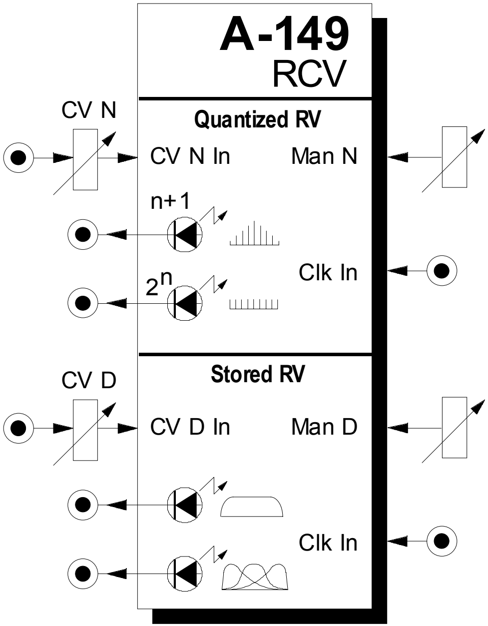


Remark: The A-149-1 can be expanded by the **A-149-2** module (8 digital random outputs with LED displays)

1. Introduction

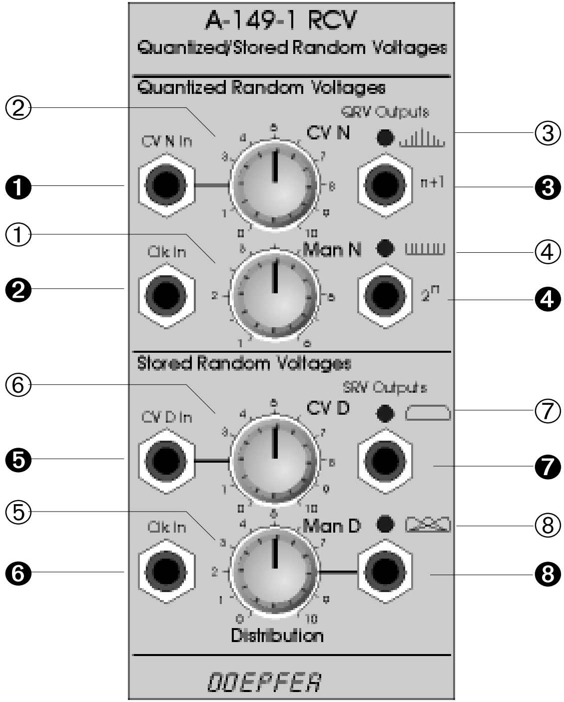
Module **A-149-1** is a **Random Control Voltage Source** based on the idea of Don Buchla's "**Source of Uncertainty 265/266**" modules. It has available **4 analog random voltages,** that are generated in different ways.

The ***Quantized Random Voltages*** section has available the outputs ***N+1*** and ***2^N States***. **N** is an integer number in the range 1...6 that can be adjusted manually (Man N) and by an external control voltage CVN. The voltage steps are 1/12 V for the 2^N output (i.e. semitone intervals) and 1.0 V for the N+1 output (i.e. octave intervals).

The ***Stored Random Voltages*** section has available an output with ***even voltage distribution*** with 256 possible output states and another output with ***adjustable voltage distribution probability.*** The distribution of this output can be adjusted manually (Man D) and by an external control voltage CVD. The voltage range is 0...+5 V for both stored random outputs.

The rising edge of the corresponding **Clock input** signal triggers a new random voltage value at the outputs.
Each output is equipped with a **LED** that displays the current output voltage.

2. Overview



Controls and Indicators:

① **Man N** : manual control of “N”

② **CV N** : attenuator for CVN at input ❶

③, ④ **LED** : display for output ❸ resp. ❹

⑤ **Man D** : manual control of distribution "D"

⑥ **CV D** : attenuator for CVD at input ❻

⑦, ⑧ **LED** : display for output ❼ resp. ❽

In - / Outputs:

❶ **CV N In** : CV input for “N”

❷ **Clk In** : clock input for Quantized RCV section

❸ **n+1** : N+1 states output

❹ **2^n** : 2^n states output

❺ **CV D In** : CV input for distribution “D”

❻ **Clk In** : clock input for Stored RCV section

❼ : output with equal probability distribution

❽ : output with adjustable probability distribution (D)

3. Controls

3.1 Quantized Random Voltages

① Man N

This is the manual control for the integer **number N** in the **range 1 to 6.** It defines the **number of possible states** at the outputs ❸ and ❹:

	Possible states of	
N	Output n+1	Output 2^n
1	2	2
2	3	4
3	4	8
4	5	16
5	6	32
6	7	64

Remark:

As N increases **n+1** increases **linear** too but **2^n increases exponentially.**

☞ The **final value of N** is the sum of the manual control ① and the external (attenuated) control voltage applied to input ❶.

② CVN

The external control voltage CVN fed into input ❶ is attenuated with this control.

③ LED • ④ LED

The brightness of each LED is proportional to the output voltage at the corresponding output ❸ resp. ❹.

3.2 Stored Random Voltages

⑤ Man D

This is the manual control for the **probability distribution** of the **256 states** appearing at output (.

With the control set fully counterclockwise most of the random voltages will be low magnitude but even medium and high magnitude voltages may appear but with smaller probability. As the control is turned to the right (or a positive control voltage appears at the CVD input) the distribution moves through medium to high magnitude voltage probability. The symbol at the lower jack ❽ socket shows this coherence graphically (see also fig. 1).

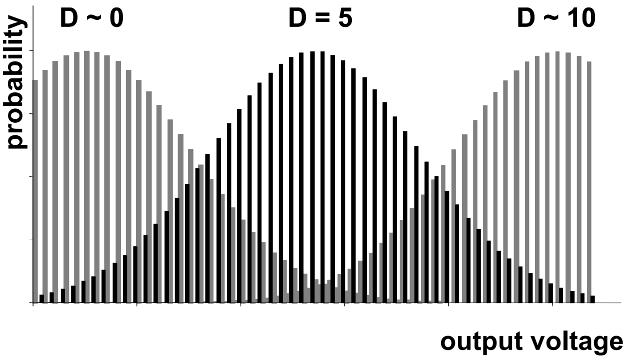


Fig.1: Probability distribution for different settings of "D"

☞ The **final value of D** is the sum of the manual control ⑤ and the external (attenuated) control voltage applied to input ❺.

⑥ CV D

The external control voltage CVD fed into input ❽ is attenuated with this control.

⑦ LED • ⑧ LED

The brightness of each LED is proportional to the output voltage at the corresponding output ❼ resp. ❽.

4. In- / Outputs

4.1 Quantized Random Voltages

❶ CV N In

This socket is the **Control Voltage input** for the parameter **"N"**.

❷ Clk In

This socket is the **Clock input** for the Quantized Random Voltages section. Each rising edge of this signal causes the generation of a new random voltage at the outputs ❸ resp. ❹. Any clock or gate signal can be used to control this input.

❸ n+1

This socket outputs the random voltage with **n+1 states**. The **voltage range** for this output is **0 to +5 V**, the **voltage steps** are **1.0 V** (i.e. 1V quantization). This corresponds to octave intervals when used to control the pitch of a VCO.

❹ 2^n

This socket outputs the random voltage with **2^n states**. The **voltage range** for this output is **0 to +5.25 V**, the **voltage steps** are **1/12 V** (i.e. 1/12 V quantization). This corresponds to semitone intervals when used to control the pitch of a VCO.

4.2 Stored Random Voltages

❺ CV D In

This socket is the **Control Voltage input** for the **probability distribution "D"**.

❻ Clk In

This socket is the **Clock input** for the Stored Random Voltages section. Each rising edge of this signal causes the generation of a new random voltage at the outputs ❼ resp. ❽. Any clock or gate signal can be used to control this input.

❼ • ❽

These sockets output the random voltages of the Stored Random Voltages section. Socket ❼ is the output with **equal probability distribution**, socket ❽ outputs the voltage with **adjustable distribution "D"**. The **voltage range** for both outputs is **0 to about +5.3 V**, the **voltage steps** are about **1/48 V** (i.e. 1/48 V quantization). This corresponds to about 1/4 semitone intervals when used to control the pitch of a VCO.

5. User examples

The **Doepfer web site** www.doepfer.com shows some **typical examples** of the A-149-1, including sound examples in the mp3 format. Even more details concerning the technical realization of the module can be found. An excellent description of several applications of random voltages like those generated by the A-149-1 can be found in the Allen Stranges "Electronic music - systems, techniques and controls" from page 82. The examples in this book are based on Don Buchla's modules 265/266 but are valid for the A-149-1 too.

The following patch is taken from this book and shows how to create very complex permanently changing sound structures by means of the A-149-1 in combination with the voltage controlled LFO A-147 and some additional standard modules (VCO, VCF, VCA, ADSR):

A high magnitude voltage at the N+1 output of the A-149-1 causes a high VCO pitch and simultaneously sets the value of N higher so that the next pitch is taken from a greater range of possibilities. If the N+1 output is low the VCO pitch will be low too and sets the value of N so that the next pitch will have a more restricted range of possibilities. Simultaneously the 2^n output controls the frequency of the filter and the tempo of the VCLFO A-147. Thus as the range of pitch selection increases the number of possible spectral ranges becomes exponentially (or geometrically) greater. As the tempo of the VCLFO is controlled by the 2^n output too, bright sounds are accompanied by longer events, longer events are accompanied by greater range pitch range possibilities and the number of of range probablities for pitch selection is correlated exponentially. This tail-chasing configuration may last a few hours (to obtain Allen Strange's original patch a voltage inverter A-175 has to be inserted between the 2^n output and the control input of the VCLFO as the CV input of A-147 controls the tempo rather than the period).

More examples with random voltage sources can be found in Allen Strange's book from page 80 (e.g. the "Dream machine" on page 85).

Some additional ideas:

- Use the RND Clock output of an **A-117** Digital Noise Generator as clock input for the A-149-1 to increase the randomness of events.
- Use the Quantizer module **A-156** to obtain more restricted pitch voltages (e.g. only notes from major/ minor scale/chords)
- Combine the A-149-1 with a A-155 sequencer (common clock) to obtain random envelopes (A-142), timbre (filters), loudness (VCA) or stereo position (VC panning A-134), frequency shifting (A-126)

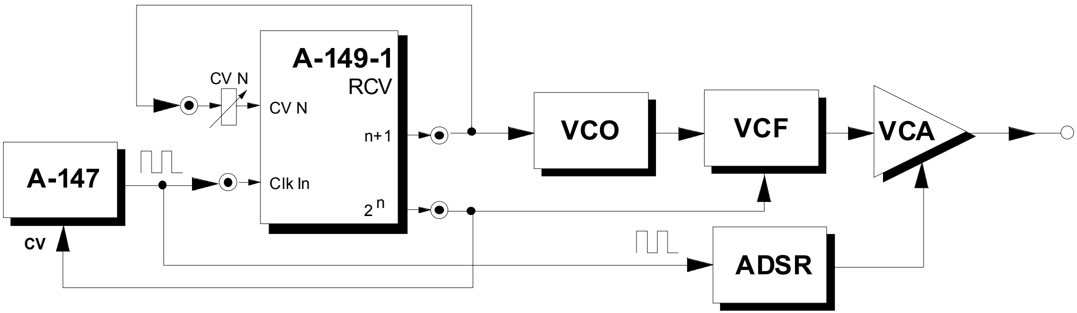


Fig. 2: "Random patch" adapted from Allen Strange's book "Electronic music - systems, techniques and controls"