

Setting UP the UMI-1 with True RTA

PC based test gear or single purpose device?

Is there an easier way? Sure. There are lots of options for a single purpose device that will allow you to make frequency response measurements of audio systems. The benefit of a closed system (a hand-held) is that it's already calibrated. You turn it on and you're ready to go. That's an attractive option, but it often comes at a much higher cost.

The benefit of using a PC is that the software available is often much more powerful and can display the information in several formats. Once you have some experience, you'll find that being able to store and analyze measurements is a valuable feature, especially if tuning audio systems is part of your profession.

We've designed this kit to be a convenient way to get all the parts you need to make accurate frequency response measurements of car audio systems without the hassle of figuring out what to buy, how it works together and how to calibrate all of it for use with your favorite analysis program.

How this works.

Another benefit of PC test gear is that instead of the accuracy of measurements being dependent on the perfect accuracy of a microphone or a soundcard, we can use the processing power of the PC to remove the frequency response of our test rig and to compensate for the frequency response of the microphone, so long as we know what that frequency response is. That's what the microphone calibration file is for.

If you follow these instructions, you'll be able to make frequency response measurements that are just as accurate as the ones you might make with a lab-grade measurement tool costing much more.

In True RTA's instructions for calibrating the sound system, they suggest not to do this unless you will use True RTA's internal signal generator. We disagree. Please calibrate the sound system before using the UMI-1. The frequency response of the sound card that's included should be removed from the measurement. Using a calibration routine, you'll make a measurement of the sound card with its input connected directly to its output. Then, the program will store that measurement as a "calibration" file and subtract that frequency response from every measurement you make. If you perform the calibration correctly, your measurements will be super accurate.

The frequency response of the microphone can also be removed from the measurement in the same way. True RTA provides a way to store the frequency response curve of the microphone (your calibration file) and also subtract it from each measurement you make.

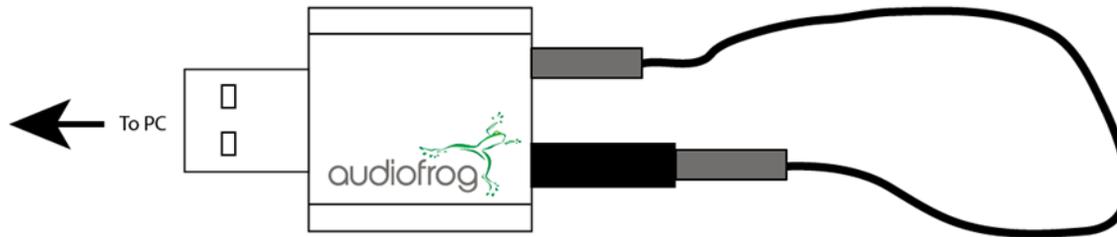
So, if accuracy is important, then it's a good idea to follow these instructions to set up your kit. You'll only have to do this once.

NOTE: This process will not calibrate the ACTUAL SPL readings you'll make with your kit. The graph will show an accurate frequency response shape, but the actual SPL level won't be correct. For that, there is a second process that we will describe in a second document. Usually, when tuning cars, we are more interested in the frequency response shape and the relative levels between channels and speakers. Accuracy of those aspects is assured by this process, even if the absolute level is incorrect.

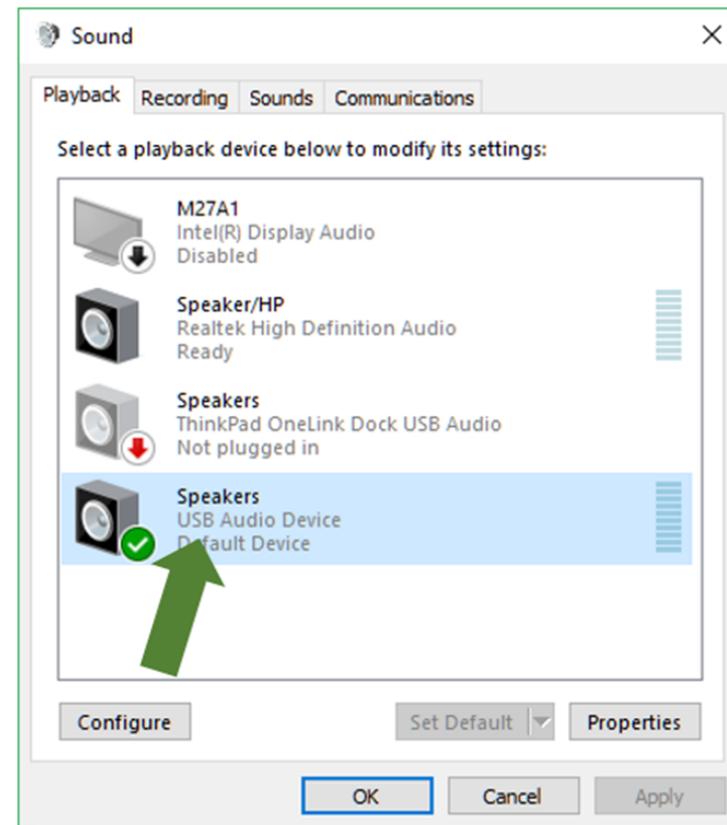


Step 1. Download True RTA (Level 3 or Level 4) at https://www.trueaudio.com/rta_down.htm and follow the instructions to install the program.

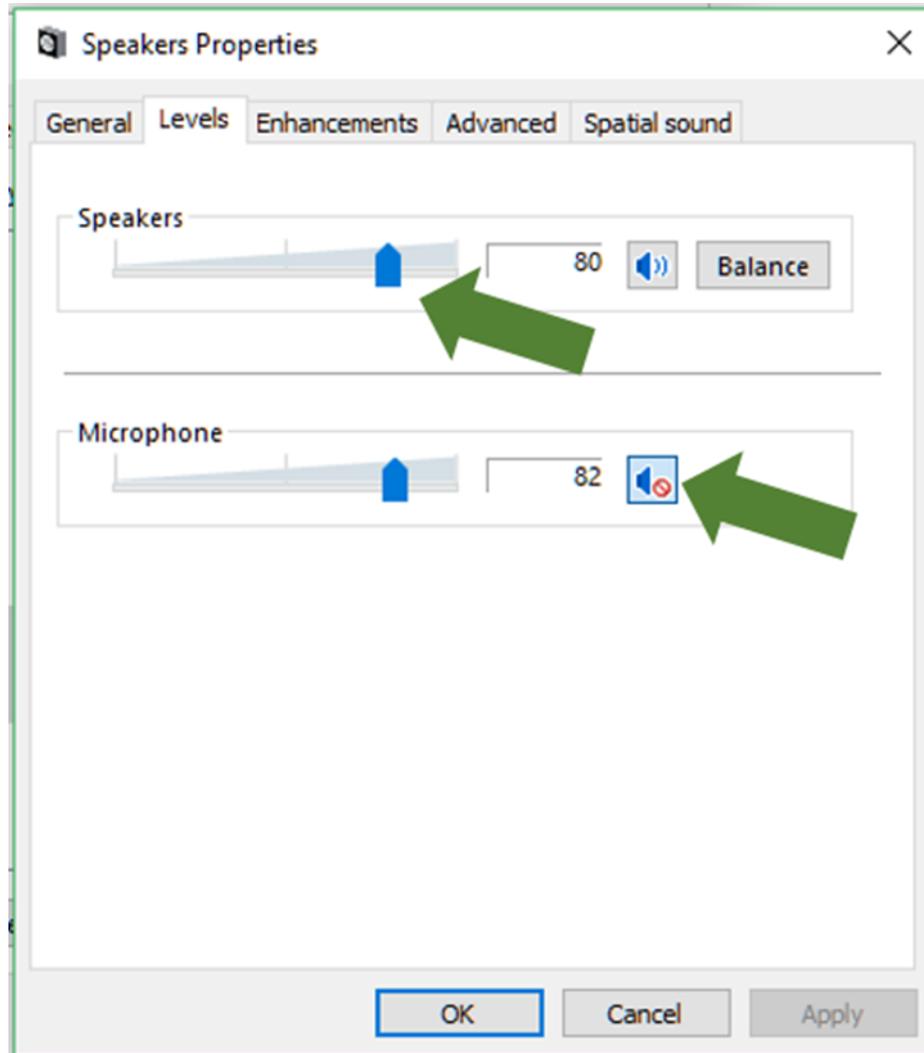
Step 2. Using the extension cable and the 3.5mm male to male adapter, plug the soundcard input into its output. Plug the soundcard in to an open USB port on your PC.



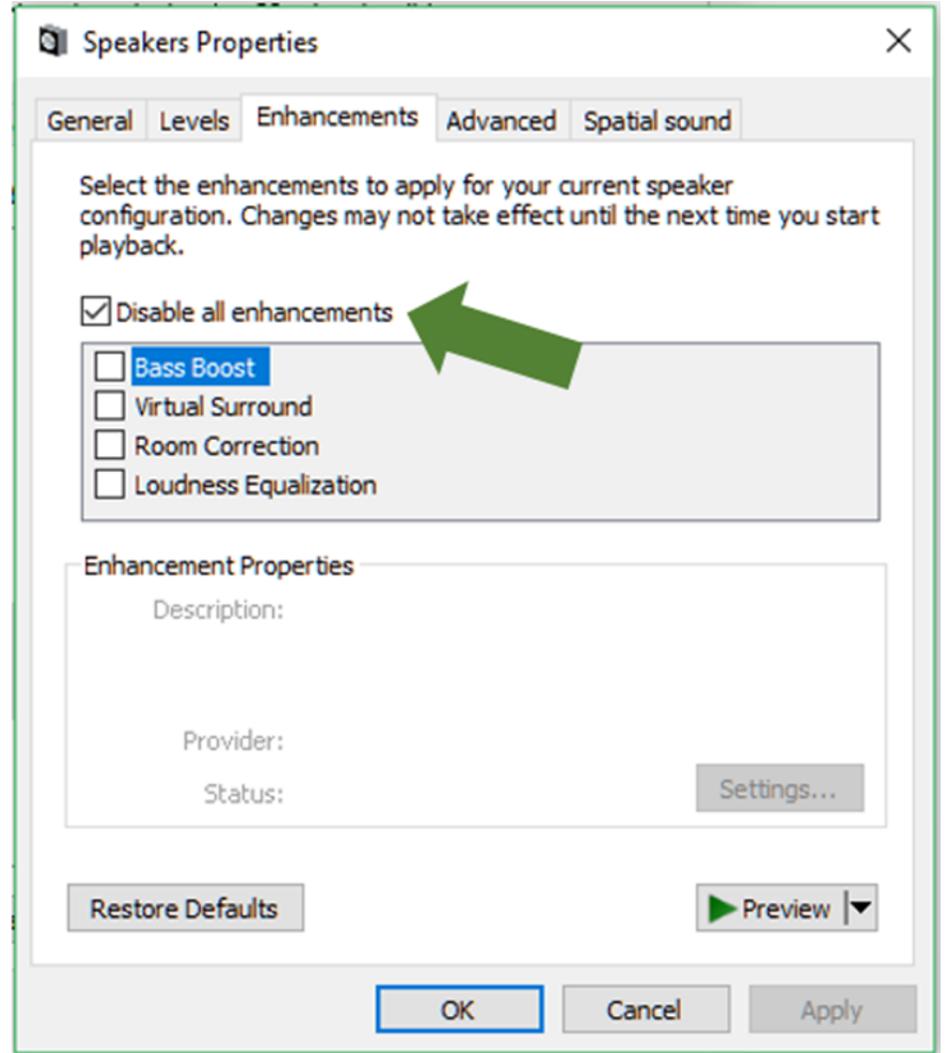
Step 3. Right click on the speaker icon at the bottom right of your computer screen and choose Playback Devices from the drop down menu. You'll see a list of all possible playback devices. The USB Audio Device should be highlighted. Double click on the USB Audio Device.



Step 4. In the box that's now open, choose the "Levels" tab and set the level to 80 using the slider control. The "Microphone" should be muted.

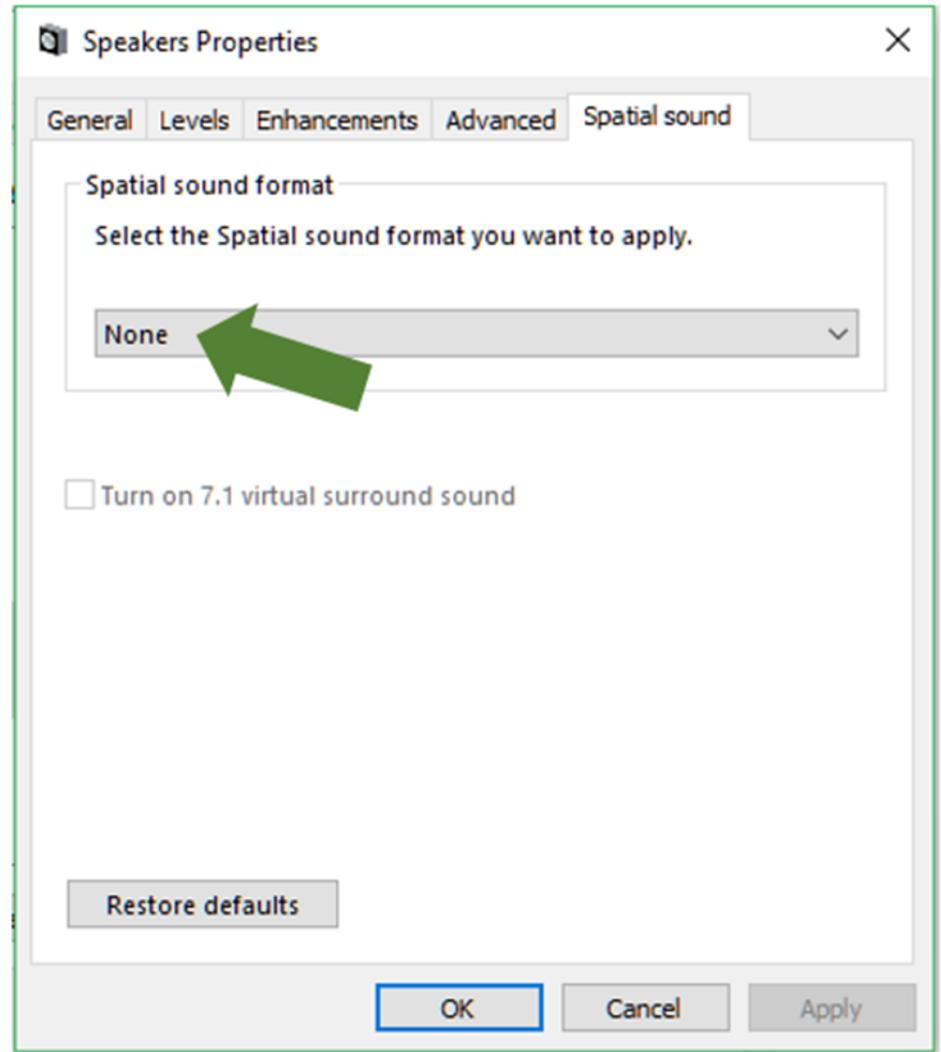
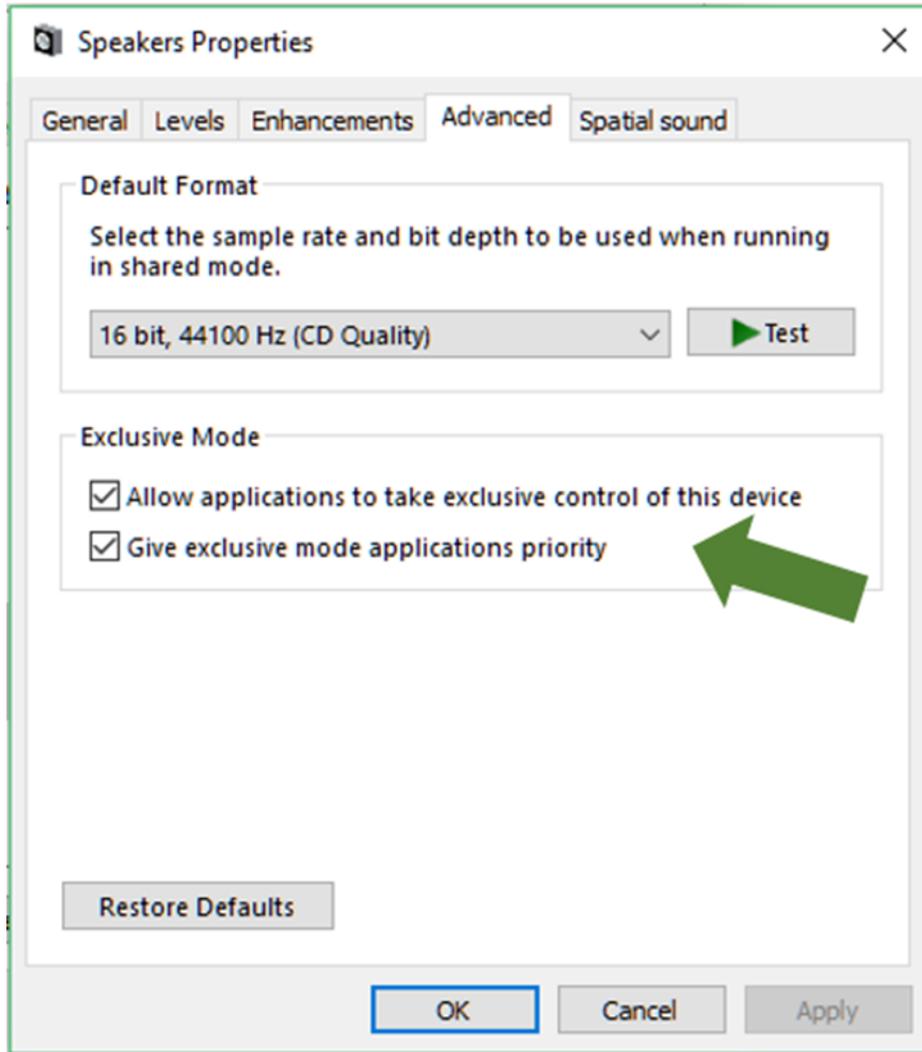


Step 5. Click on the "Enhancements" tab and be sure that all enhancements are disabled.

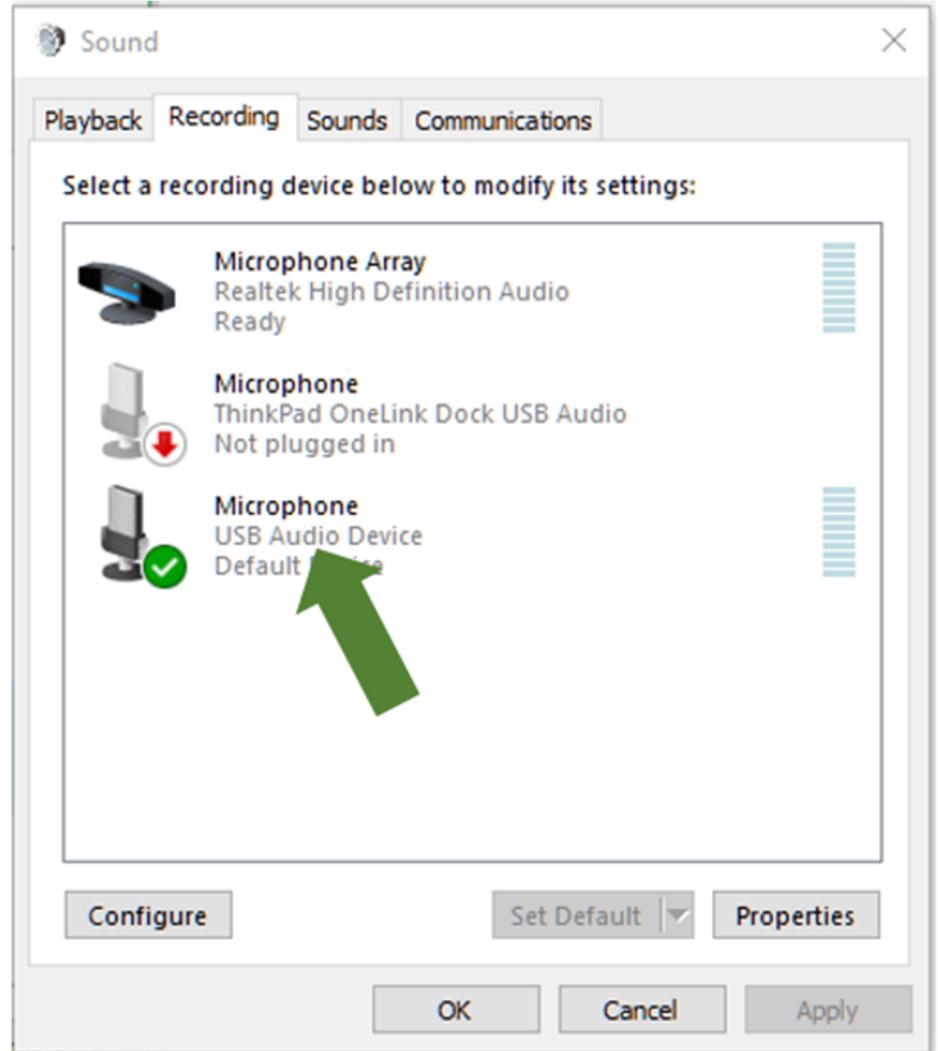
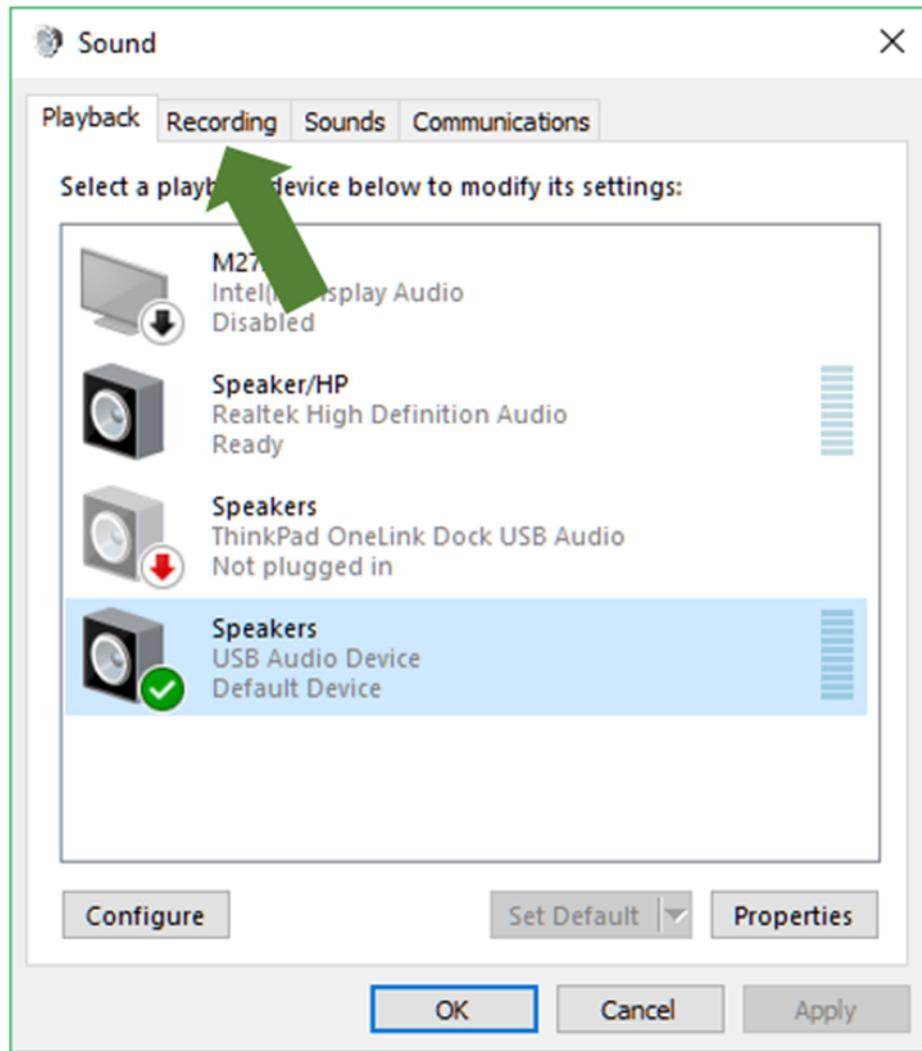


Step 6. Click on the “Advanced” tab and be sure that the boxes under “Exclusive Mode” are checked.

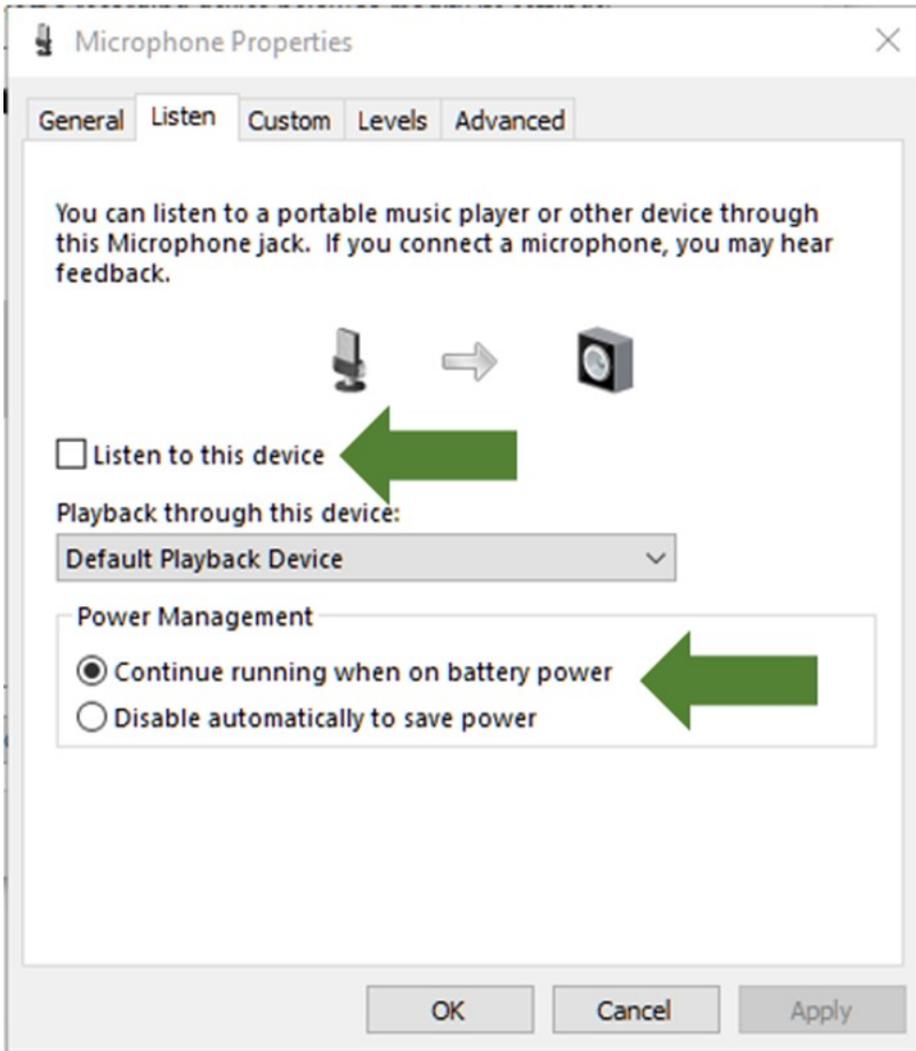
Step 7. In the “Spatial Sound” be sure that Spatial Sound is disabled. Click OK.



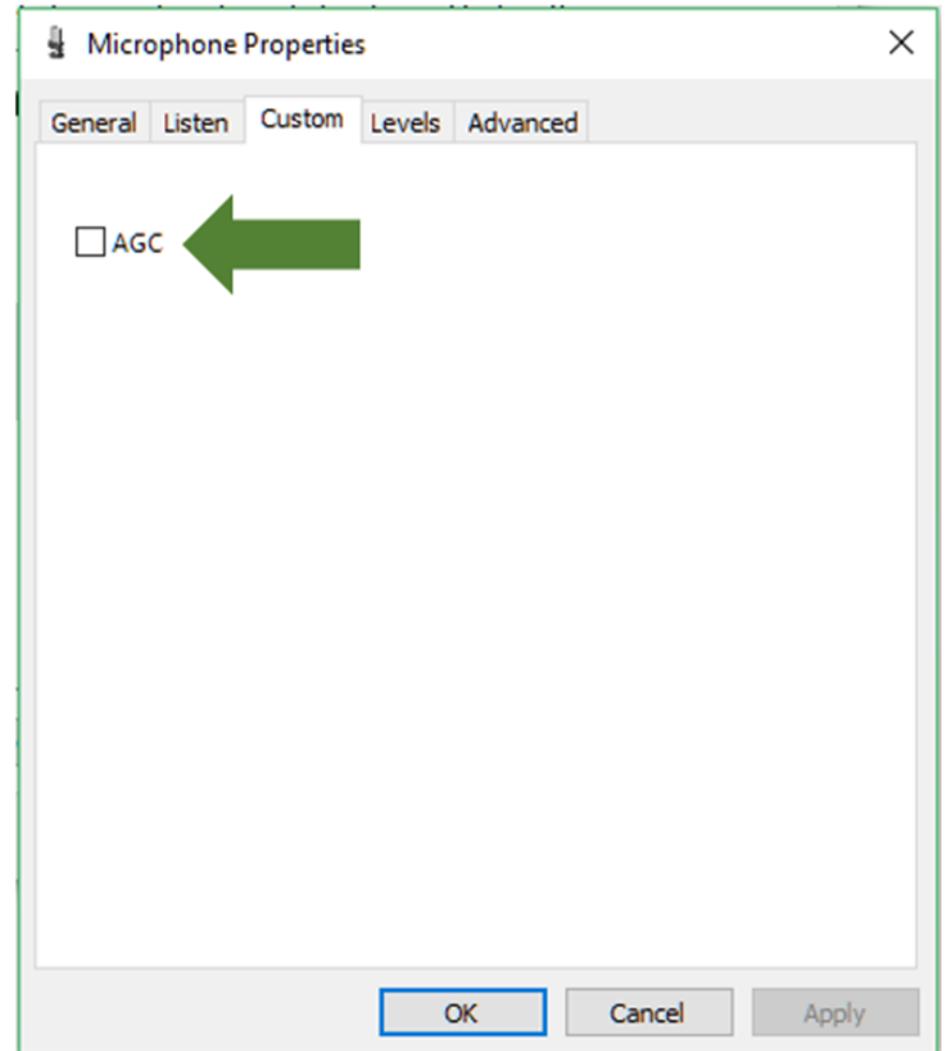
Step 8. Now, click on the "Recording" tab and double click on the USB Audio Device.



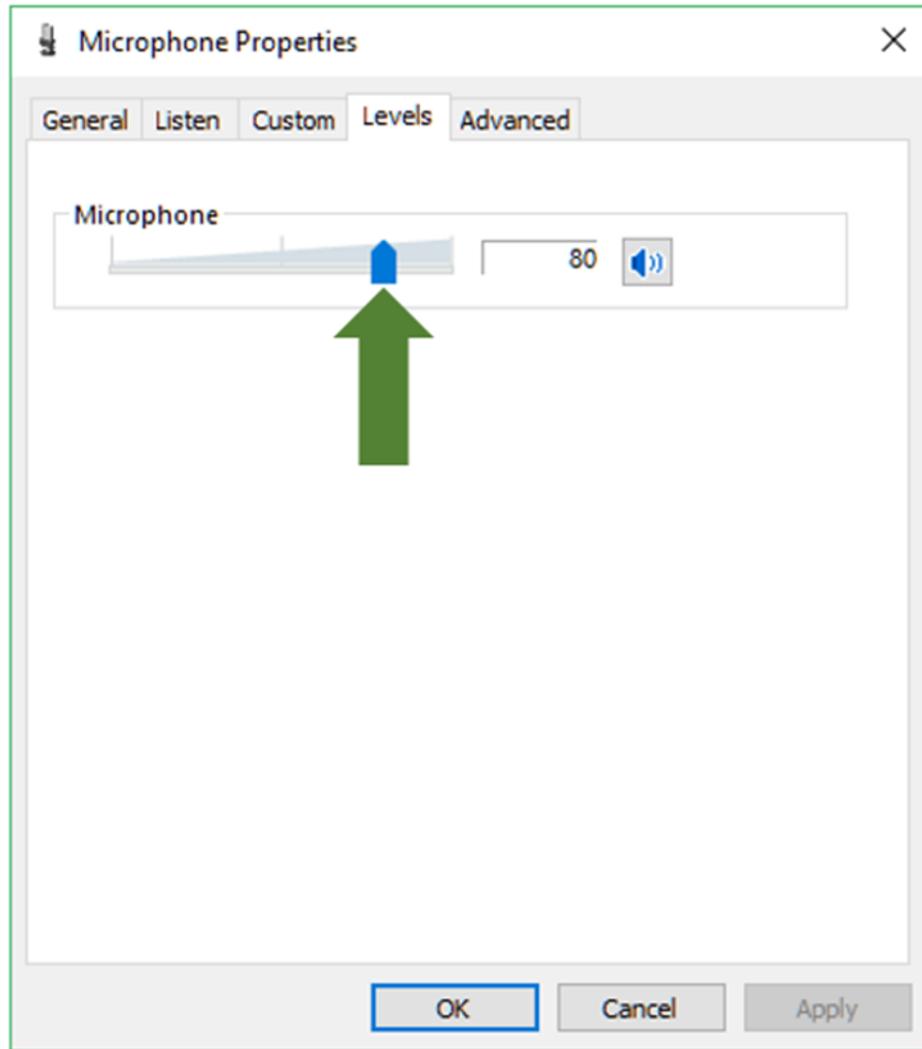
Step 9. In the “Listen” tab, be sure that the “Listen to this device” box is unchecked and that the box next to “Continue running on battery power” is checked.



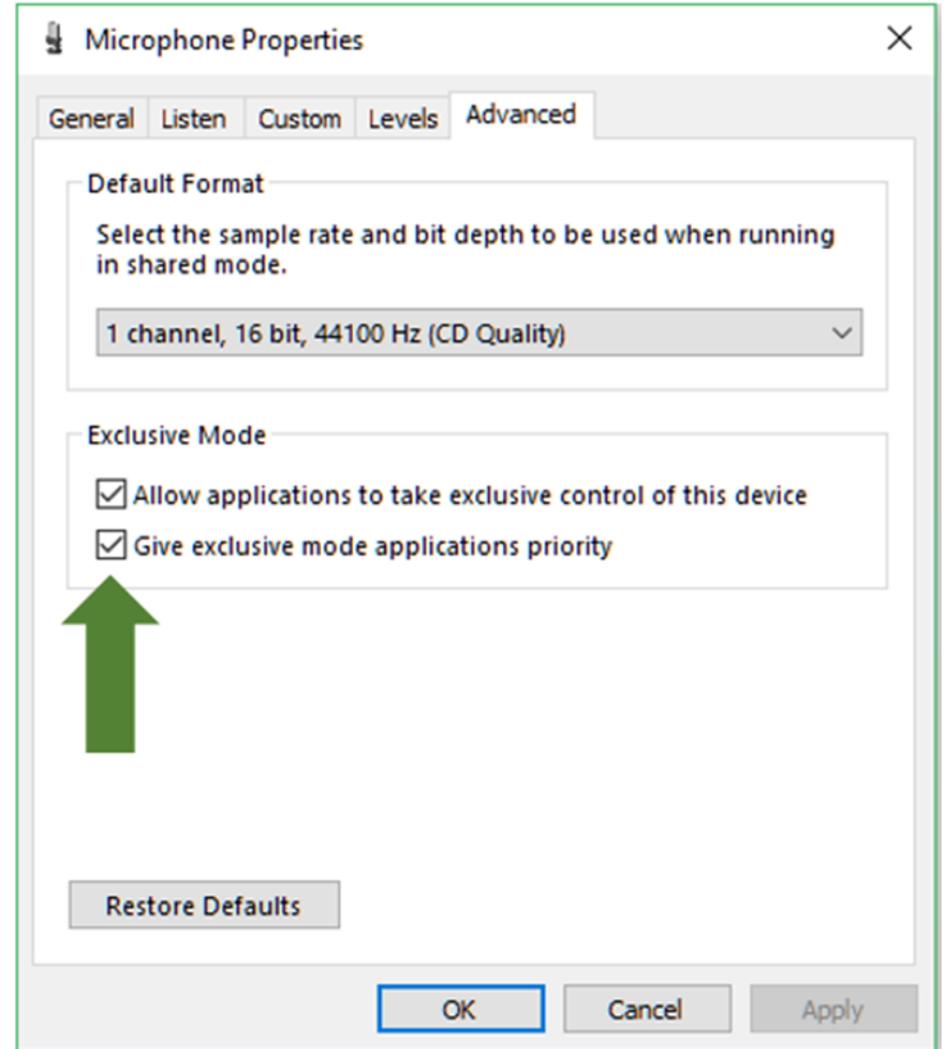
Step 10. If you have a “Custom” tab, click on it and be sure that the AGC (Automatic Gain Control) box is unchecked.



Step 11. Click on the “Levels” tab and set the level to 80.



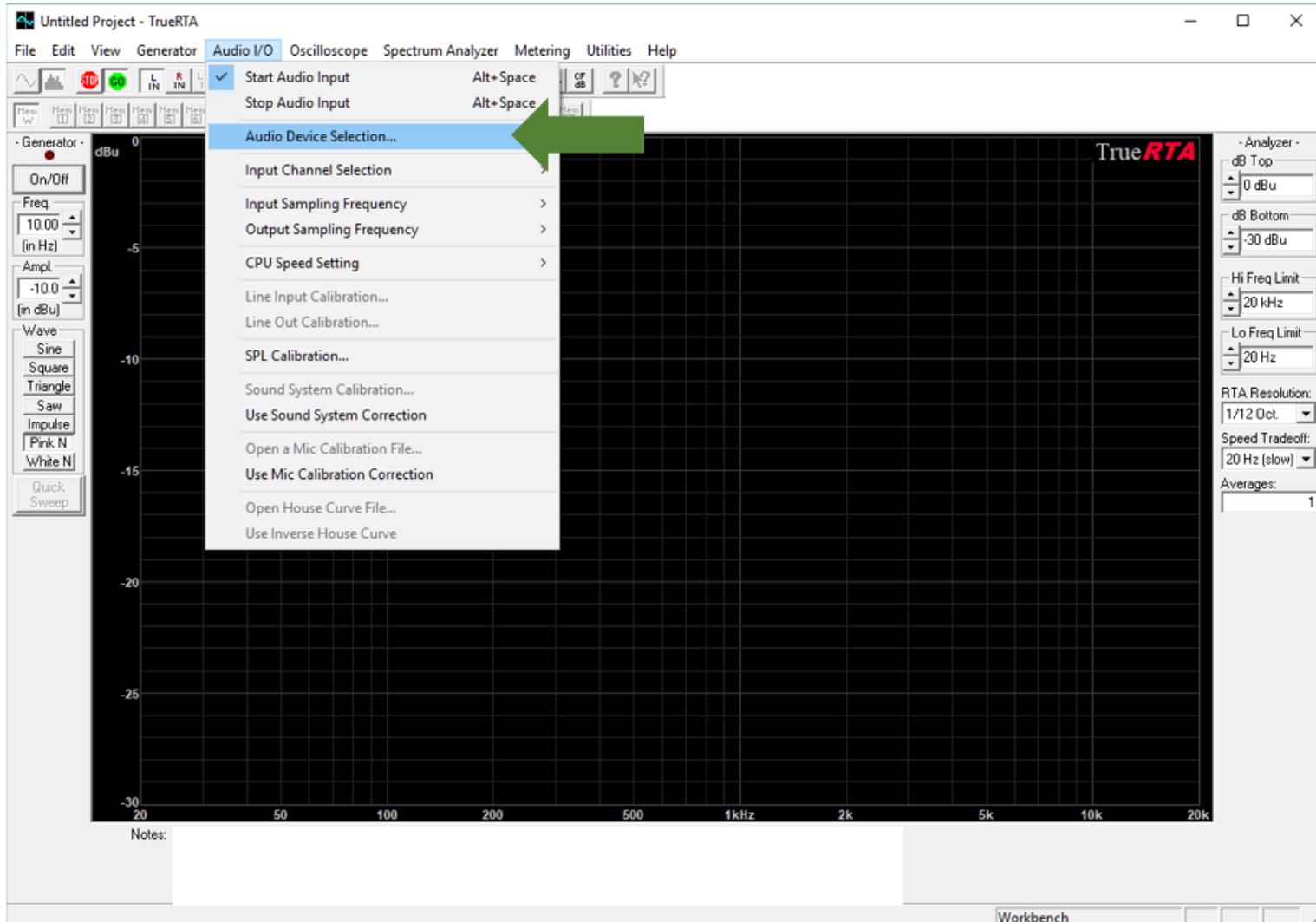
Step 12. Click on the “Advanced” tab and be sure that the boxes under “Exclusive Mode” are checked. Click OK. Then, click OK again.



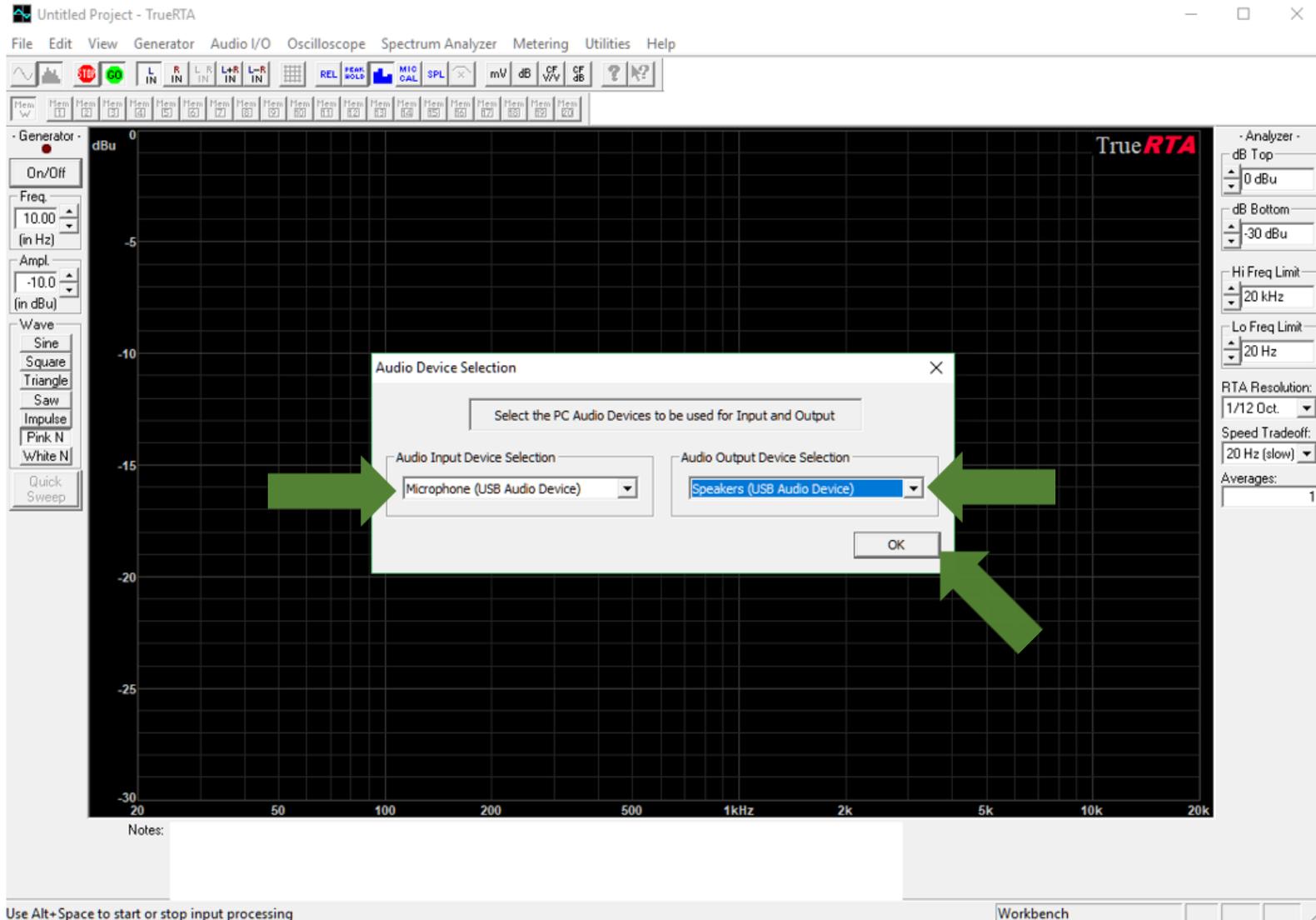
Step 13. Run True RTA and Click the Audio I/O Tab.

The screenshot displays the TrueRTA software interface. The title bar reads "Untitled Project - TrueRTA". The menu bar includes "File", "Edit", "View", "Generator", "Audio I/O", "Oscilloscope", "Spectrum Analyzer", "Metering", "Utilities", and "Help". The toolbar contains various icons, with a green arrow pointing to the "Audio I/O" icon. Below the toolbar is a row of memory slots labeled "Mem 1" through "Mem 20". The main window is divided into three sections: a "Generator" panel on the left, a large central plot area, and an "Analyzer" panel on the right. The "Generator" panel includes controls for "On/Off", "Freq." (10.00 Hz), "Ampl." (-10.0 dBu), "Wave" (Sine, Square, Triangle, Saw, Impulse, Pink N, White N), and "Quick Sweep". The central plot area shows a grid with a vertical axis labeled "dBu" ranging from -140 to 10 and a horizontal axis with frequency markers at 20, 50, 100, 200, 500, 1kHz, 2k, 5k, 10k, and 20k. The "Analyzer" panel includes settings for "dB Top" (10 dBu), "dB Bottom" (-140 dBu), "Hi Freq Limit" (20 kHz), "Lo Freq Limit" (20 Hz), "RTA Resolution" (1 Oct), "Speed Tradeoff" (20 Hz [slow]), and "Averages" (1). At the bottom of the window, there is a "Notes" field and a "Workbench" tab.

Step 14. Choose "Audio Device Selection" from the drop down menu.



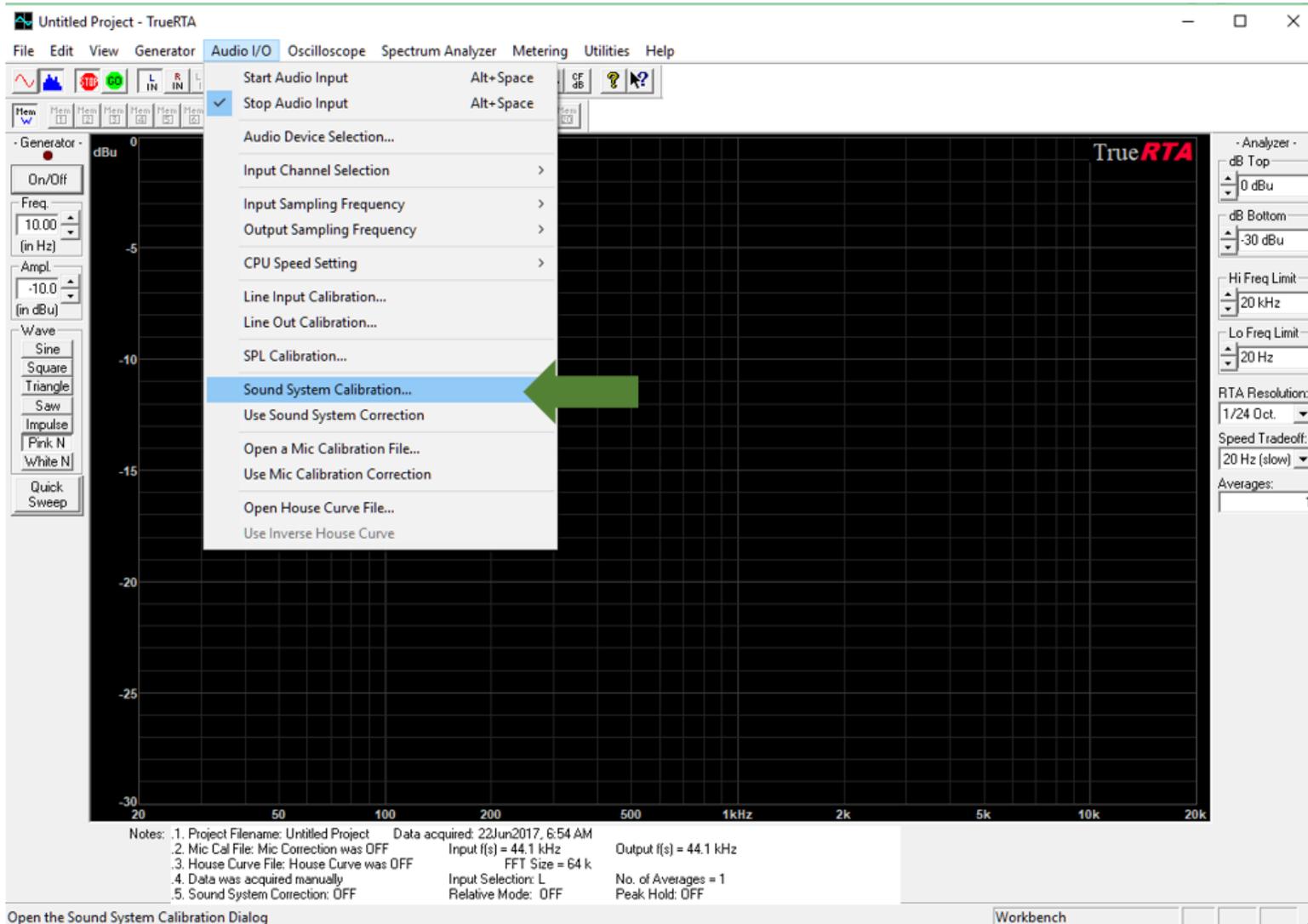
Step 15. Select the USB Audio Device for the Input and Output and click "OK"



Use Alt+Space to start or stop input processing

Workbench

Step 16. Choose “Sound System Calibration” from the drop-down menu. Sound system calibration is only available in the Level 3 and Level 4 versions of the program. IF you’re using the free version (not recommended) or the 1/3 octave version (Level 2), this option is not available. The UMI-1 sill still work, but measurements won’t be accurate above about 8 kHz.



Step 17. Check to be sure that the Amplitude level is set to -10 and then click "OK". The pop up box in True RTA indicates that your soundcard level should be turned up all the way. We don't recommend this and we've already set the input and the output at 80 .

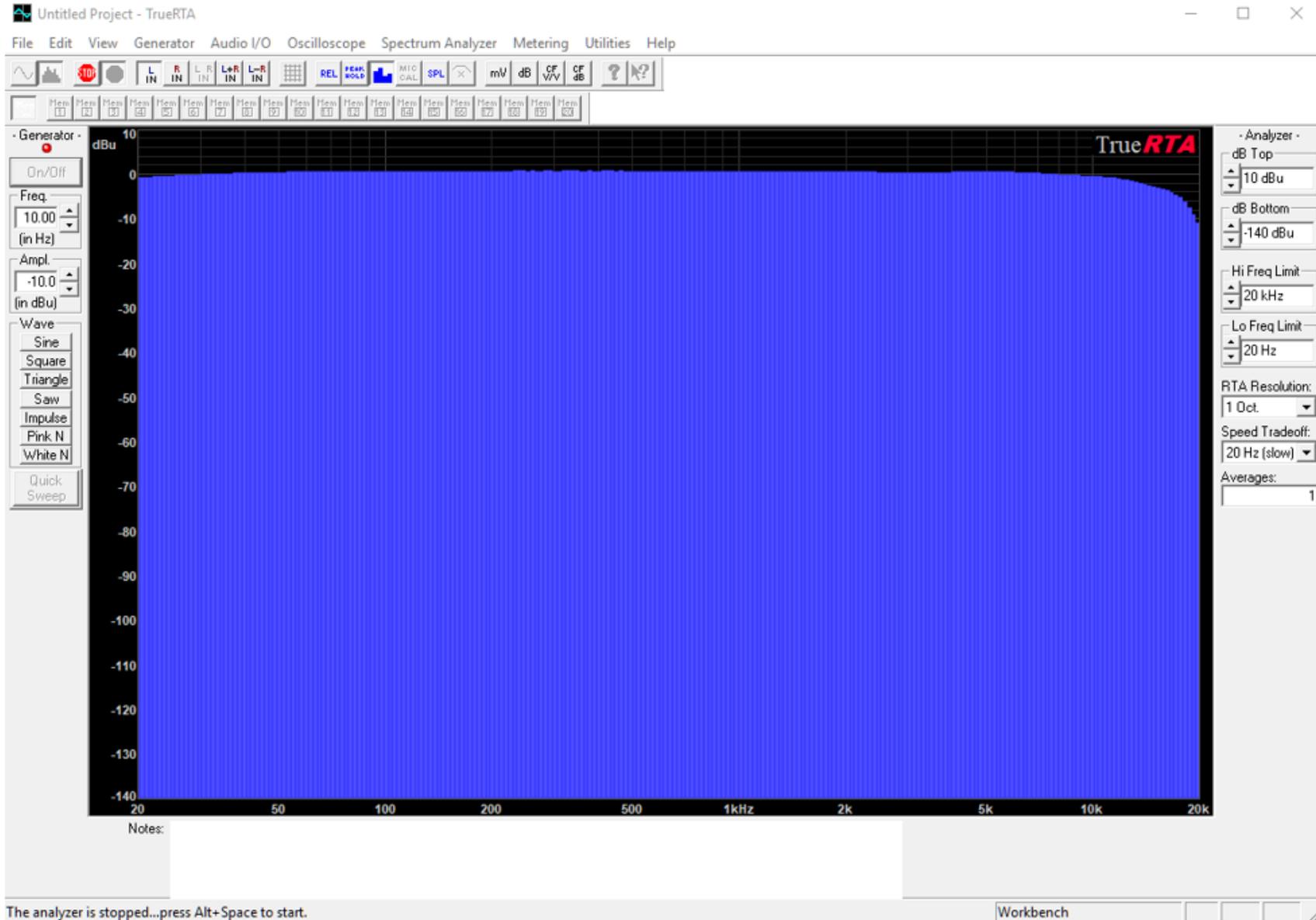
The screenshot displays the TrueRTA software interface. A central dialog box titled "PC Sound System Calibration" is open, containing the following text:

Here is the procedure to calibrate your PC sound system for a flat response. You only need to perform this calibration procedure once. After the successful creation of a calibration file your measurements will automatically be corrected to remove the frequency response of your PC's sound system. Performing a Quick Sweep self test on a calibrated system should result in a perfectly flat frequency response. Note that a file named SoundSys.cal will be created beside the application. This file will automatically be loaded each time the software starts.

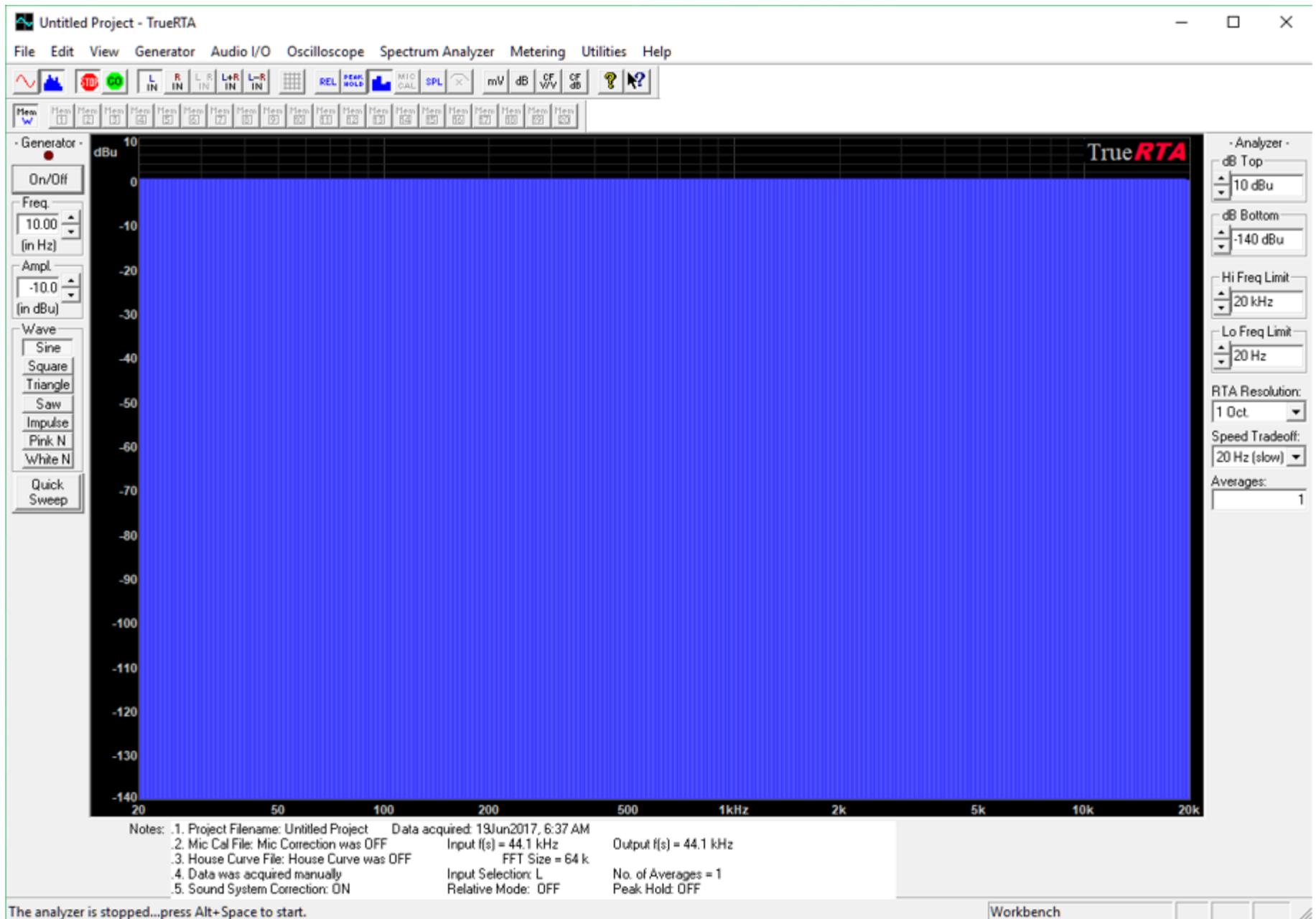
1. Make the required Signal Connections:
Patch the PC sound system's Line Output to the Line input.
2. Turn Up the Windows Master Volume Control to Maximum.
3. At the Generator Bar:
Enter -10 for the generator amplitude.
4. Press OK to generate a calibration file for your PC's sound system.

At the bottom of the dialog are "OK" and "Cancel" buttons. A red callout box with a white background and black border is positioned over the dialog, containing the text: "Don't do this. We've already set the soundcard input and output levels to 80". A red arrow points from this callout to the "OK" button. A green arrow points to the "Ampl" dropdown menu in the "Generator" panel on the left, which is currently set to "-10.0 (in dBu)". Another green arrow points to the "OK" button in the dialog. The background shows the TrueRTA main window with a frequency response graph and various control panels.

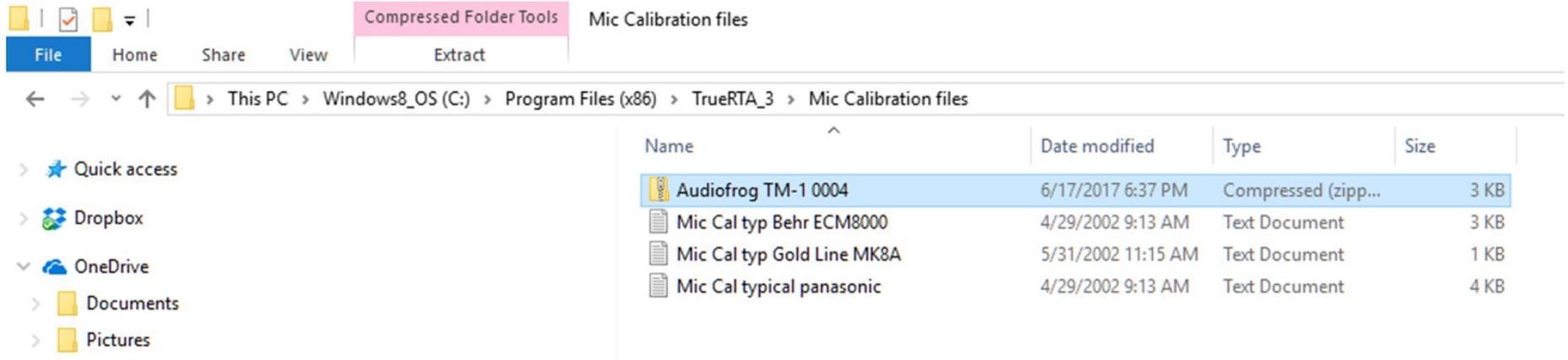
Step 18. After you've clicked "OK", True RTA will send a signal through the soundcard and will display the response. A little bit of high frequency and low frequency roll off is normal. True RTA will subtract this response from all of the measurements it makes.



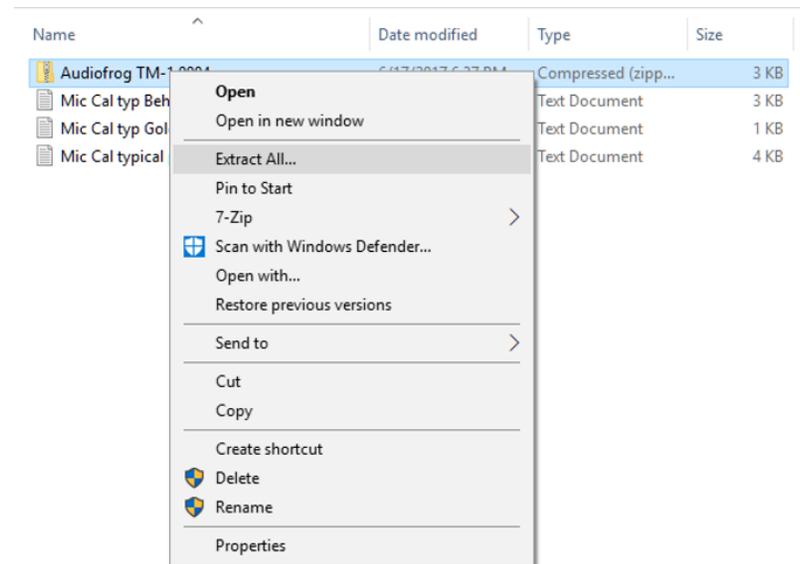
Step 19. After a few seconds, True RTA will display the corrected response of the soundcard.



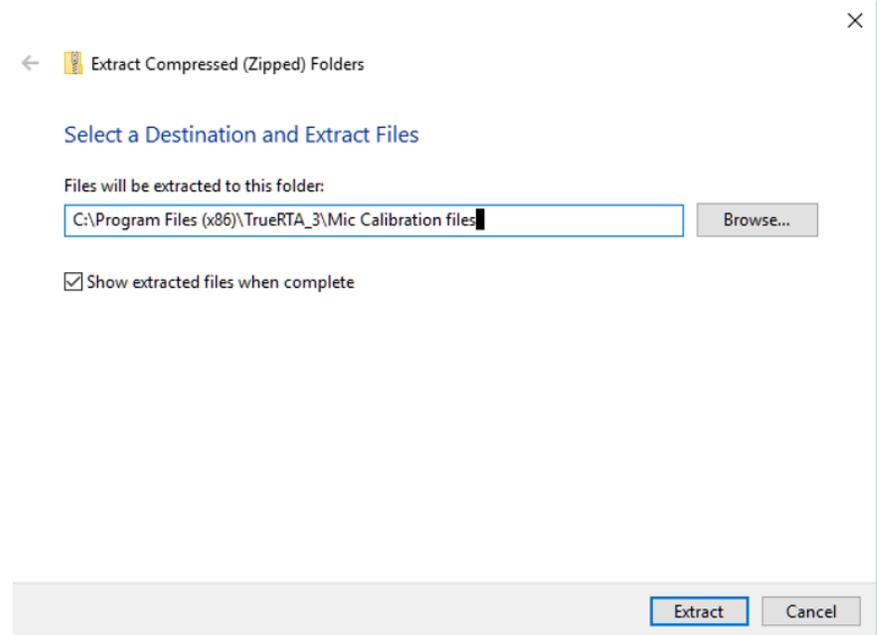
Step 20. Without shutting down True RTA (just minimize the window), save the Audiofrog mic calibration file (.zip) you received in an email to the “Mic Calibration Files” folder in the “True RTA” folder in your “Program Files” folder. The example below is for Windows 10, but other versions of Windows will be similar.



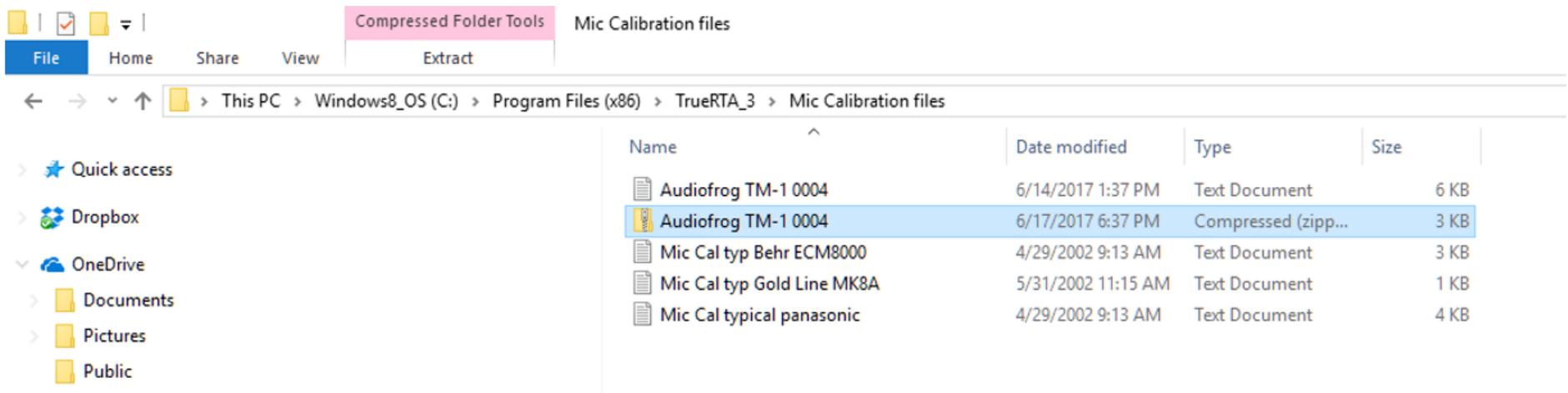
Step 18. Right click on the .zip file and choose “Extract All”



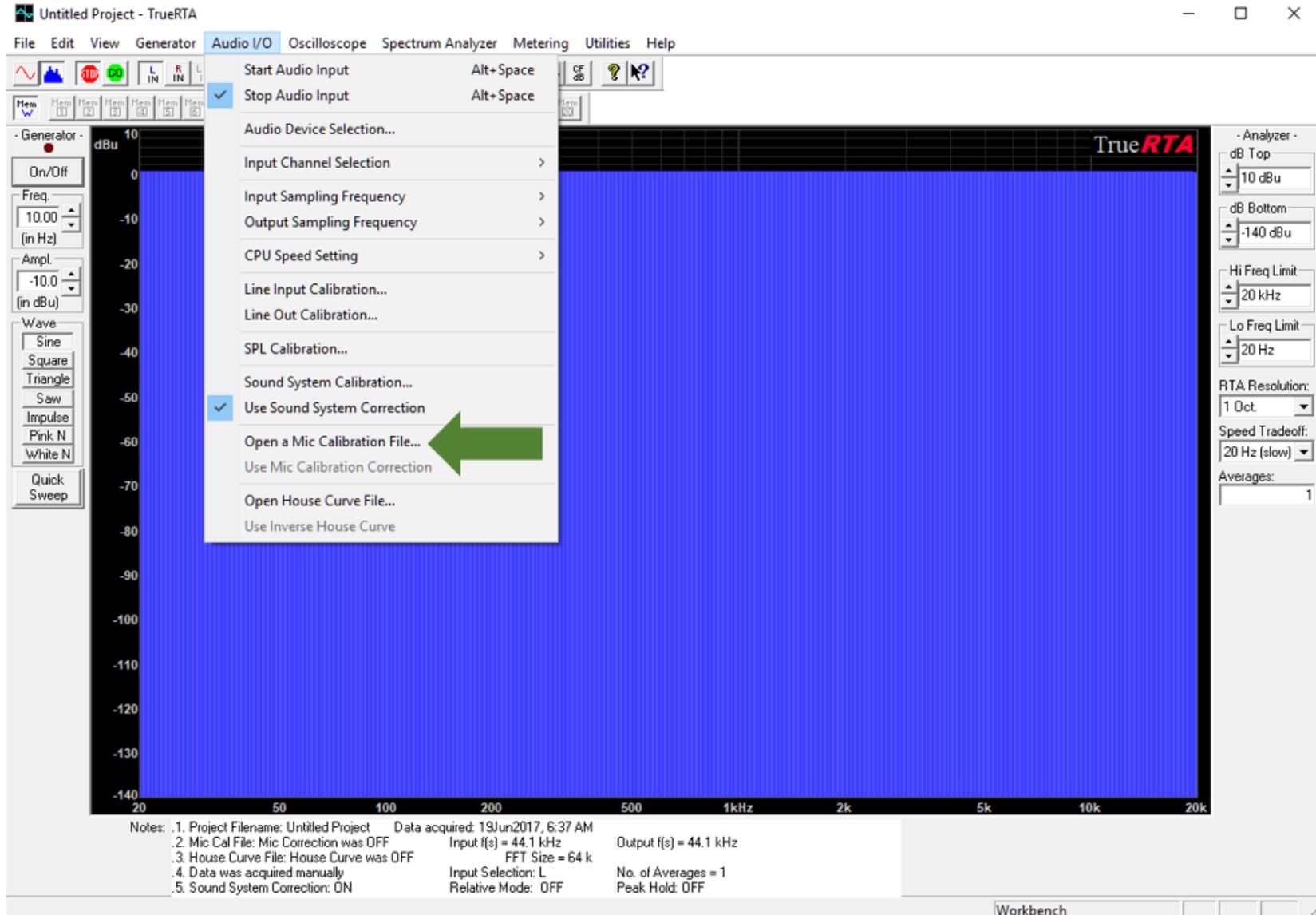
Step 21. Choose the “Mic Calibration Files” folder as the destination folder to which the calibration text file will be extracted.. Click “Extract”.



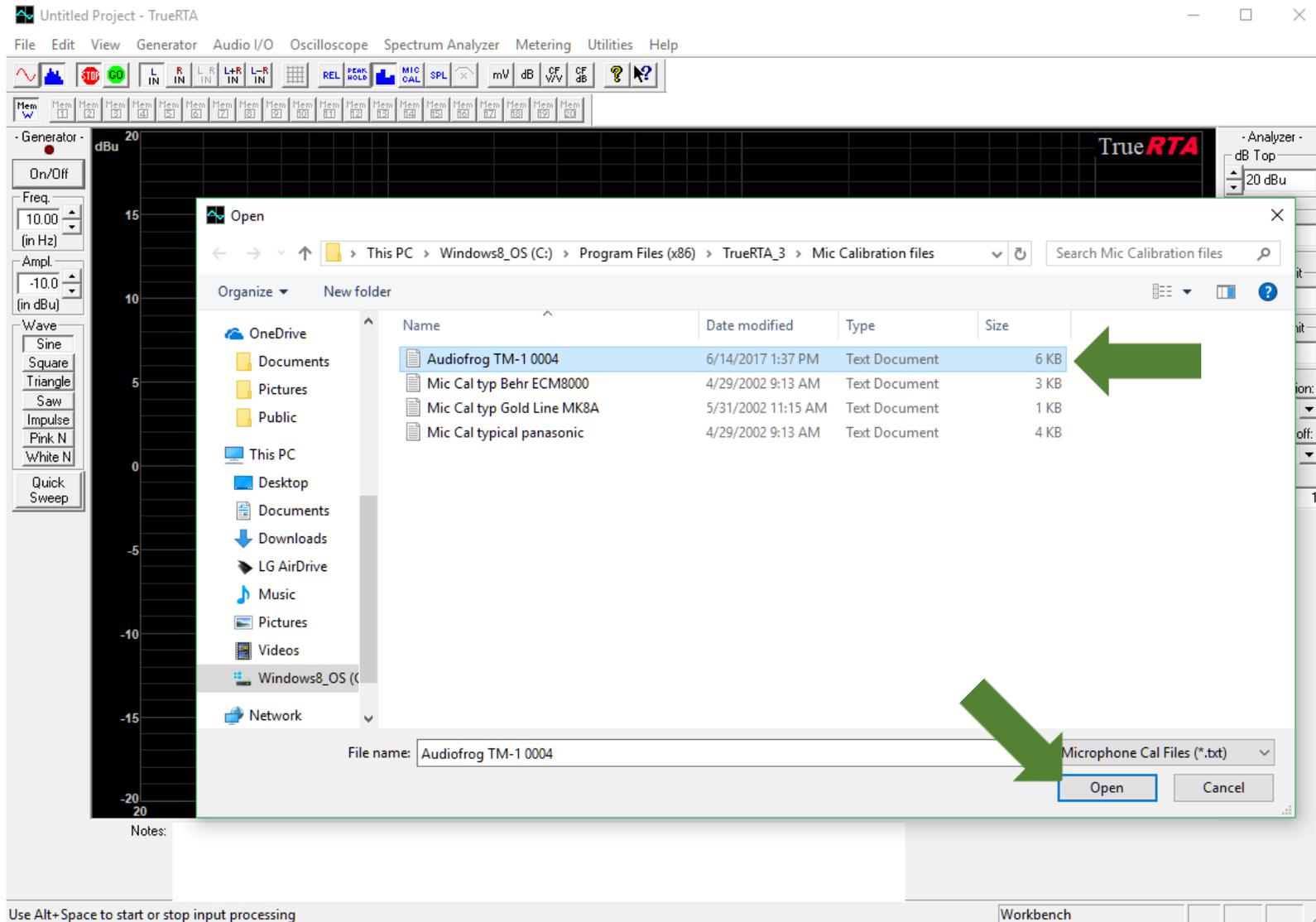
Step 20: You should see your calibration text file in the list of microphones. The others are preloaded with True RTA.



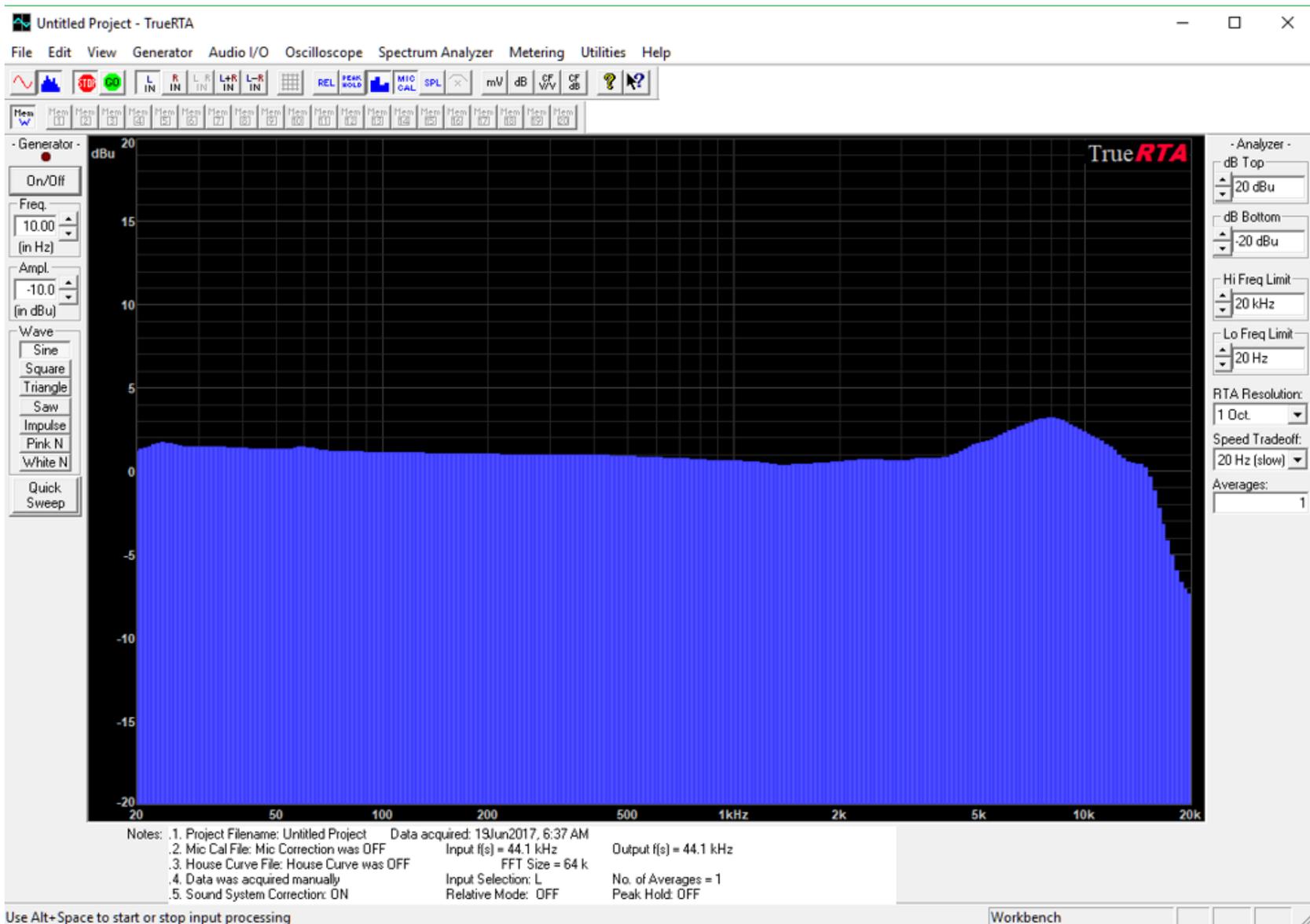
Step 22. Go back to True RTA and click on the “Audio I/O” tab one more time. Check to see that “Use Sound System Correction” is selected. Then, click on “Open a Mic Calibration File”



Step 23. True RTA will open the Mic Calibration Files folder. Click on your Audiofrog TM-1 file and click “Open”.



Step 24. After a few seconds, True RTA will display the frequency response of the microphone. As with the soundcard calibration file, this response will be subtracted from the measurements you make and the resulting measurement display will be accurate from 20 Hz—20 kHz.



Step 25. Click on the "Audio I/O" again. Check to see that "Use Sound System Correction" and "Use Microphone Calibration Correction" are both selected.

The screenshot shows the TrueRTA software interface. The 'Audio I/O' menu is open, displaying the following options:

- Start Audio Input (Alt+Space)
- Stop Audio Input (Alt+Space)
- Audio Device Selection...
- Input Channel Selection >
- Input Sampling Frequency >
- Output Sampling Frequency >
- CPU Speed Setting >
- Line Input Calibration...
- Line Out Calibration...
- SPL Calibration...
- Use Sound System Correction (checked)
- Open a Mic Calibration File...
- Use Mic Calibration Correction (checked)
- Open House Curve File...
- Use Inverse House Curve

The background shows a frequency response plot with a blue curve. The y-axis is labeled 'dBu' and ranges from -20 to 20. The x-axis is labeled with frequencies: 20, 50, 100, 200, 500, 1kHz, 2k, 5k, 10k, 20k. The plot shows a relatively flat response around 0 dBu up to about 5 kHz, followed by a roll-off.

On the right side, the 'Analyzer' settings are visible:

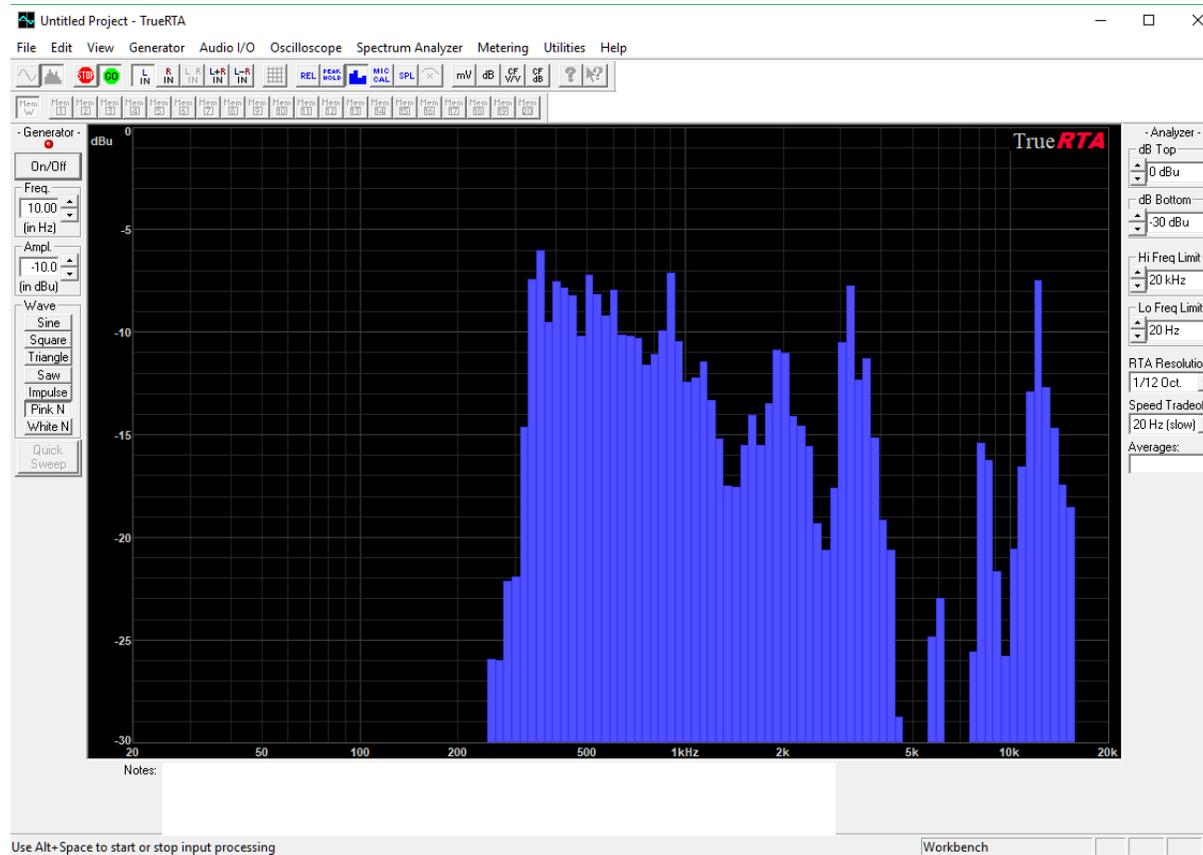
- dB Top: 20 dBu
- dB Bottom: -20 dBu
- Hi Freq Limit: 20 kHz
- Lo Freq Limit: 20 Hz
- RTA Resolution: 1 Oct
- Speed Tradeoff: 20 Hz (slow)
- Averages: 1

At the bottom, a 'Notes' section contains the following information:

- .1. Project Filename: Untitled Project
- .2. Mic Cal File: Mic Correction was OFF
- .3. House Curve File: House Curve was OFF
- .4. Data was acquired manually
- .5. Sound System Correction: ON

Additional parameters shown include: Data acquired: 19Jun2017, 6:37 AM; Input f(s) = 44.1 kHz; FFT Size = 64 k; Output f(s) = 44.1 kHz; Input Selection: L; Relative Mode: OFF; No. of Averages = 1; Peak Hold: OFF.

Step 26. To start the RTA, click on the green “Go” button. Start Track 1 on the Tuning CD and measure the frequency response of the system.



That's it! When you close True RTA, it will remember all of these settings the next time you open it. If you see a response that's unexpected the next time you use True RTA, check to see that the levels in your windows mixer are set at 80, check to see that you've selected the USB Audio Device in the Audio I/O tab and check to see that the Sound System and Mic Corrections are enabled in the Audio IO tab.

We will provide some additional information, tips and tricks and tuning help in the Forum section of www.audiofrog.com.

Happy Tuning!