Appendix F: RAWINS

F.1 Source of Observations

- NMC operational global surface and upper-air observations subsets as archived by the Data Support Section (DSS) at NCAR.
  - Upper-air data: RAOBS (ADPUPA), in NMC ON29 format.
  - Surface data: NMC Surface ADP data, in NMC ON29 format.

NMC Office Note 29 can be found at:
http://www.emc.ncep.noaa.gov/mmb/papers/keyser/on29.htm.

F.2 Bogus Options

See examples in the appendices of the RAWINS/DATAGRID Tech Note.

KBOGUS: Change Existing Observations.
- Requires an additional input file, the KBOGUS file, called KBOG_REMOTE in your local working directory.

NBOGUS: Insert Station Reports.
- Requires an additional input file, the NBOGUS file, called NBOG_REMOTE in your local working directory.

NSELIM: Remove Station Reports.
- Uses NBOGUS file

AUTOGBOGUS: Subjective Examination of Suspect Data
- Gives the user maximum control over data removal.
- Two submittals of RAWINS are required.
- First submittal:
  - Screens the data (ERRMX check) and creates analyses.
  - Plots analyses with suspect observations overlaid (file AB.PLT).
  - Creates Autobogus file listing suspect observations (called AUBG_OUT in your local working directory).
- User Control:
  - Examine plots and the list of suspect observations.
  - Decide which of the suspect observations should be included in the final analyses.
  - Edit the Autobogus file AUBG_OUT (T,F,B).
- Second Submittal:
  - Reads the edited Autobogus file AUBG_OUT from your local working directory..
  - Creates a new analysis including all observations flagged T or B in the Autobogus file.

F.3 Script Variables

Submit 0 = Not an Autobogus submittal.
1 = First autobogus submittal.
2 = Second Autobogus submittal.

InObs ARCHIVE = use archived NMC observations.
UNIOBS = Obsolete option. Do not use.

SFCsw Flag to indicate whether surface observations are to be accessed (**SFCsw** = SFC, recommended) or not (**SFCsw** = NoSFC).

BOGUSsw Flag to indicate the type of bogus data to be used:
NoBOG: Not a bogus job.
Konly: kbogus data available (no nbogus).
Nonly: nbogus data available (no kbogus).
KandN: nbogus and kbogus data available.

InDatg Pathname for the REGRID output used as input to RAWINS.

InRaobs Pathname for the RAOB data (see ~mesouser/catalog/catalog.raob file; for pre-1984 cases, see ~mesouser/catalog/catalog.raob.1973-1985).

InSfc6h Pathname for the 6-hrly surface data and ship data (see ~mesouser/catalog/catalog.sfc, LIST A).

InSfc3h Pathname for the 3-hrly surface data (see ~mesouser/catalog/catalog.sfc, LIST B).

upa_unidate 8 digit date (YYMMDDHH) for upper-air data from Unidata. If more than one time period of data is to be input, **upa_unidate** may have more than one date.

sfc_unidate 8 digit date for surface data from Unidata. Like **upa_unidate**, **sfc_unidate** may have more than one date.

F.4 Parameters

IMX, JMX Must be equal to the I and J dimensions of the domain being processed. Must include expansion if the expanded grid is processed.

LMX Must be greater than or equal to the maximum number of levels (mandatory plus new plus surface).

IRB Must be greater than the number of rawinsonde reports which will be processed.

IRS Must be greater than **IRB** + the number of surface stations which will be processed.

F.5 Namelist Variables

NNEWPL Number of new pressure levels to interpolate to.

GNLVL The pressures at the new levels (bottom to top, mb).

IWTSCM Type of weighting scheme for objective analysis:
1 = Cressman (circular).
2 = Ellipse.
3 = Banana (recommended).
4 = Multiquadric (worth a try, but use with caution).

IWIND 1= Use the surface wind as output from REGRID for first guess.
2 = Use the 1000 mb wind as output from REGRID as the first guess.

UNIOBS T/F: Use Unidata observations (Obsolete. do not touch).

RWSUBM Same as script variable SUBMIT (do not touch).

IUINTVL Time interval of raob data in hours (should be 12).

ISFCS3 T/F: Use 3-hrly surface data (recommended).

ISFCS6 T/F: Use 6-hrly surface and ship data (recommended).

F4D T/F: Create a surface FDDA file.

INTF4D Time interval (hours) for FDDA output (either 3 or 6).

LAGTEM T: Use a 3 hour lag-time for FDDA first guess.

F: Use a first guess interpolated from the 12-hour surface first guesses for FDDA first guess.

NSELIM T/F: Specific raobs (Nbogus option) are to be deleted (one flag for each time). Flags refer to 12-hour intervals for non-FDDA jobs; Flags refer to INTF4D intervals for FDDA jobs.

NBOGUS T/F: Nbogus data are included (One flag for each time) Flags refer to 12-hour intervals for non-FDDA jobs; Flags refer to INTF4D intervals for FDDA jobs.

KBOGUS T/F: Kbogus data are included (One flag for each time) Flags refer to 12-hour intervals for non-FDDA jobs; Flags refer to INTF4D intervals for FDDA jobs.

BUDWGT Weighting factor for the BUDDY test.

ERRMXW Maximum difference allowed (m/s) for the ERRMX check for winds.

ERRMXT Maximum difference allowed (K) for the ERRMX check for temperature.

ERRMXP Maximum difference allowed (mb) for the ERRMX check for pressure.

IPLOT T/F: Plot the raobs (One flag for each time period).

ISKEWT Plot the raobs as skew-T (ISKEWT=1) or Stuve (ISKEWT=2) diagrams.

ISPRINT T/F Print surface input observations.

IFPRNT T/F Print out samples of analyses and first-guess.

F.6 How to Run RAWINS

1) Obtain the source code tar file from NCAR's ftp site:

ftp://ftp.ucar.edu/mesouser/MM5V3/RAWINS.TAR.gz

2) gunzip the file ("gunzip RAWINS.TAR.gz"), and untar it ("tar -xf RAWINS.TAR"). The directory RAWINS will be created.

3) Go to the RAWINS directory ("cd RAWINS"), create the RAWINS job deck by typing "make rawins.deck".

4) Edit rawins.deck for script options, input data location/file names, parameter statements and namelist values.

5) Make sure you have the required input files: REGRID_DOMAINx, and observations files from NCAR's archive. You may use fetch.job from the Templates/ directory to obtain observations files from NCAR's MSS.

6) Type "rawins.deck >& log" to compile and run the program.

7) Check files "log", and "rawins.print.out" for possible compile and run time errors. If the job is successful, you should at least obtain the RAWINS output file: RAWINS_DOMAINx.

More information can be found in README file in the RAWINS directory.

F.7 Check Your Output

Always check the printout returned by RAWINS. You should check for at least the following:

- The "STOP 99999" print statement is the signal that RAWINS completed without crashing. This does not necessarily mean, however, that RAWINS did what you expected it to.
- Print statements soon after rawins.exe has begun executing echo many of the settings from your namelist, describe the files that are read, and describe what RAWINS expects to do.
- Number of stations found. Check to see if this number is reasonable for your area of interest.
- "DATA REMOVED BY ..." will list the data points which have been removed in the analysis procedure by the ERRMAX check and the BUDDY check.

F.8 RAWINS didn't Work! What Went Wrong?

Various problems may cause RAWINS to crash. Careful examination of the printout will often reveal the problem and the solution. Some common problems:

- Read past end-of-file: Check all the input filenames to make sure that the proper files were read. Double-check that the original files are the right ones.
- Double-check parameter settings. Remember the expanded dimensions if you used an expanded domain for TERRAIN and REGRID.
- "REPORT TYPE IRTYP = ### NOT KNOWN. STOPPING": The most likely problem is that observations input files have not been correctly specified. Check that the InRaobs script variable refers to an upper-air observation file, and that the InSfc6h and InSfc3h script variables refer to files from list A and B respectively from the catalog.sfc file.
- RAWINS gets confused if the PTOP value (top pressure level, specified in REGRID) is lower than (i.e., higher up in the atmosphere than) 50 mb.
- RAWINS is currently limited to processing 50 time periods in one submittal.

F.9 RAWINS Files and Unit Numbers

RAWINS reads and writes to and from a number of different files. RAWINS acesses most files by referring to the fortran unit numbers Unit numbers are assigned as follows:

Table 6.1 File names, fortran unit numbers and their description for RAWINS.

File name	Unit number	Description
REGRID_DOMAINx	fort.4	First-Guess fields output from REGRID (input)
rawins.namelist	fort.14	namelist for user options (input)
raobsA, B, etc.	fort.15, 16, etc.	Input upper-air observations
sfc3hrA, B, etc.	fort.20, 21, etc.	Input 3-hourly surface observations
sfc6hrA, B, etc.	fort.25, 26, etc.	Input 6-hourly surface observations
shpvolA, B, etc	fort.30, 31, etc.	Input ship and bouy observations
autobog	fort.10	Input autobogus list as edited by user
kbogus	fort.12	Input kbogus list
nbogus	fort.13	Input nbogus list

File name	Unit number	Description
RAWINS_DOMAINx	fort.2	Main output file: Analyzed fields
RAWOBS_DOMAINx	fort.11	Upper-air observations as read by RAWINS (output)
UPR4DOBS_DOMAINx	fort.61	Upper-air observations processed by RAWINS (output)
SFCFDDA_DOMAINx	fort.39	Output surface analyses for FDDA
rawab.out	fort.40	Output autobogus list of suspect stations
SFC4DOBS_DOMAINx	fort.60	Surface observations processed by RAWINS (output)

F.10 NBOGUS example

In the following example, the following namelist options are assumed:

RAWINS Settings:

F4D	=	T
INTF4D	=	6
NBOGUS	=	T, F, T, T, F

Sample NBOGUS file:

```
                1994-01-26_00:00 00001  1  4   40.20 -103.20
          1000.0   99999.0   99999.0   99999.0   99999.0   99999.0
           850.0    1441.2       6.0       2.7     100.1      14.2
           700.0    3011.3      -2.5      10.2     184.6      13.8
           500.0    5599.8     -19.8      15.0     192.6       9.3
                1994-01-26_00:00 00001 -1  2   40.20 -103.20
           852.0    1422.0       5.3       2.0      99.2       5.8
           795.0    1988.6       5.0       0.9     143.8      15.5
                1994-01-26_00:00 00002  1  5   41.20 -103.70
          1000.0   99999.0   99999.0   99999.0   99999.0   99999.0
           850.0   99999.0   99999.0   99999.0   99999.0   99999.0
           700.0    3020.7      -2.8      11.1   99999.0   99999.0
           500.0    5602.4     -20.8      14.1   99999.0   99999.0
           400.0    7204.8     -34.7       6.2   99999.0   99999.0
                1994-01-26_00:00 00002 -1  3   41.20 -103.70
           844.5    1501.0       6.2       2.3   99999.0   99999.0
           780.0    2152.1       4.0      11.1   99999.0   99999.0
           685.0    3192.0      -3.5      16.6   99999.0   99999.0
                999
                888
                1994-01-26_00:12 00001  1  4   40.20 -103.20
          1000.0   99999.0   99999.0   99999.0   99999.0   99999.0
           850.0   99999.0   99999.0   99999.0   99999.0   99999.0
           700.0    2909.9      -8.8       1.2     111.3      14.9
           500.0    5467.3     -21.5       4.4      74.0      24.3
                1994-01-26_00:12 00001 -1  1   40.20 -103.20
         99999.0   99999.0   99999.0   99999.0   99999.0   99999.0
                999
                888
                1994-01-26_00:18 00002          41.20 -103.70
           841.4                -7.3       0.9      68.7       4.2
                1994-01-26_00:18 00003          41.60 -104.80
           812.4                -5.9       0.7      26.1       2.6
                888
```

The fields in the station header records are date, station number, integer flag for mandatory (1) or significant (-1) levels, number of levels, latitude, and longitude. The fields in the data records are pressure (mb), height (m), temperature (^{o}C), dewpoint depression (^{o}C), wind direction (degrees from North), wind speed (m s^{-1}).

Note that since Version 3, the date format used in nbogus and kbogus files have been changed to use character*16 format. The format for nbogus file has been changed to

```
10     FORMAT(22X,A16,1X,A5,2I3,2F8.2)
```

for upper-air data (mandatory and significant levels), and for surface

```
10     FORMAT(22X,A16,1X,A5,6X,2F7.1)
```

F.11 NBOGUS Notes:

- See Appendix D of the DATAGRID/RAWINS document for further details. Note though the format for dates have been changed (see previous page).
- The NBOGUS file is a read with formatted read statements. Any misplaced numbers are likely to cause RAWINS to fail, or worse, to misinterpret the NBOGUS file without failing. It is thus extremely important to carefully examine the RAWINS output for an NBOGUS submittal.
- Mandatory and significant-level data from a given upper-air report are separated.
- Mandatory levels below ground are filled with 99999.0
- For an upper-air report with mandatory-level data only, insert one significant level with all fields filled with 99999.0 With significant-level data only, insert two mandatory-level records will all fields set to 99999.0
- Namelist variable NBOGUS refers to ITIMINT hourly intervals if F4D option is not used. NBOGUS refers to INTF4D hourly intervals if F4D option is used.
- For times when NBOGUS is false, no information is included in the NBOGUS file (not even the 888 and 999 lines discussed in the following two items).
- 999 in the date column denotes the end of upper-air data for a particular time.
- 888 in the date column denotes the end of surface data for a particular time.
- If no surface data are available, a line with 888 in the date column immediately follows the line with 999 in the date column.
- For times when upper-air data would normally be expected, but there are only surface bogus reports, inlude a line with 999 in the date column before starting with the surface reports.
- For times when no upper-air data are expected, start with the surface data (without inserting a line with 999 in the date column).

F.12 KBOGUS Notes:

The format of KBOGUS data in V3 RAWINS is

```
40     FORMAT(I4,I2,1X,A8,1X,F7.1,1X,F7.1,4(1X,F7.1),2X,I2,4X,A16)
```

Note the format for the date has been changed from ‘I8’ to ‘A16’.