



A CLEAR AND NATURAL SOUND IN HOME STUDIO?

A PERFECT MIX WITHOUT SPENDING A FORTUNE ON NEW MONITORS?

DISCOVER WHAT YOUR SPEAKERS ARE REALLY CAPABLE OF

WITH

CONEQ™ Workshop Limited*

Acoustic Power Frequency Response Measurement and Correction System

and

CONEQ™ P2 Plug-in

Two-channel Acoustic Power Frequency Response Correction Plug-in

For a limited period of time all users having purchased CONEQ™ P2 Plug-in receive CONEQ™ Workshop Limited* license FREE OF CHARGE

Real Sound Lab's CONEQ™ is a technology to measure and correct loudspeakers based on their Acoustic Power frequency response. With CONEQ™ correction every loudspeaker sounds better - clear, natural, without attenuations - within the limits of its physical capabilities. The CONEQ™ technology is applied in two steps. First, a precise measurement of how loud the loudspeaker reproduces tones of each frequency is done and a correction filter is automatically produced. This is done by the CONEQ™ Workshop application. Second, the filter is applied by any of the software or hardware tools supporting CONEQ™, for instance - the CONEQ™ P2 Plug-in.

This document explains in brief in two sections:

- what CONEQ™ Workshop does and how
- how CONEQ™ P2 Plug-in functions

CONEQ™ Workshop Limited (version 2.3.5)

Acoustic Power Frequency Response Measurement and Correction System

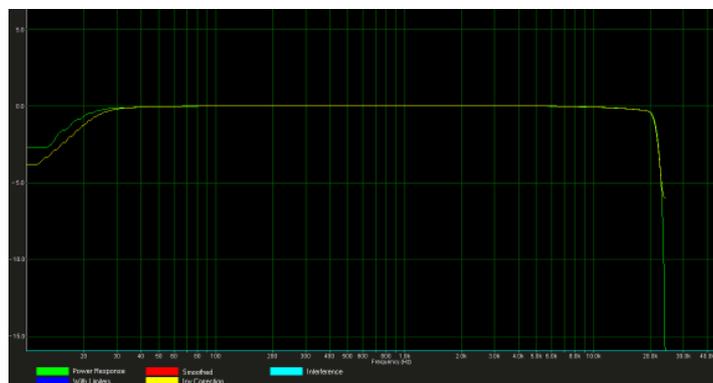
Introduction

Proper measurement is crucial to achieve the best possible results with the CONEQ™ technology. Please therefore take into account the following before using CONEQ™ technology:

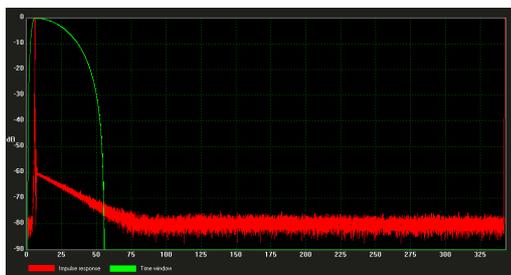
- The user must be able to properly install and configure the sound card or audio interface (audio device) and, if necessary, drivers.
- An omnidirectional measurement microphone with flat frequency response curve must be used. An acceptable alternative is to use an omnidirectional microphone with a known, electronically available individual frequency response curve in a format that is compatible with CONEQ™ Workshop
- The user must ensure that the audio device is working properly and is compatible with the CONEQ™ Workshop application. The audio device must be capable of simultaneous (full duplex) playback and recording, and both the audio device and the measurement microphone, along with the connecting cables, must be in perfect working order.
- The user should test the audio device by making input/output loopback measurements.
- The user should be ready to make calibrating measurements and corrections if necessary, prior to making the actual measurement.

It is important to understand that failure to take the steps mentioned above will increase the probability of incorrect measurements, which may cause undeserved disappointment about the achieved results, CONEQ™ Workshop software and CONEQ™ technology in general.

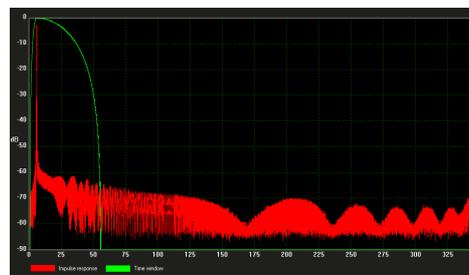
- Like all other software products from Real Sound Lab, CONEQ™ Workshop is protected against illegal copying using Syncrosoft eLicenser USB device. In the promo package of CONEQ™ Workshop Limited and CONEQ™ P2 Plug-in the eLicenser USB device is being shared and contains licenses for both applications.
- To start with, it is recommended to execute test measurement of the audio device. If the frequency response of the audio device is predominantly flat and just one narrow spike in the impulse response graph, the audio device is adequately flat and the test measurement is completed.



Correct loopback frequency response graph for the range 25-20000 Hz

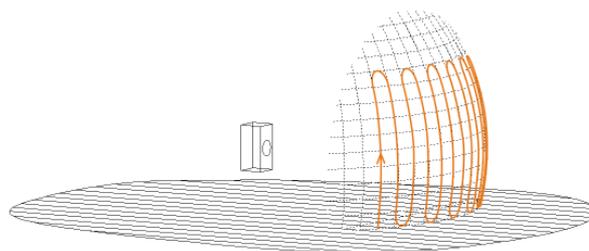


Correct loopback impulse response graph



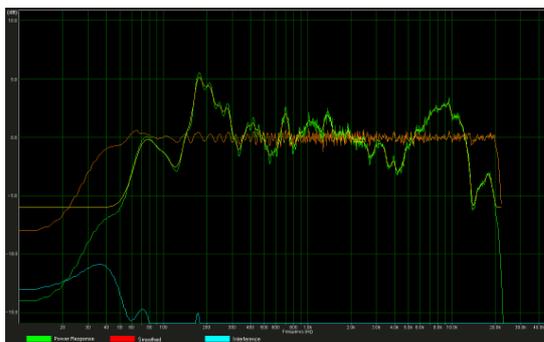
Loopback impulse response graph showing interference pattern. Such picture suggests to avoid this setup (in this case, 96kHz sample rate was too high for an internal sound card)

- CONEQ™ Workshop will run only if the USB eLicenser device is connected to the respective computer.
- The user can now start CONEQ™ Workshop and choose the project folder where project files will be saved. CONEQ™ Workshop projects are simple folders on the hard disk. The first actual measurement can start now.
- The CONEQ™ test signal (sweep) is a rapidly swept sine-wave, which is being played through the speakers to be measured. Upon measuring a loudspeaker system, the basic principle of CONEQ™ is to acquire between 150 and 250 measurement points around the loudspeaker system, thus gathering enough information to calculate the loudspeaker's true Acoustic Power Frequency Response.
- To do a proper measurement, manufacturer's specification of the loudspeaker's intended angle of coverage should be known and observed. The appropriate measurement distance from the loudspeaker or loudspeaker array must now be determined; a few simple rules apply here.
- In order to produce most accurate results measurement time window and period of test signal parameters can be adjusted.
- While CONEQ™ Workshop is recording measurement microphone should be moved throughout the angle of coverage of the loudspeaker system, working from top to bottom and from left to right, for approximately 200 sweeps. An example of a measurement surface and the microphone traverse path in front of a loudspeaker is shown in the picture below.

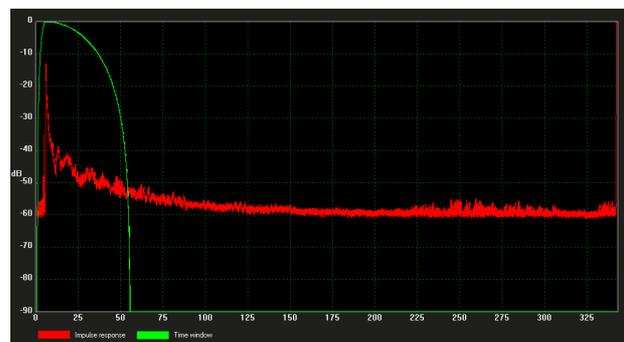


Measurement surface and microphone traverse path in front of a loudspeaker

- After gathering enough sweeps the measurement procedure can be stopped and CONEQ™ Workshop calculates the correction filters. When ready, the graph showing the frequency response curve of the tested device will appear. The green curve shows the actual measured frequency response, the yellow shows the correction filter, and the brown curve shows the difference of the measured frequency response from the correction filter. This brown curve will become the new frequency response of the device after applying the correction filter to the signal path.
- An important other curve is the cyan curve labeled *Interference*. It shows the level of noise in the environment. It must be at least 10 dB below the frequency response curve at all frequencies within the correction range.



An example of the frequency response graph



A typical impulse response graph

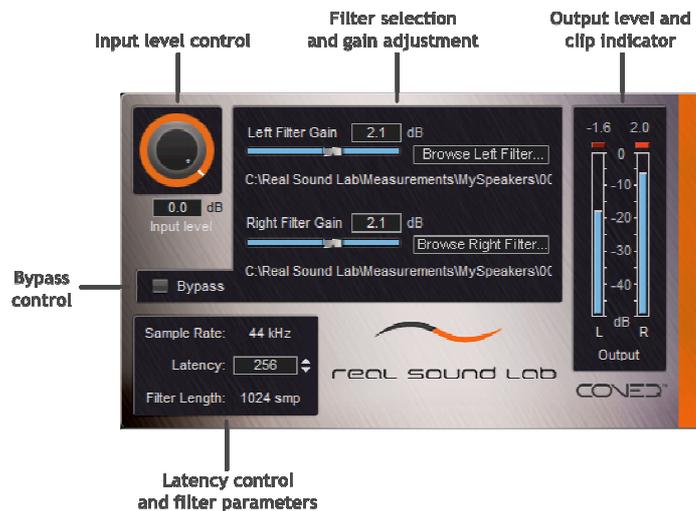
- The measurement data and correction filter files are saved in the recalculation sub-folder
- The current measurement is added to the measurement list in the project window.
- User can change any of the parameters in the project window and recalculate the measurement with new settings. With every recalculation a new sub-folder is created in the measurement folder.
- Now, as the generated correction filter files have been created (they have the extension .FIR (Finite Impulse Response)), they can be used with any of CONEQ™ driven hardware or software tools. Depending on the application different settings must be used.
- If a need to average several individual measurements and to create a single correction for all of them is present, option of composite correction feature of CONEQ™ Workshop may be considered; this may prove particularly useful in difficult environments to exclude any measurement error by repeating measurement on the same speaker system several times; or when making a single measurement of the full measurement surface is technically or physically impossible.

CONEQ™ P2 Plug-in (version 1.0.0)

Two-channel Acoustic Power Frequency Response Correction Plug-in

- CONEQ™ P2 Plug-in is a two-channel equalizer used to correct the frequency response characteristics of loudspeakers from within a DAW (Digital Audio Workstation). The CONEQ™ P2 Plug-in works inside a VST host application, such as Steinberg Nuendo or Cubase, Cakewalk Sonar, and others. For now Windows (XP, Vista) operating systems are supported.
- To use CONEQ™ P2 Plug-in, compatible CONEQ™ correction filters must be produced in CONEQ™ Workshop software application, designed to perform measurements and create correction filters to be loaded into CONEQ™ P2.
- Like all other software products from Real Sound Lab, CONEQ™ P2 Plug-in is protected against illegal copying using Syncrosoft eLicenser USB device, which is supplied with the software. This however has the advantage that CONEQ™ P2 Plug-in can be installed on as many workstations as needed and can be operated provided eLicenser USB device is present.
- CONEQ™ P2 Plug-in should be inserted as the last Plug-in on the master bus and used at all times when monitoring a recording session and editing the material.
- However, CONEQ™ P2 levels the acoustic properties of the speakers and not that of the mix. Therefore, a BYPASS button in the Plug-in must be always on during the mixdown.
- Filter selection controls allow choosing between CONEQ™ correction filters, created in CONEQ™ Workshop application earlier. CONEQ™ correction filters have extension .FIR.
- CONEQ™ P2 Plug-in uses filters only with 1 024 tap resolution. The sampling rate of the filter must match that of the material to be filtered. These details should be observed upon choosing measurement/filter settings within CONEQ™ Workshop.
- During recording and editing the material, the CONEQ™ filters should be activated with BYPASS indicator off, however doing the mixdown export the filtering must be switched off by clicking the BYPASS indicator.
- CONEQ™ P2 allows adjustment of the filter latency. As shorter latency means higher CPU load, setting according to the available CPU resources can be chosen.
- To create the CONEQ™ correction filters CONEQ™ Workshop must be used. CONEQ™ Workshop has a concept of projects. Each project is a folder on the hard disk. A project contains one or more measurements. One or more filters can be created for each measurement.

- Filters are files with the extension .FIR saved in the project file hierarchy. These files are the CONEQ™ correction filters that must be selected in CONEQ™ P2.
- Real Sound Lab will use the best effort to respond to queries as quickly as possible. CONEQ™ technology is a unique tool that due to its powerful capabilities can change the way you work and do business. Real Sound Lab's mission is to make your experience with CONEQ™ as rewarding and simple as possible.



White Paper correct by 12 May 2009 and is valid for the quoted versions of the respective products only. For further details on usage kindly refer to Reference Manuals of the respective products.

All questions and comments please direct to:

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t.: +371 6788 9828 (Headquarters)

www.realsoundlab.com



* CONEQ™ Workshop Limited expires on 30 SEPTEMBER 2009 irrevocably. Between the date of purchase and the given expiry deadline the users are given a chance to create as many filters as desired at no cost. Identical CONEQ™ Workshop Unlimited software has an RSP of € 1 200 + VAT/sales tax. Real Sound Lab invites to look out for other great offers under www.realsoundlab.com or check with the local distributor.