL.

```
SFFILE    =  $GEMDATA/HRCBOB.SFC
AREA      =  @phl
DATTIM    =  all
OUTPUT    =  t
```

```
SKPMIS      =  yes
IDNTYP      =  stid
SFPARM      =
```

3. List all stations in Pennsylvania, including nonreporting stations for the last time.

```
SFFILE      =  $GEMDATA/HRCBOB.SFC
AREA        =  @pa
DATTIM      =  last
OUTPUT      =  t
SKPMIS      =  no
IDNTYP      =  STID
SFPARM      =
```

4. List all stations in Pennsylvania where there are reported thunderstorms.

```
SFFILE      =  $GEMDATA/HRCBOB.SFC
AREA        =  @pa
DATTIM      =  LAST
OUTPUT      =  t
SKPMIS      =  yes
IDNTYP      =  STID
SFPARM      =  wthr=t
```

ERROR MESSAGES

[SFL604+1] Parameter ... cannot be computed.

[SFL604-1] Fatal error initializing TAE.

[SFL604-2] Fatal error reading TAE parameters.

[SFL604-3] No valid stations could be found.

[SFL604-4] No parameters can be computed.

4.65 SFLIST

SFLIST lists surface data from a GEMPAK surface data file.

INPUT PARAMETERS

SFFILE	Surface data file
AREA	Data area
DATTIM	Date/time
SFPARM	Surface parameter list
OUTPUT	Output device/filename
IDNTYP	STNM or STID

PROGRAM DESCRIPTION

SFLIST lists any parameters which can be derived from the data in a surface data file. The stations and times to be included are specified in AREA and DATTIM. If no data are reported for a station, that station will not be listed. The listings will be grouped by time.

If the surface file contains both decoded and undecoded text data, both types can be listed by specifying GEMPAK parameters along with parameter 'TEXT'. The special reports may also be listed in an undecoded format using the paramter 'SPCL'. TEXT and SPCL may appear anywhere in the list of parameters.

Conditions can be specified for the parameters. The conditions are documented in the SFPARM documentation.

EXAMPLES

1. List the decoded and undecoded text air and dewpoint temperatures in Fahrenheit and the mean sea-level pressure and weather of stations in Pennsylvania for the latest time. Use a locally created surface file that contains both types of data called SAOTEXT.SFC.

```
SFFILE   = SAOTEXT.SFC
AREA     = @pa
DATTIM   = last
SFPARM   = tmpf;dwpf;pmsl;wthr;text
OUTPUT   = t
IDNTYP   = stid
```

2. List the same parameters for PIT and BWI at 0500 and 0600 GMT.

```
SFFILE   = SAOTEXT.SFC
AREA     = @pit;bwi
DATTIM   = /05-06
SFPARM   = tmpf;dwpf;pmsl;wthr;text
OUTPUT   = t
```

```
IDNTYP      =  stid
```

3. List the temperature, dewpoint, pressure, and weather for stations in Pennsylvania which are reporting thunderstorms and dewpoint temperatures greater than 65 degrees Fahrenheit.

```
SFFILE      =  $GEMDATA/HRCBOB.SFC
AREA        =  @PA
DATTIM      =  /05-06
SFPARM      =  tmpf;dwpf>65;pmsl;wthr=t
OUTPUT      =  T
IDNTYP      =  STID
```

4. List the latest undecoded SAO text data for stations in Pennsylvania. Use a locally created surface file with SAO decoded and text data called SAOTEXT.SFC.

```
SFFILE      =  SAOTEXT.SFC
AREA        =  @PA
DATTIM      =  last
SFPARM      =  text;spcl
OUTPUT      =  T
IDNTYP      =  STID
```

ERROR MESSAGES

[SFLIST+1] Parameter ... is not computable.

[SFLIST-1] Fatal error initializing TAE.

[SFLIST-2] Fatal error reading TAE parameters.

[SFLIST-3] No stations reporting data.

[SFLIST-4] No valid computable parameters.

4.66 SFMAP

SFMAP plots surface station data on a map.

INPUT PARAMETERS

AREA	Data area
GAREA	Graphics area
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
SFPARM	Surface parameter list
DATTIM	Date/time
SFFILE	Surface data file
COLORS	Color list
MAP	Map color/dash/width/filter flag
LATLON	Line color/dash/width/freq/inc/label/format
TITLE	Title color/line/title
CLEAR	Clear screen flag
PANEL	Panel loc/color/dash/width/regn
DEVICE	Device|name|x size;y size|color type
PROJ	Map projection/angles/margins|drop flag
FILTER	Filter data factor
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
LUTFIL	Enhancement lookup table filename
STNPLT	Txtc/txt attr|marker attr|stnfil#col
CLRBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info

PROGRAM DESCRIPTION

SFMAP plots data at station locations on a map. Any parameter that can be computed from the parameters in the data set can be displayed. Conditions can be specified for the parameters. The conditions are documented in the SFPARM documentation. Data may be plotted in any valid GEMPAK projection and may be overlaid on images.

A list of times may be given in DATTIM allowing animation of surface plots.

The order of the input parameters determines their location on the plot. Parameters are separated by semicolons. A position may be skipped by entering two consecutive semicolons or entering the name SPAC or BLNK. A parameter will be plotted centered at the station if it is the first parameter in the list, for example, if SFPARM = SKYC, the sky cover symbol will be plotted centered on the station location. If no parameter is to be displayed centered on the station location, a semicolon must appear before the first parameter listed. SPAC or BLNK may also be entered. The following chart shows the location on the model of each position.

	8	
2	10	4
3	1	5
6	11	7
	9	

Note that wind symbols and markers are always plotted at the center of the station model.

If FILTER is set to YES, the stations will be filtered so that overlapping stations will not be plotted. FILTER may also be entered as a number greater than or equal to zero. FILTER = NO has the same effect as FILTER = 0. FILTER = 1 has the same effect as FILTER = YES. Values less than 1 allow more crowding of stations, values exceeding 1 less crowding. If a position is skipped using two semicolons or if the parameter is BLNK, the filter will not allocate the space. The parameter SPAC may be used to reserve the space with the filter option. Then later plots will plot the same stations after filtering, provided that the same parameter locations are specified.

If certain stations are not to be removed by the filter, these stations are listed first following an @. The area over which filtering is to occur is specified after a slash. For example,

```
AREA    = @bwi;iad;dca/md
FILTER  = YES
```

will display a filtered array of stations over the area corresponding to MD, but BWI, IAD and DCA will be shown regardless of the filtering.

Weather symbols can also be plotted. The size and width of the symbols can be specified by appending the numbers to the parameter name using a colon as a separator. For example, WSYM:2:5 will plot weather symbols with size of 2. and line width of 5.

Other symbols can be specified in a similar way. The names for the pressure tendency, sky cover, cloud type, weather and wind symbols and how their characteristics are set are given in the SFPARM documentation.

Parameters can be color-coded based on their own value or on the value of any other computable parameter. Refer to the COLORS documentation for details. If one or more parameters are color-coded, a color bar will be displayed for the first color-coded parameter.

EXAMPLES

1. Display the visible satellite image from 18Z and overlay the surface data for the area covered by the image. Plot a standard station model for each location in the data set. The surface data to plot include: 1) sky cover symbol; 2) temperature in Fahrenheit; 3) weather symbol; 4) coded mean sea level pressure; 5) pressure tendency with symbol; 6) dewpoint in Fahrenheit; 6) station ID; 7) visibility; and 8) wind barbs in knots. The data are plotted using the specified color list.

```
AREA     =  us
GAREA    =  dset
SATFIL   =  $GEMDATA/VIS_910819_1801
RADFIL   =
SFPARM   =  skyc:.75;tmpf;wsym:.75;smsl;ptnd;dwpf;stid;;vsby*10;brbk:1:2;m
DATTIM   =  910819/1800
SFFILE   =  $GEMDATA/hrcbob.sfc
COLORS   =  26;2;7;25;20;22;18;24;6
MAP      =  1
LATLON   =  2/10/1/1/5;5
TITLE    =  1
CLEAR    =  yes
PANEL    =  0
DEVICE   =  xw
PROJ     =  sat
FILTER   =  1
TEXT     =  1/22//hw
LUTFIL   =
STNPLT   =
```

2. Using the above specifications, change the area to New Jersey. The satellite image will be subset and replotted with the data for that area. Change the filter factor to allow more stations to be plotted.

```
AREA     =  nj-
GAREA    =  nj
SATFIL   =  $GEMDATA/VIS_910819_1801
RADFIL   =
SFPARM   =  skyc:.75;tmpf;wsym:.75;smsl;ptnd;dwpf;stid;;vsby*10;brbk:1:2;m
DATTIM   =  910819/1800
SFFILE   =  $GEMDATA/hrcbob.sfc
COLORS   =  26;2;7;25;20;22;18;24;6
MAP      =  1
LATLON   =  2/10/1/1/5;5
TITLE    =  1
CLEAR    =  yes
PANEL    =  0
DEVICE   =  xw
PROJ     =  sat
FILTER   =  .45
TEXT     =  1/22//hw
LUTFIL   =
STNPLT   =
```

3. Using the previous specifications, vary the color of the weather symbols by color coding them according to their precipitation type. To make them more discernible, omit using the satellite image and change the map projection.

```
AREA     =  nj-
GAREA    =  nj
SATFIL   =
```

```
RADFIL      =
SFPARM      =  skyc:.75;tmpf;wsym:.75;smsl;ptnd;dwpf;stid;;vsby*10;brbk:1:2;m
DATTIM      =  910819/1800
SFFILE      =  $GEMDATA/hrcbob.sfc
COLORS      =  26;2;(19-90-10/17;6;8;17;3;3;1;22;2);25;20;22;18;24;6
MAP         =  1
LATLON      =  2/10/1/1/5;5
TITLE       =  1
CLEAR       =  yes
PANEL       =  0
DEVICE      =  xw
PROJ        =  mer
FILTER      =  .45
TEXT        =  1/22//hw
LUTFIL      =
STNPLT      =
```

ERROR MESSAGES

[SFMAP-1] Fatal error initializing TAE.

[SFMAP-2] Fatal error reading TAE parameters.

[SFMAP-3] Fatal error initializing GEMPLT.

[SFMAP-4] Parameter ... is not calculable.

[SFMAP-5] Winds are not calculable.

4.67 SFMOD

SFMOD moves selected surface data from an input surface file to an output surface file.

INPUT PARAMETERS

SFFILE	Surface data file
SFOUTF	Output surface file
DATTIM	Date/time
DATOUT	Output date/time
AREA	Data area
SFPARM	Surface parameter list

PROGRAM DESCRIPTION

SFMOD takes data from an existing GEMPAK surface file, SFFILE, and writes the data into another existing surface file, SFOUTF. This program can be used to subset the original dataset by time and/or stations and/or parameters.

This program will not create a new surface file. The GEMPAK program, SFCFIL, can be used to create a surface file. If the parameters in the output file are not the same as the parameters in the input file, the required parameter conversions will be done.

If a requested station or time is not in the output file, it will be added to the file if there is room. The number of times and stations that can be included in a file is specified by TIMSTN in SFCFIL.

The parameter DATOUT can be used to set different times in the output file from those times listed with the parameter DATTIM.

The parameter SFPARM can be used to specify which parameters in the output file are to be written.

EXAMPLES

1. Put the data for all stations at the latest time in file TEST.SFC into a file called LAST.SFC.

```
SFFILE   =  test.sfc
SFOUTF   =  last.sfc
DATTIM   =  last
AREA     =  dset
```

2. Put the data for stations in Maryland and Virginia for all times into the output data set.

```
SFFILE   =  test.sfc
SFOUTF   =  last.sfc
```

```
DATTIM      =  all
AREA        =  @md/@va
```

3. Put the data for stations in Maryland for 1100 - 1400 UTC into the output file with the new times from 1500 - 1800 UTC. Write only the temperature and dewpoint data to the output file.

```
SFFILE      =  test.sfc
SFOUTF      =  last.sfc
DATTIM      =  940513/1100;940513/1200;940513/1300;940513/1400
DATOUT      =  0513/1500;0513/1600;0513/1700;0513/1800
AREA        =  @md
SFPARM      =  tmpf;dwpf
```

ERROR MESSAGES

[SFMOD+4] Parameter ... is not in output file.

[SFMOD+3] Some stations were not added to file.

[SFMOD+2] Character parameter cannot be used: ...

[SFMOD+1] Parameter ... cannot be calculated.

[SFMOD-1] Fatal error initializing TAE.

[SFMOD-2] Fatal error reading TAE parameters.

[SFMOD-3] There are no parameters to be computed.

[SFMOD-4] Time ... cannot be added.

[SFMOD-5] Number of input and output date/time are not equal.

4.68 SFSTNS

SFSTNS modifies the station information in a surface file.

INPUT PARAMETERS

SFFILE	Surface data file
STNFIL	Station information file
ADDSTN	Add station flag
IDNTYP	STNM or STID

PROGRAM DESCRIPTION

SFSTNS updates the station information in a GEMPAK surface file. The station information includes the character station identifier, STID, the station number, STNM, the latitude, SLAT, the longitude, SLON, the elevation, SELV, the state, STAT, and the country, COUN.

This information must be stored in a fixed format in the table file specified in STNFIL. See the default table for an example of the required format. Station names may be included, but are not used. The current default GEMPAK surface station table for US, Canadian and Mexican stations is SFSTNS.TBL.

ADDSTN is a logical parameter that indicates whether stations which are in the table file but not already in the surface file will also be added to the surface file, provided there is room for them.

IDNTYP governs whether station numbers, STNM, or character identifiers, STID, will be used to identify stations in the table.

EXAMPLES

1. Update surface file called SURF.DAT with station information from MYSTN.DAT, adding stations that are not already in the surface file.

```
SFFILE   =  surf.dat
STNFIL   =  mystn.dat
ADDSTN   =  yes
IDNTYP   =  stid
```

ERROR MESSAGES

[SFSTNS+1] WARNING! No stations were updated.

[SFSTNS-1] Fatal error initializing TAE.

[SFSTNS-2] Fatal error reading TAE parameters.

[SFSTNS-3] Invalid input for IDNTYP; must be STID or STNM.

[SFSTNS-4] STNFIL ... cannot be opened.

4.69 SFVGSF

SFVGSF adds or changes data in a surface file using the elements found in a Vector Graphics file.

INPUT PARAMETERS

VGFILE	Vgfile | scale file | attribute file
SFOUTF	Output surface file
DATTIM	Date/time
SFPARM	Surface parameter list
COLORS	Color list

PROGRAM DESCRIPTION

SFVGSF adds information from a Vector Graphics file to an existing GEMPAK surface file. The program may be used to add new data to a file or to change existing values. The output file must already exist.

Each parameter in the Vector Graphics file must have a unique color because the search method uses the color to distinguish between parameters. The colors listed in COLORS must correspond to the colors used to create the Vector Graphics file, so that the parameter names can be matched to the data values.

The Vector Graphics file can be created by specifying VG as the device driver in the GEMPAK program SFMAP or by generating the file in the product generation of NMAP.

The parameters to be added to the surface file are specified in SFPARM and the associated colors are listed in COLORS. The STID or STNM must be present in the VG file and the parameter list so that the data can be written to the proper station.

The date/time must also be provided by the user. Any missing parts of the date/time will be supplied by the system time.

If a station or time does not exist in the output file, it will be added to the file. If stations are added, the GEMPAK program SFSTNS can be used to add station latitudes, longitudes and elevations.

EXAMPLES

1. Read the Vector Graphics file day3max.vgf and write the data for the requested parameters to the surface file 990307.mrfmos. In this example, TDYE is the edited maximum temperature value.

```
VGFILE  =  day3max.vgf
SFOUTF  =  990307.mrfmos
```

```
DATTIM    =  990307/1200
SFPARM    =  TDYE;STID
COLORS    =  2;17
```

ERROR MESSAGES

[SFVGSF+3] Parameter ... is not in the data set.

[SFVGSF+2] Station ... cannot be added to the file.

[SFVGSF-1] Fatal error initializing TAE.

[SFVGSF-2] Fatal error reading TAE parameters.

[SFVGSF-3] VG file ... cannot be opened.

[SFVGSF-4] The output file must be a standard SF file.

[SFVGSF-5] One of the parameters must be STID or STNM.

[SFVGSF-6] Time ... cannot be added to data set.

4.70 SNCFIL

SNCFIL creates a new GEMPAK sounding file.

INPUT PARAMETERS

SNOUTF	Output sounding file
SNPRMF	Sounding parameter packing file
STNFIL	Station information file
MRGDAT	Merge data file flag/part type
TIMSTN	Times/additional stations

PROGRAM DESCRIPTION

SNCFIL creates a GEMPAK sounding file. The file may be created to store merged or unmerged data. Merged data files may contain any meteorological parameters with all parameters included at each level. Unmerged files store the mandatory data and significant-level temperature and wind data as separate parts.

MRGDAT must be set to YES or NO. If YES, a merged file will be created. The parameters to be included in the file must be specified in SNPRMF. If MRGDAT is NO, an unmerged file will be created. In this case, the type of unmerged file can be included following a slash. Type 1 creates a file with only mandatory data below 100 mb. Type 2 specifies a file with mandatory and significant-level data below 100 mb, and type 3, which is the default, specifies a file with mandatory and significant-level data below and above 100 mb.

SNPRMF contains information about the parameters to be included in a merged file. Either a list of parameters or the name of a packing file may be entered. If a list is entered, the parameters must be separated with semicolons; packing information may also be included after a slash with the minimum and maximum values and the resolution separated using dashes. For example, to include temperature and dewpoint in a file without packing, SNPRMF may be entered as:

```
SNPRMF = TMPC;DWPC
```

To pack the data, use:

```
SNPRMF = TMPC/-127-63-.1;DWPC/-63-63-.1
```

SNPRMF may also contain the name of a packing file. A packing file for data which is not to be packed contains a list of parameters with one parameter per line. In a file for packed data, each line must include the parameter name, the minimum and maximum data values and the resolution, all separated with spaces. The default packing file for merged sounding data is SNPACK.TBL.

If STNFIL is not blank, information about all the stations in STNFIL will be added to the data set. Space will be left in the file for the additional number of stations specified

as the second parameter in TIMSTN. Note that an error will result if STNFIL is blank and TIMSTN does not request additional stations.

EXAMPLES

1. Create a sounding file called SOUND.DAT containing merged data. Use the standard station and parameter files. Leave room in the file for 100 stations in addition to the stations in STNFIL and allow 15 times to be added to the file.

```
SNOUTF    =  sound.dat
SNPRMF    =  snpack.tbl
STNFIL    =  snstns.tbl
MRGDAT    =  yes
TIMSTN    =  15/100
```

2. Create an unmerged sounding file called WEEKLY.SND which will store mandatory and significant-level data below and above 100 mb. Do not add any stations now. Leave room for 14 times and 300 stations.

```
SNOUTF    =  weekly.snd
SNPRMF    =
STNFIL    =
MRGDAT    =  no/3
TIMSTN    =  14/300
```

ERROR MESSAGES

[SNCFIL+2] Negative number of stations entered -- 0 used.

[SNCFIL-1] Fatal error initializing TAE.

[SNCFIL-2] Fatal error reading TAE parameters.

[SNCFIL-3] Error opening station file ... .

[SNCFIL-4] File does not include room for any stations.

[SNCFIL-5] File does not include room for any times.

[SNCFIL-6] SNPRMF is incorrectly specified.

[SNCFIL-7] The file name for the new file is blank.

[SNCFIL-8] Vertical coordinate = ... -- specify more parameters.

4.71 SNCROSS

SNCROSS draws cross sections through sounding data.

INPUT PARAMETERS

CXSTNS	Cross-section station line
SNPARM	Sounding parameter list
SNFILE	Sounding data file
DATTIM	Date/time
VCOORD	Vertical coordinate type
PTYPE	Plot type/h:w ratio/margins
YAXIS	Ystrt/ystop/yinc/lbl;gln;tck
TAXIS	Time1-time2-tinc;lbl;gln;tck
LINE	Color/type/width/label/smth/fltr
BORDER	Background color/type/width
CINT	Contour interval/min/max
WIND	Wind symbol/siz/wdth/typ/hdsz
TITLE	Title color/line/title
PANEL	Panel loc/color/dash/width/regn
DEVICE	Device|name|x size;y size|color type
CLEAR	Clear screen flag
FILTER	Filter data factor
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
CURVE	Curve fit type
CLRBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
CONTUR	Subbox/smooth
FINT	Fill interval/min/max
FLINE	Fill colors/fill types
CTYPE	Contour type: C/F

PROGRAM DESCRIPTION

SNCROSS draws cross sections using upper-air sounding data. The cross-section line, CXSTNS, must be specified as a list of stations separated with semicolons. Alternatively, a single station may be entered in CXSTNS and a list of times in DATTIM. In this case, a time section will be drawn.

Any parameter that can be computed from the data set parameters can be displayed. The parameter to be displayed is specified in SNPARM. If the value of SNPARM is ISEN, isentropes will be drawn. Note that SNPARM may also be THTA, in which case, potential temperature will be gridded and contoured. ISEN will fit splines to the station data in plot space and then check for tangled lines and untangle them if necessary.

Contours may be displayed as lines or as a color fill. If CTYPE is C, contour lines are drawn using input from CINT and LINE. If CTYPE is F, filled contours are drawn using specifications from FINT and FLINE. Both contour lines and filled contours are drawn if CTYPE is F/C.

The attributes of the contour lines, including the color, line type, line width, and label frequency are specified in LINE. The four attributes are separated with slashes; semicolons separate the values for each attribute. If the line type is set to a single negative number, negative contour values will have the absolute value of the line type and positive values will be solid. If the label type is set to a single number, n, then every nth value will be labeled.

The contour fill intervals are specified in FINT; the attributes for the fill are specified in FLINE. The first color specified in FLINE fills values less than the first level; while the last color fills values greater than the last level. Therefore, n levels require n+1 colors. CLRBAR allows a color bar to be added for color fill contours.

A range of colors may be specified in either FLINE or LINE by specifying starting, ending and increment values in that order separated by dashes. If the increment is missing, a default of 1 is used.

The fill type may be set to 1 (solid), 2 (slanted dash) or 3 (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.

The plot background consists of a pressure axis, a horizontal axis with the station names, a filled region indicating the part of the plot below the earth surface, and vertical lines at each station. The station lines are the specified line type up to the level at which wind data stop, and are dotted from there to the level at which temperature data stop. The color and other attributes for the background axes and labels are given by the first numbers separated by semicolons in the color number, line type and line width entry sections for BORDER. The second set of numbers applies to the station lines, and the third set to the underground color fill (for which the line type and width do not apply). To eliminate, the background, the station lines, or the underground fill, just set the corresponding color number to zero. If one color number is entered, it is used for all three; if two are entered, the second is used for both the station lines and the underground fill. So, BORDER has the following entries:

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

The horizontal axis represents a straight line between the first and last stations. The positions of intervening stations are proportional to the perpendicular projections of the actual positions onto the section line. All of these calculations are done in lat/lon coordinates. If the plot is a time section, the times will be displayed on the x axis with the earliest time at the left. If the first character in TAXIS is an R, the earliest time will appear on the right.

The vertical coordinate may be specified as LIN, LOG, or STUVE; SKEWT is not valid in this program. The bottom and top limits for the y axis are specified in YAXIS, but the axis labeling specifications are ignored.

EXAMPLES

1. Draw isentropes in color 3 for the last time in the data set. Plot the background in color 1. Use a logarithmic scale for the y axis and a 5 degree interval for the isentropes. Draw wind barbs in color number 6 with line width 2.

```
CXSTNS   =  chh;acy;wal;hat;chs;ays
SNPARM   =  thta
SNFILE   =  $GEMDATA/HRCBOB.SND
DATTIM   =  last
VCOORD   =  pres
PTYPE    =  log
YAXIS    =
TAXIS    =
LINE     =  3
BORDER   =  1
CINT     =  5
WIND     =  bm6//2
TITLE    =  1
PANEL    =  0
DEVICE   =  xw
CLEAR    =  y
FILTER   =  .8
TEXT     =  1
CURVE    =  2
CLRBAR   =
CONTUR   =  0
FINT     =  0
FLINE    =  10-20
CTYPE    =  C
```

2. Draw filled contours of relative humidity for the same cross section. Fill in contours greater than 70%. Draw a horizontal color bar at the bottom of the plot. Draw the cross section from 1050 mb to 300 mb.

```
CXSTNS   =  chh;acy;wal;hat;chs;ays
SNPARM   =  relh
SNFILE   =  $GEMDATA/HRCBOB.SND
DATTIM   =  last
VCOORD   =  pres
PTYPE    =  log/.5
YAXIS    =  1050/300
TAXIS    =
LINE     =  3
BORDER   =  1
CINT     =  5
WIND     =  bm6//2
TITLE    =  1
PANEL    =  0
```

```
DEVICE    =  xw
CLEAR     =  y
FILTER    =  .8
TEXT      =  1
CURVE     =  2
CLRBAR    =  1/h
CONTUR    =  0
FINT      =  70;80;90
FLINE     =  0;21;22;23
CTYPE     =  f
```

3. Draw a time section of relative humidity for ACY. Reverse the time axis to plot latest time on the left.

```
CXSTNS    =  acy
SNPARM    =  relh
SNFILE    =  $GEMDATA/HRCBOB.SND
DATTIM    =  all
VCOORD    =  pres
PTYPE     =  log/.5
YAXIS     =  1050/300
TAXIS     =  r
LINE      =  3
BORDER    =  1
CINT      =  5
WIND      =  bm6//2
TITLE     =  1
PANEL     =  0
DEVICE    =  xw
CLEAR     =  y
FILTER    =  .8
TEXT      =  1
CURVE     =  2
CLRBAR    =  1/h
CONTUR    =  0
FINT      =  70;80;90
FLINE     =  0;21;22;23
CTYPE     =  f
```

ERROR MESSAGES

[SNCROSS-1] Fatal error initializing TAE.

[SNCROSS-2] Fatal error reading TAE parameters.

[SNCROSS-3] GEMPLT initialization error.

[SNCROSS-4] Vertical coordinate for isentropes must be PRES.

[SNCROSS-5] There are no times in the file.

[SNCROSS-6] Fewer than four stations/times were selected.

[SNCROSS-7] Data buffer is too small.

[SNCROSS-8] Temperature or pressure data not available.

[SNCROSS-9] The station ... cannot be found in the data set.

[SNCROSS-10] Error setting up graph; check invalid LOG axis.

[SNCROSS-11] Input ... for PTYPE is invalid.

[SNCROSS-12] Either input ... for YAXIS or input for VCOORD is invalid.

[SNCROSS-13] Parameter ... is not computable.

[SNCROSS-14] Parameter ... is a character.

[SNCROSS-15] The grid coordinates cannot be defined.

[SNCROSS-16] Multiple station entry is invalid for time sections.

[SNCROSS-17] Data at time ... is not in the file.

[SNCROSS-18] Wind data cannot be computed.

4.72 SNCROSS2

SNCROSS2 draws cross sections through sounding data.

INPUT PARAMETERS

CXSTNS	Cross-section station line
SNPARM	Sounding parameter list
SNFILE	Sounding data file
DATTIM	Date/time
VCOORD	Vertical coordinate type
PTYPE	Plot type/h:w ratio/margins
YAXIS	Ystrt/ystop/yinc/lbl;gln;tck
TAXIS	Time1-time2-tinc;lbl;gln;tck
LINE	Color/type/width/label/smth/fltr
BORDER	Background color/type/width
CINT	Contour interval/min/max
WIND	Wind symbol/siz/wdth/typ/hdsz
TITLE	Title color/line/title
PANEL	Panel loc/color/dash/width/regn
DEVICE	Device|name|x size;y size|color type
CLEAR	Clear screen flag
FILTER	Filter data factor
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
CURVE	Curve fit type
CLRBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info
CONTUR	Subbox/smooth
FINT	Fill interval/min/max
FLINE	Fill colors/fill types
CTYPE	Contour type: C/F

PROGRAM DESCRIPTION

SNCROSS2 is a modification of SNCROSS to allow plotting of variable color wind staffs. A range of colors may be entered in the WIND parameter definition, eg: WIND = bk30-7.

SNCROSS2 draws cross sections using upper-air sounding data. The cross-section line, CXSTNS, must be specified as a list of stations separated with semicolons. Alternatively, a single station may be entered in CXSTNS and a list of times in DATTIM. In this case, a time section will be drawn.

Any parameter that can be computed from the data set parameters can be displayed. The parameter to be displayed is specified in SNPARM. If the value of SNPARM is ISEN, isentropes will be drawn. Note that SNPARM may also be THTA, in which case, potential temperature will be gridded and contoured. ISEN will fit splines to the station data in plot space and then check for tangled lines and untangle them if necessary.

Contours may be displayed as lines or as a color fill. If CTYPE is C, contour lines are drawn using input from CINT and LINE. If CTYPE is F, filled contours are drawn using specifications from FINT and FLINE. Both contour lines and filled contours are drawn if CTYPE is F/C.

The attributes of the contour lines, including the color, line type, line width, and label frequency are specified in LINE. The four attributes are separated with slashes; semicolons separate the values for each attribute. If the line type is set to a single negative number, negative contour values will have the absolute value of the line type and positive values will be solid. If the label type is set to a single number, n, then every nth value will be labeled.

The contour fill intervals are specified in FINT; the attributes for the fill are specified in FLINE. The first color specified in FLINE fills values less than the first level; while the last color fills values greater than the last level. Therefore, n levels require n+1 colors. CLRBAR allows a color bar to be added for color fill contours.

A range of colors may be specified in either FLINE or LINE by specifying starting, ending and increment values in that order separated by dashes. If the increment is missing, a default of 1 is used.

The plot background consists of a pressure axis, a horizontal axis with the station names, a filled region indicating the part of the plot below the earth surface, and vertical lines at each station. The station lines are the specified line type up to the level at which wind data stop, and are dotted from there to the level at which temperature data stop. The color and other attributes for the background axes and labels are given by the first numbers separated by semicolons in the color number, line type and line width entry sections for BORDER. The second set of numbers applies to the station lines, and the third set to the underground color fill (for which the line type and width do not apply). To eliminate, the background, the station lines, or the underground fill, just set the corresponding color number to zero. If one color number is entered, it is used for all three; if two are entered, the second is used for both the station lines and the underground fill. So, BORDER has the following entries:

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

The horizontal axis represents a straight line between the first and last stations. The positions of intervening stations are proportional to the perpendicular projections of the actual positions onto the section line. All of these calculations are done in lat/lon coordinates. If the plot is a time section, the times will be displayed on the x axis with the earliest time at the left. If the first character in TAXIS is an R, the earliest time will appear on the right.

The vertical coordinate may be specified as LIN, LOG, or STUVE; SKEWT is not valid in this program. The bottom and top limits for the y axis are specified in YAXIS, but the axis labeling specifications are ignored.

EXAMPLES

1. Draw isentropes in color 3 for the last time in the data set. Plot the background in color 1. Use a logarithmic scale for the y axis and a 5 degree interval for the isentropes. Draw wind barbs in color number 6 with line width 2.

```
CXSTNS    =  chh;acy;wal;hat;chs;ays
SNPARM    =  thta
SNFILE    =  $GEMDATA/HRCBOB.SND
DATTIM    =  last
VCOORD    =  pres
PTYPE     =  log
YAXIS     =
TAXIS     =
LINE      =  3
BORDER    =  1
CINT      =  5
WIND      =  bm6//2
TITLE     =  1
PANEL     =  0
DEVICE    =  xw
CLEAR     =  y
FILTER    =  .8
TEXT      =  1
CURVE     =  2
CLRBAR    =
CONTUR    =  0
FINT      =  0
FLINE     =  10-20
CTYPE     =  C
```

2. Draw filled contours of relative humidity for the same cross section. Fill in contours greater than 70%. Draw a horizontal color bar at the bottom of the plot. Draw the cross section from 1050 mb to 300 mb.

```
CXSTNS    =  chh;acy;wal;hat;chs;ays
SNPARM    =  relh
SNFILE    =  $GEMDATA/HRCBOB.SND
DATTIM    =  last
VCOORD    =  pres
PTYPE     =  log/.5
YAXIS     =  1050/300
TAXIS     =
LINE      =  3
BORDER    =  1
CINT      =  5
```

```
WIND    = bm6//2
TITLE   = 1
PANEL   = 0
DEVICE  = xw
CLEAR   = y
FILTER  = .8
TEXT    = 1
CURVE   = 2
CLRBAR  = 1/h
CONTUR  = 0
FINT    = 70;80;90
FLINE   = 0;21;22;23
CTYPE   = f
```

3. Draw a time section of relative humidity for ACY. Reverse the time axis to plot latest time on the left.

```
CXSTNS  = acy
SNPARM  = relh
SNFILE  = $GEMDATA/HRCBOB.SND
DATTIM  = all
VCOORD  = pres
PTYPE   = log/.5
YAXIS   = 1050/300
TAXIS   = r
LINE    = 3
BORDER  = 1
CINT    = 5
WIND    = bm6//2
TITLE   = 1
PANEL   = 0
DEVICE  = xw
CLEAR   = y
FILTER  = .8
TEXT    = 1
CURVE   = 2
CLRBAR  = 1/h
CONTUR  = 0
FINT    = 70;80;90
FLINE   = 0;21;22;23
CTYPE   = f
```

4. Plot 6 minute profiler data at VCIO2, using color coded windbarbs. Use the BORDER color option to omit station axes in plot.

```
CXSTNS  = vcio2
SNPARM  =
SNFILE  = pro6
DATTIM  = all
VCOORD  = hght
PTYPE   = lin
YAXIS   = 0/17000
TAXIS   = r
```

```
LINE     =  3
BORDER   =  1;0;1
CINT     =  5
WIND     =  bk30-7
TITLE    =  1
PANEL    =  0
DEVICE   =  xw
CLEAR    =  y
FILTER   =  .4
TEXT     =  1
CURVE    =  2
CLRBAR   =
CONTUR   =  3/3
FINT     =
FLINE    =
CTYPE    =  c
```

ERROR MESSAGES

[SNCROSS2-1] Fatal error initializing TAE.

[SNCROSS2-2] Fatal error reading TAE parameters.

[SNCROSS2-3] GEMPLT initialization error.

[SNCROSS2-4] Vertical coordinate for isentropes must be PRES.

[SNCROSS2-5] There are no times in the file.

[SNCROSS2-6] Fewer than four stations/times were selected.

[SNCROSS2-7] Data buffer is too small.

[SNCROSS2-8] Temperature or pressure data not available.

[SNCROSS2-9] The station ... cannot be found in the data set.

[SNCROSS2-10] Error setting up graph; check invalid LOG axis.

[SNCROSS2-11] Input ... for PTYPE is invalid.

[SNCROSS2-12] Either input ... for YAXIS or input for VCOORD is invalid.

[SNCROSS2-13] Parameter ... is not computable.

[SNCROSS2-14] Parameter ... is a character.

[SNCROSS2-15] The grid coordinates cannot be defined.

[SNCROSS2-16] Multiple station entry is invalid for time sections.

[SNCROSS2-17] Data at time ... is not in the file.

[SNCROSS2-18] Wind data cannot be computed.

4.73 SNDELT

SNDELT deletes data from a sounding data file.

INPUT PARAMETERS

SNFILE	Sounding data file
DATTIM	Date/time
AREA	Data area

PROGRAM DESCRIPTION

SNDELT deletes data from a sounding data file. The stations to be deleted are specified in AREA; the times to be deleted are given in DATTIM.

If AREA is set to DSET or ALL, all the data present at the times in DATTIM will be deleted, along with the headers for those times.

EXAMPLES

1. Delete all the data at time 920722/1200.

```
SNFILE  = 92jul.snd
DATTIM  = 920722/1200
AREA    = dset
```

2. Delete data at IAD for the most recent time in the file.

```
SNFILE  = realtime.snd
DATTIM  = last
AREA    = @iad
```

ERROR MESSAGES

[SNDELT-1] Fatal error initializing TAE.

[SNDELT-2] Fatal error reading TAE parameters.

[SNDELT-3] Error deleting data at time ....

4.74 SNEDIT

SNEDIT adds data in a sequential edit file to a sounding file.

INPUT PARAMETERS

SNEFIL	Sounding edit file
SNFILE	Sounding data file
TIMSTN	Times/additional stations

PROGRAM DESCRIPTION

SNEDIT adds information from a sequential file to a GEMPAK sounding file. It can be used to add or replace data at a station. The program can be used to add data to either merged or unmerged data sets.

The data to be added must be in a text file, SNEFIL. This file can be created using F as the output device in SNLIST. MRGDAT, which can be set in SNLIST, is a flag indicating whether the data to be written will be merged or written as separate parts. If the edit file contains unmerged data, the part name must be included and the parameters must be in the order expected by GEMPAK. Undecoded text (raw reports) should not be included in SNEFIL.

If SNFILE exists, the data will be added to the file. If it does not already exist, a new file will be created. A new file will be a merged or unmerged data set, depending on the type of data in SNEFIL. The maximum number of stations and times allocated in a new file will be read from TIMSTN.

For merged edit data files, the parameters to be edited must be specified at the beginning of the edit file. For example:

```
PARM=PRES;TMPC;DWPC;DRCT;SPED;HGHT
```

The parameter line must contain the string, PARM, and =. Note that the output of SNLIST is SNPARM = xxxx;yyyy;..., which is valid. If the parameter list must be continued on the next line, the last character on the current line must be a semicolon. If SNFILE is an existing file, the parameters listed in the edit file must be exactly those in the data set, although SNFILE may include undecoded text. For unmerged data, information about the parameters is not necessary.

The information to be added to the sounding file consists of a series of station entries including information for the station, followed by station data,Station information must be listed as KEYWORD = value, where the valid keywords are STID, STNM, SLAT, SLON, SELV, and TIME. The TIME keyword must be found for each station. Either STID or STNM is also required. If the station is not already in the file, the station identifier, station number, latitude, longitude, and elevation found will be added to the file.

If the station is already in the file, the station location and elevation will not be changed. Note that program SNSTNS can be used to modify station header values.

EXAMPLES

1. Add the data in the edit file, SNLIST.FIL, to the file, SOUND.DAT, which does not exist.

```
SNEFIL      =  snlist.fil
SNOUTF      =  sound.dat
TIMSTN      =  1/ 10
```

The file SNLIST.FIL follows:

```
SNPARM      =  PRES;TMPC;DWPT;DRCT;SPED;HGHT
STNPRM      =  SHOW;LIFT;KINX



STID        =  IAD STNM = 72403 TIME = 841227/1200
SLAT        =  38.98 SLON = -77.46 SELV = 85.0


SHOW = 14.11     LIFT = 25.60      KINX = 11.50


    PRES       TMPC       DWPT       DRCT       SPED       HGHT
1024.00       2.40      -1.40       0.00       0.00      85.00
1000.00       2.20      -3.80   -9999.00   -9999.00     277.00
 850.00       5.60      -9.40   -9999.00   -9999.00    1592.00
 700.00      -1.90      -2.30   -9999.00   -9999.00    3167.00
 500.00     -15.70     -22.70   -9999.00   -9999.00    5790.00
 400.00     -28.90     -33.40   -9999.00   -9999.00    7430.00
 300.00     -44.30     -93.30   -9999.00   -9999.00    9420.00
 250.00     -55.30    -104.30   -9999.00   -9999.00   10620.00
 200.00     -66.50    -115.50   -9999.00   -9999.00   12000.00
 150.00     -65.90    -114.90   -9999.00   -9999.00   13750.00
 100.00     -66.90    -115.90   -9999.00   -9999.00   16220.00
```

The merged file SOUND.DAT will be created. It will contain the parameters PRES;TMPC;DWPT;DRCT;SPED;HGHT. Space for a maximum of 1 time and 10 stations will be allocated. The time 841227/1200 and station IAD will be added to the file and then the data for that time and station will be added. Note that the stability indices will be ignored. 2. Add the data in the edit file, IAD.FIL, to the unmerged file, REALTIME.SND, which already exists.

```
SNEFIL      =  realtime.snd
SNOUTF      =  iad.fil
```

```
TIMSTN      =  0
```

The file IAD.FIL follows:

```
STID        =  IAD STNM = 72403 TIME = 900823/0000
SLAT        =  38.98 SLON = -77.46 SELV = 85.0

TTAA        0
PRES          TMPC      DWPC      DRCT      SPED      HGHT
1008.00       19.20     18.90      0.00      3.00   -9999.00
1000.00       19.00     18.20  -9999.00  -9999.00     150.00
 850.00       14.40     13.30    160.00      8.00    1538.00
 700.00        5.40      4.30    240.00      6.00    3157.00
 500.00       -8.10     -9.80    215.00      7.00    5850.00
 400.00      -19.90    -49.90    225.00     11.00    7540.00
 300.00      -34.10    -64.10    235.00     18.00    9620.00
 250.00      -44.30  -9999.00    245.00     16.00   10870.00
 200.00      -54.30  -9999.00    250.00     22.00   12330.00
 150.00      -60.50  -9999.00    265.00     14.00   14140.00
 100.00      -64.50  -9999.00    235.00      2.00   16620.00

TTBB        0
PRES          TMPC      DWPC
1008.00       19.20     18.90
 850.00       14.40     13.30
 684.00        3.60      1.20
 602.00        0.00     -1.30
 481.00       -9.90    -12.50

PPBB        0
HGHT          DRCT      SPED
   0.00        0.00      3.00
 914.00      120.00     12.00
1219.00      130.00     10.00
1829.00      180.00      7.00
2134.00      195.00      6.00
2438.00      210.00      6.00
```

ERROR MESSAGES

[SNEDIT+1] Data for ... has been added to the file.

[SNEDIT-1] Fatal error initializing TAE.

[SNEDIT-2] Fatal error reading the TAE parameters.

[SNEDIT-3] The edit file cannot be opened.

[SNEDIT-4] List of parameters not found in edit file.

[SNEDIT-5] Too many parameters in edit file.

[SNEDIT-6] Edit file ... cannot be opened.

[SNEDIT-7] Error creating new sounding file ....

[SNEDIT-8] Edit file parms don't match those in data set.

[SNEDIT-9] First parameter not a valid vertical coordinate.

[SNEDIT-10] Error opening existing sounding file ....

[SNEDIT-11] Cannot write merged data to unmerged data set.

[SNEDIT-12] Sounding file can't be created with MAXTIM <= 0.

[SNEDIT-13] Sounding file can't be created with MAXSTN <= 0.

[SNEDIT-14] The time ... was not added to the file.

[SNEDIT-15] The station ... was not added to the file.

[SNEDIT-16] Error writing data to file.

[SNEDIT-17] The part ... has invalid parameters.

[SNEDIT-18] Edit file ... has an invalid format.

[SNEDIT-19] Station ... has an invalid format.

[SNEDIT-20] Cannot write unmerged data to merged data set.

4.75 SNHODO

SNHODO draws a hodograph of upper air data.

INPUT PARAMETERS

SNFILE	Sounding data file
AREA	Data area
LINE	Color/type/width/label/smth/fltr
MARKER	Marker color/type/size/width/hw
BORDER	Background color/type/width
TITLE	Title color/line/title
XAXIS	Xstrt/xstop/xinc/lbl;gln;tck
YAXIS	Ystrt/ystop/yinc/lbl;gln;tck
LEVELS	Vertical levels
VCOORD	Vertical coordinate type
DATTIM	Date/time
CLEAR	Clear screen flag
DEVICE	Device|name|x size;y size|color type
PANEL	Panel loc/color/dash/width/regn
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg

PROGRAM DESCRIPTION

SNHODO draws a hodograph which represents the vertical distribution of the horizontal wind at a station. The winds are plotted in meters/sec.

The line color, line type, and width are specified in LINE. The marker color, type, and size are specified in MARKER. The levels at which the line will be labeled are specified in LEVELS; VCOORD specifies the vertical coordinate for LEVELS.

The x and y axis limits are specified in XAXIS and YAXIS. If these values are blank, the axes will be scaled to the actual data.

EXAMPLES

1. Plot the hodograph for station CHH for the latest time in the data set. Label the hodograph every 100 mb from 1000 mb to 100 mb. Use hardware font 2 for the text and display the hodograph in a XW window named snhodo.

```
SNFILE    =  $GEMDATA/HRCBOB.SND
AREA      =  @chh
LINE      =  3
MARKER    =  1
BORDER    =  1
TITLE     =  1
XAXIS     =
YAXIS     =
LEVELS    =  1000-100-100
```

```
VCOORD    =  pres
DATTIM    =  last
CLEAR     =  y
DEVICE    =  xw|snhodo
PANEL     =  0
TEXT      =  1/2/1/hw
```

2. Plot the CHH hodograph using height coordinates. Label every 2000 meters from 1000 meters to 24000 meters. Draw the x and y axes from -10 to 40 meters/sec.

```
SNFILE    =  $GEMDATA/HRCBOB.SND
AREA      =  @chh
LINE      =  3
MARKER    =  1
BORDER    =  1
TITLE     =  1
XAXIS     =  -10/40/10
YAXIS     =  -10/40/10
LEVELS    =  1000-24000-2000
VCOORD    =  hght
DATTIM    =  last
CLEAR     =  y
DEVICE    =  xw|snhodo
PANEL     =  0
TEXT      =  1/2/1/hw
```

ERROR MESSAGES

[SNHODO-1] Fatal error initializing TAE.

[SNHODO-2] Fatal error reading TAE parameters.

[SNHODO-3] Fatal error initializing GEMPLT.

[SNHODO-4] The input for XAXIS is invalid.

[SNHODO-5] The input for YAXIS is invalid.

[SNHODO-6] Winds cannot be computed.

[SNHODO-7] The vertical coordinate ... cannot be computed.

[SNHODO-8] The range along the x or y axis is invalid.

[SNHODO-9] No winds can be plotted.

[SNHODO-10] No valid stations were found.

4.76 SNLIST

SNLIST lists upper air data from a sounding file for specified vertical levels and stations.

INPUT PARAMETERS

SNFILE	Sounding data file
AREA	Data area
DATTIM	Date/time
SNPARM	Sounding parameter list
STNDEX	Stability indices
LEVELS	Vertical levels
VCOORD	Vertical coordinate type
OUTPUT	Output device/filename
MRGDAT	Merge data file flag/part type

PROGRAM DESCRIPTION

SNLIST lists parameters derived from an upper air data set for the requested stations and times.

Parameters which can be computed at various levels in the data set should be specified in SNPARM. Parameters which have a single value at the station, such as stability indices, should be specified in STNDEX.

Any parameters which can be computed from the data set parameters may be listed. If the vertical levels requested are not present in the data set, the data will be interpolated between existing levels. Data will also be interpolated to a new vertical coordinate system, if requested.

Data from an unmerged data set can be listed without being merged if MRGDAT is set to NO. If unmerged data are listed, SNPARM, VCOORD and LEVELS will be ignored, except that parameter 'TEXT' is allowed for SNPARM.

If the sounding file contains both decoded data and undecoded text data, both types can be listed by specifying parameter 'TEXT' in the parameter list for either SNPARM or STNDEX. TEXT may appear anywhere in the list of parameters. Only text data for parts TTAA, TTBB, PPBB and TTCC will be listed.

EXAMPLES

1. List the parameters in the data set for the stations IAD and ACY at the mandatory levels. Also list the Showalter, lifted and K indices.

```
SNFILE    =  $GEMDATA/HRCBOB.SND
AREA      =  @iad;acy
DATTIM    =  last
```

```
SNPARM    =  dset
STNDEX    =  show;lift;kinx
LEVELS    =  man
VCOORD    =  pres
OUTPUT    =  t
MRGDAT    =  YES
```

2. List the unmerged data from IAD.

```
SNFILE    =  $GEMDATA/HRCBOB.SND
AREA      =  @iad
DATTIM    =  last
SNPARM    =  dset
STNDEX    =  show;lift;kinx
LEVELS    =  man
VCOORD    =  pres
OUTPUT    =  t
MRGDAT    =  no
```

3. List the pressure, mixing ratio, u- and v-wind components and the Montgomery stream function on the isentropic surfaces from 300 to 400 degrees in 10-degree increments. Change the station to ACY.

```
SNFILE    =  $GEMDATA/HRCBOB.SND
AREA      =  @acy
DATTIM    =  last
SNPARM    =  pres;mixr;uwnd;vwnd;psym
STNDEX    =
LEVELS    =  300-400-10
VCOORD    =  thta
OUTPUT    =  t
MRGDAT    =  yes
```

4. List the unmerged data and the undecoded text for station BOI. Use a locally created sounding file containing both types of data called DATA.SND.

```
SNFILE    =  DATA.SND
AREA      =  @boi
DATTIM    =  last
SNPARM    =  text
STNDEX    =
LEVELS    =
VCOORD    =
OUTPUT    =  t
MRGDAT    =  no
```

ERROR MESSAGES

[SNLIST-1] Fatal error initializing TAE.

[SNLIST-2] Fatal error reading TAE parameters.

[SNLIST-3] There are no parameters to be listed.

[SNLIST-4] Level parameter ... cannot be computed.

[SNLIST-5] Parm ... is character; cannot be listed.

[SNLIST-6] Vertical coordinate ... cannot be computed.

[SNLIST-7] Station parameter ... cannot be computed.

[SNLIST-8] Parm ... is character; cannot be listed.

[SNLIST-9] No stations reported at these times.

[SNLIST-10] Too many parameters; ... cannot be added.

[SNLIST-11] The data set is merged.

[SNLIST-12] No inputs for levels.

4.77 SNMAP

SNMAP plots sounding data on a map.

INPUT PARAMETERS

AREA	Data area
GAREA	Graphics area
SATFIL	Satellite image filename(s)
RADFIL	Radar image filename(s)
SNPARM	Sounding parameter list
DATTIM	Date/time
LEVELS	Vertical levels
VCOORD	Vertical coordinate type
SNFILE	Sounding data file
COLORS	Color list
MAP	Map color/dash/width/filter flag
LATLON	Line color/dash/width/freq/inc/label/format
TITLE	Title color/line/title
CLEAR	Clear screen flag
PANEL	Panel loc/color/dash/width/regn
DEVICE	Device|name|x size;y size|color type
PROJ	Map projection/angles/margins|drop flag
FILTER	Filter data factor
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
LUTFIL	Enhancement lookup table filename
STNPLT	Txtc/txt attr|marker attr|stnfil#col
IMBAR	Color/ornt/anch/x;y/ln;wd/freq|text_info

PROGRAM DESCRIPTION

SNMAP plots sounding data parameters at station locations on a map. Any level or station parameter that can be computed can be displayed. Data may be plotted in any valid GEMPAK projection and may be overlaid on images.

A list of times may be given in DATTIM allowing animation of sounding plots.

The order of the input parameters determines their location on the plot. Parameters are separated by semicolons. A position may be skipped by entering two consecutive semicolons or entering parameter SPAC or BLNK. A parameter will be plotted centered at the station if it is the first parameter in the list. If no parameter is to be displayed centered on the station location, a semicolon must appear before the first parameter, or the first parameter must be either SPAC or BLNK. The following chart shows the placement of the data around the station. The number indicates the position of the parameter in the SNPARM list:

```
          8
2        10        4
3         1        5
6        11        7
          9
```

Note that wind symbols and markers are always plotted at the center.

Station data will be filtered; i.e., overlapping stations will not be plotted, if FILTER is set to YES. FILTER may also be entered as a number greater than or equal to zero. FILTER = NO has the same effect as FILTER = 0. FILTER = 1 has the same effect as FILTER = YES. Values less than 1 allow more crowding of stations, values exceeding 1 less crowding. If a parameter is BLNK, the filter will not allocate any space for that parameter. The parameter SPAC may be used to reserve the space with the FILTER option so that later calls will plot the same stations after filtering, provided that the same number of parameters is specified.

If certain stations are not to be removed by the filter, these stations are listed first following an @. The area over which filtering is to occur is specified after a slash. For example,

```
AREA    = @iad;hts;rap/us
FILTER  = YES
```

will display a filtered array of stations over the area corresponding to US, but IAD, HTS and RAP will be shown regardless of the filtering.

Either wind barbs or wind arrows can be plotted, by specifying a wind symbol parameter name in the list of parameters for SNPARM. The wind barb or arrow is plotted at the station location according to the type specification, which is entered as described in the SNPARM documentation.

Conditions can be specified for the parameters. The conditions are documented in the SNPARM documentation. Note that individual parameters can be scaled using these conditional functions. For example, TMPC*10 will plot temperature multiplied by 10.

EXAMPLES

1. Plot a polar stereographic map of stations in the Eastern United States at 850 mb for all times in the data file. Plot a standard station model for each location. The upper air data to plot include: 1) wind barbs in knots; 2) temperature in Celsius; 3) coded height; 4) dewpoint depression in Celsius; and 5) station ID. The data are plotted using the specified color list.

```
AREA      =  east-
GAREA     =  east
SATFIL    =
RADFIL    =
SNPARM    =  brbk:1:2:112;tmpc;;stdz;;dpdc;stid
DATTIM    =  all
LEVELS    =  850
```

```
VCOORD    =  pres
SNFILE    =  $GEMDATA/hrcbob.snd
COLORS    =  6;2;5;3;18
MAP       =  1
LATLON    =  2/10/1/1/10;10
TITLE     =  1
CLEAR     =  yes
PANEL     =  0
DEVICE    =  xw
PROJ      =  nps
FILTER    =  no
TEXT      =  1
LUTFIL    =
STNPLT    =
```

2. Plot the temperature and height at 500 mb and the lifted index for all times in the data file. The data are plotted at the stations where the temperature is less than -8 degrees Celsius. The lifted index is multiplied by 10 before being plotted.

```
AREA      =  us-
GAREA     =  us
SATFIL    =
RADFIL    =
SNPARM    =  mark:2;;tmpc<-8;;hght;;;;;lift*10
DATTIM    =  all
LEVELS    =  500
VCOORD    =  pres
SNFILE    =  $GEMDATA/hrcbob.snd
COLORS    =  2;5;3
MAP       =  1
LATLON    =  2/10/1/1/10;10
TITLE     =  1
CLEAR     =  yes
PANEL     =  0
DEVICE    =  xw
PROJ      =  mer
FILTER    =  0
TEXT      =  .75
LUTFIL    =
STNPLT    =
```

ERROR MESSAGES

[SNMAP+1] Parameter ... cannot be computed.

[SNMAP-1] Fatal error initializing TAE.

[SNMAP-2] Fatal error reading TAE parameters.

[SNMAP-3] Fatal error initializing GEMPLT.

[SNMAP-4] Invalid levels or vertical coordinate have been input.

[SNMAP-5] A range of levels is invalid in SNMAP.

[SNMAP-6] Winds cannot be computed.

4.78 SNMOD

SNMOD moves selected sounding data from an input sounding file to an output sounding file.

INPUT PARAMETERS

SNFILE	Sounding data file
SNOUTF	Output sounding file
SNPARM	Sounding parameter list
AREA	Data area
DATTIM	Date/time
LEVELS	Vertical levels
VCOORD	Vertical coordinate type
TIMSTN	Times/additional stations
MRGDAT	Merge data file flag/part type
IDNTYP	STNM or STID

PROGRAM DESCRIPTION

SNMOD takes data from a GEMPAK sounding file, SNFILE, and writes it to an output GEMPAK sounding file, SNOUTF. This program can be used to subset the original dataset by time and/or stations and to change the levels and vertical coordinate.

The output dataset may be either a merged or unmerged data set. If the output file does not exist, a new file will be created by this program. If a new file is created, MRGDAT will determine whether the output file will be a merged or unmerged dataset. Note that an error will result if the input dataset is merged and the output dataset is unmerged.

The value of SNPARM will be ignored if the output dataset is unmerged. If a merged data file is to be created, SNPARM will specify the parameters to be included. In this case, if SNPARM = DSET, the parameters in the input dataset will be used. If the output file is an existing merged dataset, the parameters specified in SNPARM must be in the dataset. In this case, if SNPARM = DSET, the parameters in the output file will be used. Undecoded text (raw reports) may be included in the input file, but will not be moved to the output file.

If the output file is to be created, the maximum number of times and stations which can be stored in the file must be specified in TIMSTN.

IDNTYP has been added to specify whether station numbers or station identifiers will be used in referring to stations. Generally, IDNTYP should be set to STNM to use station numbers. However, in datasets which do not have station numbers, or which have a single invalid number, character station identifiers must be used and IDNTYP must be set to STID.

EXAMPLES

1. Put the mandatory data for stations in an area centered on IL at time 910819/1200 into a new unmerged sounding file, NEW.SND, which may contain 2 times and 150 stations.

```
SNFILE   = gemdata:hrcbob.snd
SNOUTF   = new.snd
SNPARM   = dset
AREA     = il
DATTIM   = 19/12
LEVELS   = man
VCOORD   = pres
TIMSTN   = 2/150
MRGDAT   = no
IDNTYP   = stnm
```

2. Add the stations at time 910819/00 to the file created in example 1.

```
DATTIM = 19/00
```

3. Create an isentropic dataset containing the specified parameters with levels every 5 degrees. Include all the US stations.

```
SNFILE   = gemdata:hrcbob.snd
SNOUTF   = thta.snd
SNPARM   = thta;pres;mixr;uwnd;vwnd;psym
AREA     = @us
DATTIM   = all
LEVELS   = 250-450-5
VCOORD   = thta
TIMSTN   = 4/150
MRGDAT   = yes
```

ERROR MESSAGES

[SNMOD-1] Fatal error initializing TAE.

[SNMOD-2] Fatal error reading TAE parameters.

[SNMOD-3] Output file cannot be unmerged type.

[SNMOD-4] A new file cannot be created with no times.

[SNMOD-5] A new file cannot be created with no stations.

[SNMOD-6] Parameter ... cannot be computed.

[SNMOD-7] ... is character type; cannot be added to file.

[SNMOD-8] Output vertical coordinate ... cannot be used.

[SNMOD-9] No valid parameters were specified.

[SNMOD-10] Time ... cannot be added to the output file.

[SNMOD-11] Station ... cannot be added to output file.

[SNMOD-12] Parms do not match those in output data set.

[SNMOD-13] Output file name is blank.

4.79 SNPROF

SNPROF draws profiles of upper air data.

INPUT PARAMETERS

SNFILE	Sounding data file
DATTIM	Date/time
AREA	Data area
SNPARM	Sounding parameter list
LINE	Color/type/width/label/smth/fltr
PTYPE	Plot type/h:w ratio/margins
VCOORD	Vertical coordinate type
STNDEX	Stability indices
STNCOL	Stability index color
WIND	Wind symbol/siz/wdth/typ/hdsz
WINPOS	Wind position
MARKER	Marker color/type/size/width/hw
BORDER	Background color/type/width
TITLE	Title color/line/title
DEVICE	Device|name|x size;y size|color type
YAXIS	Ystrt/ystop/yinc/lbl;gln;tck
XAXIS	Xstrt/xstop/xinc/lbl;gln;tck
FILTER	Filter data factor
CLEAR	Clear screen flag
PANEL	Panel loc/color/dash/width/regn
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
THTALN	THTA color/dash/width/mn/mx/inc
THTELN	THTE color/dash/width/mn/mx/inc
MIXRLN	MIXR color/dash/width/mn/mx/inc

PROGRAM DESCRIPTION

SNPROF draws profiles of upper air data.

Any two parameters that can be computed from the data set can be plotted. These parameters are specified in SNPARM. The profiles' colors, line types, and widths are specified in LINE. Markers identifying the data points can be plotted by setting a color in MARKER.

Profiles are plotted in an animation sequence if more than one station and/or time is specified in AREA and DATTIM, respectively.

The type of y axis is specified in PTYPE. LIN, LOG, STUVE, and SKEW are all valid. Note that SKEW is only valid when plotting temperature vs. pressure. The bottom and top of the axis, along with an increment for labels, are set in YAXIS. If the panel is changed to be less than the full screen, the default margins will often be too large. The margins can be set explicitly in PTYPE.

Winds are plotted in the right margin and can be specified in WIND. There are three positions available for plotting winds. They are numbered 1 to 3, with 1 being the left-most position. The location for the wind to be plotted is specified in WINPOS. The positions also apply to the station identifier, date/time and stability indices which are plotted above the diagram.

Dry adiabats, moist adiabats and mixing ratio background lines can be added to the diagram. The attributes of these lines are specified in THTALN, THTELN, and MIXRLN.

If the color is set to 0, no lines will be plotted. If the start, stop and increment are not set, defaults will be supplied. Note that these lines can only be drawn on plots of pressure versus temperature.

FILTER in this program determines whether the wind barbs are filtered.

EXAMPLES

1. Plot a Skew T chart for HAT for all of the times in the file. Display the Showalter index, the bulk Richardson number, CAPE, the Lifted index and the K index. Plot TMPC in color 2 using a solid line with width of 3. Plot DWPC in color 3 using a dashed line with width of 3. Include theta, theta-e, and mixing ratio lines. Plot wind barbs in color 6 in position 1.

```
SNFILE    =  $GEMDATA/hrcbob.snd
DATTIM    =  all
AREA      =  @hat
SNPARM    =  tmpc;dwpc
LINE      =  2;3/1;3/3
PTYPE     =  skewt
VCOORD    =  pres
STNDEX    =  show;brch;cape;lift;kinx
STNCOL    =  1
WIND      =  bm6//2
WINPOS    =  1
MARKER    =
BORDER    =  1
TITLE     =  1
DEVICE    =  xw
YAXIS     =  ///;1
XAXIS     =  -40/40/10/;1
FILTER    =  no
CLEAR     =  yes
PANEL     =  0
TEXT      =  1
THTALN    =  8/3/1
THTELN    =  23/1/1
MIXRLN    =  16/10/2
```

2. Plot relative humidity with a logarithmic pressure axis. Plot the data from the surface to 200 mb. The theta, theta-e, and mixing ratio lines are turned off, and no stability indices are computed.

```
SNFILE   =  $GEMDATA/hrcbob.snd
DATTIM   =  all
AREA     =  @hat
SNPARM   =  relh
LINE     =  3/1/3
PTYPE    =  log
VCOORD   =  pres
STNDEX   =
STNCOL   =  1
WIND     =  0
WINPOS   =  1
MARKER   =
BORDER   =  1
TITLE    =  1
DEVICE   =  xw
YAXIS    =  1050/200
XAXIS    =  0/100/20
FILTER   =  no
CLEAR    =  yes
PANEL    =  0
TEXT     =  1
THTALN   =
THTELN   =
MIXRLN   =
```

3. Plot equivalent potential temperature on the x axis vs. potential temperature on the y axis. Display the data for the first time in the data file for HAT, ALB and BNA. Set the X axis to range from 310 to 360 Kelvin in increments of 10. Also, set the Y axis to ranged from 280 to 350 Kelvin in increments of 10.

```
SNFILE   =  $GEMDATA/hrcbob.snd
DATTIM   =  first
AREA     =  @hat;alb;bna
SNPARM   =  thte
LINE     =  3/1/3
PTYPE    =  lin
VCOORD   =  thta
STNDEX   =
STNCOL   =  1
WIND     =  0
WINPOS   =  1
MARKER   =
BORDER   =  1
TITLE    =  1
DEVICE   =  xw
YAXIS    =  280/350/10
XAXIS    =  310/360/10
```

```
FILTER      =  no
CLEAR       =  yes
PANEL       =  0
TEXT        =  1
THTALN      =
THTELN      =
MIXRLN      =
```

ERROR MESSAGES

[SNPROF+6] Background lines cannot be drawn.

[SNPROF+5] Stability indicies are specified with color = 0

[SNPROF+4] Parameter ... was requested with color set to 0.

[SNPROF+3] Winds cannot be computed.

[SNPROF+2] Parameter ... is a character type.

[SNPROF+1] Parameter ... cannot be computed.

[SNPROF-1] Fatal error initializing TAE.

[SNPROF-2] Fatal error reading TAE parameters.

[SNPROF-3] Fatal error initializing GEMPLT.

[SNPROF-4] The plot type ... is invalid.

[SNPROF-5] The the x-axis range must be specified in XAXIS.

[SNPROF-6] The two parms use different temperature units.

[SNPROF-7] The vertical coordinate ... cannot be computed.

[SNPROF-8] The range along the x or y axis is invalid.

[SNPROF-9] No valid stations were found.

[SNPROF-10] SNPARM has not been specified.

4.80 SNSTNS

SNSTNS modifies the station information in an upper air file.

INPUT PARAMETERS

SNFILE	Sounding data file
STNFIL	Station information file
ADDSTN	Add station flag
IDNTYP	STNM or STID

PROGRAM DESCRIPTION

SNSTNS updates the station information in a GEMPAK upper air file. The station information generally consists of the character station identifier, STID, the station number, STNM, the latitude, SLAT, the longitude, SLON, the elevation, SELV, the state, STAT and the country, COUN.

This information, along with the station name, which is not used, must be stored in a fixed format in the table file specified in STNFIL. The current GEMPAK upper air station table for US, Canadian and Mexican stations is SNSTNS.TBL. An upper air file containing stations for the world is SNWORLD.TBL.

ADDSTN is a logical parameter which indicates whether stations which are in the table file but not already in the upper air file will also be added to the upper air file, provided there is room for them.

Either STID or STNM may be used to key on the desired station identifier by setting the desired value in IDNTYP.

EXAMPLES

1. Update upper air file called SOUNDINGS.DAT with station information from MYSTN.DAT adding stations that are not already in the file.

```
SNFILE  = soundings.dat
STNFIL  = mystn.dat
ADDSTN  = yes
IDNTYP  = stid
```

ERROR MESSAGES

[SNSTNS+1] WARNING! No stations were updated.

[SNSTNS-1] Fatal error initializing TAE.

[SNSTNS-2] Fatal error reading TAE parameters.

[SNSTNS-3] Invalid input for IDNTYP; must be STID or STNM.

[SNSTNS-4] STNFIL ... cannot be opened.

4.81 SNTSER

SNTSER draws a time series at a sounding station.

INPUT PARAMETERS

SNFILE	Sounding data file
DATTIM	Date/time
TAXIS	Time1-time2-tinc;lbl;gln;tck
LEVELS	Vertical levels
VCOORD	Vertical coordinate type
SNPARM	Sounding parameter list
STNDEX	Stability indices
AREA	Data area
PTYPE	Plot type/h:w ratio/margins
YAXIS	Ystrt/ystop/yinc/lbl;gln;tck
BORDER	Background color/type/width
LINE	Color/type/width/label/smth/fltr
MARKER	Marker color/type/size/width/hw
TITLE	Title color/line/title
CLEAR	Clear screen flag
PANEL	Panel loc/color/dash/width/regn
TEXT	Size/fnt/wdth/brdr/N-rot/just/hw flg
DEVICE	Device|name|x size;y size|color type

PROGRAM DESCRIPTION

SNTSER draws a time series plot for a sounding station.

Only one parameter may be plotted at a time. This parameter may be a level parameter defined in SNPARM or a stability index defined in STNDEX. If both SNPARM and STNDEX have values, SNPARM will be used. If a level parameter is defined in SNPARM, a vertical level must also be set in LEVELS.

The type of y axis can be set in PTYPE. Either LIN or LOG is valid. The limits on the y axis can be set in YAXIS.

The times to plot are specified in DATTIM. Only those times specified will be plotted. Lines will be drawn connecting the data points, provided that no more than two points are missing between segments.

The time axis is specified in TAXIS using the usual GEMPAK date/time conventions, including FIRST and LAST. If TAXIS has no increment, a reasonable value is chosen. If TAXIS is blank, the limits are taken from the first and last valid times set in DATTIM.

When the user desires multiple lines on the same graph, TAXIS and YAXIS should be explicitly set. Then LINE, MARKER, and TITLE can be varied for successive combinations of LEVELS, VCOORD, AREA, and SNPARM.

The height-to-width ratio of the plot may be specified in PTYPE following a slash. If no value is entered, a value of 0.5 will be used.

EXAMPLES

1. Plot the relative humidity at the 850 mb level for station CHH for all of the times in the data set. Use hardware font 2 for the text and plot the relative humidity using a solid green line.

```
SNFILE   = $GEMDATA/HRCBOB.SND
DATTIM   = all
TAXIS    =
LEVELS   = 850
VCOORD   = pres
SNPARM   = relh
STNDEX   =
AREA     = @chh
PTYPE    = lin
YAXIS    =
BORDER   = 1
LINE     = 3
MARKER   = 1
TITLE    = 1
CLEAR    = y
PANEL    = 0
TEXT     = 1/2/1/hw
DEVICE   = xw
```

2. Plot the lifted index at CHH for the times between 18/00 and 20/00. Plot the line with a thick short dashed pattern. Use asterisks for the markers.

```
SNFILE   = $GEMDATA/HRCBOB.SND
DATTIM   = all
TAXIS    = 18/00-20/00
LEVELS   = 850
VCOORD   = pres
SNPARM   =
STNDEX   = lift
AREA     = @chh
PTYPE    = lin
YAXIS    =
BORDER   = 1
LINE     = 2/2/3
MARKER   = 3/12
TITLE    = 1
CLEAR    = y
PANEL    = 0
TEXT     = 1/2/1/hw
DEVICE   = xw
```

ERROR MESSAGES

[SNTSER+2] WARNING, invalid PTYPE, LIN will be used.

[SNTSER+1] WARNING, more than one parameter specified.

[SNTSER-1] Fatal error initializing TAE.

[SNTSER-2] Fatal error reading TAE parameters.

[SNTSER-3] Fatal error initializing GEMPLT.

[SNTSER-4] Input for LEVEL is invalid.

[SNTSER-5] Error defining graph coordinates.

[SNTSER-6] No points found for plot.

[SNTSER-7] Session not interactive.

[SNTSER-8] No parameters entered.

[SNTSER-9] Parm ... not calculable.

[SNTSER-10] Parm ... is a character.

[SNTSER-11] PTYPE chosen is invalid.