

Creating Earthworks Mic Compensation in EASERA and Systune using Filter Hose

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EASERA and Systune accept microphone compensations in several file formats such as EASERA etm, efr and etx files, wave files, MLSSA files, etc. However, Earthworks does not provide the electronic calibration file in any of these formats. This article discusses an easy process to convert Earthworks' calibration file into an EASERA etx file using Filter Hose (<http://www.hxaudiolab.com/filter-hose.html>).

In 2015, HX Audio received a new electronic calibration file for our M30BX microphone. Essentially, it is a text file showing the microphone's magnitude response from 770Hz and up.

```
"Transfer Function Mag - dB volts/volts (0.10 oct)(eq)(eq:aux)"
    "Hz"    "Data"
    770.9704, -1.943415
    822.3684, -1.979543
    873.7665, -2.006981
    950.8635, -2.028944
    1027.961, -2.030277
    1079.359, -2.024484
    1156.456, -2.014141
    1259.252, -2.018789
    ....., .....
```

Further explanation from the manufacture:

Editing The Ecf Curve To 10hz & Below:

Using the magnitude value found at 770Hz in your ECF, you can edit the ECF, by adding coordinate points (as needed) to the .TXT file for the frequency values you require, between 770Hz & 10Hz. If you copy and paste the 770Hz line of the .TXT file into the line preceding it and then change the frequency value to 10Hz, you will have a curve with < +/-0.25dB of error between 10Hz & 770Hz. To get accurate measurement to the -3dB roll-off point of the specific model (5Hz, 4Hz, 3Hz & 9Hz for M30BX), enter the 770Hz value, less 3dB, at the specified low end frequency, for a near vanishing error.

Since our microphone calibrator signal is at 1kHz, the overall magnitude response needs be normalized so that 1kHz is at 0dB. We select 1027.961Hz, the closest frequency to 1kHz, as the 0dB reference. Its original magnitude is -2.0303dB so we add 2.0303dB to the magnitude of all frequencies. Table 1 shows the original and the normalized magnitude.

Freq.(Hz)	Original Mag. (dB)	Normalized Mag. (dB)
770.9704	-1.9434	0.0869
822.3684	-1.9795	0.0507
873.7665	-2.0070	0.0233
950.8635	-2.0289	0.0013
1027.9610	-2.0303	0.0000
1079.3590	-2.0245	0.0058
1156.4560	-2.0141	0.0161
1259.2520	-2.0188	0.0115
.....

Table 1

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In Filter Hose, open the Manual Input module under the Advance menu. This function enables user to convert any frequency domain data to linear-spaced (FFT) data by interpolation and/or extrapolation. The new data set ranges from 0Hz to half of the sample rate frequency.

We can directly paste the normalized magnitude into the left window. Several manual edits are necessary, as highlighted in Figure 1.

- Add two data points at 20Hz and 750Hz respectively, with the same magnitude as 770Hz. This ensures that Filter Hose fills a flat line at 0.0869dB from 20Hz to 770Hz.
- Add 9Hz as the -3dB roll off point, relative to the 0.0869dB flat line.
- 0Hz is chosen as the -10dB point. Different values can be used to create a nice roll-off curve.

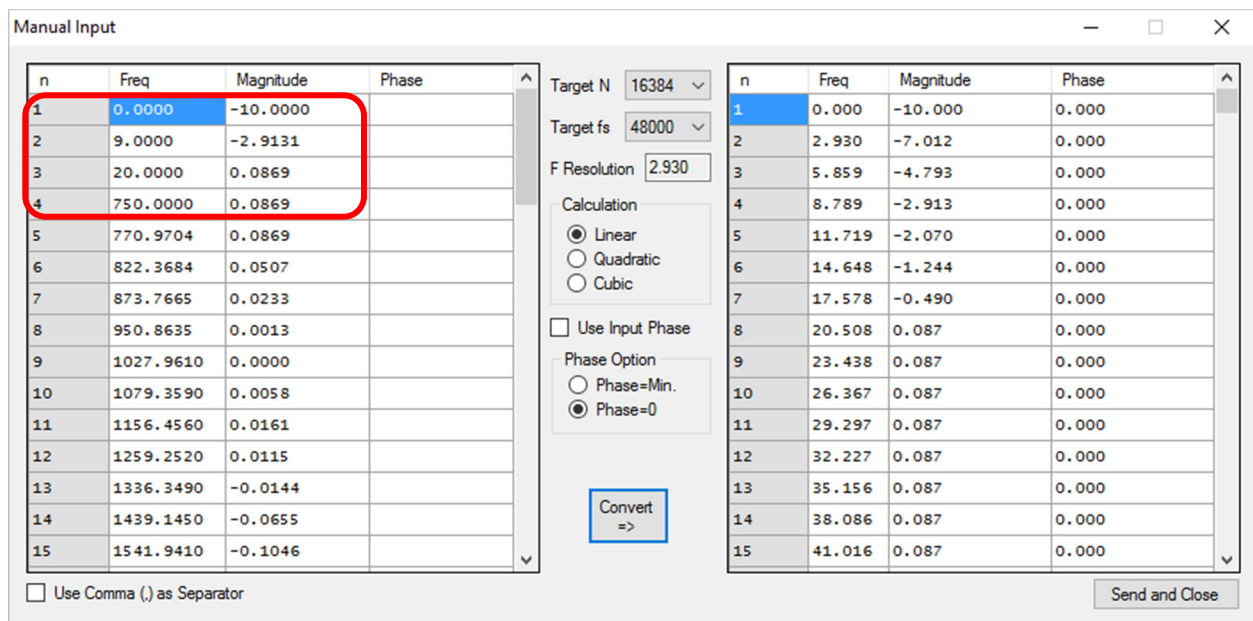


Figure 1

Please select the appropriate sample rate and length (N), and make sure "phase = 0" is chosen under the phase option. After clicking the "convert" button, we get a new set of data on the right window.

In Filter Hose's main window, right-click the right-top graph and choose "Export Text (Freq+Real+Imag)". This text file is still a couple steps away from the etx file that EASERA can load. First of all, we need to switch the file header to an etx formatted header.

Filter Hose text file header only has three lines:

```
SampleRate [Hz] 48000
Samples 16384
Freq Real Img
```

Simply delete these three lines and copy-paste an etx formatted header into the text file. A sample etx format header can be seen below. Please make sure to change the "SampleRate [Hz]" and "TimeSamples" accordingly. Any other header information is not crucial so we just leave them as is.

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```
* SDA  etx
* Version      1. 0. 3   5/4/2015 1:38:43 PM
* Dll-Version  1.1.4.10

* Files  1
* FileHeader  1
* Channels  1
* SampleRate [Hz]      48000
* DataType   Frequency (Real + Imag)
* DataSubType Not Specified
* Unit  Pa
* Complex   yes
* X-Values  yes
* FileName  C:\M30BX 48k N16k.etx
* FileDate  5/4/2015 1:37:11 PM
* User  Hadi Sumoro
* Company  HX Audio Lab
* SoftwareName EASERA
* SoftwareVersion  1.2.13
* TimeSamples 16384
* Data  8193  Lines
Hz  Pa  Pa
```

Data points start after the header

```
0      0.316227766016838      0
2.9296875      0.446057315374324      0
5.859375      0.57588686473181      0
8.7890625      0.715064141643035      0
.....
23994.140625      1.04601410072482      0
23997.0703125      1.04599151022857      0
24000      1.04596891973231      0
```

Usually etx files that are generated by EASERA also have a footer, but we can skip the footer for our purpose. Last but not least, change the file extension name from .txt to .etx.

Now we can open this file in EASERA. The magnitude response (Figure 2) should match the Earthworks' compensation curve and the phase response (Figure 3) should be 0 degree at all frequencies.

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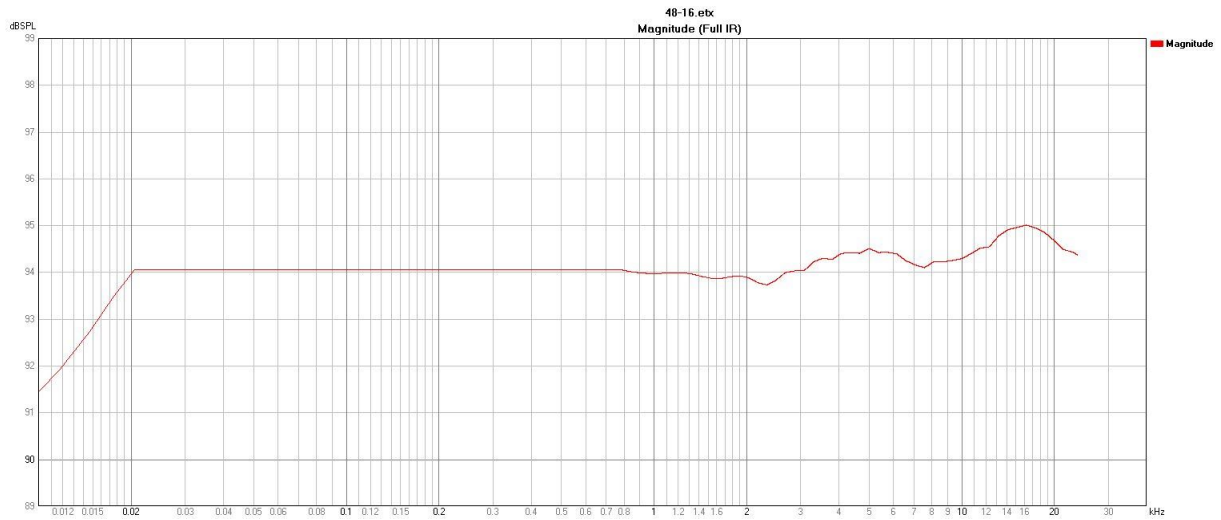


Figure 2: Magnitude Response

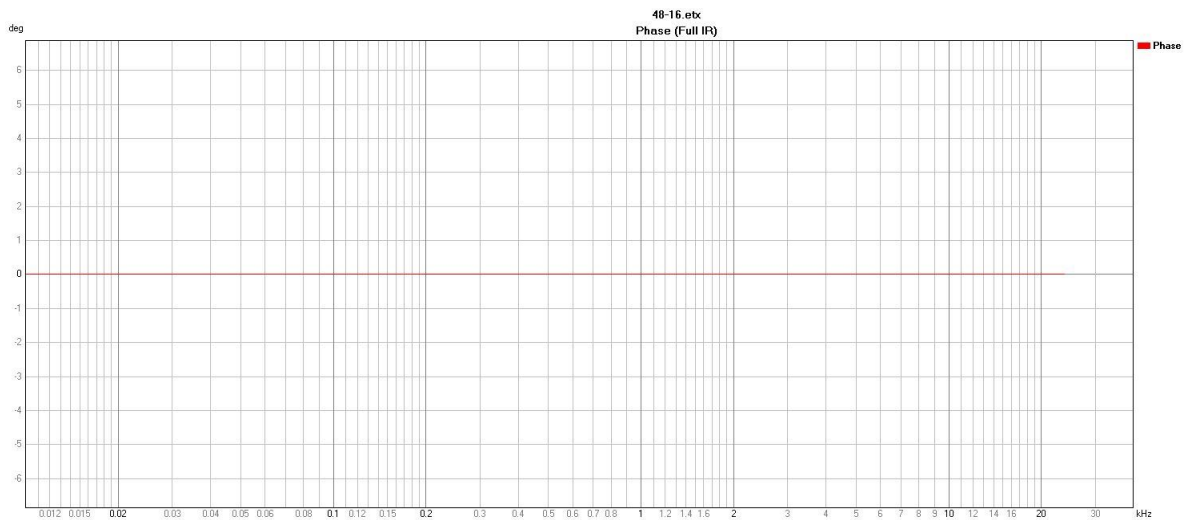


Figure 3: Phase Response

Note: Filter Hose v1.4.2 has 20 microPascal reference value in the magnitude, hence the nominal line will be close to 94dB.

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Follow the steps in Figure 4 to add this etx file as the microphone compensation in EASERA.

1. Open the microphone list from Select Measurement Setup window.
2. Choose the correct microphone from the list or add the microphone if there isn't any.
3. Click Add Reference File and use all files (*.*) type to load *.etx files.
4. Insert value of 1 as normalization.

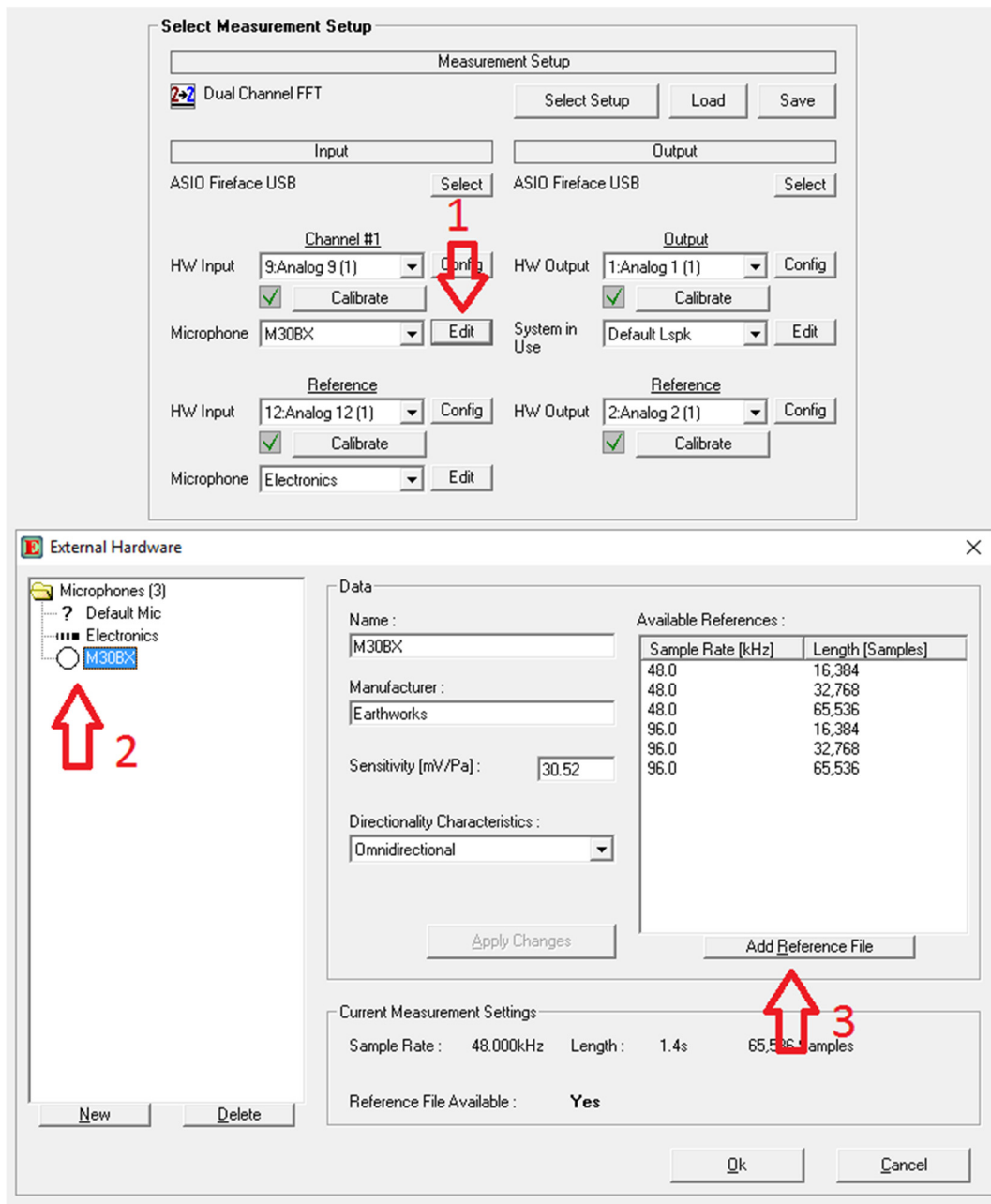


Figure 4

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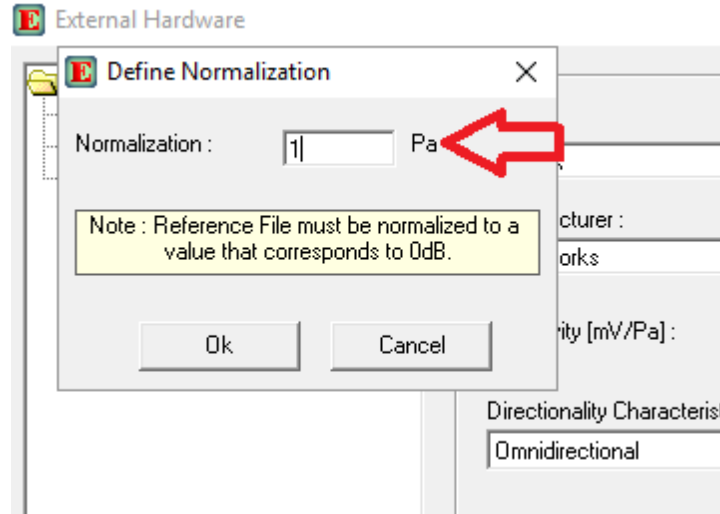


Figure 5

We can add multiple reference files with different sample rates and lengths (N) to accommodate different measurement setups.

For EASERA Pro user, the etx file can be edited directly to other desired N. For users with standard EASERA license, the easiest way is to revisit Filter Hose and select different sample rate/N in the Manual Input module.

EASERA saves the microphone compensation file in the EASERA10Data/References/Microphones folder. If you open one of the files, the frequency response should be a mirror of the original compensation curve from Earthworks, and the nominal line should be close to 0dB (or at 0dB).

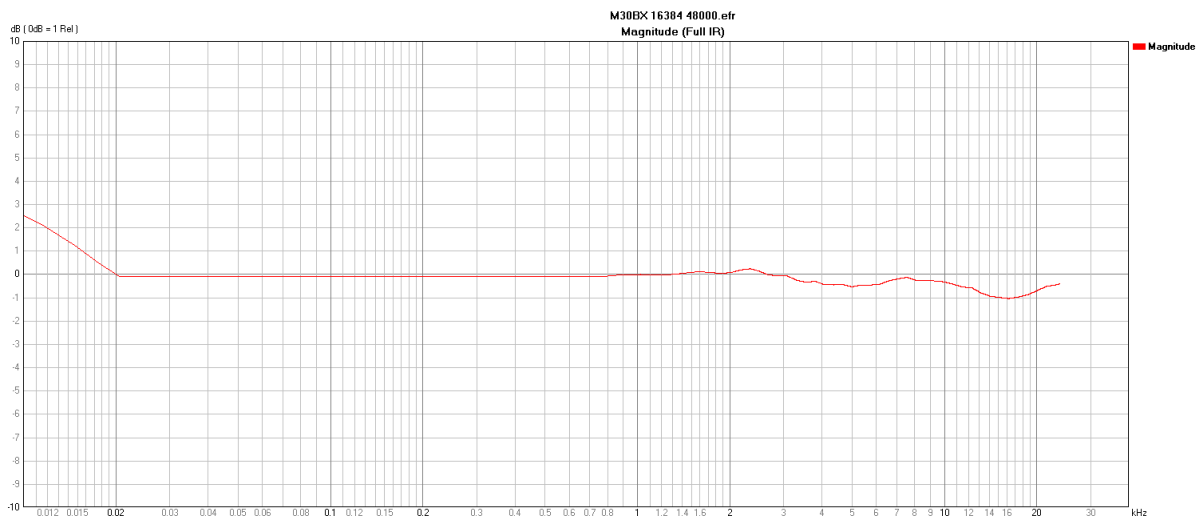


Figure 6

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To use the microphone compensation in EASERA, please make sure the appropriate channel input compensation is checked in the Start Measurement tab. This check box is only available when there is a reference file with sample rate and length that match the measurement setup.

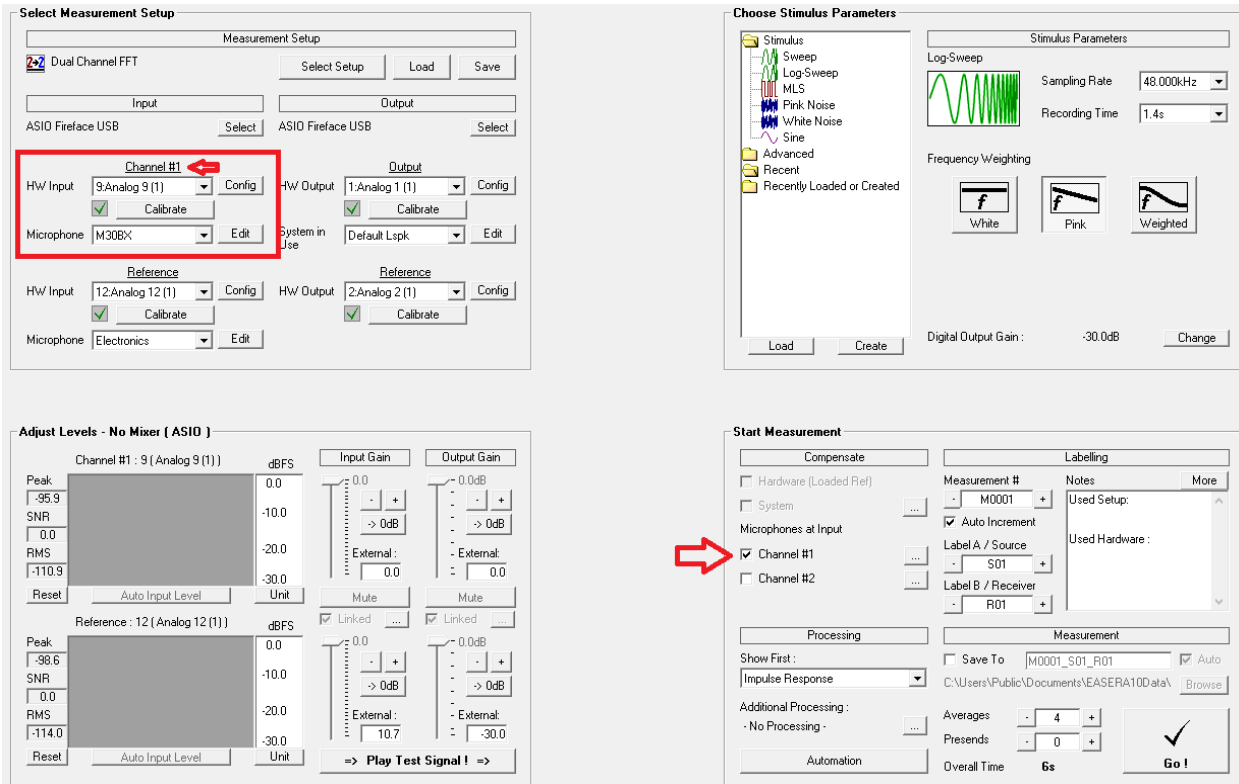


Figure 7

Creating Earthworks Mic Compensation in EASERA and Systune using Filter Hose

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To use the microphone compensation in Systune, please see figure 8, 9 and follow the steps below.

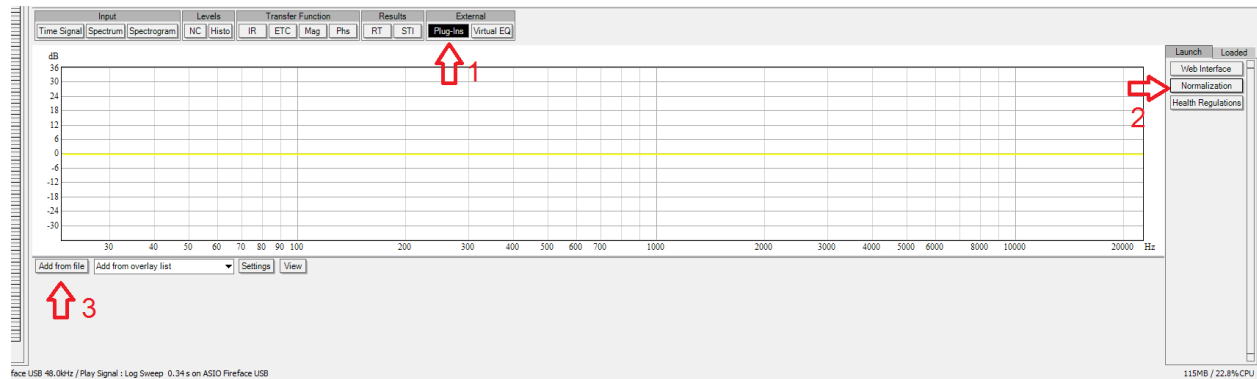


Figure 8

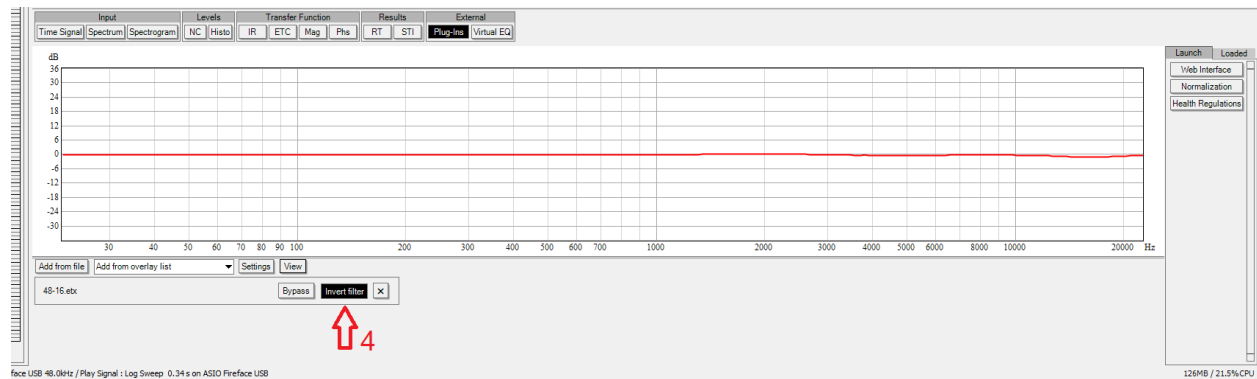


Figure 9

1. Under external tab, click on plug-ins.
2. Click on Normalization on the right window.
3. Click add from file and select the etx file.
4. Make sure invert filter is activated.

In this article, we are using: EASERA v1.2.13, Filter Hose v1.4.2, and Systune v1.3.7.