

This is written for RAM but works similarly for the BARE software.

In this test, RAM will be used with a full duplex (Simultaneous Play/Record) sound card. The test signal will be generated by the sound card as well as recorded by the sound card. This test is necessary. Please go through it - it will only take a few moments to ensure that RAM will work correctly and accurately for you.

Before starting this procedure, please take note of the following important points.

1. It is important to note the danger that MLS and Sweep based test signals can be to both human hearing and small high frequency drive units. Always use acceptable SPL levels - normally below 90 dB to keep both ears and tweeters safe from damage. These sound levels are more than loud enough to give very accurate measurement results.
2. RAM can not work in any correct way if the microphone inputs on the sound card are used in place of line inputs. The sound card must have stereo line in and stereo line out capability. Any Windows sound card that meets this requirement will work very well with RAM and these tests will prove it.
3. The "3 D effects" or other special effects may be enabled on your sound card. These options should be disabled before any measurements with RAM are attempted. Click on the multimedia icon in the Windows Control Panel to gain access to these settings.
4. If you are using a laptop, use the battery power to eliminate the power supply noise from interfering with measurements.

This help topic provides a set of step by step instructions required to configure RAM for a particular computer/sound card, to take a first measurement, and to verify measurement accuracy. RAM will give nearly perfect results with any sound/game card that is capable of full duplex stereo sampling at 44.1 KHz or 48 KHz. A highly stable threaded DLL written in C for audio data gathering ensures reliable, robust, & noise free measurements. Note: When using the U24 sound card set the buffer to 44.1 KHz.

Step 1: Connections for test kit Pro

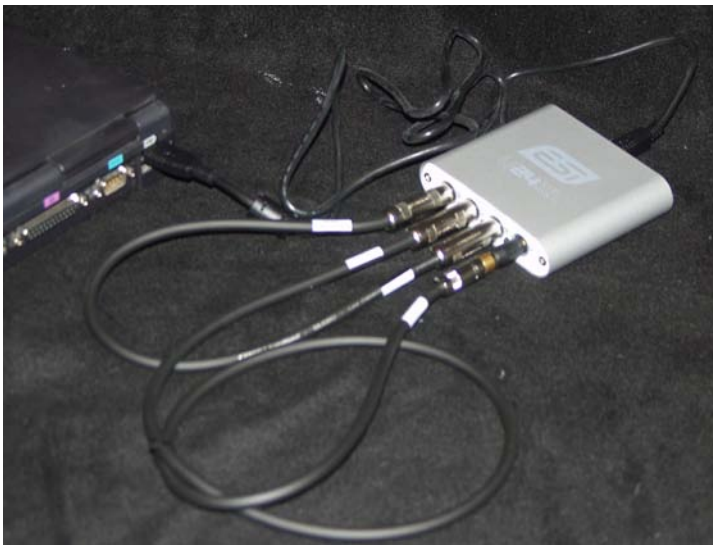
Be sure that your sound card has the proper connections. To be sure that the sound card is working properly and giving accurate measurements, a measurement of the actual sound card will be the first measurement.



Once the U24 is plugged in you will need to install software in many cases. In some cases it will be done automatically for you, as it is a plug and play device—YOU SHOULD TRY THIS FIRST. If this does not work, download the latest ESI drivers and install them manually.



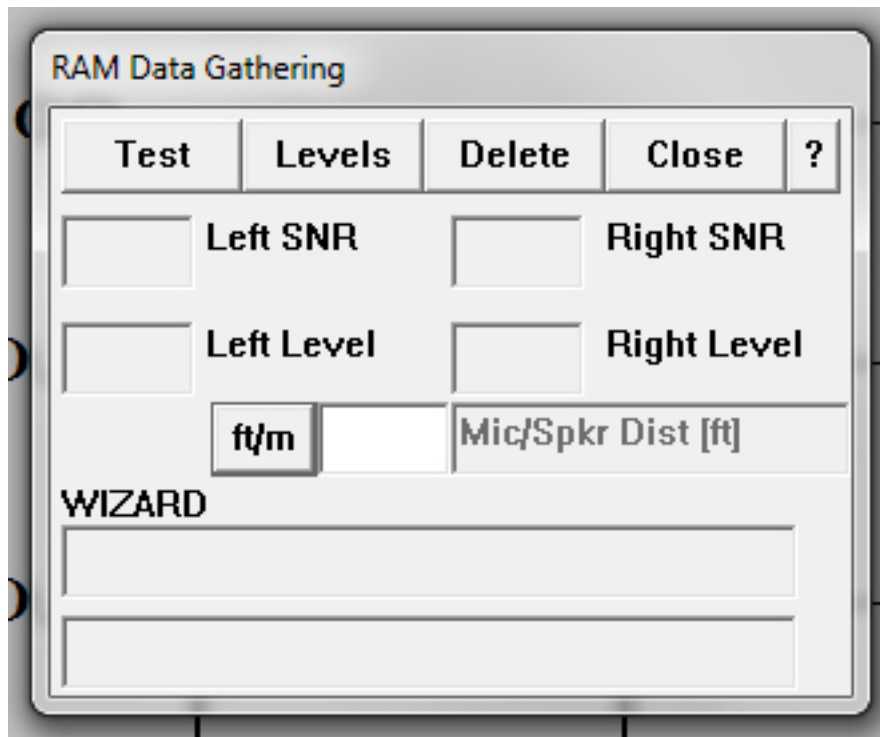
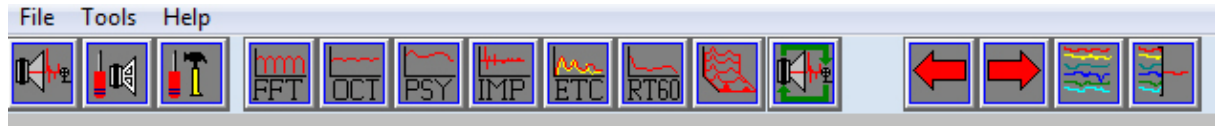
Next plug in the short cable for the left inputs and outputs of the soundcard as shown.



Then plug in the short right cable that is labeled “right U24 in” and “mic pre out”. Using the adapter provided, plug the “mic pre out” terminal into the right output on the U24 as shown to the left.

Step 2: set up for loop through test

Run RAM. Select the far left Icon to test the loop through.



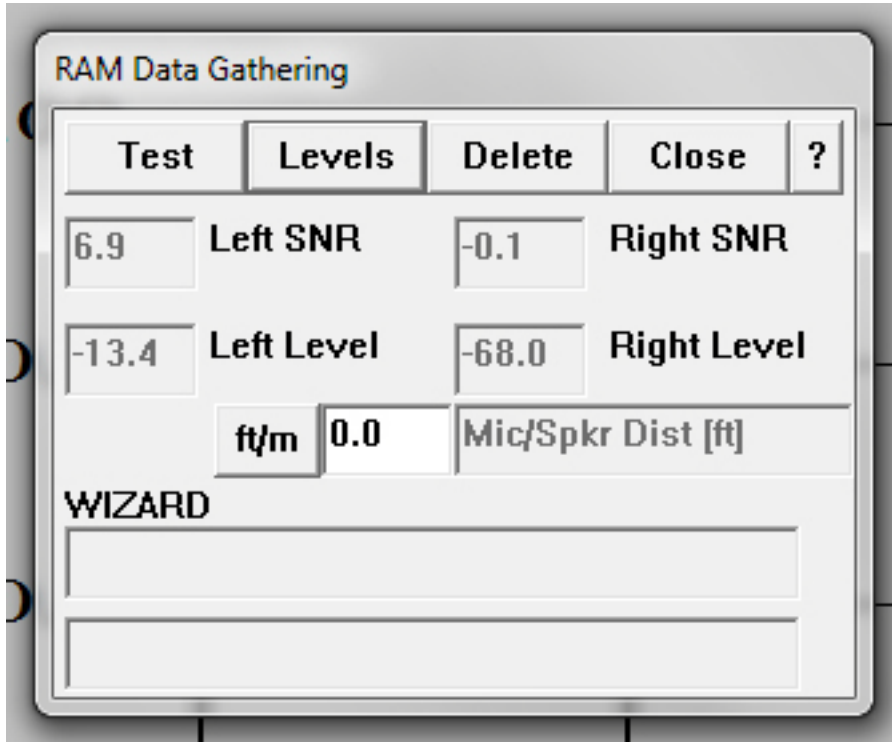
Data Gathering Box will appear and is shown above

Step 3: Levels

Click "Levels"

This button can be used as a quick check of connections. RAM will play and record a sweep tone. When this operation is finished a wave will get drawn in the "Left / Impulse Reference" and in "Right / Impulse Measurement" graphs.

Shown below is the data gathering window after the left loop through was performed. Level should be at least -13 on the loop through channel and around 7 SNR.



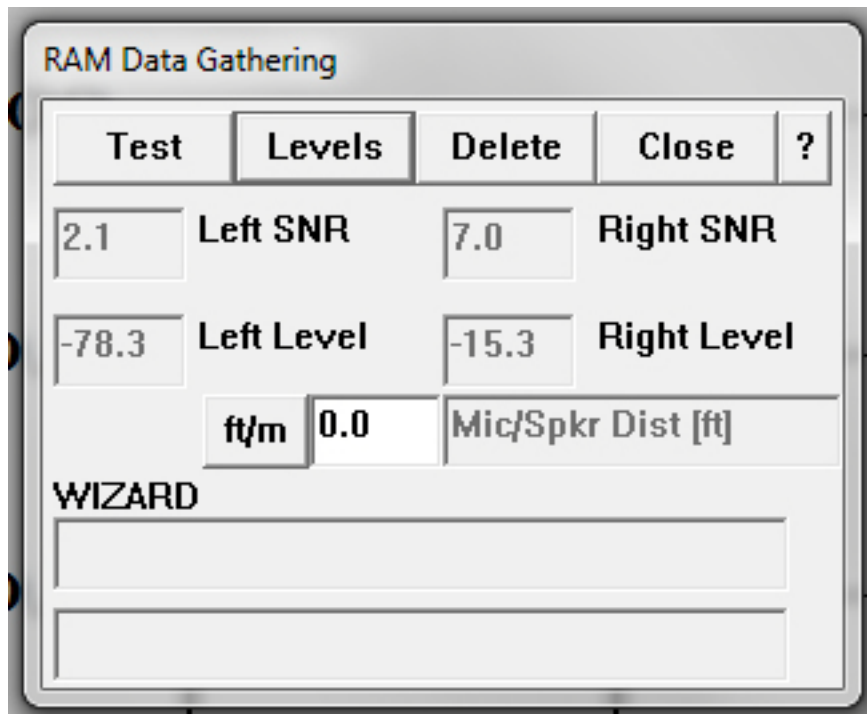
If it is not you may need to adjust the mixer.



If the SNR or level is too low raise the volume on the mixer.

Step 4: duplex card check

We've already tested the left channel by simply looping the left input to the right input. Now we want to do the same with the right channel. You should get a data gathering window result something like this.



Notice the Left SNR and level is very low, whereas the right is in or near the acceptable zone.

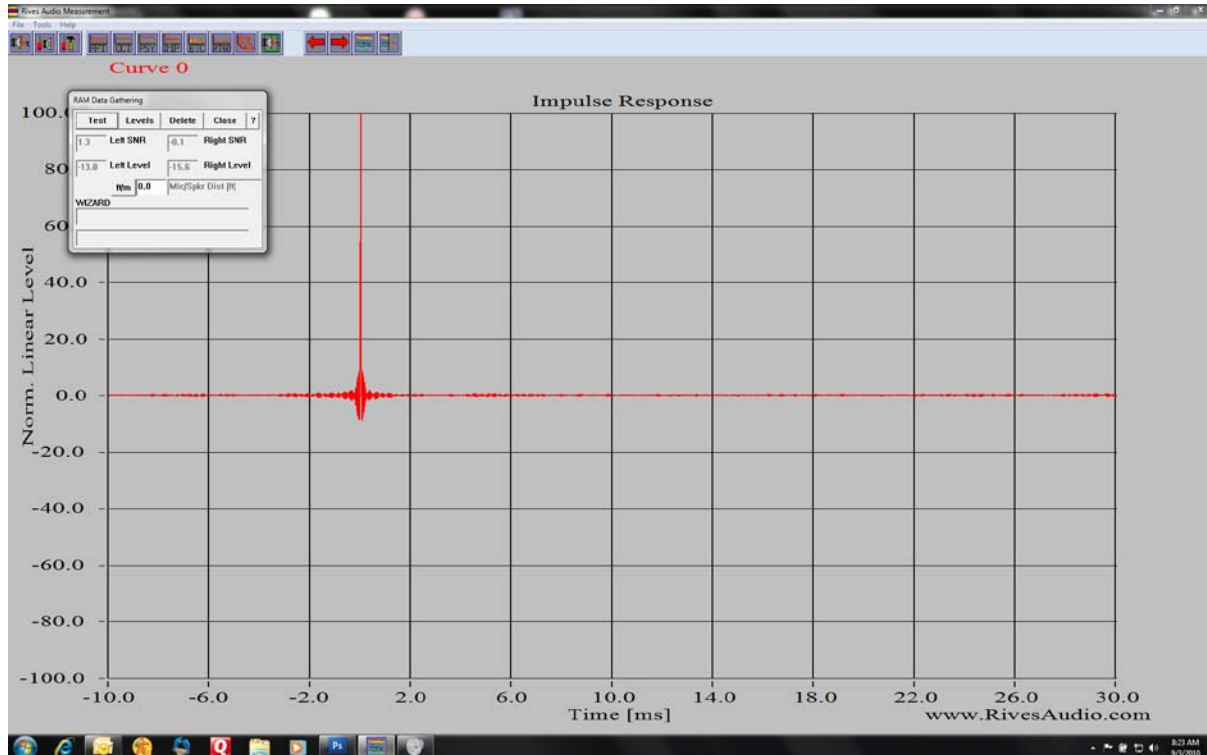
Step 5: start loop though test

Now with both the left and right channel looped through and the levels set as in the previous step click "Test"

RAM will play & record a sweep tone through the sound card. When this operation is through the wave editor graphs will show the resulting measurement levels and the selected graph. The default is impulse.

Step 6: analyze loop through

Review the impulse response. It should look something like this.



Step 7: sound card evaluation

If the impulse is a sharp spike at 0 ms, then everything should be operating properly.

Good Sound Card Measurement

If the sound card impulse response should look very similar to the above. The result should be free of noise (smooth & flat after approximately 0.5 ms. Sound card tests should look similar to "good soundcard.etf", included in the download.

Poor Sound Card Measurement

The noise in this measurement indicates software resampling. The sound card actually records at 48 KHz but resamples to give the 44.1 KHz test (RAM was set at 44.1 KHz). Changing the sample frequency in RAM to 48 KHz clears the noise because it eliminates the need for internal software resampling. The sample rate can be changed from the main menu, go to "Tools" -> "Sound Card Buffer Setting".

Step 8: Connecting the microphone

Congratulations: RAM is now ready to take a room measurement. Now you need to connect your computer to the microphone, mic pre amp, and one input connection on the stereo system you are testing. You will also need to load the file from the provided floppy disc as the mic calibration file.

First, remove the connector used for the loop through test on the right channel. Then connect the terminal label *mic pre out* to the output on the microphone preamp. There is also a dedicated cable for connecting the microphone to the mic pre amp. Last connect right output of the sound card to an available input on the stereo you are testing. We've provided an 8.5 meter cable, but understand some installations may require an additional extension cable.

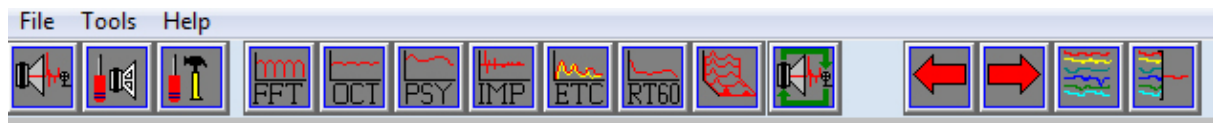


You will now need to again test the levels. Turn on the stereo to a moderate volume. Press level check. The left channel should be fine. Using an SPL meter (we recommend the Radio Shack analog SPL meter, adjust the volume of the stereo until the level check is outputting approximately 80 to 85 db at the listening position. Once you have this, then adjust the mic pre amp volume (the red knob shown above) until the levels on the RAM are back between -1 and -10 dB and the SNR is at least 2.5. Once you have accomplished this you can take a full measurement.

Step 10

In the data gathering window input the microphone distance from the speaker. This enables the most accurate triggering for measurements.

Click "Test".



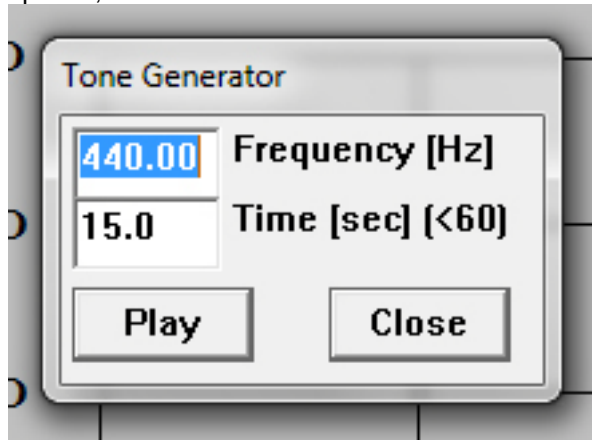
Click on the other forms of measurements to view linear frequency response (FFT), Octave average response, Pshychacoustical response, Impulse response, ETC (energy time curves), RT-60 response, waterfall plots (for low frequency only),

Step 12

Tone Generator.

RAM has a tone generator. This is under the tools menu and can be very useful in determining where certain "hot spots" in the room are. Once you have found a particular frequency that is above the normal level, set the tone generator to this frequency and to a duration that is long enough for you to make a pass around the room with an SPL meter and determine the highest peaks.

This is not a very useful tool for high frequencies as the peaks and nulls are closely spaced, rather it should be used for 500 Hz and below.



The Tone generator window is shown above:

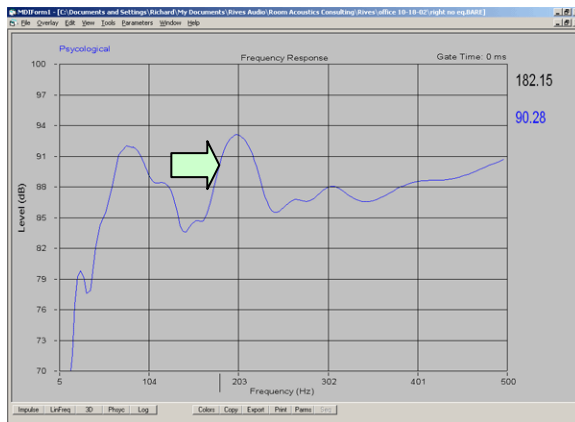
Pressing play will play this tone for the duration specified.

Using RAM to calculate Q factors Manually.

After acquiring a measurement display the psychological response.



In this picture the yellow line shows the peak at 200 Hz. This is also displayed in the top right corner precisely as 200.29 Hz. The peak is at 93.11 Hz. This is above our calibrated normal point of 88 Hz.



In these two pictures we have placed our cursor on the left point that is closest to 3 dB below the peak value, thus 90.28 db which corresponds to 182.15 Hz. On the right picture we placed our cursor on the right point that is closest to 3 db below the peak value or 90.07 db. To calculate the Q factor for this peak we use the following formula:

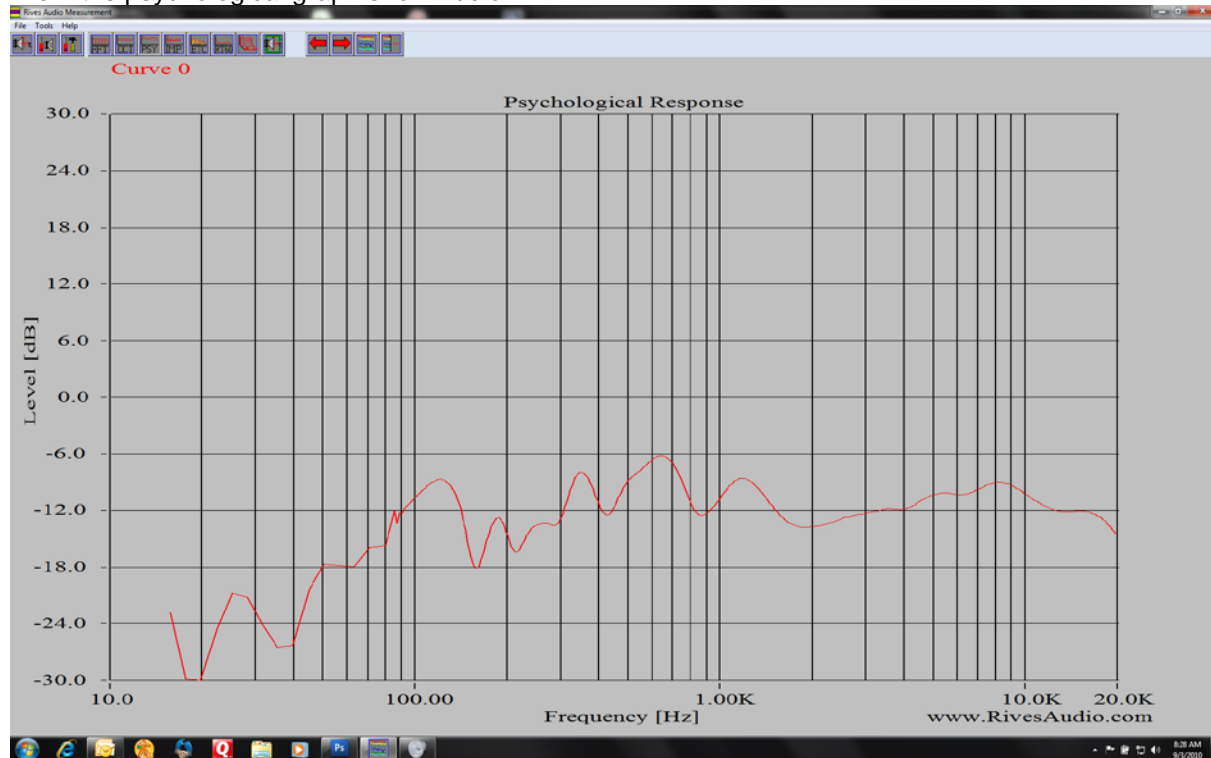
$Q = F_{\text{center}} / (F1 - F2)$ Where F1 and F2 are the right and left points 3 db down from the center point.

$$Q = 200.3 / (222.6 - 182.2)$$

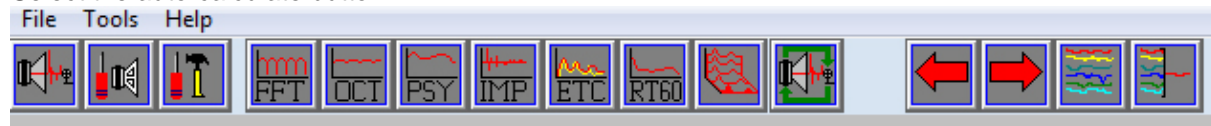
$$Q = 4.96 \text{ or approximately } 5.$$

Using RAM to calculate all parameters automatically.

From the psychological graph shown below:



Select the auto-calculate button



which is the second right most icon at the top of the screen. When you do this you will get the results in a new window. Those with 0 attenuation can be ignored. All others should be selected as shown.

Trouble Shooting:

No sound going through the external sound card:

1. If the sound card was installed correctly, this can still happen. It is usually caused by the computer defaulting to the internal sound card. With the external sound card plugged in, use your control panel, go to device manager and sound devices. Disable (but do not uninstall) your internal sound card.
2. Something is muted. Be sure to check both the play and record and insure nothing is muted.

The loop through gets sound on a channel that's not even plugged in.

1. Some internal sound cards are wired in mono, even though they are stereo cards. This is usually on the input line. This is unfortunate and there is little that can be done about this other than purchasing an external soundcard.
2. Many new computers have 3-D or other sound processing which transfers portions of the left to the right channel and vice-versa. These need to be turned off, disabled, or in some cases uninstalled for your measurements to work correctly.

I installed the drivers that came with ESI sound card, but they don't seem to work properly and the mixer is impossible to manipulate.

1. If you have Windows 2000 or XP or Windows 7, uninstall these drivers—or delete them entirely from your devices. Unplug the U24, shut the computer down. Reboot, plug in the ESI, and let windows install drivers automatically. You will see USB Audio device. This works properly with the U24 card.

I used the recommended settings from RAM, but it doesn't sound right.

1. Go back and do another RAM check with the PARC in the circuit. You should have a near flat response. If not you may need to adjust.
2. Many people find that flat is not what they like or are accustomed to. Back off on the attenuation settings by about 25%. This is subjectively usually preferred.