

## 1. Introduction

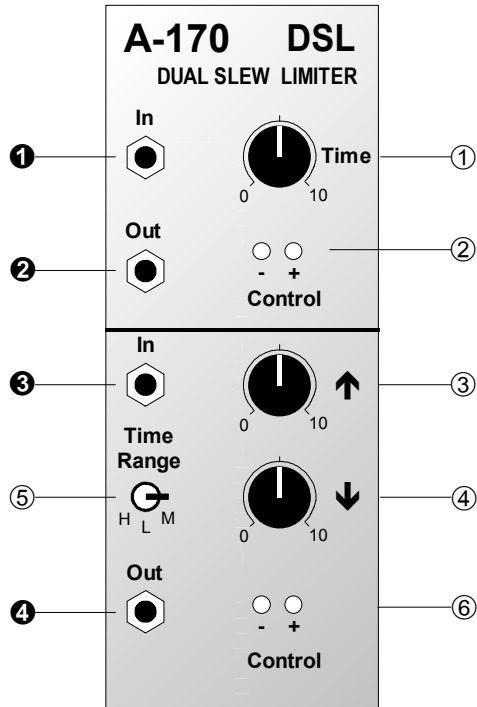
Module **A-170 (Dual Slew Limiter)** contains two separate slew limiters, also known as **portamento controllers** or **integrators**.

The **upper SL** has just one **joint control**, which sets both **rise** and **fall** times (c. 0 ...10 sec).

The **lower SL** has **separate controls** for rise and fall times, and can therefore be used as a simple AR envelope generator. Over and above this, you can set the overall range for these parameters, with a three-position switch, as on the full ADSRs.

Both slew limiters have two LEDs each, to show the state of the rising and falling voltages.

## 2. Overview



### Controls and indicators:

- ① **Time** : rise / fall time control (input 1)
- ②, ⑥ **- LED** : negative voltage indicator
- ②, ⑥ **+ LED** : positive voltage indicator
- ③ **↑** : rise time control (lower SL)
- ④ **↓** : fall time control (lower SL)
- ⑤ **Time Range**: 3-position switch for overall rise / fall time range (lower SL)

### In / Outputs:

- ①, ③ **In** : Input
- ②, ④ **Out** : Output

### 3. Controls and indicators

#### ① Time

This control sets the **rise / fall time  $t_c$**  of slew limiter 1 (see Fig. 1) in a range from 0 to 10 seconds.

#### ② - LED • ⑥ - LED

LEDs ② and ⑥ are the status indicators for the slew limiters' **falling edges**.

#### ③ + LED • ⑦ + LED

LEDs ③ and ⑦ are the status indicators for the slew limiters' **rising edges**.

#### ④ ↑

With this control you set the lower slew limiter's **rise time  $t_A$**  (see Fig. 1), within the range set by switch ⑥.

#### ⑤ ↓

The fall time  $t_R$  of the lower slew limiter (see Fig. 1) is set with this control, within the range set by the range switch ⑥.

#### ⑥ Time Range

Switch ⑥ sets the time range for the lower slew limiter's **rise  $t_A$**  and **fall  $t_R$**  times.

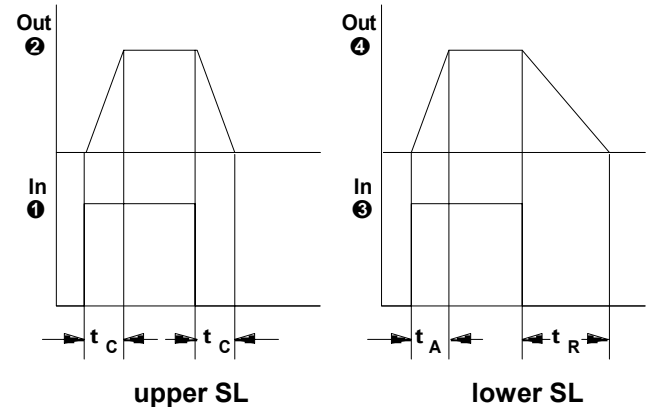


Fig. 1: A-170 response

Three time ranges are available:

- **L** (low): 0 ... ~ 0.5 sec
- **M** (medium): 0 ... ~ 10 sec
- **H** (high): 0 ... some minutes

The actual times are also dependent on amount of voltage change (0 V → 1 V goes quicker than 0 V → 10 V!).

## 4. In /Outputs

### ① In • ③ In

Sockets ① (upper SL) and ③ (lower SL) are the slew limiters' **inputs**. Patch in the voltage you want to modify here, and use the time controls  $t_c$  (upper SL) and/or  $t_A$ ,  $t_R$  (lower SL) to alter the waveform's rise and fall characteristics.

### ② Out • ④ Out

② (upper SL) and ④ (lower SL) are the outputs for the modified signal.

For **precision voltage control** (for instance of VCO pitch or portamento) only use the **upper slew limiter**.

Because the diodes in the lower slew limiter are voltage-dependent, there is a voltage offset of about 0.5 V. This naturally makes it unsuitable for precise 1V / octave work, but for simple voltage control or in use as an AR envelope generator, this is no problem at all.

## 5. User examples

### Portamento

The example in Fig. 2 shows the A-170 (**upper SL !**) as a **portamento generator**. With this patch, independently controllable portamento is created every time a note is played. Use control ① to set the portamento time.

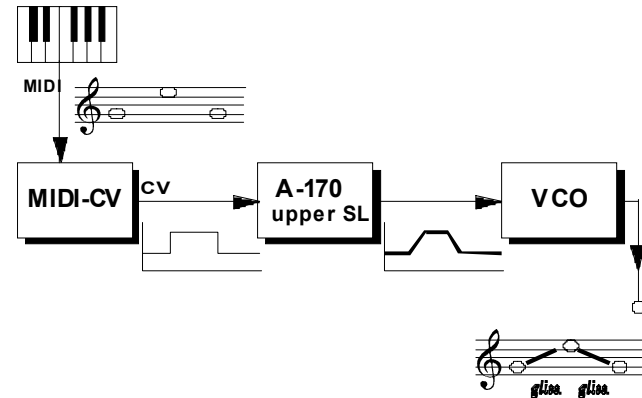


Fig. 2: The A-170 as a portamento generator

## Slew limiter as AR envelope generator

You can use the lower A-170 as a simple AR envelope generator, for instance in the example in Fig. 4, to help create a certain percussive bass sound.

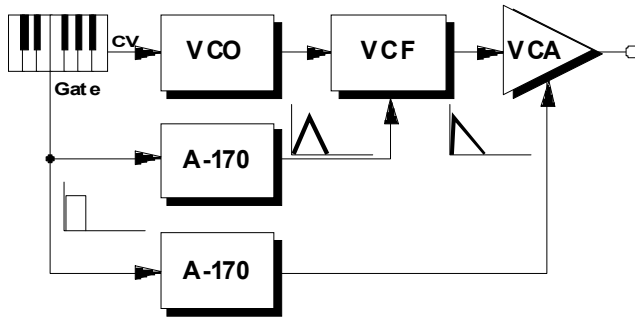


Fig. 3: The A-170 as a simple AR generator

## “Glissando AM”

The patch in Fig. 4. produces an interesting sound. The two VCOs are set to harmonically related intervals. A keyboard pitch control voltage is patched to both VCOs - directly to VCO1 (the carrier), and via the A-170 upper slew limiter to VCO2 - the modulator.

When a new note is played, the carrier VCO reacts immediately, while the modulator VCO glides gradually to the pitch of the note, producing a complex timbral sweep.

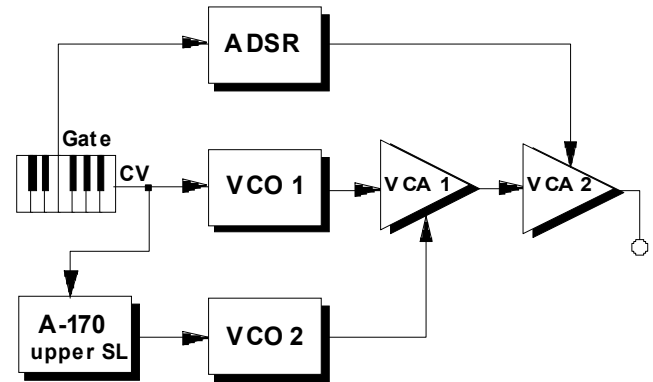


Fig. 4: "Glissando AM"



It's important to keep the time level of the A-170 less than the shortest note length played.

## Creating complex envelopes

A combination of the Clock Divider / Sequencer (A-160/161) and a number of A-170 slew limiters can produce complex envelopes (see Fig. 5).

The Clock Sequencer triggers the Slew Limiters in sequence, and their various envelopes are mixed in a linear mixer A-138a. The result is a complex envelope which can be patched from the mixer output to anywhere.



You can further elaborate on this patch, by adding other control voltages to the slew limiters' envelopes - for instance:

- an ADSR with a long envelope, triggered by output ① on the A-161;
- an LFO output, with or without reset;
- the random output from an A-118;
- an audio signal via an envelope follower (A-119).

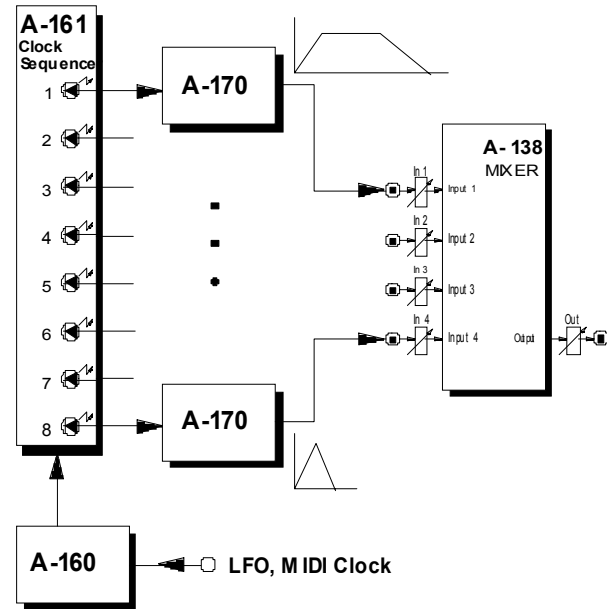


Fig. 5: Creating complex envelopes



## 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.

