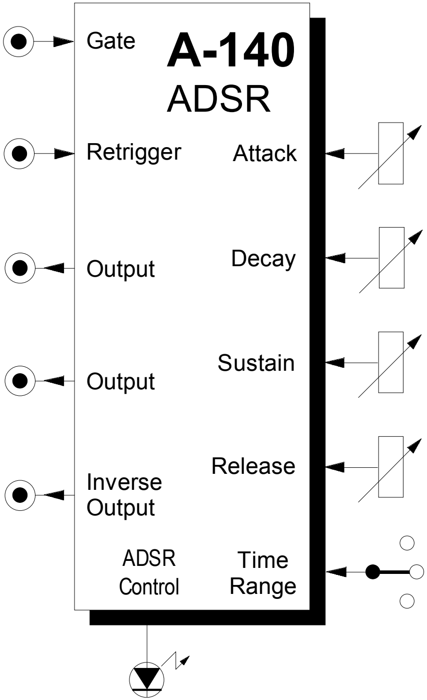


1. Introduction

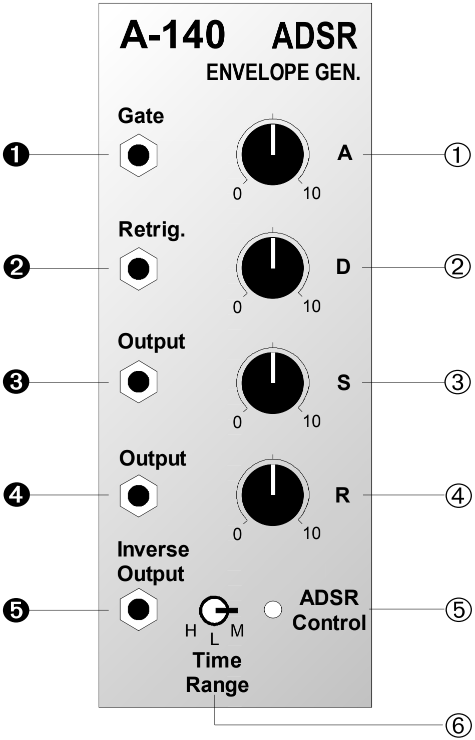
Module **A-140 (ADSR)** is an **envelope generator**, and, since it puts out control voltages, counts as one of the modulation devices in a modular system.
As soon as the gate input receives sufficient voltage, the ADSR generates a variable voltage, changing in time, called an **envelope**. This varying voltage is output in normal (positive) and inverted form, and can be used, eg., for voltage controlled modulation of a VCO, VCF, or VCA, or for processing other modules' inputs and outputs.

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).

The envelope is started **(triggered)** by a **gate signal** either from the INT.GATE voltage on the system bus, or, if a signal is put into it, from the gate input socket.

The envelope can also be **re-triggered**, ie. start from scratch again, each time a trigger signal is sensed at the Retrig. input socket, when the gate is still open (see Fig. 2 on page 5).

2. ADSR overview



Controls:

① **A**: Attack time control

② **D**: Decay time control

③ **S**: Sustain level control

④ **R**: Release time control

⑤ **ADSR Control**: LED envelope state indicator

⑥ **Time Range**: Three-position range switch

In / Outputs:

❶ **Gate**: Input for gate voltage

❷ **Retrig.**: Input for re-trigger voltage

❸ **Output**: Output: responds to a gate signal by putting out the voltage envelope set by the controls.

❹ **Output**: ditto

❺ **Inverse Output**: responds to a gate signal by putting out an inversion of the voltage envelope set by the controls.

3. Controls

The ADSR puts out a varying voltage, called an envelope, whenever a gate signal is sensed (see Fig. 1).

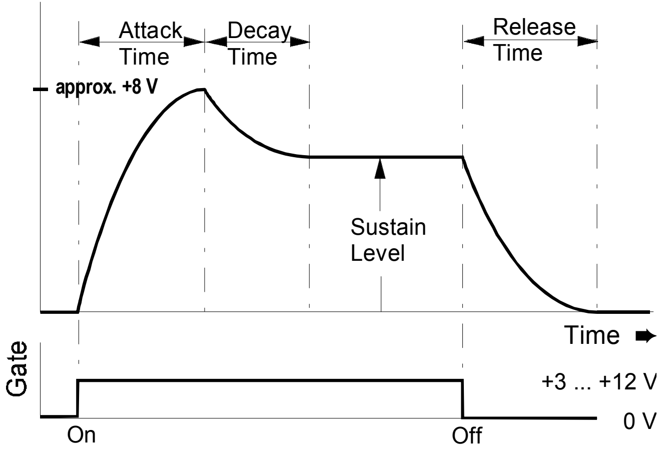


Fig. 1: An ADSR envelope and its parameters

① A

With this control you set the envelope’s **attack time**. Whenever the envelope is triggered - via the internal gate, a ‘note on’ command via a MIDI/CV interface, or a gate signal at gate input ① - a control voltage is output at sockets ③ and ④, rising to maximum in the time set by this control.

② D

This control sets the **decay time**: the time it takes for the control voltage output to fall to the level set by S, the sustain control.

③ S

This control sets the **sustain level** of the envelope - the steady-state voltage level after the decay phase. This level remains the same until the gate is closed.

④ R

This control sets the **release time** of the envelope. As soon as the gate signal finishes, for instance when the key that triggered the envelope is released, or a note off command is received via a MIDI/CV interface, the control voltage falls to zero, at a rate set by this control.

⑤ ADSR Control

LED 5 gives a visual indication of the envelope voltage at the output.

⑥ Time Range

This 3-position rotary switch lets you select the right time range for your requirements. The three positions are:

• **H**	(high):	up to minutes
• **M**	(medium):	standard mid-range
• **L**	(low):	down to less than 100 µsec

4. In / Outputs

❶ Gate

Socket ❶ is the ADSR’s gate input.

☞ The gate input is a switched socket, normalled to the **INT. GATE circuit** on the **system bus**. A gate signal on this circuit (for instance from a keyboard) will trigger the ADSR, even without an input to socket ❶.

If on the other hand you connect a gate signal to socket ❶, then the connection with the system bus is broken, and the ADSR is triggered from this socket instead.

If you want, you can undo the normalling to the system bus more permanently, by turning the A-100 off, removing the A-140 module, and taking out the little red **jumper** in the top right-hand corner of the circuit board.

❷ Retrig.

Socket ❷ is the ADSR's **retrigger input**, which can be connected, for instance, to the output from an LFO. That means that *while the gate is open,* the envelope re-triggers every time it senses a pulse from the LFO (see Fig. 2).

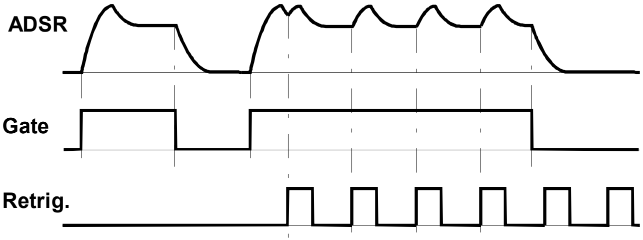


Fig. 2: Envelope re-trigger system

❸ Output • ❹ Output

Whenever the ADSR is triggered, these **outputs** carry the envelope voltage as defined by the Attack, Decay, Sustain and Release parameters (see Fig. 3).

❺ Inverse Output

The Inverse Output carries exactly the same voltage envelope as the ordinary outputs but inverted - with negative instead of positive voltages (see Fig. 3).

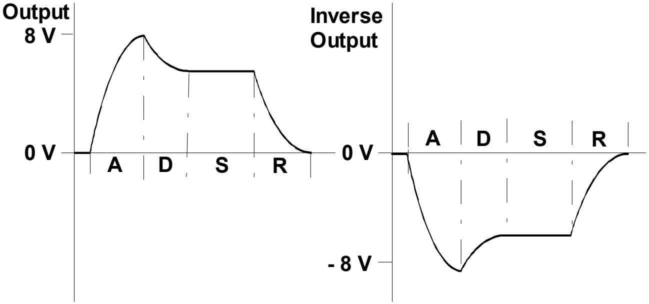


Fig. 3: normal and inverted envelopes

5. User examples

The envelope generated by the ADSR can be used for most kinds of modulation:

- **ADSR - VCA**
  Modulation of loudness / amplification over time.
- **ADSR - VCA for voltage control of any in / output processes**, with the process time controlled by the A, D, S, and R parameters.
- **ADSR - VCF**
  Modulation of the cut-off frequency produces a constantly evolving **sound spectrum**.
- **ADSR - VCO (PWM)**
  Modulation of the pulse width of a VCO produces a constantly changing **timbre**.
- **ADSR - VCO (FM)**
  Modulation of the pitch control voltage produces variation in **pitch** as a note progresses (and at very short envelope settings produces variation of timbre).
- **ADSR - VCP**
  Modulation of the phase shift of an A-125 VCP produces variation in **phase shift** as a note progresses. For this function slow settings of A, D and R parameters should be used.
- **ADSR - VCLFO**
  Control of the frequency of an A-147 VCLFO produces variation in **LFO frequency** as a note progresses. For this function slow settings of A, D and R parameters should be used.

Examples and further notes can be found in the manuals for the individual modules.

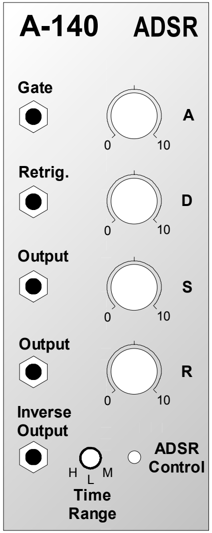
6. Patch-Sheet

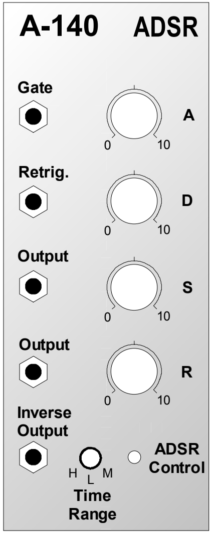
The following diagrams of the module can help you recall your own **Patches**. They're designed so that a complete 19" rack of modules will fit onto an A4 sheet of paper.

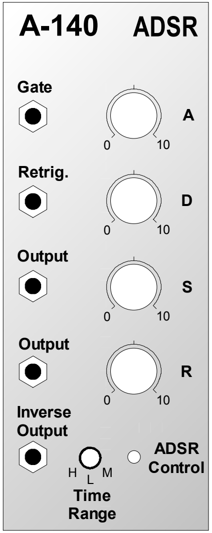
Photocopy this page, and cut out the pictures of this and your other modules. You can then stick them onto another piece of paper, and create a diagram of your own system.

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.


A-140 ADSR
Gate
A
0 10
Retrig.
D
0 10
Output
S
0 10
Output
R
0 10
Inverse Output
H L M
Time Range
ADSR Control


A-140 ADSR
Gate
A
0 10
Retrig.
D
0 10
Output
S
0 10
Output
R
0 10
Inverse Output
H L M
Time Range
ADSR Control


A-140 ADSR
Gate
A
0 10
Retrig.
D
0 10
Output
S
0 10
Output
R
0 10
Inverse Output
H L M
Time Range
ADSR Control