

Fig. 1: A-143-2 Controls, Inputs and Outputs

## 1. Introduction

Module **A-143-2** contains four independent ADSR-type envelope generators. Each sub-unit has available the controls **Attack**, **Decay**, **Sustain** and **Release**. The three-position **Range** switch allows selection of the desired time range (low - high - medium). The adjustable envelope time ranges from several minutes to less than 100 microseconds. On top of this each unit is equipped with three digital outputs (high/low): "**End of Attack (EOA)**", "**End of Decay (EOD)**" and "**End of Release (EOR)**". As soon as the criterion is valid (e.g. end of decay state) the corresponding digital outputs turns "high". These outputs can be used e.g. to daisy-chain several ADSR units. For this the digital output in question (EOA, EOD or EOR) has to be connected to the Gate input of the following ADSR. Even automatically running envelopes (pseudo LFOs) or so-called "quadrature envelopes" with cyclical modulations of several ring-shaped, daisy-chained ADSRs are possible.

In addition to the obligatory **Gate (G)** input for envelope generators each unit has available a **Retrigger (Rt)** input. The retrigger turns the direction to "upward" if the envelope has already reached the decay state while the retrigger pulse occurs. The Gate inputs 2, 3 and 4 are normalised to Gate input 1, i.e. the Gate input 1 is connected to the switching contacts of the other inputs. Thus only one Gate signal at Gate input 1 can be used to trigger all four units simultaneously.

The envelope outputs are displayed with LEDs.

## 2. Basic Principles

Fig. 2 shows the basic function of each unit:

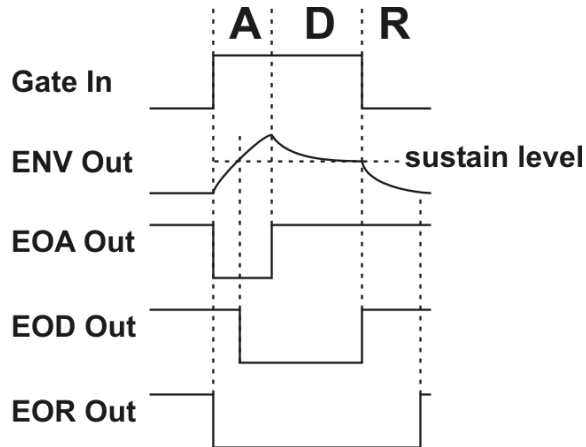


Fig. 2: Basic function

The positive edge of the gate input starts the envelope signal and resets both the "End of Attack (EOA)" and "End of Release (EOR)" output. The time required to reach the maximum value of the envelope is defined by the *attack* control. As soon as the envelope level reaches the sustain level during the rising slope, the digital "End of Decay (EOD)" output turns low. As the maximum value (about +8 V) is reached, the EOA output turns "high" and the so-called **Decay** phase begins. In the decay phase the slope falls to

the **Sustain** level defined by the *sustain* control with a time adjusted by the *decay* control. At the end of the decay phase the envelope output remains at the sustain level until the gate signal turns low. When the gate signal turns low the EOD output turns high and the **Release** phase of the envelope begins. The slope falls to zero with a time adjusted by the *release* control. When the envelope level reaches about +0.5V the EOR output turns high.

The retrigger behaviour of the A-143-2 is different compared to other envelope generators. During the attack phase the envelope cannot be retriggered or reset. During the decay phase the envelope direction changes if a positive edge appears at the retrigger input (i.e. the envelope changes from decay to attack state).

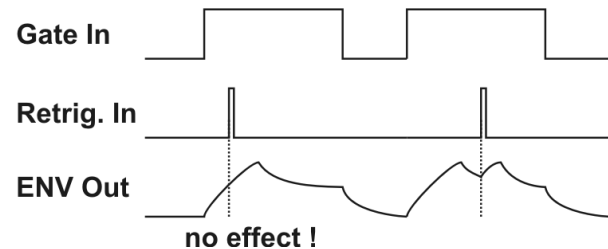


Fig. 3: Retrigger behaviour

## 3. Overview

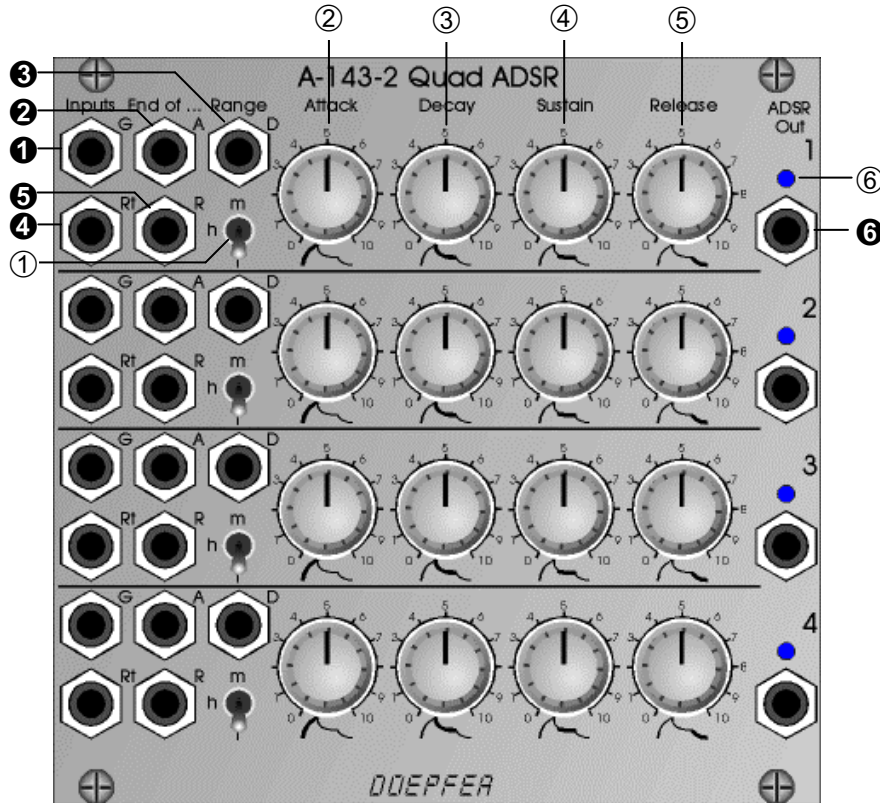


Fig. 5: A-143-2 front panel

**Controls:**

- ① Range : range switch low – high – medium
- ② Attack : attack control
- ③ Decay : decay control
- ④ Sustain : sustain control
- ⑤ Release : release control
- ⑥ : envelope display (LED)

**Inputs and Outputs:**

- ① G : gate input  
(gate inputs 2...4 are normalled to gate input 1)
- ② End of A : end of attack output
- ③ End of D : end of decay output
- ④ Rt : retrigger input
- ⑤ End of R : end of release output
- ⑥ ADSR Out: envelope output

The controls and outputs are the same for all four units.

Module width: 26 HP / 131.8 mm

Module current: 70 mA

### 3. Controls, Inputs and Outputs

- ① G : gate input
- ④ Rt : retrigger input

Socket ① is the ADSR's gate input, socket ④ the retrigger input. The detailed function of these inputs is described on page 2.

The gate inputs of the units 2...4 are normalled to the gate input of unit 1. If one common gate signal has to be used for all four units this signal has to be patched into the gate input of unit 1. As soon as a plug is inserted into the gate input 2, 3 or 4 the default connection is interrupted for the unit in question.

The retrigger inputs are not normalled.

- ① Range : range switch low – high – medium
- ② Attack : attack control
- ③ Decay : decay control
- ④ Sustain : sustain control
- ⑤ Release : release control

These controls define the ADSR shape. The rotary controls ②, ③, ④ and ⑤ are used to adjust the **attack time**, the **decay time**, the **sustain level** and the **release time**. The **range** switch ① is used to select one of three time ranges for the time controls attack, decay and release. The meaning of attack, decay, sustain and release is described in detail on page 2.

- ⑥ ADSR Out: envelope output
- ⑥ : envelope display (LED)

Socket ⑥ is the output of the envelope generator. The envelope voltage ranges from 0 to about +8V. The envelope signal is displayed with the LED ⑥.

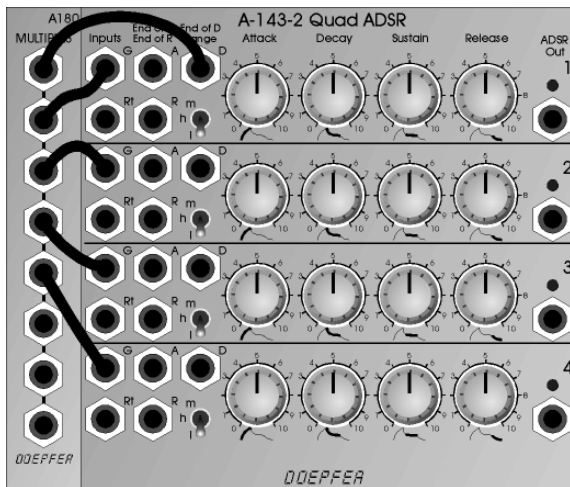
- ② End of A : end of attack output
- ③ End of D : end of decay output
- ⑤ End of R : end of release output

These are three digital outputs that indicate the end of the attack, decay or release phase. As soon as the criterion in question is valid, the corresponding digital output turns "high". The three digital outputs are described in detail on page 2. The output levels are about +10V.

These outputs can be used to trigger other A-100 modules (or another unit of the A-143-2) synchronized to the ADSR envelope generated by the A-143-2.

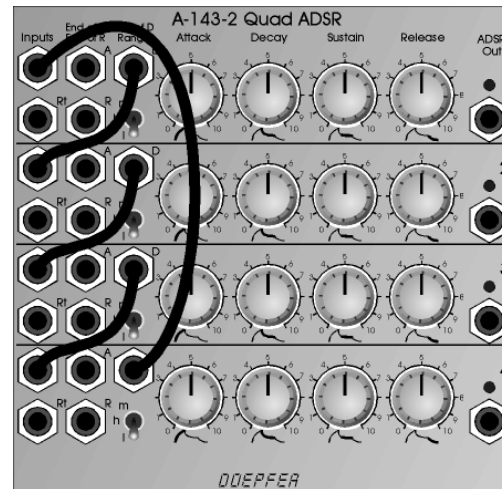
## 4. User Examples

The A-143-2 is suitable for all kinds of modulations where envelope generators are used. Please refer to the manuals of other envelope generators (e.g. A-140, A-141, A-142).



*LFO / Master Clock*

In this example unit# 1 is used as an LFO (EOD is patched to the gate input via multiples). The controls A, D, S and R are used to define the frequency, shape and lower level (S) of the LFO signal. EOD of unit#1 is connected to the gate inputs of unit#2...4 and works as a master gate signal. The four channel example of A-143-1 can be realized with the A-143-2 as well.



*Cyclically triggered envelope generators*

The EOD output of each unit is patched to the gate input of the succeeding unit. The EOD output of unit #4 is patched to the gate input of unit #1. If instead of this connection an external gate signal is connected to the gate input of unit #1 the "sequenced" envelopes can be synchronized to this signal.

By means of the universal vactrol module A-101-9 the parameters A, D and R can be **voltage controlled**. Please refer to the A-101-9 manual for details.