Network DSP Power Amplifier

User Manual

cerasonar

cerasonar.de

Index

Chapter 1: Introduction

cs-2000dsp4 supports analog input and output. It can realize a variety of DSP functions, noise gate, PEQ, delay, matrix mix, FIR automatic linear phase, compressor, limiter. The status of its temperature, gains showed in colourful IPS display. They can be quickly debugged and monitored through the nice GUI software Cerasonar, which provides a broad operating space for the construction and operation of audio amplification systems.

Applications

- Villa house
- Performance & Art Center
- Broadcast
- Stadium
- Hotel
- Shopping Mall
- Retail Store
- Restaurant

Chapter 2: Technical parameter

2.1 Features

- Analog input and output channels.
- Dante 4 input network audio.
- Build-in DSP process, noise gate, PEQ, delay, matrix mix, compressor, limiter.
- FIR automatic linear phase.
- Support mode: stereo, bridge, mono, free matrix.
- Support Constant Pressure and Resistance: 100V, 70V, 8Ω, 4Ω.
- Colourful IPS display.
- Nice GUI control software Cerasonar (PC windows).
- USB free driver connecting, support TCP/IP, RS232, RS485, GPIO connections.
- Remote on/off amplifier.
- Real time remotely monitor status of amplifier.

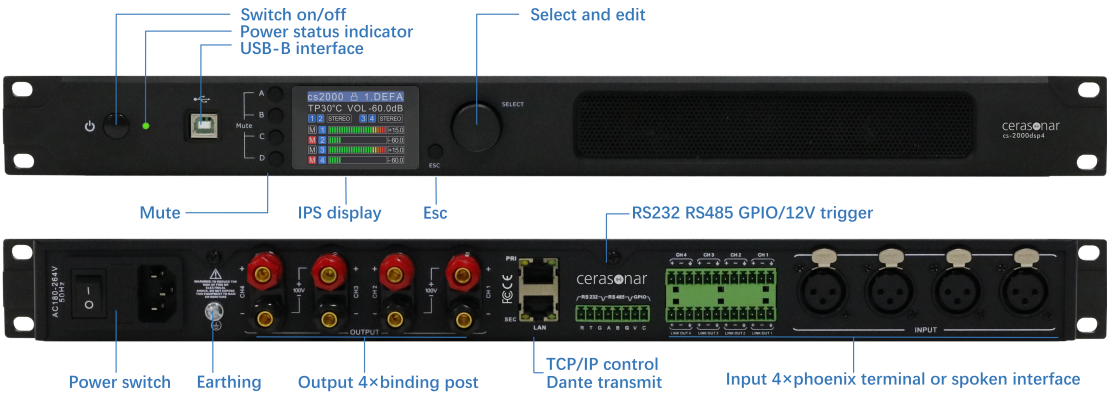
2.2 Technical data

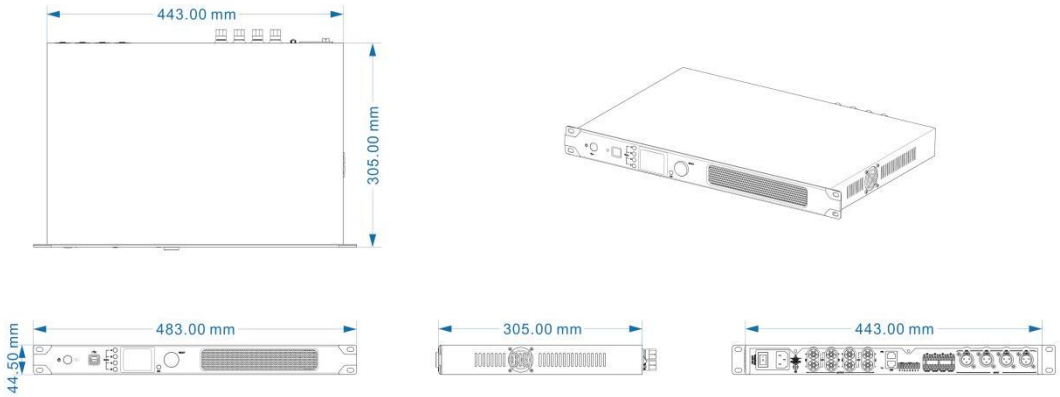
Model	**cs-2000dsp4**
INPUT AND OUTPUT CONNECTORS	

Input	Balanced 4 x XLR; 4 x Phoenix terminal
Input topology	4 x Phoenix terminal line out
Output	4 x Binding post
Dante	4 channels input
Operating mode	Stereo / Bridge / Parallel /Matrix
Control	TCP/IP, USB, RS485, RS232
POWER	
Channels	4
Power@8Ω	4 x 300watts
Power@4Ω	4 x 500watts
Bridge mode@8Ω	2 x 900watts
Constant V. and R.	100V, 70V, 8Ω, 4Ω
DSP PROCESS	
Input source	Analog, Dante, Pink noise, White noise, Sine
Input volume	Mute, Phase, Level
Input noise gate	Attack time 1 to 2895ms, Release time 1 to 2895ms, Threshold level -120dBu to 0dBu
Input PEQ	15 bands PEQ
Input delay	4 x 100ms
DSP matrix	4 x 4
Output PEQ	10 bands PEQ
Output delay	4 x 20ms
Output compressor	Soft-knee, Threshold level, Attack time, Compression ratio, Releasing time
Output limiter	Voltage 0.01V to 42.43V, Power 0.01w to 450w, Release time 1 to 2895ms
DSP presets	28 presets for user available
AUDIO PERFORMANCE SPECIFICATIONS	
Sampling	48k 24bit
Frequency Response	20Hz to 20kHz (±0.5dB)@1W, 8Ω
Gain	6dB sensitivity: 30dB (x 29.5); 0dB sensitivity: 36dB (x 31.1)
Max input level	6dB sensitivity: 14dBu (3.88V); 0dB sensitivity: 8dBu (1.94V)
SNR	6dB sensitivity: 97dB; 0dB sensitivity: 97dB
THD+N	<1%@1W to full power
Channel isolation	<-70dB
PROTECTION	
Cooling system	Dual fans intelligent control
Remotely control	Power on/standby
Monitor	Temperature, power, voltage, current

Protection	Limiter, high temperature, DC, high frequency, short circuit, back electromotive force, peak current limiter, surge current limiter, start delay, power breaker protection, power supply over-voltage/ under-voltage protection
ELECTRICAL AND PHYSICAL	
Display	320 x 240 pixel, IPS colourful
Power supply	AC100 to 240 50/60Hz
Dimension	Device 483mm*305mm*44.5mm Package 542mm*453mm*77mm
Weight	Net weight 4kg Packaged weight 5kg

Chapter 3: Functional Structure

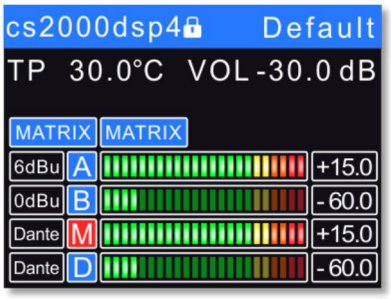




Structure and dimension

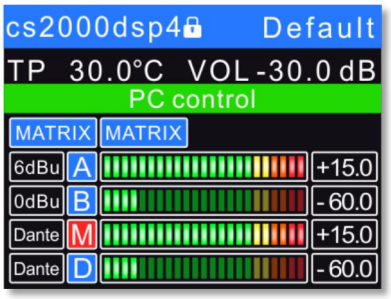
3.1 Description of display

Main interface

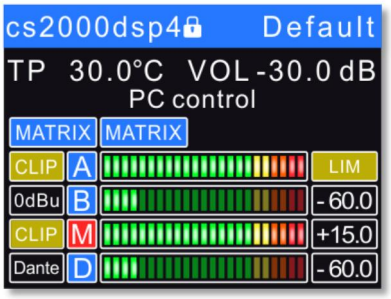


Main

In IPS display, user can learn status of this power amplifier, such as device name, temperature, mute status, gain level, current preset, volume, operating mode. When locked, long press 2 seconds to unlock.

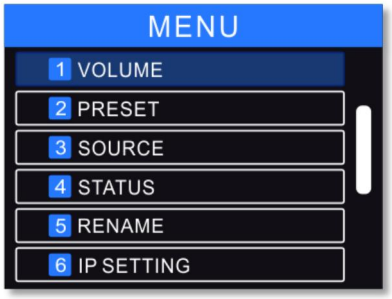


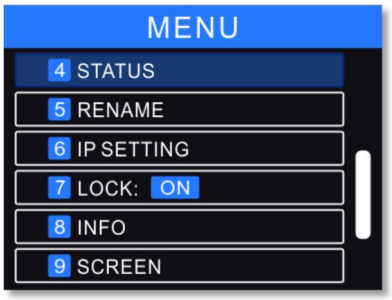
Software control



Compress/limiter start

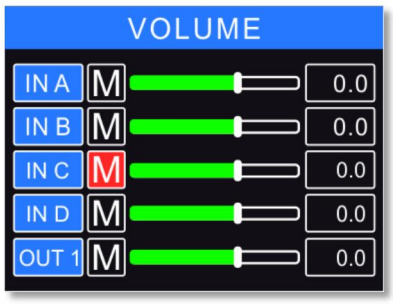
Menu interface





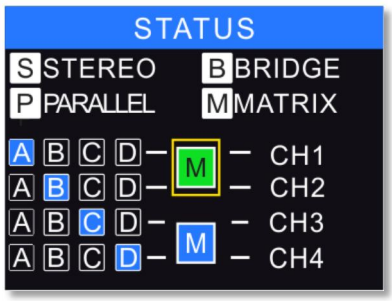
In this menu, user can quickly set functions including volume, preset, source, status, rename of device, IP address, lock automatically, view information of device and screen.

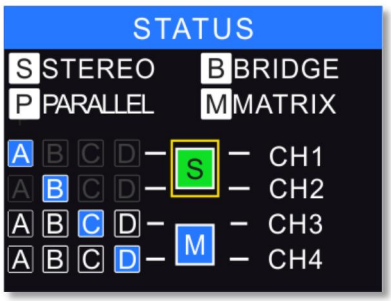
Volume

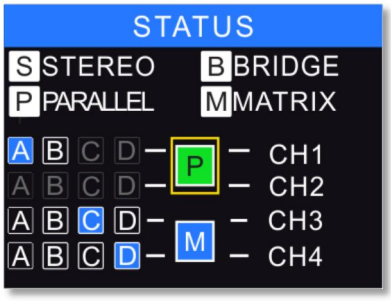


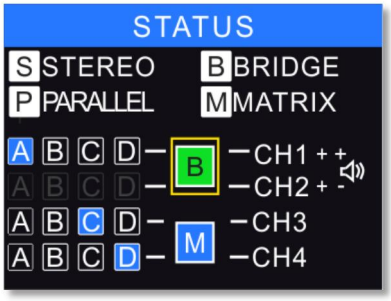
Preset

Operating mode









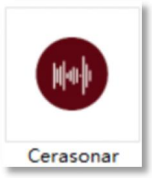
Chapter 4: Operation of control software - Cerasonar

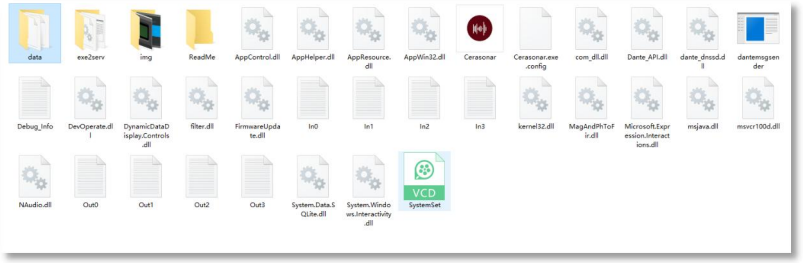
Cerasonar provides user with a fast interaction to control one or more devices through multiple methods: TCP/IP, USB, common serial port (RS232/485). Easily set DSP functions of device, GPIO control and inquire central control codes.The configuration parameter can be stored in presets, convenient for various applications.

4.1 Operating condition

Cerasonar is suitable for Win7/8/10/11 x86/x64 PC system with Microsoft .NET Framework 4.0. When connecting device in USB method, the device will

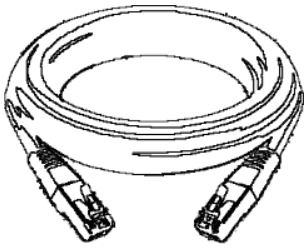
automatically ejects the storage disk, user can unzip software in Windows, no need to setup.



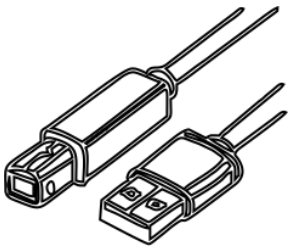


Double click **Cerasonar.exe**, the main interface will pop up.

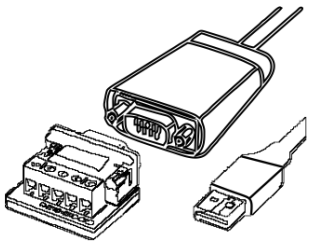
4.2 Connections setting

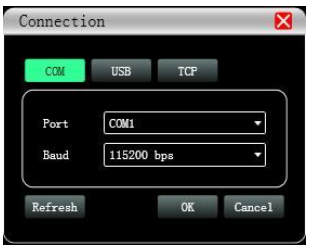


If connect device by using network cable, click **Setting** in Device List, choose TCP in Connection windows.



If connect device by using USB A-B, click **Setting** in Device List, choose USB in Connection windows.

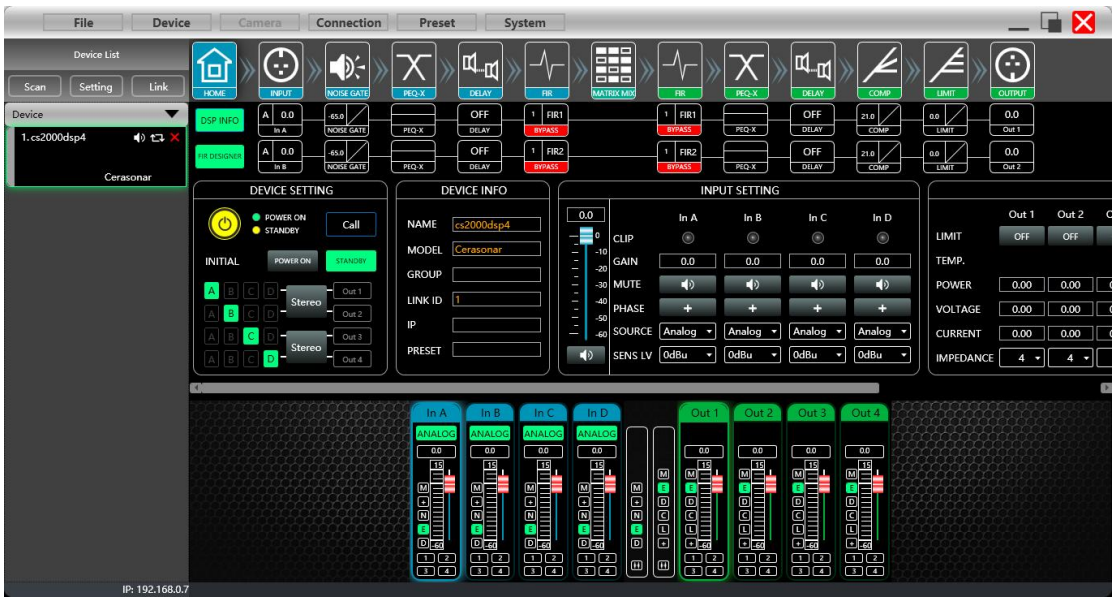




If connect device by using network cable, click **Setting** in Device List, choose COM in Connection windows. Please check port and baud rate carefully for 232 or 485 before setting.

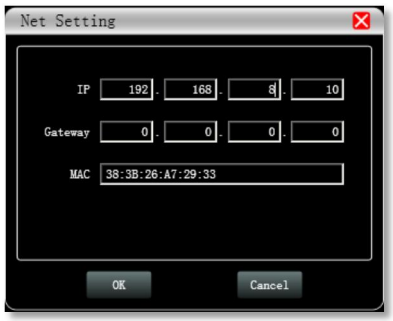
The software will scan device the method set in last time, to check if device is connected. If successfully connected, devices will be shown in device list.

User can mute device, refresh connecting, or delete device in this window. Single click device, to load function interface.

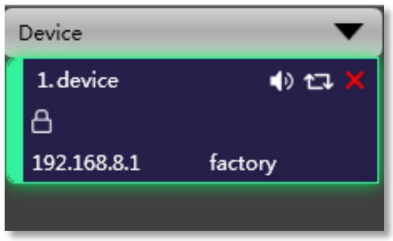


When using TCP control, there is a situation that only one point is displayed after scanning, but can not connect device. In this case, user need to change the IP address of the device to the same network segment as the PC computer.

Right-click the device enclosure, a Net Setting window will show.

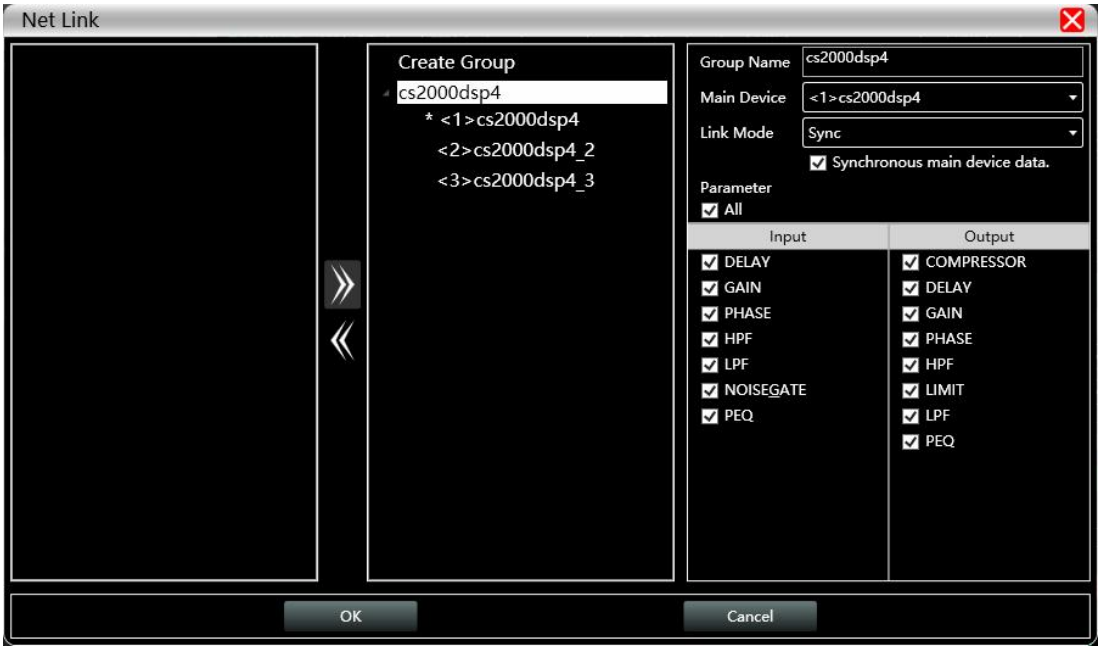


Set IP address of device refer to IP showed in the bottom of the software.



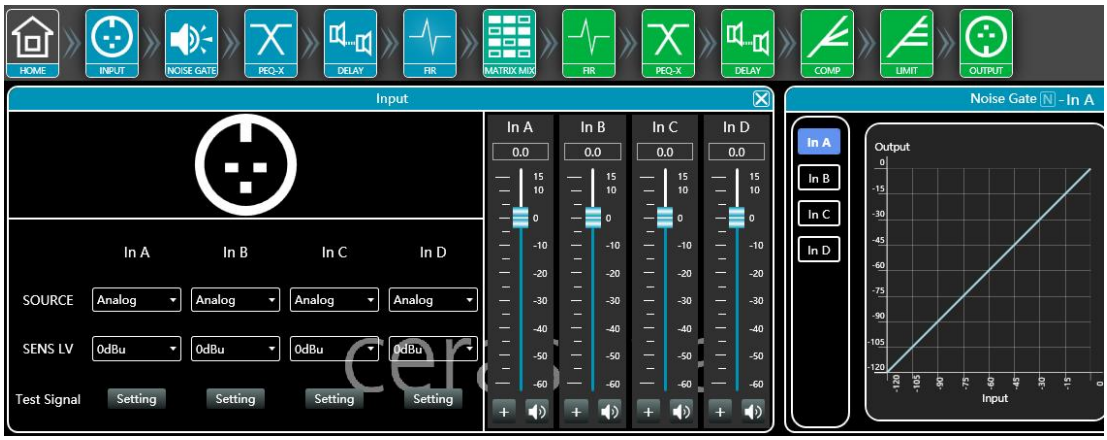
Successfully scanned and connected.

User can link multiple same devices in group by clicking Link button, and then set group device, group name and main device, link mode and parameter according to needs.

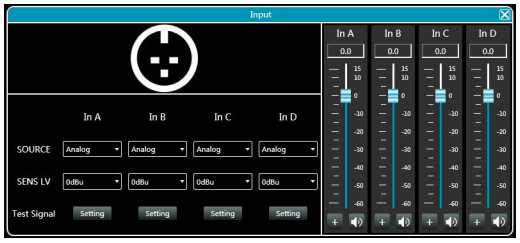


4.3 DSP functions setting

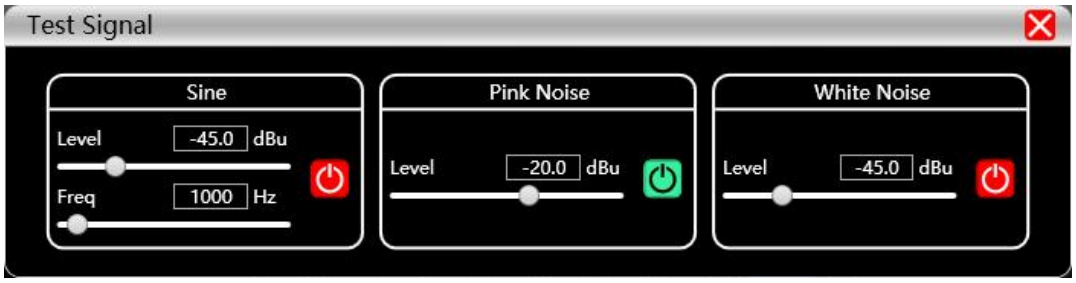
Double-click HOME icon to open all functional interfaces, or double-click a function icon separately to open the corresponding interface. When multiple function windows opened, users can drag the window to switch function Settings.



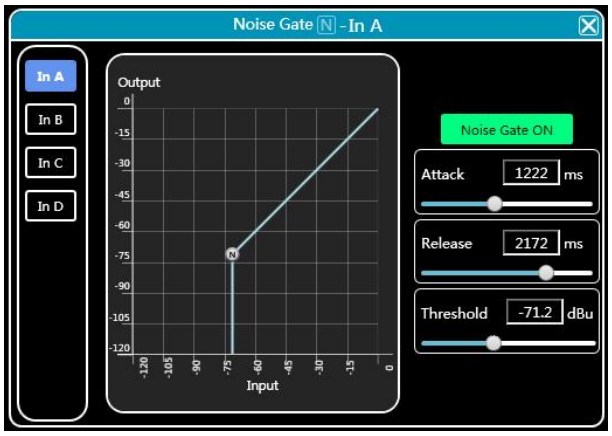
4.3.1 DSP functions setting - INPUT



- Set source of each channel;
- Set sensitivity of each channel 0/6/12dBu;
- Set gains, phase or mute in each channel;
- When choosing test signal, user can select Sine/Pink Noise/White Noise for each input channel.



4.3.2 DSP functions setting - NOISE GATE



- Attack: 1 to 2895ms;
- Release: 1 to 2895ms;
- Threshold: -120 to 0dBu;
- Click Noise Gate ON to enable this function.

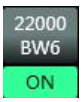
4.3.3 DSP functions setting - PEQ-X (input and output)

High pass filter

enter value of frequency and select type, press 

to enable this function: Butterworth 6/12/18/24/36/48, Bessel 12/24/36/48, Linkwitz-Riley 12/24/36/48.

Low pass filter

enter value of frequency and select type, press 

to enable this function: Butterworth 6/12/18/24/36/48, Bessel 12/24/36/48, Linkwitz-Riley 12/24/36/48.

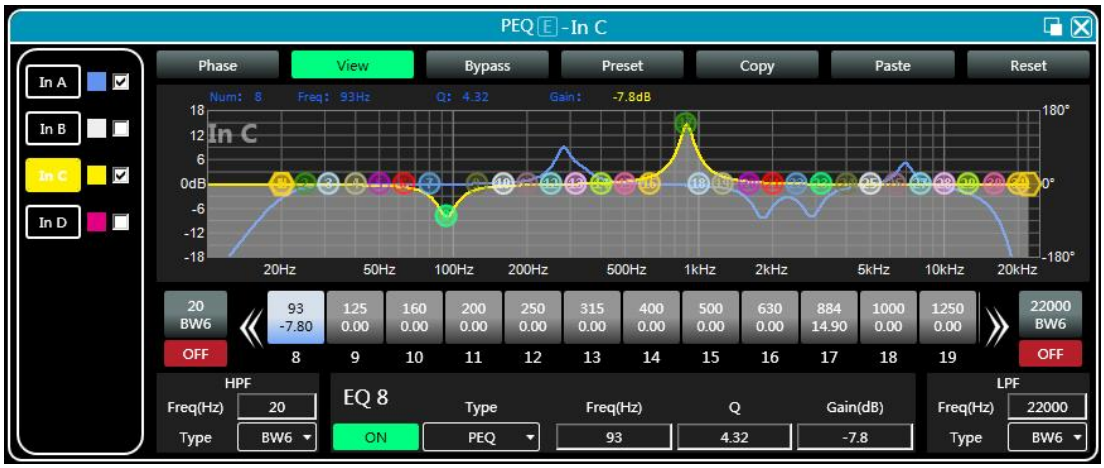
PEQ 15 bands for input channel

Type: PEQ/LSLV/HSLV/ALLPASS-1/ALLPASS-2;

Freq(Hz) Q Gain(dB): input value or use mouse pulley to set value;
Users can also drag the frequency dot on the curve to adjust.

PEQ 10 bands for output channel
Type: PEQ/LSLV/HSLV/ALLPASS-1/ALLPASS-2;
Freq(Hz) Q Gain(dB): input value or use mouse pulley to set value;
Users can also drag the frequency dot on the curve to adjust.

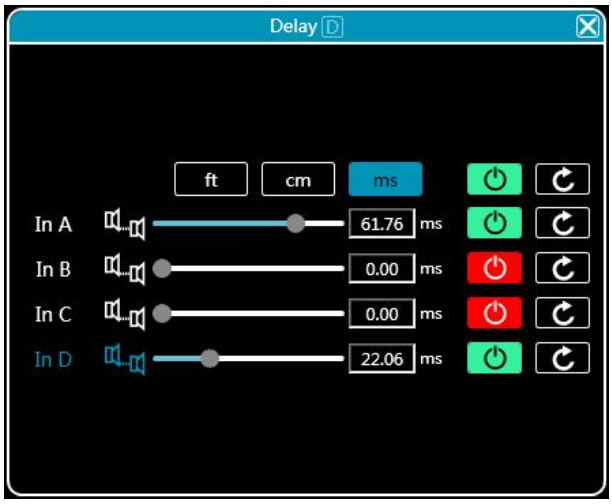
Phase curve: display the phase curve of the current channel.
View: show or hide all balance control points.
Bypass: turn on or off all equalizer EQ of the current channel at the same time
Preset: save all the setting parameter of the equalizer of the current channel to the computer, and recall the channel equalizer parameter of the computer, which can be called across channels and devices.
Copy: copy the current channel equalizer parameter value, which can be pasted to other similar channels (such as input channel parameter can only be copied to other input channels).
Paste: used in combination with the copy button to paste the last copied equalizer parameter value to the current channel.
Reset: reset the equalizer parameter to the default parameter values.



As shown in the figure above, the left side 

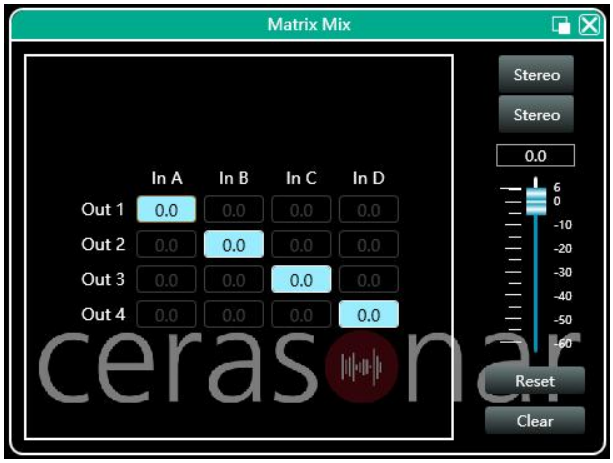
is the interface switching button for each channel. Click to switch the EQ channel, and the color is the currently selected channel.  is the curve color of the EQ channel. 
For each channel's EQ curve display switch, check it to enable it to display the curves of other channels in the current channel interface.

4.3.4 DSP functions setting - DELAY (input and output)



- Max 100ms for input channel;
- Max 20ms for output channel;
- Click  to enable this function;
- Click  to reset each channel;
- User can switch ft/cm/ms measurement for delay.

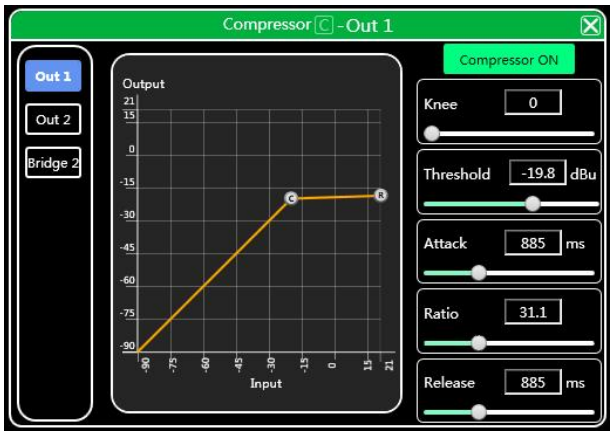
4.3.5 DSP functions setting - MATRIX MIX



In the above figure, input channel (on top side) corresponds to the output channel. The value box with a value is mixing key of channels. When the mixing key is green (double-click the value box to switch the state), the input channel and output channel signal realizes the mixing function.

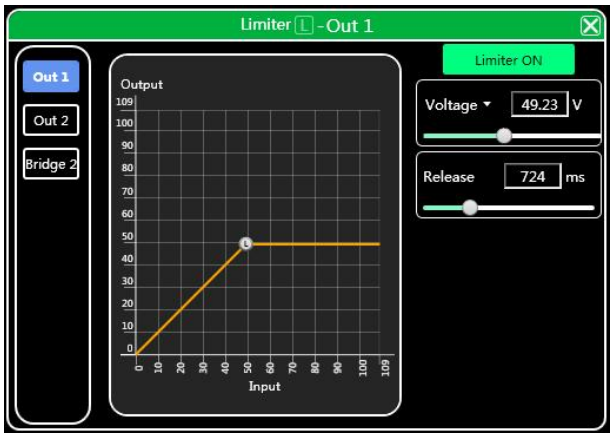
The right part of the above figure contains the gain, reset button, and clear button of the matrix mix. Click the value box on the left, and then drag the sliding block of the matrix mix gain or enter a value in the value box to adjust the matrix block Click the reset button to reset the matrix mixing function to the initial one-to-one state; click the clear button to clear all the matrix mixing functions, and there is no correspondence between the input and output of the device.

4.3.6 DSP functions setting - COMPRESSOR



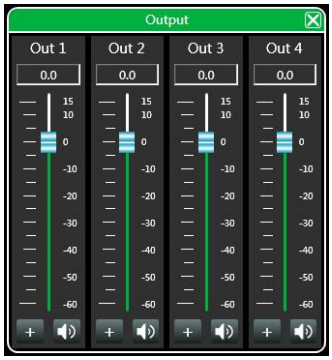
- Soft knee: 0 to 30;
- Threshold: -90 to 21 dB;
- Attack: 1 to 2895 ms;
- Ratio: 1 to 100;
- Release: 1 to 2895 ms;
- Click Compressor ON to enable this function;
- *Release time should not less than attack time.*

4.3.7 DSP functions setting - LIMITER



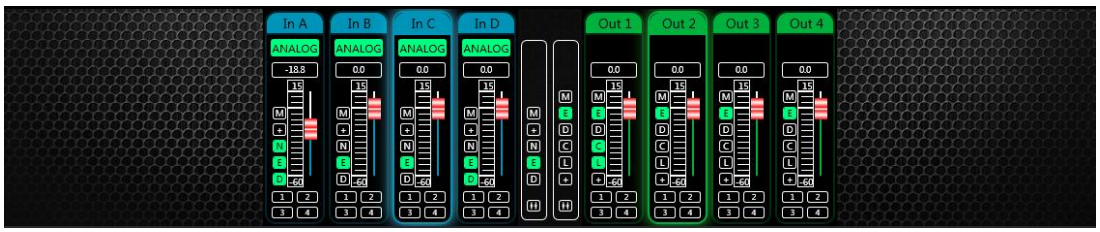
- Voltage: 0.01 to 42.43V;
- Power: 0.01 to 450watts;
- Release: 1 to 2895 ms;
- Click Limiter ON to enable this function;

4.3.8 DSP functions setting - OUTPUT



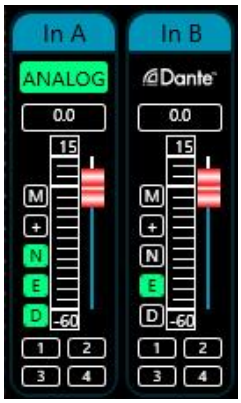
- Set phase of signal;
- Set mute of output channel;
- Set gain of output channel;
- M.Vol is used for setting total volume for device.

4.4 Monitoring and setting of channels



User can monitor gains level of input and output channels.

4.4.1 Channel gain level



There are two kinds of input signal in some products: ANALOG, DANTE network audio. It will show a label for user.

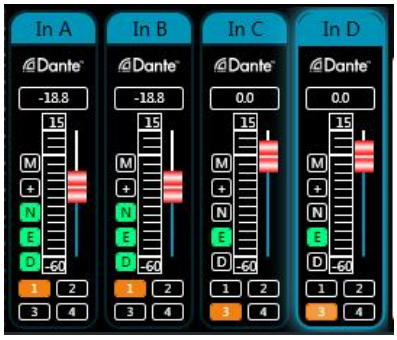
Input value, drag gain fader or use mouse pulley to set value of gain.

4.4.2 Quick buttons of DSP in channels

M Mute
+ Phase
N Noise Gate
E PEQ
D Delay

M Mute
E PEQ
D Delay
C Compressor
L Limiter
+ Phase

4.4.3 Group and channels link



User can quickly set channels in groups for opening or closing mute, phase, noise gate, PEQ and delay function.

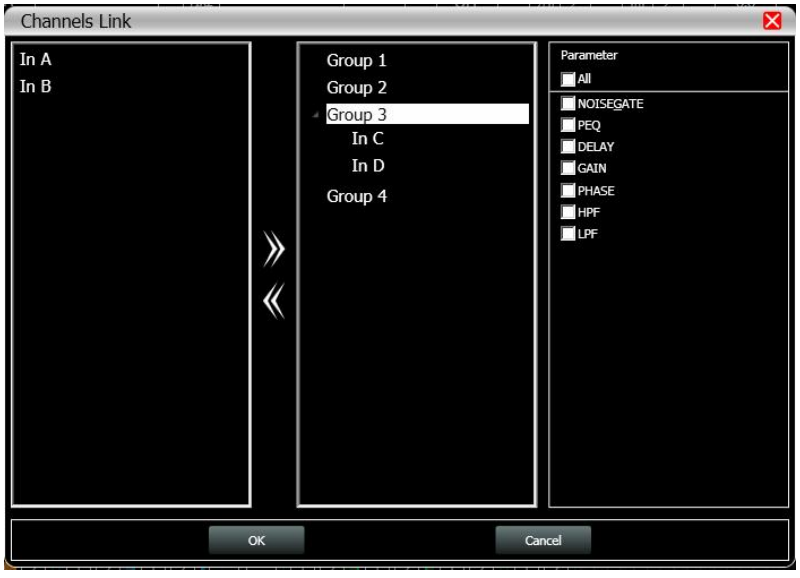
M Mute
+ Phase
N Noise Gate
E PEQ
D Delay

Channels link for input

M Mute
E PEQ
D Delay
C Compressor
L Limiter
+ Phase

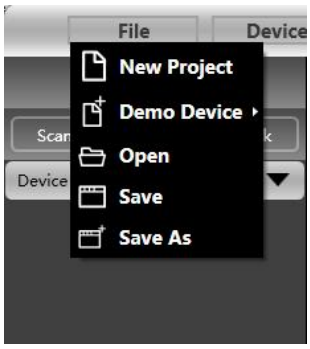
Channels link for output

When click link button, Channels Link window would show as below:



Select the corresponding channels to link, they will be in group for user to set parameter.

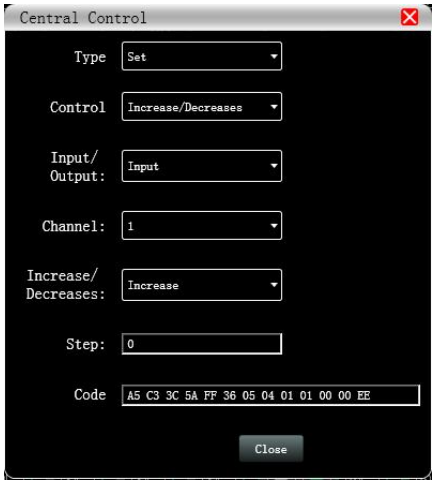
4.5 Menu - File



New project: the project is restored to the initial open state.
Demo Device: user can view all the functions of the device without affecting the specific device connected.
Open: open an existing device management project from the computer disk.
Save: save the current equipment management project in the computer disk.
Save as: save the current equipment management project to the computer disk.

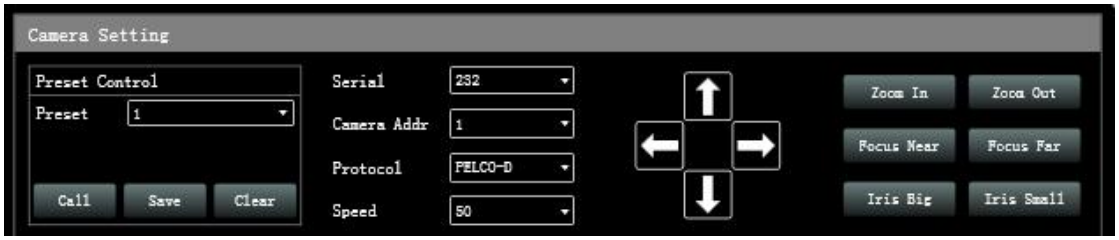
4.6 Menu - Device

Devices: view or modify the software version information, device name and device IP address of the upper and lower computer of the device.
Channel name: set the name of each input and output channel, with memory function.
Channel copy: copy device input and output channel parameter, can realize cross-device copy parameter (Note: the same type of device is required).
Central control and GPIO: Cerasonar provides user a quickly way to inquiry code of Center Control and GPIO setting. More details, please refer to another user manual <GPIO And Center Control Code User Manual>, it provides whole guide and codes for user to match every specific system.



4.7 Menu - Camera (only available in DSP matrix products)

4.7.1 Camera setting



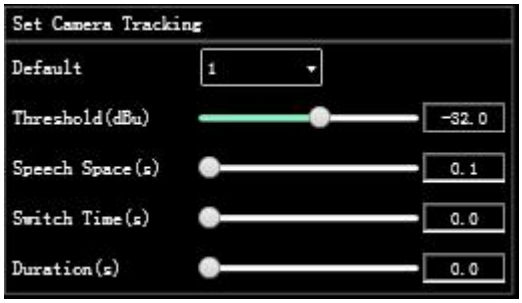
Generally, the camera position should be debugged before the tracking starts,

and finally the parameter of this part are saved on the camera.

1. Set the serial ports via RS232 or RS485.
2. Set the camera address and protocol type refer to the protocol depends on the camera model.
3. The preset No. is defined by the user for the camera, and then adjust the up, down, left, right, focal length, aperture and other parameter.
4. Click "Save" to save the parameter to the camera. "Clear" is to delete the information of the current preset, and "Call" is used to view the camera position saved by the current preset NO.

Note: A camera address can contain multiple preset No., but one preset No. corresponds to only one camera address. Camera Settings and Mic Settings have preset NO., serial port numbers, camera addresses, and protocols, which need to be considered in actual situations.

4.7.2 Set Camera Tracking

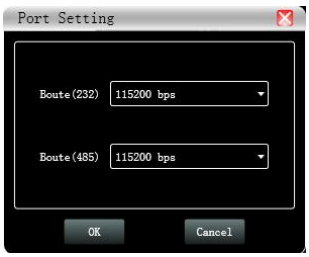


Default mic: when all mics have no input, turn the camera to the default MIC setting or send the associated command defined by the default MIC.
Tracing threshold: Indicates that the detected input signal must be greater than or equal to the tracing threshold. The system automatically enables tracing parameter.
Speech gap: the maximum discontinuous time of a valid signal. If the microphone is used to speak, the reaction time is set to 3 seconds. The signal considered to be continuously valid within 3S of the pause during speech, and invalid if it exceeds 3S.
Rotation time: the minimum speaking time required for the camera to switch to a valid position. If the microphone is used to speak for longer than the "rotation time", the channel signal is regarded as valid, and then the camera will automatically switch to the set position. Usually the "rotation time" is greater than the "rotation period".
Rotation interval: indicates the interval for sending the camera switching command or user-defined command. If the interval is 0, no camera switching command is sent.

4.7.3 Set Mic Tracking

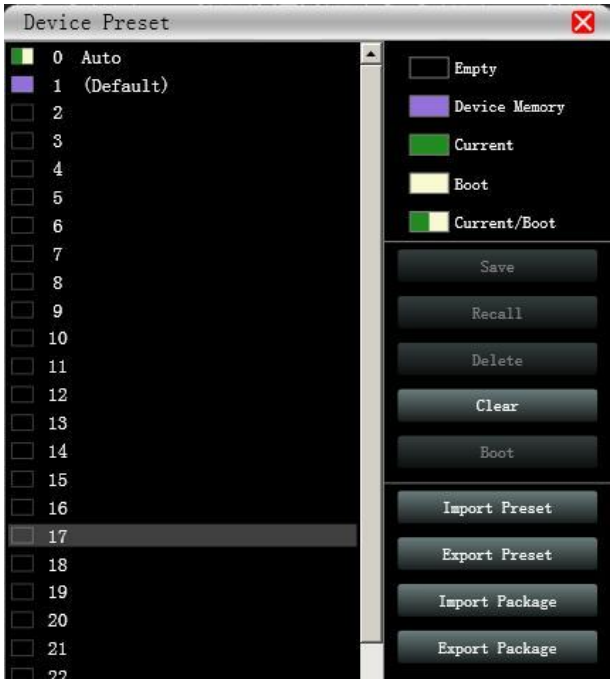
Mic No.: corresponds to the input channel of device. (parameter need to be set separately for each channel)
Priority: Higher number for priority. If the priorities are the same, the processing is performed in the sequence of triggering priorities. If two mics speak at the same time, the camera automatically rotates to the preset position corresponding to the mic with a higher priority or sends the command corresponding to the mic with a higher priority. However, if the two mics have the same priority, the signal detected first prevails.
Active: Enables camera tracking for this channel.
Apply: Saves the current microphone camera tracking parameter to the device. (After camera tracking is enabled, the parameter must be applied to take effect)
The preset point, serial port number, camera address, and protocol are related to the camera and must correspond to the actual camera connection.

4.8 Menu - Connection



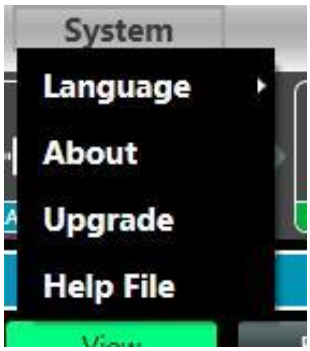
Port: set the connection mode, port number and baud rate, confirm the connection mode and then select the corresponding port.
Connect: connect and download the device parameter.
Disconnect: disconnect the connected device.
Connect all: connect and download the device parameter of all devices in the device list.
Disconnect all: disconnect all connected devices in the device list.

4.9 Menu - Preset



Save: select the saved gear, save all the parameter of the current automatic gear of the machine to the device preset (2~30 Preset bit).
Recall: call the device preset to the current automatic gear position.
Delete: delete the existing preset, the default file cannot be deleted, over written or saved.
Clear: delete all presets in the device.
Boot: select a certain preset, after setting it as the boot file, each time the device is powered on, it will automatically call the save the parameter; the last set parameter need to be automatically saved, please set the automatic file to the boot file.
Import preset: import a single preset file on the computer.
Export the preset: export all the parameter of the current state to the computer, and generate a single preset file.
Import preset package: import the preset package file containing multiple presets on the computer.
Export preset package: pack multiple presets in the machine's preset into one preset package and export it to the computer.

4.10 Menu - System



Language: multi-language switching, supports ENGLISH.
About: current control software and device firmware version information.
Upgrade: use can upgrade the firmware by using this function, a upgrade *.bin* file should be needed from seller or speaker factory. In general, no need to upgrade the firmware in device. Only there is a bug or new function in software, upgrade function will be used.

4.11 FIR filter and function

4.11.1 FIR filter and applications

When user uses PEQ to adjust audio signal and set a linear magnitude, he can find the phase of signal changed, due to IIR filter. However, DSP products provide user a useful tool FIR filter to adjust audio signal with a linear phase.

Some calculation:

Frequency resolution = Sampling/Taps
Available min. frequency ≈ Frequency resolution*3

Means when use adjust audio signal with 48kHz, 1024 taps, FIR filters will take effect in frequency above 141Hz of audio signal. The taps value more high, the FIR filter curve more steep.

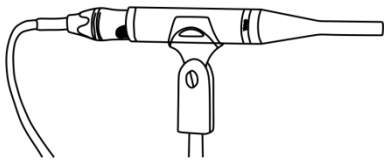
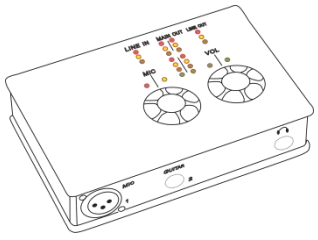
FIR filter processing audio signal will produce a certain delay:
Delay = (1/Sampling Hz)*Taps/2

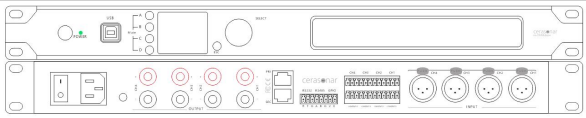
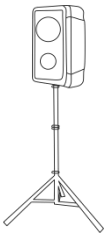
Taps	48kHz	96kHz
256	2.67ms, LF 563Hz	1.33ms, LF 1125Hz
512	5.33ms, LF 279Hz	2.67ms, LF 558Hz
768	7.99ms, LF 188Hz	4.00ms, LF 375Hz
1024	10.67ms, LF 141Hz	5.33ms, LF 281Hz
2048	21.33ms, LF 70Hz	10.67ms, LF 141Hz

Applications:

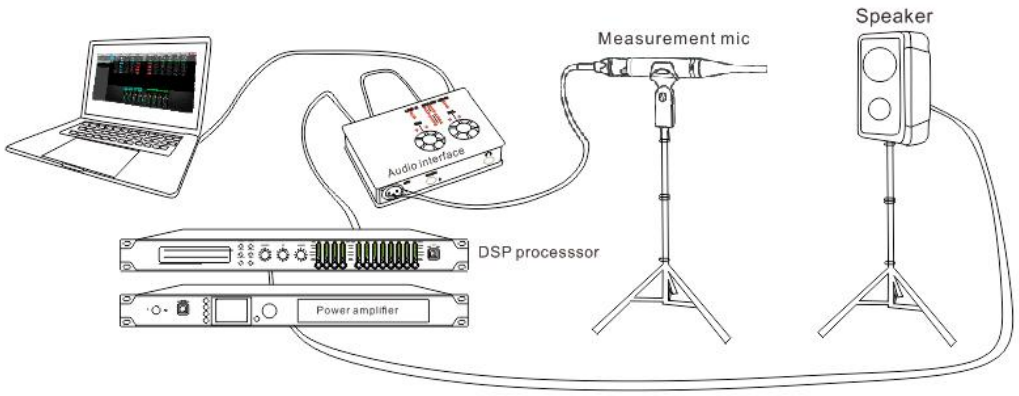
- Linear of the phase curve of the speaker;
- Match the phase and magnitude of different speaker models within the same product line, as well as different speaker models in the installation project to make it easier to debug speaker groups and arrays;
- Dealing with linear array systems (for audience area coverage optimization);
- Frequency division optimization to improve the consistency of frequency response of multi-division speakers over their coverage Angle range.

Devices required:

Measurement Microphone	×1	
Audio Interface	×1	
Windows PC (installed software including Smaart, rePhase or FIR Designer, Cerasonar)	×1	

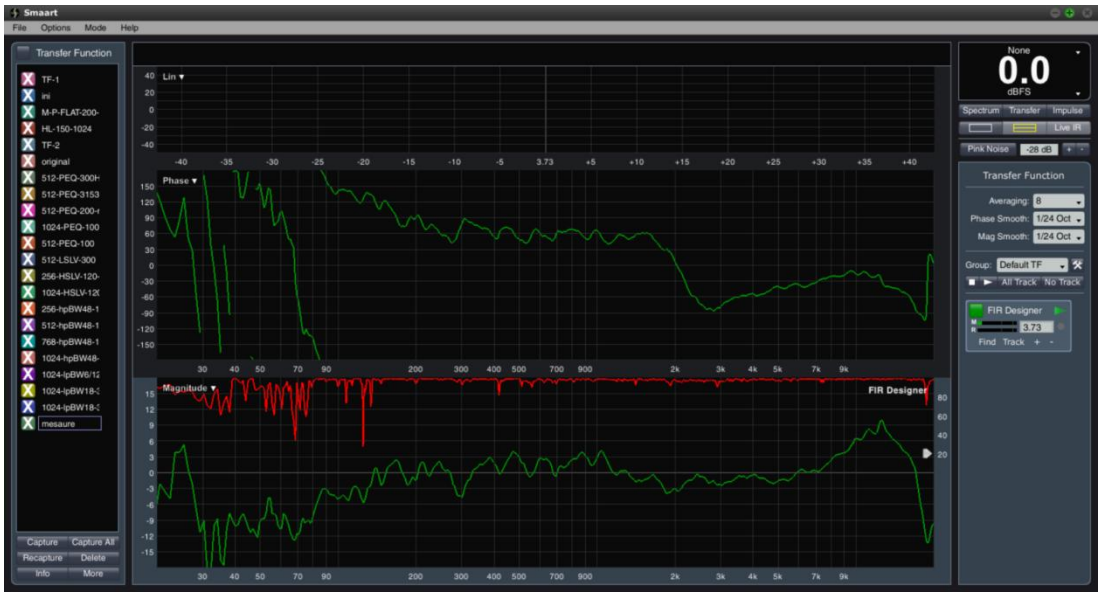
FIR audio processor or DSP network power amplifier	×1	
Speaker	×1	

Connection schematic diagram:

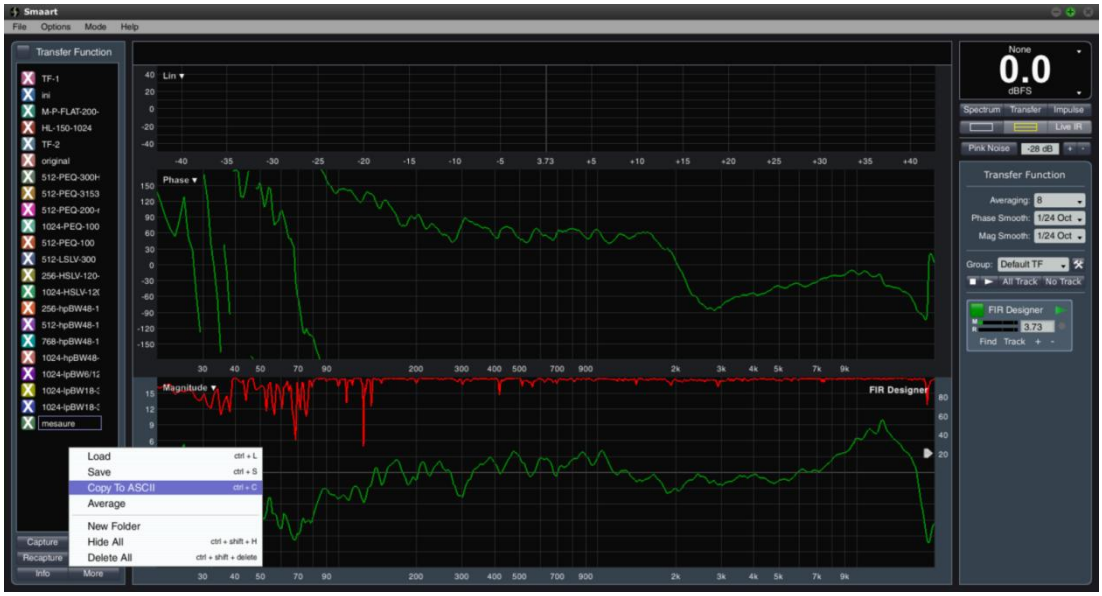


4.11.2 Using third party software to adjust FIR magnitude and phase

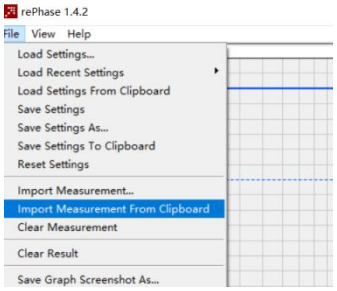
Step 1: measure phase curve of speaker in Smaart V7



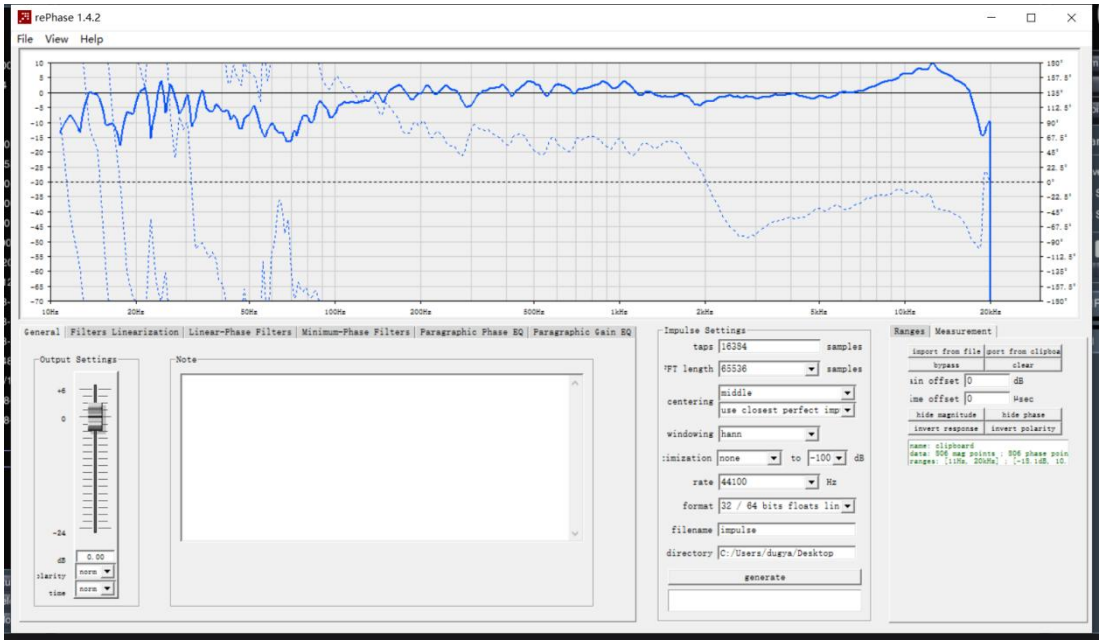
Step 2: copy curve to ASCII in Smaart V7



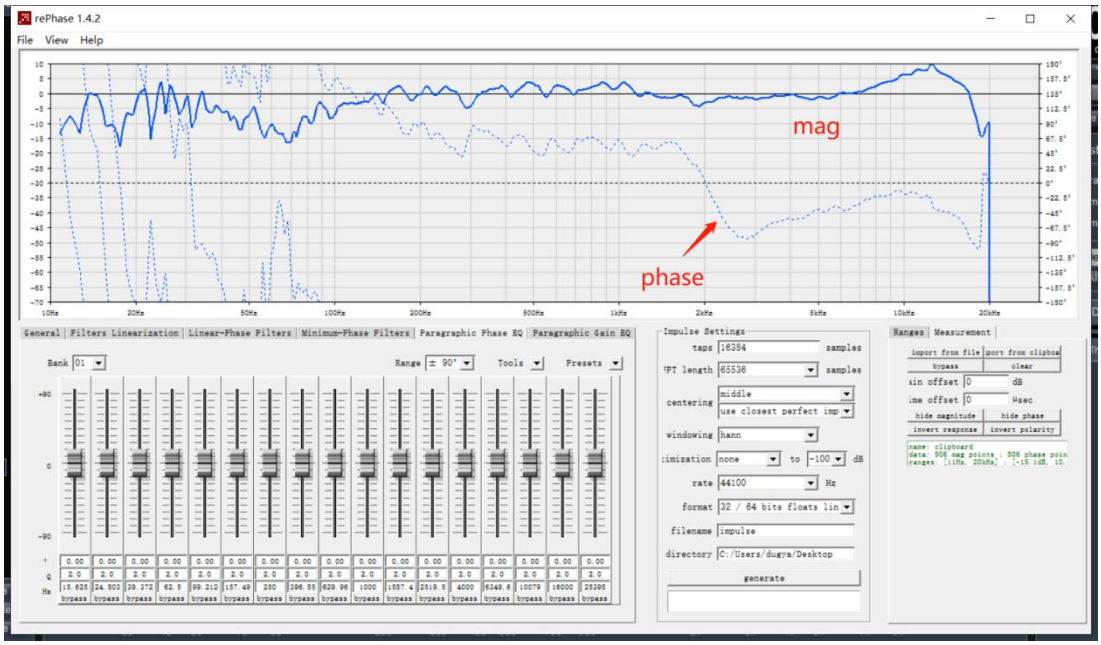
Step 3: copy curve to software rePhase or Cerasonar FIR DESIGNER

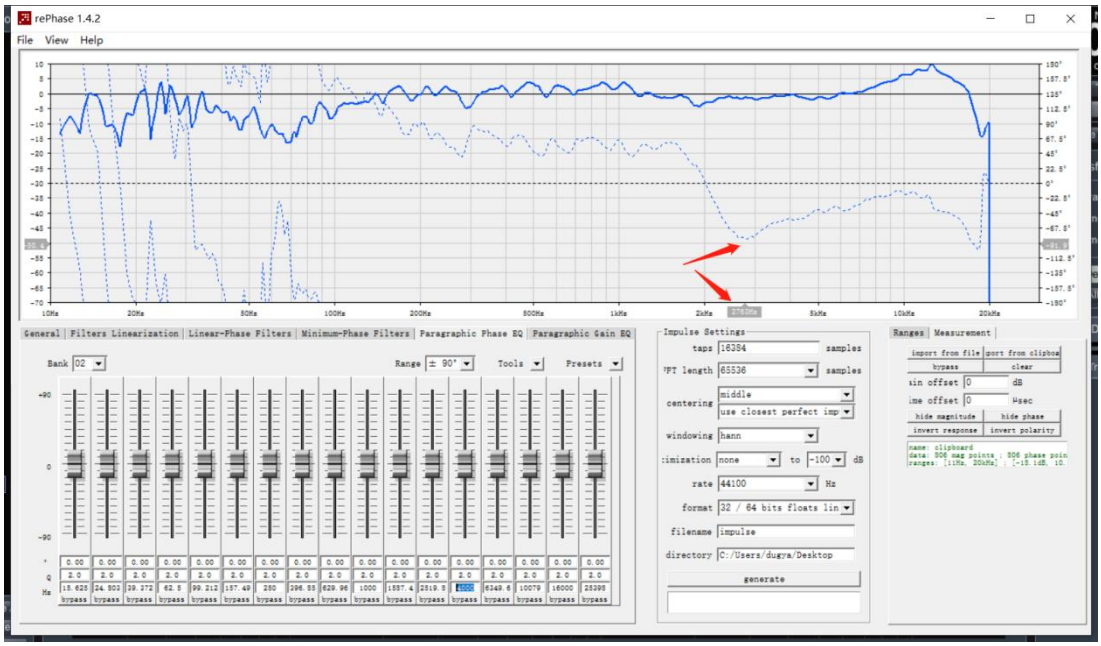


"Import Measurement From Clipboard"

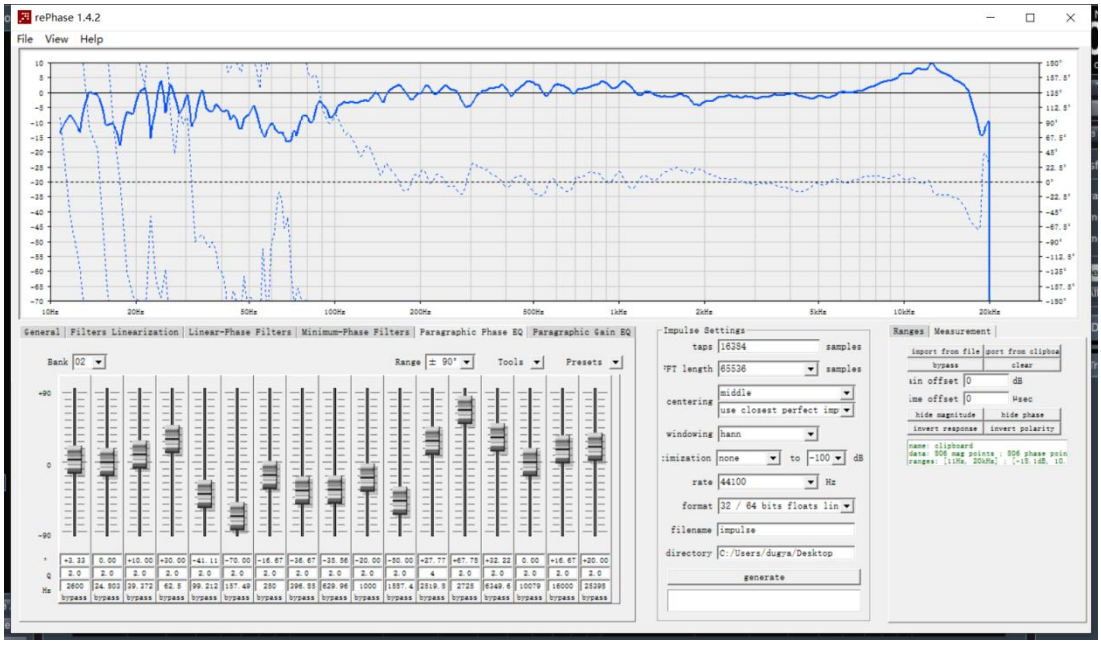


Step 4: adjust phase EQ or any other parameter in software, to match a linear phase for speaker





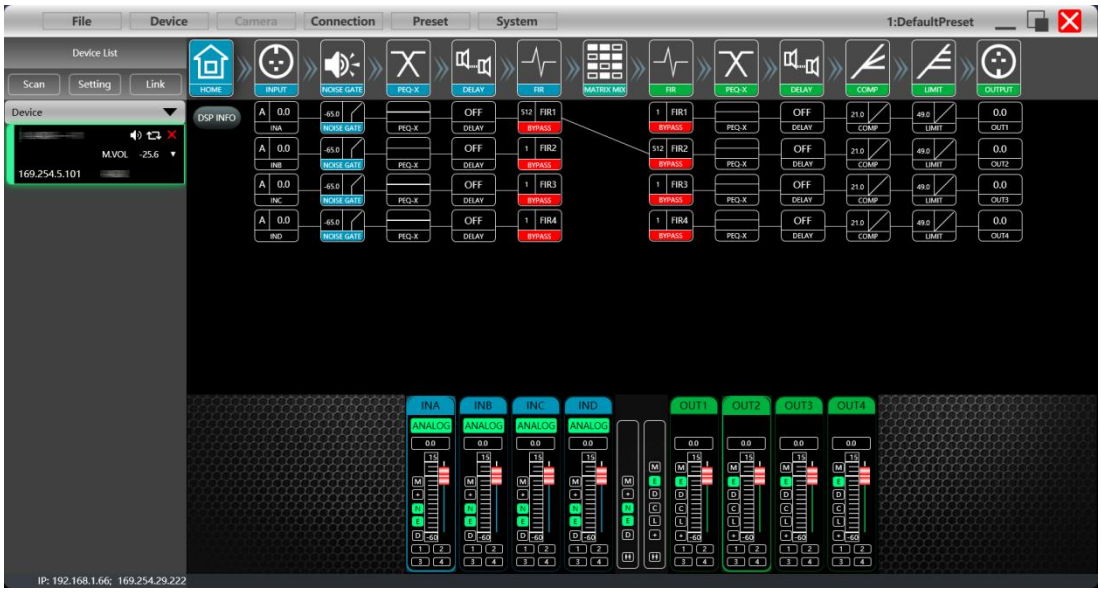
Step 5: export .txt file after setting



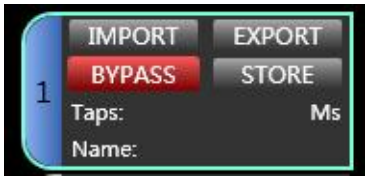
Marks:

1. Set taps in 2048/1024/768/512/256, here we set in 512.
2. Set rate in 48000Hz.
3. User can rename this file and find it easily.
4. Set directory for exporting file, such as C:/Users/User/Desktop.
5. Click “generate” to export a FIR .txt file.

Step 6: import FIR .txt file in FIR audio processor or DSP network power amplifier

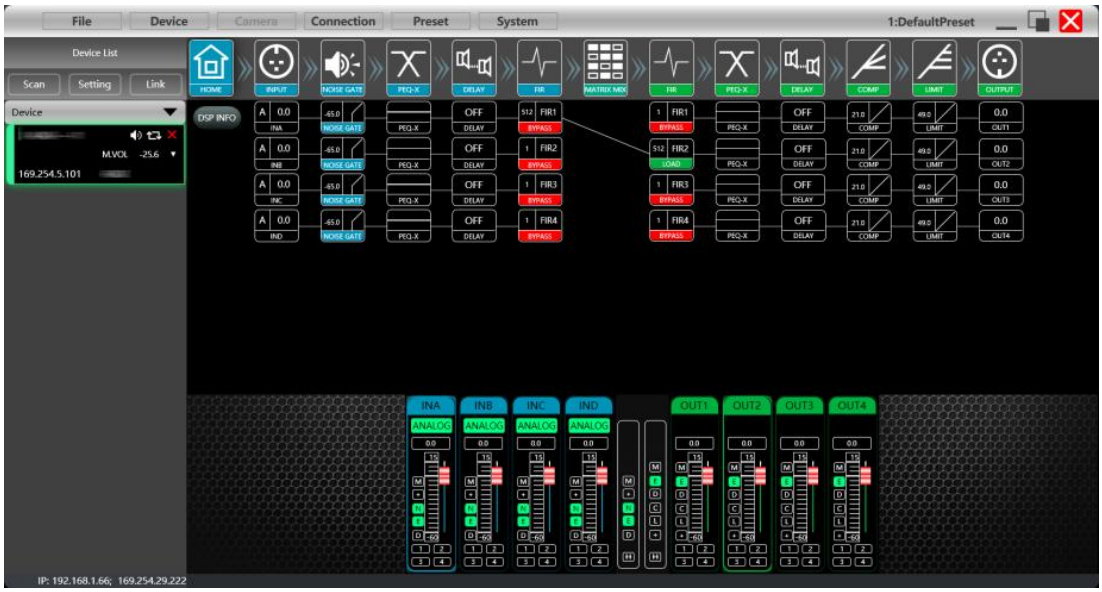


Open Cerasonar software, user can choose an input channel or output channel as needed, such as FIR in output channel, it will show a FIR function window.



press **IMPORT** to import txt. file, than press STORE to effect this importing.

remember to cancel **BYPASS**.



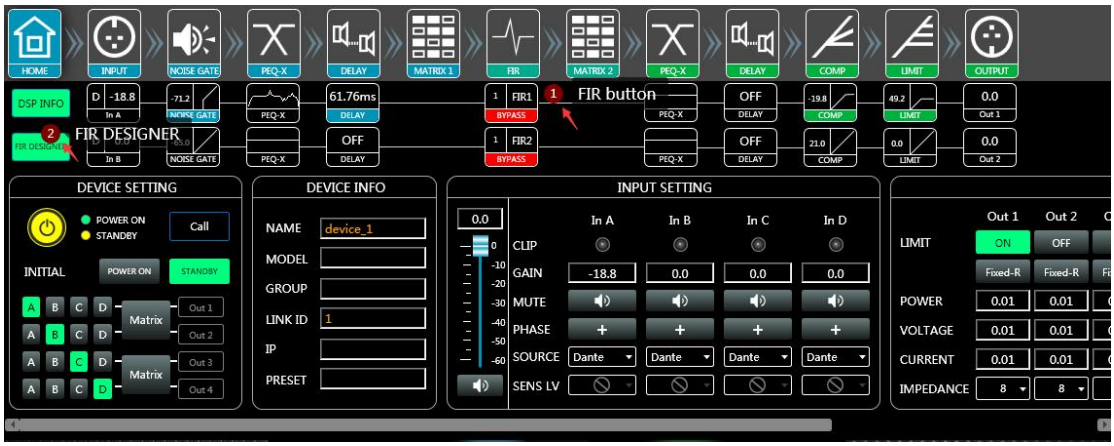
Step 8: measure the curve of speaker again, use can find it become more linear.

After all setting, please remember to save a preset for your hard working in the speaker.

4.11.3 Using FIR DESIGNER in Cerasonar to adjust FIR magnitude and phase

Beside using third party software, Cerasonar provides user a more convenient way to adjust FIR magnitude and phase of each channels.

There are two ways to open FIR DESIGNER interface:

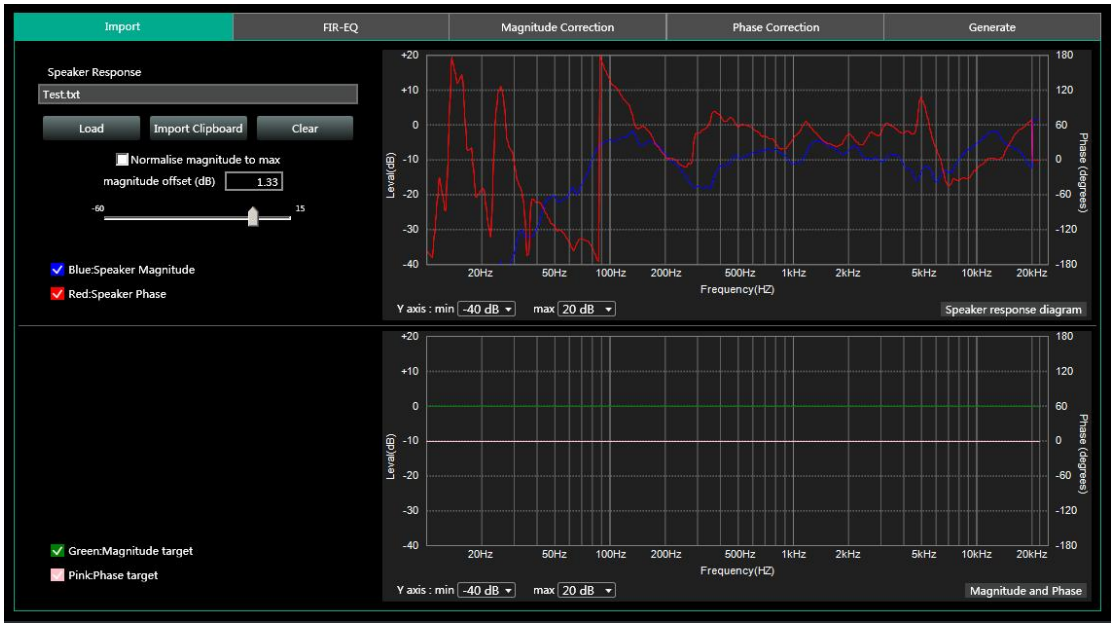


① Click "FIR" - "Designer" button to enter FIR automatic linear magnitude and phase function interface.

② Or click "FIR DESIGNER" in main interface to enter FIR automatic linear magnitude and phase function interface, which can quickly help user return to the page he set last time.

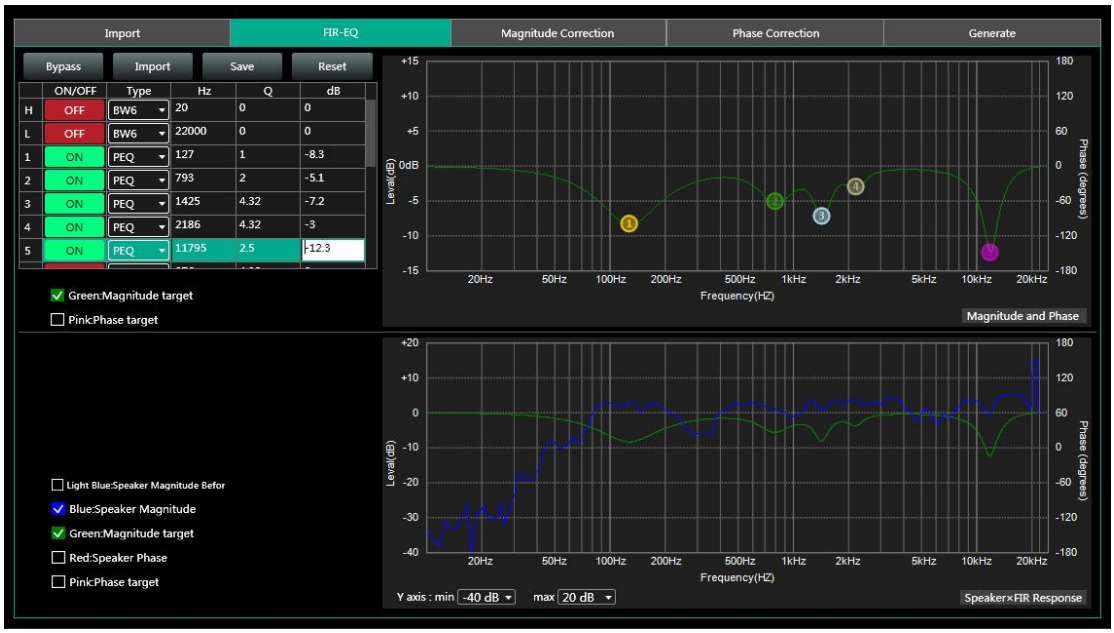
Let's begin to set:

4.11.3.a FIR DESIGNER - Import



- **Load**: load speaker measurement file from Smaart, usually it's a *.txt* file.
- **Import Clipboard**: load ASCII data directly from Smaart.
- **Clear**: clear measurement data.
- **Normalise magnitude to max** or **Magnitude offset (dB)**: this can help user to adjust a certain dB of magnitude, in order to adjust magnitude curve as little as possible.

4.11.3.b FIR DESIGNER - FIR-EQ



There are High pass filter and low pass filter for setting frequency divider, and 15

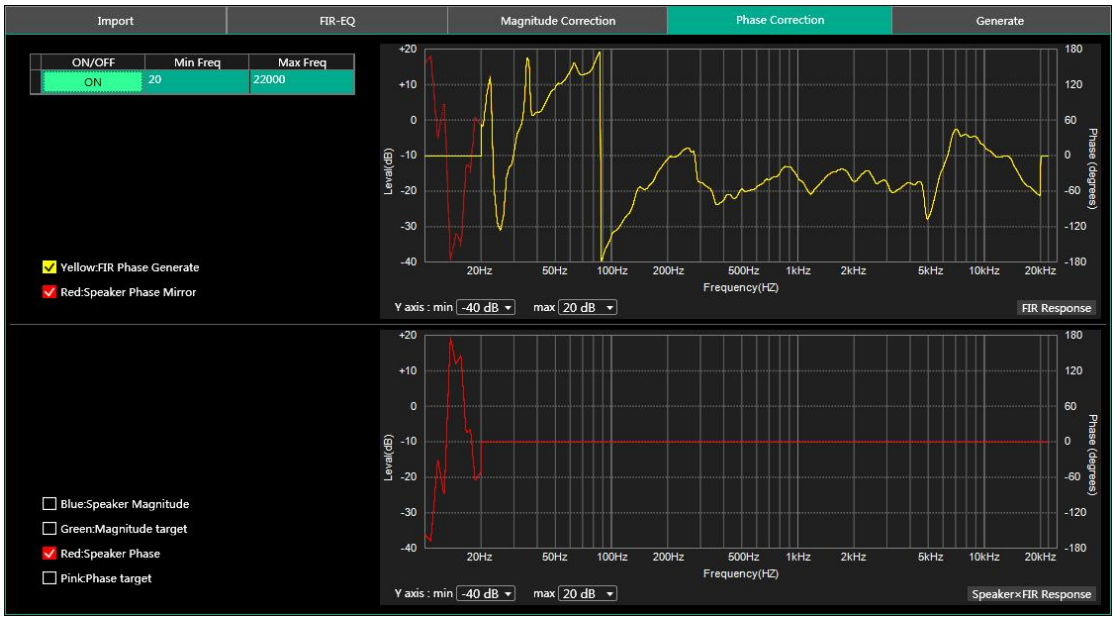
bands of PEQ \ LSLV \ HSLV to adjust magnitude. Try to set a linear magnitude of target speaker.

Mark: changing FIR magnitude doesn't effect its phase.

4.11.3.c FIR DESIGNER - Magnitude Correction and Phase Correction

Of course, if there are too many speakers to be adjust, user has to spend a long time manually adjusting their magnitude. In this case, Magnitude Correction will be more useful. Just enable ON button for frequency.

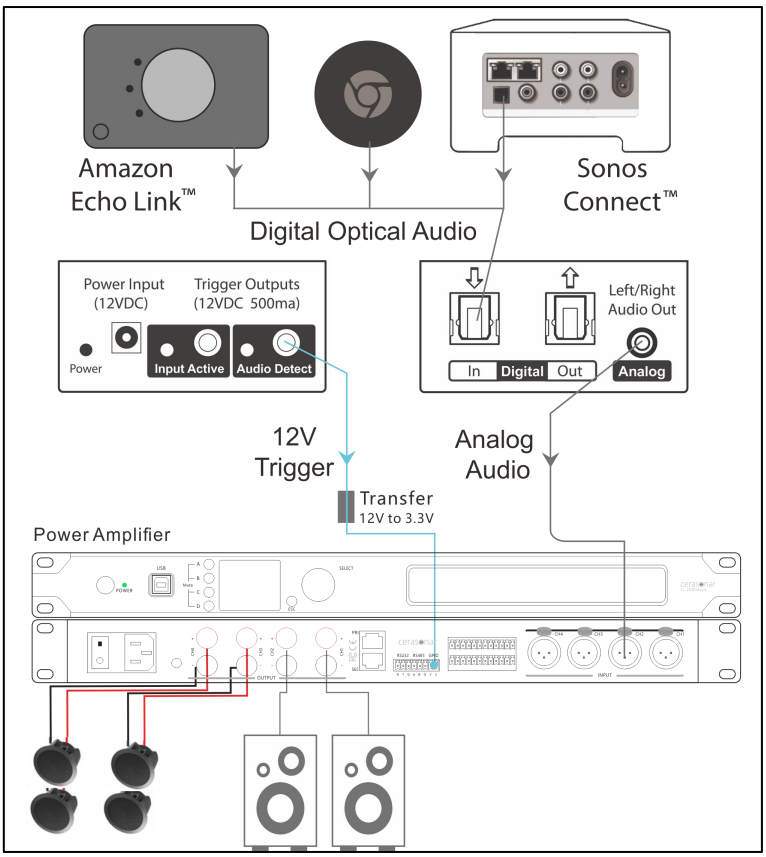
After adjusting magnitude, set linear phase of speaker.



4.11.3.d FIR DESIGNER - Generate

Select **Taps** (such as 512) of this adjustment, and store it in a FIR channel. User can also name this FIR adjustment and export it to a *.KF* file. After finish all setting, return back to FIR interface. Cancel BYPASS button to make it work.

Chapter 5: Connect with 12V trigger



Cerasonar cs-2000dsp4 offers standby operating by connecting with 12V trigger:

"12V trigger", for smooth operation we recommend integration via the 12V trigger, this is present in high-quality AV receivers or audio streaming devices and switches the cs-2000dsp4 on and off.

Tip: There is a voltage transfer inside package, it can helps you connect with 3.5mm mono interface from 12V trigger and 3.81mm phoenix on back panel of cs-2000dsp4.