3. VELOCITY DEALIASING ALGORITHM

This section defines the algorithm required to dealias (unfold) the base datavelocity. Included herein are algorithm input definitions, an algorithm description, and the Algorithm Enunciation Language (AEL).

3.1 Algorithm Inputs

The inputs as well as adaptation data used by the algorithm are listed below.

Base Data

Velocity

Nyquist Velocity

Elevation

Azimuth

Environmental Wind Data

Horizontal Wind Direction (HWD), (Referred to as DIRECTION in AEL)

Horizontal Wind Speed (HWS). (Referred to as SPEED in AEL)

Adaptation Data

THRESHOLD (Difference Unfold)

THRESHOLD (Scale Difference Unfold)

THRESHOLD (Velocity Jump Factor)

THRESHOLD (Azimuthal Difference Factor)

THRESHOLD (Number Azimuthal Jump)

THRESHOLD (Scale Standard Deviation)

THRESHOLD (Maximum Missing)

THRESHOLD (Maximum Contiguous Jumps)

THRESHOLD (Consecutive Rejected)

THRESHOLD (Maximum Jump Count)

THRESHOLD (Sounding Age)

NUMBER (Look Back)

NUMBER (Look Forward)

NUMBER (Radial)

NUMBER (Replacement Look Backward)

NUMBER (Replacement Look Forward)

NUMBER (Reunfold Previous Azimuth)

NUMBER (Reunfold Current Azimuth)

FLAG (Sounding)

FLAG (Replace Rejected Velocities)

3.2 Algorithm Description

The base data Doppler velocities from the RDA may be ambiguous. If the radial projection of the environmental wind is outside the Nyquist velocity co-interval ($\pm V_{NYQ}$), the radar measured radial projection is shifted by $\pm 2nV_{NYQ}$ into the Nyquist velocity co-interval, where n is an integer. These errors, or velocity aliases, of the true radial projection of the environmental wind are corrected by requiring spatial continuity of the radar measured velocity data along radials and between adjoining radials at the same range.

The algorithm proceeds as follows:

- Initially, each good velocity along a radial are compared to a radial neighbor at a previous (i.e., closer in range to the radar) sample bin. Only velocities which meet the SNR threshold and are not overlaid are considered good. If the nearest good neighbor is within NUMBER (Radial) sample bins of the current velocity, the velocity difference is compared to THRESHOLD (Difference Unfold). If the difference is within this threshold, the current velocity is considered unambiguous (in this case left unaltered) and some error checks discussed later are performed. If the velocity difference exceeds this threshold, an attempt is made to minimize this difference to within THRESHOLD (Difference Unfold) by adding/subtracting integral multiples of the Nyquist co-interval to/from the current velocity. When the difference can be minimized to within this threshold, the current velocity is replaced by the velocity which minimizes this difference and then the error checks discussed later are performed.

- If a good velocity cannot be found within NUMBER (Radial) sample bins, or a good velocity is found but the current velocity can not be aliased to within THRESHOLD (Difference Unfold) of its nearest radial neighbor, the current velocity is compared to an average of surrounding data. This average, comprised of all good velocities within a nine-point sample bin window, will include the four preceding sample bins (i.e., adjacent to the sample bin in question) along the same radial and five sample bins from the previous radial. The five sample bins are the sample bin at the same range as the current velocity and the next four sample bins in increasing range. One good velocity is sufficient to compute an average.

- If an average is available, the difference between the current velocity and the average is compared to the larger of THRESHOLD (Difference Unfold), 40 percent of the average, or twice the standard deviation of the data within the nine-point averaging window. Twice the standard deviation is limited by the Product of THRESHOLD (Scale Standard Deviation) and the Nyquist co-interval. If the velocity difference is within the test criterion or can be dealiased to within the test criterion, the current velocity becomes unambiguous and some error checks discussed later are performed. Otherwise, the current velocity is rejected as bad and replaced by the below SNR threshold value. However, the original velocity is temporarily stored for possible future replacement into the radial.

- If there are no good velocities within the nine-point averaging window, NUMBER (Look Back) sample bins closer in range along the current radial are searched in order to find a good velocity. If no good velocities are found on the current radial, NUMBER (Look Forward) sample bins further in range along the previous radial are searched. If a good velocity is found either in the current or previous radial, the difference between the good velocity and the current velocity is compared to the product of THRESHOLD (Scale Difference Unfold) and THRESHOLD (Difference Unfold). If the difference is within this derived threshold or can be dealiased to within this derived threshold, the velocity becomes unambiguous. Otherwise, the current velocity is rejected as bad, replaced by the below SNR threshold indicator, and temporarily stored for possible future replacement into the radial.

- If no good velocities are found within NUMBER (Look Back) sample bins along the current radial, or NUMBER (Look Forward) sample bins along the previous radial, the current velocity is compared to the Environmental Wind Data. (The Environmental Wind Data entries come from either VAD algorithm results, or manual entry at the UCP console. Note that the operator cancels automatic updates from the VAD while making manual entries at the UCP). If the difference between the current velocity and the radial projection of the Environmental Wind Data entry closest in height is within the product of THRESHOLD (Default Difference)**(See Note 1)** and the Nyquist co-interval, or can be dealiased to within this product, the velocity will become unambiguous. Otherwise, the current velocity is removed and replaced by the below SNR threshold indicator. The original velocity is temporarily stored for possible future reinsertion into the radial.

  If THRESHOLD (Consecutive Rejected) consecutive velocities have been removed and replaced with the below SNR threshold indicator, they are replaced as follows. Initially, the first velocity removed is compared to the velocity immediately preceding it in the radial. If the previous velocity is good, the velocity difference between the first velocity removed and the previous velocity is compared to the product of THRESHOLD (Default Difference) and the Nyquist co-interval. If the preceding velocity is bad, the velocity difference between the average of neighboring velocities along the previous radial and the first velocity removed is compared to the product THRESHOLD (Scale Difference Unfold) and the Nyquist co-interval. If the first velocity removed is within the

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Note 1: Refer to computation of THRESHOLD (Default Difference in 3.3.2.

prescribed velocity difference tolerance or can be dealiased to within this tolerance, it is replaced by the velocity which minimizes this difference. Otherwise, the first velocity removed is replaced by its original value. Each remaining removed velocity is similarly replaced but using the running average of those already replaced to compare with. After all velocities are replaced, error checking discussed below is performed.

An error check terminates propagation of dealiasing mistakes along a radial when they occur. If the sample bin equivalent of 2.5 km (THRESHOLD (Number Azimuthal Jump)) have velocity differences across adjacent radials exceeding the product of THRESHOLD (Azimuthal Difference Factor) and the Nyquist co-interval, the originally assumed unambiguous velocities are reunfolded so as to place them in the correct Nyquist co-interval. The reunfolding will begin at the sample bin of the last velocity considered incorrectly placed in the wrong Nyquist co-interval. The Nyquist co-interval chosen to place this velocity is that determined from the velocity at the same sample bin but on the previous saved radial. The remaining velocities are reunfolded using a least-squares minimizing technique.

The least-squares minimizing technique is a comparison of the velocity in question with the nearest good velocity in the previous saved radial and the nearest good velocity further in range from the velocity in question but along the current radial. The Nyquist co-interval of the velocity in question is chosen by minimizing the sum of squares of the differences between the velocity in question and its two neighbors. The reunfolding is terminated when the velocity in question was originally placed in the Nyquist co-interval which minimizes the sum of squared differences.

Another error check will be made to see if a velocity gradient magnitude between the current sample bin velocity and the nearest good sample bin velocity which is within NUMBER (Radial) sample bins of the current sample bin exceeds the product of THRESHOLD (Velocity Jump Factor) and the Nyquist co-interval. When there are two large velocity gradients existing on the same radial but are of opposite sense, a Nyquist co-interval will be added/subtracted to all velocities between these large gradients so as to eliminate the large gradients. If they are successfully eliminated, the radial can be used for subsequent dealiasing.

If after the entire radial has been processed by the dealiasing algorithm and a large velocity gradient still exists, the radial will not be used for subsequent dealiasing. The last previous saved radial which was considered acceptable will be used. This is allowed to happen up to four times or THRESHOLD (Maximum Contiguous Jumps) after which no previous radials are considered acceptable. The dealiasing algorithm continues without the benefit of a previous saved radial until a radial is found which has no unrealistic velocity gradients. This radial will then be saved and used for subsequent dealiasing.

After the entire radial has been processed, if the FLAG (Replace Rejected Velocities) is true, the algorithm replaces any remaining velocities that were originally set to the SNR threshold indicator (i.e., removed). Note that the velocities restored at this point in the processing have no influence on the dealiasing of velocity bins in subsequent radials. Starting with the farthest velocity bin in range to be replaced, the algorithm looks in the current radial for the first good sample bin velocity beyond that bin beginning with the adjacent bin and going as far as the current bin plus Number (Radial). If a good velocity is found, the algorithm compares the two velocities and if the difference between them exceeds the product of THRESHOLD (Scale Difference Unfold) and the Nyquist velocity, the algorithm adjusts the velocity being restored by adding/subtracting one or more Nyquist co-intervals to the velocity in question and testing the velocity difference at

each velocity adjustment. If the velocity difference is within the specified tolerance, it is restored to the radial and may be used to compare with other velocities that were removed in earlier processing.

After the algorithm has attempted to restore all sample bin velocities originally removed from the farthest in range to the nearest in range, it reverses directions. Instead, it starts with the sample bin velocity nearest the radar that was removed and not replaced by the first pass. The algorithm then looks in the current radial for the first good sample bin velocity closer to the radar beginning with the adjacent bin and going back as far as the current bin plus NUMBER (Radial). If a good velocity is found, the algorithm computes the difference between it and the velocity being restored. If the difference is greater than the product of THRESHOLD (Scale Difference Unfold) and the Nyquist velocity, the algorithm adjusts the velocity being restored by adding/subtracting multiples of the Nyquist co-interval. The difference is re-computed and tested against the same threshold as before. If the difference between a good velocity and the adjusted velocities for the sample bin being replaced doesn't fall within the tolerance, the velocity that was originally removed is restored to the current radial.

3.3 Algorithm Enunciation Language (AEL)

The AEL for the Velocity Dealiasing Algorithm is provided below. Notations and acronyms used in the AEL are defined in 3.3.1. Required computations in the AEL which are identified by the operator "COMPUTE" are defined in 3.3.2.

```
PROCEDURE
BEGIN ALGORITHM
COMPUTE (NYQUIST VELOCITY CO-INTERVAL)
COMPUTE (THRESHOLD (Difference Unfold Relaxed))
COMPUTE (THRESHOLD (Default Difference))
COMPUTE (VELOCITY JUMP(Radial Maximum))
COMPUTE (VELOCITY JUMP(Azimuthal Maximum))
COMPUTE (MAXIMUM STANDARD DEVIATION)
Initialize NUMBER (Jumps Contiguous Radials) to zero
DO FOR ALL radials this elevation
|       IF (first azimuth of this elevation) THEN
|           Set all sample bins of VELOCITY (Previous Azimuth) equal to BAD (Doppler) (See Note 2)
|       ENDIF
|       Clear the FLAG (Velocity Jump)
|       Initialize NUMBER (Consecutive Rejected) to zero
|       Initialize NUMBER (Deleted) to zero
|       Initialize the last sample bin with good velocity to a large negative number
|       DO FOR ALL sample bins this radial
|       |   IF (VELOCITY (Doppler) at current sample bin is less than or equal to BAD DOPPLER)) THEN
|       |       Set NUMBER (Consecutive Rejected) to zero
|       |   ELSE
|       |   |   Clear the FLAG (Velocity Unambiguous)
|       |   |   IF (The last sample bin with good velocity on the current radial is within NUMBER (Radial)
                  sample bins of the current sample bin) THEN
|       |   |   |   COMPUTE (DIFFERENCE VELOCITY (Radial))
|       |   |   |   IF (DIFFERENCE VELOCITY (Radial) is greater than or equal to THRESHOLD
                      (Difference Unfold)) THEN
|       |   |   |   |   COMPUTE (UNAMBIGUOUS VELOCITY (Radial))
|       |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Unambiguous - Radial))
|       |   |   |   |   IF (DIFFERENCE VELOCITY (Unambiguous - Radial) is less than THRESHOLD
                          (Difference Unfold)) THEN
0       1   2   3   4   5   Set the VELOCITY (Doppler) at the current sample bin equal to the
                              UNAMBIGUOUS VELOCITY (Radial)
|       |   |   |   |   |   Set the FLAG (Velocity Unambiguous)
|       |   |   |   |   ENDIF
|       |   |   |   ELSE
|       |   |   |       Set the FLAG (Velocity Unambiguous)
|       |   |   |   ENDIF
|       |   |   ENDIF
|       |   |   IF (FLAG (Velocity Unambiguous) is not set) THEN
|       |   |   |   COMPUTE (AVERAGE (Nine Point))
|       |   |   |   IF (AVERAGE (Nine Point) is less than or equal to BAD (Doppler)) THEN
|       |   |   |   |   IF (the last sample bin with good velocity on the current radial is within NUMBER
                          (Look Back) sample bins preceding the current sample bin) THEN
|       |   |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Radial))
|       |   |   |   |   |   IF (DIFFERENCE VELOCITY (Radial) is greater than or equal to THRESHOLD
                              (Difference Unfold Relaxed)) THEN
|       |   |   |   |   |   |   COMPUTE (UNAMBIGUOUS VELOCITY (Radial))
|       |   |   |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Unambiguous - Radial))
|       |   |   |   |   |   |   IF (DIFFERENCE VELOCITY (Unambiguous - Radial) is less than
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Note 2: The definition of velocities below threshold or signals overlaid corresponds to BAD (Doppler).

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                                                    THRESHOLD (Difference Unfold Relaxed)) THEN
0     1  2  3  4  5  6  7     Set the VELOCITY (Doppler) at the current sample bin equal to the
                                 UNAMBIGUOUS VELOCITY (Radial)
|     |  |  |  |  |  |  |     Set the FLAG (Velocity Unambiguous)
|     |  |  |  |  |  |  |  ENDIF
|     |  |  |  |  |  |  ELSE
                                 Set the FLAG (Velocity Unambiguous)
|     |  |  |  |  |  |  ENDIF
|     |  |  |  |  |  ELSE
|     |  |  |  |  |  |  Beginning at the current sample bin on the previous radial and proceeding in the
                          direction of increasing range, find the nearest VELOCITY (Previous Azimuth)
                          which is greater than BAD (Doppler)
|     |  |  |  |  |  |  IF (the nearest VELOCITY (Previous Azimuth) that is greater than BAD
                          Doppler) is within NUMBER (Look Forward) sample bins of the current sample
                          bin) THEN
|     |  |  |  |  |  |  |  COMPUTE (DIFFERENCE VELOCITY (Radial - Previous Azimuth))
|     |  |  |  |  |  |  |  IF (DIFFERENCE VELOCITY (Radial - Previous Azimuth)) is greater than or
                             equal to THRESHOLD (Difference Unfold Relaxed) THEN
|     |  |  |  |  |  |  |  |  COMPUTE (UNAMBIGUOUS VELOCITY (Radial - Previous Azimuth))
|     |  |  |  |  |  |  |  |  COMPUTE (DIFFERENCE VELOCITY (Unambiguous - Previous
                                Azimuth))
|     |  |  |  |  |  |  |  |  IF (DIFFERENCE VELOCITY (Unambiguous - Previous Azimuth) is less
                                than THRESHOLD (Difference Unfold Relaxed)) THEN
0     1  2  3  4  5  6  7  8     Set the VELOCITY (Doppler) at the current sample bin equal to the
                                    UNAMBIGUOUS VELOCITY (Nearest Sample Bin Previous Azimuth)
|     |  |  |  |  |  |  |  |  |  Set the FLAG (Velocity Unambiguous)
|     |  |  |  |  |  |  |  |  ENDIF
|     |  |  |  |  |  |  |  ELSE
                             Set the FLAG (Velocity Unambiguous)
|     |  |  |  |  |  |  |  ENDIF
|     |  |  |  |  |  |  ELSE IF (FLAG (Velocity Unambiguous) is not set) AND IF (FLAG (Sounding) is
                          set) AND (the time difference between the last update of the Environmental Wind
                          Data and the current time is less than or equal to THRESHOLD (Sounding Age))
                          THEN
|     |  |  |  |  |  |  |  Search the sounding table for the entry nearest the height of the VELOCITY
                             (Doppler) measurement at the current sample bin
|     |  |  |  |  |  |  |  COMPUTE (RADIAL COMPONENT AMBIENT WIND)
|     |  |  |  |  |  |  |  COMPUTE (DIFFERENCE VELOCITY) (Radial Component Ambient Wind))
|     |  |  |  |  |  |  |  IF (DIFFERENCE VELOCITY (Radial Component Ambient Wind) is greater
                             than or equal to THRESHOLD (Default Difference)) THEN
|     |  |  |  |  |  |  |  |  COMPUTE (UNAMBIGUOUS VELOCITY) (Radial Component Ambient
                                Wind))
|     |  |  |  |  |  |  |  |  COMPUTE (DIFFERENCE VELOCITY (Unambiguous - Radial
                                Component Ambient Wind))
|     |  |  |  |  |  |  |  |  IF (DIFFERENCE VELOCITY (Unambiguous - Radial Component
                                Ambient Wind) is less than THRESHOLD (Default Difference)) THEN
0     1  2  3  4  5  6  7  8     Set the VELOCITY (Doppler) at the current sample bin equal to the
                                    UNAMBIGUOUS VELOCITY (Radial Component Ambient Wind)
|     |  |  |  |  |  |  |  |  |  Set the FLAG (Velocity Unambiguous)
|     |  |  |  |  |  |  |  |  ENDIF
|     |  |  |  |  |  |  |  ELSE
|     |  |  |  |  |  |  |  |  Set the FLAG (Velocity Unambiguous)
|     |  |  |  |  |  |  |  ENDIF
|     |  |  |  |  |  |  ENDIF
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|       |   |   |   |   ENDIF
|       |   |   |   ELSE
|       |   |   |   |   COMPUTE (STANDARD DEVIATION (Nine Point))
|       |   |   |   |   COMPUTE (TOLERANCE (Velocity from Average))
|       |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Average))
|       |   |   |   |   IF (DIFFERENCE VELOCITY (Average) is greater than or equal to TOLERANCE
                          (Velocity from Average) THEN
|       |   |   |   |   |   COMPUTE (UNAMBIGUOUS VELOCITY(Average))
|       |   |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Unambiguous - Average))
|       |   |   |   |   |   IF (DIFFERENCE VELOCITY (Unambiguous - Average) is less than
                              TOLERANCE (Velocity from Average)) THEN
0   1   2   3   4   5   6       Set VELOCITY (Doppler) equal to UNAMBIGUOUS VELOCITY (Average)
|       |   |   |   |   |   |   Set FLAG (Velocity Unambiguous)
|       |   |   |   |   |   ENDIF
|       |   |   |   |   ELSE
|       |   |   |   |   |   Set the FLAG (Velocity Unambiguous)
|       |   |   |   |   ENDIF
|       |   |   |   ENDIF
|       |   |   ENDIF
|       |   |   IF (FLAG Velocity Unambiguous) is not set) THEN
|       |   |   |   Increment NUMBER (Consecutive Rejected) by one
|       |   |   |   Set array element NUMBER (Consecutive Rejected) of VELOCITY (Temporary) equal to
                      VELOCITY (Doppler) at the current sample bin
|       |   |   |   Set VELOCITY (Doppler) at the current sample bin equal to BAD (Doppler)
|       |   |   |   Increment NUMBER (Deleted) by one
|       |   |   |   Set VELOCITY (Deleted) to VELOCITY (Temporary)
|       |   |   |   IF (NUMBER (Consecutive Rejected) is equal to THRESHOLD (Consecutive Rejected))
                      THEN
|       |   |   |   |   IF (VELOCITY (Doppler) at the current sample bin - NUMBER (Radial) sample bins
                          is greater than BAD (Doppler)) THEN
|       |   |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Radial - First Point Replaced)
|       |   |   |   |   |   IF (DIFFERENCE VELOCITY (Radial - First Point Replaced) is greater than
                              THRESHOLD (Default Difference)) THEN
|       |   |   |   |   |   |   COMPUTE (UNAMBIGUOUS VELOCITY (Radial - First Point Replaced))
|       |   |   |   |   |   |   IF (UNAMBIGUOUS VELOCITY (Radial - First Point Replaced) is less than
                                  THRESHOLD (Default Difference)) THEN
0   1   2   3   4   5   6   7       Set VELOCITY (Temporary) equal to UNAMBIGUOUS VELOCITY
                                      Radial - First Point Replaced)
|       |   |   |   |   |   |   ENDIF
|       |   |   |   |   |   ENDIF
|       |   |   |   |   ELSE
|       |   |   |   |   |   COMPUTE (AVERAGE (Previous Radial))
|       |   |   |   |   |   IF (AVERAGE (Previous Radial) is not equal to BAD (Doppler)) THEN
|       |   |   |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Average Previous Radial))
|       |   |   |   |   |   |   IF (DIFFERENCE VELOCITY (Average Previous Radial) is greater than
                                  THRESHOLD (Difference Unfold Relaxed)) THEN
|       |   |   |   |   |   |   |   COMPUTE (UNAMBIGUOUS VELOCITY (Average Previous Radial))
|       |   |   |   |   |   |   |   IF (UNAMBIGUOUS VELOCITY (Average Previous Radial) is less than
                                      THRESHOLD (Default Difference)) THEN
0   1   2   3   4   5   6   7   8       Set Velocity (Temporary) equal to UNAMBIGUOUS VELOCITY
                                          (Average Previous Radial)
|       |   |   |   |   |   |   |   ENDIF
|       |   |   |   |   |   |   ENDIF
|       |   |   |   |   |   ENDIF
```

```
|   |   |   |   |   ENDIF
|   |   |   |   |   Set VELOCITY (Doppler) at current sample bin minus NUMBER (Consecutive
                    Rejected) + 1 sample bins equal to VELOCITY (Temporary)
|   |   |   |   |   Set NUMBER (Points Replaced) equal to 1
|   |   |   |   |   DO FOR ALL sample bins from current sample bin minus NUMBER consecutive
                    Rejected) + 2 sample bins to the current sample bin
|   |   |   |   |   |   COMPUTE (RUNNING AVERAGE (Replaced Points))
|   |   |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Replaced Points))
|   |   |   |   |   |   IF (DIFFERENCE VELOCITY (Replaced Points) is greater than or equal to
                        THRESHOLD (Difference Unfold Relaxed)) THEN
|   |   |   |   |   |   |   COMPUTE (UNAMBIGUOUS VELOCITY) (Replaced Points))
|   |   |   |   |   |   |   IF (UNAMBIGUOUS VELOCITY (Replaced Points) is less than
                            THRESHOLD (Difference Unfold Relaxed)) THEN
|   |   |   |   |   |   |   |   Set VELOCITY (Temporary) equal to UNAMBIGUOUS VELOCITY
                                (Replaced Points)
|   |   |   |   |   |   |   ENDIF
|   |   |   |   |   |   ENDIF
|   |   |   |   |   |   Set VELOCITY (Doppler) equal to VELOCITY (Temporary) Increment NUMBER
                        (Points Replaced) by one
|   |   |   |   |   ENDDO
|   |   |   |   ENDIF
|   |   |   ENDIF
|   |   |   IF (VELOCITY (Doppler) at the current sample bin is greater than BAD Doppler)) THEN
|   |   |   |   Set FLAG (No Jump Check)
|   |   |   ELSE
|   |   |   |   Clear FLAG (No Jump Check)
|   |   |   ENDIF
|   |   |   DO UNTIL (FLAG (No Jump Check) is set)
|   |   |   |   Set FLAG (No Jump Check)
|   |   |   |   IF (the last sample bin with good-velocity on the current radial is within NUMBER
                    (Radial) sample bins of current sample bin) THEN
|   |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Radial))
|   |   |   |   |   IF (DIFFERENCE VELOCITY (Radial) is greater than VELOCITY JUMP Radial
                    Maximum)) THEN
|   |   |   |   |   |   IF (FLAG (Velocity Jump) is set) AND (the difference between radial jump start
                        bin and the current sample bin is less than THRESHOLD (Maximum Jump
                        Counts) THEN
|   |   |   |   |   |   |   COMPUTE (Jump Sense New)
|   |   |   |   |   |   |   IF (Jump Sense New is equal to Jump Sense Old) THEN
|   |   |   |   |   |   |   |   DO FOR ALL (sample bins from radial jump start bin to current sample
                                bin - 1 sample bins which have VELOCITY (Doppler)) greater than BAD
                                (Doppler))
0   1   2   3   4   5   6   7   8   COMPUTE (UNAMBIGUOUS VELOCITY (Jump))
|   |   |   |   |   |   |   |   |   Set VELOCITY (Doppler) at the current sample bin equal to
                                    UNAMBIGUOUS VELOCITY (Jump)
|   |   |   |   |   |   |   |   ENDDO
|   |   |   |   |   |   |   ENDIF
|   |   |   |   |   |   |   Clear FLAG (No Jump Check)
|   |   |   |   |   |   |   Clear FLAG (Velocity Jump)
|   |   |   |   |   |   ELSE
|   |   |   |   |   |   |   Set FLAG (Velocity Jump)
|   |   |   |   |   |   |   COMPUTE (Jump Sense Old)
|   |   |   |   |   |       Set radial jump start bin equal to current sample bin
|   |   |   |   |   ENDIF
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|   |   |   |   |   ENDIF
|   |   |   |   ENDIF
|   |   |   ENDDO
|   |   |   IF (VELOCITY (Previous Azimuth) at the current sample bin is greater than BAD (Doppler))
              THEN
|   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Radial - Previous Azimuth))
|   |   |   |   IF (DIFFERENCE VELOCITY (Radial - Previous Azimuth) is greater than or equal to
                  VELOCITY JUMP (Azimuthal Maximum)) THEN
|   |   |   |   |   Increment NUMBER (Large Azimuthal Jump) by one
|   |   |   |   ELSE
|   |   |   |   |   Initialize NUMBER (Large Azimuthal Jump) to zero
|   |   |   |   ENDIF
|   |   |   ELSE IF (NUMBER (Large Azimuthal Jump) is greater than two) THEN
|   |   |   |   Increment NUMBER (Large Azimuthal Jump) by one
|   |   |   ENDIF
|   |   |   IF (NUMBER (Large Azimuthal Jump) is greater than or equal to THRESHOLD number
              Azimuthal Jump)) THEN
|   |   |   |   COMPUTE (Nyquist Folding Number)
|   |   |   |   COMPUTE (Velocity Reunfolded)
|   |   |   |   Set radial pointer equal to the current sample bin
|   |   |   |   Initialize NUMBER (Consecutive Missing) to zero
|   |   |   |   DO FOR ALL (sample bins from current sample bin - 1 to first sample bin)
|   |   |   |   |   Move the radial pointer one sample bin closer to the first sample bin in the radial
|   |   |   |   |   IF (VELOCITY (Doppler) at radial pointer sample bin is less than or equal to BAD
                      (Doppler) THEN
|   |   |   |   |   |   Increment NUMBER (Consecutive Missing) by one
|   |   |   |   |   |   IF (NUMBER (Consecutive Missing) is equal to THRESHOLD (Maximum
                          Missing)) THEN
|   |   |   |   |   |   |   EXIT DO
|   |   |   |   |   |   ENDIF
|   |   |   |   |   ELSE
|   |   |   |   |   |   Initialize NUMBER (Consecutive Missing) to zero
|   |   |   |   |   |   Set current azimuth good velocity equal to BAD (Doppler)
|   |   |   |   |   |   Set the previous azimuth good velocity equal to BAD (Doppler)
|   |   |   |   |   |   Move alternately up and down the current radial from the radial pointer location
                          until a VELOCITY (Previous Azimuth) found that is greater than BAD (Doppler)
|   |   |   |   |   |   IF (VELOCITY (Previous Azimuth) is at a sample bin within NUMBER (Reunfold
                          Previous Azimuth) of the radial pointer location) THEN
0   1   2   3   4   5   6   Set previous azimuth good velocity equal to VELOCITY (Previous Azimuth)
|   |   |   |   |   |   ELSE
|   |   |   |   |   |   |   EXIT DO
|   |   |   |   |   |   ENDIF
|   |   |   |   |   ENDIF
|   |   |   |   |   Beginning at the current sample bin + 1, move up the radial (away from the radar)
                      from the radial pointer location until a VELOCITY (Doppler) is greater than BAD
                      (Doppler)
|   |   |   |   |   IF (VELOCITY (Doppler) is at a sample bin within NUMBER (Reunfold Current
                      Azimuth)) THEN
|   |   |   |   |   |   Set azimuth good velocity equal to VELOCITY (Doppler)
|   |   |   |   |   ELSE
|   |   |   |   |   |   EXIT DO
|   |   |   |   |   ENDIF
|   |   |   |   |   COMPUTE (VELOCITY (Reunfolded)
|   |   |   |   |   COMPUTE (SUM OF SQUARES (Reunfolded - Squared))
```

```
|     |   |   |   |   COMPUTE (SUM OF SQUARES (Folded - Squared))
|     |   |   |   |   IF (SUM OF SQUARES (Reunfolded - Squared) is less than or equal to SUM OF
                        SQUARES (Folded - Squared)) THEN
|     |   |   |   |   |   Set VELOCITY (Doppler) at the radial pointer sample bin equal to VELOCITY
                            (Reunfolded)
|     |   |   |   |   ELSE
|     |   |   |   |   |   Clear FLAG (No Jump Check)
|     |   |   |   |   |   DO UNTIL (FLAG (No Jump Check) is set)
|     |   |   |   |   |   |   Set FLAG (No Jump Check)
|     |   |   |   |   |   |   IF (DIFFERENCE VELOCITY (Radial) is greater than VELOCITY JUMP
                                (Radial Maximum)) THEN
0     1   2   3   4   5   6   7   IF (FLAG (Velocity Jump) is set) AND (the difference between the radial
                                    pointer and radial jump start bin is less than THRESHOLD (Maximum
                                    Jump Counts) THEN
|     |   |   |   |   |   |   |   |   Clear FLAG (Velocity Jump)
|     |   |   |   |   |   |   |   |   COMPUTE (Jump Sense New)
|     |   |   |   |   |   |   |   |   IF (Jump Sense New is equal to Jump Sense Old) THEN
|     |   |   |   |   |   |   |   |   |   DO FOR ALL (sample bins from radial jump start bin to radial
                                            pointer which have VELOCITY (Doppler) greater than BAD
                                            (Doppler))
0     1   2   3   4   5   6   7   8   9   10  COMPUTE (UNAMBIGUOUS VELOCITY (Jump))
|     |   |   |   |   |   |   |   |   |   |   Set VELOCITY (Doppler) equal to UNAMBIGUOUS
                                                VELOCITY (Jump)
|     |   |   |   |   |   |   |   |   |   ENDDO
|     |   |   |   |   |   |   |   |   ELSE
|     |   |   |   |   |   |   |   |   |   Clear FLAG (No Jump Check)
|     |   |   |   |   |   |   |   |   ENDIF
|     |   |   |   |   |   |   |   ELSE
|     |   |   |   |   |   |   |   |   Set FLAG (Velocity Jump)
|     |   |   |   |   |   |   |   |   COMPUTE (Jump Sense Old)
|     |   |   |   |   |   |   |   |   Set radial jump start bin equal to radial pointer + 1
|     |   |   |   |   |   |   |   ENDIF
|     |   |   |   |   |   |   ELSE
|     |   |   |   |   |   |   |   Clear FLAG (Velocity Jump)
|     |   |   |   |   |   |   ENDIF
|     |   |   |   |   |   END DO
|     |   |   |   |   |   EXIT DO
|     |   |   |   |   ENDIF
|     |   |   |   ENDDO
|     |   |   ENDIF
|     |   ENDIF
|     ENDDO
|     IF (FLAG (Velocity Jump) is set)) THEN
|     |   Increment NUMBER (Jump Contiguous Radials) by one
|     |   IF (NUMBER (Jump Contiguous Radial:) is greater than or equal to THRESHOLD maximum
              Contiguous Jumps)) THEN
|     |   |   Initialize NUMBER (Jump Contiguous Radials) to zero
|     |   ENDIF
|     ELSE
|     |   Set NUMBER (Jump Contiguous Radials) to zero
|     |   DO FOR ALL range bins on previous radial
|     |       Set VELOCITY (Previous Azimuth) equal to VELOCITY (Doppler)
|     |   ENDDO
|     |   IF (FLAG(Replace Rejected Velocities) is set)THEN
```

```
|       |   |   DO FOR ALL deleted range bins in current radial from the farthest bin to the closest bin
|       |   |   |   IF (The next sample bin with good velocity on the current radial is within NUMBER
                      (Radial) sample bins of the current sample bin) THEN
|       |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Deleted))
|       |   |   |   |   IF (DIFFERENCE VELOCITY (Deleted) is greater than THRESHOLD (Difference
                          Unfold Relax)) THEN
|       |   |   |   |   |   COMPUTE (UNAMBIGUOUS VELOCITY (Detleted))
|       |   |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Unambiguous - Deleted))
|       |   |   |   |   |   IF (DIFFERENCE VELOCITY (Unambiguous - Deleted) is less than
                              THRESHOLD (Difference Unfold Relax) THEN
0       1   2   3   4   5   6   Set the velocity (Doppler) at the current sample bin to the
                                 UNAMBIGUOUS VELOCITY (Deleted)
|       |   |   |   |   |   |   Set the FLAG (Velocity Unambiguous)
|       |   |   |   |   |   |   Set the VELOCITY (Deleted) equal to FLAG (Velocity Restored)
|       |   |   |   |   |   ENDIF
|       |   |   |   |   ELSE
|       |   |   |   |   |   Set the VELOCITY (Doppler) equal to VELOCITY (Deleted)
|       |   |   |   |   |   Set the VELOCITY (Deleted) equal to FLAG (Velocity Restored)
|       |   |   |   |   ENDIF
|       |   |   |   ENDIF
|       |   |   ENDDO
|       |   |   DO FOR ALL deleted range bins in current radial from the closest bin to the farthest bin
|       |   |   |   IF VELOCITY (Deleted) greater than zero THEN
|       |   |   |   |   Set the VELOCITY (Doppler) equal to VELOCITY (Deleted)
|       |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Deleted))
|       |   |   |   |   IF (DIFFERENCE VELOCITY (Deleted) is greater than THRESHOLD (Difference
                          Unfold Relax)) THEN
|       |   |   |   |   |   COMPUTE (UNAMBIGUOUS VELOCITY (Deleted))
|       |   |   |   |   |   COMPUTE (DIFFERENCE VELOCITY (Unambiguous - Deleted))
|       |   |   |   |   |   IF (DIFFERENCE VELOCITY (Unambiguous - Deleted)) is less than
                              THRESHOLD (Difference Unfold Relax) THEN
0       1   2   3   4   5   6   Set the VELOCITY (Doppler) at the current sample bin to the
                                 UNAMBIGUOUS VELOCITY (Deleted)
|       |   |   |   |   |   ENDIF
|       |   |   |   |   ENDIF
|       |   |   |   ENDIF
|       |   |   ENDDO
|       |   ENDIF
|       |   DO FOR ALL Bins not in range on previous radial
|       |       Set VELOCITY (Previous Azimuth) equal to BAD (Doppler)
|       |   ENDDO
|       END IF
ENDDO
END ALGORITHM
```

3.3.1 Definition of Terms

AEL Name	Symbolic Name	Definition
AVENP	AVERAGE (Nine Point).	The average of the velocity data in the nine-point averaging window, in m/s.
AVEpr	AVERAGE (Previous Radial)	The average of velocities from the previous saved radial which surround the current sample bin, in m/s.
AZIMUTH	Azimuth.	The azimuth angle of the current radial in degrees. See Input 3.1.
Default	THRESHOLD (Default Difference).	Defines a velocity difference threshold for the maximum allowed velocity difference when comparing sounding to radar data. This value is also used when replacing data that had previously been removed, in m/s. See Symbolic Formula, Section 3.3.2.
Diffrelax	THRESHOLD (Difference Unfold Relaxed)	A velocity difference threshold which is used during the replacement of data that had previously been removed, in m/s.
DIFVELambcomp	DIFFERENCE VELOCITY (Radial Component Ambient Wind).	The magnitude of the difference the ambient wind radial component and the velocity at the current sample bin, in m/s.
DIFVELapr	DIFFERENCE VELOCITY (Average Previous Radial)	The magnitude of the difference between AVEpr and the first velocity in the series of rejected velocities, in m/s.
DIFVELave	DIFFERENCE VELOCITY (Average).	The magnitude of the difference between the velocity at the current sample bin and the average of the velocity data in the nine-point averaging window, in m/s.
DIFVELdel	DIFFERENCE VELOCITY (Deleted).	The magnitude of the difference between the previously rejected velocity and the current sample bin velocity, in m/s.
DIFVELfpr	DIFFERENCE VELOCITY (Radial - First Point Replaced).	The magnitude of the difference between the first in the string of previously rejected velocities and the current sample bin velocity, in m/s.
DIFVELrad	DIFFERENCE VELOCITY (Radial).	The magnitude of the difference in velocity between two sample bins the same radial, in m/s.
DIFVELradpa	DIFFERENCE VELOCITY (Radial - Previous Azimuth).	The magnitude of the difference between the current sample bin velocity and the selected sample bin velocity on the previous saved radial, in m/s.

AEL Name	Symbolic Name	Definition
DIFVELrpts	DIFFERENCE VELOCITY (Replaced Points)	The magnitude of the difference between the currently rejected velocity and running average of the previously replaced velocities, in m/s.
DIFVELuave	DIFFERENCE VELOCITY (Unambiguous - Average).	The magnitude of the difference between UNAMBave and the average of the velocities in the nine-point averaging window, in m/s.
DIFVELudel	DIFFERENCE VELOCITY (Unambiguous - Deleted).	The magnitude of the difference between UNAMBdel and the nearest good sample bin in the current radial, in m/s.
DIFVELurad	DIFFERENCE VELOCITY (Unambiguous - Radial).	The magnitude of the difference between the current sample bin velocity and UNAMBrad, in m/s.
DIFVELuradcomp	DIFFERENCE VELOCITY Unambiguous - Radial Component Ambient Wind).	The magnitude of the difference between the velocity at the current sample bin and UNAMBradcomp, in m/s.
DIRECTION	Horizontal Wind Direction (HWD).	The wind direction entry from the environmental wind table at the nearest height to the current sample bin in degrees. See Input 3.1.
ELEVATION	Elevation.	The elevation angle of the current radial, in degrees. See Input 3.1.
JUMPnew	Jump Sense New	The sign of the difference between nearest good velocity on the current radial and the velocity at the current sample bin on the current radial.
JUMPold	Jump Sense Old	The sign of the difference between velocity at the current sample bin on the current radial and the nearest good velocity on the current radial.
MaxSD		The minimum of twice the deviation of the velocities in the nine point averaging window and Mxstddev, m/s.
Mxjmpaz	VELOCITY JUMP (Azimuthal Maximum)	A velocity difference threshold used in identifying unrealistic velocity gradients between adjacent azimuths, in m/s.

AEL Name	Symbolic Name	Definition
Mxjmprad	VELOCITY JUMP (Radial Maximum)	A velocity difference threshold used in identifying unrealistic sample bin to sample bin velocity gradients along the same radial, in m/s.
Mxstddev	MAXIMUM STANDARD DEVIATION	The maximum standard deviation allowed for the data used in computing the nine-point average, in m/s.
NBapr	NUMBER (Average Previous Radial)	The number of good velocities in AVERAGE (Previous Radial).
NBnpa	NUMBER (Nine Point Average)	The number of sample bins with VELOCITY (Doppler) greater than BAD (Doppler) in the nine-point averaging window.
NFN	Nyquist Folding Number.	The Nyquist interval to place the reunfolded velocities.
NPCR	CURRENT RADIAL (Nine Point)	The number of sample bins on the current radial in the nine-point averaging window.
NPPR	PREVIOUS RADIAL (Nine Point).	The number of sample bins on the previous saved radial in the nine-point averaging window.
NPRB	NUMBER (Replacement Look Backward)	The number of sample bins along previous radial to look back, for velocities to compute AVEpr.
NPRF	NUMBER (Replacement Look Forward)	The number of sample bins along previous radial to look forward searching for velocities to compute AVEpr.
NRP	NUMBER (Replaced Points)	The number of currently replaced points.
RADCOMP	RADIAL COMPONENT AMBIENT WIND.	The radial component of the ambient wind at the azimuth, elevation, and range of the current sample bin, in m/s.

AEL Name	Symbolic Name	Definition
RUNAVE	RUNNING AVERAGE (Replaced Points)	The running average of the currently replaced points, in m/s.
SPEED	Horizontal Wind Speed (HWS).	The wind speed entry from the environmental wind table at the nearest height to the current sample bin, m/s. See Input 3.1.
Ssfsq	SUM OF SQUARES (Folded - Squared).	The sum of squares of the differences between the folded velocity and its two neighbors; one on the current radial and one on the previous saved radial.
SSrusq	SUM OF SQUARES (Reunfolded - Squared).	The sum of squares of the differences between the reunfolded velocity and its two neighbors; one on the current radial and one on the previous saved radial.
STDDEV	STANDARD DEVIATION (Nine Point).	The standard deviation of the velocity data in the nine-point averaging window in m/s.
TOLMAXAVE	TOLERANCE (Velocity from Average).	The velocity difference tolerance between The current sample bin velocity and the average of the velocities in the nine point averaging window, in m/s.
UNAMBave	UNAMBIGUOUS VELOCITY (Average).	The velocity which minimizes DIFVELave, in m/s.
UNAMBapr	UNAMBIGUOUS VELOCITY (Average Previous Radial)	The velocity which minimizes DIFVELapr, in m/s.
UNAMBdel	UNAMBIGUOUS VELOCITY (Deleted)	The velocity which minimizes DIFVELudel, in m/s.
UNAMBfpr	UNAMBIGUOUS VELOCITY (Radial - First Point Replaced).	The velocity which minimizes DIFVELfpr in m/s.
UNAMBjump	UNAMBIGUOUS VELOCITY (Jump)	The velocity which minimizes DIFVELradpa in m/s.

AEL Name	Symbolic Name	Definition
UNAMBrad	UNAMBIGUOUS VELOCITY (Radial).	The velocity which minimizes DIFVELrad, in m/s.
UNAMBradcomp	UNAMBIGUOUS VELOCITY (Radial Component Ambient Wind)	The velocity which minimizes DIFVELambcomp, in m/s.
UNAMBradpa	UNAMBIGUOUS VELOCITY (Radial - Previous Azimuth).	The velocity which minimizes the DIFVELradpa, in m/s.
UNAMBrpts	UNAMBIGUOUS VELOCITY (Replaced Points)	The velocity which minimizes DIFVELrpts, in m/s.
VD	VELOCITY (Doppler).	This is the array of velocity values along the current radial, in m/s.
VDdel	VELOCITY (Deleted).	The array of previously deleted velocity values for the current radial, in m/s.
VDru	VELOCITY (Reunfolded).	The velocity resulting from adding/subtracting the appropriate Nyquist co-interval(3) to/from the velocity to be reunfolded.
VNYQINT	Nyquist Velocity Co-interval	Twice the Nyquist Velocity, in m/s.
VPAZ	VELOCITY (Previous Azimuth).	This is the array of velocity values from the previous saved radial, in m/s.
VT		The array of temporarily velocities. These are the that had been rejected previously, in m/s.

3.3.2. SYMBOLIC FORMULAE

COMPUTE (NYQUIST VELOCITY CO-INTERVAL)

VNYQINT = 2 * NYQUIST VELOCITY

COMPUTE (THRESHOLD (Difference Unfold Relaxed))

Diffrelax = THRESHOLD(Scale Difference Unfold) * THRESHOLD(Difference Unfold)

COMPUTE (VELOCITY JUMP (Radial Maximum))

Mxjmprad = MIN(THRESHOLD(Velocity Jump Factor) * VNYQINT, 45.0)

COMPUTE (VELOCITY JUMP (Azimuthal Maximum))

Mxjmpaz = THRESHOLD (Azimuthal Difference Factor) * VNYQINT

COMPUTE (MAXIMUM STANDARD DEVIATION)

Mxstddev = MIN(THRESHOLD (Scale Standard Deviation)*VNYQINT, 22.5)

COMPUTE (THRESHOLD (Default Difference))

Default = MIN(THRESHOLD (Scale Standard Deviation)*VNYQINT, 22.5)

COMPUTE (DIFFERENCE VELOCITY (Radial))

DIFVELrad = |VD(i)–VD(m)|

where i is the array index pointing to the current sample bin and m is the array index pointing to the nearest previous good velocity on the current radial.

COMPUTE (UNAMBIGUOUS VELOCITY (Radial))

$$UNAMBrad = NINT\frac{VD(m) - VD(i)}{VNYQINT} * VNYQINT + VD(i)$$

where i is the array index pointing to the current sample bin, and m is the array index pointing to the nearest previous good velocity on the current radial.

COMPUTE (DIFFERENCE VELOCITY (Deleted))

DIFVELdel = |VDdel(i)-VD(m)|

where i is the array index pointing to the current deleted sample bin and m is the array index pointing to the nearest good velocity on the current radial.

COMPUTE (DIFFERENCE VELOCITY (Unambiguous - Radial))

DIFVELurad = |UNAMBrad - VD(m)|

where m is the array index pointing to the nearest previous good velocity on the current radial.

COMPUTE (UNAMBIGUOUS VELOCITY (Radial - Previous Azimuth))

$$UMAMBradpa = NINT\frac{VPAZ(m) - VD(i)}{VNYQINT} * VNYQINT + VD(i)$$

where m is the array index pointing to the selected sample bin velocity on the previous saved radial and i is the array index pointing to the current sample bin on the current radial.

COMPUTE (DIFFERENCE VELOCITY (Radial - Previous Azimuth))

DIFVELradpa = |VD(i) - VPAZ(m)|

where i is the array index pointing to the current sample bin on the current radial and m is the array index pointing to the nearest velocity previous azimuth.

COMPUTE (AVERAGE (Nine Point))

$$AVENP = \frac{\sum_{i}^{NPCR} VD(i) + \sum_{j}^{NPPR-1} VPAZ(j)}{NBnpa}$$

for current sample bin – NPCR ≤ i ≤ current sample bin– 1 and current sample bin ≤ j ≤ current sample bin +NPPR–1. Only those values greater than BAD (Doppler) are considered. If there are no good velocities to compute an average, then AVENP is set to BAD (Doppler).

COMPUTE (RADIAL COMPONENT AMBIENT WIND)

RADCOMP = –SPEED*cos (DIRECTION – AZIMUTH) *cos (ELEVATION)

COMPUTE (DIFFERENCE VELOCITY (Radial Component Ambient Wind))

DIFVELambcomp = |VD(i) - RADCOMP|

where i is the array index pointing to the current sample bin on the current radial.

COMPUTE (UNAMBIGUOUS VELOCITY (Radial Component Ambient Wind))

$$UNAMBradcomp = NINT\ [\frac{RADCOMP - VD(i)}{VNYQINT}] * VNYQINT + VD(i)$$

where i is the array index pointing to the current sample bin on the current radial.

COMPUTE (DIFFERENCE VELOCITY (Unambiguous - Radial Component Ambient Wind))

DIFVELuradcomp = |UNAMBradcomp – RADCOMP|

COMPUTE (DIFFERENCE VELOCITY (Unambiguous - Deleted)

DIFVELudel = | UNAMBdel - VD(m) |

where m is the array index pointing to the nearest good velocity on the current radial.

COMPUTE (STANDARD DEVIATION (Nine Point))

$$STDDEV = [\frac{\sum_{i}^{NPCR} VD(i)^2 + \sum_{j}^{NPPR-1} VPAZ(j)^2}{NBnpa} - AVENP^2]^{1/2}$$

for current sample bin – NPCR ≤ i ≤ current sample bin– 1 and current sample bin ≤ j ≤ current sample bin +NPPR–1. Only those values greater than BAD (Doppler) are considered. If there are no good velocities to compute the standard deviation, then STDDEV is set to BAD (Doppler).

COMPUTE (TOLERANCE (Velocity from Average))

TOLMAXAVE = MAX (THRESHOLD (Difference Unfold), 0.40*AVENP, MaxSD)

where MaxSD is MIN(Mxstddev, 2*STDDEV)

COMPUTE (DIFFERENCE VELOCITY (Average))

DIFVELave = |VD(i) - AVENP|

where i is the array index pointing to the current sample bin on the current radial.

COMPUTE (UNAMBIGUOUS VELOCITY (Average))

$$UNAMBave = NINT\ \frac{AVENP - VD(i)}{VNYQINT} * VNYQINT + VD(i)$$

where i is the array index pointing to the current sample bin on the current radial.

COMPUTE (DIFFERENCE VELOCITY (Unambiguous - Average))

DIFVELuave = |UNAMBave – AVENP|

COMPUTE (DIFFERENCE VELOCITY (Radial - First Point Replaced))

DIFVELfpr = |VD(i) – VT(1)|

where i is the array index pointing to the current sample bin on the current radial.

COMPUTE (UNAMBIGUOUS VELOCITY (Radial - First Point Replaced))

$$UNAMBfpr = NINT\ [\frac{VD(i) - VT(1)}{VNYQINT}] * VNYQINT + VT(1)$$

COMPUTE (AVERAGE (Previous Radial))

$$AVEpr = \frac{\sum_{i}^{NPRB} VPAZ(i) + \sum_{j}^{NPRF} VPAZ(j)}{NBapr}$$

for (current sample bin – NPRB–1) ≤ i ≤ (current sample bin) and (current sample bin +1) ≤ j ≤ (current sample bin + NPRF). Only those values greater than BAD (Doppler) are considered. If there are no good velocities in the previous radial within this sample bin interval, then AVEpr is set to BAD (Doppler).

COMPUTE (DIFFERENCE VELOCITY (Average Previous Radial))

DIFVELapr = |VT(1) - AVEpr|

COMPUTE (UNAMBIGUOUS VELOCITY (Average Previous Radial))

$$UNAMBapr = NINT\left[\frac{AVEpr - VT(1)}{VNYQINT}\right] * VNYQINT + VT(1)$$

COMPUTE (RUNNING AVERAGE (Replaced Points))

$$RUNAVE = \frac{\sum_{k=1}^{NRP} VT(k)}{NRP}$$

COMPUTE (DIFFERENCE VELOCITY (Replaced Points))

DIFVELrpts = |VT(k) - RUNAVE |

COMPUTE (UNAMBIGUOUS VELOCITY (Replaced Points))

$$UNAMBrpts = NINT\left[\frac{VT(k) - RUNAVE}{VNYQINT}\right] * VNYQINT + VT(k)$$

where k is the array index pointing to the next velocity to be replaced.

COMPUTE (Jump Sense New)

JUMPnew = SIGN(VD(m) – VD(i))

where m is the array index pointing to the last sample bin with good velocity on the current radial and i is the array index pointing to the current sample bin. JUMPnew is 1 if the sign of the velocity difference is positive and -1 otherwise.

COMPUTE (UNAMBIGUOUS VELOCITY (Jump))

UNAMBjump = VD(i) – JUMPnew*VNYQINT

where i is the array index pointing to the current sample bin.

COMPUTE (Jump Sense Old)

JUMPold = SIGN(VD(i) – VD(m))

where m is the array index pointing to the last sample bin with good velocity on the current radial and i is the array index pointing to the current sample bin. JUMPold is 1 if the sign of the velocity difference is positive and -1 otherwise.

COMPUTE (Nyquist Folding Number)

$$NFN = - \frac{VD(i) - VPAZ(i)}{|VD(i) - VPAZ(i)|}$$

where i is the array index pointing to the current sample bin.

COMPUTE (VELOCITY (Reunfolded))

VDru(i) = VD(i) + NFN * VNYQINT

COMPUTE (SUM OF SQUARES (Reunfolded - Squared))

$$SSrusq = [VDru(i) - VPAZ(m)^2] + [VDru(i) - VD(m)]^2$$

where VPAZ(m) is the previous azimuth good velocity and VD(m) is the current azimuth good velocity.

COMPUTE (SUM OF SQUARES (Folded - Squared)

$$SSfsq = [VD(i) - VPAZ(m)^2] + [VD(i) - VD(m)]^2$$

where VPAZ(m) is the previous azimuth good velocity, and VD(m) is the current azimuth good velocity.

COMPUTE (UNAMBIGUOUS VELOCITY (Deleted))

$$UNAMBdel = NINT \frac{VD(m) - VDdel(i)}{VNYQINT} * VNYQINT + VDdel(i)$$

where i is the array index pointing to the current deleted sample bin, and m is the array index pointing to the nearest good velocity on the radial.