Sonde 0.0.1 ©2013 Black Cat Systems, All Rights Reserved

Sonde demodulates and decodes Mark IIa Radiosonde transmissions. These radiosondes are launched twice a day by the National Weather Service, typically an hour or two prior to 0000 UTC and 1200 UTC. Transmissions are on one of four frequencies, 1676, 1678, 1680, and 1682 MHz.

To decode these transmissions, you must feed the audio from your radio's wide FM discriminator tap to your computer's line level input. Sonde can also process recorded audio, which must be a 48000 Hz sample rate, 16 bit, monophonic WAVE file.

After launching Sonde, the first step is to configure it. Select Config from the File menu.

The sound input channel is selected from the popup menu at the top.

Next set your location, latitude and longitude should be entered as decimal degrees, north and east are positive, south and west are negative. For example 39.5 for 39 degrees 30 minutes north.

Next enter your altitude in meters.

Max range can be entered in kilometers, it is optionally used to reject potentially corrupted radiosonde packets with a GPS location outside this range.

Display PSU Data can be checked to display raw sensor data

Display Calibration Data can be checked to display the radiosonde packet hex bytes that are presumed to contain calibration data for the sensors. This data is not used by Sonde.

Click OK to save your changes

Back to the main Sonde window, there are some settings on the lower right part of the window:

The Record button can be toggled to save decoded packets to a text file. The text file name will be a timestamp with .txt appended to it if processing live audio, or if processing aWAVE file, the name of the file with .txt appended to it.

Invert can be toggled to invert the polarity of the audio. It is sometimes needed depending on your setup and the demodulation mode used.
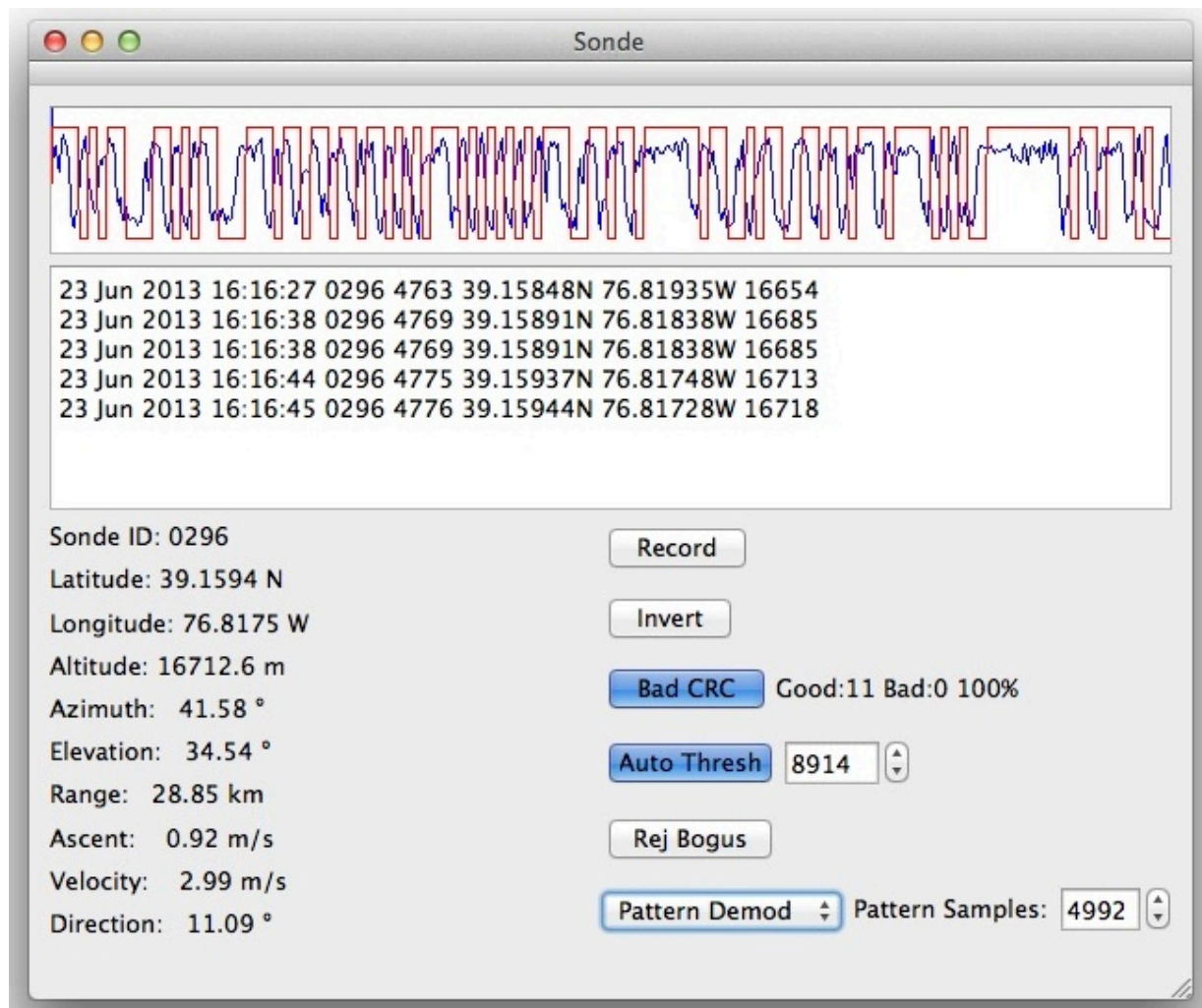
Bad CRC can be toggled on to display packets that fail the CRC (checksum). This allows for display of data under poor reception conditions, but will likely result in garbage output for some fields as well.

Auto Thresh can be toggled on to have Sonde automatically compute the threshold used to identify data bit transitions in Edge and Level demod modes. The threshold value (in sampled sound amplitude values, which range from +/-32767) is displayed in the combo box ro the right. Alternately, you can turn off this feature, and manually set the threshold.

Rej Bogus can be toggled on to ignore data packets that are obviously bad, such as those with a negative altitude, GPS locations with a latitude outside the +/-90 degree range or longitude outside the +/-180 degree range, or GPS locations outside the Max range set in Config, relative to your location.

Finally the demodulation method is selected. Presently there are three methods:
1. Edge Demod - Transitions in the audio level are used to detect edges between series of 0 or 1 data bits.
2. Level Demod - The audio level it used to determine whether a 0 or 1 bit is being received.
3. Pattern Demod - A brute force demodulation is done on the audio samples, shifting them through one sample at a time, looking for a valid series of start of packet bytes as well as a valid CRC. While computationally intensive, this is by far the best demodulation method, producing twice as many decoded packets at the others, based on my tests. One value must be set, Pattern Samples, which determines the spacing between data bits in the audio data. While I find that the default value of 4992 (which actually means 4.992 audio samples per bit) works best, this may need to be adjusted due to sound card sampling rate errors.

The above window shows the app running. The top display shows the audio (blue trace) as well as data bits (red trace). Below that is the decoded text. Each packet is timestamped in UTC time. Following the timestamp is the radiosonde ID, which is 4 hex digits. Then the number of seconds since power up of the radiosonde is displayed. Following that is the location, longitude and latitude as well as altitude in meters.

If the PSU data or Calibration data options are checked, additional data is displayed on each line.