# Computer Data Logging Formats

**Recording Formats - General Information**

After many years the first SARA data recording format was agreed upon at the 1991 conference. This article is intended to record the characteristics of various formats such that reviewing old computer data will be simplified.

You do not have to store your data in the current format, but if you share data with other members you should write a translator program to put the data in the required format. If you are writing your own logging or plotting programs, this should not be difficult. If you develop a new format, be sure to take the time to describe the format in detail.

Most formats will only handle simple drift scan type recordings, this is the equivalent of chart recordings. More complex formats can be developed using the SARA 1991 format as a base.

The SARA1991 header on the file tells what format to expect the data that follows. The header ID should be protected as a "key" to the format that follows.

I suggest that all data be stored in ASCII text files. This is inefficient but a simple way to examine data. The use of Pkzip, Stuffit and other file compression programs will allow the transfer of data in an efficient manner. When transferring data via modem do not confuse ASCII text data with the ASCII text file transfer method. Use XModem or the equivalent to transfer your ASCII text file.

Data when shared via floppy disk can be sent on any format compatible with the persons sharing data. An Ms-DOS 1.44 meg format is suggested. For Macintosh users having the 1.44 meg disk drive, reading and writing the Ms-DOS floppy should be no problem.

It is important to set your computer clock to GMT time and read the clock to determine when to save a sample. This prevents cumulative errors that occur if a timing loop is used to select samples. Putting data points in a range of 0 to +32767 gives adequate resolution and is within the range of integer values for most computer languages.

**SARA 1991 Format**

The format on the disk file is as described below.  Each element of data is stored in the text file with a CR and LF appended at the end of each line of data.  I noticed that Mac text files when read into MS-DOS machines have CR but not LF so you Mac programmers add the extra LF to help out the MS-DOS people.

Line 1 - Contains the text **SARA1991** to tell the file reader what format to expect.  Use only upper case letters.

Line 2 to 11 - Each line may contain up to 255 characters, upper or lower case.  Line 2 should be equipment description, line 3 antenna description and line 4 the observer's name and  address.  Lines 5 to 11 are at your choice.  If you do not have an entry for these lines I suggest you enter the word **Blank**.

Line 12 - Contains the year the data logging **started**.  Use **1991** as the entry.  Remember all dates and times are GMT time.  A hint is the set the system clock on your computer to GMT time and listen to WWV on 5, 10, 15, 20 or 25 MHz for time synchronization tones.  Radio Shack makes an inexpensive WWV receiver.

Line 13 - Contains the month the data logging **started**.  Use **1 to 12** as the entry.

Line 14 - Contains the day the data logging **started**.  Use **1 to 31** as the entry.

Line 15 - Contains the hour the data logging **started**.  Use **0 to 24** as the entry.

Line 16 - Contains the minute the data logging **started**.  Use **0 to 60** as the entry.

Line 17 - Contains the second the data logging **started**.  Use **0 to 60** as the entry.

Line 18 - Contains the year the data logging **ended**.  Use **1991** as the entry for this year.

Line 19 - Contains the month the data logging **ended**.  Use **1 to 12** as the entry.

Line 20 - Contains the day the data logging **ended**.  Use **1 to 31** as the entry.

Line 21 - Contains the hour the data logging **ended**.  Use **0 to 24** as the entry.

Line 22 - Contains the minute the data logging **ended**.  Use **0 to 60** as the entry.

Line 23 - Contains the second the data logging **ended**.  Use **0 to 60** as the entry.

Line 24 - Contains the elevation above **your** horizon that the antenna is pointed.  Typical values are 0 degrees for an antenna aiming to the South horizon, 90 for straight up and 180 degrees if aimed back over to the North horizon.  This assumes the azimuth of the antenna is 180 degrees for South.  It also assumes an Azimuth/Elevation or Transit mount.  A suggestion is to purchase a rotary protractor at your local hardware store and read the settings directly.  Enter 9999 if you do not chose to include this data.

Line 25 - Contains the azimuth that **your** antenna is pointed.  Typical values are 0 degrees for an antenna aiming to the North, 180 if pointing to the South and 270 degrees if aimed to the West.  This assumes an Azimuth/Elevation or Transit mount.  Enter 9999 if you do not chose to include this data.

Line 26 - Contains the Right Ascension of the source or where your antenna is pointed if it is a polar mount.  Enter the RA hours and minutes as four integers such as **HHMM.**  Do not use a colon.  Enter 9999 if you do not chose to include this data.

Line 27 - Contains the Declination of the source or where your antenna is pointed if it is a polar mount.  Enter the Dec hours and minutes as four integers such as **HHMM.**  Do not use a colon.  Enter 9999 if you do not chose to include this data.

Line 24-27 Assumes the antenna is fixed and you are using a drift scan at the 15 degrees per hour rotation of the earth.  Make sure you enter data on at least lines 24/25 or on lines 26/27.  **A simple conversion table or program to convert from one format to the other is a good project for our computer hackers in the group.**

Line 28 - Contains the decimal value of the antenna site longitude multiplied by 100.  This is for the fellows programming in integer math.  If you are located at 89 degrees, 20 minutes, 40 seconds the location is expressed as 89:20:40.  the decimal equivalent is =

```
        Degrees                89.00
        Minutes                  .3           (20/60)
        Seconds                  .017         (40/3600)
                               ------
                               89.311
                     times 100
                               ------
                               8931          integer value stored
```

Line 29 - Contains the upper case letter **E** or **W** for east or west longitude.

Line 30 - Contains the decimal value of the antenna site latitude multiplied by 100.  Same as for longitude.

Line 31 - Contains the upper case letter **N** or **S** for north or south latitude.

Line 32 - Contains the observation frequency as an integer value in MHz.  Observations at 775.5 MHz would be entered as **775**.

Line 33 - Contains the time in hundreds of a second between samples shown in the record below.  If you stored data values at one second intervals, enter **100** on this line.

Line 34 - Your recording system has a given time constant due to capacitors and resistors in the circuitry.  Usually this is in the range of 1 to 60 seconds.  Note the integration period as an integer value of the number of seconds times ten (10).  A 0.5 second integration period would be entered as **5.**

Line 35 - Contains an integer number noting the number of data point values to follow.  Try to limit data points to 32,767 or less for this format.  Actually less than 4000 points is better.

Line 36 on - Record each data point.  Do not use negative numbers and limit integer values between **0 and 32767**.  Values should not include commas for number greater than 999.

If your digitizer outputs values from -128 to +128 simply add at least 128 to each value before storing on the data file.  All data is in integer values, no commas, no decimal points.

## A Look At A Sample Data File - SARA1991 Format

This is what a typical file will look like if you pull it into your word processor or editor.

SARA1991
NRAO Observation equipment
40 Foot telescope at NRAO
Chuck Forster, Oregon, WI
This was an observation recorded
at NRAO during the 1990
SARA conference.  The source is Cass-A
This was a vertical sweep and not a drift scan
That is why the pass time is only 70.5 seconds
Blank
Blank
1990
6
13
11
19
48
1990
6
13
11
20
59
110
180
2323
5850
7984
W
3844
N
1420
500
100
141
174

**Revision for SARA Format**

The proposed format produces a file that is simpler to record using computer techniques, easier to understand and more accurate.

Line 1 contains the text SARA1992, this is the format version
Line 2 to 11 contains a description of the observatory
Line 12 is the elevation of the antenna above your horizon  = 47
Line 13 is the azimuth of the antenna, usually 180 degrees
Line 14 is your longitude times 100 i.e.. 89.45 = 8945
Line 15 is your longitude direction E or W
Line 16 is your latitude times 100 i.e.. 45.47 = 4547
Line 17 is your latitude direction N or S
Line 18 is the observation frequency in MHz as an integer i.e. 600
Line 19 is the seconds per sample
Line 20 is the milliseconds of integration in your detector as an integer
The following lines are the recorded data values separated by commas
  Hour,Minute,Second,CodedDayofYear,Decl,RA,RecordedValue
  23,4,5,2004,-5,217500,2171
  (RA is in decimal hours times 10,000 i.e. 217500 is 21 hours 45 minutes)

A new term is introduced in this format.  I use CodedDayOfYear.  This is the day of the year plus 1000 for 1991, or plus 3000 for 1993.  The third day of January 1994 would be 4003.

The GMT time is read directly from the computer clock, if you set the clock for GMT time.

This is what a typical file will look like if you pull it into your word processor or editor.

*SARA1992*
*This is data from C. Forster (608) 835-9282*
*The data is from a 12 ft. and 16 foot dish interferometer spaced 50 ft*
*The recording frequency was 775 MHz*
*Mast head preamps were used at each feed antenna*
*The feed antenna was a three element yagi*
*This is line 7 data*
*This is line 8 data*
*This is line 9 data*
*This is line 10 data*
*This is line 11 data*
*This is line 12 data*
*47*
*180*
*8943*
*E*
*4297*
*N*
*775*
*10*
*1000*
*21,50,10,3086,0,41628,+01341*
*21,50,20,3086,0,41655,+01324*
*21,50,31,3086,0,41686,+01320*
*21,50,40,3086,0,41711,+01328*
*21,50,50,3086,0,41739,+01307*
*21,51,0,3086,0,41767,+01325*