

N3FG PRESENTS



**Precise Frequency
Measurement With
Simple Equipment**

It is possible to measure off-the-air signals to a small fraction of a cycle with the equipment available to most hams.

Several times a year the ARRL runs an on-the-air “Frequency Measuring Test” or FMT.

See page 90 in the March issue of QST for details on a typical ARRL FMT or search K5CM for details and how-to-do-it info.

K5CM, W6OQI, W8KSE, W6ZTY
and others run FMT's more often.
They even run FMT's for the ARRL.

The technique that I use requires a stable receiver with a digital display and a method of accurately measuring the audio frequency from the receiver.

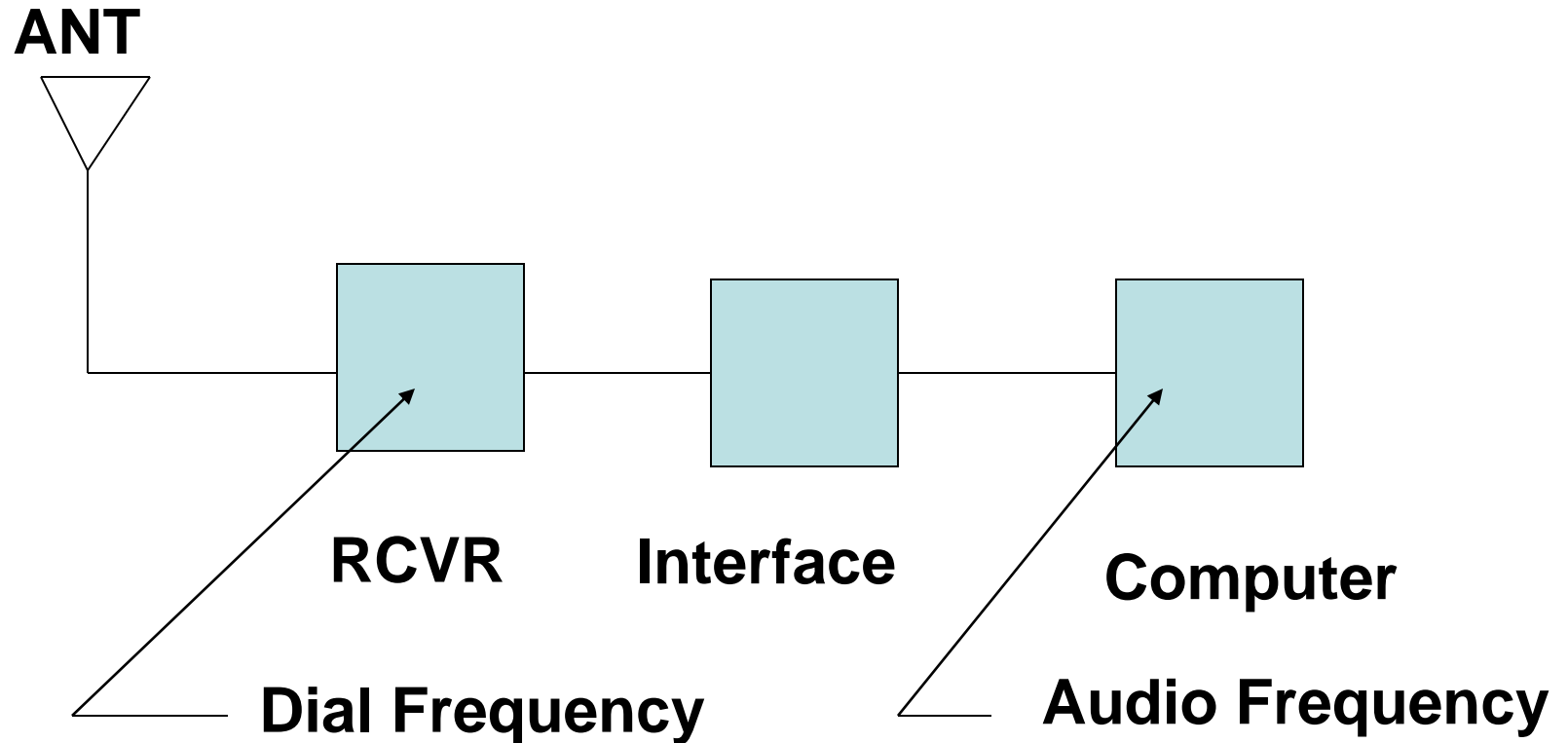
The audio frequency is most easily measured with an audio spectrum analysis program running on a PC.

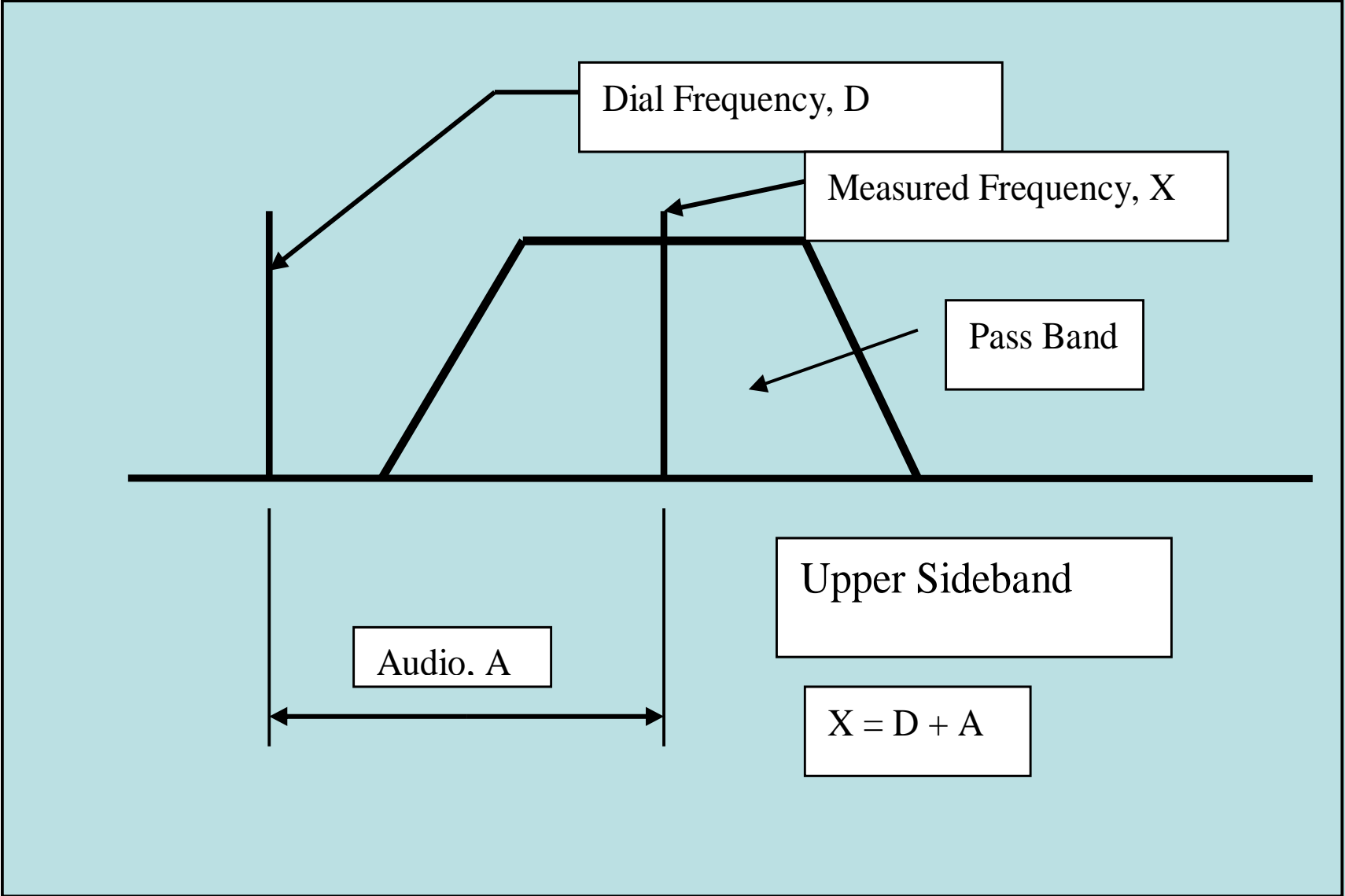
Presently I use:

- **A stock IC-7200 transceiver**
- **Signalink USB interface**
- **DELL Inspiron PC**
- **Spectran Software**

I have also used an IC-706 with the CR-282 high stability crystal oscillator option.

Setup for frequency measurements.





CW Mode

Dial, Fd

Unknown, Fm

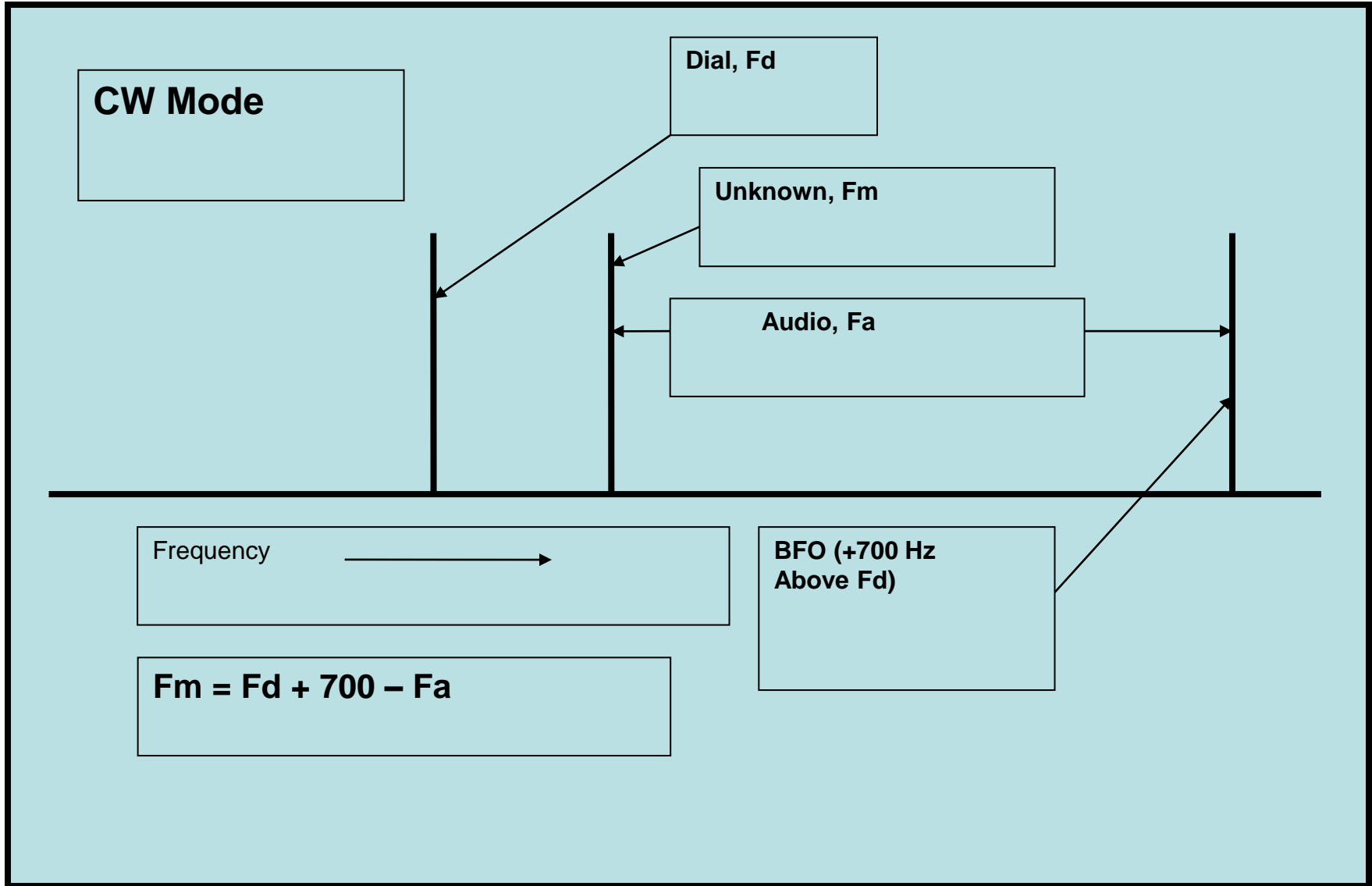
Audio, Fa

Frequency



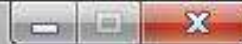
$$F_m = F_d + 700 - F_a$$

**BFO (+700 Hz
Above Fd)**



There are two audio spectrum analysis programs available on the internet for free. Either of these will enable one to measure the frequency of an audio signal to a hundredth of a cycle or better.

- Spectrum Laboratory – the more sophisticated of the two and the one used by many of the more experienced FMT participants. It has a rather steep learning curve.**
- Spectran – this is the one I have been using with pretty good results. It is much simpler to use, but lacks some of the bells and whistles available in Spectrum Lab.**



Spectran Setup Mode Palette Filters Capture About

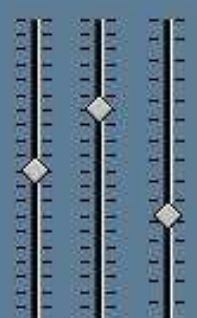
1:39:57 PM

3/23/2011

Record

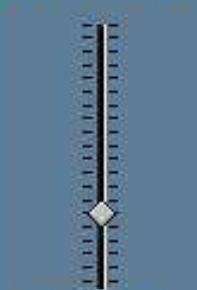
Mouse : 696.5 Hz

Ticks : 1 10 30 60 seconds

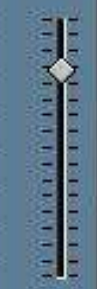
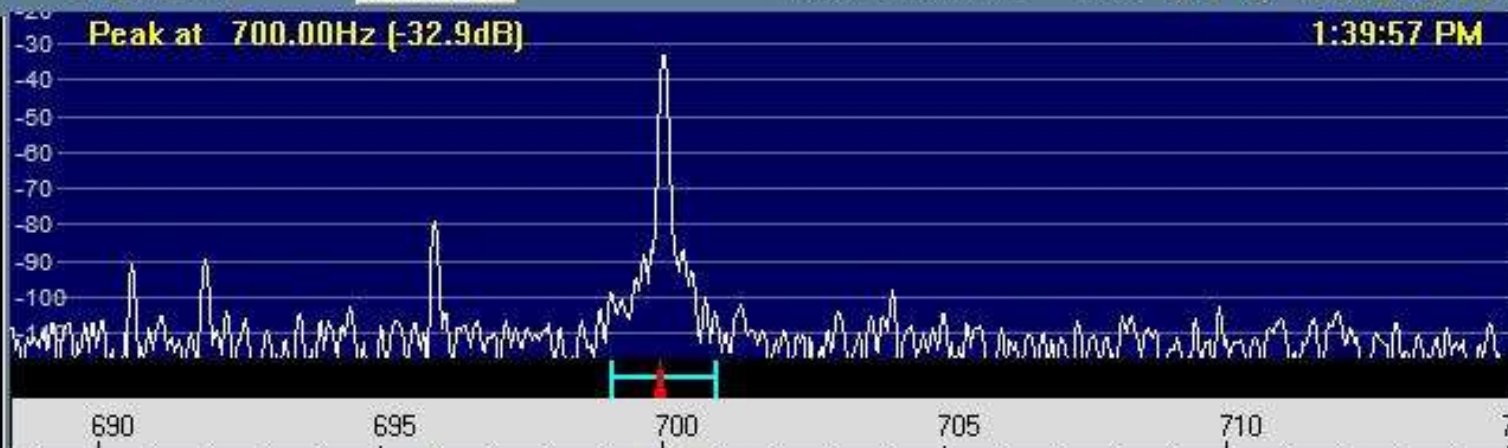


Vol Gain Speed

- Average
- Humid
- Denoiser
- BandPass
- BandRej.
- CW Peak
- Auto brig.
- PassThru



Contrast Freeze



Base Hz



PROCEDURE:

Warm up the gear for several hours.

Keep room temperature constant.

Calibrate the system using a frequency reference such as WWV or CHU. Use the one closest in frequency and physical location to the signal source being measured. This helps to eliminate the effects of doppler shift in the atmosphere.

WWV in Fort Collins, Colorado is available on: 2.5, 5, 10, 15, 20, 25 MHz.

CHU in Ontario, Canada is available on: 3.33, 7.850, and 14.670 MHz.

CORRECTION FACTOR:

Assume that I tune to WWV at 5 MHz using the CW method and I get an audio tone of 700.15 Hz (ideally I should get 700.00 Hz). This would put me 0.15 Hz too low in frequency when I ran the calculations. Thus I need a correction factor of +0.15 Hz. This correction factor accounts for all the errors in my equipment and signal path (doppler).

THAT IS ALL FOLKS.

DE N3FG SK