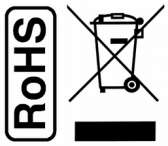
DSPeaker

ShakEQ™
User's Guide

Recycling information

ShakEQ™ is marked according to the **Waste Electrical and Electronic Equipment Directive**. There are take-back systems in place that help to preserve nature and natural resources when products are disposed of appropriately. If you need to dispose of this product, follow the local laws and regulations, and use the take-back system that has dedicated collection facilities for electronic equipment. Do not put the product into household waste disposal!



ShakEQ™ is manufactured using parts and processes that follow the EU directive of the Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS).

Safety Instructions

- ShakEQ™ is intended for domestic indoors use to be used with cables of up to 3m in length. With longer cables, observe electrostatic discharge precautions when connecting or disconnecting them to avoid damage to equipment. Longer cables may also be susceptible to electromagnetic interference.
- ShakEQ™ may produce shaker effects more often and with higher level than a system without it. This can cause more stress to the mechanical connections between the bass shaker and the furniture it is connected to, affecting its structural integrity. Observe and follow notes and installation instructions specified in the bass shaker's manual and associated materials.
- **CAUTION**: Use ShakEQ™ only with bass shakers, do **not** use with speakers or subwoofers. Choose a suitable Anti-Mode™ product for your subwoofers and/or speakers instead.
- **CAUTION**: **Swallowing and choking hazard.** Keep packaging and all parts out of reach of children and pets to prevent accidents.
- **CAUTION**: The remote control supplied with ShakEQ™ contains a button cell battery. Only replace it with the same type (CR2025) and in the correct orientation! Check the battery type, opening instructions, and correct replacement orientation from the markings on the backside of the remote.

WARNING: Do not ingest battery, Chemical Burn Hazard!

Keep batteries out of reach of children and dispose of the used battery appropriately. If a battery is swallowed, it can cause severe internal burns in just 2 hours and can lead to death. If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention.

If the battery compartment does not close securely or is otherwise damaged, stop using the remote control and keep it away from children.

- **CAUTION**: The power supply that is shipped with the unit is 12VDC 0.6-1.6A with a 2.1mm/5.5mm connector, center positive. Only use a power supply with specifications of 12VDC and at least 0.6A.

Table of Contents

1.Overview

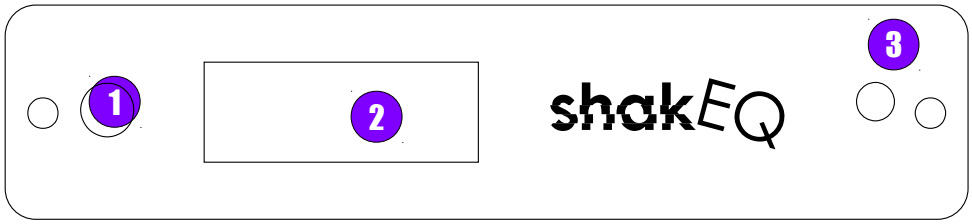
What's included in the box

✔ The ShakEQ™ unit (center)
✔ A measurement disc with a sensor (left)
✔ A dummy measurement disc (right)
✔ An infra-red remote controller (with battery, remove the plastic tab before use)
✔ A power supply for your country / region (12VDC) (not pictured)
✔ This guide (not pictured)

Basic Information

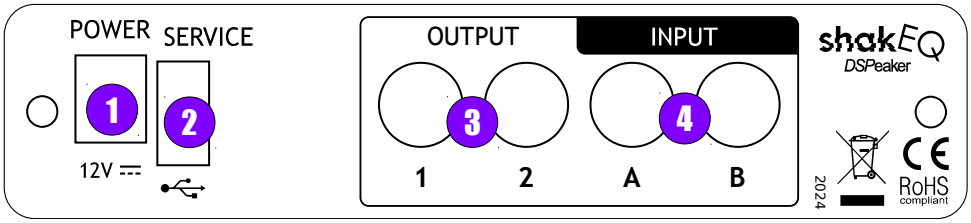
ShakEQ™ is a state-of-the-art automatic bass shaker enhancer for tactile transducers. It has three enhancing functions. Dynamic processing is an adaptive compression algorithm to improve the dynamic range of the tactile transducer. Bass Extender converts mid-bass audio cues that are normally outside of the range of a heavy bass shaker to a lower-frequency instance of themselves to be felt. And thirdly, ShakEQ can measure and correct distortion present in your shaker system by Calibration (p. 16). The user can control and fine-tune the characteristics and operation of the tactile transducer by adjusting ShakEQ settings based on preference and input material.

Front Panel

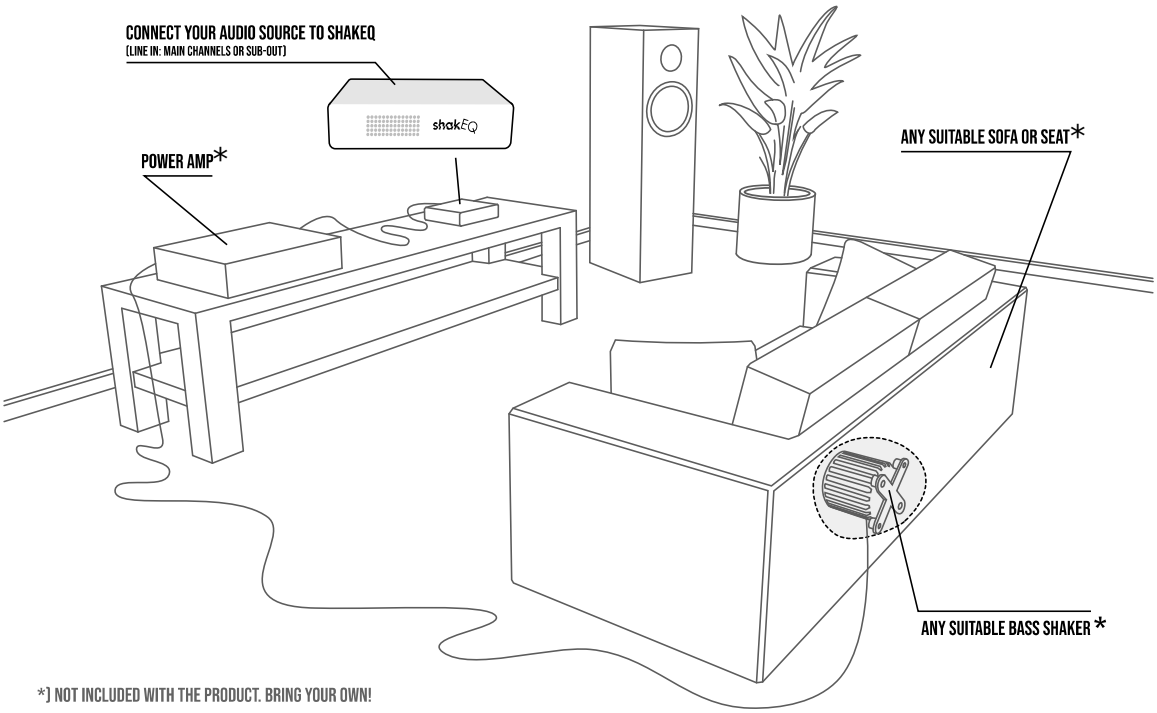


(1) Sensor connector with insertion detection
(2) Matrix display (3) IR receiver

Rear Panel



(1) Power supply connector, 12VDC 0.6A – (2.1mm/5.5mm, center positive)
(2) USB host port for firmware update and measurement export using a USB memory stick
(3) 1 and 2 RCA line-level outputs (only connect shakers, not speakers or subwoofers)
(4) A and B RCA line-level inputs (preferably a wide frequency range)



Connections

Connect either (or both) analog outputs of ShakEQ to the amplifier that controls your bass shaker. Connect your audio source to one (mono source) or both (stereo source) of ShakEQ's A / B inputs.

In an existing bass shaker system it is natural to insert ShakEQ at the shaker amplifier's input. However, the signal of a LFE / subwoofer output is very band-limited – the cross-over frequency is by default 80Hz in Audio/Video Receivers (AVRs). ShakEQ prefers to receive a wider-range audio signal (up to 1kHz). Our suggestion to get the most out of your system is to avoid using the LFE output, if possible.

- Stereo system (2 channels): connect the A and B inputs of ShakEQ to the left and right line-level outputs of your audio source, external DAC, or pre-amplifier. Use Y-splitters if needed.
- Home theater system: either
  - preferably connect the A and B inputs to the line-level outputs of the main (left / right) channels with speakers set to "large" in the amplifier's speaker configuration, i.e. do **not** use the subwoofer / LFE output for ShakEQ,
  - or if that is not possible and you have subwoofer(s) connected, connect the A input to the AVR's subwoofer output, then configure the main speakers as "small". This results to a wider frequency range to be sent to the subwoofer output, instead of just the LFE effects.
- Headphones and bass shaker: connect the same full-range signal to headphones and ShakEQ.

Then connect the power supply to a wall socket and the plug to the POWER connector. The unit automatically starts and enters the home screen.

For more information about setup and tuning, see https://www.dspeaker.com/shakeq-setup-guide .

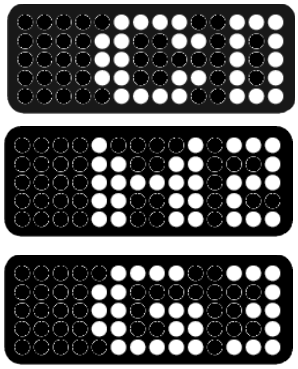
2.Operation Modes

ShakEQ has three main operation modes, each optimized for a different content type and usage. The currently active mode affects the signal enhancement and how the Wet/Dry setting alters the operation.

1. **Cinema** – Shaker output is optimized for movies that have masses of low frequency sound effects, some music, and a lot of spoken dialogue.
2. **Music** – Musical mode that emphasizes the rhythmic, tonal, and musical properties of the shaker.
3. **Game** – Mode where the optimization concentrates on a mix of atmospheric sounds and sound effects with high-intensity transients being still prevalent.

The operation modes can be tweaked in master profiles to gain a more personal and content-dependent experience and also be stored into custom profiles. The three master profiles save settings automatically once modified, the custom profiles can be saved into manually (see Profiles on p.9). The different signal paths and blocks are summarized in Processing Flow on page 7.

Home Screen



Home Screen is the default view of the user interface. It indicates the active custom profile (if any) by a number from 1 to 3, the operating mode by one character (C, M, or G), and the Wet/Dry setting (the effect amount) by a number. E.g. ” C0” is Cinema master profile with Wet setting of 0.

Mode Abbreviation	Full Name
C	Cinema mode
M	Music mode
G	Game mode

Remote Control Summary

LOW CUT: Sets the lowest frequency that is sent to the shaker.

GAIN: Adjusts the output level.

WET/DRY: Adjusts the effect level.

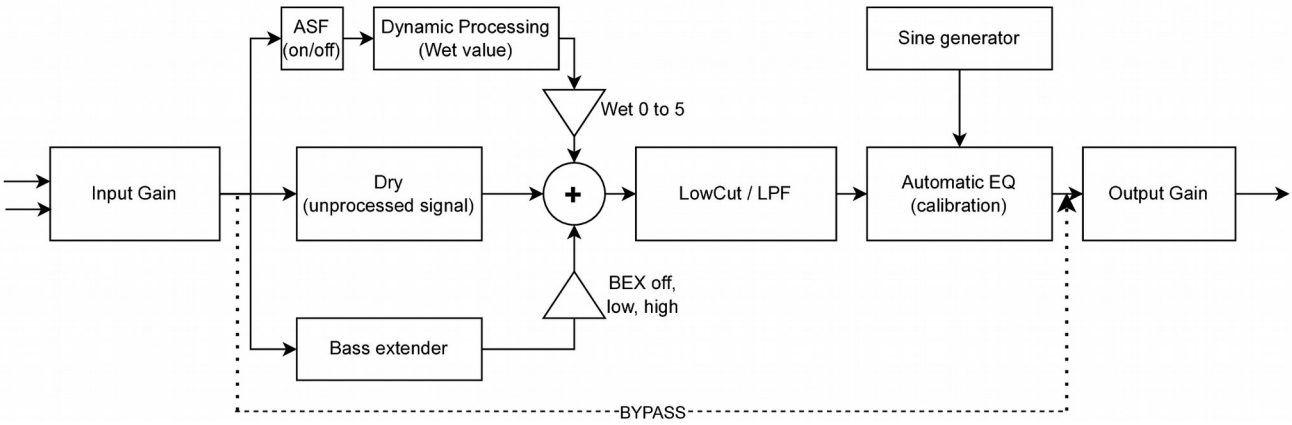
Cinema, Music, and Game buttons select the respective master profiles. Buttons 1, 2, 3 choose (or save) custom profiles.

Short press of CANCEL activates or deactivates mute. A long press enters menu. In menu a short press cancels a change or returns from menu or menu item.

Short press of BYPASS disables/enables processing. A long press restores factory settings.

SAVE / OK stores settings and profiles, or confirms selections.

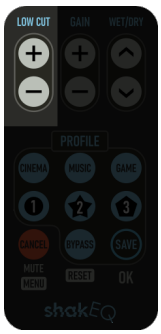
3.Processing Flow



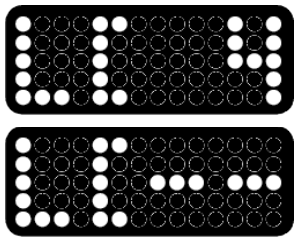
The processing flow is shown above. Before making very detailed and fine-tuned adjustments, remember to perform the Calibration (see page 16).

4.Quick Adjustments

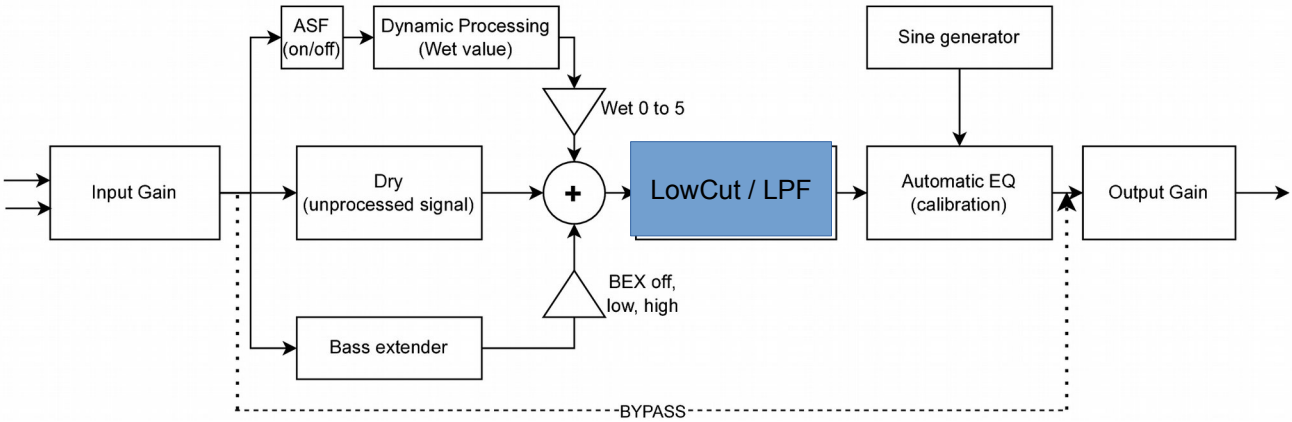
There are three settings that are directly adjusted from remote buttons: Low Cut, Gain, and Wet/Dry. The first press of one of these buttons shows the current value, next presses adjust it.



Low Cut Adjustment

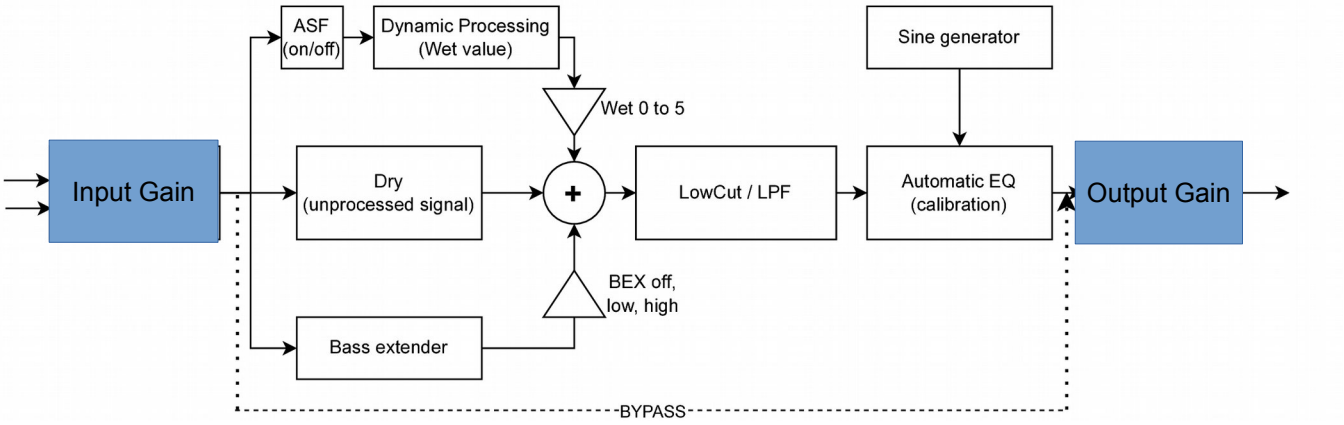


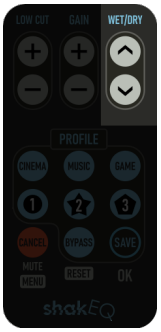
The Low Cut filter is an adjustable highpass (infrasonic) filter that cuts (removes) lower frequencies. In all of the modes and profiles, you can set the low limit of the output signal with the “Low Cut” +/- buttons. The screen indicates ”LC” and a frequency in Hertz (Hz) number from 4 Hz to 92 Hz or ”--” for off. The filter slope is 12dB/octave.



Gain Adjustment

You can adjust the output gain between to -27 dB and +9 dB using the remote buttons to adjust the total shaker effect. Avoid using positive values, because that may introduce clipping at the output without any visible indication. See Input Gain / Monitor on page 15 for how to set the input gain.

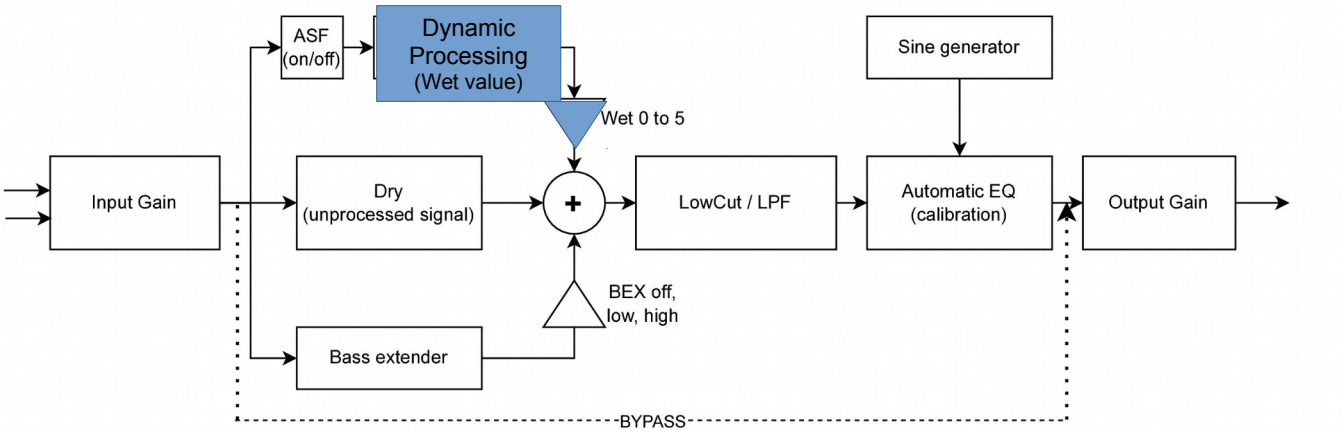




Wet/Dry Adjustment

Dynamic processing brings more subtle sounds into perceived levels. The Wet/Dry buttons adjust the effect value from 0 (none or minimum) to 5 (maximum). The values have a different effect in each of the main operation modes. In all modes the value adjusts the dynamic processing effect level.

Additionally, in Music mode the three highest values of Wet (3 to 5) incrementally introduce its own specific Bass Extender effect (see p.14), to produce output from mid-bass transients that would not otherwise produce output from the tactile transducer on their own. In other modes Bass Extender is controlled by the BASX setting.

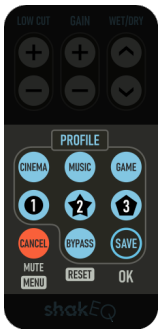


Wet/Dry setting does not affect the equalization performed during calibration.

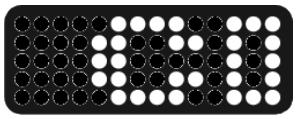
Long press of Wet/Dry (in Cinema and Game modes) allows to edit BASX (Bass Extender, p.14).

5.Other Functions

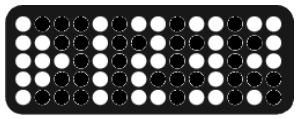
Profiles



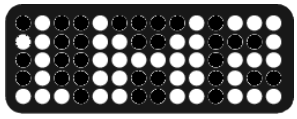
There are three master profiles and three custom profiles. The screen indicates which profile and operation mode is active and the Wet value. The letter in the center stands for C=Cinema, M=Music, and G=Game. Master profiles have no preceding number, custom profiles are numbered 1 to 3. The number on the right indicates the Wet (effects) value.



Any adjustments to the Cinema, Music, and Game master profiles (no profile number shown) are automatically saved into their respective profile memories.



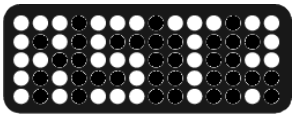
The current settings can also be stored into any of the three custom profile slots 1, 2, or 3. To store a custom profile, adjust all of the settings first and then press the SAVE button. After the screen prompts >123?, press the button of the profile you want to store the setting to, or press CANCEL to skip saving. Once stored, these settings can be recalled in the home screen by pressing the associated profile button 1, 2, or 3.



Adjustments to a custom profile (profile number is shown) are only saved explicitly with the SAVE function. For example, you can recall profile 1, make adjustments, then save to profile 2 or recall another profile without settings of profile 1 being changed.

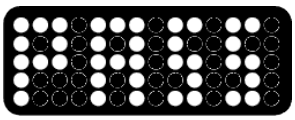
Any of the three custom profiles can be of any type. For example you can have 3 custom profiles for Game, and still have different settings in the Game master profile.

Factory Reset



To restore all settings to factory values, press and hold the BYPASS button until the display prompts "RST?". To proceed resetting, press the SAVE/OK button. To return without resetting, press the Cancel button.

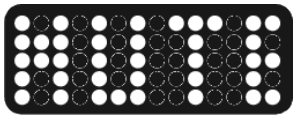
Bypass



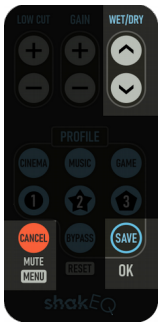
Both the frequency equalization and effects can be disabled on the home screen by pressing the BYPASS button. This is indicated by "PASS" on the screen.

Press any button to return to normal operation.

Mute



You can mute output by pressing MUTE and any button to restore output.

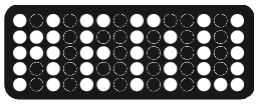
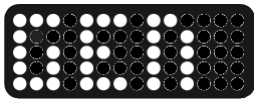
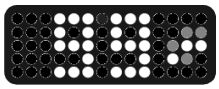
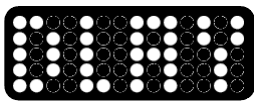
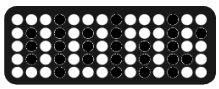
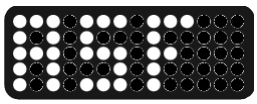
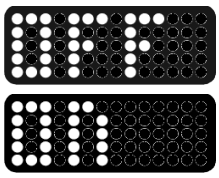
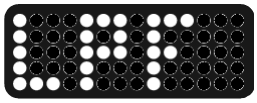
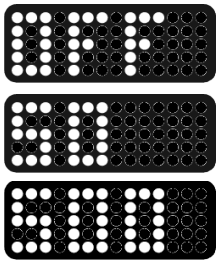
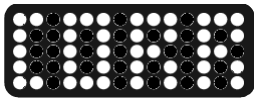
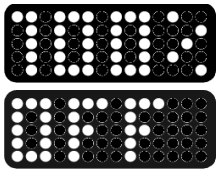
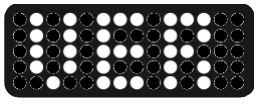
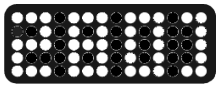
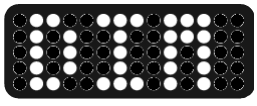
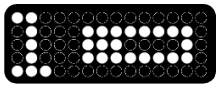


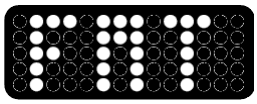
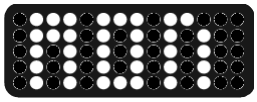
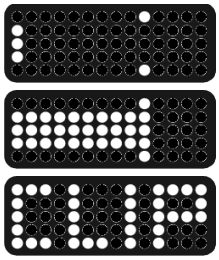
Menu

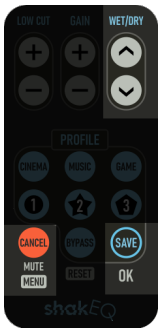
More settings are available through a menu. Keep MENU/MUTE/CANCEL pressed until the menu activates. WET/DRY UP and DOWN scrolls menu items, press OK to edit or activate.

If you have changed a setting, OK saves the value and returns or CANCEL discards the change, otherwise CANCEL returns to menu.

CANCEL leaves the menu, then press any button to unmute.

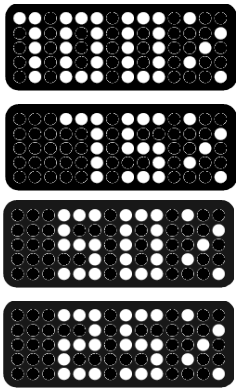
	OK → leave menu UP/DOWN → scroll through menu items		
	Sine Generator OK → start		UP / DOWN adjusts frequency. See Sine Generator on page 12. CANCEL to return.
	Delay Adjustment OK → adjust the delay		+ / - adjusts delay.
	Anti-Speech Filter OK → adjust		+ to switch ON, - to switch OFF.
	Adjustable Master Lowpass Filter OK → adjust		+ / - to adjust between OFF and from 50Hz to 500Hz in 10Hz steps.
	Correction Amount OK → adjust		UP / DOWN adjusts equalization from OFF to 150% in 25% steps. The default is 100%.
	OK → show version		Shows day and month of the current version. CANCEL to return.
	Display Dimmer OK → Adjust		UP / DOWN adjust brightness from 0 to 3. Setting 0 turns off display completely after a delay.

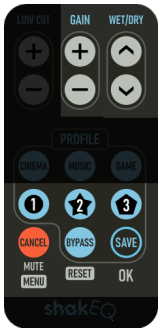
	FAT Format OK →	Plug in USB stick. Press and hold the Game button to confirm format.	Formats a USB stick to FAT32 format to allow measurement export and firmware update. Needed for 64GB and larger disks which Windows only formats as exFAT filesystem.
	Input Gain / Monitor OK → Show level		GAIN + / - adjusts input gain. A horizontal bar displays the signal level going into processing. CLIP indicates signal clipping either after the gain or at the inputs. See Input Gain / Monitor on page 15.



Correction Amount

The shaker system response is measured in calibration and equalizing correction filters are created. If calibration has been performed, the correction amount adjusts this equalization between 150% and completely off in 25% steps. 100% is the default. SAVE/OK stores the setting. CANCEL cancels the change or returns from the CORR adjustment. Correction amount is set separately for each profile.



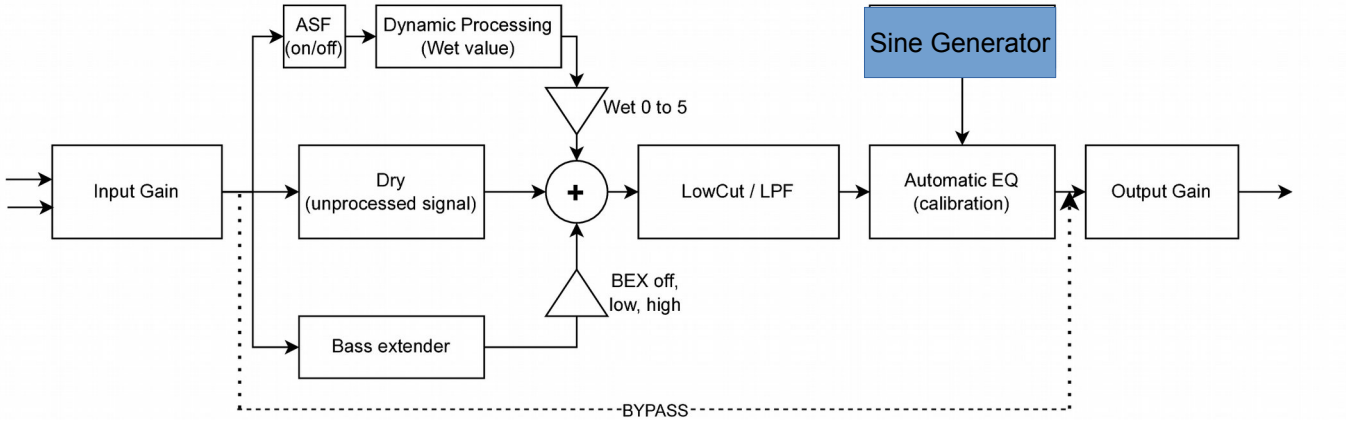


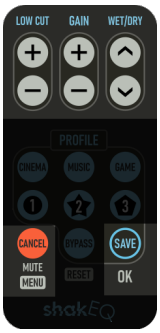
Sine Generator

The built-in sine generator can be used to observe the frequency response and equalization settings of the shaker. The sine generator can be found in Menu→GEN. The sine generator outputs sinusoidal frequencies between 10Hz and 199Hz. Wet/Dry UP/DOWN buttons adjust the frequency in 1Hz steps. The display shows the frequency in Hz. Gain can be adjusted with the Gain buttons while the sine generator is active.

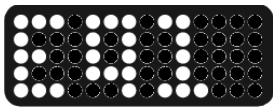
To quickly jump between custom set frequencies, press profile buttons 1, 2 and 3. These are by default 20, 40, and 60Hz. To change a quick jump frequency, set the desired frequency first and then press the SAVE/OK button and the displayed frequency starts flashing. Now press the quick set button (profiles 1-3) to store this frequency, or CANCEL to skip the storing.

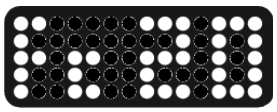
Quick jump frequencies can be a handy tool in discovering the frequency response of the shaker system and the effect of the automatic correction. The Bypass button toggles correction off and back on also while in the sine generator mode. Bypass is indicated with ”B” in the place of the animated signal icon.

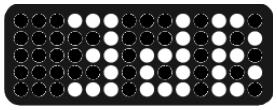


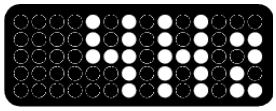


Manual EQ









You can set three parametric EQ filters manually. The filters are configured while in Sine Generator (Menu→GEN). A long press of 1, 2, or 3 lets you edit the corresponding EQ.

The center frequency of an EQ is initially the corresponding quick jump frequency. Wet/Dry buttons edit the center frequency.

Gain adjusts the EQ gain in decibels (-9 dB to +9 dB).

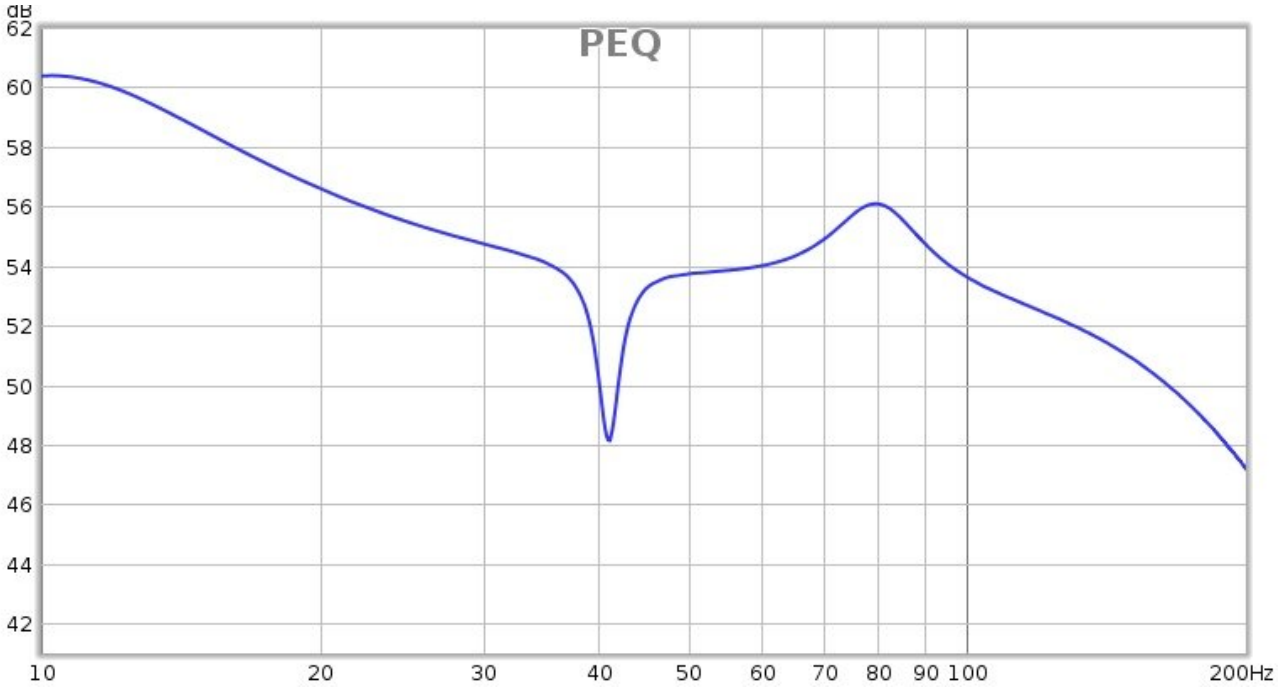
Low Cut adjusts the EQ bandwidth from 2 Hz to 99 Hz. The default 10 Hz.

Set gain to 0 to disable the filter. Press CANCEL to reject changes and/or return to Sine Generator, OK to save the settings.

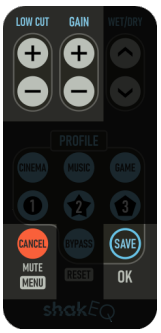
Manual EQ filters are shared by all profiles.

Some people are more familiar with Q values. The Q-value of a filter is the center frequency divided by bandwidth: $Q=F_C/BW$. ShakEQ uses bandwidth, because for many people it is easier and more intuitive. The following measurement shows an example of manual EQs. In the response, the LowCut (high-pass) filter has been set to off, Lowpass is at 200Hz and all 3 parametric EQs have been applied.

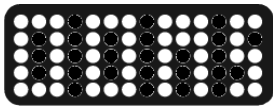
- EQ1: F_C=10Hz, gain +8dB, BW=9Hz
- EQ2: F_C=41Hz, gain -6dB, BW=2Hz
- EQ3: F_C=80Hz, gain +3dB, BW 20Hz



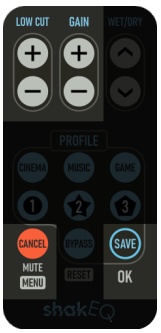
This example response shows how manual EQ can be used to boost extremely low frequencies, cut a narrow notch in the response and yet add a wide midbass-emphasizing effect all on top of the automatic correction and other filters.



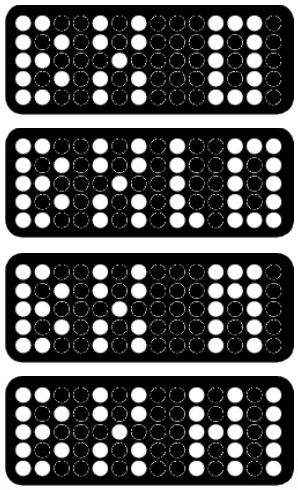
Delay Adjustment



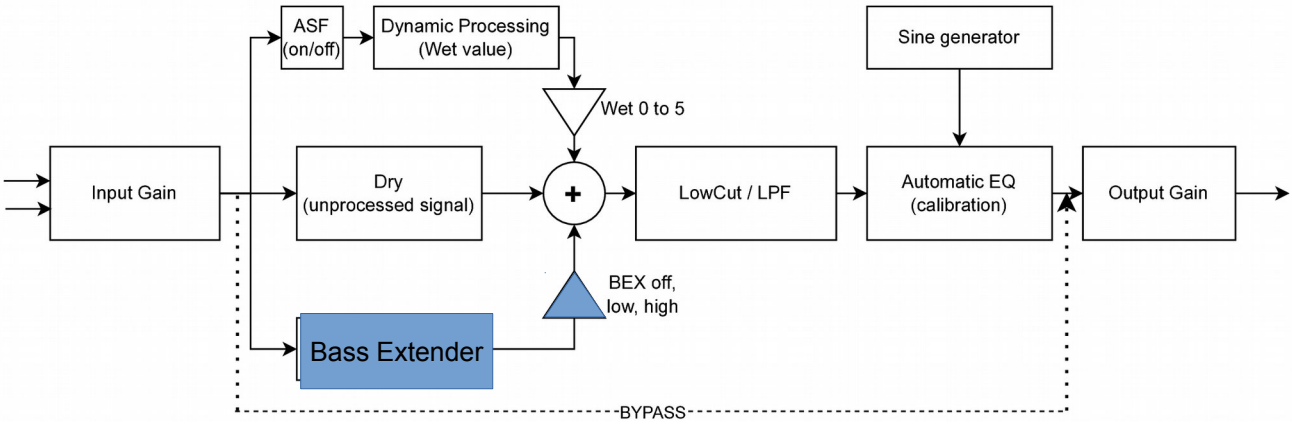
The output can be delayed for example to synchronize the shaker with subwoofers that have high latency. Go to Menu->DLAY and set the delay in milliseconds using the + and - buttons. Values between 00ms and 99ms can be set and stored by pressing the SAVE/OK button. CANCEL cancels the change or returns from the DLAY adjustment. The delay setting is shared by all profiles.

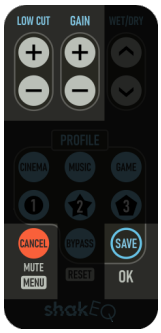


Bass Extender

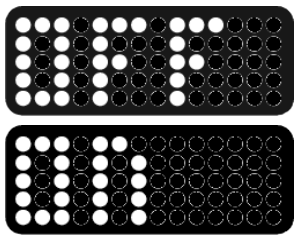


The Bass Extender widens the spectrum of the input to offer output from the shaker even when the incoming sound is effectively outside of the frequency range of the shaker. This typically adds presence and impact feedback with transients that are at midbass region just above the reproduction band of the shaker. This feature can be adjusted by a long press of WET/DRY buttons in the home sceeen in Cinema and Game modes. The Music mode has a similar bass extender feature gradually activated with the three highest Wet/Dry settings (3 to 5).

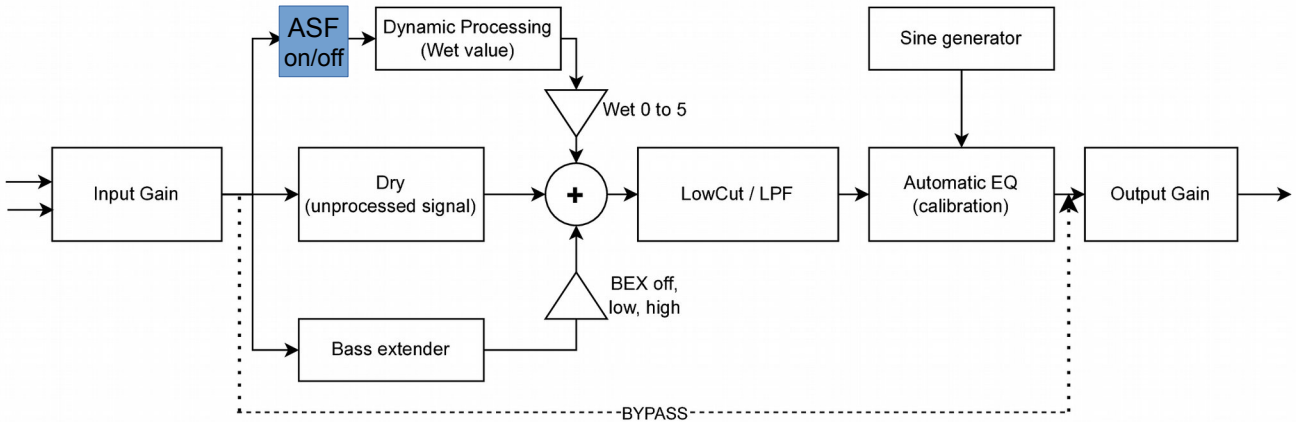


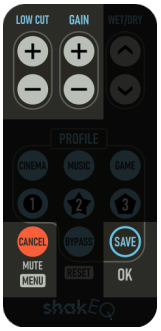


Anti-Speech Filter

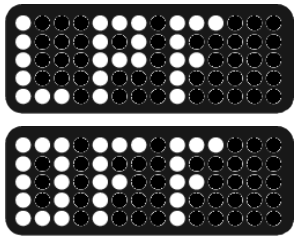


When playing content that is rich with speech, this speech may get reproduced as audible sound. An anti-speech notching filter can be engaged to counter the effect. This feature can be found in Menu→ASF where it can be toggled on/off. The default value is off. Note that using the Anti-Speech Filter can somewhat tone down the wet channel effect.



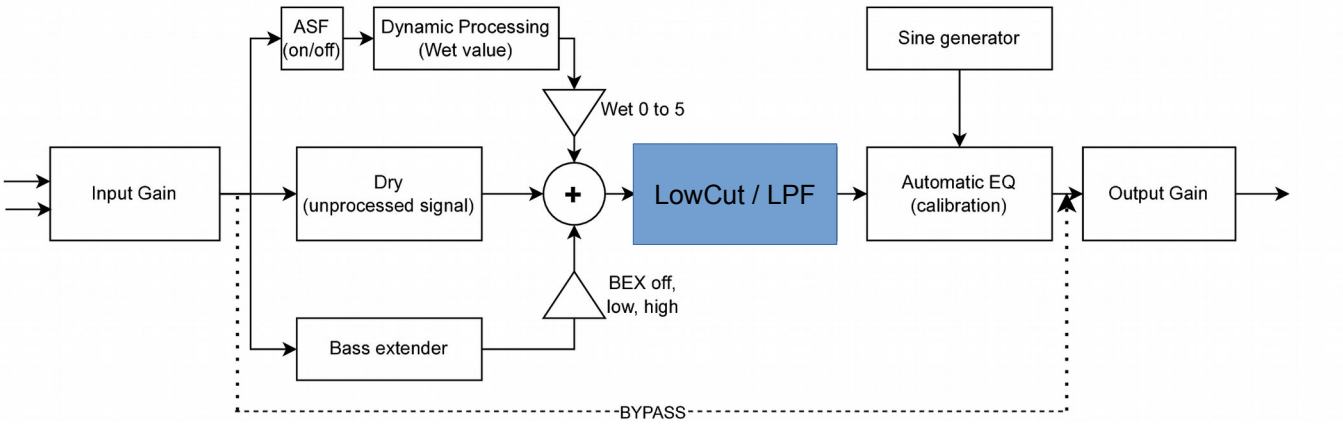


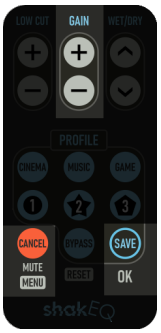
Adjustable Master Lowpass Filter



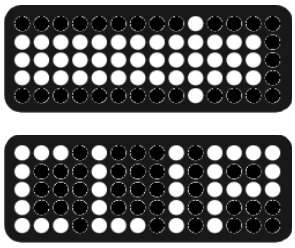
Similarly as the "Low Cut" highpass filter defines the lower frequency limit of the output for each profile, the upper frequency limit of the shaker system can be defined by a global user-selectable lowpass frequency, which removes frequencies higher than the limit. This effectively prevents higher-frequency unwanted sounds to be reproduced by the shaker system. To adjust the frequency cutoff for the lowpass filter, go to Menu→LPF and select the desired upper limit of frequencies.

The default setting is OFF. Adjust the value with either the "Low Cut" or "Gain" plus and minus buttons. The value starts with OFF, when increased the value adjustment range is from 50 to 500Hz. Press SAVE to save the value and return to menu, or press CANCEL to restore the saved value (and then CANCEL again to return to menu).

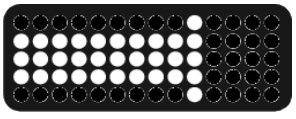




Input Gain / Monitor



GAIN + / - adjust input gain. The bar displays the maximum level of the combined inputs including the input gain. Each vertical line is 3dB. The maximum input level without distortion has the rightmost vertical line unlit (0 dB). A CLIP text indicates signal clipping either at the RCA inputs (you need to lower the volume of your audio source) or after the input gain (reduce input gain).

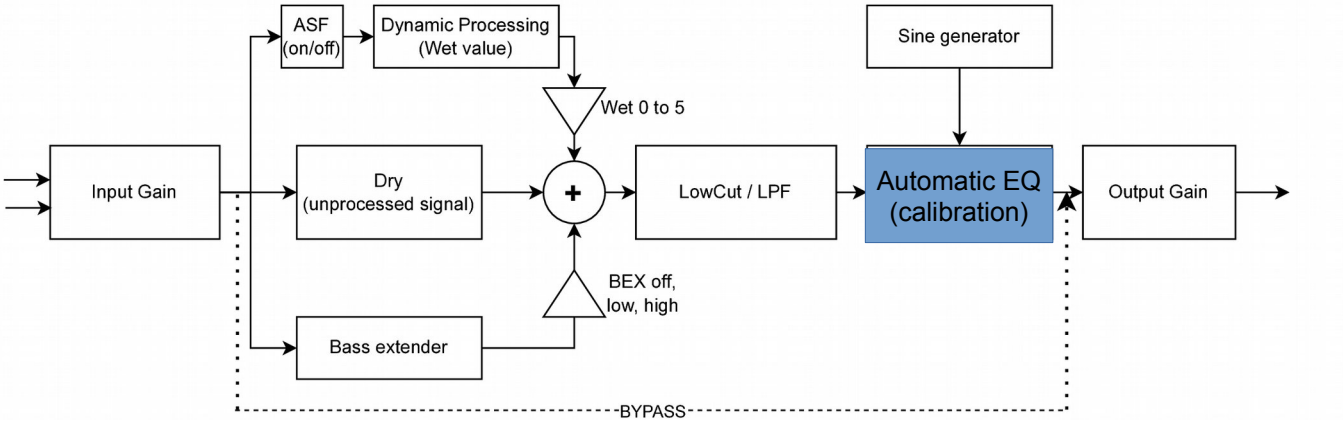


The dots on the top and bottom line show a level to reach during the level setup video. Adjust the volume of your audio source to accomplish this. If this adjustment is not possible or not enough, increase input gain with GAIN +/- until you get to approximately to this level. If you do not use the level setup video, then set the gain so that you get the maximum input without getting clip warnings.

The CLIP text is also shown If clipping occurs during home screen.

6.Calibration

Calibration determines the combined response of your shaker installation and yourself, then creates equalization filters to make the effect feel more uniform across the shaker's reproduction range.



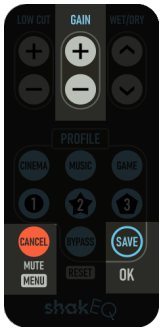
Calibration may not produce a big difference in all cases, but your system is still benefiting from the other features of ShakEQ.

Before Calibrating

- Connect the ShakEQ unit between your audio source and the amplifier that drives the tactile transducer. Refer to **Connections** on page 5. Plug the power supply into a wall socket and the power connector to the ShakEQ unit.
- Adjust the signal level that goes in to ShakEQ by adjusting the gain of your audio source and/or using the input gain setting, see Input Gain / Monitor on page 15. This doesn't affect calibration, but is recommended for optimal results.

Running Calibration

- Make sure the ShakEQ unit is powered. Take out the measurement discs (one with a sensor and one dummy disc). Connect the 3.5mm sensor jack into the sensor connector on the front panel. This automatically starts the calibration process.
- First a rhythmic noise is generated. Place both measurement discs on the seating position of the furniture to be equalized. The flat side of each disc should be against the furniture. Sit on top of both measurement discs, keeping them exactly centered on each buttock, your ischial bones touching the indentation of the discs as much as possible.
- Adjust volume with the GAIN + /- buttons until the vibration feels the same as in normal listening conditions. Make sure the volume is high enough to feel properly while sitting on the boards, then press SAVE/OK to start the first measurement sweep. Please remain seated and sit relatively still during the measurement sweeps. Parts of the sweeps may not be felt, because the frequency reproduction



range of tactile transducers vary a lot. While a moving wave graphics is displayed, the measurement sweep is still in progress. Each sweep takes about 40 seconds.

- The calibration can be interrupted at any time by unplugging the sensor or pressing the MUTE/CANCEL button. If the shaker bottom outs at some frequencies, press CANCEL and try calibration again with a lower gain.
- The calibration requires 3 sweeps at slightly different positions. Once the first position is measured, move yourself and the measurement discs about 10cm (4 inches) (preferably forward or backward) and press OK again. Repeat this one more time to get 3 unique positions measured.
- When the calibration is finished, the unit automatically returns to home screen. You can now remove the sensor plug and return the measurement discs to the box until needed again.

Congratulations, the equalization has been created and your system optimized!

To review the results, see **Export** on page 19. The produced equalization can be disabled by Bypass, but this will also disable the other signal enhancing effects. An integrated sine generator can be used to test the difference of each frequency between 16 and 199Hz. See **Bypass** on p.9 and **Sine Generator** on p.12.

Tips

If the display gets messed up due to electrostatic discharge, visiting the menu restores the display.

For more information about setup and tuning, see https://www.dspeaker.com/shakeq-setup-guide .

7.Firmware Update, Export

The firmware of ShakEQ™ is updated using a USB memory stick.

- Download the firmware file (FIRMWARE.SQ) and copy it to the USB memory's root directory. Make sure the USB memory is using the FAT filesystem format (FAT or FAT32). Memories of size 64GB and larger are usually formatted with the exFAT filesystem, which is not supported. You can use Menu→FMT to format a USB memory to FAT32. These are still compatible with Windows.
- Power down the ShakeEQ unit by removing the power plug.
- Attach the USB stick to the "SERVICE" USB port on the rear panel.
- Turn on the ShakEQ and wait until the system automatically installs the firmware.
- Do not remove the USB stick during the update process. After finishing installation the system reboots normally. Now the USB stick can be removed.

The firmware is not updated if the unit already contains the same version of the firmware. In this case, after checking the contents of the USB stick the unit will start normally.

If you encounter problems during the update, make sure the USB stick is properly connected and contains the firmware file. If the problem persists, try copying the firmware file again on a different USB memory stick. Make sure the USB memory is using the FAT filesystem format. Some USB memory sticks may not be compatible with the firmware update.

Export

In addition, if a USB memory is connected when the unit is turned on (and has a FAT/FAT32 filesystem), ShakEQ creates files containing the response of calibration in text format and as SVG graphics format. Possibly existing response files are overwritten. A progress bar is shown during the write. This takes only a second. After exporting the unit starts up normally and you can remove the USB memory. You can view the exported files e.g. with a web browser.

8.Manufacturer

***DSP*eaker**
Hermiankatu 8G
FIN-33720 Tampere
FINLAND
Email: info@dspeaker.com
Phone: +358504623200

Contact

Website: www.dspeaker.com

Technical Support: support@dspeaker.com

Safety / Sales Support: info@dspeaker.com

9.Technical Specifications

Interfaces

- Analog 2-channel RCA input
- Analog 2-channel RCA output
- Sensor input
- IR receiver for remote control
- Service USB port for firmware update and measurement export

Analog Specifications (typical)

- Frequency Range: 3.5Hz to 3.5kHz (without lowpass)
- Analog inputs: 2.5 Vrms (max)
- Analog outputs: 3.0 Vrms (max)
- Power consumption: active 0.5W

Mechanical

- Unit Weight: 0.3 kg
- Unit Dimensions: 126mm (width) x 80mm (depth, without cables) x 28mm (height)
- Measurement sensor and remote control included