

x1Generator

Multi-tone & Multi-channel Signal Generator

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1 Features

- Signal generator software for standard sound cards
- High dynamic signals thanks to a resolution of up to 32 bits!
- Multi-sine output, e.g., for IMD measurements
- Output to up to 32 outputs
- Signal shape: sine, square, sweep, pink and white noise
- Different signals at the outputs (sine/square)
- 32 signal memory locations
- Memory location import/export



With the x1Generator and a standard audio interface, you get a highly accurate and flexible signal generator. The resolution of up to 32 bits allows signal output with high dynamics, which is required for hi-fi measurements.

1.1 Software installation / test without risk

You can download the demo/full version of the software from our download page. Please test compatibility with your audio interface before purchasing. Please run the setup file as an administrator.

1.2 Styles

The surface is available in 3 color styles.



2 Preparation, notes

- First, select an “audio interface”
- Then, set the sample rate. We recommend 96000Hz.
- Check the ASIO memory size. It must be 1024 or higher. If necessary, change it using the “ASIO Control” button.



The alternating voltage is output via the audio interface outputs (channel 1 = Out1 and channel 2 = Out2, etc.).

Important: Incorrectly applied signals can damage your audio equipment (amplifiers, speakers, etc.) or your hearing. Observe the input voltage of the equipment or the maximum permissible voltage on speakers or the sound level generated from them. Use of the signal generator is at your own risk.

Press the “Start” button to start outputting the set signal type. You can switch the type during operation.

3 Display voltage to output signal (optional)



In order for the signal voltage to be displayed in mV, dBu, or dBV in the footer, the system must be calibrated as follows:

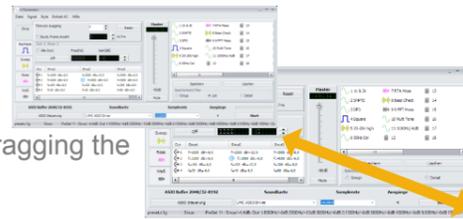
- Disconnect all outputs from connected devices
- Output a 50 Hz sine wave via output 1
- Determine which output you want to calibrate: line or headphone output
 - Line out: Set the gain control to 75%-90%
 - Headphones: Set the volume control to 75%-90%
- Measure the AC output voltage with a voltmeter
- Select the menu item "File / Calibrate Outputs"
- Enter the measured voltage in mV. Confirm the entry

This completes the calibration process. After calibration, do not change the Output/Mix/Main controls on the sound card, if available! The calibration applies to the selected output type: Line or Headphones.

4 Operation

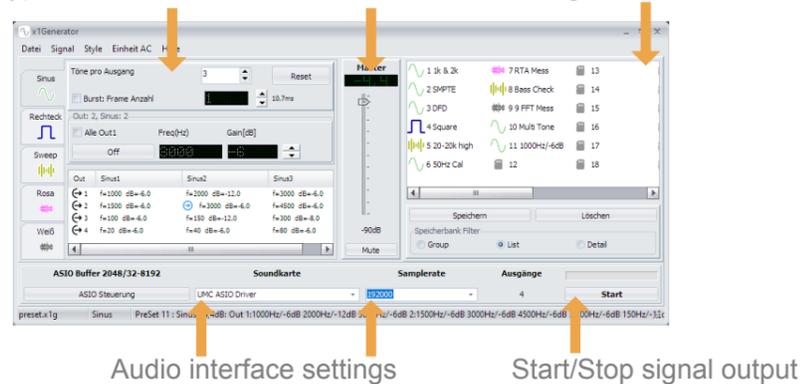
4.1 Scale window

The size of the window can be changed by clicking and dragging the corners.



4.2 Generator

Select signal types / Parameters Master volume Signal PreSet



4.3 Menu bar (header)

File	Description
Calibrate output	Calibrate the system to specify the output voltage in mV, dBu, or dBV. The display appears in the footer.
Preset load	Load signal tone presets from file, e.g. from another PC
Preset save as	Save signal tone presets to file (backup, transfer)
Close	Close x1Generator

Signal	Description (See also chapter 4.4.1.2 Copy signal to another output)
Out copy	Only applies to "Sine" and 'Square' Select the "Out" channel to be copied in the matrix by clicking on Out 1,2,3...
Out paste	Applies only to "Sine" and 'Square' Select the "Out" channel where the signal configuration of the copied channel is to be inserted

AC Unit	Description
Einheit AC	Switch the display unit for the output voltage per channel: mV, dBu, dBV. Note: The display only appears after prior calibration, see "Display voltage to output signal (optional), chapter 3"

Style	Description
Style	Switch the color scheme of the program interface per click

Help	Description
Help Web	Display PDF instructions for x1Generator from the Internet. PDF Reader SW must be installed.
Info	Show x1Generator program version & installation key

4.4 Signal types

4.4.1 Sine

Output Multi sine wave signal with variable frequency and level (e.g., for distortion factor measurement).

Function	Description
Sines per outputs	The signal for each sound card output is generated from 1 to 3 sine waves. Create a multi-sinusoidal signal for each sound card output, such as 60Hz@-3dB and 7kHz@-15dB (SMPTE signal for intermodulation measurement).
Reset	Set all outputs to 1kHz and -100dB level (mute)
"Burst: Frame count"	Limit signal output time. Duration in number of "ASIO buffer size" packets (e.g., Qty packets 3 with ASIO buffer 1024 and 44100Hz sample rate => duration 3x1024 / 44100 = 69,66ms). Length in ms is displayed. Playback stops automatically. <ul style="list-style-type: none"> • Selected: Active • Not selected: Inactive
Checkbox "All Out1"	<ul style="list-style-type: none"> • Selected: Input "Frequency" and "Gain" affects all outputs • Not selected: Input "Frequency" / "Gain" per output
Button "Off"	Set Gain to -100dB = Mute
Freq(Hz)	Change the frequency to the selected sine wave tone & output from the table. Use the mouse to select a tone. Indicator shows the selection. To change the frequency, click in the "Freq" field. Then enter the frequency using the PC keyboard. Confirm your entry by pressing "Enter."
Gain(dB)	Changing the level for the selected sine tone & output (see Freq(Hz) for selection). To change the level, click in the "Gain" field. Then enter the level using the PC keyboard without "-". Confirm your entry with "Enter." Alternatively, use the up/down keys.

4.4.1.1 Mute individual output

Double-clicking on an output in the table mutes it. Double-clicking again restores the previous level.

Out	Sine1	Sine2
↔ 1	f=60 dB=-3.0	f=7000 dB=-15.0
↔ 2	f=60 dB=-3.0	f=7000 dB=-15.0

4.4.1.2 Copy signal to another output

- Select the output to be copied in the table
- Select Copy Signal/Output from the menu
- Select the output to be inserted
- Select Insert Signal/Output from the menu

Out	Sine1	Sine2
↔ 1	f=60 dB=-3.0	f=7000 dB=-15.0
↔ 2	f=60 dB=-3.0	f=7000 dB=-15.0

4.4.2 Square

Output rectangular signal with variable frequency, level, and duty cycle.

Function	Description
"All Out1"	<ul style="list-style-type: none"> • Selected: Input "Frequency" and "Gain" affects all outputs • Not selected: Input "Frequency" / "Gain" per output
Freq(Hz)	<p>Change the frequency to the selected output from the table. Use the mouse to select an output. Indicator shows the selection.</p>  <p>To change the frequency, click in the "Freq" field.</p>  <p>Then enter the frequency using the PC keyboard. Confirm your entry by pressing "Enter."</p>
Gain(dB)	<p>Changing the level for the selected sine tone & output (see Freq(Hz) for selection).</p> <p>To change the level, click in the "Gain" field.</p>  <p>Then enter the level using the PC keyboard without "-". Confirm your entry with "Enter." Alternatively, use the up/down keys.</p>
Ratio	Duty cycle in the range from 5% to 95%. The percentage value indicates the duration of the positive portion of the signal. The remaining portion is the duration of the negative signal.

4.4.2.1 Mute individual output

Double-clicking on an output in the table mutes it. Double-clicking again restores the previous level.

Out	Square
↔ 1	f=1000 dB=-6.0 Ratio=50%
↔ 2	f=1000 dB=-6.0 Ratio=50%

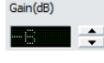
4.4.2.2 Copy signal to another output

- Select the output to be copied in the table
- Select Copy Signal/Output from the menu
- Select the output to be inserted
- Select Insert Signal/Output from the menu

Out	Square
↔ 1	f=1000 dB=-6.0 Ratio=50%
↔ 2	f=1000 dB=-6.0 Ratio=50%

4.4.3 Sweep (log)

Output sine wave signal that continuously runs through a specified frequency range (start-stop frequency).

Function	Description
Start Freq(Hz)	<p>Sweep start frequency in Hz.</p> <p>To enter a value, click in the field with the mouse and enter a value using the PC keyboard. Confirm your entry with Enter.</p>
Stop Freq(Hz)	<p>Sweep stop frequency in Hz.</p> <p>To enter a value, click in the field with the mouse and enter a value using the PC keyboard. Confirm your entry with Enter.</p>
Gain(dB)	<p>Changing the level for the selected sweep.</p> <p>To change the level, click in the "Gain" field.</p>  <p>Then enter the level using the PC keyboard without "-". Confirm your entry with "Enter." Alternatively, use the up/down keys.</p>
t=	Sweep duration in seconds, range 1s..30s
Loop	<p>Enabled: Repeat sweep until press "Start" or disable "Loop".</p> <p>Disabled: Sweep stop after first playback.</p>

4.4.4 Pink noise

Pink noise output (e.g., for measurement with a real-time analyzer, RTA)

Function	Description
Gain(dB)	<p>Changing the level for the selected sweep.</p> <p>To change the level, click in the "Gain" field.</p>  <p>Then enter the level using the PC keyboard without "-". Confirm your entry with "Enter." Alternatively, use the up/down keys.</p>

4.4.5 White noise

White noise output (e.g., for measurement with an FFT analyzer).

Function	Description
Gain(dB)	<p>Changing the level for the selected sweep.</p> <p>To change the level, click in the "Gain" field.</p>  <p>Then enter the level using the PC keyboard without "-". Confirm your entry with "Enter." Alternatively, use the up/down keys.</p>

4.5 Master Volume

Master Volume applies equally to all signal types and outputs. The output level for each signal type is determined by the individual setting on the signal type page AND the Master Volume setting.

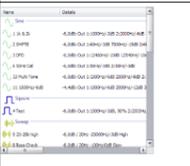


4.6 Signal PreSet

The memory bank stores frequently used signals for quick access. All details about the signal type and the master volume are saved. A maximum of 32 signals can be stored. The entries can be exported or imported as a file.

4.6.1 Views

You can change the display using the “Memory Bank Filter”:

List		<p>List sorted by preset number.</p> <p>Displays the entry number, signal type via icon, and name for each entry.</p>
Group		<p>List grouped by signal type.</p> <p>Displays the entry number, signal type via icon, and name for each entry.</p>
Detail		<p>List grouped by signal type.</p> <p>Displays the save number, signal type via icon, and name for each entry. Also displays details about the signal type.</p>

4.6.2 Detailed view of storage space in the footer

When you click on a storage location, the details of the signal are displayed in the footer until the next action.

4.6.3 Save signal

Save the currently set signal as follows:

- Press the “Save” button (remains pressed)
- Double-click on the memory location
- Signal saved. A name is assigned to the memory location. You can change the name later. The “Save” button is no longer pressed

4.6.4 Delete a preset

To delete a preset:

- Press the “Delete” button
- Double-click on the storage location
- The storage location is deleted.

4.6.5 Change names to presets

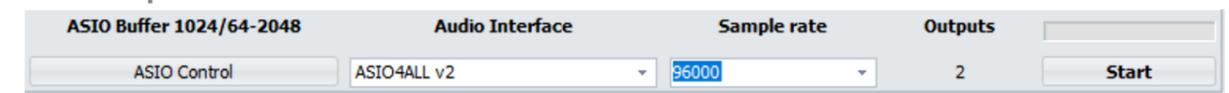
- Simply click on the name
- The name will now be displayed in a text field
- Delete the entire entry using the “Backspace” key and enter a new name
- Press “Enter.” The name is now saved.



4.6.6 Export / save / load presets

You can save or load all memory locations as a file or share them via the “File” menu in the header. See chapter „4.3 Menu bar (header) “.

4.7 Setup audio interface



Function	Description
ASIO Buffer	Text field shows the currently selected buffer size in bytes and the possible range. 1024 bytes or higher are required for smooth operation.
ASIO Control	Open the ASIO control panel via the window shown. If necessary, change the ASIO buffer size here. Follow the instructions. Note: Do not change the sample rate in the ASIO control panel. You can change it via the “Samplerate” selection box on the x1Generator interface.
Audio Interface	Select sound card. Only sound cards with ASIO drivers or those that work with ASIO4ALL are supported.
Sample rate	Setting the sampling rate. Note: The maximum frequency that can be generated is 50% of the sample rate.
Outputs	The number of outputs on the sound card recognized by the software.
Button “Start”	Start/stop signal output.

4.8 Footer

preset.x1g	Sine	Vrms Out 1:-7,6dBV 2:-7,6dBV 3:-10,8dBV 4:-10,8dBV 5:-10,8dBV 6:-10,8dBV 7:-10,8dBV 8:-10,8dBV	...
Description			
Preset.x1g	Dateiname der aktuellen Speicherbank		
Sine,....	Currently selected signal type		
Vout...	<ul style="list-style-type: none"> • Output voltage per sound card output (when calibrated, see chapter “3. Display voltage to output signal (optional) ”) • Alternatively, details about the clicked storage location 		

5 Technical specifications

- Sampling rate 44.1 kHz/48 kHz/96 kHz/192 kHz (depending on the interface)
- Dynamic range 16-bit, 24-bit, 32-bit (depending on interface)
- Frequency range 10 Hz to half the sample rate, frequency in 1 Hz increments
- Supported audio interfaces with 1 to 32 outputs
- Signal types: sine, square, sweep log., pink noise, white noise
- Log sweep duration 1s to 30s in 1s steps
- Configurable signals per output: sine = 1 to 3 signals, all others = 1
- Square duty cycle 5% to 95%, Sine Burst length 1 to 99 x ASIO Buffer Size
- Frequency range 10Hz up to 95kHz (depending on sample rate)
- Signal type level in 1dB increments, -100dB to 0dB
- Master volume in 0.1dB increments, -90dB to 0dB
- Level displayed in dB, mV, dBu, dBV
- For example output voltage, see chapter “6.2. Audio interface”

6 System requirements

6.1 PC

- MS-Windows 10 / 11, 32 or 64bit
- CPU Intel i3 2GHz or faster
- Screen min. 1024x768 pixel

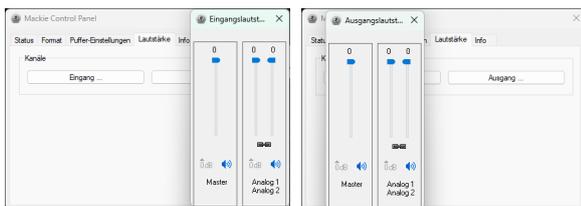
6.2 Audio interface

- Interface with 1 -32 channels, ASIO driver support. Example interface / output voltage:
 - 2 ch. 192k@24bit Mackie Onyx Producer 2.2 (Output voltage up to +10dBu, appr. 2.45Vrms)
 - 2 ch. 192k@24bit Steinberg UR22 mkII or C (Output voltage up +12dBu, appr. 3.0Vrms)
 - 4 ch. 192k@24bit Behringer UMC404HD (Output voltage up +3dBu / appr. 1.0 Vrms)
- Sample rate 44100Hz or more, D/A converter 16,24,32bit

7 FAQ

7.1 No output signal?

- Check the Output, Main, Mix, or Headphone controls.
- Check the ASIO control window to see if there is a “Volume” tab. Set all controls for output and input to “0” (e.g., for Mackie Onyx 2.2).



Web: <http://x1g-en.stute-engineering.de>

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