ED102 – Hertz-Volts-Octave

User Guide

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The ED102 borrows heavily from the Korg MS-02™ although it was developed independently of Korg Inc.

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ED102 – Hertz/Volts/Octave Converter

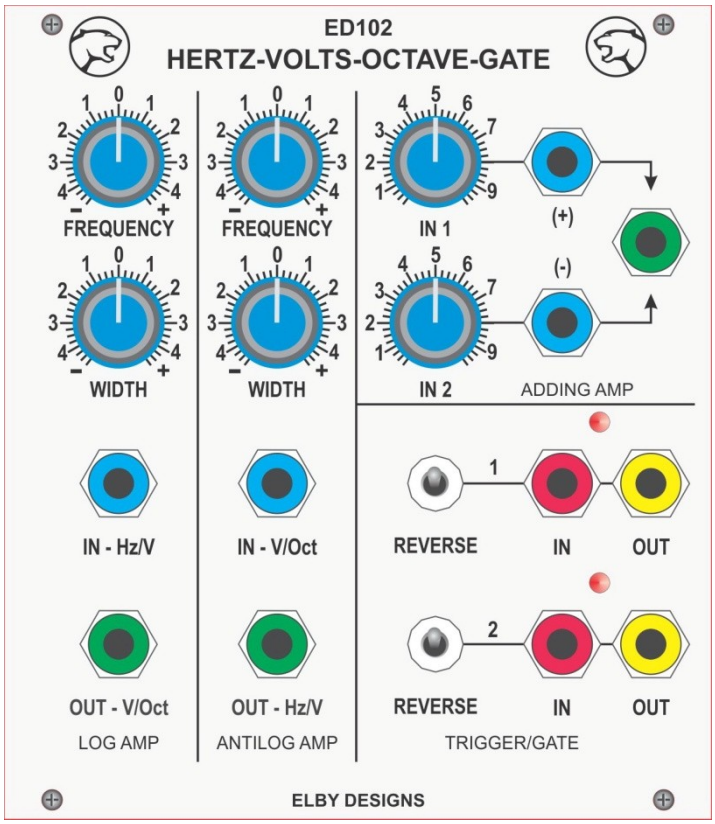
Introduction

The ED102 is ideal if you want to upgrade your synthesizer by adding on other synthesizer units having different kinds of keyboard control voltage and trigger signals. The built-in, fully adjustable log amp, anti-log amp, and trigger processor ensure complete system flexibility and compatibility between any presently voltage controlled synthesizer.

In order to get the most out of your ED102, please read this owner's manual carefully before use. The ED102 Hz/V/Oct Converter is designed for the purpose of connecting V/Octave synthesizers with Hz/V synthesizers. This sophisticated signal processor greatly enhances the performance possibilities of your synthesizer.

Among presently available music synthesizers, there are two different types of control system used for the VCO (voltage controlled oscillator) and EG (envelope generator). One of these systems is used by Korg and Yamaha; the other is employed by every other synthesizer manufacturer.

The ED102 provides you with a way to change the control signals of one system into the control signals used in the other system. In this way, it acts as an interface so that any two synthesizers can be used together, provided that the synthesizers are equipped with the conventional input and output jacks for control voltage and trigger or gate signals.



CV systems

In the Hz/V system, the VCO oscillator frequency is proportional to the control voltage whilst in the V/Octave systems the oscillator frequency changes one octave for every one volt (1V) change in the control voltage. Since an increase of one octave means that the frequency is doubled, each increase of one volt in the control voltage means a doubling of VCO frequency.

The problem with the V/Octave system is that it must employ a log amp in order to double the frequency for each one volt increase in the control voltage. Log amp circuitry can, unfortunately, be very unstable because of its sensitivity to temperature changes. This causes so many problems that most professional musicians automatically assume that synthesizers always have unstable pitch. When Korg developed their first Korg synthesizer, they decided that such a circuit was entirely unsuitable for a musical instrument. So, instead they invented their own unique, patented circuit in which the keyboard voltage (which is the VCO control voltage) itself doubles for each one octave increase in pitch.

The graph in Figure 1 shows the relationship between the VCO oscillator frequency (pitch) and the control voltage (keyboard output voltage). The straight line on the graph is from a V/Octave synthesizer in which there is a one octave change for every one volt change in the control voltage. In contrast, the curved line on the graph is the control voltage from a Hz/V synthesizer in which VCO frequency is proportional to voltage. Note that the voltage doubles for each octave rise in pitch.

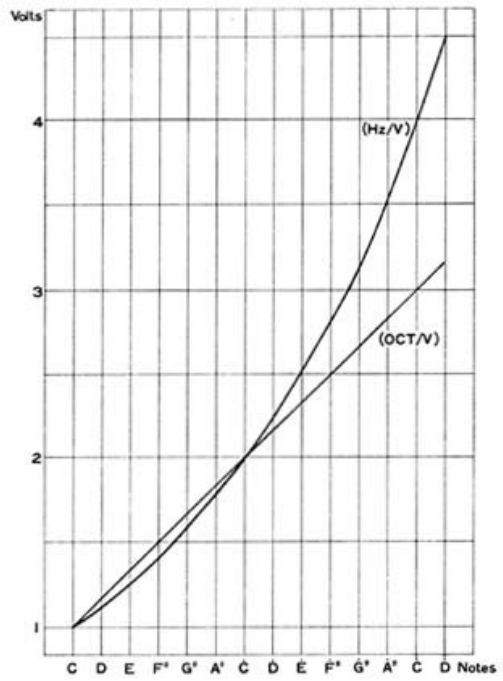


Figure 1 - logarithmic versus linear cv systems

Trigger Systems

EG control is also simplified in the S-Trig system. For the trigger signal (also called a "gate" signal) that is used to start EG operation, S-Trig uses a simple switch and 2-pole phone plug connection instead of the special plugs and switches needed for the +V type of system.

The difference between the trigger (gate) signals of the two systems is clearest if you think of the trigger as a switch. In the upper diagram below is shown the S-Trig system (GND) of switching on EG operation (initiating operation), and the means by which the other system (+V) accomplishes the same thing.

In the (GND) system, only two lines are needed to connect the switch to the EG.
In the (+V) system, either three lines, or the addition of local power (e.g. a battery) to the switch is required.

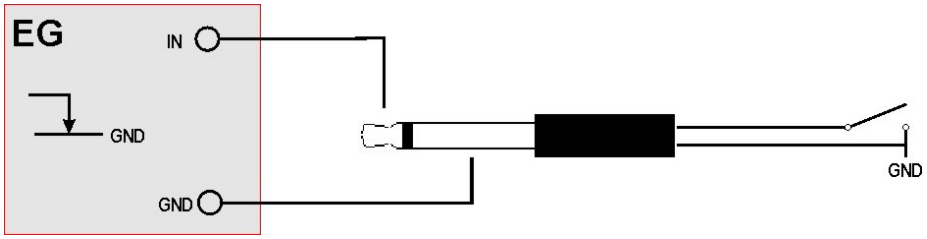


Figure 2a - S-Trig (Switch Trigger)

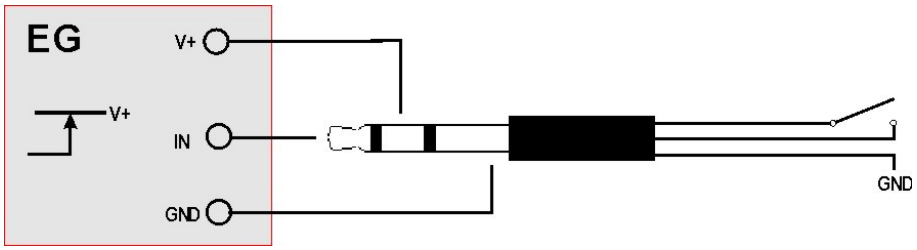


Figure 2b - V-Trig (Voltage Trigger)

ED102 – Hertz/Volts/Octave Converter

Features and Functions

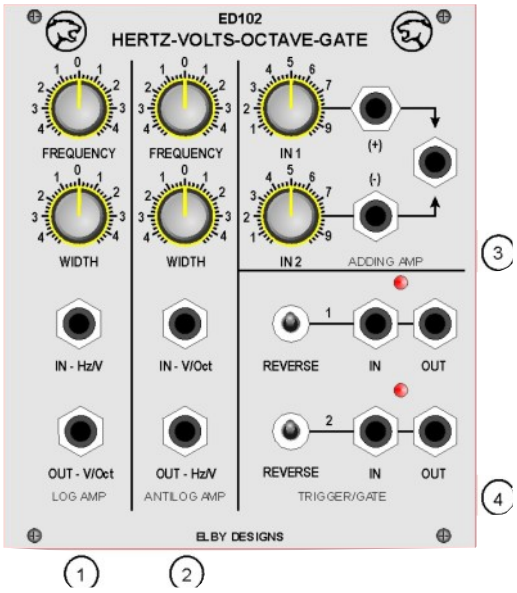


Figure 3

① Log Amp:
This changes a Hz/V type keyboard CV (control voltage) output into a V/Octave type of CV. Use the Log Amp to change the control signal from a Hz/V synthesizer into a signal you can use with a V/OCT synthesizer.

Hz/V input (0 ~ 15V)
Oct/V Output (-12V ~ +12V)

② Antilog Amp:
This changes a V/Octave type of keyboard CV output into a Hz/V type of CV. Use this Antilog Amp when you want to control a Hz/V synthesizer, such as a Korg, by means of a unit that uses the V/OCT system.

Oct/V input (-4V ~ +4V)
Hz/V output (-12V ~ +12V)

③ Adding Amp:
This can be used for mixing control voltage signals or sound signals.
When not plugged into an outlet, the adding amp operates as if -5V and +5V inputs were connected to its two channels. Therefore, depending on how you set up your equipment, you can also use the adding amp as a voltage supply, or to shift a control voltage to a higher or lower value, and so forth.

④ Trigger\Gate:
This lets you change either type of trigger signals, S-Trig (GND) or V-Trig (+V) into the kind of trigger signal you need by means of the Reverse switch.

Input (Vth = +2.5V)
Output (0V ~ +15V)

Using the ED102

a) Using the keyboard of a Hz/V type synthesizer to simultaneously play (control) a V/Octave type synthesizer.

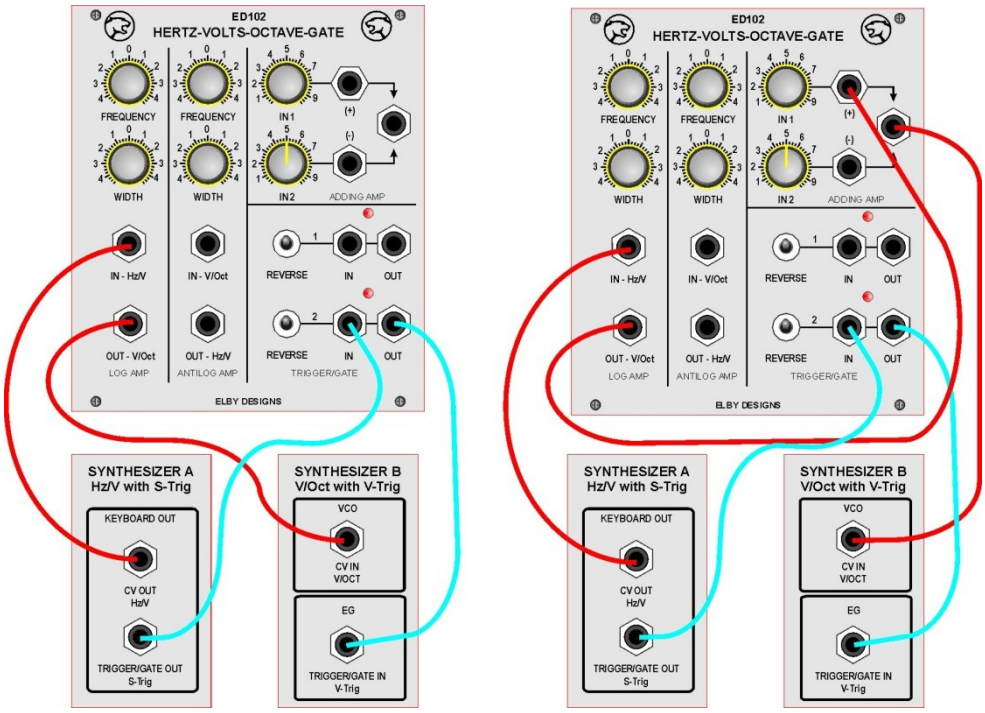


Figure 4 - Hz/V to V/Octave conversion

1. Connect synthesizer A (Hz/V) and synthesizer B (V/Octave) as shown by the layout to the left.
2. Set the octave (scale) selectors on both synthesizers to 8' and set the tuning knobs to the centre position.
3. While playing the lowest note on the A keyboard, use the [Log Amp FREQUENCY] knob and the synthesizer B tuning knobs to match the pitch of B with that of A. If you cannot get the same pitch by this method, change the connections to those shown by the layout to the right. Turn the [Adding Amp CH-2] level knob to the central x1 position and then slowly raise the [CH-1] knob. This will greatly increase the pitch of synthesizer B. If you need to lower the pitch of B, change the Adding Amp connection from the [CH-2] input jack to the [CH-1] input jack. Then set the [CH-1] level to x1 and adjust the pitch with the [CH-2] level knob.
4. While playing the highest note on the A keyboard, adjust the [Log Amp WIDTH] knob so that the pitch of B matches the pitch of A. If you are using the Adding Amp and you can't get the pitch of B to match that of A, use the knob you set to x1 to roughly readjust the pitch.
5. Repeat steps (3) and (4) as necessary until the scales of synthesizers A and B are perfectly matched.

b) Using the keyboard of a V/Octave type synthesizer to simultaneously play (control) a Hz/V type synthesizer

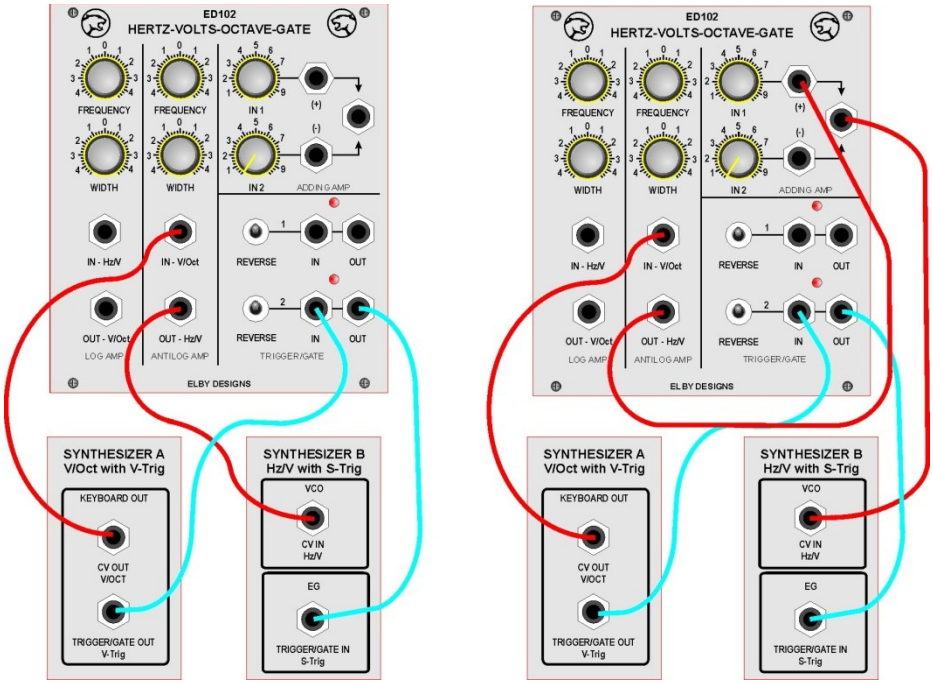


Figure 5 – V/Octave to Hz/V conversion

1. Connect synthesizer A (V/Octave) and synthesizer B (Hz/V) as shown by the layout to the left.

2. Set the octave (scale) selectors on both synthesizers to 8' and set the tuning knobs to the centre position.

3. While playing the lowest note on the keyboard of synthesizer A (the note that produces a CV OUT voltage of 0V), adjust the [Anti Log Amp FREQUENCY] knob and set the synthesizer B tuning knobs so that the pitch of B matches that of A. If you cannot get the same pitch by this method, change the connections to those shown by the layout to the right. Make sure that the [Adding Amp CH-2] level knob is set to "0". Then perform rough pitch adjustment using the [CH-1] level knob.

4. While playing the highest note on the keyboard of synthesizer A (the note that produces the highest absolute value of the CV OUT voltage), use the [Anti Log Amp WIDTH] knob to adjust the pitch of B so that it matches the pitch of A.

Repeat steps (3) and (4) as necessary until the scales of A and B are perfectly matched.

c) Using an S-Trig device to control a synthesizer having a V-Trig type trigger (gate) input

If you employ the trigger processor on the ED102, you can use any S-Trig device to control any brand of synthesizer equipped with VCO CV IN and EG TRIGGER IN input jacks.

Figure 6 shows one example of how to connect the three units.

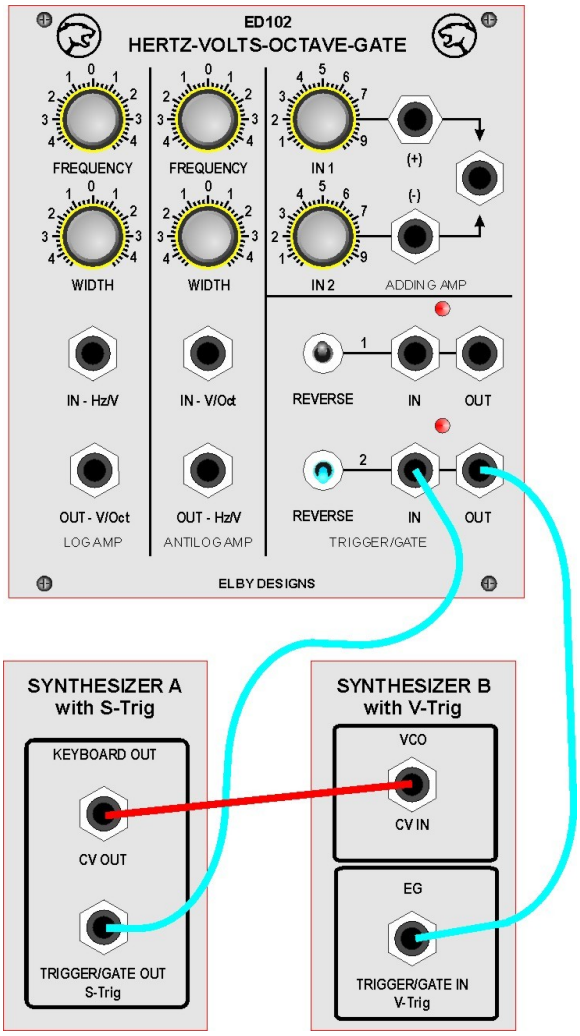


Figure 6

d) Using the ED102 for rough pitch adjustment between two Hz/V type synthesizers

1. Connect synthesizers A and B as shown in the figure above.

2. Set the controls on both synthesizers so that the octave (scale) selectors are at 8' and the tuning knobs are set at the center position.

3. While playing a note in the middle of the keyboard of synthesizer A, adjust the ED102 Adding Amp Ch-1 level knob so that the pitch of B is the same as the pitch of A. For fine adjustment, use the tuning knobs on synthesizer B.

Note: Be sure that the Adding Amp's Ch-2 level knob is set at the "0" position.

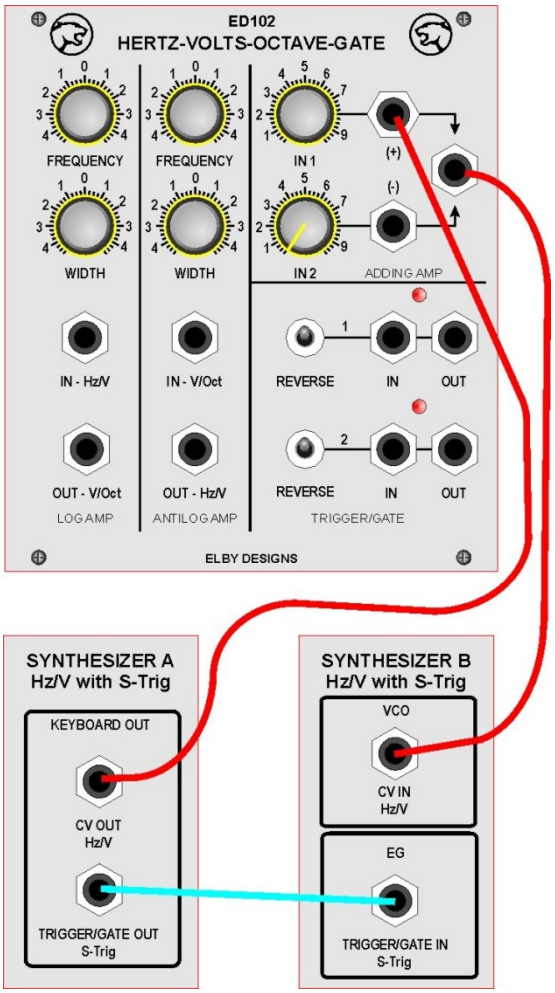


Figure 7

e) Using the ED102 for rough pitch adjustment when playing two Hz/V type synthesizers from one keyboard

Use the setting in figure 8 to lower the pitch of synthesizer B; to raise the pitch of synthesizer B, follow figure 9 when making connections.

(1) rough pitch adjustment between two Hz/V type synthesizers from one keyboard (lowering pitch)

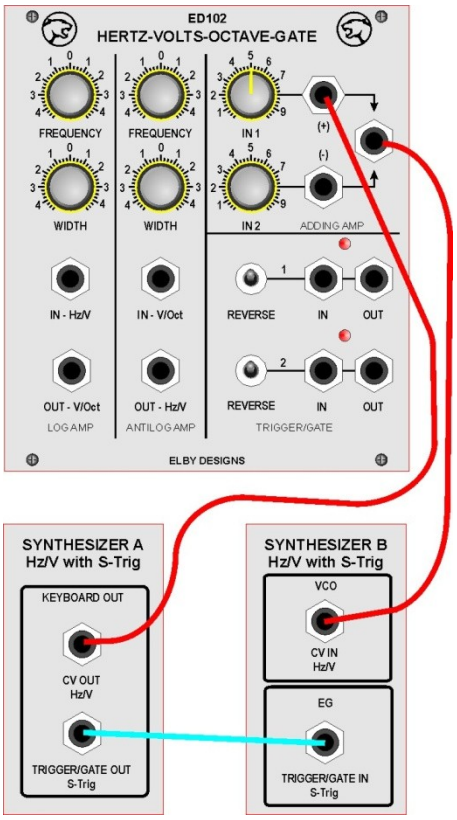


Figure 8

Lowering pitch:

1. While playing the lowest note on the keyboard (the note that produces 0V CV OUT voltage) of synthesizer A, adjust the Adding Amp Ch-2 level knob so that the pitch of synthesizer B matches that of A.

2. While playing the highest note on the keyboard of A (the note that produces the highest CV OUT voltage), use the Adding Amp Ch-1 level knob to fine tune the pitch of synthesizer B so that it matches A.

3. Repeat steps (1) and (2) as necessary until the scales are matched.

(2) rough pitch adjustment between two Hz/V type synthesizers from one keyboard (raising pitch)

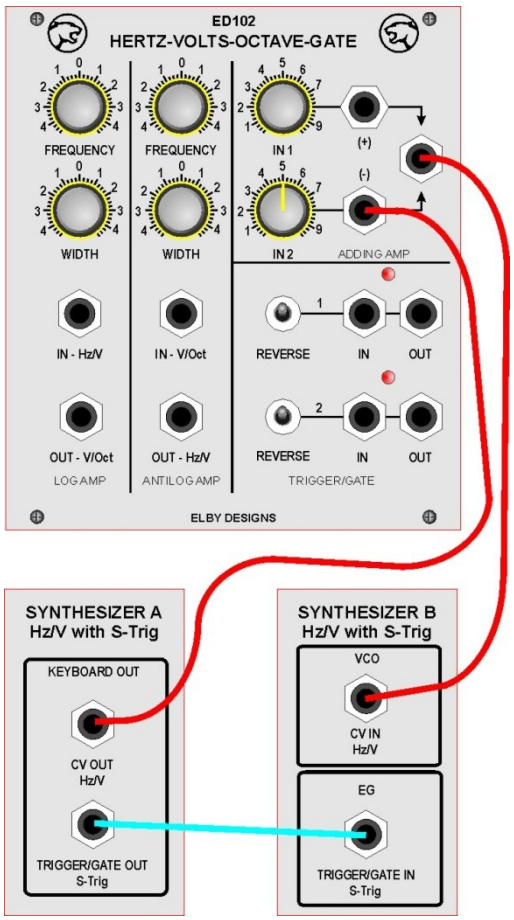


Figure 9

Raising pitch:

1. While playing the lowest note on the keyboard of synthesizer A (the note that produces a CV OUT voltage of 0V), use the Adding Amp Ch-1 level knob to adjust the pitch of synthesizer B so that it matches A.

2. While playing the highest note on the keyboard of A (the note that produces the highest CV OUT voltage), use the Adding Amp Ch-2 level knob to fine tune the pitch of synthesizer B so that it matches A.

3. Repeat steps (1) and (2) as necessary.

f) Using the ED102 as a modulation input for pitch bend and vibrato effects with an external control unit

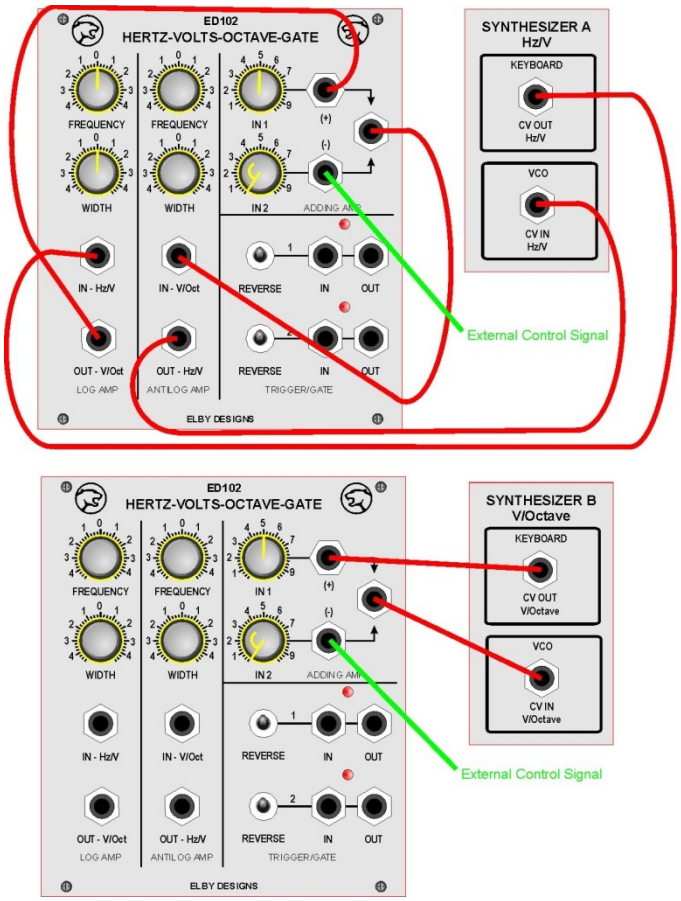


Figure 10

modulation inputs for pitch bend and vibrato effects Hz/V system [left side of figure]

1. Connect the Hz/V type synthesizer and ED102 as shown in the diagram on the left of figure 10.
2. Set the Log Amp controls as shown on the diagram. Set the Adding Amp Ch-2 level knob to "0".
3. Play the lowest note on the synthesizer keyboard and use the Adding Amp Ch-1 level knob and the Anti Log Amp Frequency knob to adjust the pitch to match some accurate reference, such as the Korg Tuning Trainer WT-10A or an electric organ.
4. Play the highest note on the keyboard and use the Anti Log Amp Width knob to adjust the pitch to match a reference tone, as in step (3).
5. Repeat steps (3) and (4) as necessary.
6. Use the Adding Amp Ch-2 level knob to adjust the strength of the effect you get when you operate the external control unit.

modulation inputs for pitch bend and vibrato effects V/OCT system [right side of figure]

1. Connect the OCT/V type synthesizer and ED102 as shown in the diagram.
2. Play the lowest note on the keyboard (the note that produces a CV OUT voltage of 0V) and use the tuning knobs on the synthesizer to adjust the pitch to match an accurate reference, such as the Korg Tuning Trainer WT-10A or an electric organ.
3. Play the highest note on the synthesizer keyboard (the note that produces the highest CV OUT voltage) and use the Adding Amp Ch-1 level knob and the Anti Log Amp Frequency knob to adjust the pitch to match your reference tone.
4. Use the Adding Amp Ch-2 level knob to adjust the effect you get when you operate the external control unit.