Part 2

INPUT ATTRIBUTES

This part provides a detailed description of all the input control string attributes and the implications of their use. Except for the reserved mnemonic fields, the attribute arguments used are just examples and do not constitute restrictions on the use of a particular attribute.

2.1 Input Data File Specification

`INPUT:"20jul86";`

Specifies the name of the input file. The software assumes that the filename will end in **`.tape`** for Universal Format; in this example, the file **`17jul86.tape`** will be used as the input file. Further, the software will expect to find this file in the pathname specified by the environment variable `SCRATCH`. This variable is set by the **`runreo`** script to point to the directory containing your Universal Format files.

For DORADE data tape images you will need to include the full path name of this file in double quotes.

`DIRECTORY:"/dt/oye";`

Specifies the input is to be sweep files and this is the directory containing DORADE sweep files produced by the Solo software. If the INPUT and DIRECTORY attributes are both present INPUT takes presidence and DIRECTORY will be ignored.

2.2 Output Data File Specification

`OUTPUT:"20jul86grid";`

Specifies the name of the output file which receives the gridded data in the 'pure' format currently used by CEDRIC. This file will also be placed into the directory specified in the environment variable `SCRATCH`.

`NETCDF:"/dt/oye";`

Causes the production of an additional netCDF file with naming conventions and structures that are compatable with the Zebra software package.

2.3 Radar Coordinates

The location of the radar and the location of the grid origin should be specified each time; otherwise both the radar coordinates and the grid origin coordinates become the location of the radar specified on the input tape.

`RLONGITUDE:-86.8325;`

or `RLONGITUDE:-86,-49,-57;` specifies the radar longitude which can be in two forms: degrees as a decimal fraction or degrees, minutes, and seconds.

`RLATITUDE:34.8486;`

or `RLATITUDE:34,50,54.96;` specifies the radar latitude in two forms: degrees as a decimal fraction or degrees, minutes, and seconds.

`RALTITUDE:.245;`

Specifies the radar altitude in km. msl.

2.4 Grid Origin Coordinates

Specification of the grid coordinates is similar to the radar coordinates.

`GLONGITUDE:-86.8325;`

or `GLONGITUDE:-86,-49,-57;` specifies the longitude of the grid origin.

`GLATITUDE:34.8486;`

or `GLATITUDE:34,50,54.96;` specifies the longitude of the grid origin.

`GALTITUDE:.245;`

Specifies the altitude of the grid origin.

`GBASELINE:90;`

Specifies the azimuth of the x-axis of the grid. This attribute is most often used to specify the baseline for `COPLANE` data, but it can also specify a rotation of the cartesian grid.

`COPLANE DATA;`

Specifies that the output grid is to be in cylindrical coordinates rather than Cartesian.

`EARTHRADIUS:6366.8056;`

Specifies the earth radius in km. used in the translation of the coordinates of a gate of radar data to the grid coordinates. The argument shown is the default value contained within the program. Use this attribute only if the default value is not correct.

2.5 Data Grid Specification

`XMINIMUM:-11.1;`

Specifies the x coordinate of the lower left corner of the data grid in km. relative to the grid origin.

`XMAXIMUM:22.2;`

Specifies the x coordinate of the upper right corner of the data grid in km.

`XSPACING:0.5;`

Specifies the distance along the x axis between grid points in km.

`YMINIMUM:-11.1;`

Specifies the y coordinate of the lower left corner of the data grid in km.

`YMAXIMUM:22.2;`

Specifies the y coordinate of the upper right corner of the data grid in km.

`YSPACING:0.5;`

Specifies the distance along the y axis between grid points.

`ZMINIMUM:0.5;`

Specifies the elevation of the lowest level of the data grid in km. For `COPLANE` data this attribute specifies the lowest dihedral angle of the grid in degrees.

`ZMAXIMUM:15.5;`

Specifies the elevation of the highest level of the data grid in km. For `COPLANE` data this attribute specifies the highest dihedral angle of the grid in degrees.

`ZSPACING:0.5;`

Specifies the spacing between levels or elevations of the grid in km. For `COPLANE` data this attribute is the spacing between dihedrals in degrees.

2.6 Radius of Influence

There are three ways to specify the radii of influence for the interpolation. One is fixed distances for each axis in the cartesian grid space. The second is in **COPLANE** space and the third way causes the radius of influence to vary as a function of range.

For cartesian space:

`XRADIUS:0.5;`

This is the radius of influence in km. in the x direction and will be referred to as dX.

`YRADIUS:0.5;`

This is the radius of influence in km. in the y direction and will be referred to as dY.

`ZRADIUS:0.5;`

This is the radius of influence in km. in the z direction and will be referred to as dZ.

For **COPLANE** data:

`XRADIUS:0.5;`

This is the radius of influence in km. in the x direction and will be referred to as dX.

`YRADIUS:0.5;`

This is the radius of influence in km. in the y direction and will be referred to as dY.

`ZRADIUS:1.0;`

This is the radius of influence in degrees of dihedral angle and has the same effect as **ELRADIUS**.

Variable radius of influence:

`AZRADIUS:0.9;`

Specifies the delta-azimuth component of the radius of influence calculation and will be referred to as dA.

`ELRADIUS:0.9;`

Specifies the delta-elevation component of the radius of influence calculation and will be referred to as dE.

`RGRADIUS:1.0;`

Specifies the delta-range component of the radius of influence in km. and will be referred to as dR. The absence of the `RGRADIUS` attribute causes dR to be calculated as $(r * dA)$ the range times the delta azimuth. This causes the number of gates used in the interpolation of a grid point to increase as range away from the radar increases.

For each gate of each beam dX, dY, and dZ are calculated as a function of the AZ, EL, Range, dA, dE, and dR causing the effective radii of influence to increase with range. The formula for this calculation was developed by Jay Miller. The presence of angular radius of influence attributes causes the fixed radius attributes (`XRADIUS`, `YRADIUS` and `ZRADIUS`) to be ignored.

2.7 Weighting Schemes

There are presently four weighting schemes available for use in deriving the grid points. `CRESSMAN` is the default if no weighting function is specified.

```
WEIGHTING FUNCTION:CRESSMAN;

WEIGHTING FUNCTION:EXPONENTIAL,-2.4;

WEIGHTING FUNCTION:UNIFORM;

WEIGHTING FUNCTION:CLOSEST POINT;
```

For `CRESSMAN` and `EXPONENTIAL` two parameters are important, R and r, where R is a function of the radii of influence:

$$R^2 = dX^2 + dY^2 + dZ^2$$

and r^2 is the square of the distance between the gate and the grid point.

For `CRESSMAN` the weight W for a particular gate value is calculated using the equation

$$W = \frac{R^2 - r^2}{R^2 + r^2}$$

and for **EXPONENTIAL**

$$W = \exp(\frac{-2.4 * r^2}{R^2})$$

where the -2.4 is an attenuation factor that can be specified as the second argument of the **WEIGHT FUNCTION** attribute. The actual default is -2.302585093 which is the log(0.1).

For **CLOSEST POINT**, the radius to the last gate used is kept and when the radius to a new gate is smaller the radius and the data value are replaced by the closer one.

For **UNIFORM** all gates used in the calculation of a grid point are given the same weight of 1.0 and the grid point becomes the average of all the gates within the radius of influence.

2.8 Specification of Source Data Fields

Source data fields are fields that are accessible in the input data file via the access package.

FIELD:VR,VELOCITY;

Specifies the gridding of a source data field **VR** where the first argument is a two character mnemonic identifying an input field and the second optional argument specifies the name given this field in the output file. If the output name is not present the source data field mnemonic will be used. Source data field names are 2 character mnemonics as used in Universal Format and FOF datasets. Output field names can be up to 8 characters. There can be several fields.

DBZFIELD:DZ,REFLEC;

Operates similar to the FIELD specification except the input field is assumed to have units of dBZ and is converted to Z before being interpolated and converted back to dBZ after being interpolated.

UNFOLD:VR,UNFVEL;

Operates similar to the FIELD specification except before each gate of the specified field is interpolated, it is unfolded [Miller 86]. The algorithm for unfolding uses the first gate encountered for the grid point as a reference velocity and simply adds or subtracts the Nyquist interval if the difference between the current gate value and the reference is greater than the Nyquist velocity.

`KFIELD:VR,KVALUE;`

Operates similar to the UNFOLD attribute except that the output field produced is the number of unfolds or K value [Miller 86]. K will have the integer values (-1,0,1) but K will be weighted just like any other source field and when it is gridded it will become a floating point number in the range (-1.0,1.0).

2.9 Reserved Mnemonic Fields

`FIELD:TI,TIME;`

This attribute produces a time field that is the elapsed time in seconds from the first beam in the input file or from the `REFERENCE TIME` specification.

`FIELD:AZ,AZIMUTHS;`

This produces a field of interpolated azimuths.

`FIELD:EL,ELEVATION;`

This produces a field of interpolated elevations.

`FIELD:RG,RANGES;`

This produces a field of interpolated ranges.

`FIELD:XX,RANDOM;`

Produces a field of interpolated data provided by a special subroutine FSPECL. The default version returns random numbers to be interpolated just like any other input field. It is possible for users to provide their own versions of the routine FSPECL in order to simulate radar sampling of spacial data.

2.10 Output of Gridding Statistics

`COUNT:VR,VRCOUNTS;`

Produces a count of the number of gates used in the calculation of a particular grid point for a particular field where the first argument is the name of the source field and the second argument is the name given this field in the output file.

`OCTANT:VR,VROCT;`

The octant field flags the presence of input data in each of the eight octants surrounding the grid point for a particular field.

`WFACTOR:VR,VRWF;`

Outputs a weight factor that is defined as the sum of the squared weights over the sum of the weights squared for all the gates used in calculating the grid point.

`RADIUS:VR,VRRAD;`

Outputs the radius to the closest gate from the grid point. This can be done for any weighting scheme but is probably most useful when the `CLOSEST POINT` weighting scheme is used.

There are other output parameters that can be generated that are a function of the characteristics of the specified source fields used in gridding.

`QUALITY:VR,QUAL;`

Specifies the output of a quality field [Miller 86], for this example named `QUAL`, that is accumulated during the process of gridding the variable `VR`. This function is defined as the standard deviation normalized by the nyquist velocity squared over 3;

`SDEVIATION:VR,SDEV;`

Outputs standard deviation of all the gate values that went into the gridding of the field VR.

`AVERAGE:VR,AVERG;`

Outputs average of all the values that went into the gridding of the field VR.

`VREFERENCE:VR,VREF;`

Outputs the reference velocity used for `UNFOLD` or `KFIELD`.

2.11 Data Access Attributes

`EXPERIMENT:MIST;`

This attribute is necessary to access the proper dataset for FOF cataloged data.

`INSTRUMENT:CP2;`

This attribute specifies the name of the radar and is used to access the proper dataset for cataloged data. For Universal Format the presence of this attribute will cause the data positioning algorithm to try to match the name provided with the radar name in the Universal Format dataset. This is useful in case there are similar time spans for different radars included in the same data set.

Please note that this name must exactly match the radar name in the UF dataset or the error message "error in catalog access" will be displayed and processing will stop. If you know that only one radar is included in the dataset, it is safest to omit this line.

`START:12-JUL-86,12:13:14;`

Specifies the start date and time of the input dataset. The access package will start at the beginning of the first scan that starts at or after the START time.

`STOP:12-JUL-86,12:16:17;`

Specifies the stop date and time of the input dataset. The access package will stop at the end of the first scan that contains the stop time.

`EXCLUDE:12-JUL-86,12:14:15,12-JUL-86,12:14:25;`

Causes the beams within the time period specified to be excluded from the process. There can be up to eleven exclusions.

`SPANVOLUMES;`

The presence of this attribute causes the program to ignore end of volume indicators in the data set and processes all the data between the start and stop times.

`AIRCRAFT;`

The presence of this attribute indicates moving platform data and causes REORDER to ignore the radar origin information in the input attributes and get the radar location information directly from the data.

`AZIMUTHS:123,234;`

Specification of the azimuth limits in degrees of the data to be used in the gridding. The sector is assumed to start at the first argument and proceed clockwise to the second argument.

`PRF:456,1234;`

Specifies PRF limits for the data. All data outside these limits will be excluded.

`ASCENDING;`

The presence of this attribute causes the program to exclude all beams whose fixed angle is below the previous fixed angle. This option is meant for data where several low level surveilance scans are intersperced within the three dimensional volume scan.

`GATESKIP:2;`

Causes the filtering alogrithm to skip gates (in this example two gates) as it proceeds out the beam computing the contribution of each gate to the influenced grid points.

`GROUND_OUT;`

Causes a calculation of the intersection between the ray and the surface and the deletion of data from one-half the beam width above the calculated surface through the end of the ray. The beam width can be changed with the GND_ECHO_BMWIDTH attribute. This option applies only to aircraft data and only data taken above a sea surface.

`GND_ECHO_BMWIDTH:1.1;`

Permits the user to select a beam width as discussed in GROUND_OUT that is different from the default.

2.12 Output Display Attributes

Output from this program takes the form of a Cedric-type file of gridded data in "pure" format, a table of input scan information, some statistics for the output fields, and an optional alphanumeric display of the interpolated data fields. See Appendix A.

`DISPLAY:UNFVEL,0,1;`

The presence of one or more display attributes will cause alphanumeric displays of the output data to be produced. The first argument selects the output field to be displayed, the second argument assigns a value to the center symbol of the alphanumeric symbol set and the third value specifies the increment between symbols. The symbol set has 51 symbols. The center symbol is a zero. The 25 symbols on the right side of `0` are the upper case letters from `A` to `Y` and the left side are the lower case letters from `y` to `a`. In the above specification the value of the center symbol is indeed zero and a -1 would be represented by a lower case `a` and a $+1$ would be represented by an upper case `A`.

By default the program would produce a display of the selected fields at all levels.

`LEVELS:0.5,4.5,8.5;`

Controls which levels are displayed and in this example specifies displays at three levels, 0.5, 4.5, and 8.5.

`LEVELS:0.5-4.5;`

Specifies displays at all levels at or between 0.5 and 4.5.

2.13 Reference Time

`REFERENCE TIME:11:22:33;`

This is used for the production of the `TIme` field or for `ADVECTION` and produces an elapsed time to a given data value.

2.14 Advection

`ADVECTION:123,5;`

Causes the data is to be advected by a wind of 5 m/s (second argument) at 123 degrees (first argument) based on the elapsed time from the first beam processed or the `REFERENCE TIME`

`ADVECTION:123,5,2.5;`

This is is the form used if the user wishes to advect by different values at different levels. Here the advection at 2.5 km. above the radar (the third argument) is 5 m/s at 123 degrees. Advection can be specified at the number of levels necessary (200). A piecewise linear interpolation is done for levels in between those specified and an extrapolation is done for levels above and below the levels specified.

2.15 Questions

If you have questions or problems with this software, contact:

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```

or

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If at all possible, please ask questions through electronic mail via the following addresses:

Internet: **case@stout.atd.ucar.edu**
uucp: **...!ncar!case**

or

Internet: **oye@stout.atd.ucar.edu**
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