## 1. Introduction

Module **A-116 (Voltage Controlled Waveform Processor)** provides **voltage-controlled dynamic waveform modification** of audio signals. It can produce new waveforms from the standard VCO shapes, and **modulate these changes** in real time.

The signal first of all goes through an **input amplifier,** which can attenuate the signal as well as amplify it by up to a factor of 2.

After the input amplifier, the signal goes through **two parallel processors:** a **clipping circuit,** and an **asymmetrical amplifier**. The processed signals are **added together** and sent to the output.

Clipping-Level and **Symmetry** amounts are not just manually controllable, but can also be **modulated** by control voltages, to produce complex, constantly changing waveforms.

2. VC Waveform Processor - Overview
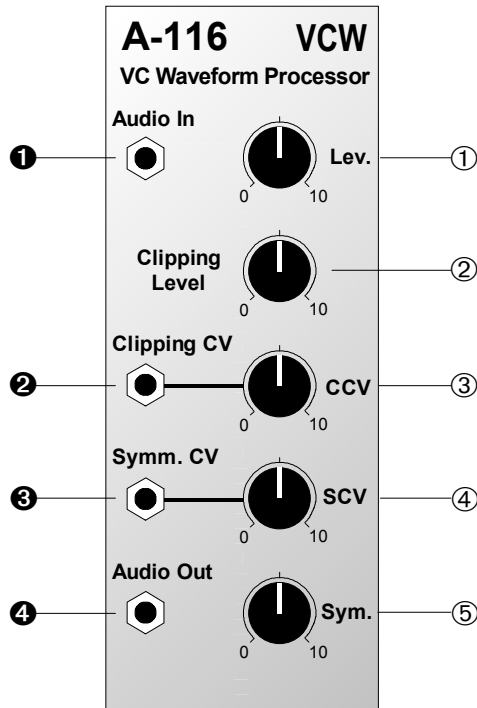
Controls:

① **Lev.** :	Input ❶ amplifier level control
② **Clipping Level** :	Clipping threshold control
③ **CCV** :	Clipping CV attenuator
④ **SCV** :	Symmetry CV attenuator
⑤ **Sym.** :	Symmetry control

In / Outputs:

❶ **Audio In** :	Signal input
❷ **Clipping CV** :	Clipping CV input
❸ **Symm. CV** :	Symmetry CV input
❹ **Audio Out** :	Signal output

3. Controls

① **Lev.**

The **input amplifier**'s gain can be set with attenuator ①. Since the gain amount is variable from 0 up to a factor of 2, you can attenuate as well as amplify input signals.

② **Clipping Level**

With control ②, you set the **clipping threshold** level in a range from -10 V to +10 V. Any part of a waveform which was **above** this threshold is clipped - that is, held at the threshold level (see Fig.1).

③ **CCV**

If you want to use a CV at input ❷ to control or modulate the clipping threshold, set the **clipping control voltage level** with Attenuator ③.

④ **SCV**

Symmetry can likewise be controlled or modulated by voltage control. Use attenuator ④ to control the **level of the symmetry control voltage** at input ❸.

⑤ **Sym.**

Symmetry, that is the g**ain factor of the internal symmetry VCAs**, is altered by control ⑤. The Sym-

metry VCA is a special amplifier which operates in the amplification range from -1 to +1, so can amplify negative as well as positive voltages (see Fig. 2).
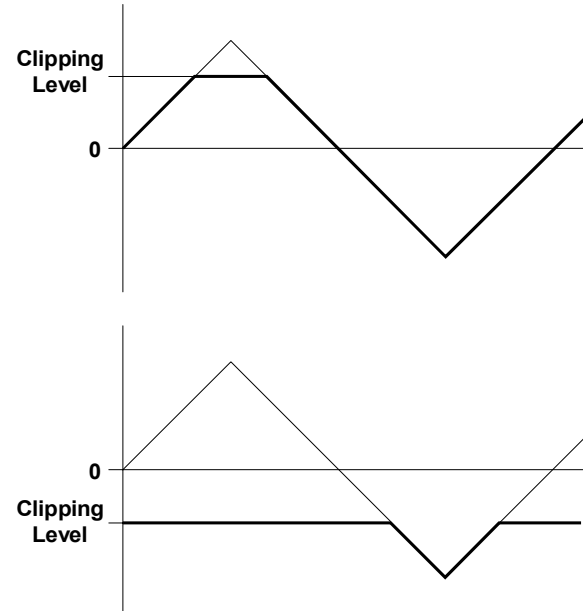

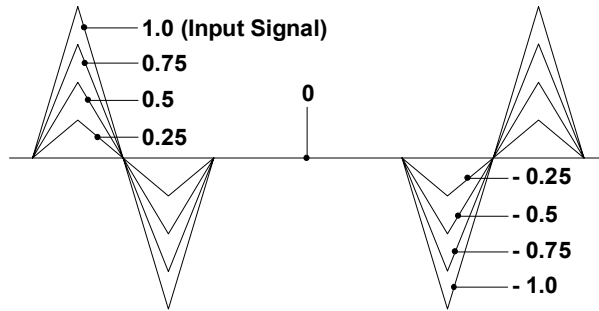**Fig. 1**: how the clipping level works

1.0 (Input Signal)
0.75
0.5
0
0.25

- 0.25
- 0.5
- 0.75
- 1.0

Fig. 2:In this example, a triangle wave is symmetrically amplified by the internal symmetry VCA, with various gain factors from 1.0 to -1.0

4. In / Outputs

❶ Audio In

Socket ❶ is the A-116 audio input.

❷ Clipping CV

The input to use for **voltage control** of the **clipping threshold.**

❸ Symm. CV

The input to use for **voltage control** of **symmetry**.

❹ Audio Out

Socket ❹ is the A-116 **output**.

5. User examples

The VC Waveform Processor A-116 is a very complex module, which, especially through the modulation of clipping level and symmetry parameters, can give any number of sometimes drastic waveform transformations. It's definitely worth systematically investigating all its possibilities. There follow a few suggestions, which may be helpful starting points.

❒ Begin with waveforms like sine and triangle waves, which have few overtones. Experiment with different combinations of symmetry and clipping level, and listen to the results.

❒ Fig. 4   shows an example of the different waveforms which emerge from clipping a triangle wave and putting it through different amounts of symmetrical amplification.

❒ Try modulating one parameter with an LFO while keeping the other constant. Experiment with different LFO waveforms and frequencies.

❒ Repeat this process with different settings for the second parameter.

❒ Try the same with the first parameter fixed, and the second modulated by an LFO.

❒ Modulate both the clipping level and symmetry at the same time. Try different combinations of modulation, such as

•   LFO (sine wave) for Symmetry,
       LFO (square wave) for Clipping Level

•   RANDOM for Clipping Level,
       Modulation wheel for Symmetry

etc.

❒ Try the same experiments with more complex (rich
   in harmonics) waveforms like a square wave, sa-
   wtooth, PWM, FM, or ring modulated sounds, or
   external audio, for the input signal. Listen to the
   results and take note.

❒ patch the original signal and the A-116's output
   into a mixer.

❒ Try using the waveforms generated by the A-116 to
   modulate other modules such as a VCF or VCA.

❒ Try using as an input the signal coming from a ring
   modulator or a synced VCO. You can also get
   interesting results by feeding the output of the
   A-116 into a ring modulator, or into the sync input
   socket of a VCO (see Fig. 3).

By experimenting in these and other ways, you'll soon
realise what a powerful and endless source of dyna-
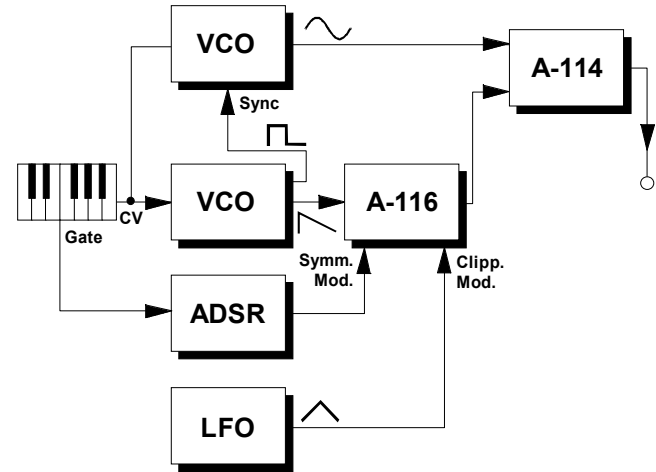mic wave form variations the A-116 is.

Fig. 3: The A-116 used in combination with a ring mo-
dulator and synced VCOs.

v = 1

v = 0.5

Input Signal

Signal after Clipping

v = 0

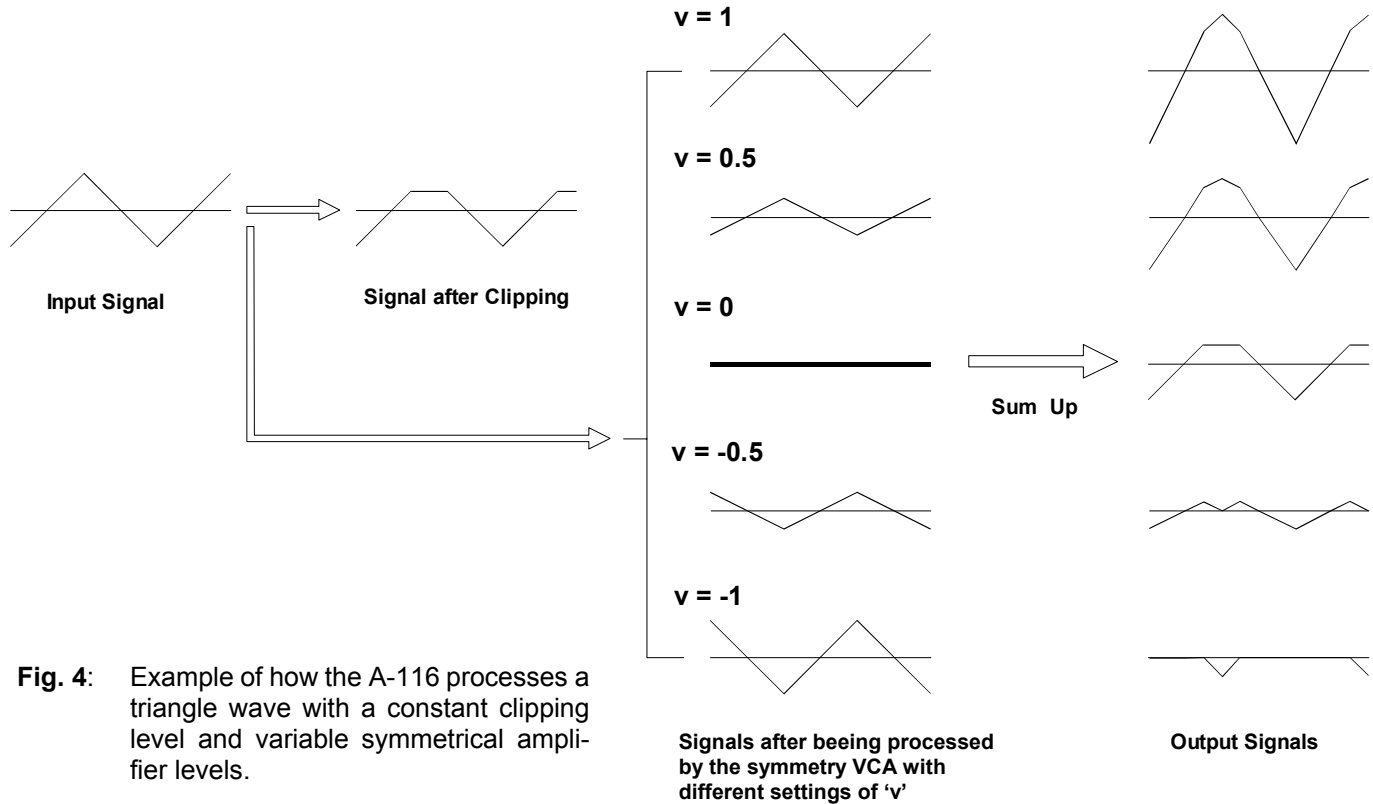Sum Up

v = -0.5

v = -1

Fig. 4:   Example of how the A-116 processes a triangle wave with a constant clipping level and variable symmetrical amplifier levels.

Signals after beeing processed by the symmetry VCA with different settings of 'v'

Output Signals