SOME NOTES IN ADDITION TO THE HELP FILE (USER MANUAL) OF THE ROOM EQ WIZARD ("REW") SOFTWARE

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https://audioreviews.org

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Purpose: this cookbook aims to clarify and streamline the information in REW's original help file in order to save time and frustration with the setup.

The original REW help index (*read as often as possible*): https://www.roomeqwizard.com/help/help_en-GB/html/

What you need:

- 1. A computer with external speakers
- 2. The REW software (free download: https://www.roomeqwizard.com)
- 3. A USB microphone OR a calibrated measurement microphone (<u>like this Dayton</u> imm-6)
- If you don't have a USB microphone but the second kind ("Dayton"), you need an USB audio adapter such <u>as this one</u> between the mic and the computer's usb port
- 5. A TRS to TRRS adapter for connecting Dayton with usb audio adapter
- 6. An external dac/amp with volume control connected to another one of your computer's usb ports (I use the Schiit Fulla but could also use the Shanling MO, for example)
- 7. A sound meter like <u>this one</u>...there may be phone apps, too.



Setup workflow:

- 1. Setting up preferences
- 2. Soundcard calibration, step I: calibrating REW's internal SPL (Sound Pressure Level)
- 3. Soundcard calibration, step II: calibrating dac/amp and usb audio adapter

If you purchase a USB microphone, you can skip steps 2 and 3. And that's all, folks...always good to get the big picture right away. So let's start with the preferences...

Setting Up Preferences

This is easy. You just copy the settings provided. Biodegraded has extracted them from discussion forums. And they work...

When you open the "Preference" panel you see the following tabs.

000		Preferences				
Soundcard	Mic/Meter	Comms	House Curve	Analysis	Equaliser	View

Only the two underlined tabs "Soundcard" and "Analysis" need to be modified by you – the other five tabs remain untouched.

This is the **Soundcard preference panel**. All you have to do is inputting the numbers and input/output devices seen in this screenshot. The input volume should be 0.9. "Output device" is whatever dac/amp you have plugged in, and "input device" is whatever your computer calls the USB audio adapter.

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Calibration					-40 -40	-40
calibration						
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Levels					dees dees	dires
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Help						
Choose the Out	put Device and Input Device	you wish to use for mea	asurements. After the devi	ces have been selected t	the particular Output ar	nd Input
and inputs are	stereo so you have the choic	e of using the left or rig	ht channel, or (for output of	only) both channels. Som	e soundcards only prov	ride mono
inputs or output	ts, if that is the case the cha	nnel selectors will be di	sabled. Note that for ASIO	drivers (only available of	n Windows) all channels	are mono.
Make sure that	the input channel is the one	connected to your SPL	meter (or mic preamp out	out). If Use loopback as t	iming reference has be	en selected
in the Analysis I loopback conne	Preferences the other chann ction on the reference chan	al will be used a referen nel.	ice to remove time delays	within the computer and	soundcard, this require	es a
		eound	card profe	head		-
		Sound	calu preis	useu	Next >	Cancel

This is the Analysis preference panel. Just fill in these settings into your own window.

Note: the greyed-out Control output mixer/volume should be set at 0.500. We had some initial problems doing that.

000	Pref	erences	
Soundcard Mic/Meter Comms	House Curve Analysis Equaliser	View	
Impulse Response Window Defaults			
Left Side	Right Side	Spectral Decay Left	Spectral Decay Right
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\checkmark Set IR window widths automatically		Spectrogram Left	Spectrogram Right
Default Width (ms)	Default Width (ms) 500 🔹	Hamming	Blackman-Harris 4
Add frequency dependent window	Width in cycles		
Impulse Response Calculation		Frequency Response Calculation	
No timing reference	✓ Set t=0 at IR peak	✓ Allow 96 PPO log spacing	No smoothing
✓ Sub-sample timing adjustment	✓ Decimate IR	Show response below window limit	
For imports set t=0 at impulse peak	Truncate IR after 1.7s 💌	Limit cal data boost to 20 dB	
Help			
Impulse Response Window Defaults The Left Side and Right Side window se These are the defaults applied to new default REW will set the widths of the w automatically box and set the default v If Add frequency dependent window is windows have been applied. The width	s electors offer a choice of window types measurements, window types for exist vindows automatically to show the whol widths you wish to be applied to new m s selected a frequency dependent wind h of the FDW is set by the controls to th	to be applied to the impulse response dat ing measurement can be altered via the IR e room response, to override this uncheck leasurements. ow (FDW) will be applied to the measurem e right and can be specified in cycles or in	ta before and after the peak. Windows toolbar button. By the Set IR window widths ent after the left and right octaves. If the width is in cycles

And we are done with the Preference setup – close the pane. Wasn't all that bad, was it? But hey, why did we ignore the mic/meter tab? After all, our Dayton mic comes with a calibration file...shouldn' we input it there? Well, no, apparently the measurement results are better without the calibration file.

Soundcard calibration, step I: calibrating REW's internal SPL

https://www.roomeqwizard.com/help/help_en-GB/html/inputcal.html - top

Hardware setup:

Input: microphone \rightarrow TRS to TRRS adapter \rightarrow USB audio adapter \rightarrow computer's usb port *Output*: computer's headphone jack \rightarrow external speaker

The idea of this step is to tell the internal SPL what 85 dBs in real life is. For this, we need an external sound source. An 85 dB sound from the computer's loudspeakers is recorded by the (in our case) <u>Dayton imm-6 microphone</u>. 85 dB is an arbitrary number that has proven to work well for measurements. The sound is generated with the REW software and output to an external speaker via the headphone jack and recorded by the microphone. When you hold your hand held <u>sound meter</u> side-by-side with the microphone, you can adjust the volume of the sound so that both sound meter and microphone record the desired 85 dB.

1. After having connected all devices, open the <u>SPL</u> in REW. Select "Calibrate" and choose Signal Source "Use an external signal".

2. Next, select "Generator" to produce the sound. Make sure, you got the right settings: RMS level: -3.0
1000 Hz sine wave
Speaker: can be left or right, doesn't matter

3. Now run the sine wave and adjust the volume on your amplifier (Fulla or whatever) until you measure 85 dB with the hand held sound meter. Place the microphone at the location where the sound meter reads 85 dB, adjust the internal SPL to 85 dB, and then push "Calibrate" à use external signal.

Done! Now we have calibrated the internal SPL as part of the soundcard calibration. And you never will have to do this again for this hardware.

Soundcard calibration, step II: calibrating dac/amp and usb audio adapter

Hardware Loop:

First USB port (*output*) \rightarrow dac/amp \rightarrow 3.5 mm audio cable \rightarrow TRRS to TRS adapter

 \rightarrow audio adapter \rightarrow second computer USB port (*input*)

This step produces a calibration file to be used in your soundcard preferences. For this we need an internal sound source. This calibration file is specific for this hardware arrangement and can be used each time you perform measurement. If you decide, for example, to use another amp/dac, you will have to create another calibration file.

1. Carefully double-check your soundcard preferences.

This is the same screenshot as the first one above.

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Soundcard Min	c/meter Comms House	Curve Analysis Eq	ualiser view				
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	Output		Input				
	SPEAKER	▼ Right ▼	MICROPHONE	▼ Right. ▼	-10	-10	-10
			<u> </u>		-20	-20	-20
nput Options	Control output mixe	r/volume	Control input mixer,	volume			2
Invert	Output Volume: 0.	500 🔺 🗌 Mute	Input Volume: 0.	889 -	-30	-30	-30
High Pass	Sweep Level:	3.0 dBFS					
Calibration					-40	-40	-40
File: None		Browse	Clear Cal Calibrate	Make Cal		NULL.	
					-50	-50	-50
.evels					dBFS	dBFS	dBFS
Use main speaker	test signal to check/set levels	-	Check Levels Gener	ate Debug File			
teln							
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can be chosen.	The channels used for outp	ut and input are selected	from the drop downs to t	he right of the output an	d input selection	ins, most o	utputs
and inputs are s	stereo so you have the choic	e of using the left or right	t channel, or (for output or	ly) both channels. Some	soundcards or	ly provide	mono
inputs or output	ts, if that is the case the cha	nnel selectors will be dis	abled. Note that for ASIO d	rivers (only available on	windows) all c	nanneis are	mono.
Make sure that	the input channel is the one	connected to your SPL n	neter (or mic preamp outpu	it). If Use loopback as til	ning reference	has been s	selected
In the Analysis P loopback conne	ection on the reference chann	el will be used a referen nel.	ce to remove time delays w	ithin the computer and :	soundcard, this	requires a	
		cound	card profe	used			•
		Sound		useu		70	

There is a "Calibrate" and a "Make Cal" button. What is the difference? "Make Cal" is the important one -- used to create our calibration file.

The "Calibration" is used to apply the calibration file to the soundcard.

Open Generator and SPL: produce a sine wave with the same settings as before:

RMS level: -3.0 1000 Hz sine wave

Press the SPL's record button. Adjust the volume of the dac/amp so that the SPL meter shows 85 dB (you remember that number from before). Let it run.

Next, push the "Calibrate" button to run the calibration process.

Now switch off the sound.

Push the "Make Cal" button to save your calibration in a file. At one point you will have to name this newly generated file.

Congratulations, your soundcard is now calibrated and will never have to be recalibrated again for this hardware setup...unless you accidentally push the "calibration button".

And if you break your Dayton microphone for another one, you will also not have to recalibrate the SPL meter again – as the error of any specimen of this model has more variation than our calibration error.

And now some window dressing...fine-tune your display window that will host your frequency response curves.

Set axis limits to 50 to105 [dB] and 20 to 20000 [Hz]

And done. Now we can focus on the measurements.



Measurement SPL by Biodegraded

After performing the SPL and 'soundcard' calibrations described above, you're ready to make some measurements. Because different headphones have different sensitivities, you'll need to play with the volume on your output device (amp) to get the same level (85 dB SPL at 1 kHz) for each headphone being investigated. To do this:

 Put the headphone/earphone on/in your microphone measurement coupler (e.g., our highly sophisticated plastic double-tube) and connect it to your output device (amp).
 Open the Generator and adjust it to RMS Level dBFS -3; choose Sine Wave & 1000 Hz for the inputs and Speaker, L or R (corresponding to whichever 'phone you're measuring); and hit the 'play' button. 3) Open the SPL Meter, hit the big red 'record' button, and adjust the volume on your amp until the dB screen reads 85.0.

4) DO NOT HIT THE 'CALIBRATE' BUTTON on the SPL Meter, or you'll ruin all the good work you did in calibration step 1 above and will have to repeat it. Exit the SPL Meter and Generator.

Note that a common standard for headphone measurements is 90 dB at 1 kHz rather than 85 dB. We use the latter because we find with our setup that peaks in the frequency response (commonly the ones around 3kHz) any higher can result in clipping (overloading of the input), leading to the FR curve at the offending frequency being blunted or flattened (and the sound being distorted). Occasionally (e.g. with 'Chifi chainsaws') this also happens at 85 db. REW will warn you if it does. If so, use a lower level (e.g. 80 dB) at step 3 and try again. If you still get clipping at 80 we suggest there's no need for any more measurements and recommend throwing the offending earphones away or using them to punish evil children rather than putting them in your own ears.