M112 Noise Generator

FUNCTION DESCRIPTION

The M112 Noise Generator produces continuous bursts of random frequencies and waveshape from approximately 25Hz to 20Khz. Three types of energy distribution are provided: WHITE noise, PINK noise and SLOW RANDOM noise.

The WHITE noise distributes amplitude evenly throughout the indicated audio spectrum.

The PINK noise however reduces the amplitude of each frequency increment proportionally to produce equal energy per octave. PINK noise, thus, sounds "lower" in pitch to the ear.

The SLOW RANDOM noise is derived from the PINK noise by passing it through a very low pass filter at about 11Hz thus creating a very low moving (near DC) waveform.

Musical Application

Almost all acoustically generated sounds one hears, at all times, contain some amount of random noise. Most obvious are wind, surf, and thunder. Some amount of unpitched sound is evident in just about every environment. Acoustic instruments produce varying amounts of unpitched sound along with specific notes.

Drums, Tam Tam, Blocks, gongs, and various other percussion instruments, are all unpitched instruments. WHITE and PINK noise provide the synthesist with a basic source for simulating these instruments, as well as a source for creating "environments". As an audio source, the M112 Noise Generator is most often used in connection with filters to create a desired frequency band or correct spectral sweeps.

The M112 Noise Generator also provides a source of control voltage for filters, oscillators, amplifiers, and other voltage-controlled modules, producing interesting, random modifications. As a source for the M102 Envelope Generator, random triggers (gates) can be produced as well as slowly varying DC voltage contours {with slow response time}. Noise is also useful as a control source for sample & hold circuits, and random sequencer triggers.

The circuit description

A big part of this circuit is derived from the famous MOTM 101 Noise Generator/S&H module. The only section kept was the noise generating section. Some components have been changed to better suit this noise generation version.

The Noise generator can be build around 2 different versions of WHITE noise generations.. Analog OR Digital..

WHITE noise analog version:
First, generating WHITE noise..
The noise is generated by using the 2 x 1N5240B Zener diodes (D2,D3) avalanche effect, then amplifying the thin amount of WHITE noise at C11 using 2 consecutive TL072 sections(U1).
Since both Zener diodes needs some times to get a "stabilized" voltage at power up across C11(3.3uf) there is a need to "clamp down" the largely waving voltage for a small period of time.. This is the job of C6,D1,R2,R1,Q1. The 2N3819(Q1) JFET shorts U1A feedback loop at power up to help keep the WHITE noise output at U1A pin1 quiet until the Zener's voltage is DC stable and reliable.

WHITE noise digital version:
The WHITE noise can be generated by the use of a microcontroller.
Tom Wilshire at https://electricdruid.net/ created a nice white noise generator with the help of a small Microchip controller programmed in a way that it generates pure white noise (5vpp).
All the details and the programming code can be downloaded here:
https://electricdruid.net/white-noise-source/
or you can directly buy a pre-programmed chip here:
https://electricdruid.net/product/noise-1b-noise-generator/

There are 2 different versions of its noise generators **ver1B** and **ver2**.
Version 2 even supplies both WHITE and PINK noises on the same chip !
Since I chose the analog way of generating PINK noise from WHITE noise I chose to use **ver1B** and only use the white noise generation.
For this the Microchip IC is an 8 pins DIP PIC12F675(U5).
It uses an internal clock so no needs for any crystal. Just connect it to a +5vdc supply and you are ready to use it. C17 and R18 acts as DC removal to get a 5vpp AC signal to U4A (TL072) pin3. The opamp amplifies it for a 10vpp signal at header H2 (NOISE SELECT).

Then the selected WHITE noise type goes through a specific low pass amplified array (R4,C7,R6,C11) to get a rounded version of PINK noise at U2B output.
This generates a PINK noise of around 1.8v AC rms at U2B pin7 (10vpp).

Finally the PINK noise is then REALLY low-pass filtered by U2A at about 11 Hz.
This generates a near DC signal, that averages about 11Hz.
This signal is around 10vpp.

Adjustments and trimmings:

The following adjustment procedure is only for analog WHITE noise use:

-Connect an oscilloscope at PINK NOISE output jack.

-Adjust VR1 (noise gain adjust) to get a signal around 10vpp.

-All needed trimmings done !

December, 2021
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ELECTRONIC SPECIFICATIONS

POWER CONNECTOR PIN ASSIGNMENTS

1	-15V
2	A GND
3	A GND
4	+15V
5	D GND
6	+5V

Panel Size: Single width 2.125”w x 8.75”h.

Outputs:

WHITE NOISE signal: 1.8VAC rms (10vpp)

PINK NOISE signal: 1.8VAC rms (10vpp)

SLOW RANDOM signal: 10vpp

All output impedances: 1000ohms, nom.

Power:
+15V @ 7mA,
-15V @ 7mA,
+5V @ 0mA.