vsound 2

volume

preamp

0 dB

14 dB

response select

bypass toggle

Vsound 2 Manual

Revision 2.2

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1.   Introduction

Congratulations on your purchase of vsound 2. Vsound is a revolutionary device that modifies the sound produced by an electric violin (or an acoustic violin fitted with a pickup), producing an output that matches the timbre and voice of a high quality acoustic violin. vSound is complex piece of electronic engineering, but it is very simple indeed to operate. Simply plug the violin audio lead into vSound, plug the output from vSound into an amplifier or headphones, switch on and select a violin sound. Done.

Vsound comes with a range of other functions for optimal performance including a gain-selectable preamplifier, volume control, a 20-band graphic equalizer, a versatile arbitrary equalizer, and an adjustable blender. The blender, which combines the original with the processed signal, extends the scope of the system for use with acoustic instruments fitted with pickups on the bridge. The unit can be controlled either from a computer using the software supplied, or directly from the footswitches on the top panel of the pedal.

Vsound is supplied with pre-loaded violin impulse responses in its memory, and additional ones are supplied with the software. You can also download your own responses or contact us to provide you with new or modified responses.

Here at Signal Wizard Systems Ltd we are really excited about vsound and we hope you get many hours of enjoyment using this system.

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2.   Quick start tutorial

Ensure your computer or laptop has internet access. If you are reading this then you will have already downloaded and installed the vsound software from the website, and the vsound software is open. Now follow these steps:

Connect the supplied power adaptor to vsound and switch on (do not use any other adaptor).

Connect vsound to the computer using the USB cable provided.

The drivers for the USB communication will automatically be installed from the internet. Do not proceed until this stage has been completed.

From the software main menu, Select Hardware ¦Detect vsound, or click the "Detect" button in the Notification log and control area. The system will search for the vsound unit, and will typically report the following messages:

Detecting hardware...

Hardware found.

Resetting system...

Testing status...

Communications: OK
Firmware version: 2.2

Start up mode: Default
Volume: 5
Equalizer: off
Mixer wet: 100
Mixer dry: 0
Selected response: None

Reset sequence complete.

Your vsound system is now fully set up and ready to go.

3.   Main control panel

The main control panel button and switches are as follows:

- Detect – establishes communication with vsound. This button must be clicked each time the software is opened (with the hardware unit connected to the computer).

- Reset – resets the vsound unit. This is equivalent to powering up the hardware unit.

- Status / Sync - Returns the operating status of vsound and syncs the settings of the software to those of the hardware. For example, if the volume control has been altered using the navigator buttons on the hardware, clicking "Status / Sync" will update the volume level shown by the software.

- Pause – halts the audio output but does not stop the processor.

- Run – resumes the audio output.

- Clear info – clears all messages in the notification log.

- Sleep - Places the hardware into a low power mode. In this mode it will not respond to any commands until a reset is performed.

- Default start – clicking this button returns the vsound unit to its default condition following the next reset or power up sequence. The default condition is:

      Start up mode: Default
      Volume: 5
      Equalizer: off
      Mixer wet: 100
      Mixer dry: 0
      Selected response: None

- Equalizer – selects or deselects the equalizer. Configuration of the equalizer is performed using either the graphic or arbitrary equalizer tab page, described later.

- Digital volume buttons - these increase or decrease the digital volume in 4 dB steps. These buttons act as a master volume control. Like all other controls, the digital volume setting is retained unless changed or overridden using the default start up conditions.

- Increase mix and decrease mix – These buttons control the mix or blend proportions of the original (dry) signal with the processed (wet) signal. It is a very powerful feature since it allows the player to make subtle changes to the timbre and colouration of the final audio output. The dry signal is the signal originating directly from the pickup (after pre-amplification), but before the bass cut filter. The wet signal is the signal following impulse response processing and equalization. See the system diagram.

4.   Response download

The response download tabbed page is the section of the software that allows the user to open an impulse response and download it to the hardware. The impulse response and its spectrum are shown in the chart area when loaded from disc.

To open an impulse response file, simply click "Open file" or go to the main menu and select File > Open impulse response…

The name of the file will appear in the Title edit box. You can change this title to anything you wish. However, only the first 32 characters of the title will appear in the display.

To download the file, simply select any sector between 1 and 10, and click "Download", or select File > Download impulse response… from the main menu. As the file is being downloaded, the software will display the message "Downloading impulse response…" Any existing impulse response in the chosen sector will be overwritten.

The vsound unit will automatically select an impulse response once downloaded. To choose other previously downloaded responses, click Hardware – Select impulse response… from the main menu.

Note: any settings and responses that you select will be automatically saved and recalled each time the device is switched on or reset.

The controls are summarised as follows:

- Open file – opens an impulse response as a text file or a WAV (wave). The files supplied with the software conform to a particular format, described under "About impulse responses".

- Download – downloads the impulse response to the chosen sector (1 – 10). The first 32 characters of the title, which may be edited, will be used by vsound and appear in the "Select impulse response" display.

- Grid – toggles the grid on the frequency response plot.

- Clear display – clears the impulse and frequency response plots and internally closes the associated impulse response file.

- Loudness – by default, the software will automatically normalize an impulse response ("normalize" radio button checked), setting the frequency response maximum to 0 dB. Using the slider named "normalization factor, dB", it is possible to alter this between ±20 dB for quieter or louder reproduction. The "Maximize" radio button sets the gain of the impulse response to the highest level the hardware can accommodate (just below saturation). This option should be used with caution. The "None" radio button uses the impulse response directly, without applying any scaling. The "Reset" button resets the normalization to 0 dB.

- Frequency response - these radio buttons change the way the frequency response, or spectrum, is shown in the lower plot.

- Window - this determines the window applied to the impulse response before calculating the frequency response.

- Zoom frequency response - To select a region of the frequency response to zoom, hold down the left mouse button, drag and release then click "Zoom frequency response". It is possible to perform nested zooms.

5. Spectrum editor

The Spectrum Editor is a new and very powerful feature introduced in vsound version 2.2. It allows the frequency response to be modified with exceptional precision using an interactive tool, generating a new impulse response that can then be saved or downloaded to the hardware unit in the usual manner.

Unlike the graphic and arbitrary equalizers, the Spectrum Editor introduces no latency in the modified impulse response.

To use the editor, simply select a region of the frequency response you wish to change, by holding down the left mouse button, dragging and then releasing. The gain of the highlighted region will be altered according to the parameters that you now specify.

- The "Scaling" radio box determines whether you wish to enter a gain change expressed in dBs or in linear format. The default is dB.

- The "Shaping" radio box allows you to choose how the gain will be applied to the highlighted region. If Hanning is selected, the gain will change in a smooth envelope. If rectangular is selected, the gain change will be uniformly applied to the entire highlighted region.

- The "Gain to apply" edit box specifies the gain. You can increase or decrease the gain arbitrarily. For example, if you want to increase the gain of a region by 10 dB, make sure dB is selected in the "Scaling" radio box and enter the value 10 in the "Gain to apply" edit box.

- Now click "Filter". Instantly, the gain changes, and a new impulse response is generated.

The same effect could have been achieved by selecting linear in the "Gain to apply" edit box and entering a gain of 3.16.

To reduce the gain, apply a negative dB value or a fractional linear value. For example, -5 dB is equal to a linear gain of 0.56.

- The "Fade out" edit box allows you to gradually fade out the end of the impulse response if the newly edited one has an end-of-impulse response artefact. The IR is 4096 values in length, from 0 to 4095, so if, for example, a fade out length of 200 is selected and "Filter" is clicked, the response will fade gradually to zero from 3895 to 4095.

- The "Undo" button restores the original impulse response (as it was when opened).

- The "Save IR" button allows you to save the newly edited impulse response as a new file.

6.   Graphic equalizer

The graphic equalizer tabbed page contains a 20-band graphical equalizer, from 40 Hz to 16 kHz, each band having a range of ±20 dB. Once the equalizer has been configured, it can be downloaded into the device with a single click and used as required.

Each slider may be moved in steps of 0.1 or 1 dB, by positioning the cursor within or just outside of, respectively, the up/down slider arrow icons.

An equalizer profile may be opened from or saved to disc using the buttons in the "Profiles:" group box.

The graphic equalizer also comes with a number of pre-set profiles, accessible from the "Pre-sets:" group box.

Clicking the "All zero" button returns all sliders to 0 dB (flat response).

The smoothing, or Q, of the bands is controlled by the slider in the "Smoothing:" group box. Clicking "Reset" in this box restores the default smoothing to 50%.

The "vsound control:" group box includes four button controls:

- Download - this downloads the equalizer to vsound. As it transfers, vsound displays the message "Downloading graphic equalizer response…"

- Export response – this allows the equalizer coefficients to be exported as a text file. This is useful if you wish to plot the response using third party software.

- Equalizer on and Equalizer off – theses buttons enable or disable the equalizer on the hardware. The equalizer can also be enabled/disabled using the button in the Notification log and control area of the software.

- The "grid" check box toggles the graphic equalizer horizontal grid lines.

7. Arbitrary equalizer

The arbitrary equalizer tabbed page contains a highly versatile arbitrary equalizer with a frequency range of 40 Hz to 18 kHz and an amplitude dynamic range of ±40 dB. It is one of the vsound's most powerful features since it provides almost limitless control over the frequency response characteristics of the output. The user can draw virtually any conceivable response simply by adding control markers to the response curve and dragging them using the mouse. Once the equalizer has been configured, it can be downloaded into the device with a single click and used as required. The arbitrary equalizer requires a little practice since it is very different to a conventional graphic equalizer. However, it is well worth the effort since it produces truly impressive results.

By default, the arbitrary equalizer is a flat line. To add a marker, simply position the mouse anywhere in the plot area and click the left mouse button. A solid circular marker appears, and now the frequency response describes a curve linking the start and end markers with the new marker. To move the marker, position the cursor over it. The cursor changes to a hand. Hold the left button down (the marker turns red) and drag. The marker follows the mouse, and the curve is redrawn accordingly.

To add further markers, again click the left mouse button. To delete a marker, move the cursor over the selected marker and click the right mouse button. There is no limit to the number of markers you can add, nor are there any restrictions to the positions of the markers. If you move a marker left or right of a neighbouring marker, the curve is redrawn such that it never doubles back on itself.

An arbitrary equalizer profile may be opened from or saved to disc using the buttons in the "Profiles:" group box.

The "View:" group box allows the user to toggle the visibility of the markers, axes, grid and crosshairs. If the crosshairs are on, the intersection point will always track the curve as the mouse is moved around the plot.

The "Cursor position:" group box shows the equalizer amplitude at the current x-axis position of the cursor (whether or not the crosshairs are enabled).

The "Rendering:" group box allows the frequency response to be drawn as a spline curve (default), linear interpolation (straight-line segments) or as a series of step functions (also known as a zero-order hold curve). Note that whatever function is chosen, this will be used in practice by the hardware.

If the spline curve is selected, its tension can be adjusted using the slider in the "Curve tension:" group box. This is equivalent to altering the tension on an elastic band wrapped around the markers. The default tension can be reset using the "Reset" button in this control box.

The "Markers:" group box allows the markers to be drawn either as solid circles or squares.

The "X-axis scaling:" allows switching between logarithmic (default) and linear scaling of the x-axis. Again, this has a real effect on the equalizer behaviour and is not just for display purposes.

The "vsound control:" group box includes four button controls:

- Download - this downloads the equalizer to vsound. As it transfers, vsound displays the message "Downloading graphic equalizer response…"
- Export response – this allows the equalizer coefficients to be exported as a text file. This is useful if you wish to plot the response using third party software.
- Equalizer on and Equalizer off – theses buttons enable or disable the equalizer on the hardware. The equalizer can also be enabled/disabled using the button in the Notification log and control area of the software.

The arbitrary equalizer also comes with a number of pre-set profiles, accessible from the "Pre-sets:" group box. "All zero" in the "Pre-sets:" group box deletes all markers (other than at the start and end points) and resets the equalizer to a flat line with a gain of 0 dB.

8. Selecting an impulse response from the software

Use this dialog box to select different violin responses using the integrated software. The controls are as follows:

- Select buttons - these work like the left footswitch, except that any response can be selected at random. The device will always remember the most recently selected response and use this on power-up or after a reset.

- Bypass - this deselects all filters (00 on the display) and runs the vsound unit in bypass mode.

- Clear - clears all the violin response names from the name fields, setting them to empty (note: the filters are still retained in the unit's memory, and remain there until overwritten).

9.   Updating the operating system

Using this dialog box, you can download new versions of the real-time firmware operating system (OS) from the Signal Wizard Systems website as they become available. To check which version of the firmware you have, click the "Status / Sync" button from the Notification log and control area. If the version on the web has a higher number, then download it and save it to the vsound folder.

To download this to the unit, click the "Download Operating System" button in the System update dialog box. The firmware will be downloaded in seconds.

To activate the new version of the firmware, click "Detect". Check that the newly installed firmware matches the version number on the website.

If the vsound unit is damaged it is possible that the firmware may be corrupted, in which case no communication with the device is possible. In this case, it will be necessary to perform a factory-level reinstallation of the firmware from the Update system dialog box using the "PC mode (advanced)" control. This requires expertise and should be undertaken in consultation with Signal Wizard Systems Ltd. In summary, the stages are as follows:

- Remove power from the unit and all cables.
- Configure the DIP switches on the printed circuit board to 1010.
- Apply power to the device.
- Go to the Windows Control Panel and select the Device Manager. This will show a list of hardware items. Expand the node labelled "COM & LPT". This will show the port number of the vsound USB serial port.
- From the vsound "Update system" dialog box, click the "USB configuration:" drop down list and select the port number that corresponds to the one listed in Device Manager.
- Click "Execute OS from Host". The firmware will be downloaded to the volatile memory of vsound. If successful, the unit will start operating.
- Click "Download Operating System" to store the firmware in vsound's flash memory.
- Power down the device.
- Return the DIP switch configuration to 0110.
- Power up the device.
- Click "Detect". If the unit still fails to respond it should be returned to Signal Wizard Systems for repair.

10. About impulse responses

Vsound operates by convolving the impulse response from an acoustic violin with an input signal, normally taken from an electric (silent) violin. However, it is equally possible to use vsound with an acoustic violin fitted with a bridge pickup. The use of the blender is desirable in this case, since it allows the player to mix the original (dry) signal with the processed (wet) version, in any proportion.

Obtaining a high-fidelity impulse response from an acoustic violin is a subtle procedure, involving measurements normally undertaken in an anechoic chamber under strictly controlled conditions. Signal Wizard Systems offers a violin characterization service to provide our customers with impulse responses of their favourite acoustic violins. For more details, please contact us through our website: www.signalwizardsystems.com.

The impulse response files packaged with the system are formatted as encrypted text files and therefore cannot be used with any other third-party software or system.

If you wish to produce your own impulse response files please note that they must be in stored in WAV (wave) file format. The WAV file must be single channel, 16-bit or 32-bit using PCM encoding (not floating-point encoding) and contain 4096 values. The sample rate must be exactly 36 kHz (for technical reasons relating to the internal operation of the vsound hardware).

11. Hardware features

- Ten pre-loaded violin responses, including Stradivarius, Guarneri and Catenari
- Rugged Stomp-box design
- Large 2-digit 7-segment LED display
- Foot switches: violin select and bypass/toggle
- Switchable preamp: 0 dB or 14 dB
- 500 kΩ input impedance
- Standard quarter inch mono phono sockets
- Output to amplifier or headphones
- Rotary volume control
- Autosave settings
- Sleep mode
- 9V DC input, centre negative
- Micro USB socket
- Linear power adapter
- Dimensions (mm): L127 x W94 x H42
- Weight: 315 grams

12. Software features

- Seamless communication with hardware unit

- Download and control of impulse responses

- Auto loudness correction

- Gain adjustment and full digital gain

- Blender control (wet/dry balance)

- Detailed impulse and frequency response display with zoom and pan

- Graphics equalizer with profile save/load

- Arbitrary equalizer with profile save/load

- Full real-time control of unit and violin select

- Diagnostics and easy firmware upgrade

- Context sensitive help

13. Technical specifications

Analogue system

- 24-bit sigma delta codec (ADC, DAC), 36 kHz sample rate

- Single channel input

- Gain switchable pre-amplifier, 0 dB and 14 dB

- Input impedance: 500 kΩ

- Output: audio power amplifier, 250 mW per channel of continuous average power to an 8X load with 0.1% (THD).

- Full scale input/output voltage range, V (peak-to-peak), typical: ±1.8 V

- Noise: <1 mV RMS, codec sample rate of 36 kHz

- System latency, bypass: 0.68 milliseconds

- System latency, IR: 1.80 milliseconds

- System latency, bypass and EQ: 29 milliseconds

- System latency, IR and EQ: 30 milliseconds

Processor system

- Clock Speed: 200 MHz

- Enhanced Filter Co-Processor (EFCOP)

- 400 MMAC

- 24-bit resolution (56-bit intermediate)

- Highly parallel instruction set with unique DSP addressing modes

- Two 56-bit accumulators including extension byte

- Parallel 24 X 24-bit multiply-accumulate in 1 instruction cycle (1 clock cycle)

- Double precision 48 X 48-bit multiply with 96-bit result in 6 instruction cycles

- 56-bit addition/subtraction in 1 instruction cycle

- Fractional arithmetic with support for multi-precision arithmetic

- Hardware support for block-floating point FFT

- Hardware nested DO loops

- Digital Phase Locked Loop (PLL) clock multiplier

- 32768 X 24-bit on-chip program memory

- 81920 X 24bit bytes on-chip X-data memory

- 81920 X 24bit bytes on-chip Y-data memory

- 262144 bytes off-chip flash memory (OS and equalizer)

14. Contact us

You can get in contact with us either by completing the online contact form on the Signal Wizard website, by sending us an email or by phone.

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Company details

15.   Terms and conditions

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All Signal Wizard products are guaranteed for 12 months from the date of purchase. If your product fails within this period, for reasons other than mishandling, physical shock, water ingress or other such accidents, we will repair or replace it free of charge.

You also have the right to cancel the purchase of a good without having to give a reason at any time within the "cooling off period" of seven working days, beginning on the day after you receive the goods.

If you are in possession of the goods you are under the duty to retain them and take reasonable care of them. You must send the goods back to us to our contact address at your own cost (unless we delivered the item to you in error or the item is damaged or defective) as soon as possible once you have cancelled the contract.

We reserve the right to make a charge not exceeding our direct costs of recovering the goods if you do not return the goods or return them at our expense.

Once you have notified us that you wish to cancel the contract, any sum debited to us will be refunded to you as soon as possible and in any event within 30 days of your cancellation.