Ultimate Equalizer V5 – MME for Windows7 and Windows10

Background

The Ultimate Equalizer DSP software package is intended to facilitate the following functions:

- 1. Loudspeaker driver SPL/Phase equalization in Minimum-Phase acoustic mode.
- 2. Loudspeaker driver SPL/Phase equalization in Linear-Phase acoustic mode. In this mode, the loudspeaker will correctly reproduce square wave.
- 3. Room Mode equalization typically below Schroeder Frequency
- 4. DSP Crossover implementation of various types and slopes
- 5. Time delay to align drivers' acoustic centres
- 6. MLS measurement system, and more...

This is rather comprehensive list of the available DSP functions. However, the most important feature of the program is to allow you to experiment with Linear-Phase loudspeaker design.

The UE5 is a simplified version of the flagship DSP software UE10. The program is based on MME/WDM audio interface available in Windows7 and Windows10 operating systems. It is intended to be used with quality PCI and PCIe sound cards allocated as described in the next paragraph.

Sound Cards and Operating Systems

Windows 7

Recommended sound cards for Windows 7 operating system are Delta1010LT and Delta410. These sound cards and their drivers are still available on the internet. For example the latest driver for Delta1010LT sound card is Version 6.0.8.

Using this card, you will be able to implement up to 2 x 4-way stereo systems on Windows 7 PCs. Example of Input (Recording) settings in Windows 7 Sound Manager:

💱 Sound 🛛 🗶	😴 Line 1/2 Properties 🛛 🗙
Playback Recording Sounds Communications	General Listen Levels Advanced
Select a recording device below to modify its settings:	Default Format
Record 01+02 Lymx AES16-SRC Ready	Select the sample rate and bit depth to be used when running in shared mode.
Line 1/2 M-Audio Delta 1010LT Default Device	Exclusive Mode
Line 3/4 M-Audio Delta 1010LT Ready	 Allow applications to take exclusive control of this device Give exclusive mode applications priority
Line 5/6 M-Audio Delta 1010LT Ready	
Line 7/8 M.Audio Delta 1010LT Ready	
Configure Set Default V Properties	Restore Defaults
OK Cancel Apply	OK Cancel Apply

Example of Output (Playback) settings in Windows 7 Sound Manager:



Example of Delta1010LT settings in Delta Control Panel:

N-Audio Delta Control Panel		
mixer input output hardware	about	
sample settings	sync source	settings
sample rate	locked	reset delete
ASIO/WDM buffer size	internalexternal - spdif	select PCI card
256 samples	external - word clock	📕 Delta 1010LT
spdif settings	other settings	
mode emphasis	disable asio direct monitoring	
consumer not indicated data type scms audio none (00)	invert analog ins	
		M-AUDIO

The above example is given for 48kHz sampling rate setting. Obviously, when attempting to play standard music CD wave files, the settings should be changed to 44.1kHz.

Example of UE5 Preferences Screen settings, that correspond to the selections above for 2in/8out configuration, are shown below.



Please note, that Delta1010LT shows as a 10-channel Playback audio device in Windows Sound Manager, therefore UE5 Preferences are set to "8 + SPDIF" for Outputs. SPDIF outputs are not used in this version of UE5.

Windows 10

There are two sound cards recommended for Windows 10 operating system: Trace8 and TraceOut16, both available from a German company Marian GmbH. Again, these sound cards are still available on the internet and come with drivers for Windows 10. Using these cards, you will be able to implement up to 2 x 8way stereo systems (2in/16out) on Windows 10 PCs

It is worth mentioning, that another card from Marian – Seraph8 will be soon incorporated into the recommended suite of cards for UE5. It is then expected to allow implementation of 8in/16out DSP systems, when used with TraceOut16 card.

Shown below are settings for Trace8 sound card.

Please note, that Trace8 is the "Synch Master" card and the TraceOut16 is locked to the Master card.

Settings 1: Trace 8	× Settings 1: Trace 8 ×
General Sync. Latency Midi Firmware	General Sync. Latency Midi Firmware
Operation Mode	SyncBus Clock
Sample Rate up to 48 kHz (Mixer with 6 AUX Sums)	Card is SyncBus Master
Sample Rate up to 96 kHz (Mixer with 2 AUX Sums) Sample Rate up to 192 kHz (Mixer without AUX Sume)	MME/DirectSound Clock Source
Sample Rate up to 192 kHz (Mixel Without Abx Sums)	Choose automatically
WC/SC Input Signal Idle Sample Rate	Clock Source:
WC x1 The Trace 8 uses the incoming frequency as a rate, use the following rate:	Internal Clock
O WC x4 samplerate. O last used rate	SvncBus Clock
SC 256 In this Samplerate 48000 Hz	ASIO
O SC 128	Initial Clock Source: Internal
✓ Termination active	
MME/DirectCound Complexate Conflicts	GigaStudio
	These settings apply to all installed Trace 8. Changes at these settings are used immediately. Thus, it is not necessary to
	dick "Apply" or "Ok".
>> Info Cancel Apply Ok Settings 1: Trace 8 General Sync. Latency Midi Firmware	>> Info Cancel Apply Ok X Settings 1: Trace 8 X General Svnc. Latency Midi Firmware
DMA Buffereire (Geneller)	
These settings apply to all installed Trace 8. Changes at these settings are used immediately. Thus, it is not necessary to d "Apply" or "Ok".	#1:VID_1382&PID_44A8&REV_02&BUILD_00000000 #2: Not Installed #3: Not Installed #4: Not Installed
64 256 40	Update 196 The driver optimate sutematically taken care on the right frequence version the
Test Tone at "Play 1-2 (MARIAN Trace 8)" (1 kHz, -6 dB, 44.1 kHz) Resulting Latency (depends on samplerate):	hardware is working with. In very rare cases only it is necessary to do a firmware update manually.
kHz 22.05 32 44.1 48 64 88.2 96 176.4 192	2 The firmware update is always executed for all installed Trace 8. Execute a
ms 11.61 8.00 5.80 5.33 4.00 2.90 2.67 1.45 1.3	3 manual firmware update only if your are asked to do so by the MARIAN support.
Changes will cause disruptions when made during record or playback	Execute a manual firmware update now
No latencies greater than 18 ms when using the Microsoft Multimed	ia
Drivers (Standard MME)!	

Windows Sound Manager settings for Trace8 are shown below:

Sound	X Analog 1-2 Properties X
Playback Recording Sounds Communications	General Listen Levels Advanced
Select a recording device below to modify its settings:	Default Format
Analog 1-2 MARIAN Trace 8 Ready	in shared mode.
Analog 3-4 MARIAN Trace 8 Ready	Exclusive Mode
Analog 5-6 MARIAN Trace 8 Ready	 Allow applications to take exclusive control of this device Give exclusive mode applications priority
Analog 7-8 MARIAN Trace 8 Ready	
TDM 1-2 MARIAN Trace 8 Ready	v
Configure Set Default V Prope	ies Restore Defaults
OK Cancel A	OK Cancel Apply

Now, TraceOut16 settings at Marian card driver are:

Settings 1: Trace Out A16	× Settings 1: Trace Out A16	×
General Sync. Latency WDM Audio Firmware	General Sync. Latency WDM Audio Firmware	
Operation Mode	SyncBus Clock	
Sample Rate up to 48 kHz (Mixer with 6 AUX Sums)	Card Is SyncBus Master	
Sample Rate up to 96 kHz (Mixer with 2 AUX Sums) Sample Rate up to 192 kHz (Mixer without AUX Sums)	MME/DirectSound Clock Source	
WC/SC Input Signal Idle Sample Pate	Chock Source:	
WC x1 The Trace Out A16 If no program determines a sam	le O Internal Clock	
OWC x2 uses the incoming rate, use the following rate:	O WC/SC Input (WCx1)	
SC 256 Samplerate.		
O SC 128	Initial Clock Source: Internal	\sim
	Cira Chulta	
	Gigastudio	\sim
>> Info Cancel Apply C	>> Info Cancel	Apply Ok
Settings 1: Trace Out A16	X Control Current Laterary W/DM Audio T	^
General Sync. Latency WDM Audio Firmware	WDM Audio - Multichannel	io - Stereo
DMA Buffersize (Samples) These settings apply to all installed Trace Out A16.	Multichannel Device active Number of	Stereo Devices: 0
Changes at these settings are used immediately. Thus, it is not necessary to "Apply" or "Ok".	lick First Channel:	
	Channel Count: 16	
64 256	Attention	
Test Tone at "Searching Device" (1 kHz, -6 dB, 44.1 kHz)	Channels occupied by the Multichannel Device are not	available as Stereo Device.
Resulting Latency (depends on samplerate):	Restart Windows to apply these settings.	
kHz 22.05 32 44.1 48 64 88.2 96 176.4 1 ms 11.61 8.00 5.80 5.33 4.00 2.90 2.67 1.45 1	3	
Changes will cause disruptions when made during record or playback		
O No latencies greater than 18 ms when using the Microsoft Multimu Drivers (Standard MME)	ia	
Drivers (standard minic):		
>> Info Cancel Apply O	>> Into Cancei	Арріу Ок
Windows Sound Manager settings for	Trace8 are shown below:	
Sound	X A Multichannel Properties	×
Playback Recording Sounds Communications	General Levels Advanced	
Select a playback device below to modify its settings:	Default Format	
Play 9-10	Select the sample rate and bit depth to be in characteristics	used when running
MARIAN Trace 8	in shared mode.	
Ready	16 channel, 24 bit, 48000 Hz (Studio Quali	ity) 🗸 🕨 Test
Play 11-12 MARIAN Trace 8		
Ready	Exclusive Mode	
Play 13-14	Allow applications to take exclusive con	ntrol of this device
MARIAN Trace 8 Ready	Give exclusive mode applications priori	ity
Ready		
Play 15-16 MARIAN Trace 8		
Ready		
Multichannel		
MAKIAN Irace Out A16 Ready		
Configure Set Default 💌 Propert	Restore Defaults	
OK Cancel Ap	ОК	Cancel Apply

The driver for TraceOut16 Version 4.01 is available from Marian: <u>https://www.marian.de/en/downloads</u>

https://www.marian.de/files/trace_out/readme.htm

IMPORTANT: Marian sound cards are interconnected via TDM SynchBus cable. <u>https://www.marian.de/en/shop</u>

Example of UE5 Preferences Screen settings, that correspond to the selections above for both cards and 2in/16out configuration, are shown below.



The above example is given for 48kHz sampling rate setting. Obviously, when attempting to play standard music CD wave files, the settings should be changed to 44.1kHz.

Using Motherboard Audio

A typical PC comes with motherboard audio available as 2in/8out configuration. While the Input side (Recording – in Windows Sound manager) can be reliably used for capturing external signals into UE5, the Output (Playback) may be a different story. This is because Windows uses Realtek audio system, which often comes as pre-configured 2/4/8 way system, with channel parameters modified to suit given configuration, like 7.1 surround sound system. In short, the two main output channels may have flat frequency response and standard voltage levels, but surround channels may have imposed some limitations. This is why external sound cards are recommended for proper multichannel operation.

System Examples

Since the UE5 described in this document is a descendant of the Ultimate Equalizer family, it is strongly recommended for you to become familiar with the manuals of the UE family available from https://www.bodziosoftware.com.au/

UE5 comes with an MLS measurement system, Diffraction Simulator and File Editor to allow for free-standing operation for creating fully edited driver files, including measurements and Room EQ. All these operations are described in UE manuals and will not be repeated here.

1. 2in / 8out Stereo System

Shown below is an example of a 2x4way stereo system, with Bessel filtering block. This configuration could be used with Delta1010LT sound card using Win7.



Only the "Front Left" and "Front Right" buttons are operational for plotting transfer functions. Please note inputs are allocated as **In1 and In3**.

2. 2in / 16out Stereo System

Shown below is an example of a 2x8way stereo system, with most filtering blocks removed. This is just an example of system used to test 16-channel sound card. This configuration could be used with Trace8 + TraceOut16 sound cards using Win10. Please note inputs are allocated as **In1 and In3**.





Playback of CD - WAV files

If you check the "Play WAV File" checkbox and then press "PLAY" button, the following selection box will be opened.

3 Open					×
\leftarrow \rightarrow \checkmark \uparrow \blacksquare \rightarrow This PC \rightarrow Local Disk (C:) \rightarrow	Music > Creedence CR	5 V	Search C	reedence CR	م
Organise 👻 New folder				•== •	
📌 Quick access	Name		#	Title	^
OneDrive	As Long A I can See The light.wav		21	Track 21	
	Bad Moon Rising.wav		1	Track 1	
💻 This PC	🞯 Born On The Bayou.wav		24	Track 24	
📃 Desktop	Down On The Corner.wav		15	Track 15	
Documents	Fortunate Son.wav		9	Track 9	
Develorde	Good Golly Miss Molly.wav		5	Track 5	
Downloads	🧃 Green River.wav		12	Track 12	
J Music	Have You Ever Seen The Rain.wav		18	Track 18	
Pictures	Hey Tonight.wav		4	Track 4	
📑 Videos	I Heard It Through The Grapevine.wav		6	Track 6	
🏪 Local Disk (C:)	I put A spell On You.wav		3	Track 3	
A	Juli Lodi.wav		11	Track 11	
💣 Network	Looking Out My Back Door.wav		2	Track 2	
	Molina.wav		23	Track 23	
	Ooby Dooby.wav		10	Track 10	~
	<				>
File name: Bad Moon Rising.wa	av	~	Wave Fil	es (*.wav)	\sim
			<u>O</u> pe	en	Cancel

Please select the song you wish to hear and press "Open" button.

The program will now automatically calculate transfer functions for the Front-Left and Front-Right channels and will commence playback.

Concluding Remarks

Loudspeaker design can be an exciting activity, at least at the beginning. If your enthusiasm fades somehow, because the design process and the final products become a little predictable, then perhaps the approach offered by UE5 would inject some life back into your hobby.

The outcome will be a DSP equalized loudspeaker system with acoustically linear phase. Only such system can reproduce square waves. Add to it the intelligent room EQ, and the final product will outperform previous designs. The DSP will process up to 16 channels with 8192 - 32768 coefficients in each channel, offering **outstanding low-frequency resolution**.

All the above can be accomplished by investing in a second-hand Win7 or Win10 computer and a sound card or two.