

## Using Fldigi For Rig Calibration and Frequency Measurement

You should already have Fldigi set up for your rig and computer sound card. Have your rig and computer connected via USB/serial cable so you can see the rig's frequency in the Fldigi frequency window. Connect your rig headphone output to the computer line/mic input. Warm up your rig and computer for at least three hours.

### 1. Macros

You need to create two macros in Fldigi to turn data collection on and off. To create a macro, right click on a blank macro button and the macro editor will open.

The first macro starts data collection. Enter **<CSV:on>** in the "Macro text" window. Enter **CSV On** in the "Macro Button Label" window and hit "Apply" then hit **Close**.

The second macro stops data collection. Right click on another blank macro button to open the macro editor. Enter **<CSV:off>** in the "Macro text" window. Enter **CSV Off** in the "Macro Button Label" window and hit "Apply"

Hit **Close** to close the macro editor. In the Fldigi menu, select **File – Macros – Save** and when the next window appears, hit **Save** then hit **Replace** in the next window.

### 2. Computer Calibration

a. Select **Op Mode – WWV**

b. Select **View – Floating Scope**. The Scope window will detach. Use your mouse to extend the Scope so it spans the full height of your computer screen. You'll want it to be tall and narrow. If your rig is connected and turned on, you should see a waterfall slowly filling the Scope window.

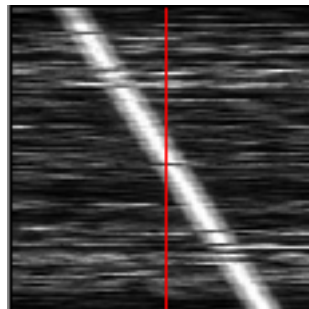
c. Put your rig in AM mode and tune to a strong WWV signal. Using your mouse, move the bandpass on the main Fldigi waterfall window so the WWV signal is centered. You should now see a narrow white line appearing in the Scope window. Left click on the white line to center the white line in the Scope window, then right click anywhere in the Scope window to increase resolution. The white line should now be thick.

d. In the Fldigi main menu, select **Configure – Sound Card** and when the Sound Card configuration window opens, select **Audio – Settings**. Keep this window open while calibrating your computer, and move it out of the way so you can see Fldigi and the Scope window.

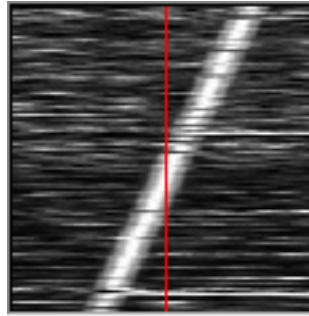
e. Let WWV run for several minutes. You should see the thick white line develop a slope, either to the right or left. Your goal is to make the line perfectly vertical.

f. If the line slopes to the left:

You need to add positive correction (+ numbers) to **RX ppm** in the **Audio – Settings** window.




- g. If the line slopes to the right:  
You need to add negative correction (- numbers) to **RX ppm** in the **Audio – Settings** window.



- h. Add corrections a little at a time (e.g. 10 ppm) and see what happens to the slope of the line. This will take a while. You can re-center the white line by left clicking on it. When you think the line is vertical, let WWV run for about an hour to check.
- i. When the line is vertical, hit **Save** and **Close** in the **Audio – Settings** window to save your changes.

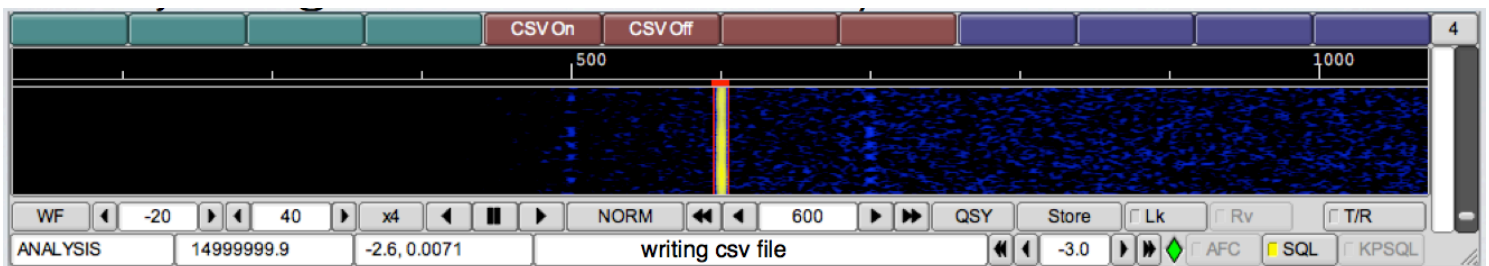
### 3. Rig Calibration

- a. To calibrate your rig, you'll use Fldigi to measure the frequency of WWV and create a spreadsheet showing frequency error.
- b. Select **Op Mode – Frequency Analysis**.
- c. Put your rig in USB mode and tune to WWV, then tune 600 Hz below. e.g., For the 15 MHz WWV signal, tune to 14,999.94 MHz. You should hear a strong tone and see a bright line in the main Fldigi waterfall at about 600 Hz. Use your mouse to put the Fldigi cursor on the signal. Hit the  button on the bottom of the Fldigi screen (below the waterfall) to center the display. If you hover your cursor over the various buttons, you'll see a help window pop up. The centering button pop up is "Center display on signal."
- d. Hit the x1 button on the bottom of the Fldigi screen repeatedly until it changes to x4. This increases resolution of the display.
- e. If your rig is connected properly, you should see a frequency displayed at the bottom of the Fldigi screen. This frequency is the actual frequency your rig thinks WWV is at – it takes the 600 Hz offset into account.
- f. Using your rig's calibration procedure, adjust your rig's calibration so the Fldigi frequency at the bottom of the screen is as close as possible to the WWV frequency. The white line on the waterfall will be centered very close to 600 Hz. Note: you will not be able to calibrate to the exact frequency of WWV. There is small drift all the time, and your rig calibration probably has a minimum step size of 1 Hz. In the next section, you'll calculate your error.

### 4. Error Calculation

- a. Go to the folder where Fldigi creates spreadsheets. On the Fldigi main menu, hit **File – Folders – Fldigi Config**. A new Finder window will open up. Locate the **temp** folder and open it. When you collect data, Fldigi creates a file called

- analysis.csv** in this folder, and every time you start new data collection, the old **analysis.csv** file is deleted and a new one is created.
- While monitoring WWV in the Frequency Analysis mode, hit the **CSV On** macro button. You'll see a label "writing csv file" at the bottom of Fldigi. Collect about two minutes of data and hit the **CSV Off** macro button. You should now see the **analysis.csv** file in the **temp** folder.
  - Open the analysis.csv file with your spreadsheet program. The **Error** column shows the deviation from WWV every second. Use your spreadsheet program to compute the average error and graph the readings to show drift. If the average error is more than about half a hertz, try adjusting your rig's calibration to get it lower – you may not be able to.
  - Tune to every other WWV and CHU frequency (-600 Hz) and repeat the data collection and error calculation, but do not adjust your rig any more – just compute average error on each frequency and graph them for a record. Remember that your previous **analysis.csv** file is deleted when you start a new data collection, so save your spreadsheet to a new location so it is not deleted.
  - Fldigi in Frequency Analysis mode while collecting data should look like:



Macro buttons created.  
 Cursor and signal at 600 Hz.  
 Analysis mode.  
 Frequency almost at 15 MHz (WWV)  
 Writing csv file.  
 x4 resolution.