



User  
Manual


**DSP8X8**  
Digital Signal Processor



# Safety instructions

When using this electronic device, basic precautions should always be taken, including the following:

- 1 Read all instructions before using the product.
- 2 Do not use this product near water (e.g., near a bathtub, washbowl, kitchen sink, in a wet basement or near a swimming pool etc). Care should be taken that objects do not fall into liquids and liquids would not be spilled on the device.
- 3 Use this device when you are sure that it has a stable base and it is fixed securely.
- 4 This product may be capable of producing sound levels that could cause permanent hearing loss. Do not operate for a long period of time at a high volume level or at a level that is uncomfortable. If you experience any hearing loss or ringing in the ears, you should consult with otorhinolaryngologist.
- 5 The product should be located away from heat sources such as radiators, heat vents, or other devices that produce heat.
- 6 Note for power connections: for pluggable equipment, the socket-outlet shall be installed near the equipment and shall be easily accessible.
- 7 The power supply should be undamaged and never share an outlet or extension cord with other devices. Never leave device plugged into the outlet when it is not being used for a long period of time.
- 8 Power disconnection: when the power cord connected to the power grid is connected to the machine, the standby power is turned ON. When the power switch is turned ON, the main power is turned ON. The only operation to disconnect the power supply from the grid, unplug the power cord.
- 9 Protective Grounding - An apparatus with class I construction shall be connected to a power outlet socket with a protective grounding connection.  
Protective Earthing - An apparatus with class I construction shall be connected to a mains socket outlet with a protective earthing connection.
- 10 The lightning flash with an arrowhead symbol, with an equilateral triangle, is intended to alert the user to the presence of uninsulated dangerous voltage<sup>1</sup> within the products enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons. 
- 11 The exclamation mark within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance. 
- 12 There are some areas with high voltage inside, to reduce the risk of electric shock do not remove cover of the device or power supply. The cover should be removed by the qualified personnel only.
- 13 The product should be serviced by qualified service personnel if:
  - The power supply or the plug has been damaged.
  - Objects have fallen into or liquid has been spilled on the product.
  - The product has been exposed to rain.
  - The product has been dropped or the enclosure damaged.

 <b>CAUTION</b> RISK OF ELECTRIC SHOCK DO NOT OPEN	To reduce the risk of electric shock, do not remove screws. No user-serviceable parts inside. Refer servicing to qualified service personnel. To reduce the risk of fire, electric shock or product damage, do not expose this apparatus to rain, moisture, dripping or splashing and that no objects filled with liquids, such as vases, shall be placed on the apparatus.
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# Before you start

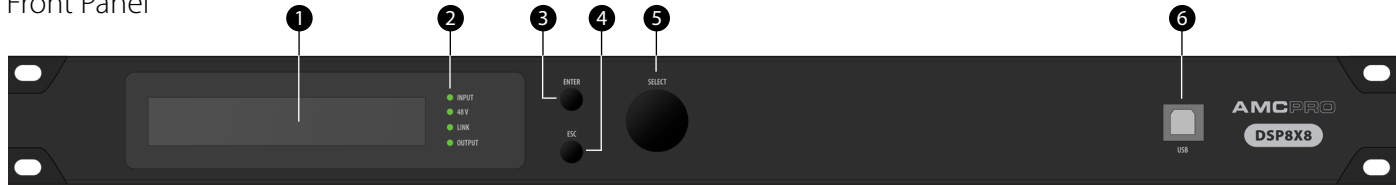
DSP8X8 is a 8 inputs and 8 outputs DSP matrix audio processor for conference and background audio systems. It provides with useful voice algorithm AFC, AEC, ANC, and DSP functions including auto mix, matrix mixer, noise gate, crossover, parametric EQ, delay, compressor, limiter.

## FEATURES

- 8 analog inputs and 8 analog outputs, support to select Line level and Mic level
- USB audio card inside, 2-in/2-out.
- Support 48V phantom for each Mic level input, 40 level sensitivity (1dB in step).
- Built-in AFC(feedback control) , 2 level to select.
- Built-in AEC(echo control) for remote video-conference system.
- Built-in ANC(noise control) for optimizing local meeting system.
- Built-in AGC(automatic gain control) for optimizing microphone signals in complex scenarios
- Input with 8 PEQ and output with 8 PEQ. Support LSLV, HSLV, ALL-PASS, PHASE, ELLIPTIC, LOW PASS AND HIGH PASS filters. Support HPF and LPF with Butterworth / Bessel / Linkwitz-Riley.
- Support auto and matrix mixing.
- Support camera tracking with most of camera control.
- 60 presets memory, possibility to lock/unlock preset.
- Control connections: USB or TCP/IP. Configured with RS232 and RS485 central control connection. Configured with GPIO external control connection.
- Control software for Windows OS.

# Operation

## Front Panel



1. LCD screen | 2. LED indicators | 3. ENTER button | 4. ESC(ape) button | 5. Rotary dial and select button | 6. USB type-B cable socket

## Rear Panel



1. Mains power connector and power switch | 2. Ethernet port | 3. GPIO, RS-485 and RS-232 ports | 4. Balanced signal outputs 1-8 | 5. Balanced signal inputs 1-8

# Operation

## Front panel functions

### **LCD SCREEN**

LCD screen is used to display device state and menus. The screen will turn off automatically, if no user input is made for a period of time.

### **LED INDICATORS**

LED lights for indicating presence of input and output signals, +48 V phantom power, linking status.

### **ENTER & ESC BUTTONS**

Use ENTER button to make a selection

Use ESC button to exit menu

### **ROTARY DIAL**

Rotating dial clockwise and counter-clockwise navigates the menu and makes parameter changes.

Pressing the dial makes a selection or confirms parameter setting.

### **USB TYPE-B PORT**

USB port for connecting device to Windows PC.

## Rear panel functions

### **MAINS POWER CONNECTOR AND SWITCH**

Connect mains power lead and switch device power ON/OFF

### **ETHERNET PORT**

Connect the device to local Ethernet network.

### **GPIO, RS-485 AND RS-232 PORTS**

Ports for connecting device control interfaces.

### **BALANCED SIGNAL OUTPUTS**

1-8 audio outputs with balanced Phoenix connectors.

### **BALANCED SIGNAL INPUTS**

1-8 audio inputs with balanced Phoenix connectors.

# Operation

## Operating front panel

### SETTING DEVICE MASTER VOLUME

When device is in default state, turn SELECT knob to adjust device master volume. It affects all outputs of the device.

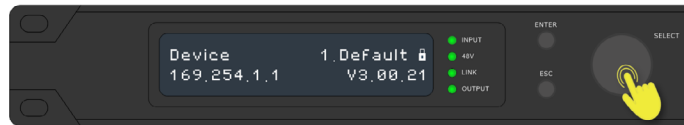
### ENTER THE MENU

Press ENTER or SELECT to show menu list.

If the screen is locked, hold ENTER or SELECT button for 5 seconds to unlock it. Turn the SELECT knob clockwise or counterclockwise to select functions: INPUT VOLUME, OUTPUT VOLUME, PRESETS, INPUT SOURCE, IP SET, RENAME, SECURITY.

Press ENTER or SELECT button to set function.

Press ESC button to exit menu.



### MUNU STRUCTURE

Device menu allows making basic adjustments for inputs and outputs. Use SELECT knob to select parameter for adjustment, press SELECT or ENTER to enter adjustment or confirm setting. Pressing ESC button leaves setting without saving adjusted value.

MENU ITEM	REMARK
INPUT VOLUME	Mute or adjust input level for each channel from -60 dB to 15 dB range.
OUTPUT VOLUME	Mute or adjust output level for each channel from -60 dB to 15 dB range.
PRESET	Select and load device settings preset.
INPUT SOURCE	Allows selecting input type for each channel: LINE / MIC / PHAN (for phantom powered microphones) MIC and PHAN options have gain adjustment option.
IP SET	Enter device IP and gateway settings for networked control.
RENAME	Enter the name of the device
SECURITY	Enables of disables SCREEN AUTO LOCK function.

# Software interface

## Operation of control software

DSP8X8 provides user with a fast interaction to control one or more devices through multiple methods: TCP/IP, USB and RS232. Easily set DSP functions and check central control codes. The configuration parameters can be stored in presets, convenient for various applications.

### SYSTEM REQUIREMENTS

The software works with Windows x64 or x32 operating system, and can run directly from PC without installation.

### CONNECTION SETTINGS

When opening software, user will be given a choice of connection methods:

- TCP – if DSP8x8 is connected to local network.
- USB – if DSP8X8 is connected by using USB cable.
- COM – if DSP8X8 is controlled via serial interface. Please check port and baud rate before using RS232.

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

### DEVICE LIST

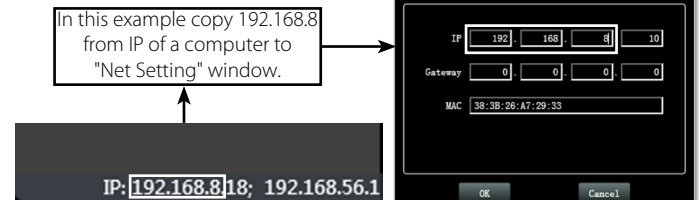
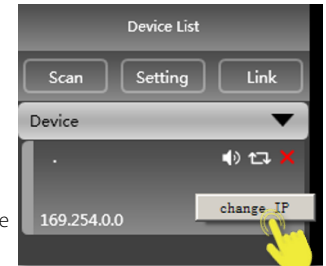
User can mute device, refresh connecting, or delete device in this window. Single click device, to load function interface.

### TROUBLESHOOTING TCP CONNECTION

When using TCP control, there is a situation that instead of device name only one point is displayed, and connection is not possible. In this case, user needs to change the IP address of the device to the same network segment as the PC computer.

Right-click the device in the list for "change IP" setting.

Set IP address of device in reference to IP showed in the bottom of the device list. Set the first three paragraphs to be the same as the IP of PC.

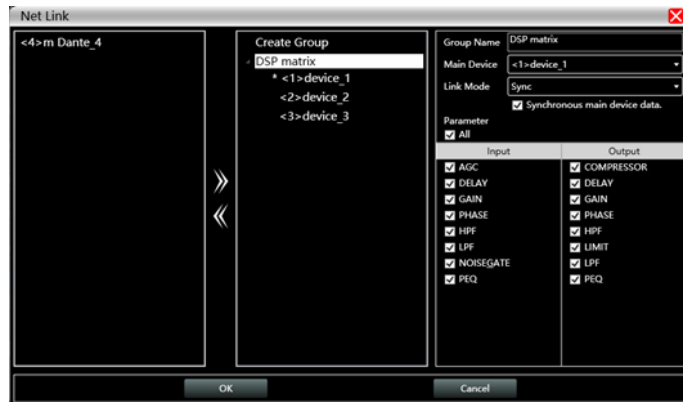




# Software interface

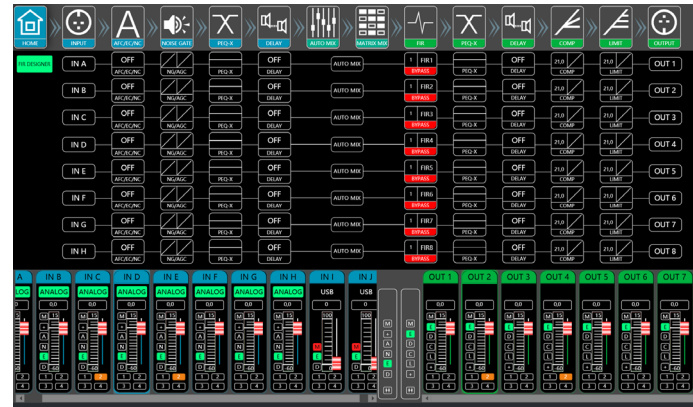
## LINKING (GROUPING) MULTIPLE DEVICES

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.



## DSP functions

Double-click HOME icon to open DSP8X8 general view of all functions and channel settings. Double-click any function icon separately to open the corresponding interface. When multiple function windows opened, users can scroll horizontally to see any open function the windows.



# Software interface

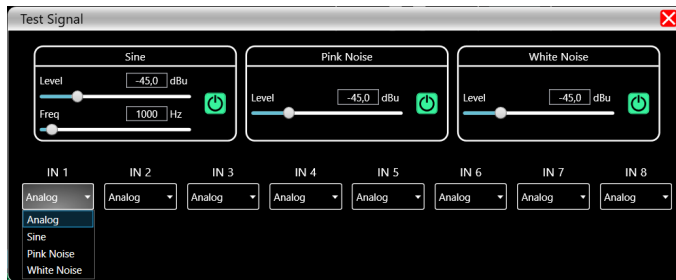
## INPUT

Input window allows following settings:

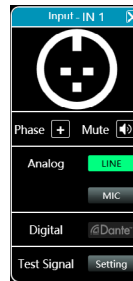
- Set Phase;
- Mute;
- Set gain or select Line level;
- Turn microphone phantom power ON/OFF
- Access test signal generator

## TEST SIGNAL GENERATOR

Test signal generator allows to generate sine wave, pink or white noise and route it to selected inputs. It can be used to test the DSP signal flow or speaker lines.



For each input select whether to use Analog input or generated Sine, Pink or White noise. All test signal generators can be used at the same time.



## AFC – ACOUSTIC FEEDBACK CONTROL

The processor provides acoustic feedback control function AFC for microphones. With two levels to select, user can control acoustic feedback easily when setting each microphone;

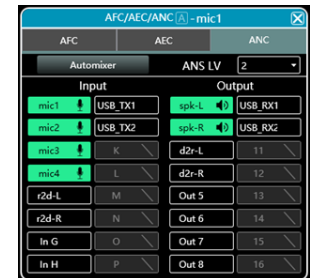
- Level 1, low degree process;
- Level 2, high degree process;
- The window of AFC will show input channel name, please select corresponding input channel to set.



## ANC – ACTIVE NOISE SUPPRESSION

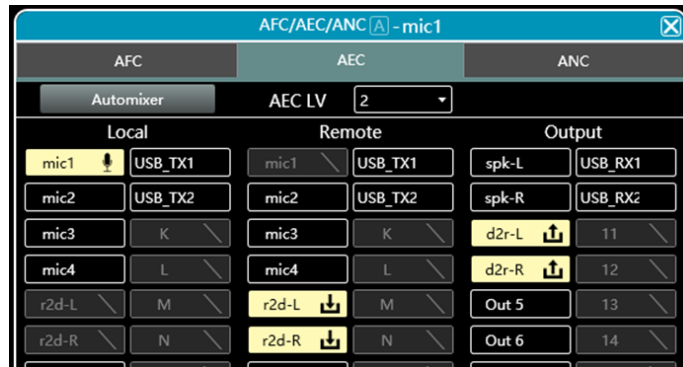
Ambient noise compensation module designed to eliminate ambient noise and focus on the vocal or speech to make it clear as possible. In order to start using this module audio input and output should be selected, also need to set level how deep module eliminates audio which is not detected as voice.

There is option to use an audio from auto mixer module. In this case "Automixer" button should be selected in both modules AFC and AEC.



# Software interface

## AEC – ACTIVE ECHO CANCELATION



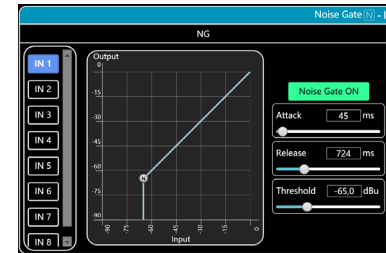
Acoustic echo cancellation module designed to solve the acoustic feedback problem. It is mainly used for conference systems. To enabling module user should set inputs for local microphones, for remote audio (video conferencing system etc.) and also, for audio output. Need to setup how deep module effects audio a by selecting AEC level also.

There is option to use an audio from auto mixer module. In this case “Automixer” button should be selected.

## NG – NOISE GATE

This DSP professor can automatically mute input if level in the input is lower than set threshold. Noise gate helps to prevent background noise in moments when audio input is activated but not used.

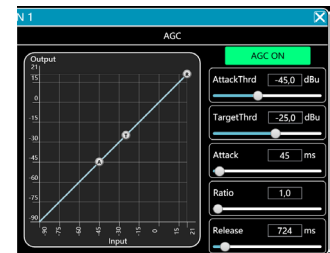
- Attack: 1 to 2895 ms
- Release: 1 to 2895 ms
- Threshold: -90.0 to 0.0 dBu



## AGC – AUTOMATIC GAIN CONTROL

Function designed to increase input gain if audio level is lower than specified in settings. Auto gain setting allows set target signal level, ratio, threshold and timing.

- AttackThrd: -90 to 21 dBu
- TargetThrd: -90 to 21 dBu
- Attack: 1 to 2895 ms
- Ratio: 1.0 to 100.0
- Release: 1 to 10000 ms

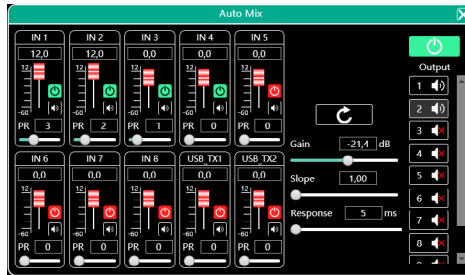


# Software interface

## AUTO MIX

DSP8X8 has an automated sound mixer that can adjust volume of active sound sources. This function is mainly used when there are multiple microphones, but not all are used at the same time, i.e., in a conference.

To use automixer, function must be activated via ON/OFF button (turns green). Each input must also be turned ON to be used in mixing. PR setting means channel priority in the mix: higher priority means a channel will likely be amplifier over lower priority channels if they happen to be active at the same time.



Gain, Slope and Response adjust how fast the mixing process is done.

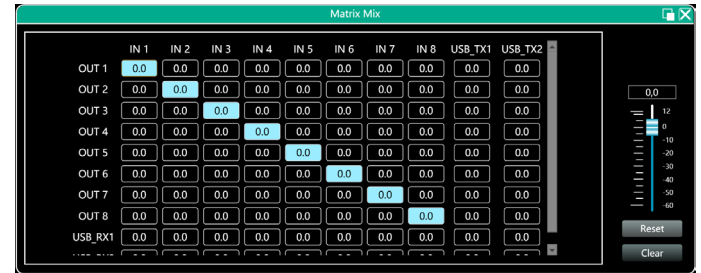
Output section allows routing automatically mixed signals from all inputs to one or more outputs.

There is a Automixer button in ANC and AEC windows, which provides user a signal routing from Auto Mix to ANC or AEC process.

## MATRIX MIX

To enable input-output routing, double-click on the corresponding window. The window is highlighted in blue colour to indicate active routing, and the amount of signal sent to the output. Double-clicking again deactivates routing.

Single-clicking any window allows changing amount of input signal sent to the output. Use fader on the right side to adjust the parameter.



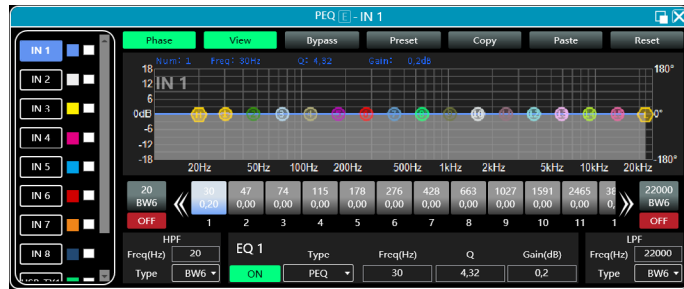
# Software interface

## PEQ-X INPUT & OUTPUT EQUALIZER

DSP8X8 has separate equalizers for each input and output. Input EQ contains 15 points, high-pass and low-pass filters, while output EQ contains 10 points, high-pass and low-pass filters.

Equalizer points can be set in following shapes:

- LSLV - low shelf filter. Adjust part of the frequency spectrum below a set frequency point.
- HSLV - high shelf filter. Adjust part of the frequency spectrum before a set frequency point.
- ALLPASS-1, ALLPASS-2 and PHASE filter - Creates a phase shift across the frequency point. In order to view affected phase in frequency window enable "Phase" button located on the left corner of the window.



## HIGH-PASS & LOW-PASS FILTERS

Under PEQ-X window of each input and output channel users can set individual high-pass and low-pass filters. DSP8X8 has common filter types with following slopes per octave: 12, 24, 36 and 48 dB.

Enable/disable filter by pressing ON/OFF button and set filter type and frequency in the HPF or LHP window. Filter frequency can be adjusted by mouse: to adjust high-pass filter click and hold mouse pointer on the "H" symbol on frequency curve and drag it left or right to adjust frequency. Hold and drag "L" symbol to adjust low-pass frequency.

High and low-pass filter types:

- BW – Butterworth
- BL – Bessel
- LW - Linkwitz-Riley

## EQUALIZER PRESETS

Equalizer presets allow to save all EQ parameters of the current channel to the computer. This allows recalling the EQ parameters from computer to any connected DSP8X8 device. Feature also lets users copy and paste settings from one channel to other, also clicking "Reset" button will restore EQ of selected channel to default state (flat, with HFP and LPF set to OFF).

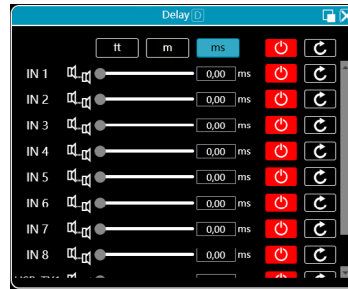
# Software interface

## DELAY

There are two Delay modules in DSP8X8: one for inputs, another for outputs. Settings can be separately adjusted in each input and output.

Signal delay amount can be set in feet, meters or milliseconds.

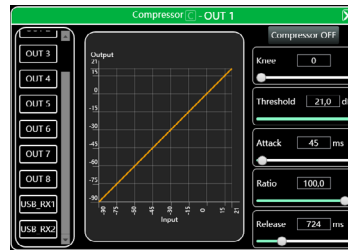
Click red ON button to activate the delay for the channel, or an arrow button to reset to default OFF state.



## COMPRESSOR

Allow to compress audio signal dynamic range according to threshold, ratio and attack/release settings. Compressor is only available on output channels.

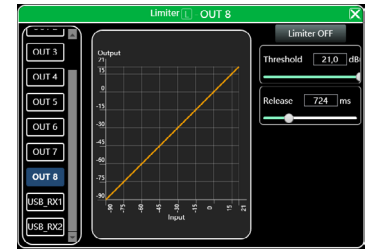
Click "Compressor OFF" button to engage the compressor for the selected channel.



## LIMITER

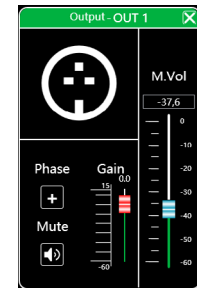
Allows limit audio signal amplitude according threshold settings. It helps to prevent audio amplifier overloading and signal clipping. Limiter is only available on output channels.

Click "Limiter OFF" button to engage the limiter for the selected channel.



## OUTPUT

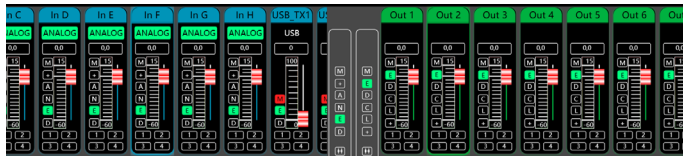
Output window allows control of output level and device master output level. It also allows phase inversion and muting of the channel.



# Software interface

## MONITORING AND SETTING OF CHANNELS

On the bottom of the main window DSP8X8 displays all input and output channels in a channel strip form. User can monitor gain levels, activate EQ, delay, limiter and compressor functions, also invert phase or mute channels.



## LINKING CHANNELS

Input and output channels can be linked together to 4 groups. Each channel can only be assigned to one group at the time, linking inputs to outputs or USB channels is not possible. Linking allows synchronized control of channel parameters. Press buttons 1-4 under channel strip to assign channel to group.



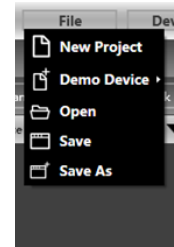
Between input and output strips in the mixer is a global input and output control. Clicking the bottom icon opens channel linking window. From this window channels can be linked & unlinked from groups and individual parameters can be selected for each group for synchronization of the grouped channels.



## Software Menus

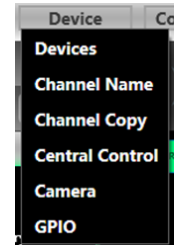
### MENU - FILE

- New project: the project is restored to the initial state.
- Demo Device: user can view all the functions of the DSP8X8 without actual connected device.
- Open: open an existing device management project from the computer.
- Save: save the current equipment management project in the computer.
- Save as: save the current equipment management project to the computer in different location or name.



### MENU - DEVICE

- Devices: view the software version information, device name and device IP, gateway and MAC address.
- Channel name: set the name of each input and output channel.
- Channel copy: copy device input and output channel parameter, make cross-device copying.
- Central control: a serial interface tool to send and read DSP8X8 RS232 commands. Please check RS232 command list in [www.amcpro.eu](http://www.amcpro.eu) web site. It provides guide and RS232 control protocol.
- Camera: camera tracking control function.
- GPIO: control device by using GPIO interface.



# Software interface

## CAMERA SETTING

DSP8X8 can control video cameras via RS232 and RS485 interface. This feature is perfect for video conference systems. It automatically adjusts video camera position according to preprogrammed presets. All camera positions are programmable and activated automatically when DSP indicates audio to programmed microphone inputs.



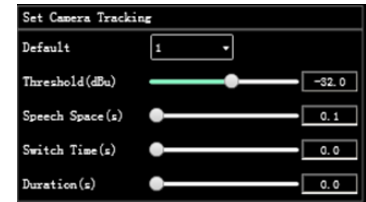
Before start setting camera presets:

1. Set the serial ports via RS232 or RS485.
2. Set the camera address and protocol type (depends on the camera model).
3. Select preset number and then adjust camera position by using DSP8X8 camera setting window.
4. Click "Save" to save the camera position, "Clear" is to delete the information of the current preset. "Call" is used to view the camera position saved by the currently selected preset.

Note: A camera address can contain multiple presets, but one preset corresponds to only one camera address. Camera Settings and Mic Settings have preset numbers., serial port numbers, camera addresses, and protocols, which need to be considered in actual situations.

## SET CAMERA TRACKING

- Default: when all mics are inactive, the camera turns to the default MIC setting or send the associated command defined by the default MIC.



- Threshold: Set the audio input signal level threshold for camera to react to input. Audio level must be over or equal to set threshold level, otherwise camera will not reach to audio input. Then sound level reaches threshold, input is considered active.
- Speech space: This is the maximum time interval that audio level can fall below threshold for input still to be considered active. Duration of 3 seconds is considered typical for speech (typical long pause between sentences). If the signal continues to be below threshold after set time, input is then considered to be inactive.
- Switch time: The time delay for camera to react to active input. When set to 0,0 camera will react to active input instantly. Setting switch time above 0,0 prevents camera from reacting to momentary microphone activations (i.e. if microphone with higher priority is bumped by accident).
- Duration: DSP8X8 allows repeated sending of RS232 control codes to prevent camera control errors due to data loss in transmission. Duration setting is the time interval between repeated sending of RS232 commands. 0,0 setting means RS232 command will only be sent once without repeating.



# Software interface

## SET MIC TRACKING

- Mic No.: corresponds to the input channel of device. Parameter needs to be set separately for each channel.



- Priority: Higher number means higher input 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/disable 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.

## CENTRAL CONTROL

This menu allows you to find control commands to adjust the parameter or request DSP status without the control software. There are two types of commands:

- Read: it's the command to request DSP parameter status. The user should select a parameter and the Central control unit generates a control code, which should be sent to DSP in order to receive feedback with parameter status.
- Set: it's the command to adjust the DSP parameter. The user should select a parameter and the Central control unit generates a control code, which should be sent to DSP in order to adjust parameter status.

## GPIO CONTROL

DSP8x8 has an 8 GPIO port to control the main DSP parameters. ALL GPIO ports can be set as input or output in the GPIO menu also need to set main parameters: function type, GPIO PIN number, and others, depending on the selected function.

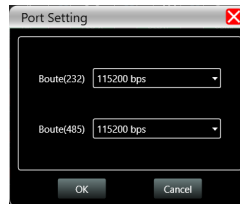
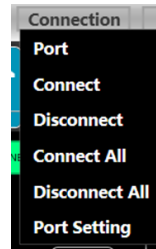
Before using GPIO as input to control DSP functions user must add pull-up resistors to keep GPIO input at a high level all the time. The circuit diagram and GPIO pinout are in page 33.

GPIO output data: Voltage: low level 0V, high level:3V, max. current 10mA.

# Software interface

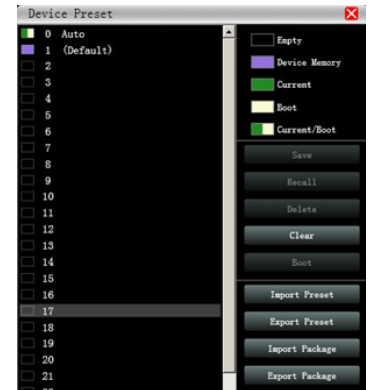
## MENU - CONNECTION

- Port: This setting allows choosing connection interface. There are available three ports: USB, Ethernet (TCP) and RS232 (COM). Set the connection mode, port number and baud rate for serial interface.
- 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.
- Port setting: Menu designed to setup RS232 and RS485 bout rate. Please setup bout rate before using camera control or RS232 interface.



## MENU - PRESET

- Save: save all the parameter of the current settings to the preset. Total is available 59 presets. The first (default) preset cannot be modified.
- Recall: call the device preset to the current position.
- Delete: delete the existing preset; the default preset cannot be deleted, over written or saved.
- Clear: delete all presets in the device.
- Boot: Please select a certain preset, after setting it as the boot file. Each time the device is powered on, it will automatically call the Boot preset. The last set parameters need to be automatically saved. Please set the Auto preset as the boot file in order to boot DSP with the last settings.
- 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.

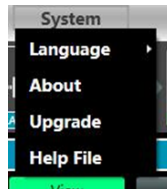


# Software interface

- Import preset package: import the preset package file containing multiple presets on the computer.
- Export preset package: pack multiple presets into one package and export it to the computer.
- Preset LOCK and Preset UNLOCK: Allows setting password in order to prevent from unauthorized usage.

## MENU - SYSTEM

- Language: software is in ENGLISH language only.
- About: control software and device firmware version information.
- Upgrade: user can upgrade the firmware by using this function. In general, no need to upgrade the firmware in device. This helps if DSP fails or manufacture release firmware update. Contact distributor or manufacture for latest information.



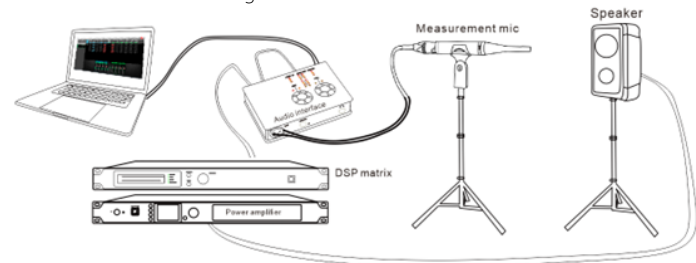
## FIR Filter And Applications

When using PEQ to adjust audio signal and set a linear magnitude, the phase of signal can change due to IIR filter. However, DSP processing provides a useful tool – the FIR filter to adjust audio signal with a linear phase.

### 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.

### Connection schematic diagram



# Software interface

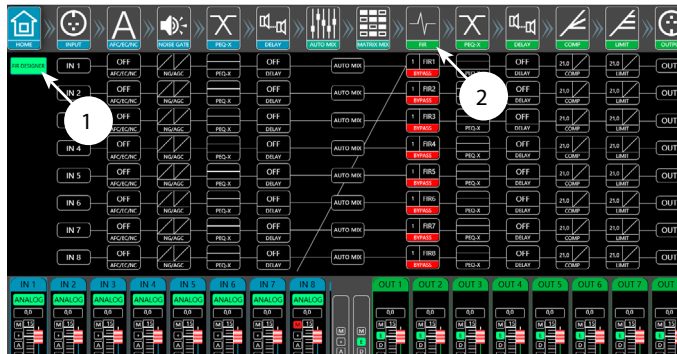
Devices required:

- Measurement Microphone
- Audio Interface
- Windows PC with installed software including Smart/REW & AMC control
- DSP8X8
- Power amplifier and speaker

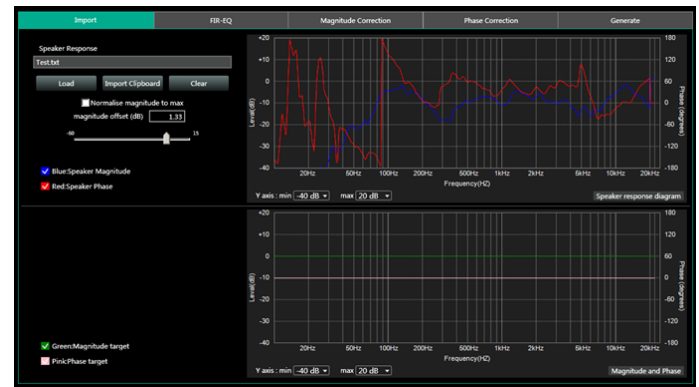
## FIR DESIGNER IN MCONSOLE TO SET FIR MAGNITUDE AND PHASE

Beside using third party software, Mconsole provides user a more convenient way to set FIR magnitude and phase of each channel.

There are two buttons to open FIR DESIGNER interface:



## 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.
- Normalize 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.

# Software interface

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.

Note: changing FIR magnitude doesn't affect its phase.

FIR DESIGNER - MAGNITUDE CORRECTION



Magnitude Correction is a useful tool to adjust magnitude of multiple speakers at once.

Enable correction by clicking ON button and enter minimum and maximum frequencies for adjustment.

# Software interface

## FIR DESIGNER - PHASE CORRECTION



Phase Correction allows linear phase correction of speakers.

Enable correction by clicking ON button and enter minimum and maximum frequencies for adjustment.

## FIR DESIGNER - GENERATE



Select Taps (such as 512) of this adjustment, and store it in a FIR channel. Users can also name this FIR adjustment preset and export it to a .KF file.

# Software interface

## Remote Control Configuration

### RS232 AND RS485 CONFIGURATION

Default DSP8X8 serial interface data:

- Baud rate: 115200 bit/s
  - Parity bits: NONE
  - Data bits: 8
  - Stop bits: 1
- 
- Time interval between sending control commands should be longer than 200 ms.
  - Presets function require longer time period. Leave more than 3 sec. pause between control commands.
  - Baud rate for serial interfaces can be changed in "Connection" and "Port settings" menu.

Available Baud rates:

- 2400 bit/s
- 4800 bit/s
- 9600 bit/s
- 19200 bit/s
- 38400 bit/s
- 57600 bit/s
- 115200 bit/s

### TCP/IP CONFIGURATION

DSP8X8 support control over a Ethernet by using TCP client.

TCP/IP setup:

- Transport protocol: TCP client
  - IP address: Check IP address information in LCD display, or check it in DSP8X8 AMC control software.
  - Network port: 8234
- 
- Time interval between sending control commands should be longer than 200 ms.
  - Presets function require longer time period. Leave more than 3 sec. pause between control commands.

### CONTROL AND FEEDBACK CODE PROTOCOL

DSP8X8 use the same control commands for serial and TCP/IP control. The control and feedback data structure below.

NOTE: Serial and TCP/IP control cannot be used if device is being controlled by AMC control software. Only one control method can be used at once: serial RS232/TCP/IP or AMC control software.

NOTE: All command in user manual are in HEX format.

# Software interface

## SEND INSTRUCTION TO DEVICE. CONTROL CODE.

0xA5 0xC3 0x3C 0x5A 0xFF **0x36** 0xFF 0xFF 0xFF ... 0xFF 0xEE

Feedback from device:

- 0x00: sending successful
- 0x01: sending failed

## READ STATUS OF DEVICE. FEEDBACK REQUEST CODE.

0xA5 0xC3 0x3C 0x5A 0xFF **0x63** 0x00 0xFF 0xFF ... 0xFF 0xEE

Feedback from device depends from the requested DSP function. Please read user manual to find feedback structure in each case.

- 0x00: sending successful
- 0x01: sending failed

NOTE: Reading and switching presets:

In order to switch presets using serial or TCP IP, all presets must be configured and saved using AMC control software before trying to load it. It is not possible to load non-configured preset number.

## RECALL PRESETS

Start	Device ID	Control byte	Function	Data length	Value	End
A5 C3 3C 5A	FF	36	02	01	01 (= default preset) 02 (= preset 2) ... 1D (= preset 29) 1E (= preset 30)	EE

Value byte calculation: Preset decimal number convert to HEX.

Examples:

Command	HEX code	Feedback	HEX code
Recall preset 5	A5 C3 3C 5A FF 36 02 01 05 EE	Sending successful	00
Recall preset 25	A5 C3 3C 5A FF 36 02 01 19 EE	Sending failed	01

## READ CURRENT PRESET NUMBER

Start	Device ID	Control byte	Function	Value	End
A5 C3 3C 5A	FF	63	02	00	EE



# Software interface

## Feedback

Start	Device ID	Control byte	Function	Data length	Value	End
A5 C3 3C 5A	FF	63	02	01	01 (= default preset) 02 (= preset 2) ... 1D (= preset 29) 1E (= preset 30)	EE

Value byte reading: Preset number = convert to received HEX byte to Decimal.

## Examples:

Command	HEX code	Feedback	HEX code
Read current preset number	A5 C3 3C 5A FF 63 02 00 EE	Current preset No1	A5 C3 3C 5A FF 63 02 01 01 EE
		Current preset No9	A5 C3 3C 5A FF 63 02 01 09 EE

## MUTE CONTROL

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	Value 3	End
A5 C3 3C 5A	FF	36	03	03	01 (= input) 02 (=output)	00 (= all channels) 01 (= 1 channel) ... 08 (= 8 channel)	01 (= mute) 02 (= unmute)	EE

Value1 byte: Decides command controls DSP input or output.

Value2 byte: Set input/output channel. Value byte calculation: Channel decimal number convert to HEX.

Value 3byte: Set audio channel status, mute or unmute.

## Examples:

Command	HEX code	Feedback	HEX code
Mute input 1	A5 C3 3C 5A FF 36 03 03 01 01 01 EE	Sending successful	00
Unmute input 1	A5 C3 3C 5A FF 36 03 03 01 01 00 EE	Sending failed	01
Mute output 1	A5 C3 3C 5A FF 36 03 03 02 01 01 EE	Sending successful	00
Unmute output 1	A5 C3 3C 5A FF 36 03 03 02 01 00 EE	Sending failed	01

## READ MUTE STATUS

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	End
A5 C3 3C 5A	FF	63	03	02	01 (= input) 02 (=output)	00 (= all channels) 01 (= 1 channel) ... 08 (= 8 channel)	EE

# Software interface

Value1 byte: Sets to reads DSP input or output.

Value2 byte: input/output channel number. To get value convert to decimal channel number to HEX.

Feedback

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	Value 3	End
A5 C3 3C 5A	FF	63	03	03	01 (= input)	00 (= all channels) 01 (= 1 channel)	01 (= mute)	EE
					02 (=output)	... 08 (= 8 channel)	02 (= unmute)	

Value1 byte: Describe data is about DSP input or output.

Value2 byte: Channel number. To get value convert to received HEX to decimal number.

Value3 byte: Channel status, muted or unmuted.

Example

Command	HEX code	Feedback	HEX code
Read input 6 mute status	A5 C3 3C 5A FF 63 03 02 01 06 EE	Input 6 unmuted	A5 C3 3C 5A FF 63 03 03 01 06 00 EE
Read output 1 mute status	A5 C3 3C 5A FF 63 03 02 02 01 EE	Output 1 muted	A5 C3 3C 5A FF 63 03 03 02 01 01 EE

## MASTER VOLUME

Note: Master volume level range is from 0dB to -60dB.

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	Value low byte	Value high byte	End
A5 C3 3C 5A	FF	36	04	04	00	01	XX	XX	EE

Value1 byte: 00 all the time for master volume

Value2 byte: 01 all the time for master volume

# Software interface

Value low and high bytes: volume level must be calculated by using formulas below:

**Low byte expression:** =RIGHT(DEC2HEX(A2\*10;2);2)

**High byte expression:** =MID(DEC2HEX(A2\*10;4);LEN(DEC2HEX(A2\*10;4))-3;2)

In order to calculate values, copy these formulas to excel sheet. The volume data should be written to the same excel **A2** cell.

Example below: Low byte formula copied to **C2** cell. High byte formula copied to **D2** cell. Volume level for conversion must be typed to **A2** cell.

	A	B	C	D
	Volume level (add it in A2 cell) ↓		Answer from Low byte formula located in C2 cell ↓	Answer from High byte formula located in D2 cell ↓
1				
2	-60		A8	FD

Example

Command	HEX code	Feedback	HEX code
Set master volume to 0 dB	A5 C3 3C 5A FF 36 04 04 00 01 00 00 EE	Sending successful	00
Set master volume to -10 dB	A5 C3 3C 5A FF 36 04 04 00 01 9C FF EE		
Set master volume to -60 dB	A5 C3 3C 5A FF 36 04 04 00 01 A8 FD EE	Sending failed	01

## INPUT/OUTPUT VOLUME CONTROL

Note: Volume level range is from +15dB to -60dB.

Only analog input/output can be controlled by using serial or IP/TCP commands. USB input/output volume can't be controlled.

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	Value low byte	Value high byte	End
A5 C3 3C 5A	FF	36	04	04	01 (= input)  02 (= output)	01 (= 1 channel) ... 08 (= 8 channel)	XX	XX	EE

Value1 byte: selects DSP input or output will be affected.

Value2 byte: Set input/output channel. Value byte calculation: Channel decimal number convert to HEX.

Value low and high bytes: volume level must be calculated by using formulas. Check the Low and high byte expression in master volume manual (page No: 25).

# Software interface

## Example

Command	HEX code	Feedback	HEX code
Set input 1 volume to 0 dB	A5 C3 3C 5A FF 36 04 04 01 01 00 00 EE	Sending successful	00
Set output 1 volume to -31 dB	A5 C3 3C 5A FF 36 04 04 02 01 CA FE EE		
Set master Input 6 volume to -36,4 dB	A5 C3 3C 5A FF 36 04 04 01 06 94 FE EE	Sending failed	01

## READING INPUT/OUTPUT VOLUME

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	End
A5 C3 3C 5A	FF	63	04	02	00 (= master volume) 01 (= input) 02 (= output)	00 (= master volume) 01 (= 1 channel) 08 (= 8 channel)	EE

Value1 byte: Sets to reads DSP input or output or master volume

Value2 byte: Input/output channel number. To get value convert to decimal channel number to HEX. To get master volume feedback this byte should be 00.

## Feedback

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	Value low byte	Value high byte	End
A5 C3 3C 5A	FF	63	04	04	00 = master volume	00 = master volume	XX	XX	EE
					01 = input	01 = 1 channel			
					02 = output	08 = 8 channel			

Value1 byte: 00 all the time for master volume

Value2 byte: 01 all the time for master volume

Value low and high bytes: volume level must be calculated by using formula below:

$$=IF(LEFT(A2;1)="F";HEX2DEC(CONCATENATE("FFFFFF";A2))/10;HEX2DEC(A2)/10)$$

In order to calculate volume level, copy this formula to excel sheet C2. The data from low and high bytes must be written to the same excel sheet A2 cell.

NOTE: First must be written High byte and second Low byte data. No space between data.

# Software interface

Example below: Formula copied to C2 cell. High and low bytes from feedback copied to A2 cell.

Example

Command	HEX code	Feedback	HEX code
Read input 6 volume	A5 C3 3C 5A FF 63 04 02 01 06 EE	Input 6 volume: -36,4dB	A5 C3 3C 5A FF 63 04 04 01 06 94 FE EE
Read output 1 volume	A5 C3 3C 5A FF 63 04 02 02 01 EE	Output 1 volume: -5,3dB	A5 C3 3C 5A FF 63 04 04 02 01 CB FF EE

Feedback: A5 C3 3C 5A FF 63 04 04 01 06 94 FE EE

	A	B	C
1	Feedback: High byte & low byte (Add it to A2 cell) ↓		Answer: Volume level in dB located in C2 cell ↓
2	FE94		-36,4

Feedback: A5 C3 3C 5A FF 63 04 04 02 01 CB FF EE

	A	B	C
1	Feedback: High byte & low byte (Add it to A2 cell) ↓		Answer: Volume level in dB located in C2 cell ↓
2	FFCB		-5,3

## INPUT/OUTPUT VOLUME CONTROL IN STEPS

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	Value 3	Value 4	End
A5 C3 3C 5A	FF	36	05	04	00	00	0A	0A	EE
					= all channels	01	=1dB step		
					01	= reduce volume			
					= input	14	=2dB step		
02	01	00	1E	= increase volume					
= output	= 8 channel	=3dB step							
08	= 8 channel								

Value1 byte: Sets to reads DSP input or output or master volume

Value1 byte: selects DSP input or output will be affected.

Value2 byte: Set input/output channel. Value byte calculation: Channel decimal number convert to HEX. Command will affect all inputs/outputs if Value2 byte will be 00.

Value3 byte: This byte set the step polarity. Depend this byte audio level will be reduced or increased.

# Software interface

Value 4 byte: It's about how big step will be. To find byte value step level in decimal should be multiplied by 10 and decimal number converted to HEX.

Example how to calculate 6dB step:  $6 * 10 = 60$ . 60 converted to HEX = 3C

Example

Command	HEX code	Feedback	HEX code
Adjust input 1 volume by -3dB	A5 C3 3C 5A FF 36 05 04 01 01 01 1E EE	Sending successful	00
Adjust output 1 volume by -1dB	A5 C3 3C 5A FF 36 05 04 02 01 01 0A EE		
Adjust all inputs volume by -10dB	A5 C3 3C 5A FF 36 05 04 01 00 01 64 EE	Sending failed	01

## LINE/MIC SENSITIVITY

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	Value 3	End
A5 C3 3C 5A	FF	36	06	03	01	00	00	EE
					= 1 channel	=mic input	=gain level 0dB	
					...	...	...	
					08	01	28	
					= 8 channel	=line input	=gain level 40dB	

Value1 byte: Set input channel. Value byte calculation: Channel decimal number convert to HEX.

Value2 byte: Switch input setup Mic or Line.

Value3 byte: Sets input gain if Value2 is set to 01 (Mic input). In order to find HEX value convert decimal gain number to HEX. Gain range from 0dB to 40dB.

Example

Command	HEX code	Feedback	HEX code
Input 1 line input	A5 C3 3C 5A FF 36 06 03 01 01 00 EE	Sending successful	00
Input 2 mic input. Gain 10dB	A5 C3 3C 5A FF 36 06 03 02 00 0A EE		
Input 1 mic input. Gain 30dB	A5 C3 3C 5A FF 36 06 03 01 00 1E EE	Sending failed	01

## READING INPUT SENSITIVITY

Start	Device ID	Control byte	Function	Data length	Value 1	End
A5 C3 3C 5A	FF	63	06	01	01	EE
					= 1 channel	
					...	
					08	
					= 8 channel	

# Software interface

Value1 byte: Channel number

Feedback

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	Value 3	End
A5 C3 3C 5A	FF	63	06	03	01 = 1 channel ... 08 = 8 channel	00 =mic input 01 =line input	00 =gain level 0dB ... 28 =gain level -40dB	EE

Value1 byte: Input channel. Value byte calculation: Channel NEX number convert to decimal number.

Value2 byte: Input sensitivity Mic or Line.

Value3 byte: Input gain level.

Example

Command	HEX code	Feedback	HEX code
Read input 6 gain	A5 C3 3C 5A FF 63 06 01 06 EE	Input 6 gain: Line	A5 C3 3C 5A FF 63 06 03 06 01 00 EE
Read output 1 gain	A5 C3 3C 5A FF 63 06 01 01 EE	Input 1 gain: Mic 27 dB	A5 C3 3C 5A FF 63 06 03 01 00 1B EE

## PHANTOM POWER ON/OFF

Note: Phantom power can only be enabled if input is setup to MIC input.

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	End
A5 C3 3C 5A	FF	36	07	02	01 = 1 channel ... 08 = 8 channel	00 = OFF 01 = ON	EE

Example

Command	HEX code	Feedback	HEX code
Turn On input 2 phantom power	A5 C3 3C 5A FF 36 07 02 02 01 EE	Sending successful	00
Turn Off input 2 phantom power	A5 C3 3C 5A FF 36 07 02 02 00 EE	Sending failed	01

## READ PHANTOM POWER STATUS

Start	Device ID	Control byte	Function	Data length	Value 1	End
A5 C3 3C 5A	FF	63	07	01	01 = 1 channel ... 08 = 8 channel	EE

Value1 byte: Channel number

# Software interface

## Feedback

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	End
A5 C3 3C 5A	FF	63	07	02	01 = 1 channel ... 08 = 8 channel	00 = Phantom Off 01 = Phantom On	EE

Value1 byte: Input channel number.

Value2 byte: Phantom power status.

## Example

Command	HEX code	Feedback	HEX code
Read input 3 phantom power status	A5 C3 3C 5A FF 63 07 01 03 EE	Input 3 phantom On	A5 C3 3C 5A FF 63 07 02 03 01 EE
Read input 1 phantom power status	A5 C3 3C 5A FF 63 07 01 01 EE	Input 1 phantom Off	A5 C3 3C 5A FF 63 07 02 01 00 EE

## AFC FEEDBACK CONTROL

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	End
A5 C3 3C 5A	FF	36	08	02	01 = 1 channel ... 08 = 8 channel	00 = AFC is Off 01 = AFC level 1 02 = AFC level 2	EE

Value1 byte: Input channel number.

Value2 byte: AFC On/Off control and level.

## Example

Command	HEX code	Feedback	HEX code
Turn On input 1 AFC on level 2	A5 C3 3C 5A FF 36 08 02 01 02 EE	Sending successful	00
Turn Off input 1 AFC	A5 C3 3C 5A FF 36 08 02 01 00 EE	Sending failed	01

## READ AFC STATUS

Start	Device ID	Control byte	Function	Data length	Value 1	End
A5 C3 3C 5A	FF	63	08	01	01 = 1 channel ... 08 = 8 channel	EE

Value1 byte: Channel number.



# Software interface

## Feedback

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	End
A5 C3 3C 5A	FF	63	08	02	01 = 1 channel ... 08 = 8 channel	00 = AFC is Off 01 = AFC level 1 02 = AFC level 2	EE

Value1 byte: Channel number.

Value 2 byte: AFC level.

## Example

Command	HEX code	Feedback	HEX code
Read input 5 AFC status	A5 C3 3C 5A FF 63 08 01 05 EE	Input 5 AFC level 1	A5 C3 3C 5A FF 63 08 02 05 01 EE
Read input 8 AFC status	A5 C3 3C 5A FF 63 08 01 08 EE	Input 5 AFC level 2	A5 C3 3C 5A FF 63 08 02 08 02 EE

## MATRIX CONTROL

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	Value 3	End
A5 C3 3C 5A	FF	36	09	03	01 = 1 input ... 08 = 8 input	01 = 1 output ... 08 = 8 output	01 = connect 00 = disconnect	EE

Value 1 byte: input channel.

Value 2 byte: output channel.

Value 3 byte: input and output status, connected or not.

## Example

Command	HEX code	Feedback	HEX code
Input 1 connected to output 3	A5 C3 3C 5A FF 36 09 03 01 03 01 EE	Sending successful	00
Input 1 disconnected from output 1	A5 C3 3C 5A FF 36 09 03 01 01 00 EE		
Input 2 connected to output 1	A5 C3 3C 5A FF 36 09 03 02 01 01 EE	Sending failed	01

# Software interface

## READ MATRIX STATUS

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	End
A5 C3 3C 5A	FF	63	09	02	01 = 1 input ... 08 = 8 input	01 = 1 output ... 08 = 8 output	EE

Value 1: Input channel number

Value 2: Output channel number

Feedback

Start	Device ID	Control byte	Function	Data length	Value 1	Value 2	Value 3	End
A5 C3 3C 5A	FF	63	09	03	01 = 1 input ... 08 = 8 input	01 = 1 output ... 08 = 8 output	01 = connect ... 00 = disconnect	EE

Value 1 byte: Input channel number

Value 2 byte: Output channel number

Value 3 byte: input and output status, connected or not.

Example

Command	HEX code	Feedback	HEX code
Read input 1 and output 1 status	A5 C3 3C 5A FF 63 09 02 01 01 EE	Input 1 and output 1 connected	A5 C3 3C 5A FF 63 09 03 01 01 01
Read input 3 and output 8 status	A5 C3 3C 5A FF 63 09 02 03 08 EE	Input 3 and output 8 disconnected	A5 C3 3C 5A FF 63 09 03 03 08 00

## DECIMAL AND HEXADECIMAL DIGIT TABLE

DEC:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HEX:	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F

DEC:	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
HEX:	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E

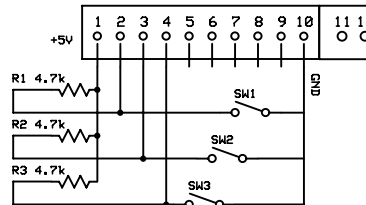
# General Specifications

## DSP8X8 Digital Signal Processor

Technical Specifications	DSP8X8
Power supply	~ 115-230 V, 50/60 Hz
Power consumption	14 W
Input / output connector	Balanced Phoenix
Input impedance	16 k $\Omega$
Maximum input level	Line: 17 dBu Mic: -3 dBu
Output impedance	150 $\Omega$
Maximum output level	+10 dBu
Maximum gain	-40 dBu
Frequency response	20 Hz - 20 kHz
THD+N	Line: -90 dB (@ 17 dBu, 1 kHz) Mic: -90 dB (@ -6 dBu, 1 kHz, 20 dB gain sensitivity)
SNR	Line: 110 dB (@ 17 dBu, 1 kHz) Mic: 100 dB (@ -6 dBu, 1 kHz, 20 dB gain sensitivity)
Phantom power	+48 V DC, 5.5 mA in each input channel
Sampling rate	48 kHz
AD/DA converter	24 bit

Process	32 bit float point DSP 400 MHz
System delay	<3 ms
Control protocols	RS232, RS485, TCP/IP, GPIO
Control ports	USB Type B, RJ45, USB, phoenix
Indicator light	Input signal, Phantom power, Link, Output signal
Supported OS	Windows
Dimensions (H x W x D)	483 x 265 x 44.5 mm
Weight	3.3 kg

### GPIO Connector



1. +5V
2. GPIO in/out 1
3. GPIO in/out 2
4. GPIO in/out 3
5. GPIO in/out 4
6. GPIO in/out 5
7. GPIO in/out 6
8. GPIO in/out 7
9. GPIO in/out 8
10. GND
11. RS485 +
12. RS485 -

The specifications are correct at the time of printing this manual. For improvement purposes, all specifications for this unit, including design and appearance, are subject to change without prior notice.

