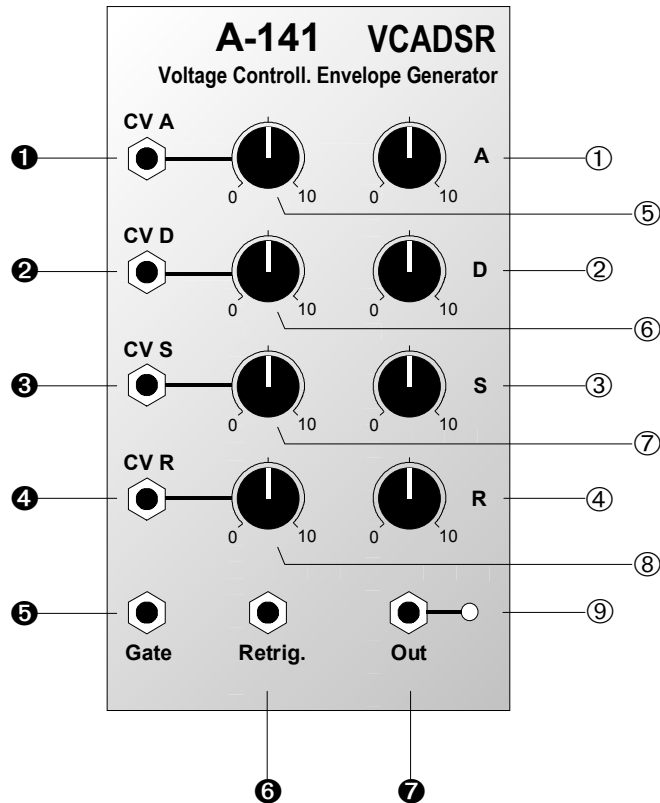## 1. Introduction

Module **A-141 (VCADSR)** is a **voltage controlled envelope generator.**

Whenever a **gate signal** is sensed at the VCADSR's **gate input**, an adjustable sequence of voltages is triggered - the **envelope**. You can then use these envelopes to modulate a VCO, VCF and/or VCA, and alter the input and output voltages of all sorts of modules.

The shape of the envelope is governed by four parameters: **A**ttack, **D**ecay, **S**ustain and **R**elease (see Fig. 1 on page 3). On the A-141, these parameters can be controlled **by hand**, or by **voltage control**, via the dedicated CV inputs (each with an attenuator).

The A-141 VCADSR also has a **retrigger facility:** *while the gate is open*, a trigger pulse received at the retrigger socket will **re-start the envelope** from the beginning of its attack phase (see Fig. 2 on page 5).

2. VCADSR - Overview

A-141   VCADSR
Voltage Controll. Envelope Generator

CV A

CV D

CV S

CV R

Gate   Retrig.   Out

Controls and indicators:

①	**A** :	Attack time control
②	**D** :	Decay time control
③	**S** :	Sustain level control
④	**R** :	Release time control
⑤ ... ⑧ :		Attenuators for CV inputs ❶ to ❹
⑨	**LED** :	Envelope state indicator

In- / Outputs:

❶	**CV A** :	Attack voltage control input
❷	**CV D** :	Decay voltage control input
❸	**CV S** :	Sustain voltage control input
❹	**CV R** :	Release voltage control input
❺	**Gate**:	Gate signal input
❻	**Retrig.**:	Retrigger signal input
❼	**Output**:	Envelope voltage output

3. Controls and indicators

As soon as a **gate signal** is sensed at the VCADSR gate input ⑤, the VCADSR puts out a varying voltage, changing in time, known as an **envelope**. See Fig. 1.
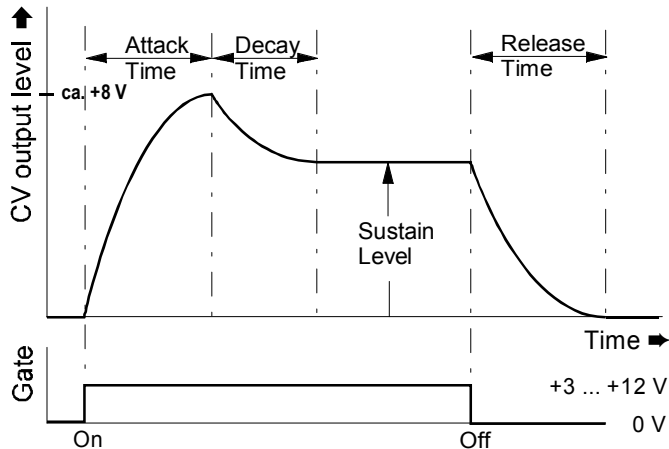

Fig. 1: ADSR envelope and its parameters

The parameters A, D, S and R can be adjusted by hand with controls ① to ④, or can be controlled by the voltages patched into CV inputs ❶ to ❹. These control voltages and the voltages set by hand are summed.

① **A**

This controls the **Attack time** of the envelope. Whenever the VCADSR is triggered - by a key being pressed on your controller keyboard, or by an external gate being sensed at the gate input ⑤ - the control voltage at output ⑦ rises to the maximum, in a time determined by the setting of this knob, and any voltage patched into its Attack CV input.

② **D**

This controls the **Decay time** of the envelope. After the attack phase is finished, the voltage falls to the level set by the sustain knob and CV, in a time determined by the setting of this knob, and its CV input.

③ **S**

This controls the **Sustain level** of the envelope. After the decay phase, the voltage stays at this level until the gate is released.

④ **R**

This controls the **Release time**. As soon as the gate signal finishes, for instance when the key on the controller keyboard is released (Note Off in MIDI), the voltage at the output falls to its minimum, in a time determined by this knob and the Release CV.

⑤ **CV A   ...   ⑧ CV R**

Attenuators ⑤ to ⑧ set the **level of voltage control** for inputs ❶ to ❹.

⑨ **LED**

The LED indicates the level of the envelope's voltage.

Fig. 2: Envelope re-triggering

4. In- / Outputs

❶ **CV A   ...   ❹ CV R**

CV inputs ❶ to ❹ are where the voltages you want to use to control the envelope parameters are patched.

❺ **Gate**

Socket ❺ is the VCADSR's **gate input**.

❻ **Retrig.**

Socket ❻ is the VCADSR's **retrigger input.** This is where you patch in a voltage to re-trigger the enve-lope. If, for instance, you patch an LFO in, then *while the gate is open,* the envelope is re-triggered every time an LFO pulse is received (see Fig. 2).
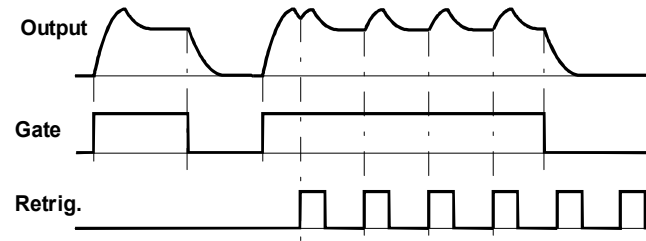
❼ **Output**

Output socket ❼ is where the envelope determined by the A, D, S, and R parameters is available, every time the VCADSR is triggered (see Fig. 1).

5. User examples

Basically, the envelope generated by the VCADSR can be used for any number of types of modulation:

- **VCADSR - VCA**
  Complex amplitude changes over time
- **VCADSR - VCA for voltage control**
  Time-dependent control of all sorts of modulation voltages to and from other modules
- **VCADSR - VCF**
  Modulation of the filter cut-off frequency for constantly evolving **sound spectra**
- **VCADSR - VCO (PWM)**
  Time control of **Pulse Width Modulation** changes for evolving timbres
- **VCADSR - VCO (FM)**
  Pitch modulation as notes progress (and timbral change with very short envelope settings).

Look in the individual manuals for further examples and notes.

The VCADSR in a MIDI system

In contrast with the A-140 standard ADSR, the A-141's parameters can be voltage controlled. One particular possibility is to control the changes in parameters with a MIDI sequencer and MIDI-CV interface (for instance, the A-191) by simply sending **MIDI controller messages**.

That actually makes the **ADSR parameters programmable**, and also means that you can change them as you play, in **real time** (for instance by using velocity to control the Decay parameter).

Using the VCADSR with a sequencer

Used in conjunction with a sequencer like the MAQ 16/3, you can get some interesting results - for instance programming a **different VCF or VCA decay time for each note** in a sequence. You simply connect the second CV output of the MAQ 16/3 to input ❷ (CV D) on the A-141 which is patched into the VCF or VCA.

Controlling the release time

A common VCADSR application is shown in the patch in Fig. 3, where the higher the note played, **the shorter the release time**. This mimics the natural behaviour of most acoustic instruments.

The A-175 Voltage Inverter simply inverts the pitch CV and sends it to the release CV input ❹ (CV R). You control the intensity of this effect with control ⑧.
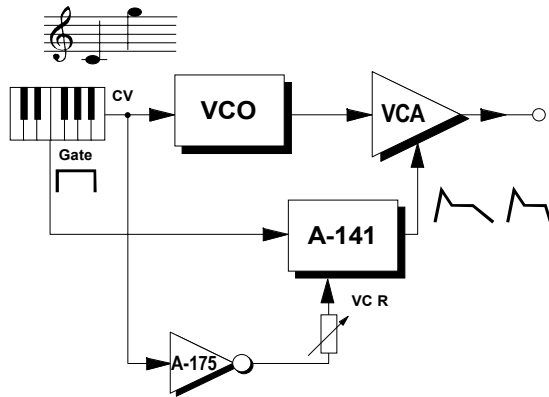
Fig. 3: Controlling release time

The same basic system can be used, eg, to **shorten the attack phase the higher the velocity sensed**; playing hard produces a short attack, and playing more gently a slower attack to the note. Simply patch the relevant velocity output of a MIDI-CV interface, (for instance output CV2 on an A-190) to the A-175 Voltage Inverter's input, and the A-175's output to the CV input ❶ (CV A) of the VCADSR.

Random/cyclical parameter changes

You can get some interesting results by modulating ADSR parameters either **at random**, with the random output from an **A-118 module,** or **cyclically**, by using an LFO such as the **A-145**, **A-146** or **A-147**.

This is where creativity and love of experimentation get to be really important - but one suggestion at least is that the Decay parameter is a good one to start with.

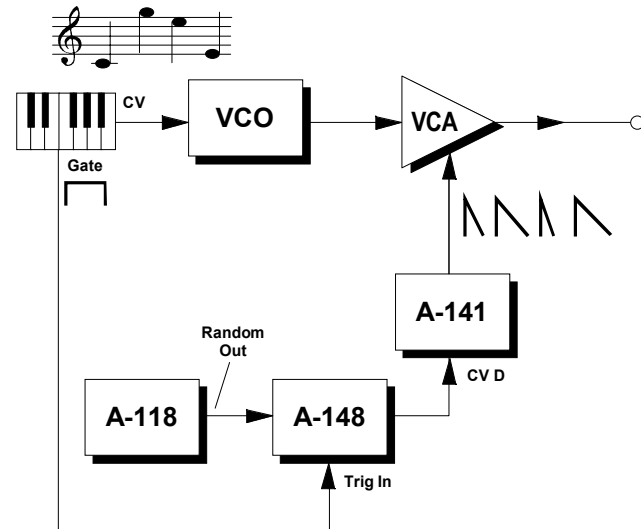In the patch in Fig. 4, **each new note has a different (random) decay.**

Fig. 4: Random decay with each new note

6. Patch-Sheet

The following diagrams of the module can help you recall your own **Patches**. They're designed so that a complete 19" rack of modules will fit onto an A4 sheet of paper.

Photocopy this page, and cut out the pictures of this and your other modules. You can then stick them onto another piece of paper, and create a diagram of your own system.

Make multiple copies of your composite diagram, and use them for remembering good patches and set-ups.

• Draw in patchleads with colored pens.
• Draw or write control settings in the little white circles.