TURN IT ON!

Set the 500 on a flat surface. Unwrap the power cord and plug it into a 110 volt outlet. If your wall socket will not accept this plug, use a universally available 3 to 2 adapter. Do not cut the third prong off of the 500 power cord.

Turn on the power switch located near the fuse holder on the back of the 500. (If the fuse ever blows, only replace it with a 1/4 amp SLO BLO fuse.)

The 500 must be connected to a sound system to produce a sound. Three separate outputs are available for connecting the 500 to different sound systems.

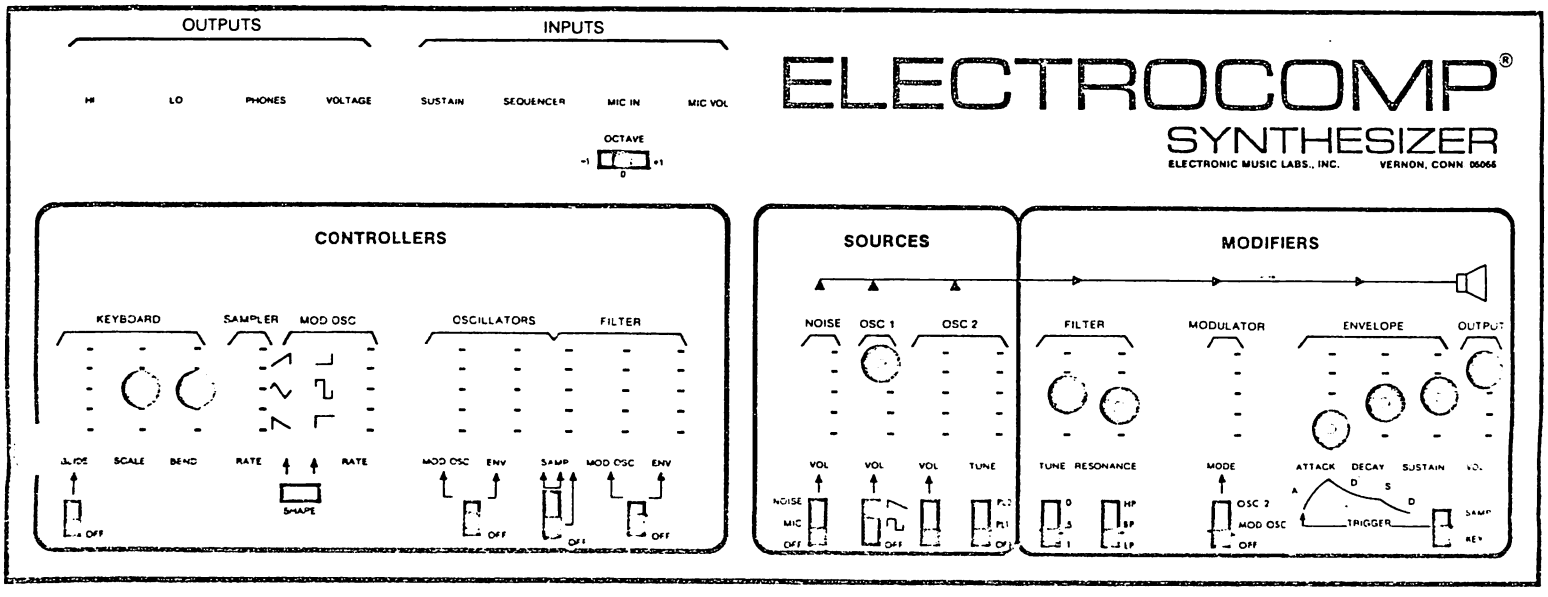
1. Hi Out. This output is used in connecting the 500 to stereo amplifiers, tape recorders, and organs. To complete this connection, take the phono to RCA patch cord. Place the phono end into the plug where it says Hi Out. Take the RCA pin end and plug it into your amplifier where it says Aux or Tape Mon.

2. Lo Out. This output is used for connecting the 500 to guitar type amplifiers and other electronic music amplifiers. This connection is made by taking a phono to phono patch cord. Plug one end into the 500 where the Lo Out is. Take the other end and plug it into the amplifier.

3. Phones. This output is for monitoring with high impedance headphones (500 ohms or greater).

When connecting the 500 to an amplifier be sure that the volume slide pot on the 500 is all the way down and the volume control on your amplifier is all the way off. This is to insure the safety of your speakers. The volume of the Hi and Lo Output jacks is controlled by the synthesizer's output Volume slide control. The output Volume slider does not vary the volume when monitoring the headphones. This permits you to monitor the 500 on stage without having the sound pass through your amplification system.

When the synthesizer is connected, set the controls as shown and turn up your amplifier to a desired level. Depress a key - you should hear a sound. If you don't, disconnect the 500 from the amplifier and monitor the 500 with headphones. If you hear a sound in the headphones, this indicates the problem is with your amplifier. If you still don't hear a sound, check and see if your controls are set as shown.



EXPLORING THE 500!

The first thing to do is to look over the panel. Notice there are three sections: Controllers, Sources, and Modifiers.

The Sources section is where pitches are produced and varied. There are three sources within the 500. Two are audio oscillators that produce pitched sounds. One is a noise source for producing percussive, sea, wind, and thunder effects.

This section also provides for introducing external sources through the synthesizer's microphone input.

Identify the sources and study their controls. Of the seven controls, three provide for selection, three control volume, and one controls tuning.

After being mixed, the Sources go to the Modifiers.

The Modifiers have the ability to vary the timbre and loudness of the sources.

The Filter changes the timbre or quality of the sound. It has three controls. The Tune control determines the brightness of the sound. The Resonance control determines the amount of emphasis. The Mode switch determines whether the high, low or combination frequencies will be emphasized.

The Modulator takes the output of the Filter and can reshape its loudness with tremolo or change its timbre by ring modulation.

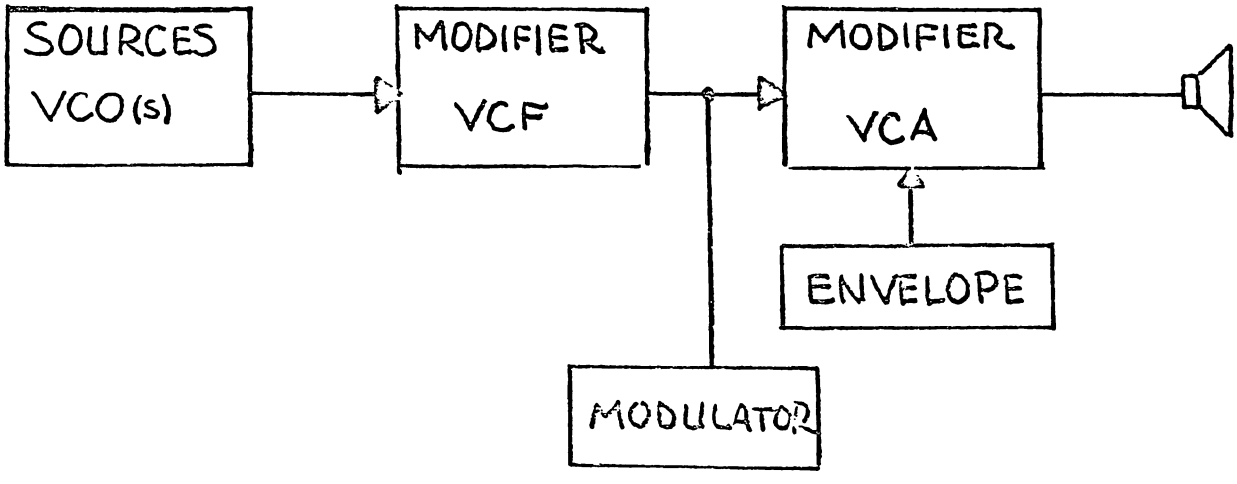
It has two controls. The slider determines the amount of modulation. The switch permits selection of the modulation source. The final modifier is the Amplifier. It modifies the loudness of the sound in partnership with the Envelope Generator. The Envelope Generator contains 4 controls.

The Attack slider determines how long it takes to reach maximum loudness after depressing a key (silence). The Decay control determines how long it takes to return silence.

The Sustain control determines how loud the sound is while the key is depressed after the attack and decay have settled out. The Volume control determines the maximum volume during an attack/decay/sustain cycle.

The switch determines whether an envelope occurs once for each key depression or repeats continuously. (The keyboard "remembers" the last key depressed.)

The path taken by the sound from the Sources through the Modifiers is called the audio path. It is blocked below.



Now that you are familiar with the controls in the audio path, we will go through them in detail.

The Controller section acts on the Audio path and determines what kind and how much of a change will occur in the audio path. It is necessary to use one of the Controllers - the Keyboard. This is necessary because the Keyboard tells the Oscillators what pitch to produce, the Filter "where to" filter, and tells the Envelope Generator to start its attack, decay, sustain function.

OSCILLATORS.

The Oscillators produce pitches that correspond to the keys on the Keyboard.

When a key is depressed, it sends out a voltage which goes to the Oscillator. The Oscillator reads the voltage and produces the corresponding pitch for that key depressed.

This ability gives the synthesizer Oscillators a special name - Voltage Controlled Oscillators. This means that the pitch of the Oscillator will respond to a change in voltage with a corresponding change in pitch.

When a varying voltage is applied to the Voltage Controlled Oscillator, a varying pitch is produced. This will be apparent in the Controller section of the synthesizer.

The 500 contains two Voltage Controlled Oscillators (VCO). These oscillators produce pitches in the audio range - that is, when

connected to speakers they cause the air to move fast enough to be heard. Both Oscillators have volume controls. These sliders can be preset. The switches located below them permit selection of the preset volume levels.

These switches also permit you to select one of two different waveforms - either square  or sawtooth 
These waveforms sound different from each other because their harmonic structures (timbres) are different. Their pitches and loudness are equal.

To this point, you have been listening to only Oscillator 1. Now turn on Oscillator 2 to its square wave.

The Oscillators produce pitches proportional to the lowest key being depressed. Oscillator 2's pitch is normally different from Oscillator 1. This is because Oscillator 2 has a separate Tune slider located next to its Volume slider. This control permits its pitch to be transposed above or below Oscillator 1.

You should hear them beating. The number of beats tells you how flat or sharp they are tuned. When they are in tune, you will not hear any beating. (See Phase Locking in the back of the manual.)

Oscillator 2's Tune slider allows you to tune these oscillators to any musical or non-musical interval.

Move the Tune slider slowly while depressing a key. Experiment with the two Voltage Controlled Oscillators. Select different waveforms for the two. Notice how the sound changes. Don't

hesitate to mark some of the interesting positions of the Tune slider on a facsimile sheet for future reference.

THE NOISE SOURCE.

Turn your two VCO's off. Turn on the Noise and raise its Volume slider. Like the VCO's, the Noise volume can be preset and selected with the switch located below it.

When a key is depressed, you will hear a constant hissing. This is called Noise - it is like listening to a 1000 oscillators all tuned at random. It is used for creating percussive, wind, sea and thunder effects. Achieving these effects will be covered in the Modifier and Controller sections.

As you know, sounds that don't vary are not usually considered musically interesting. Therefore, the major part of your synthesizer - the Modifiers and Controllers - are dedicated to producing variations in the sound.

The Controllers determine the amount of variation that occurs in the pitch, timbre and/or loudness.

The variations in pitch actually occur in the Oscillators. The variations in timbre and loudness occur in the Modifiers.

So far, you have learned about the Keyboard and Sources (Oscillators and Noise). Now we'll go to the next step in the audio path - the Filters.

THE FILTERS.

The Filters in the 500 are Voltage Controlled Filters (VCF). Their job is to permit variations in timbre. They do this by modifying the waveshapes of the Sources, particularly the Oscillators.

This should not be a surprise. You are already aware that changing the waveform from square to sawtooth changes the timbre. Simply, different waveshapes produce different timbres. Your Filter works with the Source's basic timbre and has an ability to alter these basic waveshapes to produce different timbres.

These changes can be of two varieties, either 1) manual change by moving a switch or slider or 2) automatic change as commanded by the Controller section.

This is identical to the way the pitch of Oscillator 2 can be changed - manually by moving its Tune slider or automatically from the Controller section.

The Filter contains three controls for manual changes in timbre. They warrant extensive exploration with various sources. Begin with Oscillator 1's sawtooth.

The Filter's Tune slider permits you to brighten or dull the sound. The higher it goes, the brighter the sound.

Depress a key and move this control up and down. Repeat this

process varying the speed and the position of its companion control - the Resonance slider.

Often when the Resonance slider is moved up, it is necessary to increase the volume of the selected Source because the Filter has eliminated most of the overtones except for those located near the pitch set by the Filter's Tune slider.

Using these controls you should be able to produce excellent wah-wah effects.

When performing, don't hesitate to manually effect the sound with these controls or any other, even after you are familiar with automatic control of the synthesizer.

Experiment freely with the Filter. One thing you shouldn't miss is to set the Resonance up full. Depress a key and slowly move the Tune slider up and down. You are hearing the individual harmonics of this basic sawtooth waveshape. (Harmonics will be covered in a separate technical publication.)

Below the Resonance control is a switch which lets you select any of the synthesizer's three Filters. Set the Filter's Tune and Resonance controls about 1/3 of the way up. Move the Filter's mode switch between its three positions. Try this with other settings of Tune and Resonance.

After experimenting with the Oscillators, try the same with the Noise source.

TUNING THE EML 500 KEYBOARD SYNTHESIZER

The EML 500 synthesizer should be turned on 20 to 25 minutes before tuning is done. (Warm up.)

1. All Controllers must be off.
2. Octave switch must be in center position (0 octave).
3. Oscillator 1 - On.
   Oscillator 2 - Off.
4. Depress bottom key and adjust Bend pot for correct pitch (87.3 Hz).
5. Depress top key and adjust Scale pot for correct pitch (1046.5 Hz).

This completes tuning for Oscillator 1. Oscillator 2 tuning should be done with Phase Lock Switch in Off position. Turn on Oscillators 1 and 2, depress the top key and adjust Oscillator 2, Tune for desired interval (unison, third, fourth, fifth, etc.).

EXPLANATION OF BEND AND SCALE CONTROLS.

SCALE: This control varies the interval between keys, and swivels about the bottom key. It is used for tuning purposes only and should not be used as a "Bend" while playing.

BEND: This control transposes the entire keyboard up or down about 6 semitones without affecting the interval between keys. It is used for tuning and may also be used to "Bend" pitches while playing.

NEW FEATURES

For the patches descirbed to this point, the Phase Lock switch located under OSC 2's Tune control can be in any position; the Tracking switch located under the Filter's Tune control should be in the uppermost position (1).

PHASE LOCK SWITCH

The addition of Phase Lock to the 500 musically expands the effectiveness of the MODULATOR, enables more realistic guitar and piano synthesis, and permits perfect tuning of the two audio oscillators to traditional musical intervals.

A switch for selecting Phase Lock is located under OSC 2's Tune control. It is a three position switch. In its lowermost position, Phase Lock is off. This permits you to adjust the two audio oscillators to slow beating.

PL 1 or the middle position permits "weak" locking. PL 2 or the uppermost position is a "strong lock.

Experiment with moving OSC 2's Tune control with Phase Lock. You should find it particularly easy to adjust the two audio oscillators to various musical intervals. (Both OSC 1 and OSC 2 should be on during this experimentation).

Other interesting effects can be achieved by using Phase Lock on OSC 2 while using the 500's MODULATOR. Experiment with the MODULATOR, using OSC 1 as a source oscillator and OSC 2 as "the modulating oscillator". Move the OSC 2's Tune control to acheive different effects.

FILTER TRACK SWITCH

Musically the addition of variable FILTER tracking permits more realistic synthesis of some instrumental sounds. This is accomplished with a switch located under the FILTER TUNE CONTROL which permits the FILTER to track the keyboard three different ways.

In it's lowermost position (1), the FILTER follows the KEYBOARD exactly resulting in constant timbre across the keyboard.

In its upper position (0), the FILTER does not move with the KEYBOARD, but rather behaves like a fixed filter similar to the bass and treble controls on an amplifier. If the Resonance control is not set "up" at its maximum, this is a useful position for some instrumental sounds.

Experiment with patches provided on the proceeding pages. (Since the FILTER does not track the keyboard in this position, adjustment of the FILTER'S TUNE CONTROL may be necessary for proper voicing of these patches).

In the middle position (.5), the FILTER partially tracks the KEYBOARD. Repeat your previous experimentation with the FILTER tracking switch in this position.

WAVESHAPES AND HARMONICS

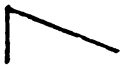
The sine wave -  is pure, it has no harmonics. The frequency (or rate of vibration) of the sine will determine its pitch. If it is vibrating very fast, say 2000 cycles per second, the pitch is high. If it vibrates slow - 40 cycles per second, the pitch is low. Since the sine is pure, the pitch we hear we identify as the fundamental (f_1). A sine wave is like a flute in tonal quality.

Other waveshapes are actually a group or series of sine waves combined together. The particular series of sine waves will determine the tonal quality of the sound. In the series, the fundamental sine wave which is the strongest - the loudest - in series determines the pitch. The remaining sine waves which are weaker than the fundamental give the sound its "quality", its timbre. The frequencies of these sine waves are whole number multiples of the fundamental, hence they do not "beat". They are called harmonics. For example, a sound having a fundamental sine wave of 100 Hz may have possible harmonics of 200 Hz, 300 Hz, 400 Hz, 500 Hz, and so on.

The basic waveshapes are:  sine which has no harmonics, just the fundamental (f_1). The  triangle wave is made up of the fundamental (f_1) and all of the odd numbered harmonics (f_3, f_5, f_7, f_9, f_{11},....). The harmonics of the triangle are very, very weak. The quality of the triangle is similar to that of a recorder.

The  square wave contains the fundamental (f_1) and like the triangle wave all of the odd numbered harmonics (f_3, f_5, f_7, f_9, f_{11},....). The difference being the harmonics of the square wave are much stronger and louder. (NOTE: Bar Graph)

The square wave is like a clarinet in quality.

The  sawtooth wave shape consists of the fundamental (f_1) plus all of the odd and even harmonics (f_2, f_3, f_4, f_5, f_6, f_7, f_8,....). It is the richest wave shape. Its timbre is similar to brass and string instruments (tonal quality for brass and strings is determined by the filter mode).

FILTER: TUNE, RESONANCE & MODE

The filter, as mentioned before, selects which harmonic(s) will be emphasized and which will be attenuated. The tune control will "move" the filter to "pinpoint" a specific harmonic. The resonance control will determine how that "tuned-to" harmonic will be emphasized. The mode will select what filter (low pass, band pass, or high pass) is operating and hence what other harmonics, if any, will be allowed to be passed (heard). (NOTE: Graphs)

Instruments are like pre-set synthesizers, they all have oscillators, filter, and amplifiers controlled by envelopes. For example - a violin: the strings are the oscillators, the box and its resonant characteristics determine the filter; the bow and the violinist control the envelope or loudness pattern. In a horn, the air the player blows into the instrument is the oscillator, the tube and bell determine the filtering and how he blows into the instrument determines the loudness pattern.

For help in synthesizing instruments we have generally indicated the filter modes for many of the orchestras instruments.

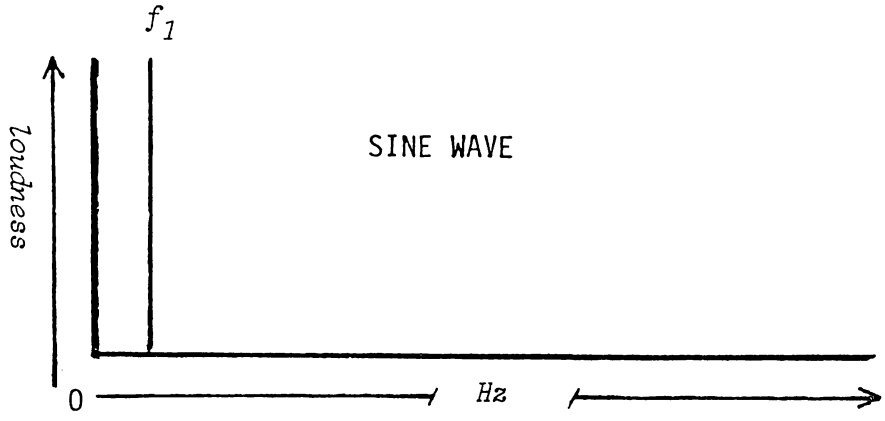
LOW PASS: wood winds, brass, bass, drums, bass end of the piano, organ and cellos.

BAND PASS: brass, treble end of the piano, violas, harpsicord and celeste

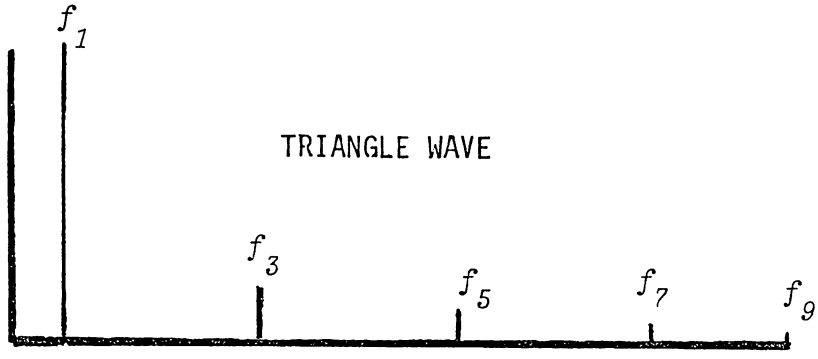
HIGH PASS: violins, harps and bells

WAVESHAPE and HARMONICS

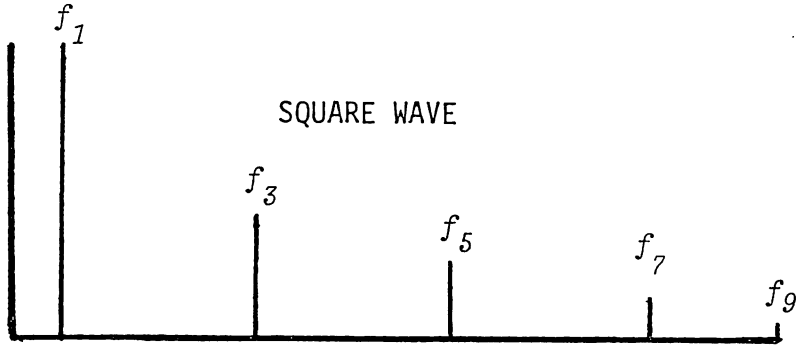
1.



2.



3.



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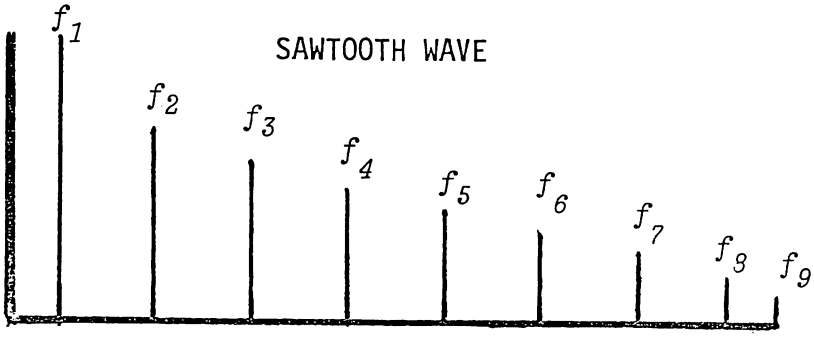
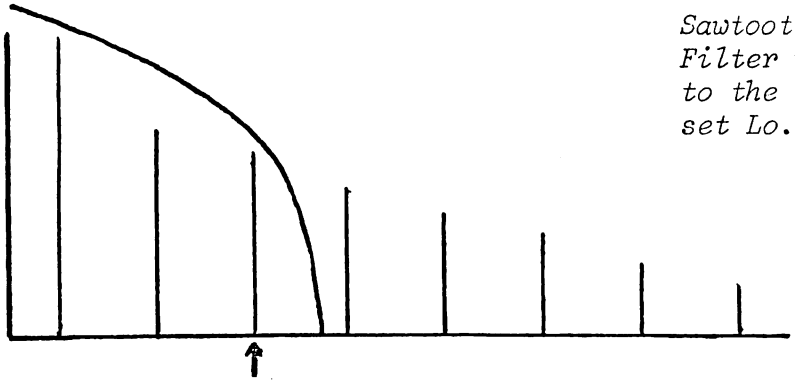
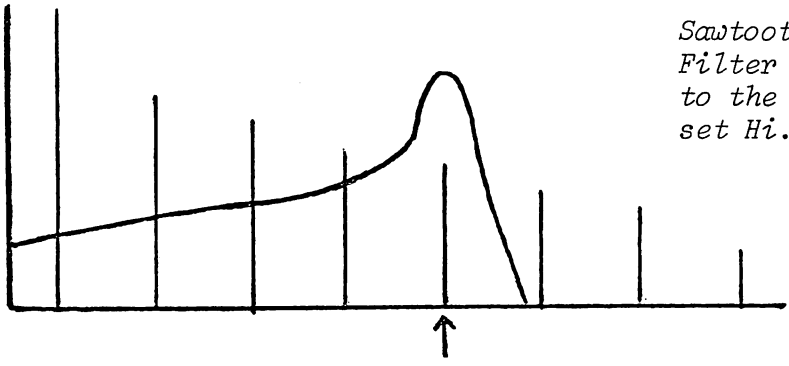


A.



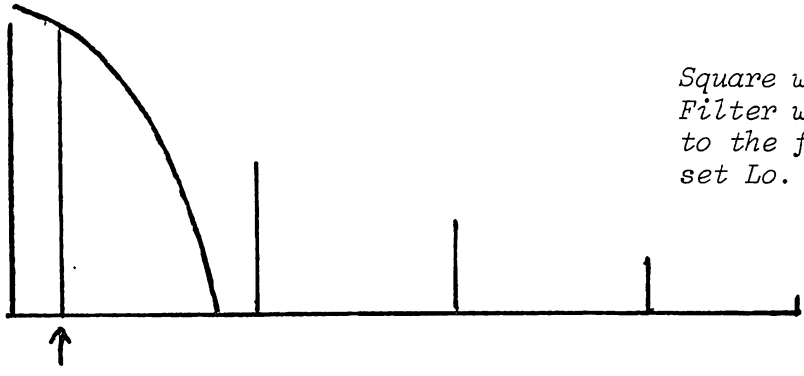
Sawtooth wave into a Low Pass Filter with the Filter "tuned" to the 3rd harmonic, Resonance set Lo.

B.



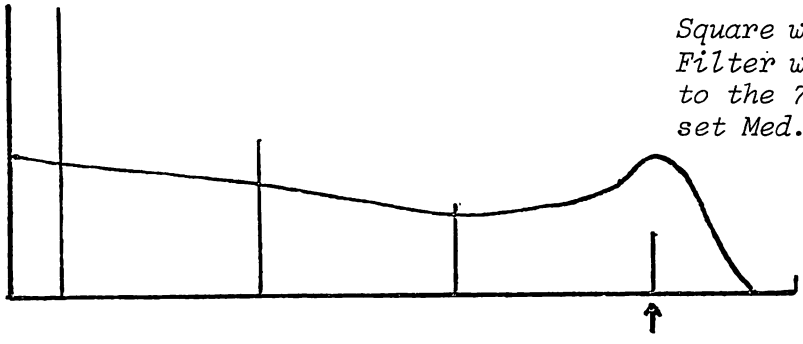
Sawtooth wave into a Low Pass Filter with the Filter "tuned" to the 5th harmonic, Resonance set Hi.

C.



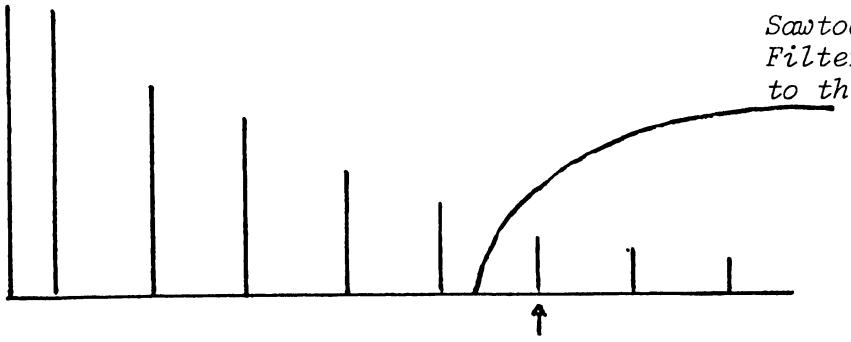
Square wave into a Low Pass Filter with the Filter "tuned" to the fundamental, Resonance set Lo.

D.



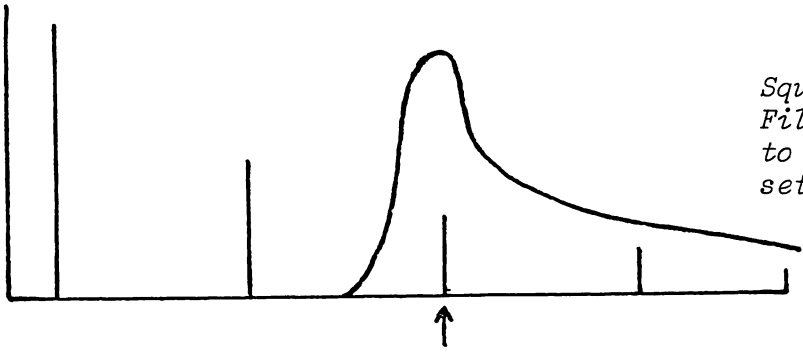
Square wave into a Low Pass Filter with the Filter "tuned" to the 7th harmonic, Resonance set Med.

E.



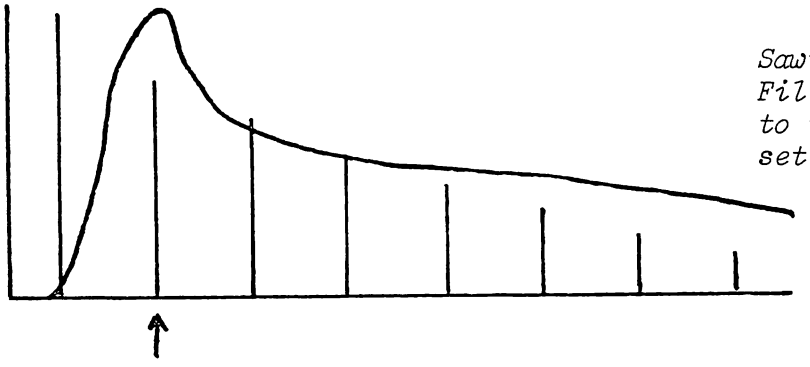
Sawtooth wave into a Hi Pass Filter with the Filter "tuned" to the 6th harmonic, Resonance set Lo.

F.



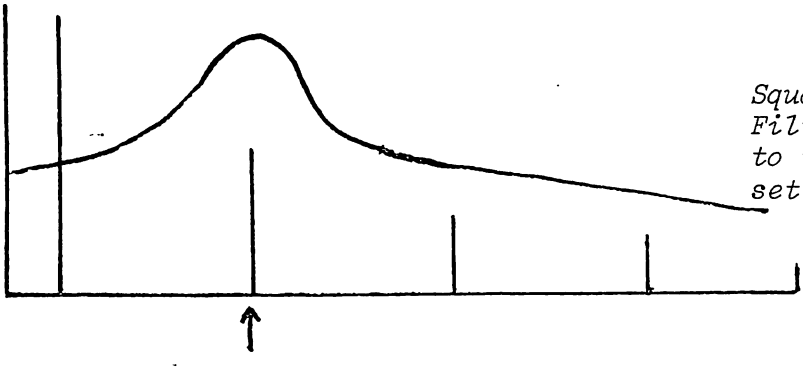
Square wave into a Hi Pass Filter with the Filter "tuned" to the 5th harmonic, Resonance set Hi.

G.



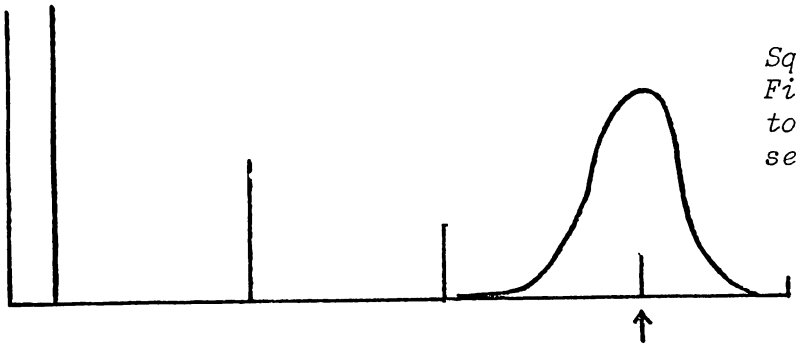
Sawtooth wave into a Hi Pass Filter with the Filter "tuned" to the 2nd harmonic, Resonance set Med.

H.



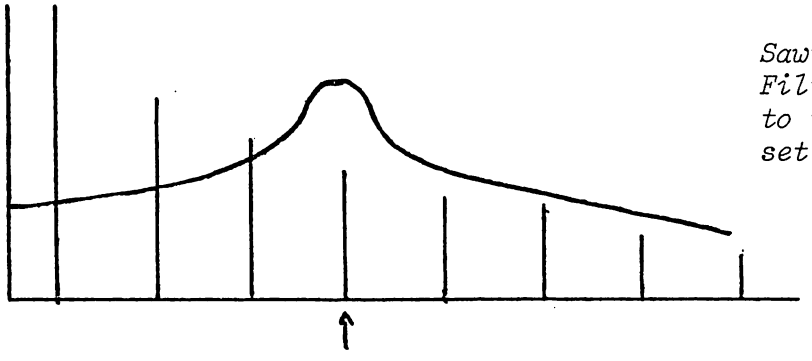
Square wave into a Band Pass Filter with the Filter "tuned" to the 3rd harmonic, Resonance set Lo.

I.



Square wave into a Band Pass Filter with the Filter "tuned" to the 7th harmonic, Resonance set Hi.

J.



Sawtooth wave into a Band Pass Filter with the Filter "tuned" to the 4th harmonic, Resonance set Med.

Before continuing to the next modifier, read the following and consider it in the context of your experimenting. Please go back and reconsider the Filter in this light.

LO PASS FILTER.

The Lo Pass Filter lets you hear all the overtones below its Tune slider's setting. In general, this is a duller, heavier sound than any of the other Filter modes. If this control is set too low, the signal will be very weak. Normally the Tune control in this mode is set at least 1/4 of the way up or higher.

HIGH PASS FILTER.

The Hi Pass Filter lets you hear all the overtones above its Tune slider's setting. In general, this is a brighter, buzzier sharp sound than any of the other Filter modes. If this control is set too high, the signal will be weak because the higher overtones don't have much strength. Normally this control is set 1/4 of the way down or lower.

BAND PASS FILTER.

The Band Pass Filter lets you hear all the overtones around its Tune slider's setting. In general this sound is like a combination of Hi Pass and Lo Pass - dull, but brighter than Lo Pass.

When the Resonance slider is at or near the top these three modes sound very similar.

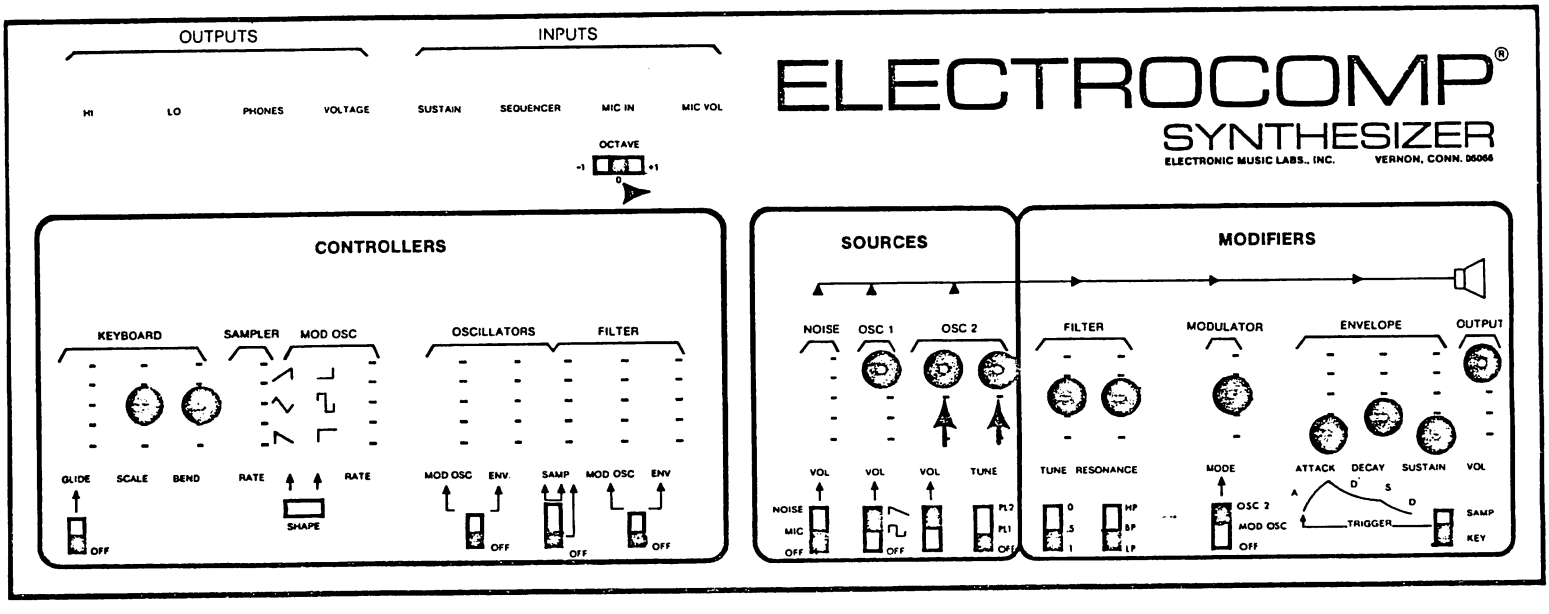
From the filter, the audio path continues through the Modulator.

THE MODULATOR.

The Modulator can be used to vary the timbre of the sound or the loudness of the sound. Whether timbre or loudness is to be controlled is determined by the position of the Modulator's slider and switch.

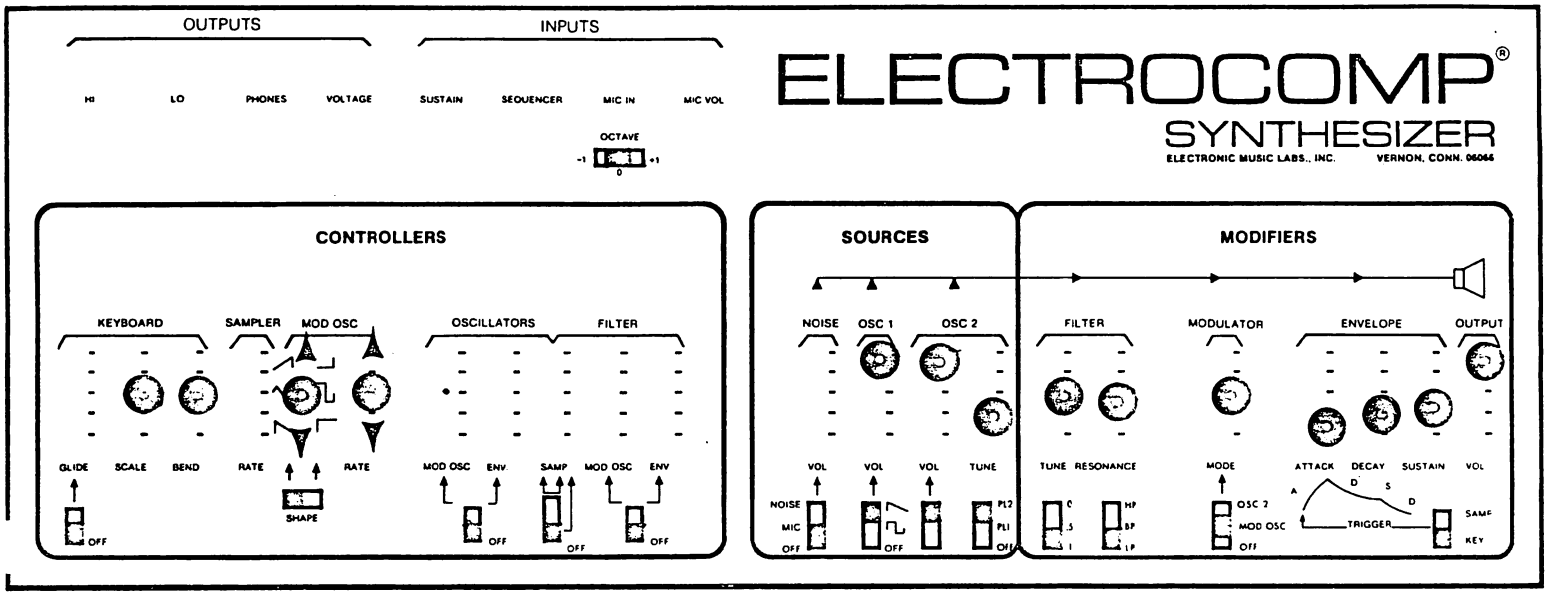
The slider permits you to preset the type of modulation. The switch permits you to select the source of modulation - either Oscillator 2 or the Modulation Oscillator.

The settings shown below illustrate various forms of loudness and timbre controls possible with the Modulator. Play a bit. Don't hesitate to vary the sliders marked with arrows as you play.



RING MODULATION

AMPLITUDE MODULATION

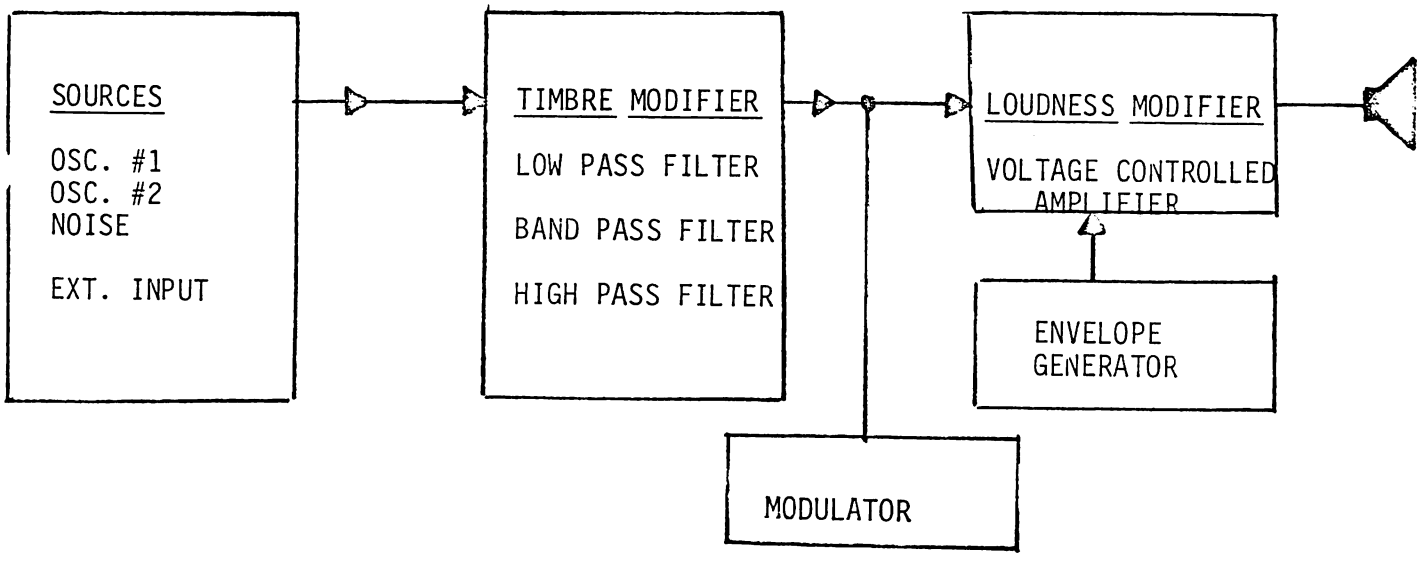


From the Modulator the audio path continues through the Voltage Controlled Amplifier (VCA). This device is not shown on the front panel, but is inside your synthesizer. It is the primary way you have of controlling loudness.

Instead of showing it on the front panel, the part of the synthesizer that controls the VCA is shown - the Envelope Generator.

The Envelope Generator is actually one of the three principal controllers of the 500.

It fits into the audio path as shown below.



AUDIO PATH

ENVELOPE GENERATOR/VOLTAGE CONTROLLED AMPLIFIER.

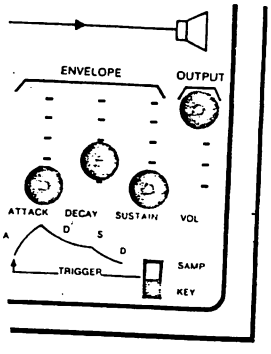
The envelope Generator produces a varying voltage with each key depression. This voltage is used to control the loudness of

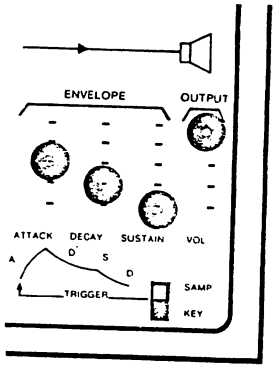
the sound coming from the Sources through the previous modifiers.

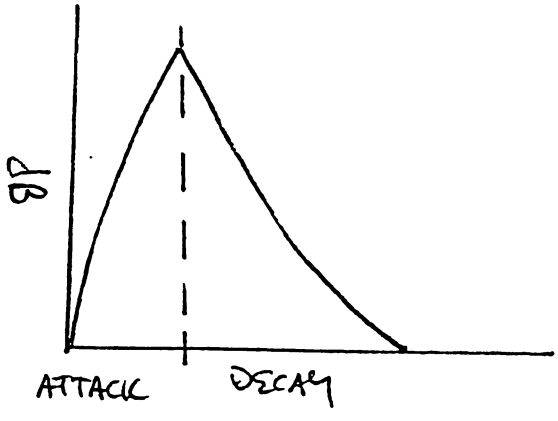
Three controls are provided to permit you to determine the shape of this varying voltage called an Envelope.

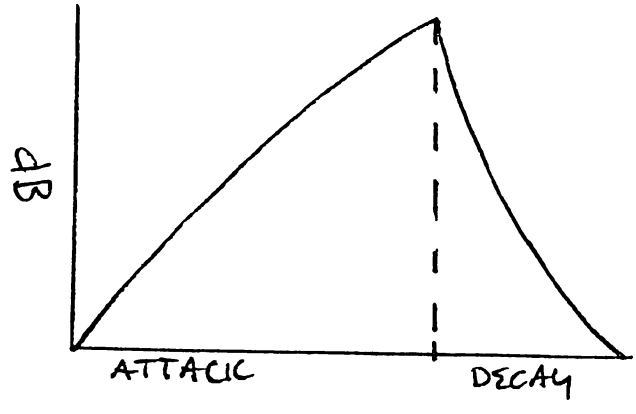
The Attack slider determines how long it will take for the voltage to achieve its maximum size. This is variable from an instant to many seconds.

Set the 500 as shown below and depress a key. Notice that the sound reaches its maximum loudness instantly.







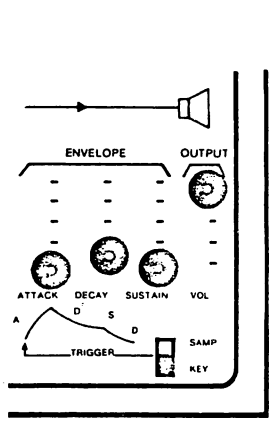


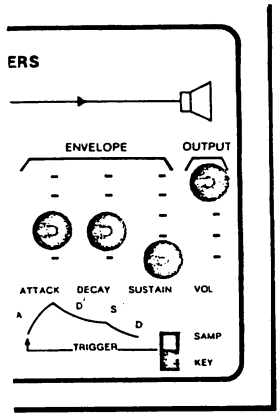
Increase the Attack. Depress another key. Notice how the loudness gradually increases to its maximum.

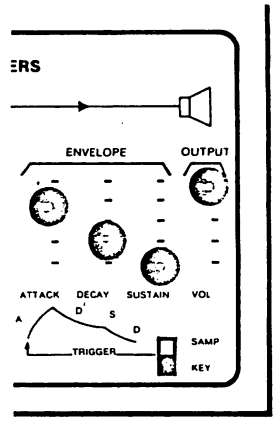
The Decay slider determines how long it takes for the voltage to return to its starting point after key release (silence).

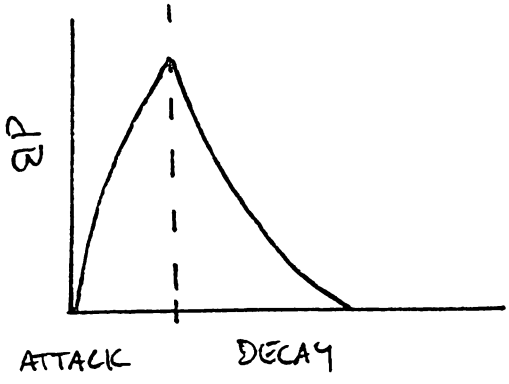
Increase the Decay. Try various settings. Don't hesitate to return the Attack to zero.

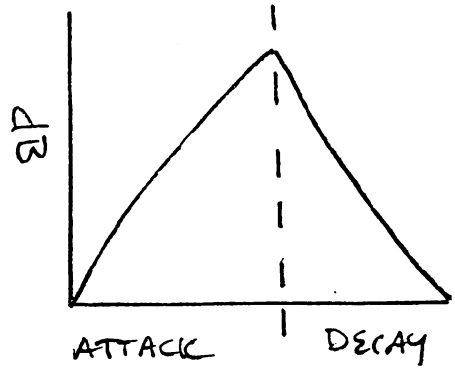
Below are drawings describing some of the voltages you are hearing the effects of.

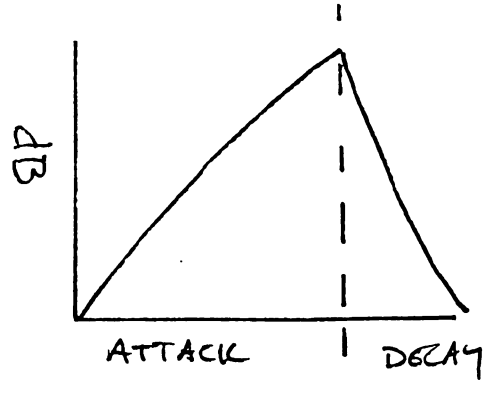








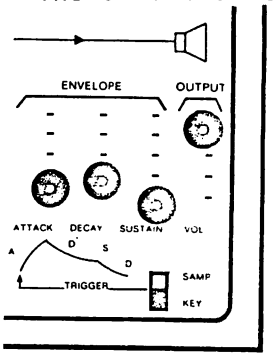


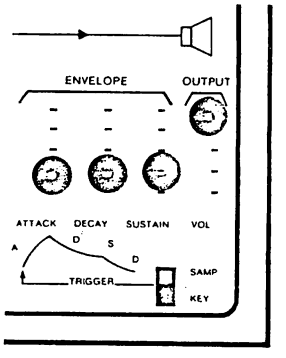


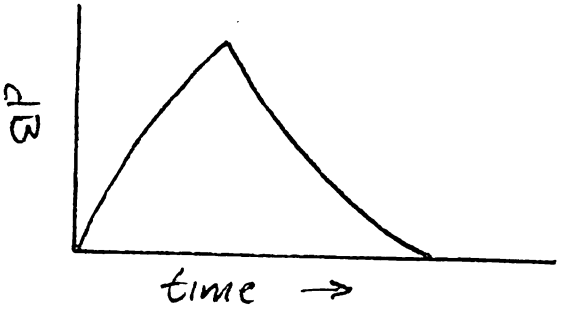
The Sustain slider has been set at maximum, reduce it to about halfway. Set the attack to zero and the Decay about halfway. Depress a key and hold. Listen.

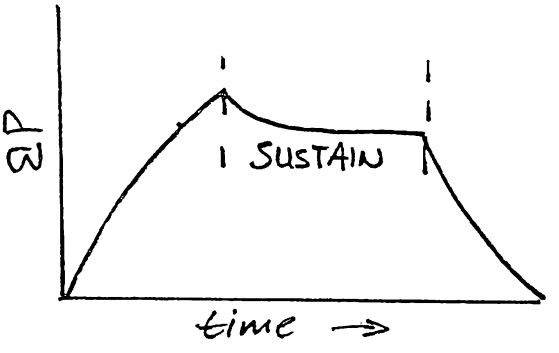
What's happening is this - with the Sustain set halfway the Envelope attack to its maximum then decays to the sustain level and remains there until the key is released. When the key is released it continues its decay. If the Sustain is set to zero, the Envelope will attack to maximum and return to its starting point regardless of how long the key is depressed.

The effect of the Sustain slider is shown below.







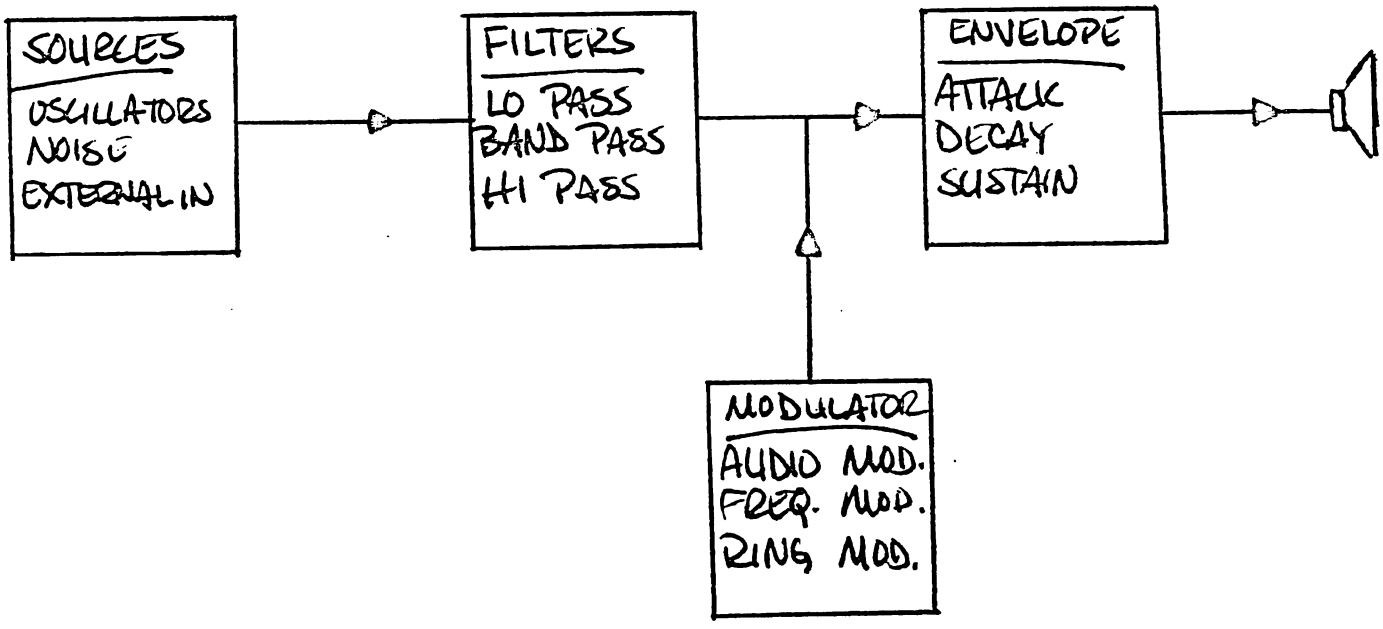


The Volume slider controls the output volume. Below the Volume slider is a switch which permits the Envleope to be triggered automatically instead of manually. Of course, the Envelope is triggered manually by the Keyboard. It is triggered automatically at the Sampling rate.

Take your hands off the keyboard. Push this switch up. Listen. You should hear the Envelope being triggered at a speed determined

by the Sampler's Rate slider. This slider is located in the Controller section.

Keeping the Attack short and the Decay less than a 1/4, slowly vary the Sampler's Rate slider. Note that the Envelope Generator's trigger switch permits you to select a preset Sampler Rate. This completes our investigation of the audio path. Here's what we have covered.



Let's move on to the Controllers.

CONTROLLERS.

The Controller section of the synthesizer is the most important. It primarily provides for automatic control of pitch and timbre. It accomplishes its control function primarily through voltage control. Voltage Control means that if a varying voltage is applied to the Oscillators (the pitch sources), the Filters (the timbre modifiers), or the Amplifier (loudness modifier) the pitch, timbre or loudness will vary correspondingly. Simply, varying voltage can produce varying pitch, timbre or loudness.

An example of this is the Envelope controlling the loudness of sounds that passed through the Voltage Controlled Amplifier (VCA).

However, the Envelope is not the only source of control voltage within the 500. There are three others.

1. Keyboard
2. Modulation Oscillator
3. Sampler

KEYBOARD.

Depressing a key sends a control voltage to the Oscillators. Normally this voltage causes the Oscillators to instantly change pitch.

There is an alternative to this instantaneous change in pitch that we've come to expect on pianos and organs. The alternative

is called Glide or portamento.

GLIDE.

There are two Glide controls. The slider permits you to preset the amount of Glide; the switch permits you to select Glide. The time required to Glide between any two keys is determined by two factors:

1. The position of the Glide slider.
2. The distance between successive keys.

Hold down a key; depress a lower key. Trill that lower key. Try different settings of Glide.

INTERVAL.

The Interval slider is used to adjust the 500 to semitone scales. It has been set at the factory to be in tune when set halfway.

Once you have adjusted this control for perfect octavation, it will rarely require further adjustment.

BEND.

Once the octavation is set, the Bend slider may be used to tune the 500 to other instruments. This control permits transposition by 6 semitones. It also may be used to produce manual vibratos and pitch bending.

OCTAVE TRANSPOSE.

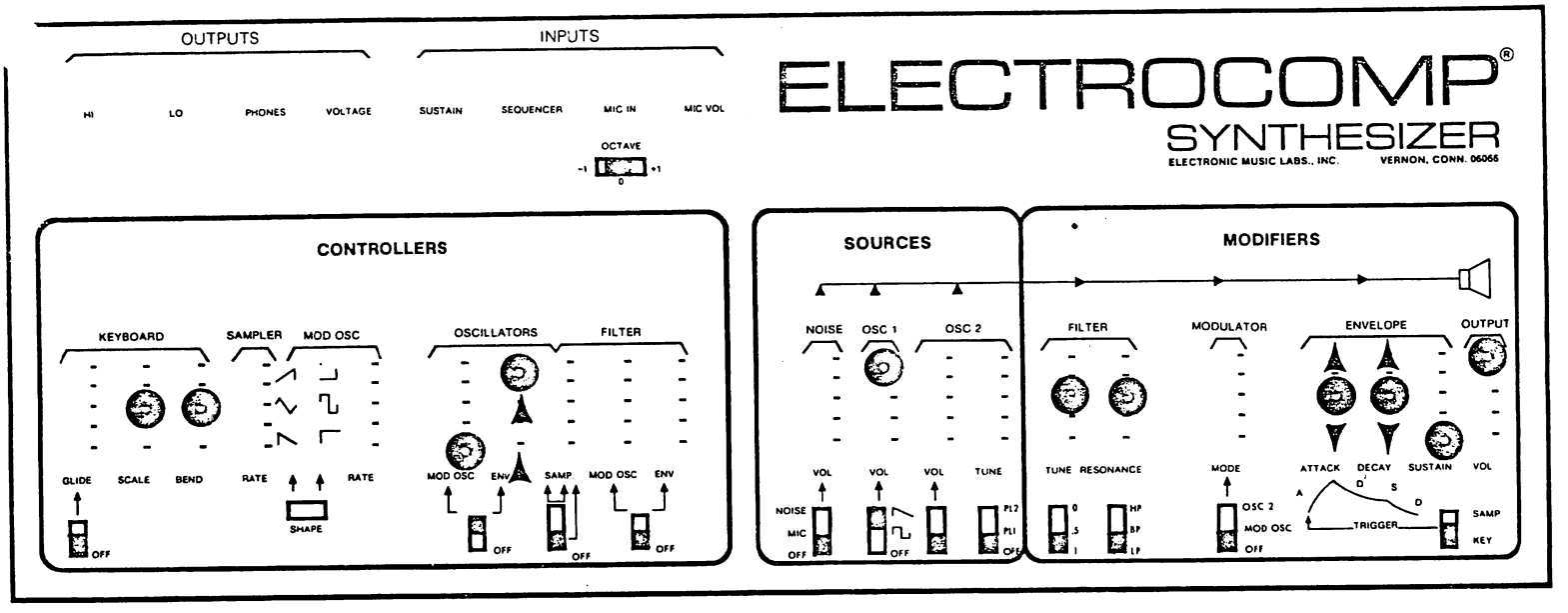
This switch permits the Keyboard to be transposed up or down by one octave.

The Glide, Interval, Bend and Octave controls all effect the Keyboard voltage.

The Keyboard is normally responsible for generating a second control voltage. When a key is depressed the Keyboard triggers the Envelope. This Envelope can be used to control the Oscillators and Filters in a similar fashion to the way it controlled the Amplifier. We will now use the Envelope to control pitch and timbre.

ENVELOPE CONTROL OF PITCH.

Set the 500 as shown below. Depress a key. Release it. Wait. Depress it again.



You should have heard Oscillator 1's pitch increasing and decreasing at the same time the loudness increased and decreased. This is the result of applying the same Envelope to both the Oscillator 1 and the Amplifier. The amount of variation in pitch

is determined by the Envelope slider located in the Vibrato (Oscillator) section of the Controller section.

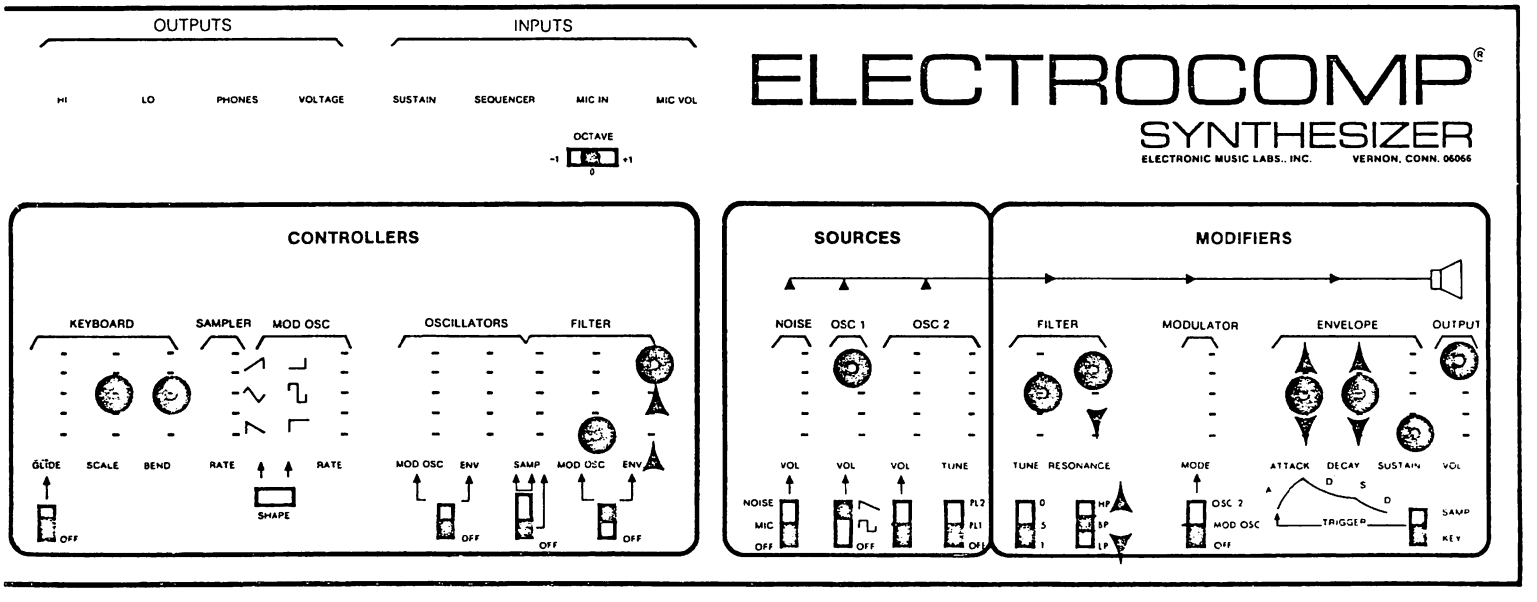
The Vibrato (Oscillator) section is responsible for automatic changes in pitch. Anything preset here can be selected by the Vibrato sections switch.

Experiment with different settings of the Envelope's Attack, Decay and Sustain sliders. Try to understand the relationship between pitch change and Envelope settings. The less envelope voltage you apply the less pitch change that occurs; the more applied the greater the change.

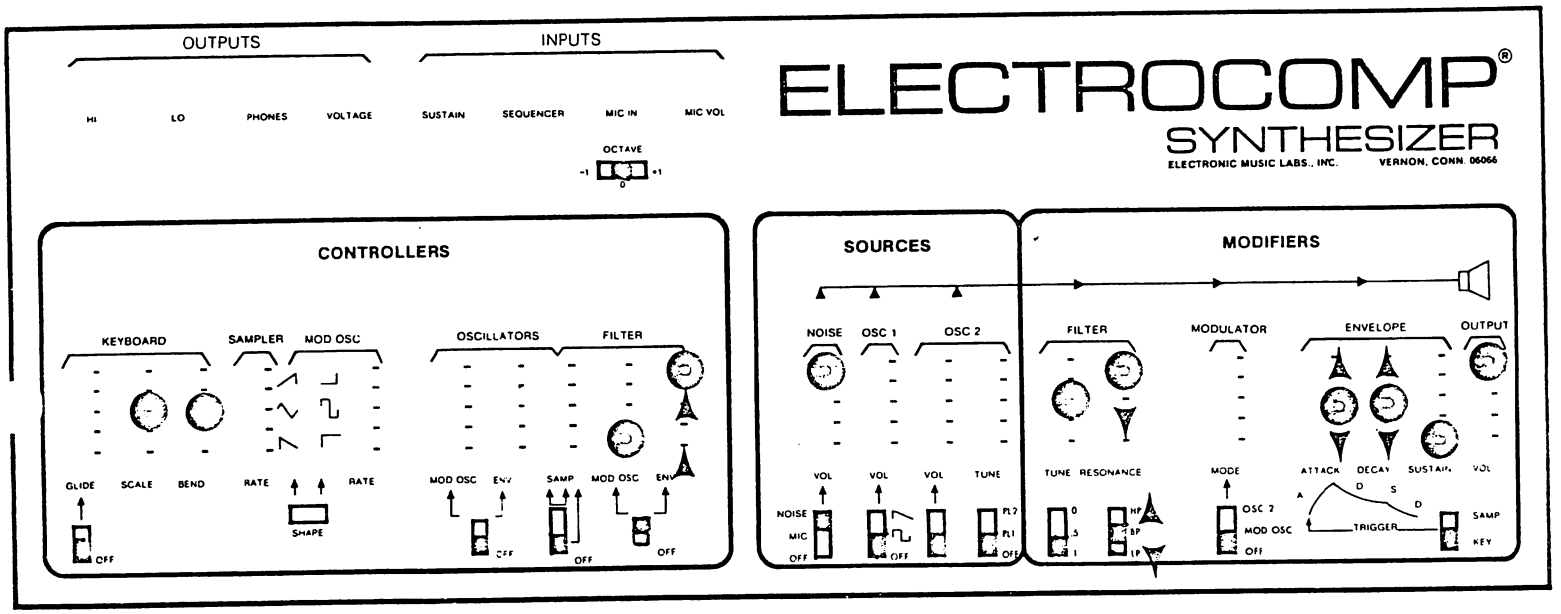
Experiment with different amounts of Envelope on Oscillator 1. Turn on Oscillator 2 and control both Oscillators at once.

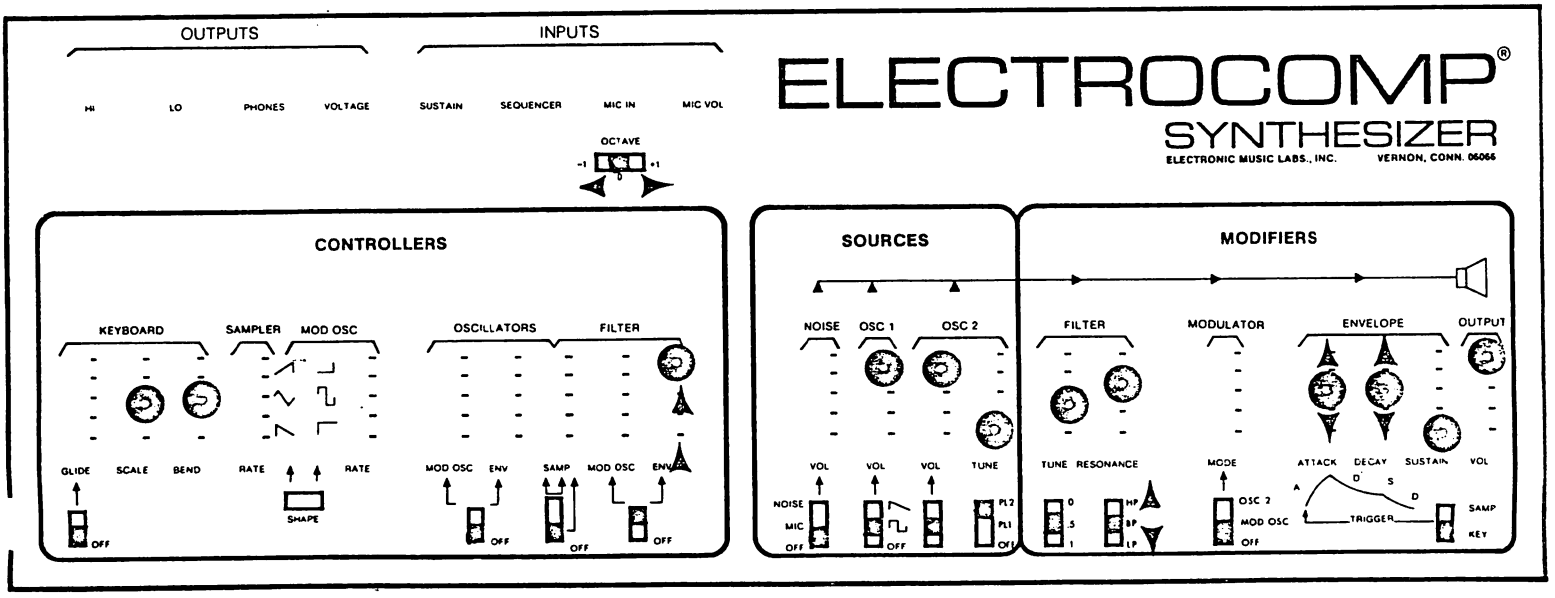
ENVELOPE CONTROL OF TIMBRE.

The the 500 as shown below. Depress a key. Release it. Depress it again. Hear the sound get brighter and then duller.



This is the result of applying the Envelope to the Filter. The amount of variation is timbre that the Envelope produces is set by the Envelope slider located in the Timbre (Filter) section of the Controller. The Timbre (Filter) is responsible for automatic changes in timbre. Anything preset here can be selected by the Timbre's switch. Experiment with the settings shown below.



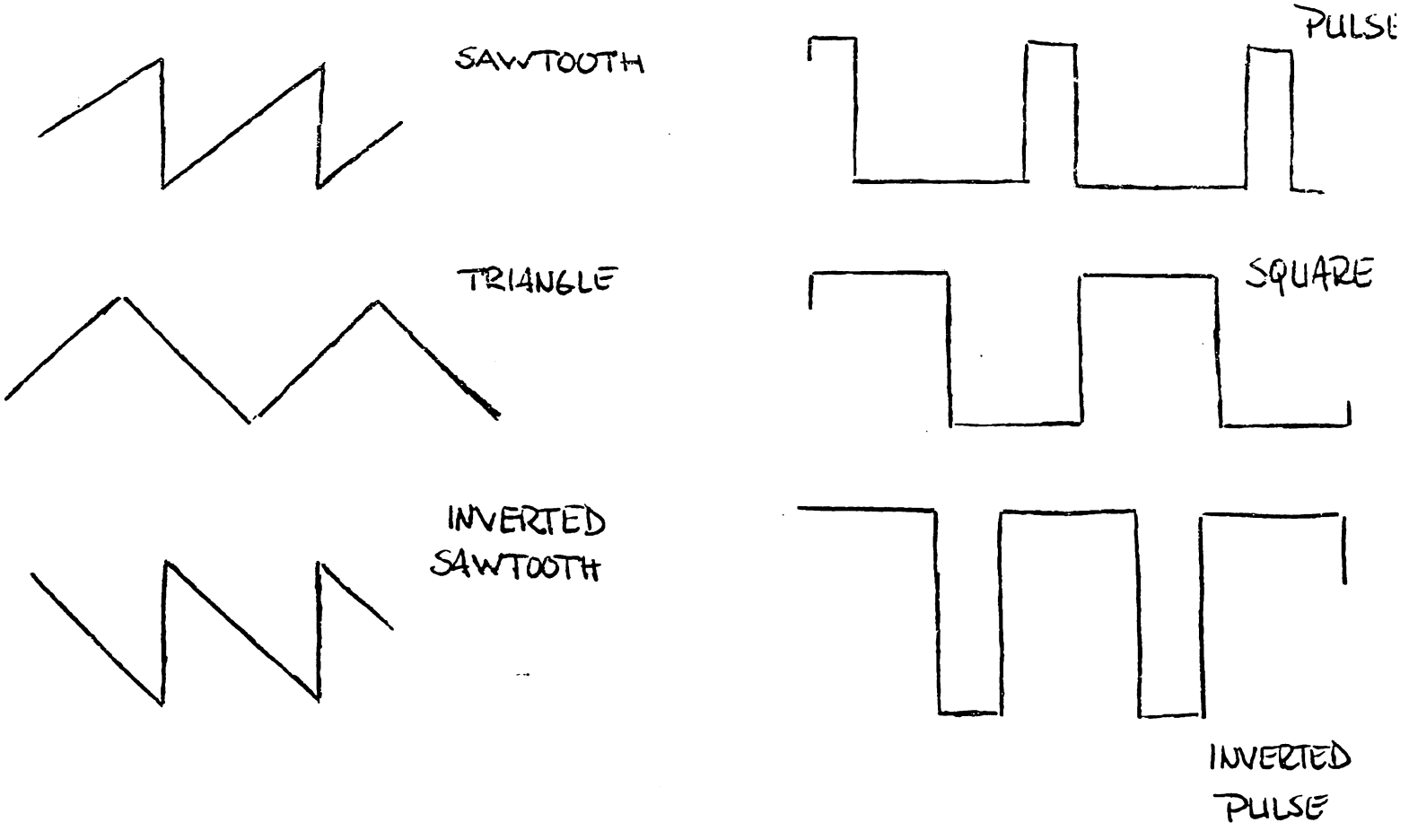


The Keyboard and Envelope control voltages occur once for each key depression. They differ from the Sampler and Modulation Oscillator which repeat a number of times during a key depression.

THE MODULATION OSCILLATOR.

The Modulation Oscillator produces a varying voltage that repeats. The shape and speed of this varying voltage can be preset and then selected to control the Oscillators, Filters and Modulator.

The shape of the varying voltage is determined by two controls - the shape slider and switch. These controls produce six easily attainable obtainable waveshapes.



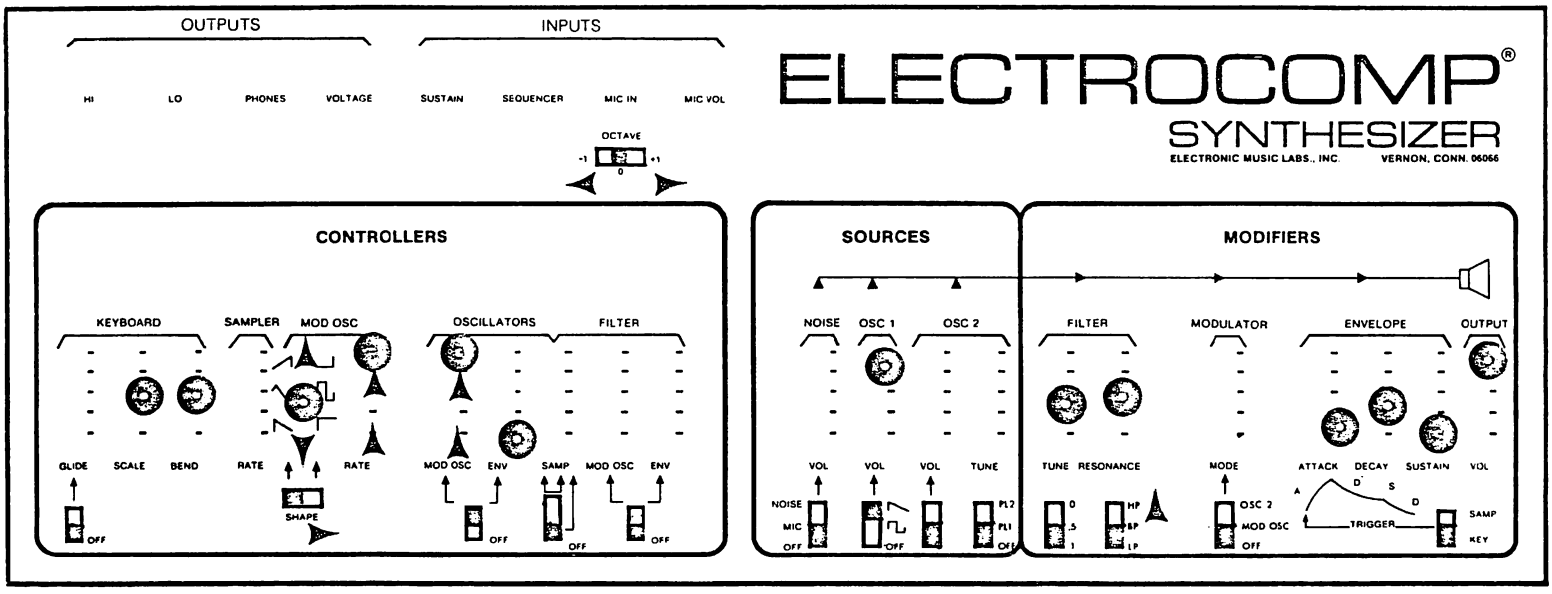
The slider provides for continuous variation from sawtooth through triangle to inverted sawtooth if the shape switch is to the left.

The slider also provides for continuous variation from pulse through square to inverted pulse when the shape switch is to the right.

The speed of repitition of the Modulation Oscillator and the effects it controls is set with its Frequency slider. This slider can be adjusted over a 1000 to 1 range. Anything from very slow vibratos to high speed (frequency modulation) is possible.

MODULATION OSCILLATOR CONTROL OF PITCH.

Set the synthesizer as shown below. Depress a key.



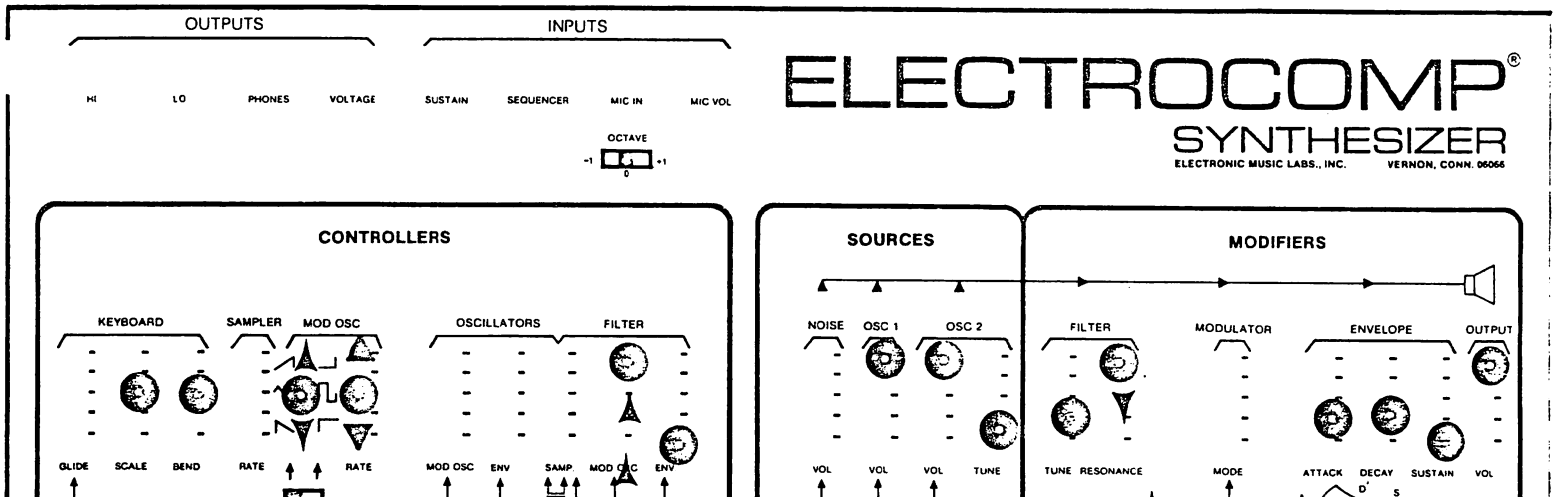
You should hear Oscillator 1's pitch varying slowly. Adjust the speed with the MOD. OSC. Frequency slider. Adjust the amount of pitch change with the MOD. OSC. slider in the located Vibrato (Oscillator).

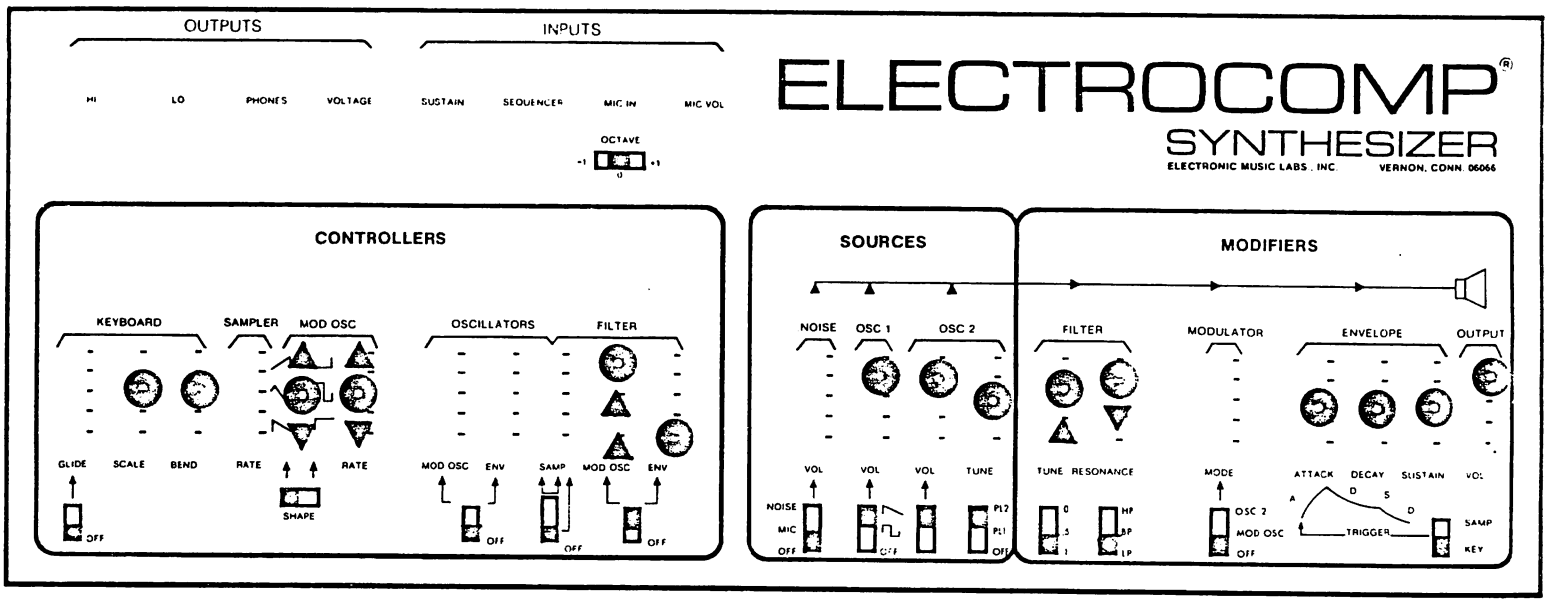
section. This slider presets the effect of the MOD. OSC. on pitch.

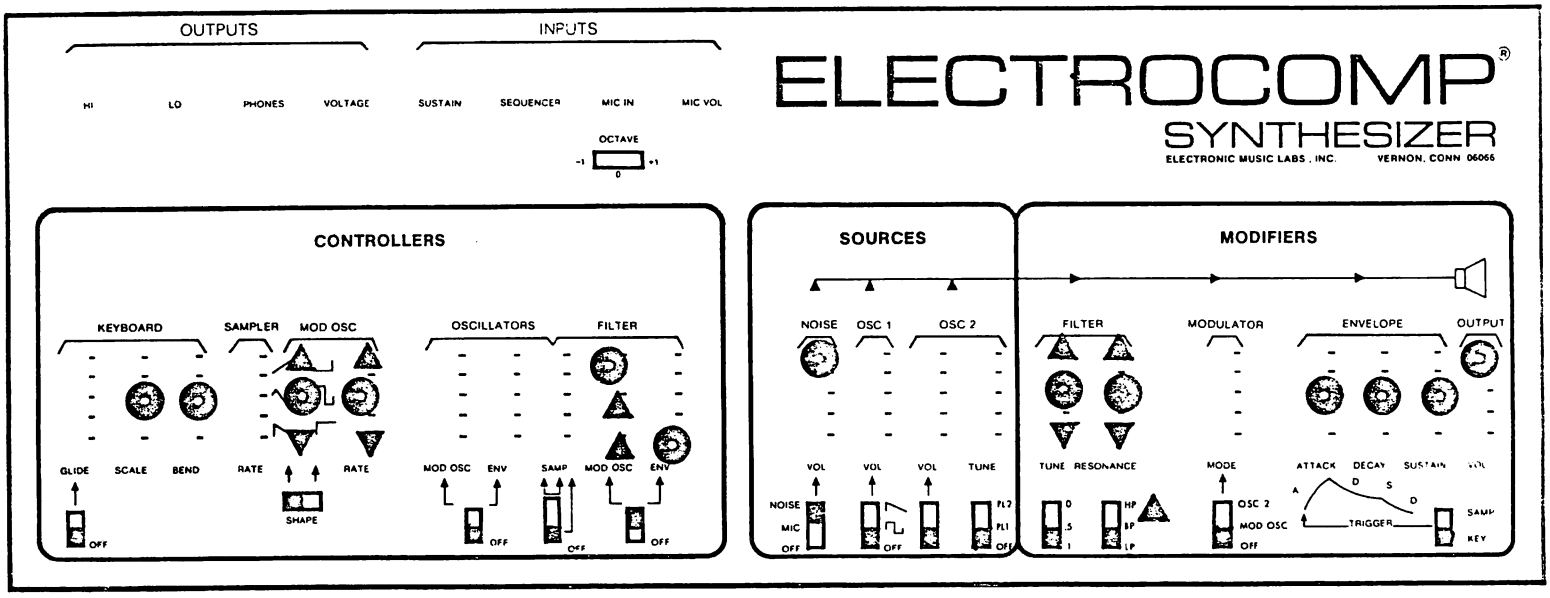
Using the Shape switch change the shape used to control the pitch of Oscillator 1. You should try to correlate the shape change with pitch change.

MODULATION OSCILLATOR CONTROL OF TIMBRE.

The Modulation Oscillator can also be used to control the Filter in a similar fashion that was used to control the Oscillators. Try the settings shown below.







SAMPLER.

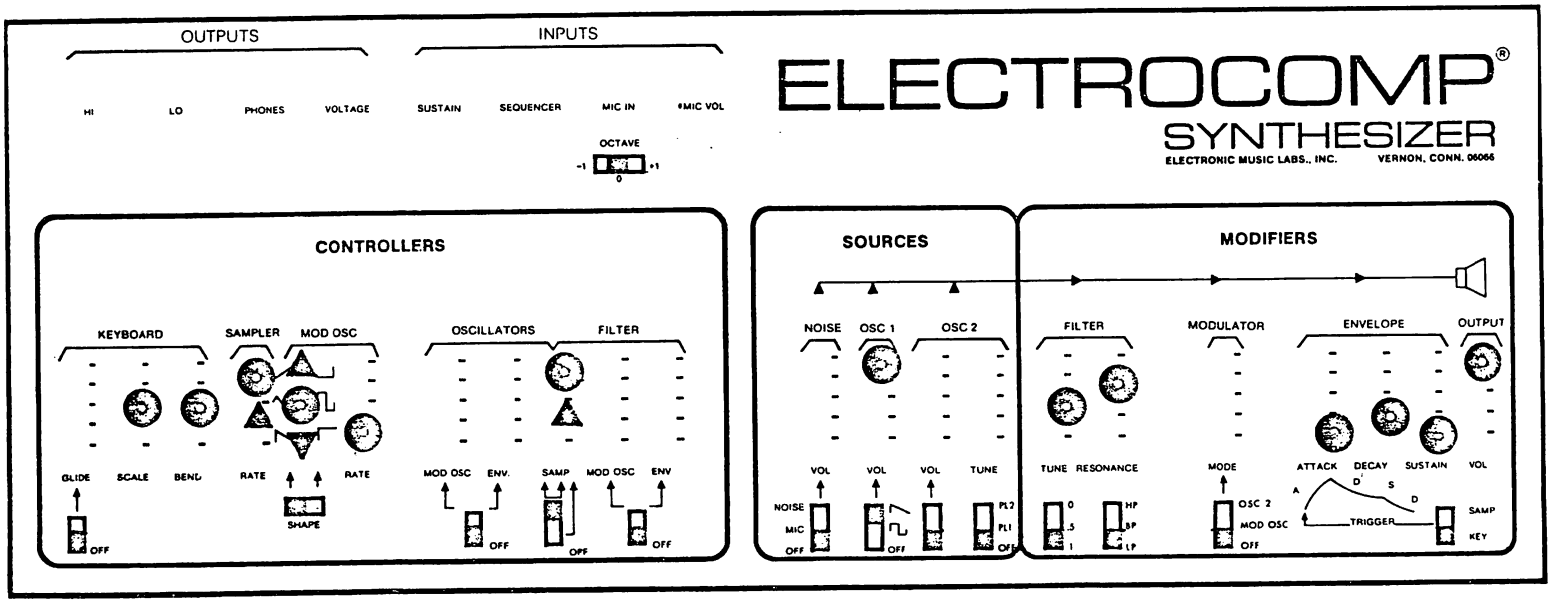
The Sampler changes the output of the Modulation Oscillator to permit the generation of random or ordered patterns of pitch and/or timbre.

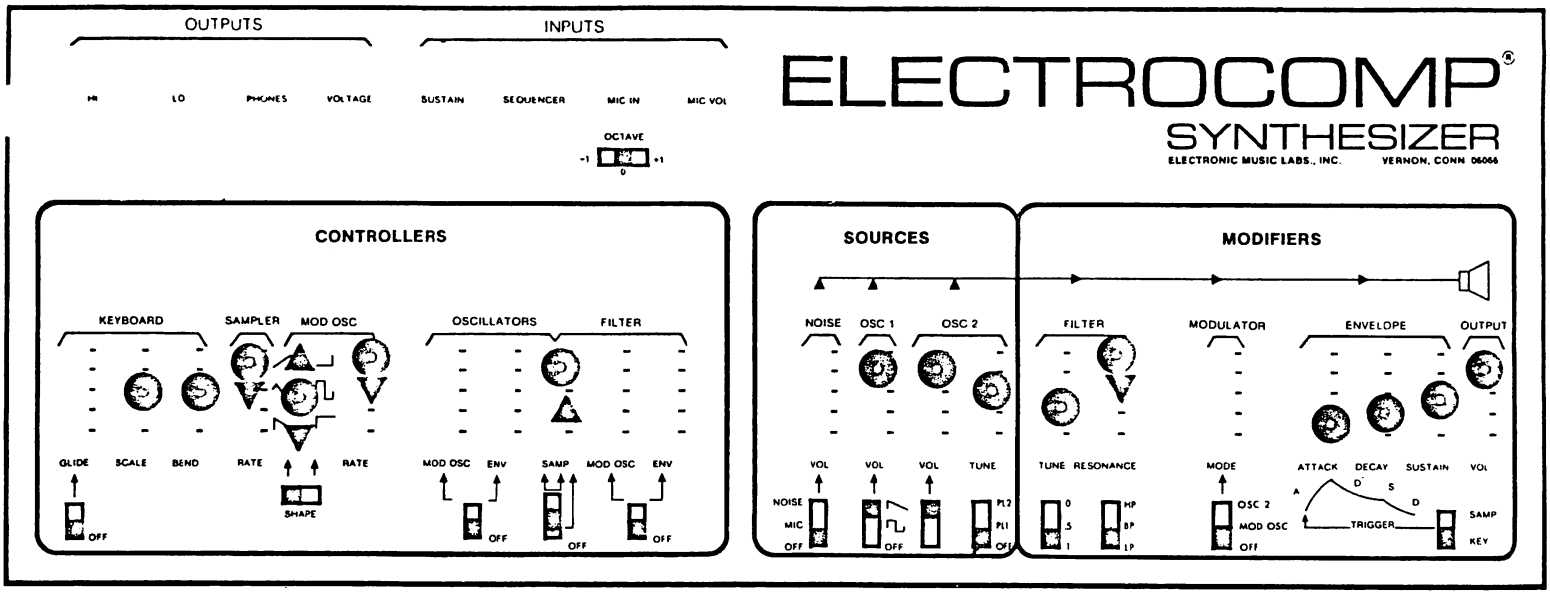
The time between changes in pitch, timbre and Envelope triggering are set by the Sampler's Rate slider.

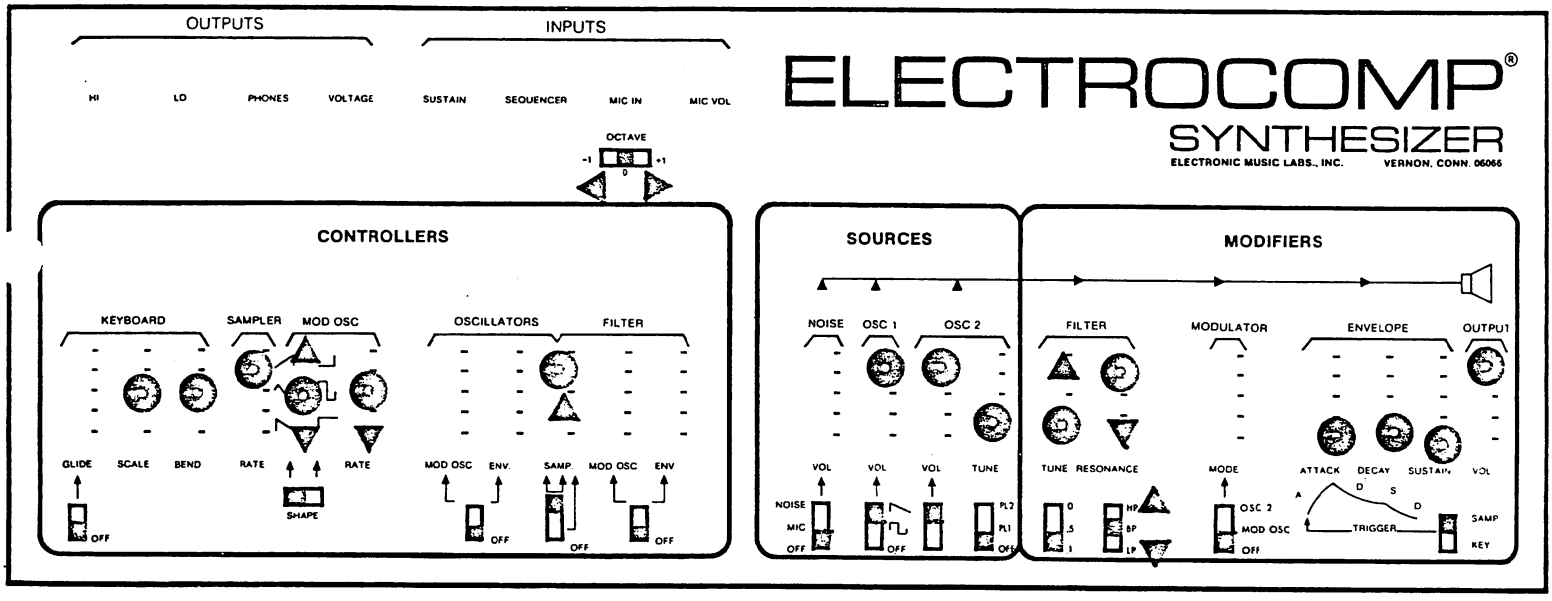
The amount of change is preset by the Sampler slider located between the Vibrato (Oscillator(and Timbre (Filter) sections of the Controller group.

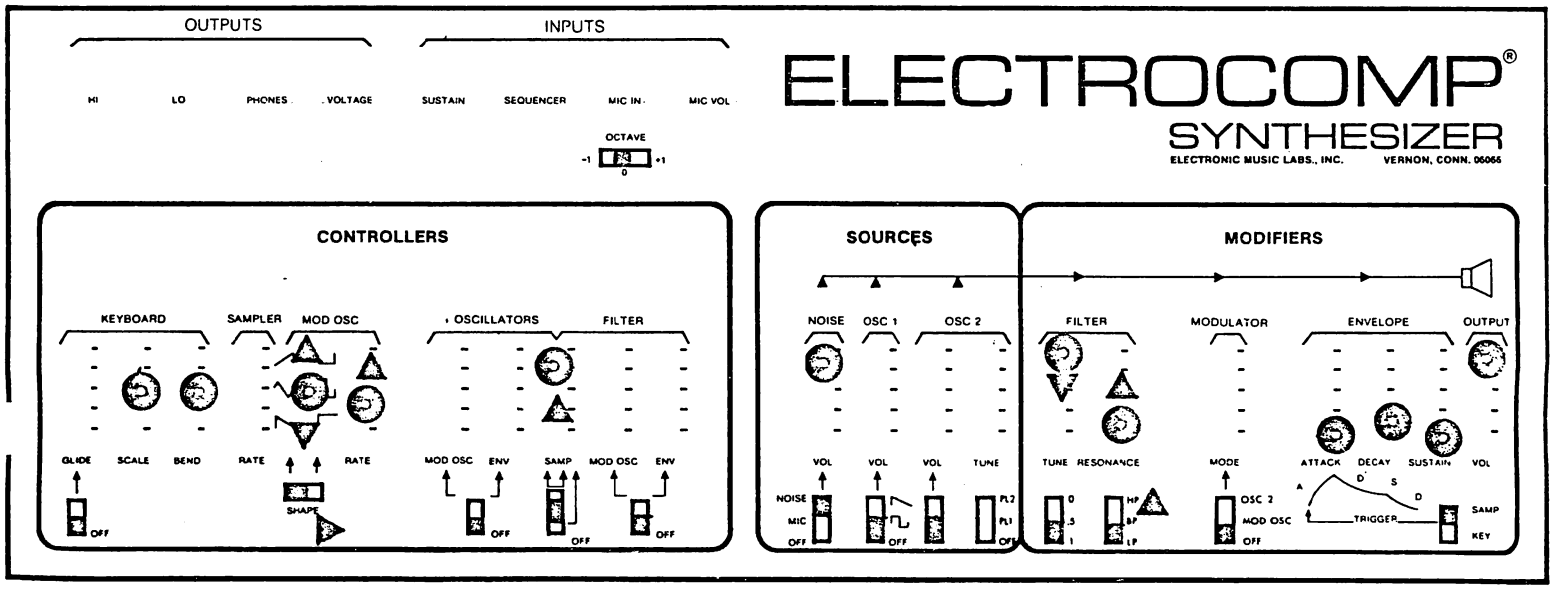
The switch located below this slider determines if the preset Sampler output is to be applied to the Filter alone (mid position) or Oscillator and Filter (upper position).

Try the settings shown below. Don't hesitate to move the marked controls.









JACKS.

SUSTAIN. A foot switch plugged here permits you to terminate the decay upon key release regardless of the Decay and Sustain slider settings. This switch retails for $22.50.

SEQ. These jacks permit the synthesizer to be controlled by our Sequencer - the EML 400.

MIC IN. This input is provided for the introduction of external sound sources for subsequent modification by the 500. These include, but are not limited to organ, guitar, or voice.

MIC VOL. This control permits you to preset the volume best suited to your particular external source.

External inputs are selected in the Sources section to the exclusion of the Noise source.

Carrying Case. A carrying case is available for your 500. Contact your local dealer or the factory for further information.