ARPODYSSEY

ELECTRONIC MUSIC SYNTHESIZER OWNER'S MANUAL

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WARNING

To prevent fire or shock hazard, do not expose this instrument to rain or moisture.

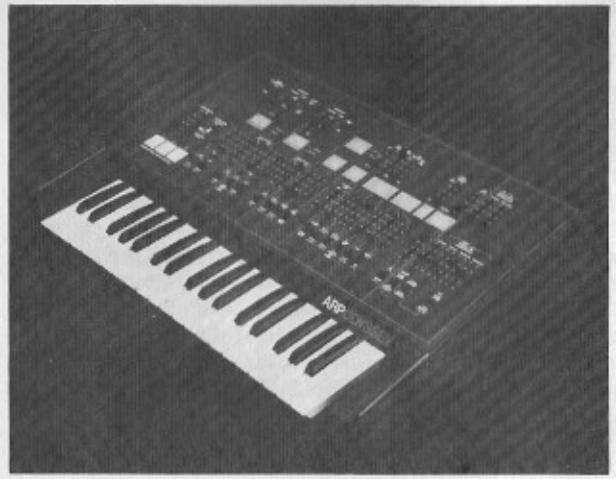
CONTENTS

INTRODUCTION

Welcome to the ARP ODYSSEY. This instrument has been redesigned by ARP's engineers and product specialists to incorporate all of the most important technological developments which have made ARP the leader in the field of electronic music synthesizers. It includes such state-of-the-art firsts as Phase-Synchronization, digital Ring Modulator, Sample & Hold circuits, and our latest innovation, Proportional Pitch Control (PPC). This touch-sensitive feature allows the musician an enormous range of expressive effects.

The controls on your ODYSSEY have been "human engineered" to feel right in your hands. Controls are grouped logically and are electrically scaled to respond easily to musical demands. As you learn to play your ODYSSEY, the value of this human engineering will become increasingly apparent. The result is an instrument of elegant simplicity, superior performance, and unparalleled quality in design and workmanship.

The ODYSSEY belongs to the class of Variable synthesizers. A variable synthesizer, as opposed to a Preset synthesizer, allows you to shape every aspect of a sound, from the attack and decay to the harmonic structure. Your ODYSSEY is equipped with controls that will let you precisely shape each and every parameter of the sound you are creating.



Synthesizers create sounds electronically in much the same fashion that any natural sound is created acoustically. There are definite elements of sound which, when put together in different combinations, will reproduce any sound from a clarinet to a jackhammer. The ODYSSEY is a musical instrument comprised of a number of different electronic circuits, each one designed to control different elements of sound.

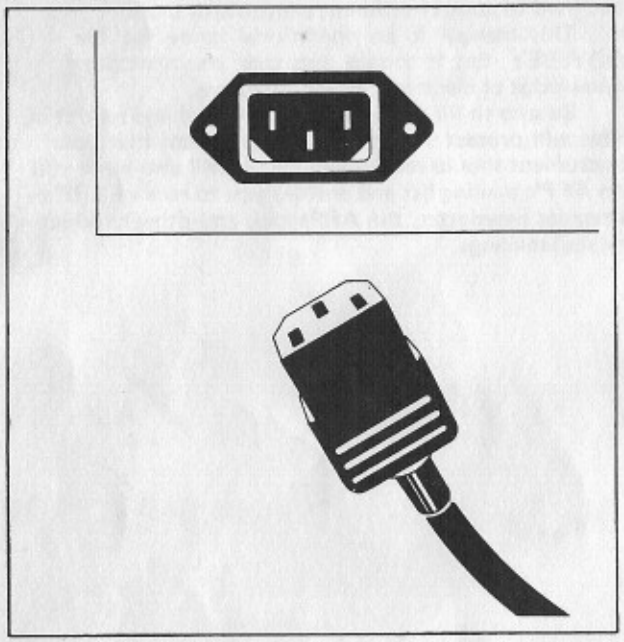
This manual is an operational guide for the ODYSSEY, but it should also give you a working knowledge of electronic music functions.

Be sure to fill out your warranty card and send it in. This will protect you in the unlikely event that your instrument should require service. It will also place you on ARP's mailing list and entitles you to receive ARP's irregular newsletter, the ARPeggio, and other product-related mailings.

INITIAL HOOKUP

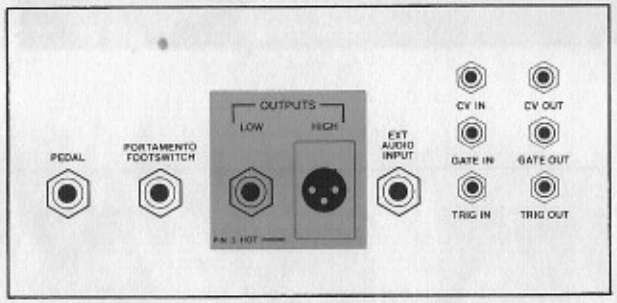
POWER

To get started, first connect the power cord (supplied with your instrument) to the three-pin connector located on the rear panel of the synthesizer just below the power switch.



MAIN OUTPUTS

Two different MAIN OUTPUT jacks are provided. The three-pin XLR connector is used in all professional recording equipment and is the most reliable connector in widespread use. This connector (marked HIGH) carries a line-level audio signal capable of driving even the most insensitive amplifiers. The other connector (marked LOW) is a standard ¼" phone jack, and carries a somewhat lower level signal. Much of the commercial equipment used in a P.A. application might overload or distort using the high-level signal. Use the HIGH connector whenever possible, but if distortion occurs, use the LOW connector. A standard guitar cord is sufficient to make this connection.

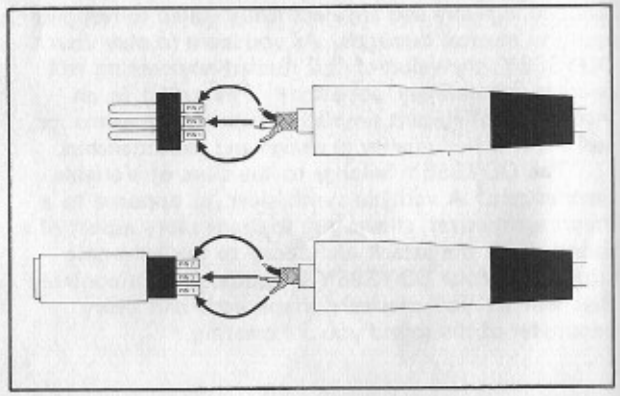


The XLR Jack

Using the XLR output will provide a "hum-free" signal when used in conjunction with a mixer that features "balanced line" inputs.

Here's how to wire up your own cables:

1. Obtain one "female" XLR connector and one "male" connector.
2. Obtain the desired length of "2-conductor shielded cable" (15' is usually standard).
3. Wire the connector as follows:



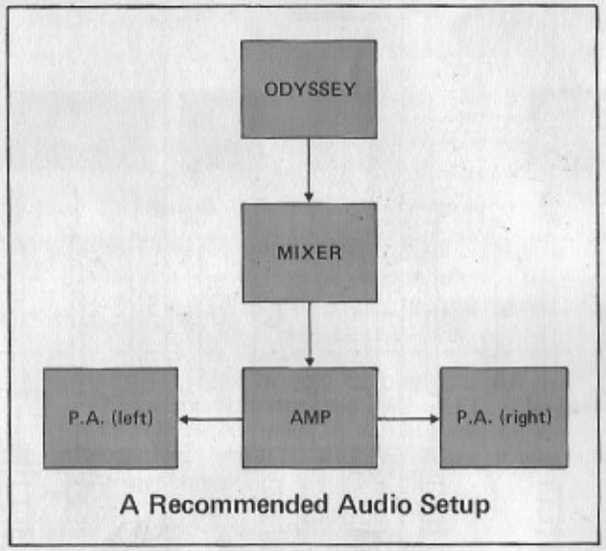
4. Pin 3 is "hot," and is connected to Pin 3 on the other connector.
5. Pin 2 is connected to Pin 2.
6. Pin 1 should be connected to the cable shield on both the "male" and "female" sides.

AMPLIFICATION

The whole idea of a synthesizer is to give you the capability to shape and control every aspect of a musical sound using the synthesizer's controls. Therefore, the ideal amplification system for synthesizers should introduce as little distortion or coloration as possible. For this reason, P.A. systems usually produce the cleanest sound with synthesizers. Likewise, a bass guitar amplifier is probably the worst kind of amplification for synthesizers because bass guitar amps usually have poor high frequency response. Some lead guitar amps also have a lot of distortion and coloration. If you play your synthesizer through such an amp, your sounds will tend to be characteristic of the amplifier rather than the synthesizer. Sometimes, however, the combination of the synthesizer and an amplifier with a great deal of its own coloration will produce just the sound you might be looking for.

Generally, the type of sound system that is right for you depends on the following factors:

1. Exactly what instruments will be connected into the sound system.
2. The type of music you play.
3. How loud you play.
4. The size of the room you play in.



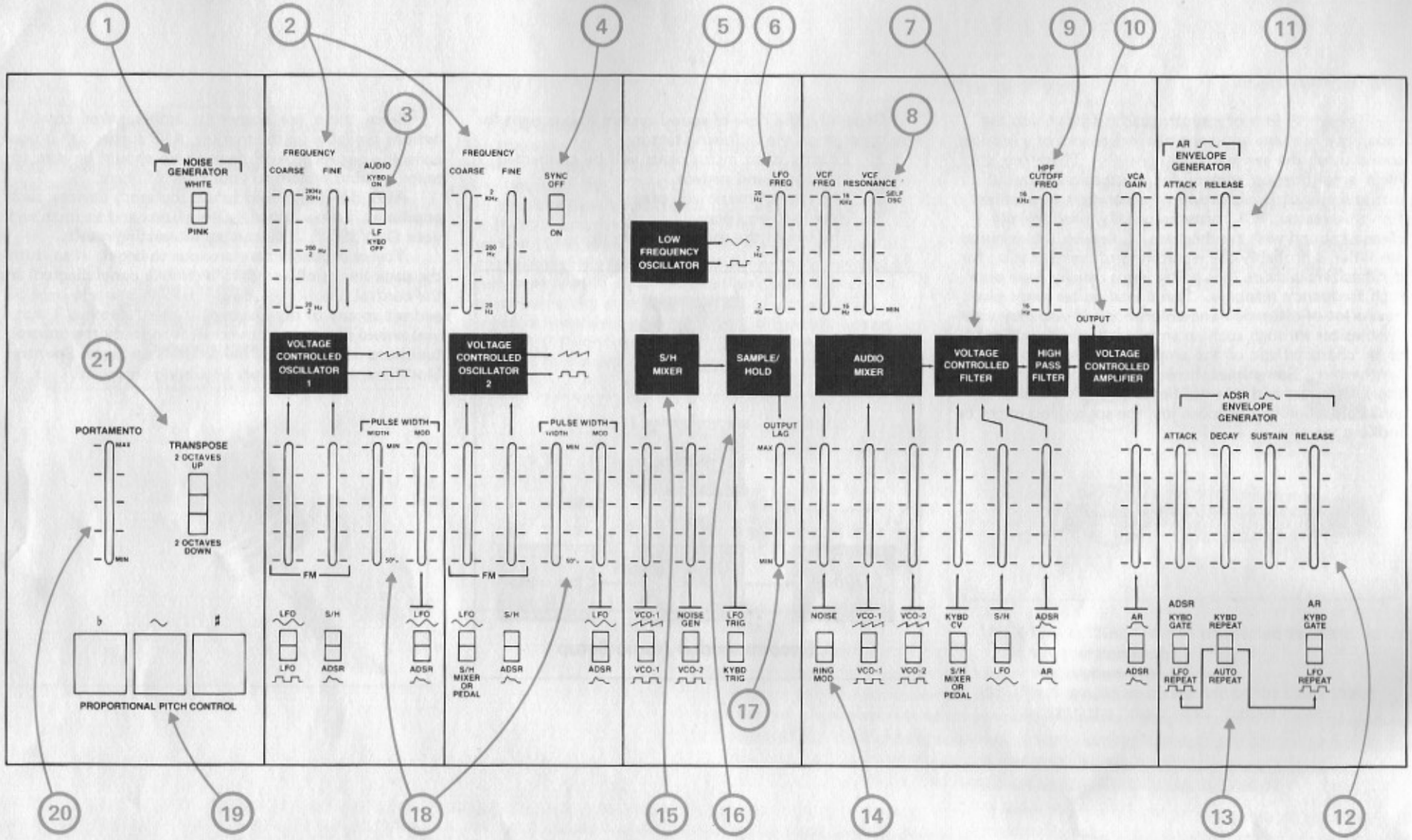
A Recommended Audio Setup

Since there are numerous amp/speaker combinations available on the market, ARP suggests that you consult your local ARP dealer who should be able to tailor a sound system to your style of music.

Also, don't be afraid to use accessory devices, such as phasers, fuzz-wah pedals, equalizers and so forth with your ODYSSEY. You can get interesting results.

You're probably very anxious to begin. If so, turn the page and briefly study the control panel diagram and the control function descriptions. Then turn to page 33 and set up any of the diagrams (called "patches") that you would like to try. If you wish to study the control functions in detail, read the sections on Signal Sources, Modifiers, and Controllers beginning on page 6.

PANEL DESCRIPTION



1 NOISE GENERATOR: Produces two random, aperiodic waveforms useful for surf, wind, drums, and other sound effects.

2 VOLTAGE CONTROLLED OSCILLATORS (VCOs): Produce pitched sounds which may be controlled by the LFO, S/H, AR, ADSR, PPC, the foot pedal, and the keyboard.

3 AUDIO SWITCH: Changes the frequency range of VCO 1 to subsonic. VCO 1 may then be used as a controller via the S/H MIXER.

4 SYNC SWITCH: Synchronizes the frequencies of VCO 1 & VCO 2.

5 LOW FREQUENCY OSCILLATOR (LFO): Produces no audio signal, but a voltage which may be used to control other functions on the ODYSSEY, such as the frequency of the VCOs, the cut-off point of the VCF, or the Pulse Width of the square wave.

6 LFO FREQ: Sets the rate at which the LFO (sine wave or square wave) operates.

7 VOLTAGE CONTROLLED FILTER (VCF): Modifies the sound fed to it by removing the higher frequencies of the sound. May be controlled by the LFO, S/H, AR, ADSR, the foot pedal, or the keyboard.

8 RESONANCE: Emphasizes a small band of harmonics at the filter cut-off point. Useful in generating a sine wave.

9 HIGH PASS FILTER (HPF): Modifies the output of the VCF by removing the lower frequencies of the sound.

10 VOLTAGE CONTROLLED AMPLIFIER (VCA): Used to control the amplitude of the sound fed to it by the VCF. May be controlled by the AR or the ADSR.

11 AR ENVELOPE GENERATOR: Performs basically the same function as the ADSR, but is less complex. May be used to control the VCA or the VCF.

12 ADSR ENVELOPE GENERATOR: Used to shape the sound. May be used to control the VCA, the VCF, Pulse Width, or frequencies produced by the VCOs.

13 REPEAT: May be used to trigger the AR or ADSR at a rate determined by the LFO. If set in KYBD REPEAT mode, it will act only on key depression; in AUTO REPEAT mode, it will retrigger continually.

14 RING MOD: Performs a complex mathematical operation on the signals from VCO 1 & VCO 2, and outputs the combined signal to the VCF. Useful in producing gong and bell sounds.

15 S/H MIXER: Mixes signals from four sources, and outputs them as controllers to the SAMPLE/HOLD, VCO 2, or the VCF.

16 SAMPLE/HOLD: Takes the signals fed to it from the S/H MIXER, picks whatever voltage level happens to be occurring at a given moment, and outputs that voltage level as a controller to either the VCOs or the VCF. The rate at which it selects these voltages is determined by the LFO FREQ slider, or the keyboard.

17 OUTPUT LAG: Acts as a Portamento in the SAMPLE/HOLD.

18 PULSE WIDTH: May be adjusted manually, or controlled by the LFO and ADSR.

19 PROPORTIONAL PITCH CONTROL (PPC): Used to control pitch bending sharp or flat, and may also be used to produce vibrato.

20 PORTAMENTO: Causes the ODYSSEY to "slide" from one note to the next.

21 TRANSPOSE: Shifts the pitch of the VCO up or down by two octaves.

SIGNAL SOURCES

THEORY

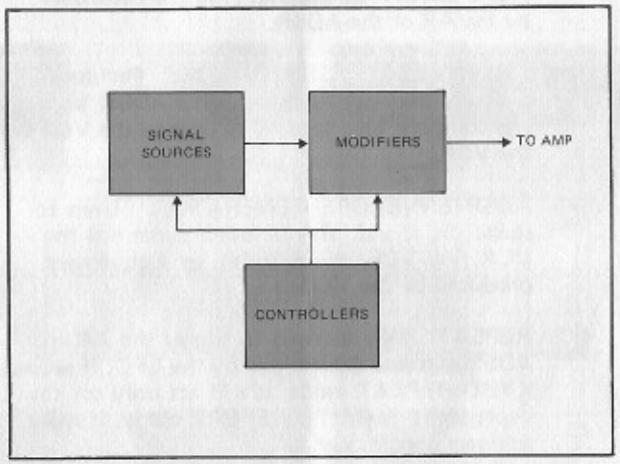
All of the electronic circuits in your ODYSSEY fall into one of three basic categories:

1. SIGNAL SOURCES: The "raw" pitched tones or noise signals which will be modified or controlled by the other functions on the ODYSSEY. The Signal Sources on your instrument are the VCOs 1 and 2 (sawtooth or square wave), the Noise Generator, and External Audio Input. The VCF may also be used as a Signal Source, but its primary function is that of a Modifier.

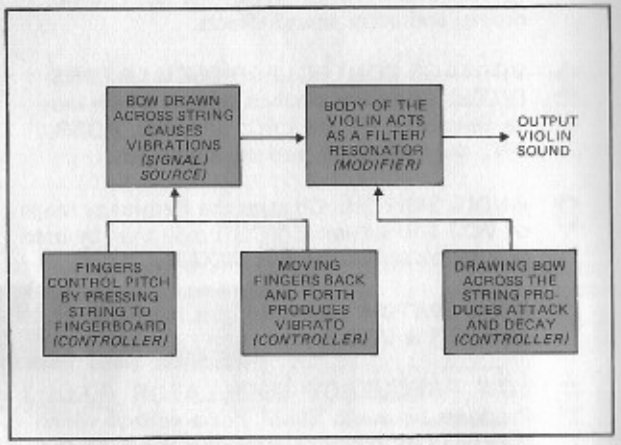
2. MODIFIERS: Devices which "process" the raw signal from a Signal Source. These devices may be used to alter the timbre (tone quality) of a sound, or to increase/decrease the amplitude of a sound. The Modifiers on your ODYSSEY are the VCF, HPF, VCA, and RING MOD.

3. CONTROLLERS: Used to operate or "control" the output of Signal Sources of Modifiers. For example, the keyboard is a Controller which you use to tell the VCO which note to produce. Similarly, the LFO (sine wave) may be used to open and close the VCF to produce a tremolo effect. The Controllers on your ODYSSEY are the keyboard (including the Portamento and Transpose functions), PPC, S/H, pedal, LFO (square wave or sine wave), and the AR and ADSR Envelope Generators. Signal Sources may also be used as controllers, via the S/H MIXER. These special applications will be discussed later in the CONTROLLERS section of the manual.

The following is a simple block diagram. Block diagrams are commonly used as visual aids to help understand the flow of information in electronic devices, such as the ODYSSEY. From the diagram below, you will see that signals flow from the Signal Sources, through the Modifiers, and out to the amplifier. Controllers, however, are constantly being used to adjust the outputs of both Signal Sources and Modifiers.



All mechanical instruments work in a similar way. A violin, for instance, has a vibrating string which would be a signal source. The vibrating string corresponds to the oscillator in your ODYSSEY. The vibrations from the string are transmitted to the body of the violin which modifies the sound of these vibrations. The body of the violin is actually a mechanical filter and corresponds to the Voltage Controlled Filter (VCF) on the ODYSSEY. It is the characteristic resonances of the body that give the violin its distinctive tone quality. The fingerboard, like the keyboard on your ODYSSEY, determines the pitch of the sound. The movement of the bow, like the ADSR envelope generator, determines the attack and decay characteristics of the sound.



Interconnecting the various functions shown in Figure A is known as creating a "patch." The block diagram illustrated in Figure A is, of course, a violin patch. Similarly, it is possible to diagram any patch that you may play on the ODYSSEY. Actually, this visual representation of a patch permits you to better understand what functions of the synthesizer are being employed and how each function contributes to the finished sound.

FIGURE A

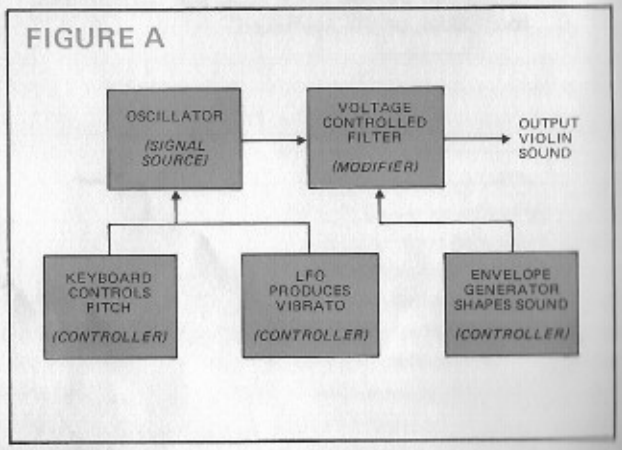


Figure B is a generalized block diagram of all the major functions in your ODYSSEY.

As we proceed with our discussion of these functions, you will be able to see exactly how they interact.

FIGURE B

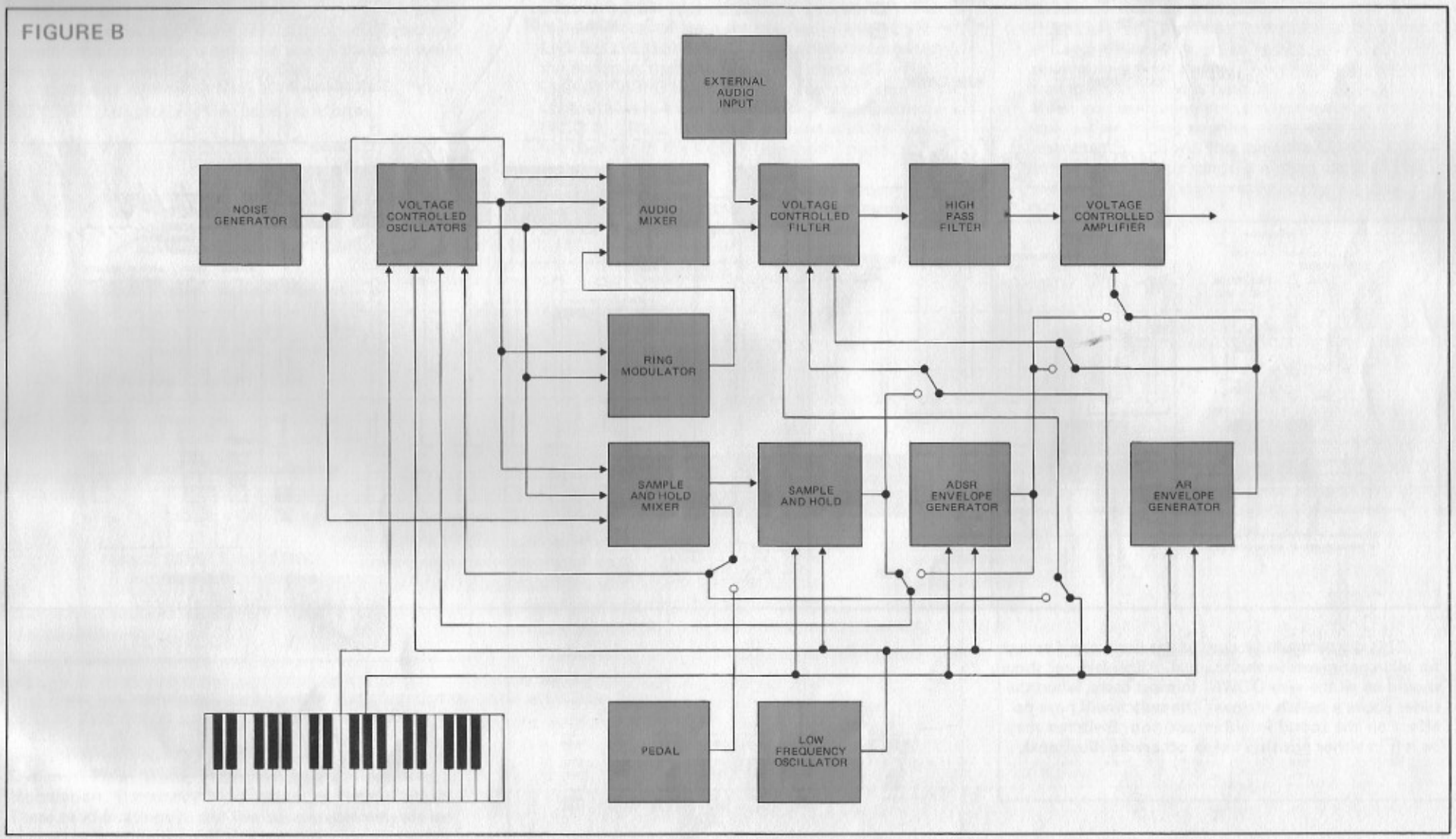
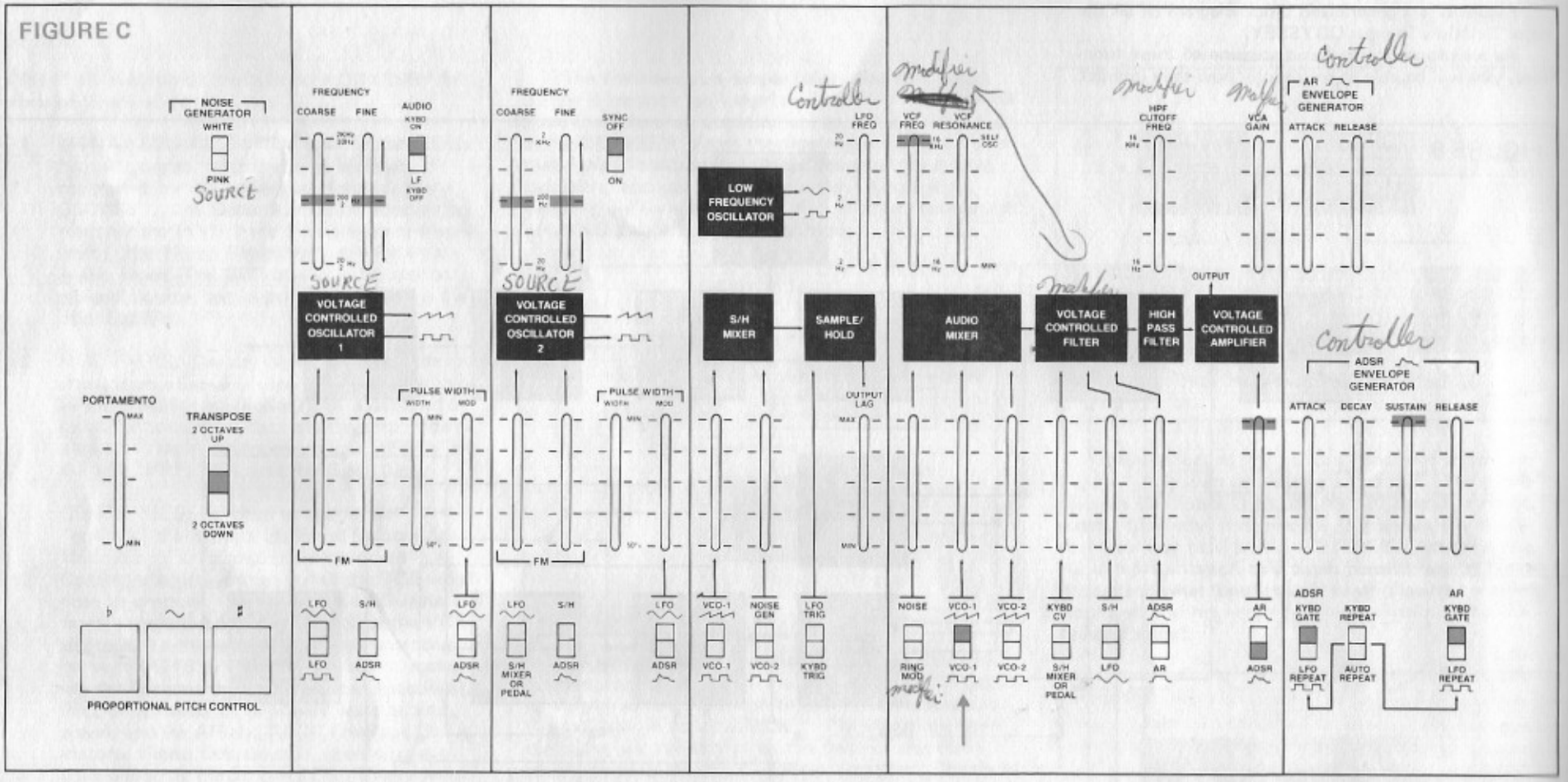


FIGURE C

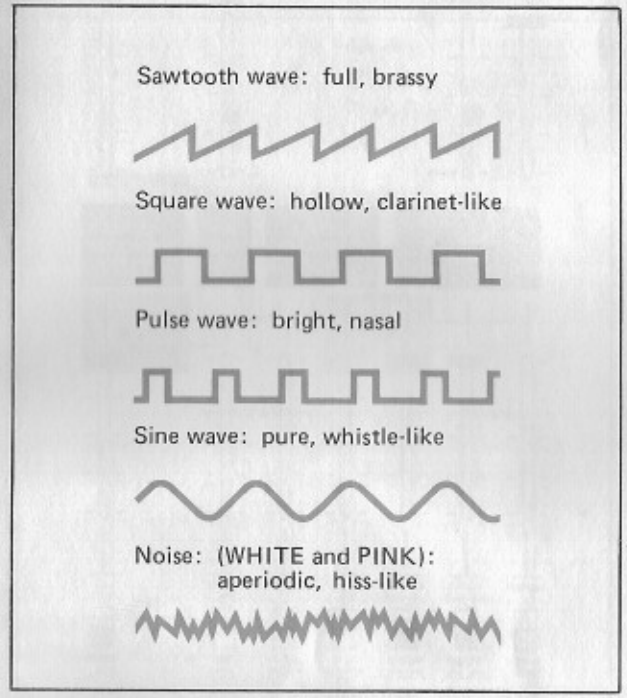


This diagram will be used as the basic panel set-up for all experiments in this manual. All sliders not shown should be all the way DOWN. In most cases, when the slider above a switch is down, the switch will have no effect on the sound in either position. Switches may be left in either position unless otherwise illustrated.

WAVEFORMS

The Voltage Controlled Oscillator on your ODYSSEY produces electrical waveforms (sawtooth, pulse, and square waves) which are used to create a wide range of sound timbres. If a signal generated by an oscillator has the same waveform as a sound created by a traditional instrument, both will sound the same when the signal has been properly modified.

Different waveforms have different sounds. Your ODYSSEY can produce five basic waveforms.

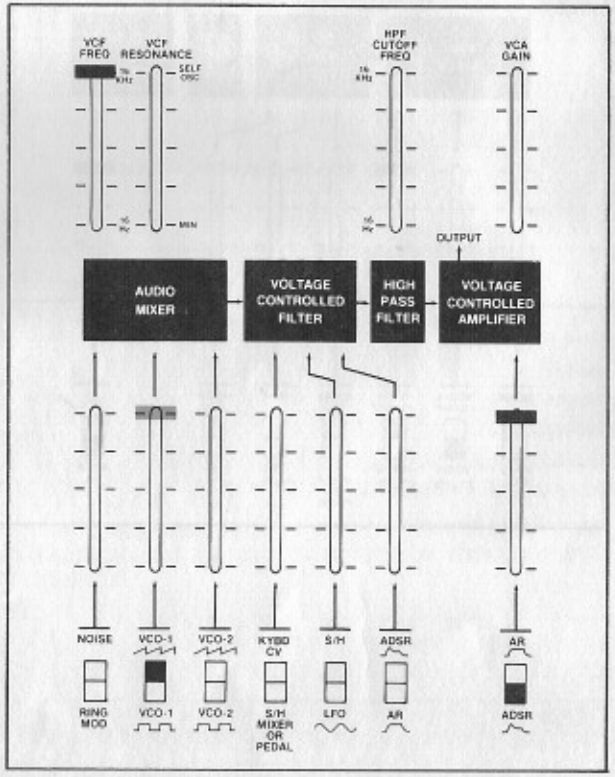


These five waveforms are known as static waveforms because their characteristics are stable (unmodulated). You can produce dozens of modified or modulated waveforms on your ODYSSEY. Among these are the Dynamic Pulse Wave, Phase synchronization, Ring Modulation, Frequency Modulation, and many others. These modifications to the five basic waveforms are explained in later sections of this manual.

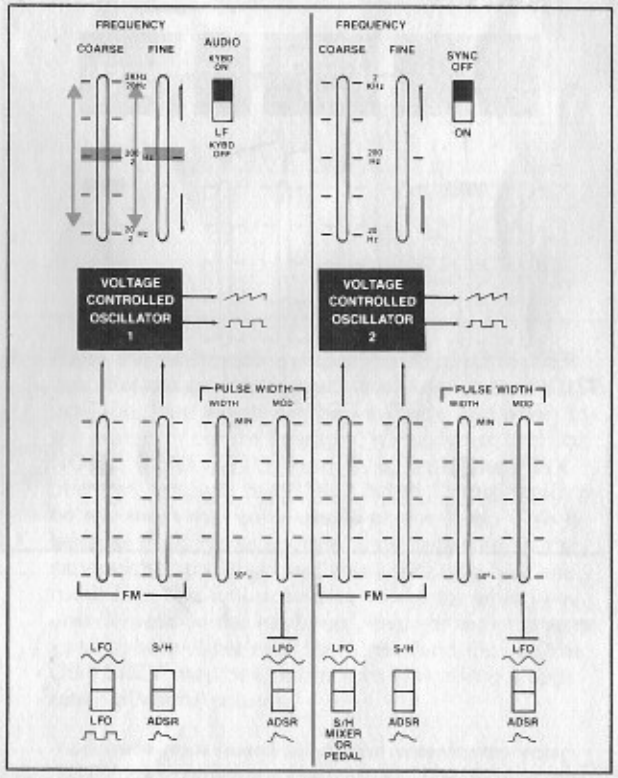
The Sawtooth Wave

1. Set the controls on your ODYSSEY to match the settings shown in Figure C. You will notice that almost every slider in the bottom row has a two-position switch located directly beneath it. With the exception of the switches below the ADSR ENVELOPE GENERATOR, these switches select the function that the slider will attenuate. For example, in this patch, you will want to listen to the sawtooth wave from Voltage Controlled Oscillator 1 (VCO 1). Thus, the switch marked with the arrow has been set in the VCO 1 (sawtooth) position.

2. If you now raise the slider directly above this switch, you will hear the sawtooth wave generated by VCO 1 when you play the keyboard.

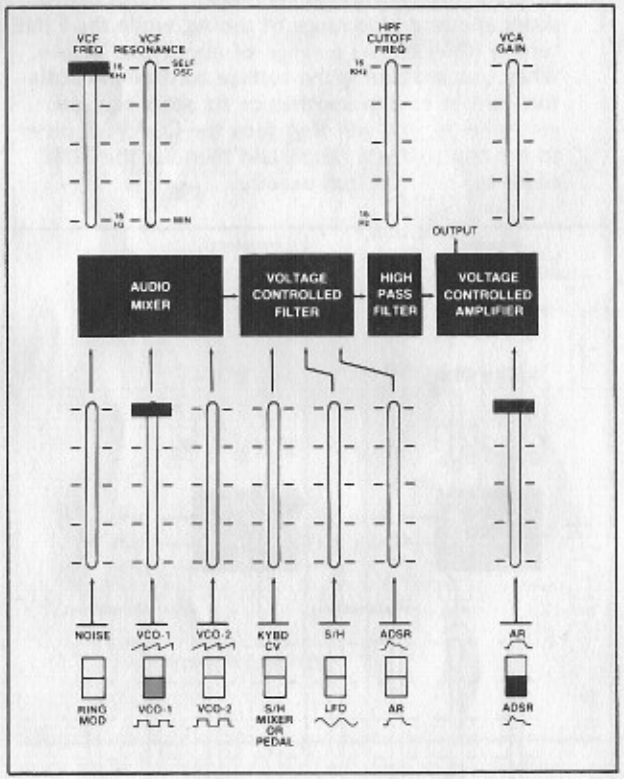


3. The pitch of this oscillator can be tuned manually through use of the COARSE and FINE tuning sliders. These sliders are located on the left part of the panel marked VOLTAGE CONTROLLED OSCILLATOR 1. Hold a note down and push each of these sliders through its range. The COARSE slider allows a wide range of tuning, while the FINE tuning slider allows a range of about one octave. When you are tuning the voltage controlled oscillators, either to one another or to other musical instruments, you will first tune the COARSE slider to the approximate range, and then use the FINE slider to find the pitch exactly.

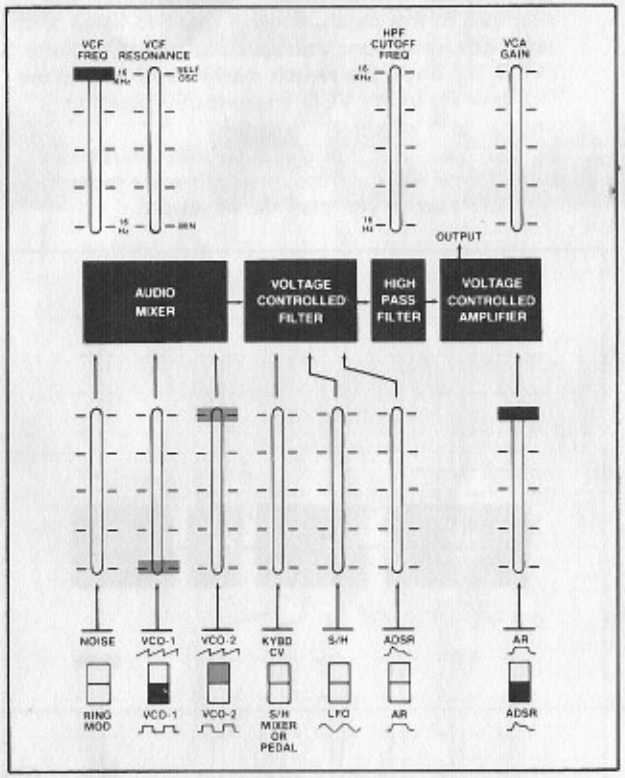


The Square Wave

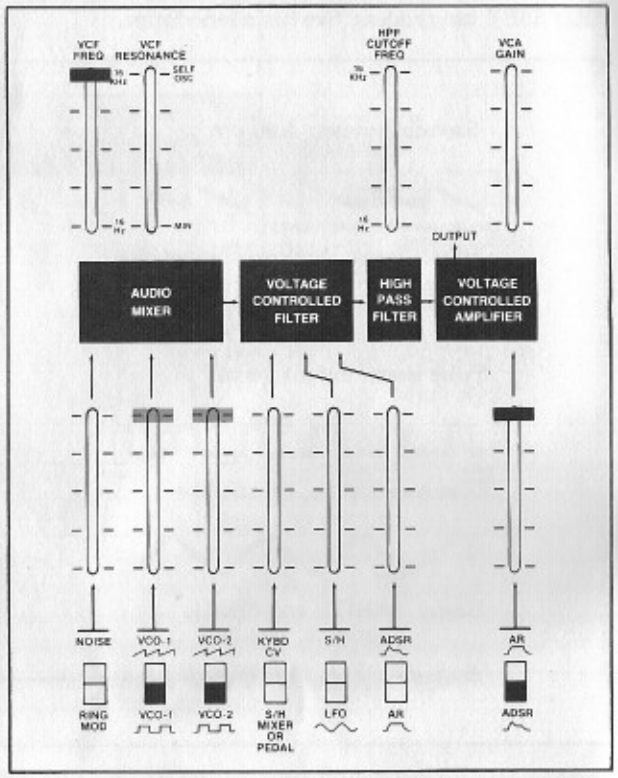
1. Change the switch to the VCO 1 (square wave) position. Now when you play the keyboard, you will hear the square wave generated by VCO 1. Notice that the square wave has a hollow, clarinet-like sound.



2. Lower the blue slider under the AUDIO MIXER box, and raise the green slider. The green slider attenuates the output of VCO 2 in exactly the same manner as the blue slider attenuates the output of VCO 1. Repeat the sawtooth and square wave experiments with the VCO 2 slider.



3. Raise both VCO sliders (blue & green) under the AUDIO MIXER box. If your tuning sliders are tuned exactly in unison, you will hear no noticeable change in the sound. If they are not in unison, you will hear two notes when you play one key. Try tuning both oscillators to unison, then to different intervals (thirds, fifths, etc.).

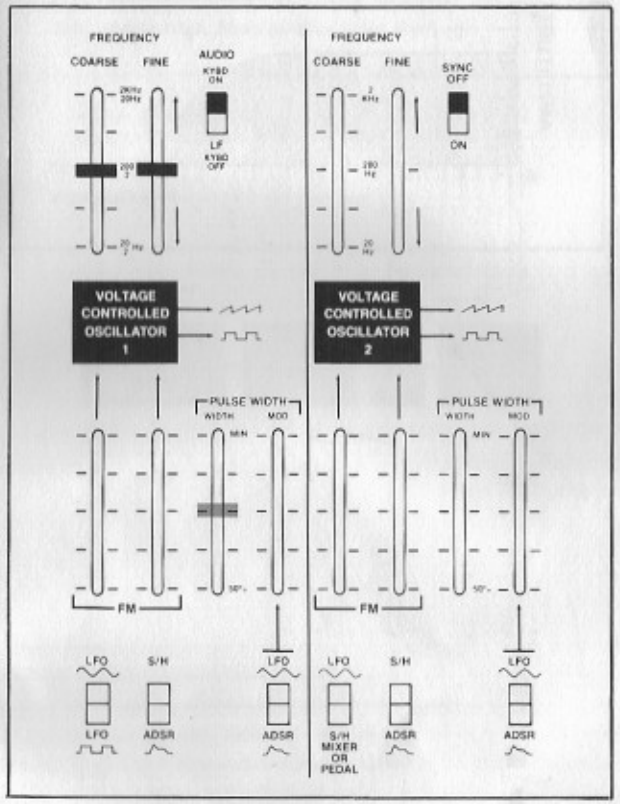


4. When both sliders are raised in the AUDIO MIXER, you may play two notes simultaneously on the keyboard. Usually, the tuning sliders should be tuned to unison, but you may experiment with different interval tunings.

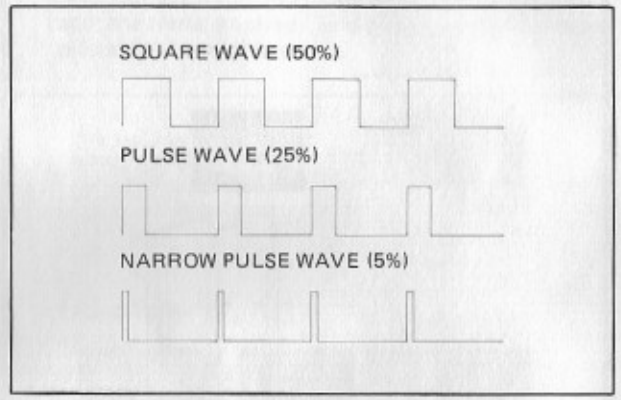
The Pulse Wave

1. Set the controls to match the settings in Figure C. Raise the blue slider in the AUDIO MIXER box and select the VCO 1 (square wave) switch position.

2. In the VCO 1 section, you will find two sliders marked PULSE WIDTH. Raise the blue slider labeled WIDTH to about half way, and play a few notes on the keyboard. Notice how the sound has become brighter, more nasal than the square wave.

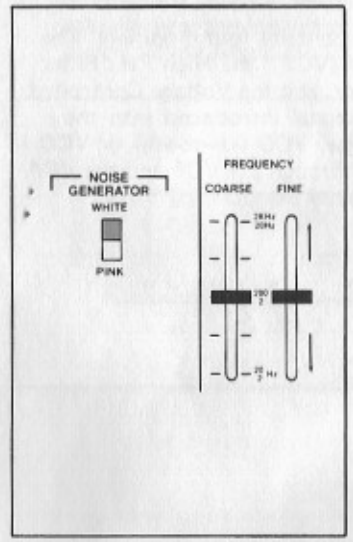


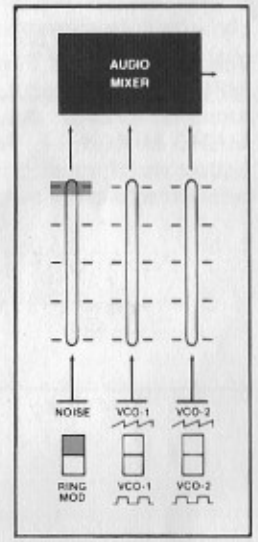
3. An even narrower pulse wave can be created by raising the WIDTH slider all the way to the MIN marking. This waveform is very buzzy and thin. At the MIN marking, the top part of the pulse waveform is only about five percent of the total cycle. A square wave, as its symbol implies, has a top part of its waveform that is exactly fifty percent of the total waveform. This is provided on both VCO 1 and VCO 2. Try different settings of the WIDTH sliders in both VCOs. One thing to remember: you can *only* change the pulse width of the square wave.



Noise

1. Set the controls as shown in Figure C. Find the switch in the upper left corner of the ODYSSEY labelled NOISE GENERATOR. Set this switch in the WHITE position.





2. Raise the white slider under the AUDIO MIXER box. Set the switch beneath this slider in the NOISE position. Play a note on the keyboard and listen to the sound. You are hearing "White Noise." If the NOISE GENERATOR switch is set in the PINK position, you will hear "Pink Noise," considered to be the most musically useful of the two. This is because Pink Noise sounds more balanced to the ear—neither too high and hissy, nor too low and rumbling. You will note that no matter which key you depress on the keyboard, the sound is the same. Later, you will see how the other functions on the ODYSSEY may be used to turn Noise into a wide range of useful sounds.

You have now heard all of the waveforms your ODYSSEY can generate except one: The Sine Wave. For a description of how to generate a pure sine wave, turn to page 14.

MODIFIERS

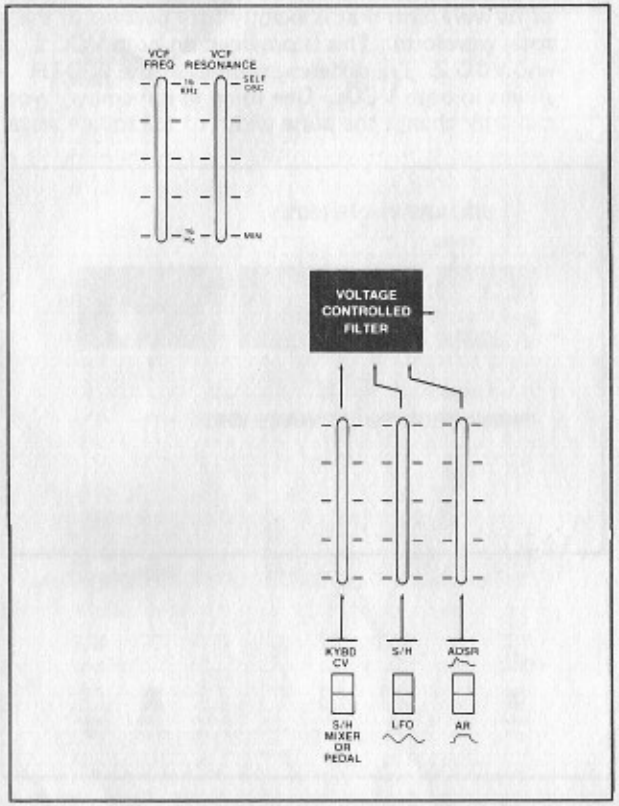
THEORY

Modifiers are electronic devices that can process a signal and change its sound. Consequently, a modifier must have an input and an output. A tone control on a hi-fi set is a simple modifier since it changes the nature of the sound signal that passes through its circuitry.

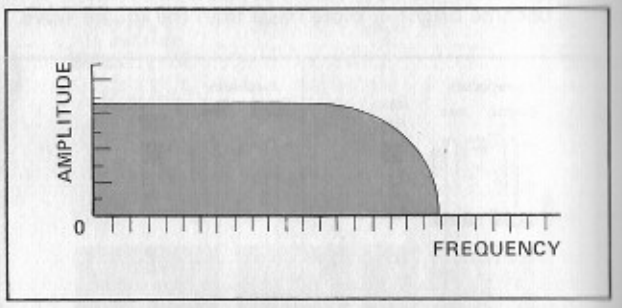
The ARP ODYSSEY contains four modifiers: The Voltage Controlled Filter (VCF), the High Pass Filter (HPF), the Ring Modulator, and the Voltage Controlled Amplifier (VCA). Any signal introduced into the AUDIO MIXER; i.e., Noise, VCO (sawtooth) or VCO (square wave), must pass through the VCF and the VCA before reaching the output of the ODYSSEY.

THE VOLTAGE CONTROLLED FILTER (VCF)

The Voltage Controlled Filter (VCF) is the most important modifier on any synthesizer. The VCF is responsible for taking the raw signals from the VCOs and the Noise Generator and shaping them into useful musical sounds.



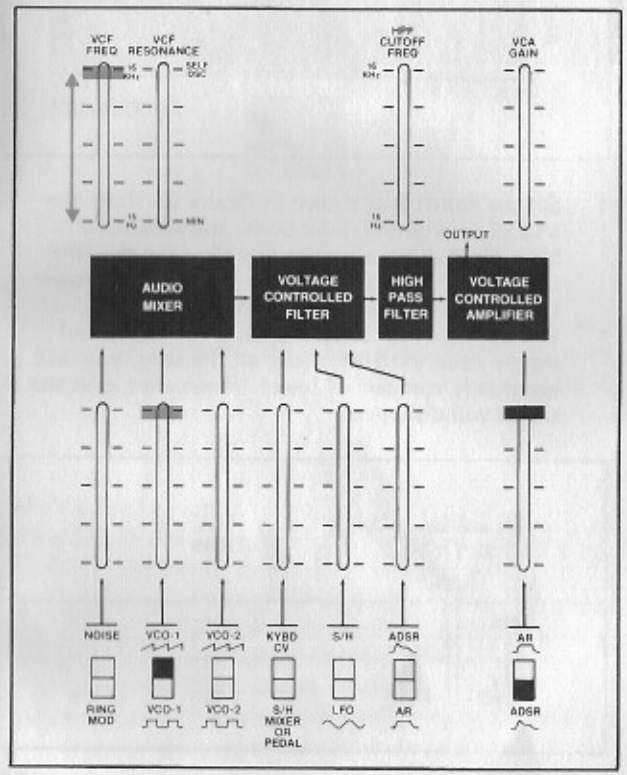
The VCF in your ODYSSEY is technically called a "Low Pass Filter." Low pass means that the filter will pass all audio frequencies below a certain point (called the "cut-off" point) determined by the setting of the VCF FREQ slider, and will filter out all frequencies above this point. The colored area in the diagram below indicates the frequencies passed by the filter.



VCF FREQ

1. Set the controls on your ODYSSEY according to Figure C. Raise the VCO 1 (sawtooth) slider in the AUDIO MIXER box.

2. Play a note in the middle of the keyboard and hold it down. Slowly lower and raise the VCF FREQ control and listen to the effect. Notice how the sound gets brighter and louder as you raise this control. It does so because you are raising the "cut-off" point of the filter, thereby letting more and more high frequencies pass through.

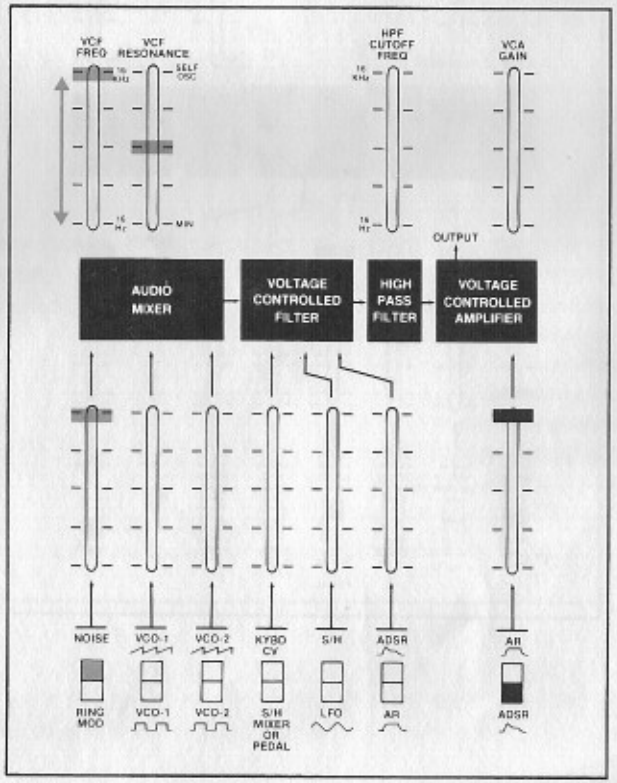


3. Slowly lower the VCF FREQ control. The highs will fade and finally the whole signal will be filtered out.

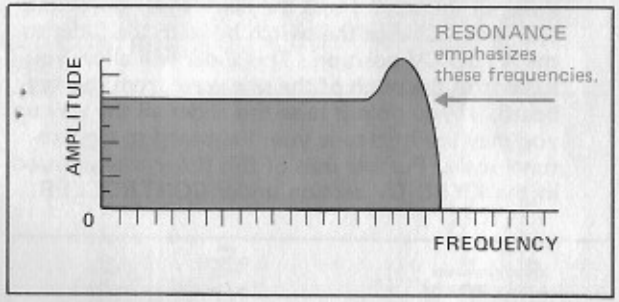
RESONANCE

1. Lower the VCO 1 (sawtooth) slider under the AUDIO MIXER box and raise the white NOISE slider. Again, open and close the VCF by raising and lowering the VCF FREQ control.

   Notice how the noise can be made to sound like surf by opening and closing the filter slowly. Raise the RESONANCE slider about half way up and try the same experiment. Notice how the noise now takes on a whistling quality. This whistling is caused by the resonance of the filter. Resonance emphasizes a narrow band of frequencies just at the filter cut-off frequency. The more resonance you add, the more emphasis, and consequently the more pitched the sound becomes.



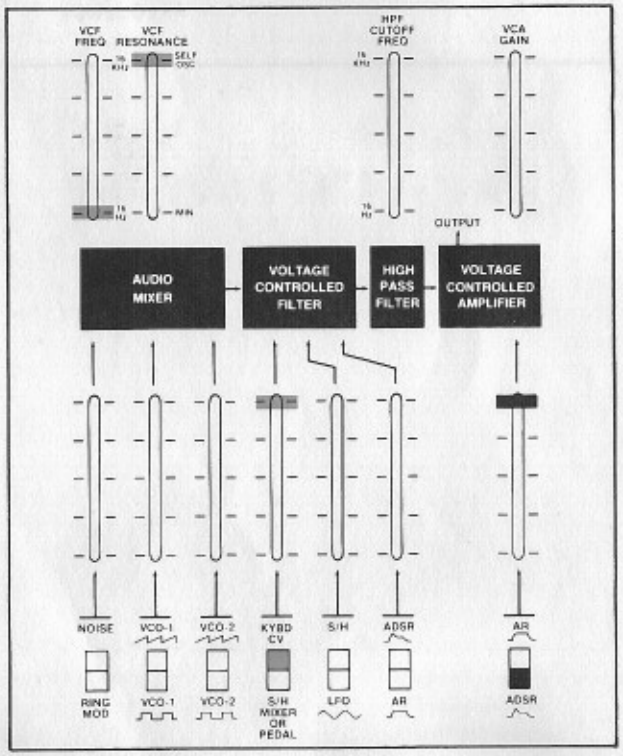
2. Lower the NOISE slider and listen again to the VCO (sawtooth) wave. Again move the VCF FREQ control up and down slowly with different settings of the RESONANCE control. Notice that when the resonance is between the ½ and ¾ marks you can actually hear the individual harmonics of the sound as you slowly sweep the VCF FREQ up and down.



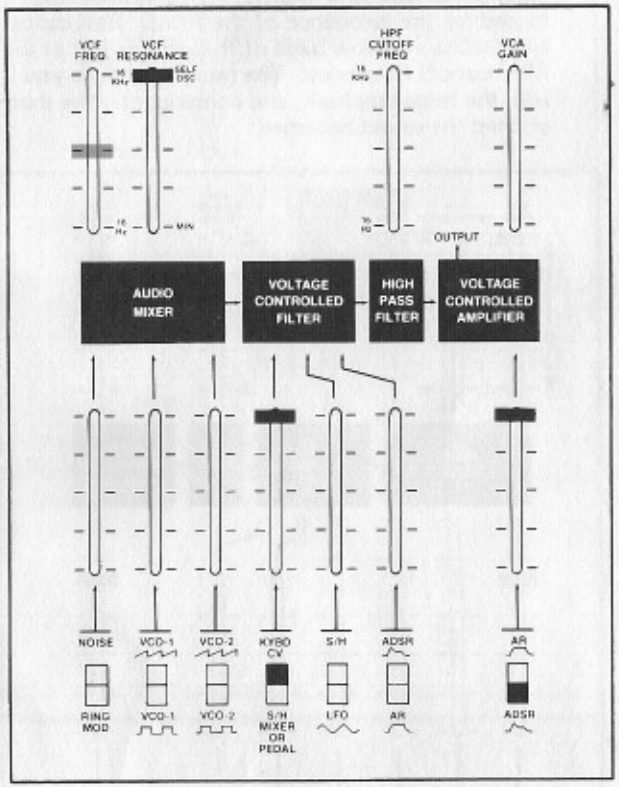
The Sine Wave

The VCF may also be used as a signal source with which you may generate a sine wave. Follow the procedure described below. Be careful to lower the volume, as the sine wave you will produce is 4 times louder than signals generated by the VCOs.

1. Set the panel controls as shown in Figure C. Lower the VCF FREQ slider and raise the RESONANCE slider all the way. Raise the black slider under the VCF box. Change the switch beneath the slider to the KYBD CV position. This slider will allow you to control the pitch of the sine wave from the keyboard. If you do not raise this slider all the way up, you may use it to tune your keyboard to a microtonal scale. Further uses of this slider are discussed in the KYBD CV section under CONTROLLER.

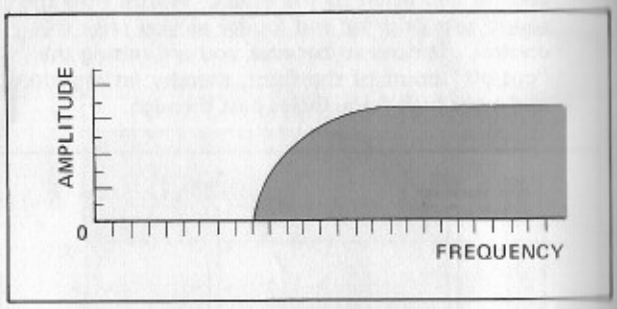


2. Hold a key down and slowly raise the VCF FREQ slider. What you are hearing is a pure sine wave, generated by the VCF. This feature of the VCF is called self-oscillation. You may tune the frequency of this sine wave with the VCF FREQ slider. Try tuning the sine wave to an audio signal from VCO I or VCO 2. You may attenuate the volume of the sine wave with the RESONANCE slider.

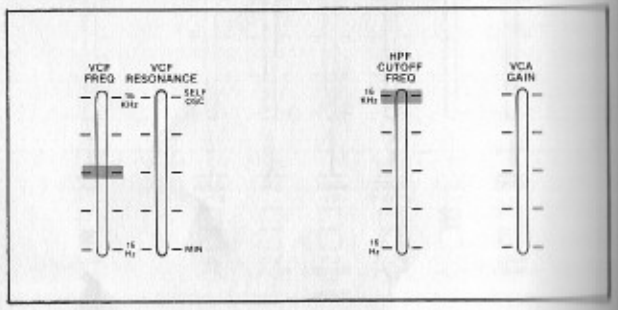


THE HIGH PASS FILTER (HPF)

Audio signals from the VCF are output to the High Pass Filter (HPF). The HPF is an exact opposite of the VCF. It will only pass frequencies above its cut-off point, and filter out all of the frequencies below its cut-off point, which is determined by the setting of the HPF slider.



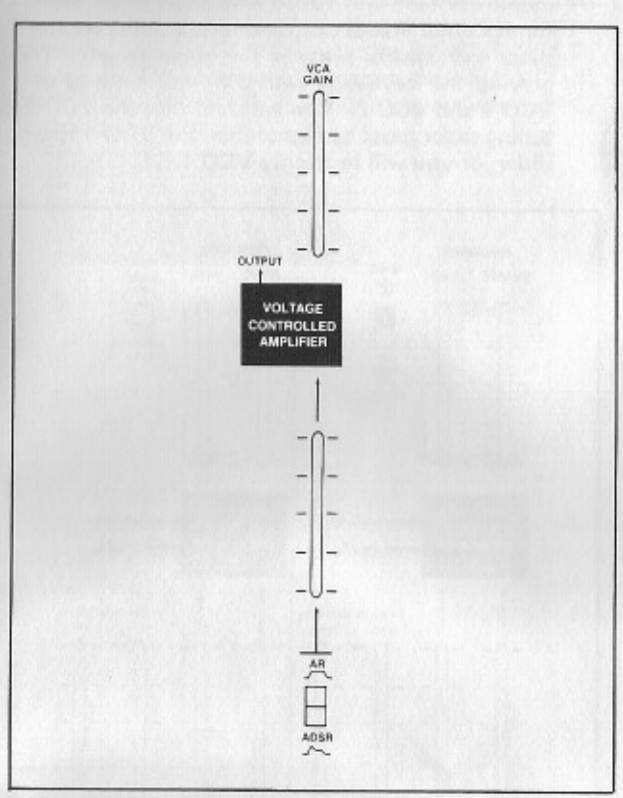
1. Set the controls as shown in Figure C. Raise the VCO 1 (sawtooth) slider under the AUDIO MIXER box. Hold down a key and slowly raise the HPF CUTOFF FREQ slider. You will hear the lower frequencies of the sound gradually diminish. If you set the VCF FREQ slider at about ½ and slowly raise the HPF slider all the way, you will eventually run out of lower frequencies, and the sound will disappear.



The HPF is useful in eliminating "boominess" from low bass notes, and aids in simulating certain instrumental sounds.

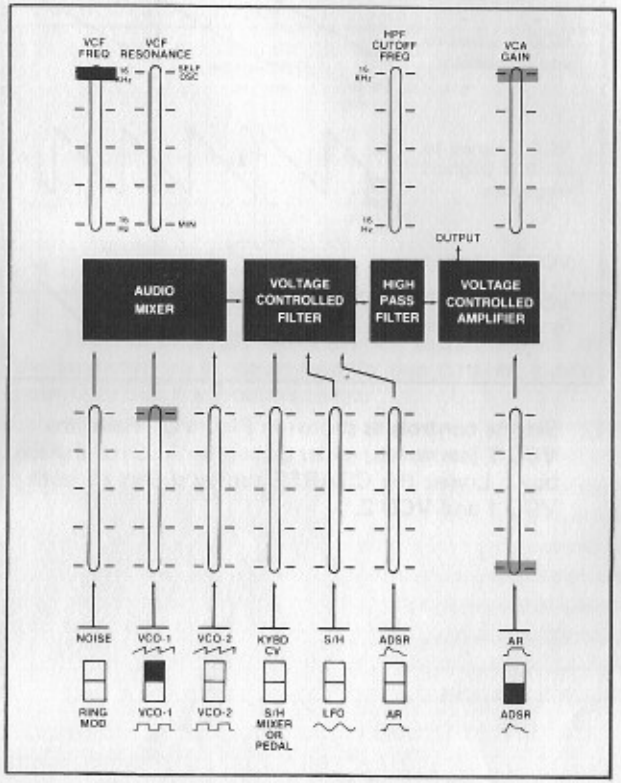
THE VOLTAGE CONTROLLED AMPLIFIER (VCA)

The Voltage-Controlled Amplifier (VCA) is responsible for modifying the amplitude (loudness) of a sound. All signals passed by the VCF must go through the VCA before becoming audible sounds. The VCA has two master controls; the VCA GAIN and the AR/ADSR attenuator.



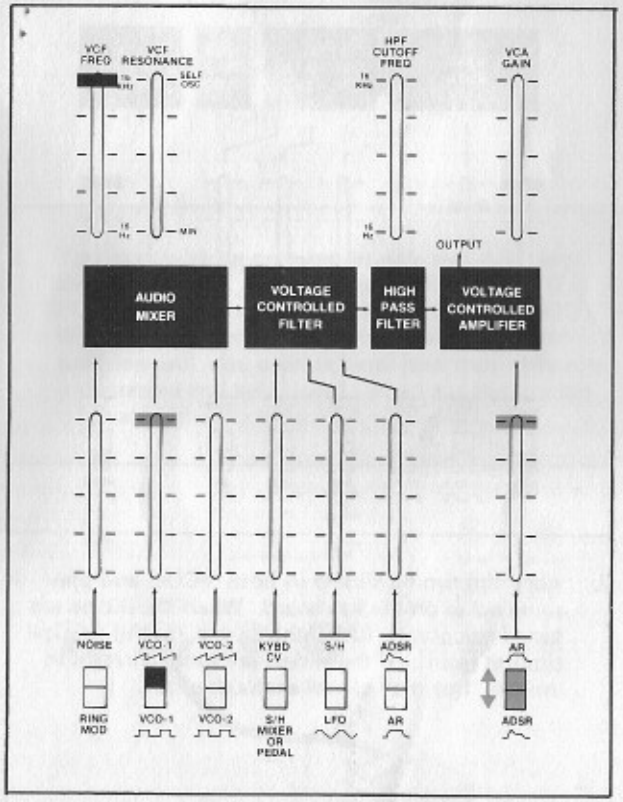
VCA GAIN

1. Set the controls as shown in Figure C. Raise the VCO 1 (sawtooth) slider in the AUDIO MIXER. Lower the red slider under the VCA box. Now raise the VCA GAIN slider. You will immediately hear a sound which will continue as long as this slider is raised. If you play a key the note will change, but the note will not stop when you release the key. This slider will function as a volume slider as you raise and lower it.



AR/ADSR

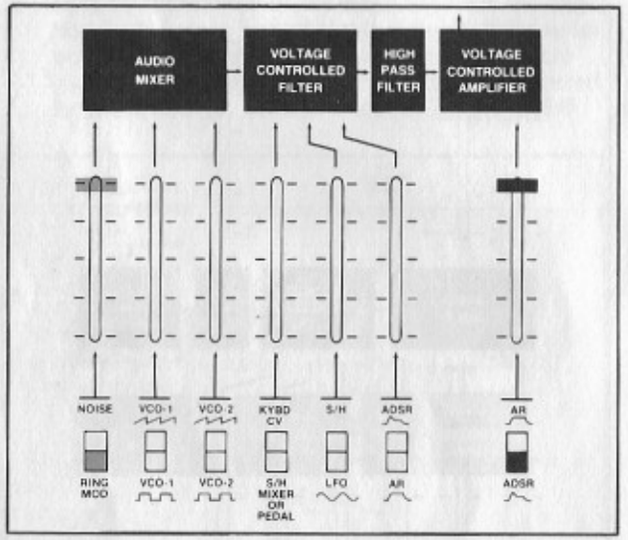
1. Set the controls as shown in Figure C. Raise the VCO 1 (sawtooth) slider in the AUDIO MIXER. The red slider under the VCA box attenuates the output of the AR and ADSR Envelope Generators. These will be explained in greater detail later in this manual. For the time being, it is sufficient to say that this slider will also act as a volume control, with the switch under it set in either position. You will notice that, unlike the VCA GAIN slider, the sound will stop on release of the key. For further information, see the AR and ADSR sections under CONTROLLERS.



RING MOD

The Ring Modulator takes the square wave outputs of VCOs 1 and 2, performs a complex mathematical operation on the combined signal, and outputs it to the VCF. The final signal has unique audio properties, bearing close relation to gong and bell sounds.

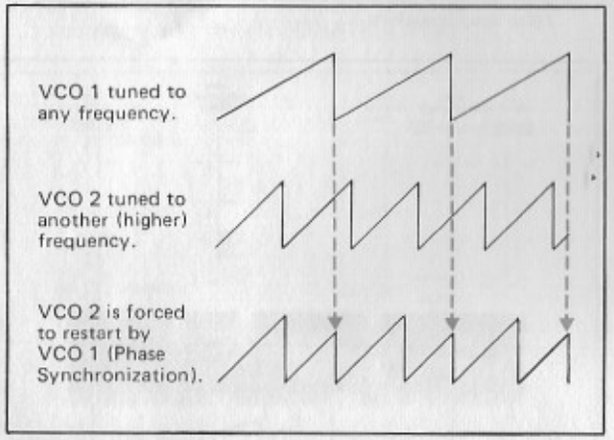
1. Set the controls as shown in Figure C. Change the switch beneath the white slider under the AUDIO MIXER box to the RING MOD position. Raise the slider and play a few notes on the keyboard. This slider brings the processed square wave output from both VCOs to the VCF.



2. Vary the tuning sliders in both VCOs, and play some notes on the keyboard. When the sliders are tuned to octaves, fifths, thirds, etc., useful musical timbres result. If the sliders are tuned exactly to unison, they may cancel each other out.

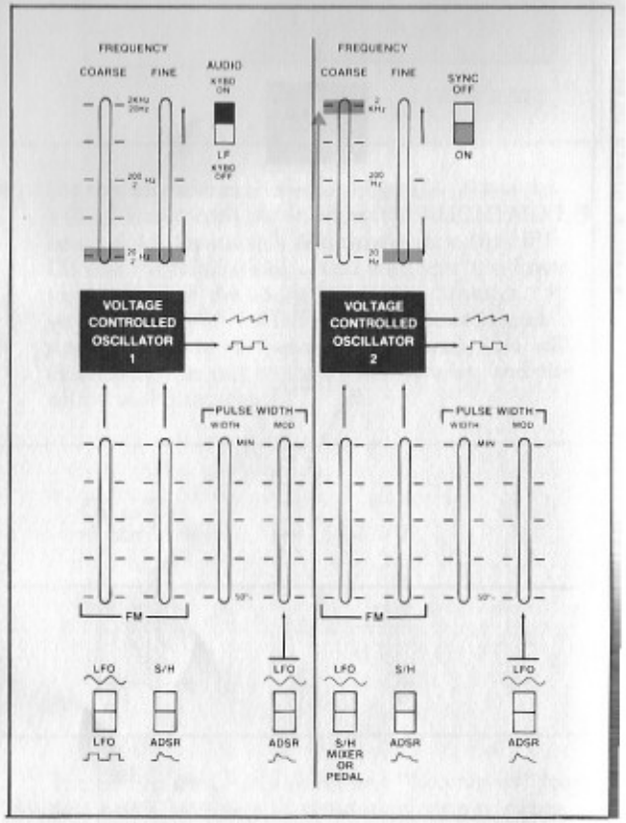
PHASE SYNC

Phase Synchronization is a means of combining two waveforms. The waveform supplied by VCO 1 is used to establish the fundamental frequency, or pitch. The waveform from VCO 2 is used to determine the harmonic content of the fundamental frequency. The square wave or sawtooth may be selected to perform either function.



1. Set the controls as shown in Figure C. Raise the VCO 2 (sawtooth) slider under the AUDIO MIXER box. Lower the COARSE tuning sliders of both VCO 1 and VCO 2.

2. Change the SYNC switch in the VCO 2 section to ON. Play a note on the keyboard and hold it down. Slowly raise the VCO 2 COARSE tuning slider. You will hear the fundamental frequency (from VCO 1) remain constant, while harmonic content steps up as you raise the slider. Eventually, the harmonic content will become stronger than the fundamental frequency, and the VCO 2 tuning slider will control pitch in the upper ranges. Try playing the keyboard with different tunings of VCO 1 and VCO 2. You will find that the VCO 2 tuning slider must be higher than the VCO 1 tuning slider, or you will hear only VCO 1.



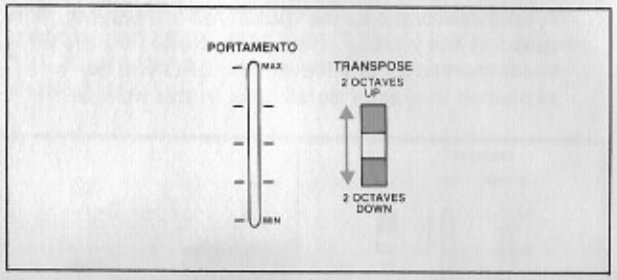
CONTROLLERS

THEORY

Controllers are devices on the synthesizer which are used to create electrical signals which in turn control modifiers or signal sources on the synthesizer. For instance, the most obvious controller on the ODYSSEY is the keyboard. The keyboard produces a voltage (called Control Voltage or KYBD CV) which controls the VCOs and may be used to control the VCF. Other controllers on the ODYSSEY are the SAMPLE/HOLD, AR and ADSR Envelope Generators, the LFO, VCO 1, the NOISE GENERATOR, VCO 2 (square wave), PPC, and the foot pedal.

THE KEYBOARD

As we have already mentioned, the keyboard is the primary controller of your ODYSSEY. The Keyboard Control Voltage (KYBD CV) is normally connected to the VCOs. The pitch of the VCO changes according to the voltage that the keyboard produces. Later, we will see how this Control Voltage may be applied to the VCF. The keyboard on your ODYSSEY has two controls: the TRANSPOSE SWITCH and the PORTAMENTO slider.

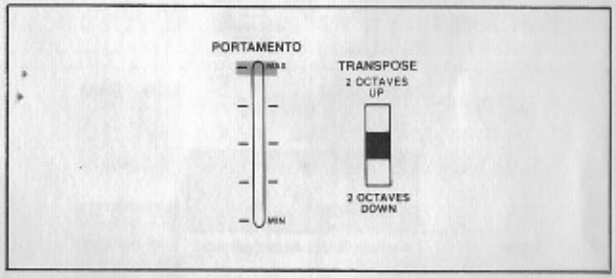


The TRANSPOSE SWITCH will shift the pitch of the keyboard up or down exactly two octaves, giving your ODYSSEY a 7-octave range.

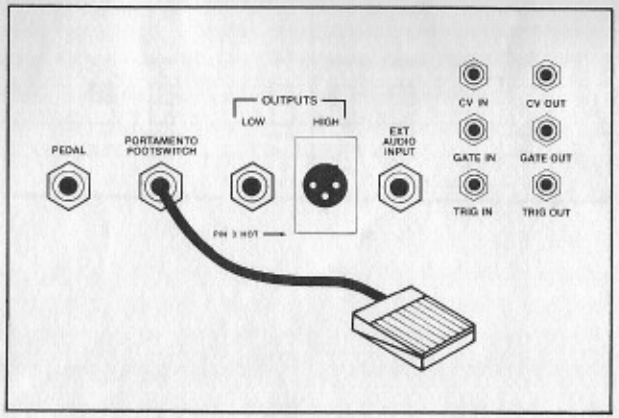
PORTAMENTO

Portamento is a "sliding" effect; that is, the pitch will rise and fall gradually from one note to the next.

1. Set up your ODYSSEY as in Figure C. Raise the VCO (sawtooth) slider under the AUDIO MIXER box. As you play, raise the PORTAMENTO slider and listen to the effect. You will note that the time necessary to slide from one note to the next is determined by the setting of this slider.

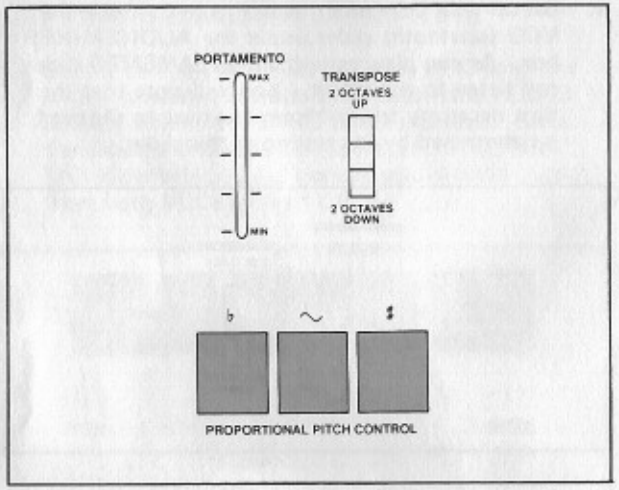


2. You may wish to connect an optional ARP foot switch into the jack marked PORTAMENTO FOOTSWITCH on the back of your ODYSSEY. When this switch is plugged in, the Portamento function will not operate until the foot switch is depressed and held down. When the foot switch is released, the Portamento is turned off.



PROPORTIONAL PITCH CONTROL (PPC)

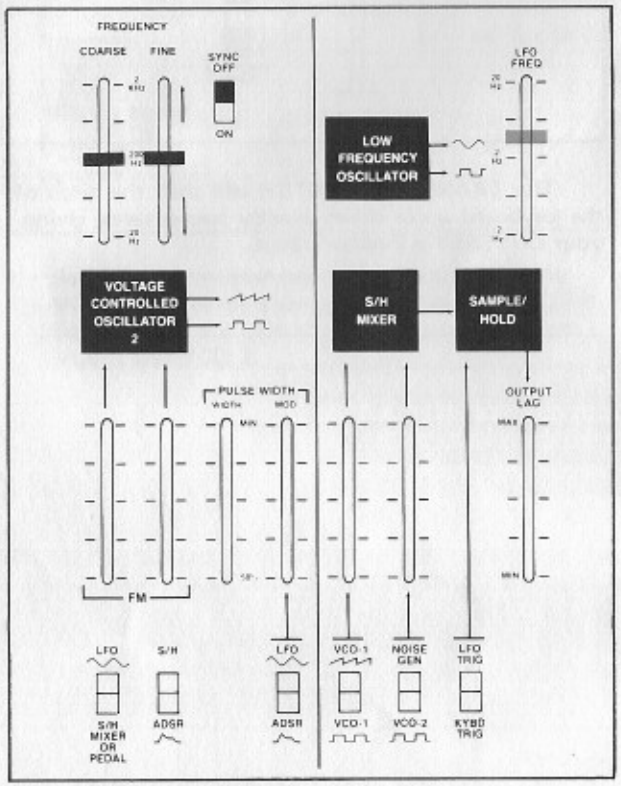
The PPC controller on your ODYSSEY is located immediately above the left end of the keyboard.



1. Set up the controls as shown in Figure C. Hold down a note with your right hand, and depress the left pad (marked *flat*) with your finger. You will notice that the pitch drops in proportion to the amount of pressure you apply to the pad.

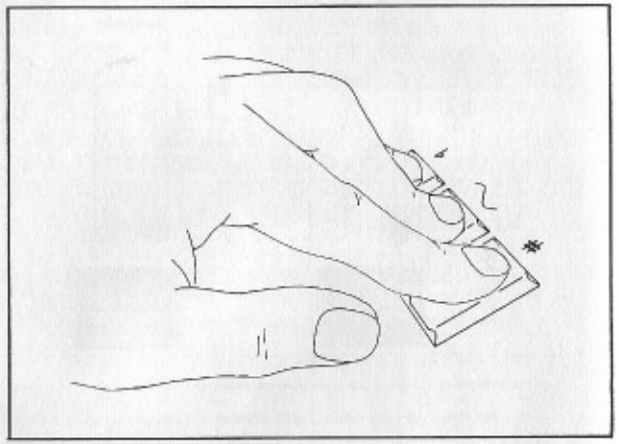
2. Next, try the same operation with the right pad (marked *sharp*). The pitch now bends up.

3. The center pad (marked with a sine wave) is unique. It applies vibrato to the sound you are playing. The speed of the vibrato effect is controlled by the pink slider marked LFO FREQ. The LFO will be explained in greater detail later in this manual.



The effect of the PPC pads is more pronounced toward the top of the pad than it is toward the bottom. This will help you tailor the effect you are using to your own touch requirements.

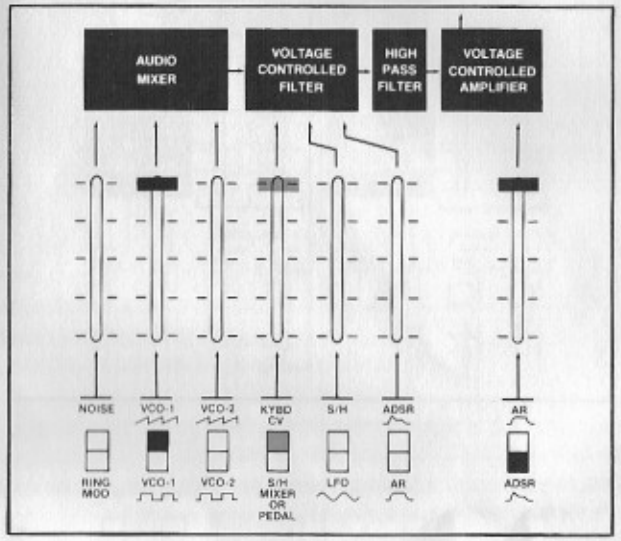
When using the synthesizer to imitate traditional instrument sounds in which pitch bending and vibrato are inherent characteristics (e.g., guitar, saxophone, trombone), use the PPC to add realistic expression. For other sounds, PPC gives you unlimited expressive capability, especially for solos and melody lines. Guitar-type sounds are enhanced considerably with the use of PPC, permitting pitch bending similar to the "string bending" techniques used by guitarists.



KYBD CV

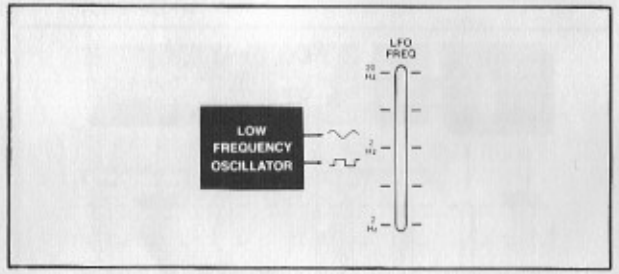
1. Set the panel controls as shown in Figure C. Raise the VCO 1 (sawtooth) slider under the AUDIO MIXER box. Lower the VCF FREQ slider to about half way. Hit the lowest note on the keyboard, then the highest. You will hear a very muted low note, and probably no high note at all. This is because the low-pass filter in the VCF is not passing the higher frequencies.

2. Now raise the black slider under the VCF box. Change the switch beneath the slider to the KYBD CV position. Hit the lowest note on the keyboard, then the highest. The low note will still sound muted, but the high note will be audible. The Control Voltage from the keyboard is now automatically opening the filter more and more with the higher notes you play. This effect is best described as "constant brilliance" over the full range of the keyboard. Try different settings of the VCF FREQ and KYBD CV sliders, and the TRANSPOSE switch.



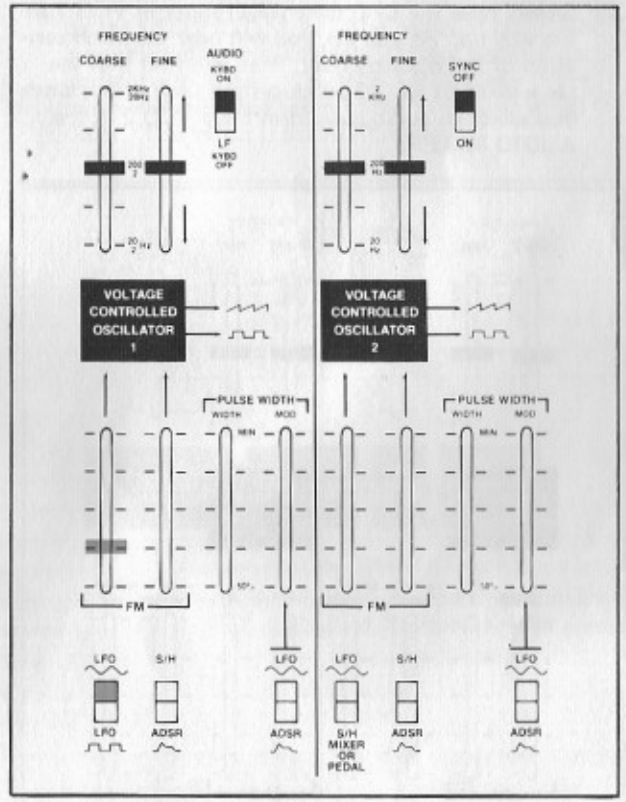
THE LOW FREQUENCY OSCILLATOR (LFO)

The Low Frequency Oscillator (LFO) is one of the most widely used features in synthesizers. If you look under the sliders in the lower row on your ODYSSEY, you will find nine switches marked for this function. The LFO in your instrument produces two waveforms; a low frequency sine wave, and a low frequency square wave. These waveforms are below the audio spectrum; that is, they are not audible as pitched sounds. They are used as tools to control other functions in your ODYSSEY, helping to produce useful musical effects such as vibrato (already demonstrated with the PPC), tremolo, and other repetitive effects. First, we will see how to use the LFO to modulate the frequency of an oscillator.



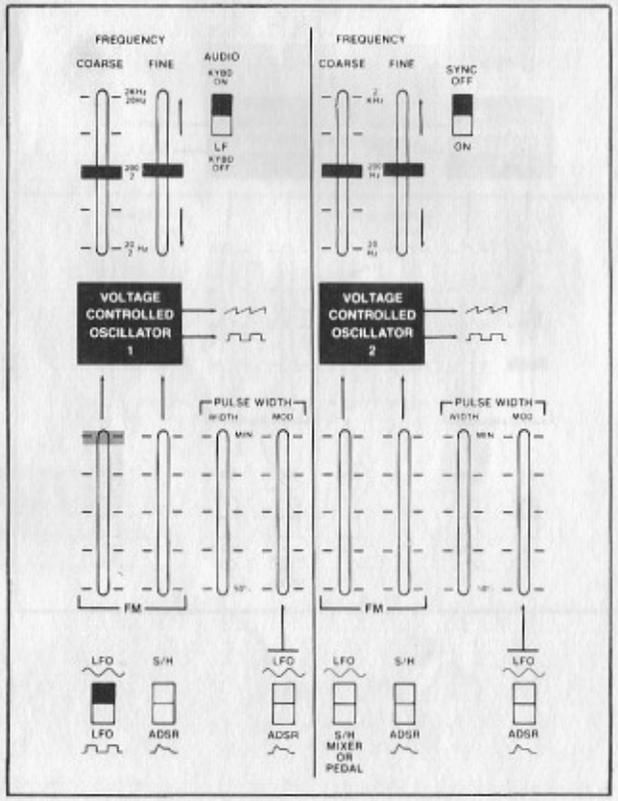
Frequency Modulation with the LFO

1. Set the controls as shown in Figure C. Select the VCO 1 (sawtooth) under the AUDIO MIXER box. Raise the first pink slider in VCO 1 up about a quarter. Set the switch below this slider to the LFO (sine wave) position. Raise the LFO FREQ slider (next to the LFO box) to about ¾.



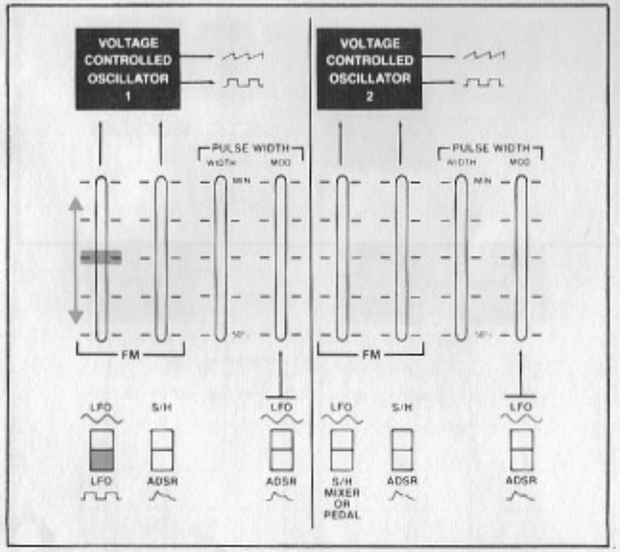
2. When you play a key, you will hear a pleasant vibrato. This is due to the sine wave from the LFO raising and lowering the frequency (pitch) of the oscillator. If you change the LFO FREQ slider, you can speed up or slow down the vibrato effect. Return the LFO FREQ slider to about ½.

3. Slowly raise the LFO (sine wave) slider in VCO 1 all the way up. As you do, you will hear the pitch variation of the vibrato effect. You will find that the same slider in VCO 2 produces the same effect when you select an audio waveform from VCO 2 in the AUDIO MIXER.



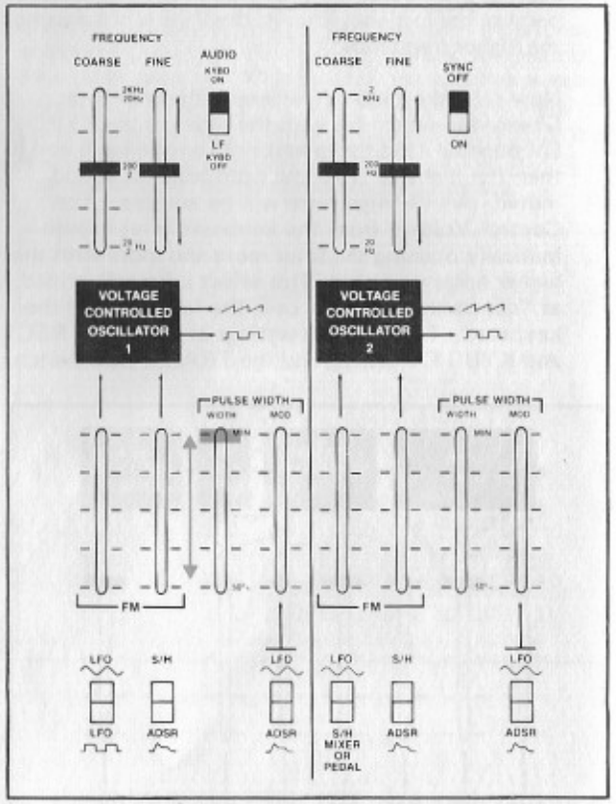
4. Now change the switch below the first pink slider in VCO 1 to the LFO (square wave) position. This will produce what is known as a trill. The speed of the trill, like the speed of the vibrato effect, is controlled by the LFO FREQ slider.

5. Varying the slider in VCO 1 will cause the two notes of the trill to become more widely separated. The base note (the one you are holding on the keyboard) will remain the same, but the second note will become higher as you raise the slider. This slider controls the depth of the trill, as it did with vibrato. There is no corresponding function in VCO 2. Try tuning the trill to fifths, thirds, octaves, etc.

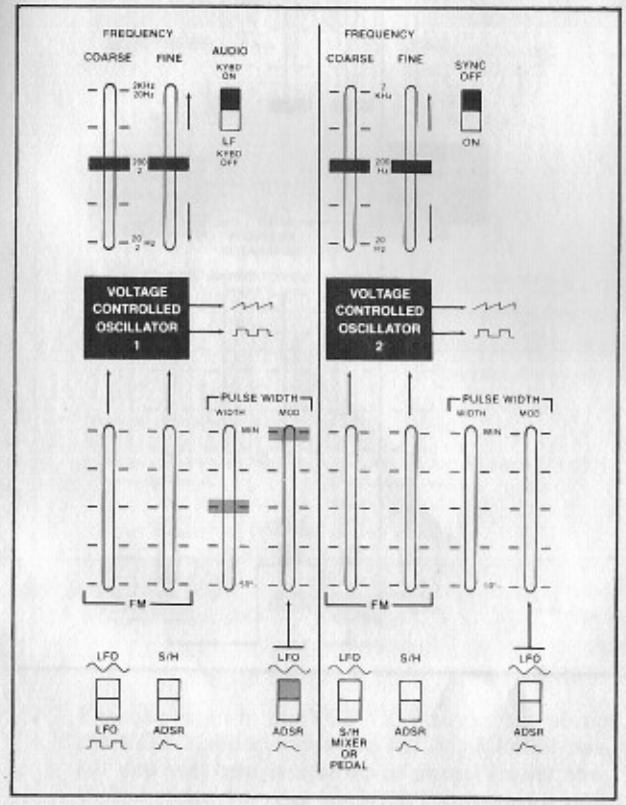


Pulse Width Modulation with the LFO

1. Set the controls as shown in Figure C. Select the VCO 1 (square wave) under the AUDIO MIXER box. Manually raise and lower the WIDTH slider in the PULSE WIDTH section of VCO 1. You will hear a constantly changing (dynamic) pulse wave.

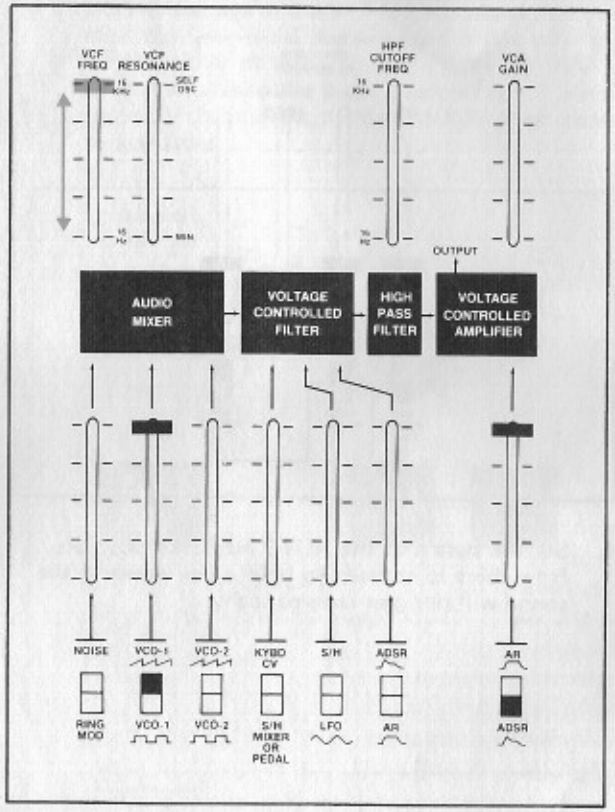


2. Set the LFO FREQ slider and the WIDTH slider at about half way. Raise the MOD slider in the VCO 1 PULSE WIDTH section all the way. Change the switch below the slider to the LFO (sine wave) position. The sound you will hear will closely duplicate the sound you just created manually. The LFO is opening and closing the pulse width of the VCO 1 square wave. The speed of this effect is controlled by the LFO FREQ slider, and the depth of this effect is controlled by the MOD slider. The WIDTH slider selects the operating range of the MOD slider. You may perform this identical operation on VCO 2 when you select the VCO 2 (square wave) in the AUDIO MIXER.

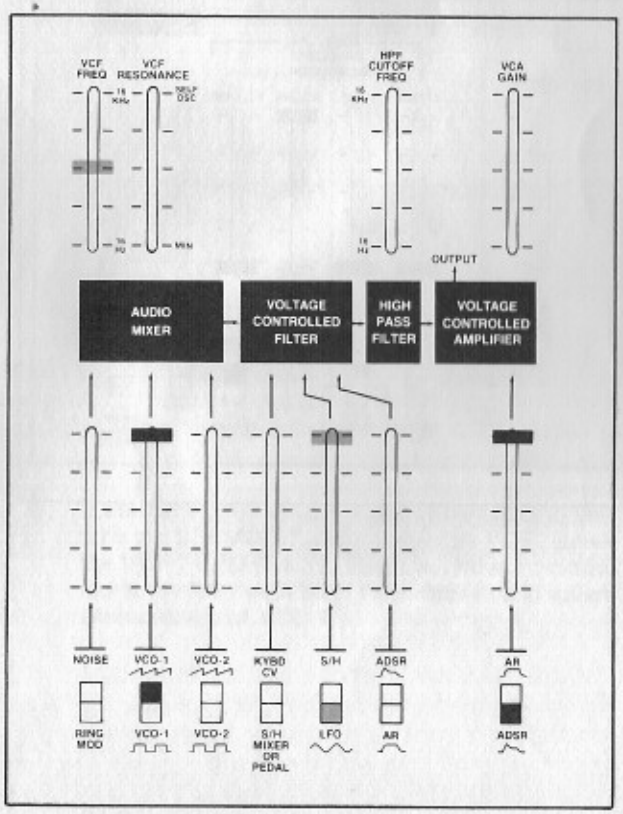


LFO Modulation of the VCF

1. Set the controls as shown in Figure C. Select VCO 1 (sawtooth) in the AUDIO MIXER. Raise the LFO FREQ slider to about half way. Hold a key down, then raise and lower the VCF FREQ slider. You will hear a wah-wah sound, similar to that produced by a guitar effects pedal.



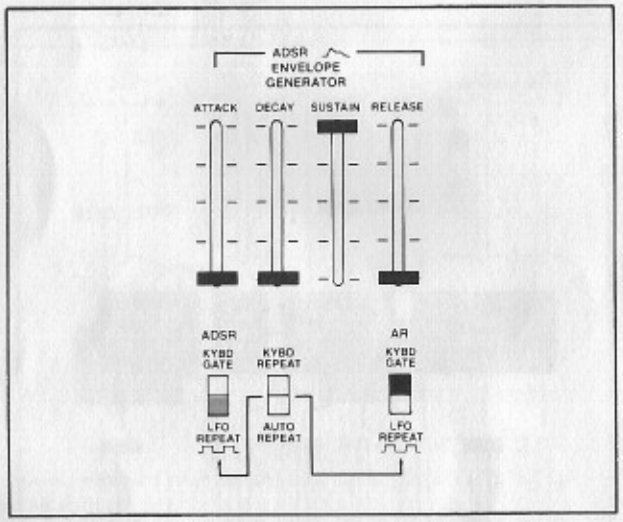
2. Leave the VCF FREQ slider at about half way. Raise the yellow slider under the VCF box all the way. Set the switch below the slider to the LFO (sine wave) position. Now when you hold down a key, you will hear a sound very close to that which you just produced by hand. The LFO sine wave is automatically raising and lowering the cut-off point of the VCF. The speed of this effect is controlled by the LFO FREQ slider. The depth of this effect is controlled by the yellow LFO (sine wave) slider under the VCF box. The VCF FREQ slider determines the operating range of the LFO (sine wave) slider. This effect is called "Tremolo".



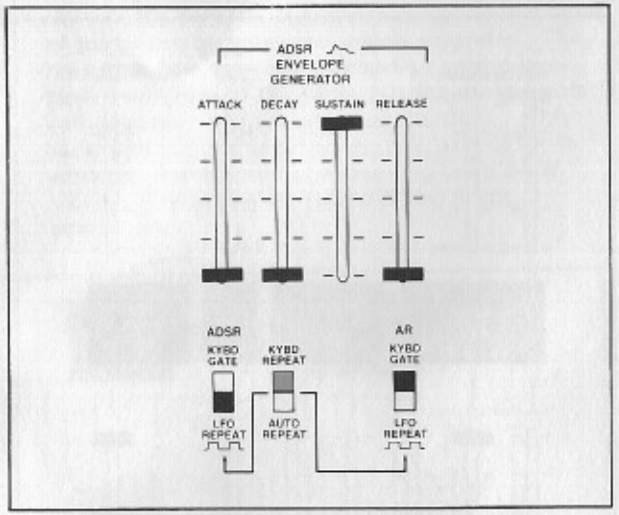
LFO Control of AR and ADSR

1. Set the controls as shown in Figure C. Select VCO 1 (sawtooth) in the AUDIO MIXER. Raise the LFO FREQ slider to about ¾.

2. Under the ADSR Envelope Generator are three switches. Set the switch labeled ADSR to the LFO REPEAT position. When this switch is set in the KYBD GATE position, the ADSR Envelope Generator will only trigger once (on key depression). When it is in the LFO REPEAT position, it will trigger continually at a rate determined by the LFO FREQ slider.

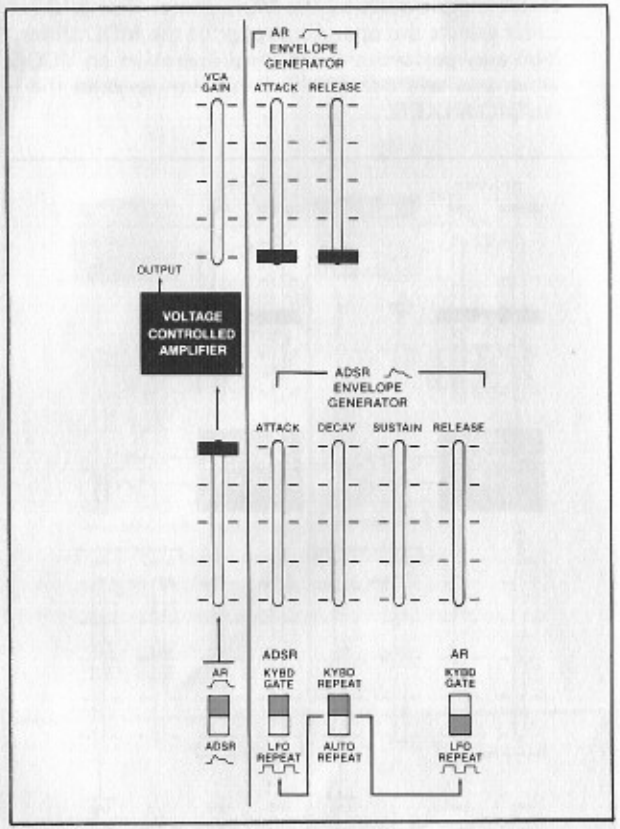


3. Set the switch next to the ADSR switch in the KYBD REPEAT position. When you hold a key down, you will hear a continual retriggering of the sound. When you release the key, the sound will stop.



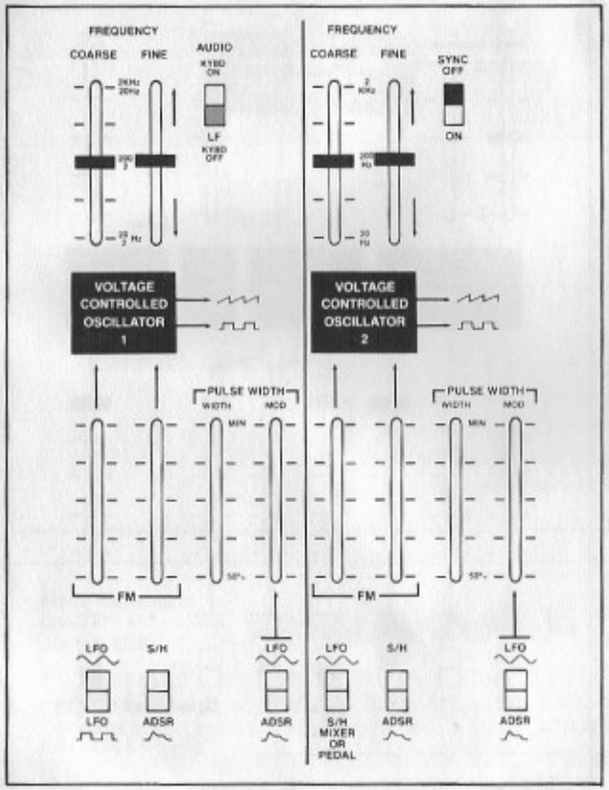
4. Set the switch in the AUTO REPEAT position. Now there is no need to hold a key down as the sound will retrigger automatically.

5. Return the switch to the KYBD REPEAT position and the ADSR switch to the KYBD GATE position. The switch labelled AR will perform exactly the same when you have selected the AR Envelope Generator with the switch under the red VCA slider. You may also use the AR and ADSR in other sections of the ODYSSEY. For further information, see the AR and ADSR sections later in this manual.



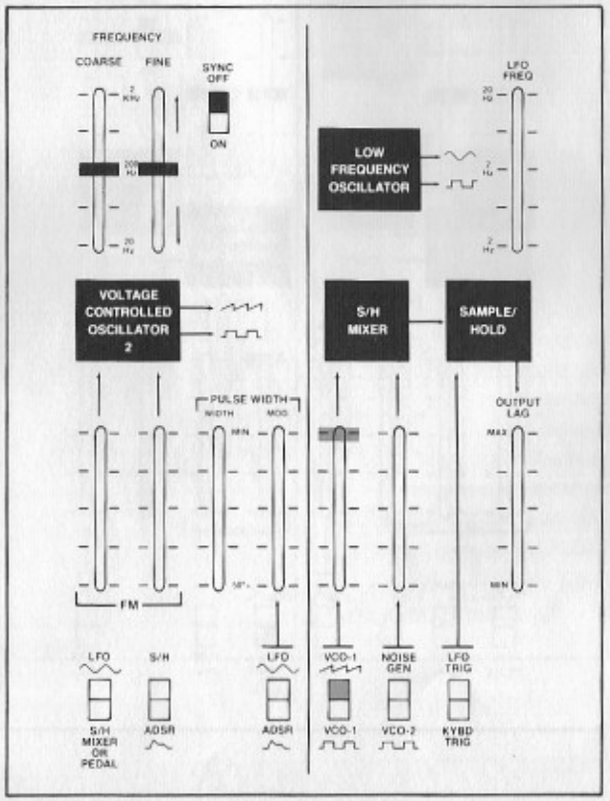
VCO 1 in LF Mode

1. Set the controls as shown in Figure C. You can make a voltage-controlled, low-frequency oscillator out of VCO 1 by changing the switch labeled AUDIO to the LF (KYBD OFF) position. This lowers the frequency range of VCO 1 by a factor of 100, and disables keyboard control of VCO 1. Now you have available to you another low-frequency square wave, and a low-frequency sawtooth wave as well.

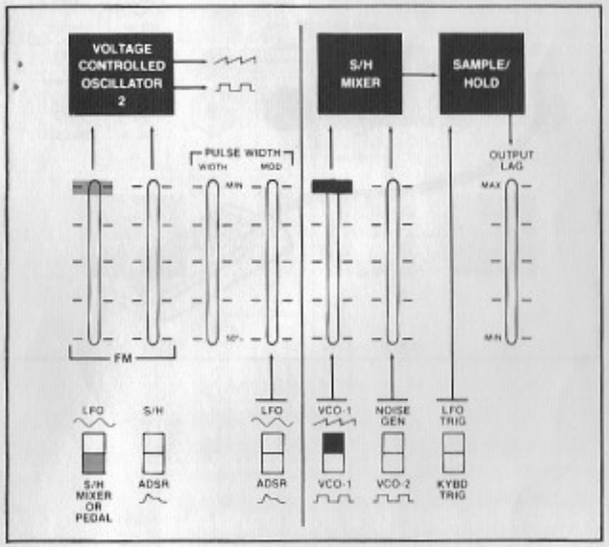


2. You can listen to the VCO 1 LF output by raising the VCO 1 slider under the AUDIO MIXER box. All you will hear is a series of pops. Lower the VCO 1 slider and raise the VCO 2 (sawtooth) slider.

3. In order to use the VCO 1 LF output, first you must select the waveform you wish to use via the S/H MIXER. Raise the blue VCO 1 (sawtooth) slider under the S/H MIXER box. Now look under the lower row of sliders. You will find two switches marked S/H MIXER or PEDAL (one in VCO 2, and one in the VCF). This means that you must have the pedal disconnected if you wish to control either of these functions with the VCO 1 LF output. When the pedal is connected, it automatically disconnects the S/H MIXER from these two switches.



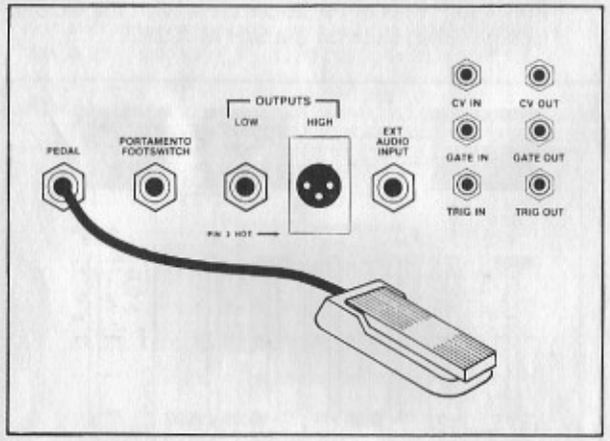
4. Raise the first pink slider under VCO 2. Be sure the switch is set in the S/H MIXER position. Now when you play a key, you will hear the pitch repeatedly "slide" up the ramp of the sawtooth wave, and drop back to its original pitch. The VCO 1 tuning sliders control the speed of this effect. Both the S/H MIXER and VCO 1 (sawtooth) sliders control the depth. Repeat the above steps with the VCO 1 (square wave) slider in the S/H MIXER.



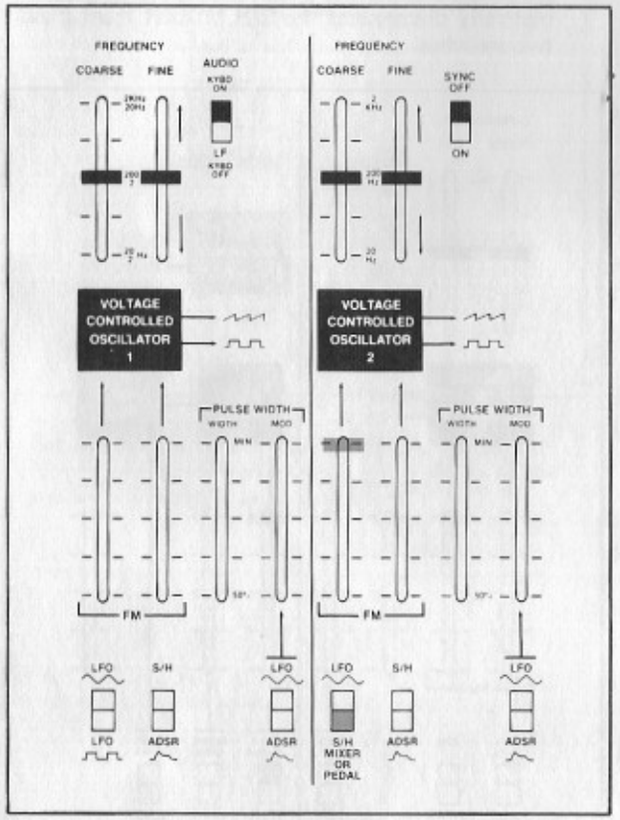
5. Lower the S/H MIXER slider under VCO 2, and raise the S/H MIXER slider under the VCF. Lower the VCF FREQ slider to about ¾. Now try modulating the filter with both the sawtooth and square wave outputs of VCO 1.

PEDAL

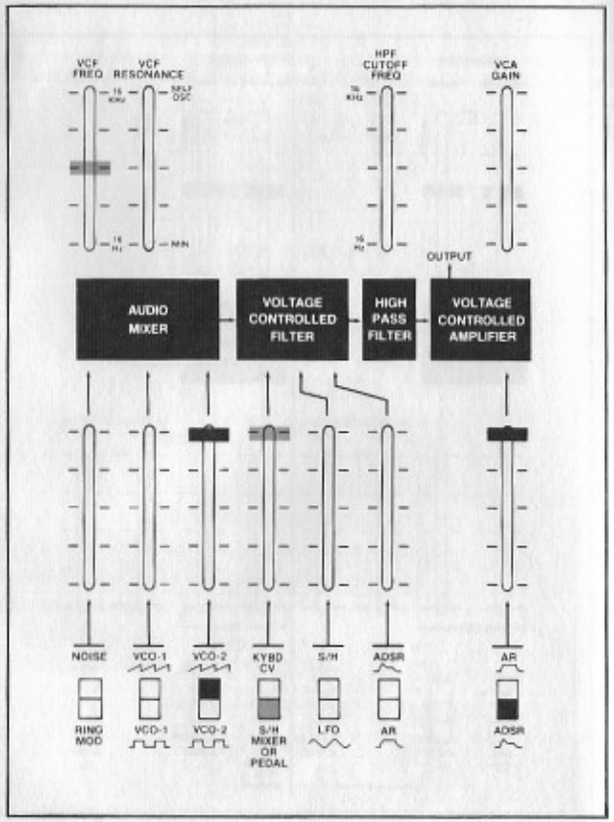
You may wish to connect an optional ARP foot pedal into the jack labeled PEDAL on the back of your ODYSSEY. It can be used to modulate the frequency of VCO 2 or to open and close the VCF. Set the controls as shown in Figure C. Raise the VCO 2 (sawtooth) slider under the AUDIO MIXER box.



1. To modulate the frequency of VCO 2, raise the first pink slider under the VCO 2 box. Be sure the switch beneath the slider is set in the S/H MIXER OR PEDAL position. The pedal will now control the frequency (pitch) of VCO 2. The slider will control the range of the pedal. Try changing the SYNC switch in VCO 2 to the ON position. You can now modulate the PHASE SYNC effect with the pedal. Return the switch to the OFF position.

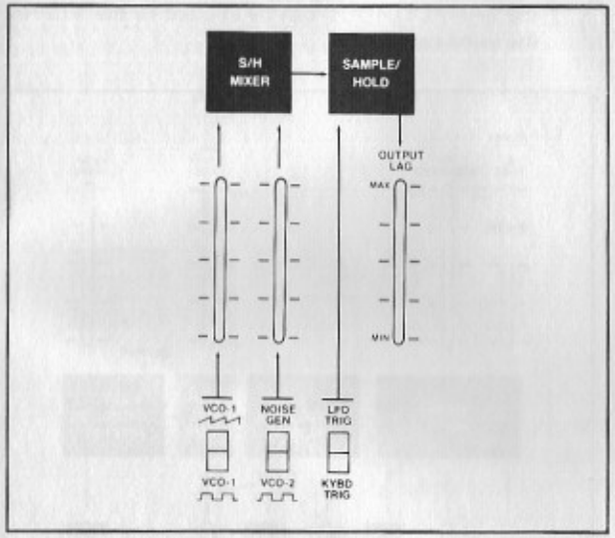


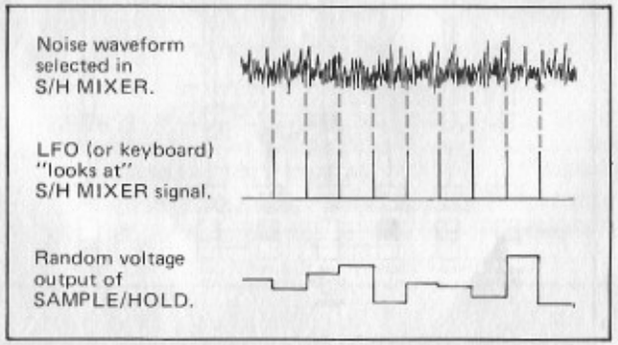
2. To control the VCF, lower the pink slider under VCO 2 and raise the slider labeled S/H MIXER OR PEDAL under the VCF box. Lower the VCF FREQ slider to about half way. Now when you play a key, the sound will be muted and dull until you depress the pedal. The slider controls the range of the pedal. The VCF FREQ slider determines the starting point of the pedal control.



SAMPLE/HOLD

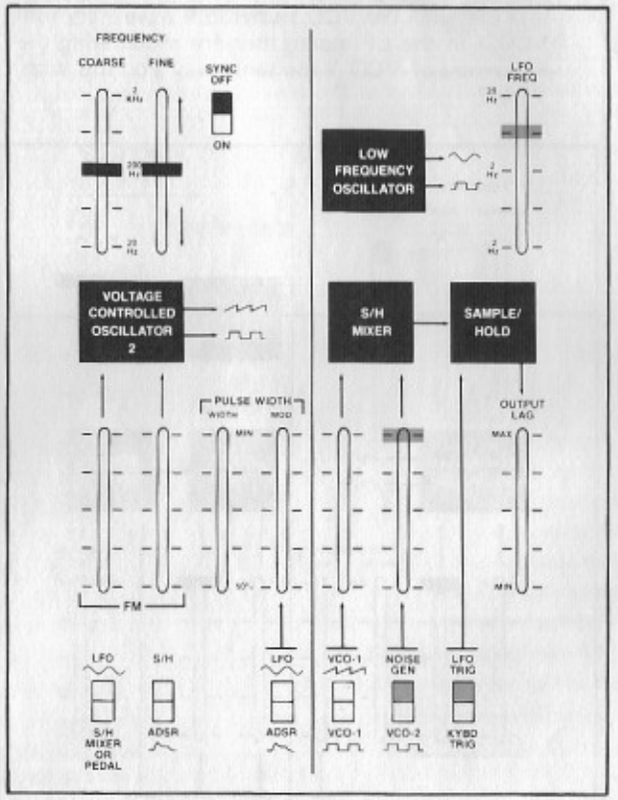
The SAMPLE/HOLD (S/H) is a controller which may be automatically triggered at a specific rate or triggered manually by the keyboard. When the S/H is triggered, it "looks at" whatever waveform (or waveforms) are selected in the S/H mixer, takes whatever voltage level is occurring at that instant, and holds it. This is called the S/H CV. The S/H CV will change every time the S/H is retriggered. The S/H CV may be used as a controller in three locations (VCO 1, VCO 2, and the VCF).



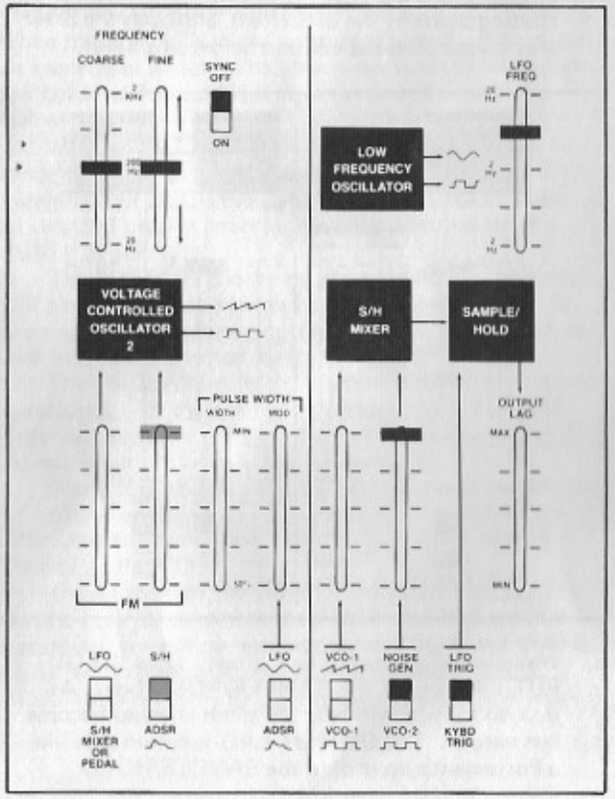


Frequency Modulation with the S/H

1. Set the controls as shown in Figure C. Raise the VCO 2 (sawtooth) slider in the AUDIO MIXER. Raise the white slider under the S/H MIXER box. Set the switch below the slider to the NOISE GEN position. Change the switch next to it in the LFO TRIG position. Raise the LFO FREQ slider to about ¾. This slider controls the rate of the S/H CV when the switch is in the LFO TRIG position.

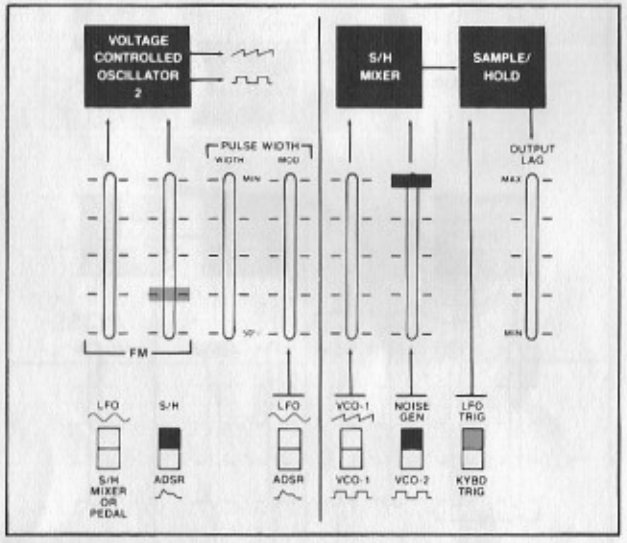


2. Raise the yellow slider under the VCO 2 box all the way. Set the switch below this slider to the S/H position. When you play a key, you will hear a random "sampling" of different pitches occurring at a steady rate. These pitches are random because you are using noise as your sample source. The LFO FREQ slider controls the rate of the changes.



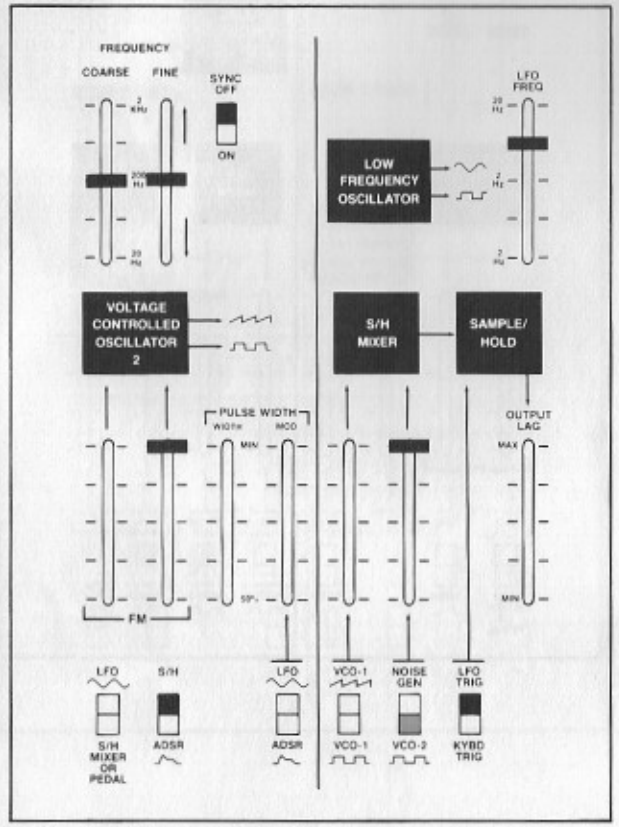
3. Now set the switch from LFO TRIG to KYBD TRIG. The LFO no longer controls the rate of the S/H CV. Hit one key several times in succession. You will hear the pitch change with every key depression; you are now manually controlling the rate of the S/H CV with the keyboard.

4. Return the switch to the LFO TRIG position. Lower the yellow S/H slider under VCO 2 to about ¼. Now when you play a key, the random pitch changes occur in a very narrow range. As you raise the slider, this range will increase. Try this same experiment with the white slider in the S/H MIXER. Both of these sliders control the range of the S/H effect. The VCO 2 tuning sliders will determine the starting point of the S/H effect, although the S/H may trigger notes above and below this point.



5. While holding down a key, slowly raise the OUTPUT LAG under the SAMPLE/HOLD box. As you do so, you will hear the pitch changes become less abrupt. The OUTPUT LAG function acts like a Portamento control in the SAMPLE/HOLD.

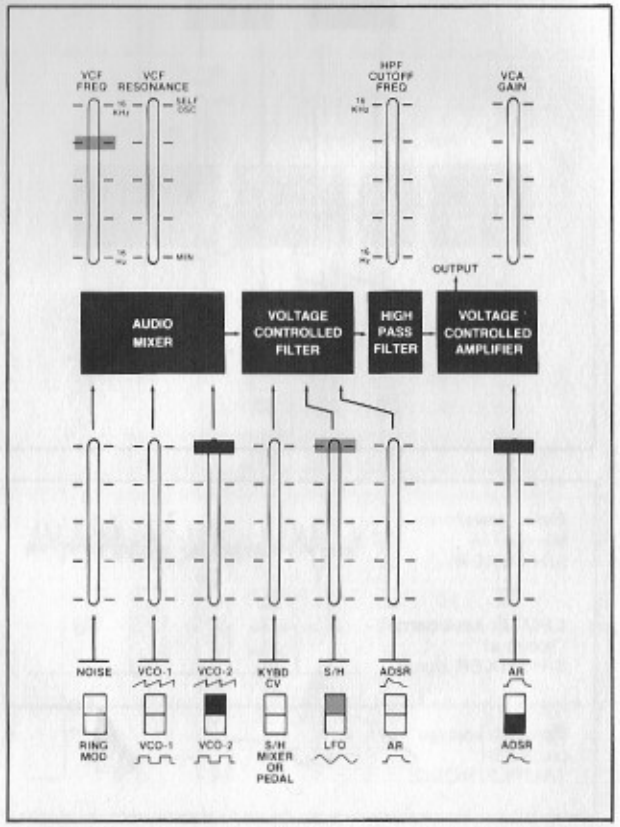
6. Change the switch under the white slider in the S/H MIXER to the VCO 2 (square wave) position. Instead of random noise, the S/H CV will now be sampling a waveform which has only two voltage levels (the high and low portions of the square wave). However, you will frequently hear the S/H sample a portion of the ascender or descender of the square wave, giving you an occasional random pitch. Try using the VCO 1 square wave in the S/H MIXER, then the VCO 1 sawtooth wave. Try using VCO 1 in the LF mode, then try modulating the frequency of VCO 1 the same way you did with VCO 2.



S/H Modulation of the VCF

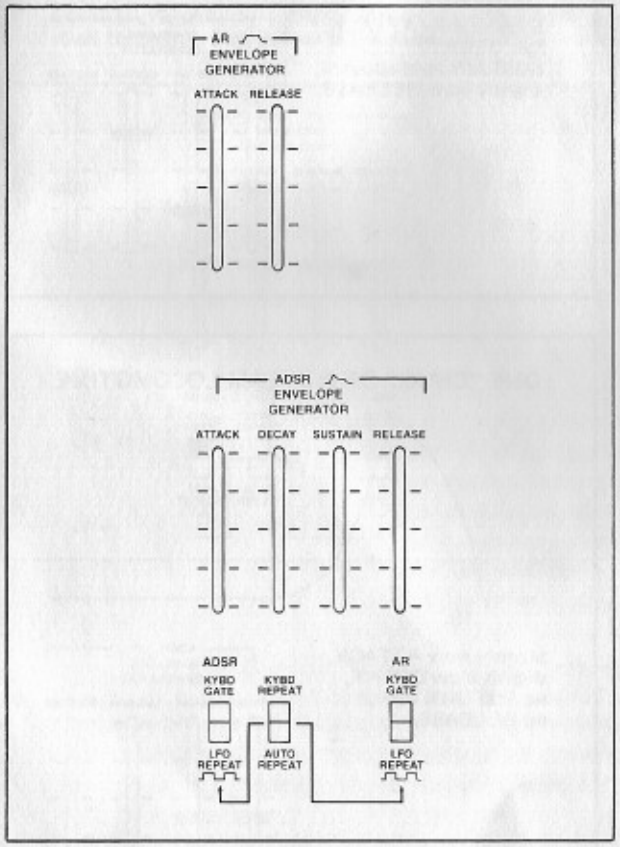
1. Repeat step 1 from the previous experiment.

2. Lower the VCF FREQ slider to about ¾. Raise the yellow slider under the VCF box. Set the switch below the slider to the S/H position. Now when you play a key, you will hear the random voltage samples opening and closing the filter in a series of random "steps" while the pitch remains constant. If you repeat all of the steps in the previous experiment using the S/H slider into the filter, you will find that all of the controls in the S/H MIXER and the SAMPLE/HOLD can be applied to the VCF in the same manner.



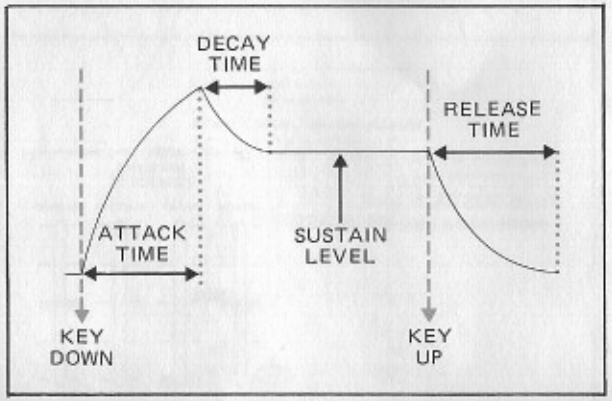
AR & ADSR ENVELOPE GENERATORS

The AR and ADSR Envelope Generators are the most versatile and flexible functions on your synthesizer. The Envelope Generators are used to "shape" the sound from start to finish. The AR and ADSR Envelope Generators produce no sound of their own, but are used as controllers in much the same way the LFO is used as a controller. The AR Envelope Generator is a less complex version of the ADSR, so we will discuss the ADSR first.



ADSR

Each time a key is depressed, the keyboard generates a trigger signal that initiates an ATTACK signal from the ADSR. A complete cycle of the ADSR looks something like this:



As you will see, this is a somewhat idealized illustration of an envelope, as these parameters are all adjustable. This is what happens during the course of an ADSR event:

When a key is depressed and held down, the ADSR produces a rising voltage. This signal is called the ATTACK. The ATTACK signal rises at a speed which you determine with the setting of the ATTACK slider. When the ATTACK slider is set at minimum, it produces an immediate signal. When the slider is set at maximum, the signal will take about four seconds to reach its full strength.

- When the ATTACK signal has reached its peak, it turns around and begins descending at a speed determined by the DECAY slider. The signal will continue to descend until it reaches the level selected by the SUSTAIN slider.

The SUSTAIN slider sets a level at which the signal will be maintained as long as the key is held down. As soon as the key is released, the signal will again begin to fade at a speed selected by the RELEASE slider.

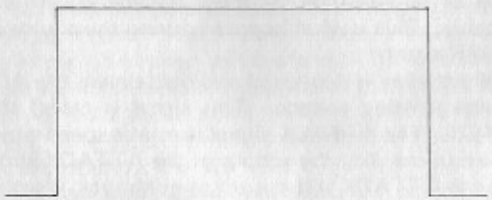
The RELEASE signal is initiated only when the key is released. At the minimum setting, the RELEASE slider will produce an immediate decrease in the signal. At maximum, it takes about five seconds.

These four sliders can be used to control the volume of a sound or they may be used to open and close the filter, modulate the pulse width, or control the frequency of the VCOs.

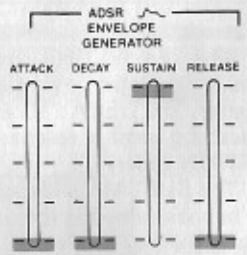
If you look at the panel of your ODYSSEY, you will find six places where the ADSR may be used as a controller; frequency modulation of VCO 1 and VCO 2, pulse width modulation of VCO 1 and VCO 2, modulation of the VCF, and modulation of the VCA.

ADSR SETTINGS FOR VARIOUS ENVELOPES

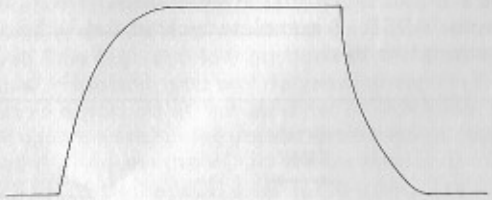
ORGAN



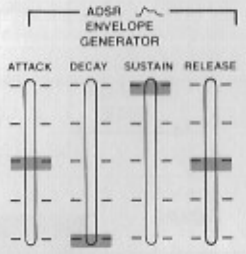
Fast ATTACK,
no DECAY time,
high SUSTAIN level,
immediate RELEASE.



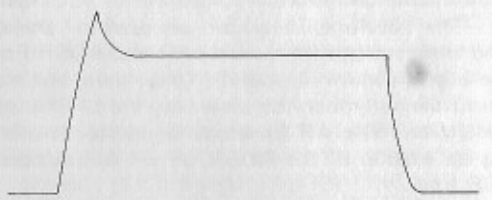
VIOLIN



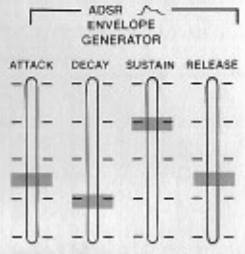
Medium ATTACK time,
no DECAY time,
high SUSTAIN level,
moderately long RELEASE.



TRUMPET

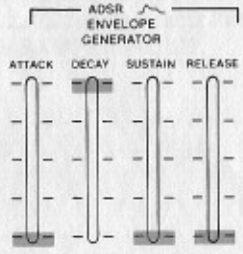


Slightly slow ATTACK,
fast DECAY,
SUSTAIN level about ¾,
slightly slow RELEASE.



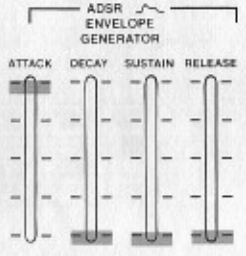
GUITAR

Fast ATTACK,
long DECAY,
no SUSTAIN level,
no RELEASE,

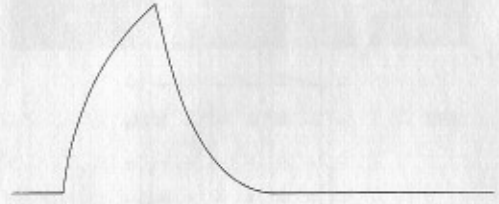


GUITAR TAPED AND PLAYED BACKWARDS

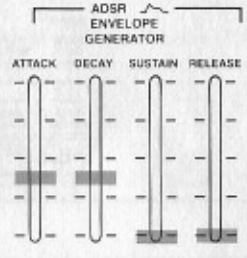
Long ATTACK,
immediate DECAY,
no SUSTAIN level,
no RELEASE.



ONE "CHUG" OF A STEAM LOCOMOTIVE



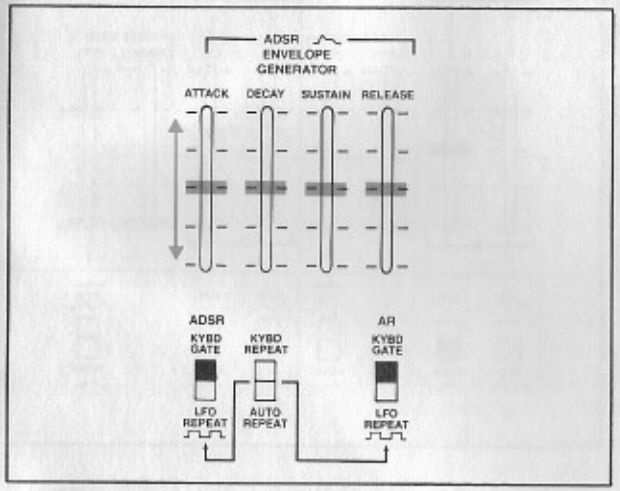
Slightly slow ATTACK,
slightly slow DECAY,
no SUSTAIN level,
no RELEASE.



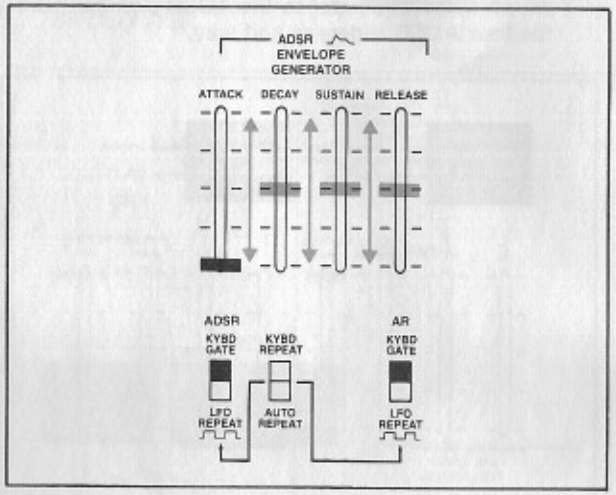
ADSR Modulation of the VCA

Throughout this manual you have been controlling the VCA with an elementary envelope. This is accomplished by the red slider under the VCA box. The switch under this slider is set in the ADSR position, so whatever is set up on the ADSR will control the VCA.

1. Set the controls as shown in Figure C. Raise the VCO (sawtooth) slider in the AUDIO MIXER. Set all four ADSR sliders at half way. Play a few notes on the keyboard. Now raise the ATTACK slider all the way up. Play a few notes, then lower it all the way. Play a few more notes.



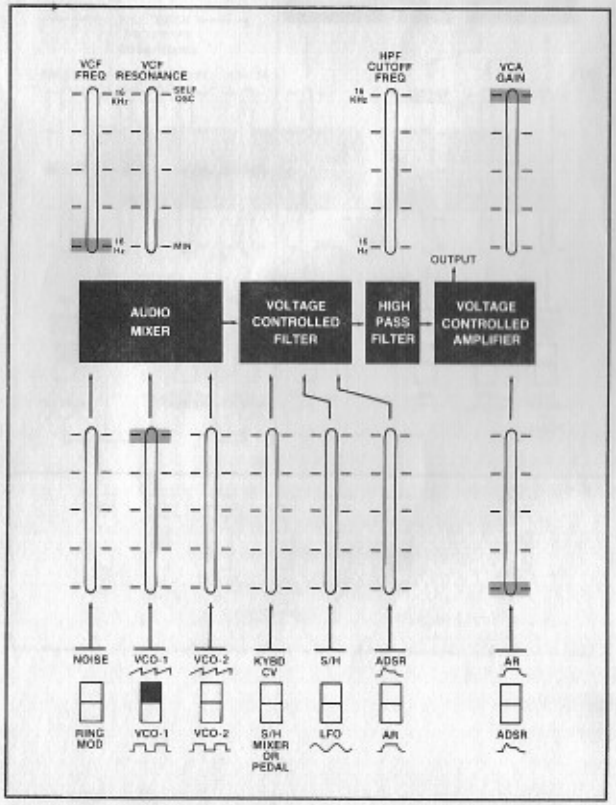
2. Repeat the same steps with the DECAY, SUSTAIN, and RELEASE sliders. Play around with the four ADSR sliders until you have familiarized yourself with the process of creating an envelope. The red ADSR slider controls the depth of this effect.



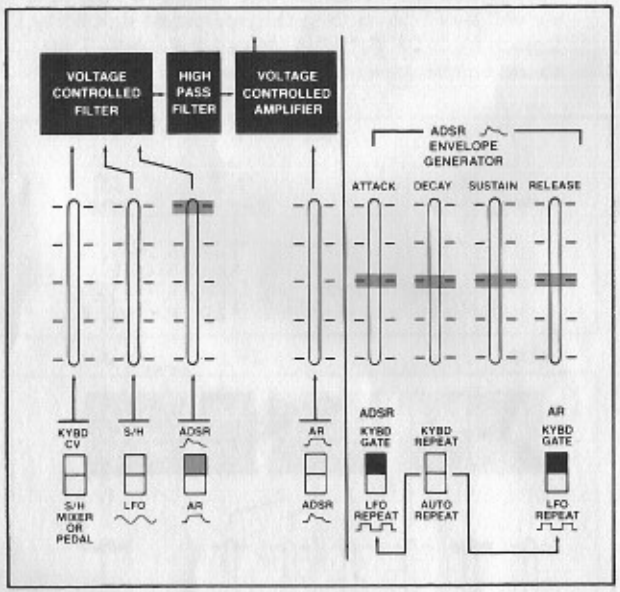
ADSR Modulation of the VCF

The ADSR may be used to open and close the VCF in much the same manner as the LFO was used.

1. Set the controls as shown in Figure C. Raise the VCO 1 (sawtooth) slider into the AUDIO MIXER. Lower the red slider under the VCA box and raise the VCA GAIN slider all the way. (This is to avoid confusion. The ADSR, LFO, S/H, etc. may all be used to control more than one thing at a time, but we will avoid doing so in the interest of simplicity.) Lower the VCF FREQ slider all the way. The sound will disappear completely.

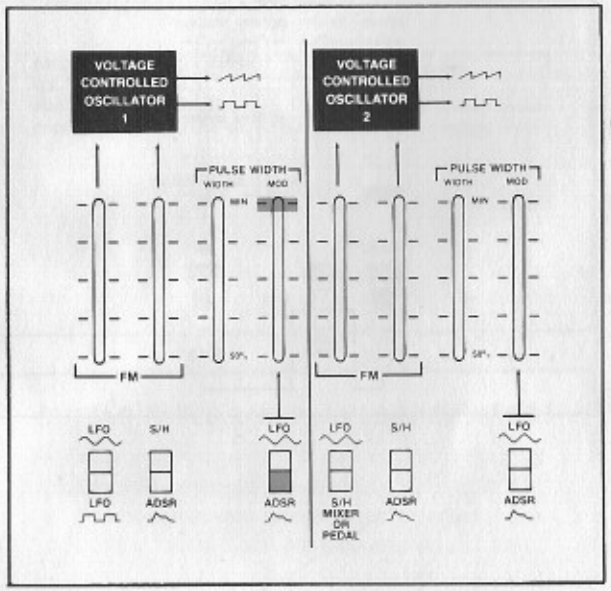


2. Now raise the red slider under the VCF box. Change the switch to the ADSR position. Set the four ADSR controls to half way. When you play a key, the ADSR will open and close the filter according to the settings of the four ADSR sliders. Raise and lower the sliders as you did in the previous experiment. The ADSR slider in the VCF controls the depth of this effect.



ADSR Modulation of Pulse Width

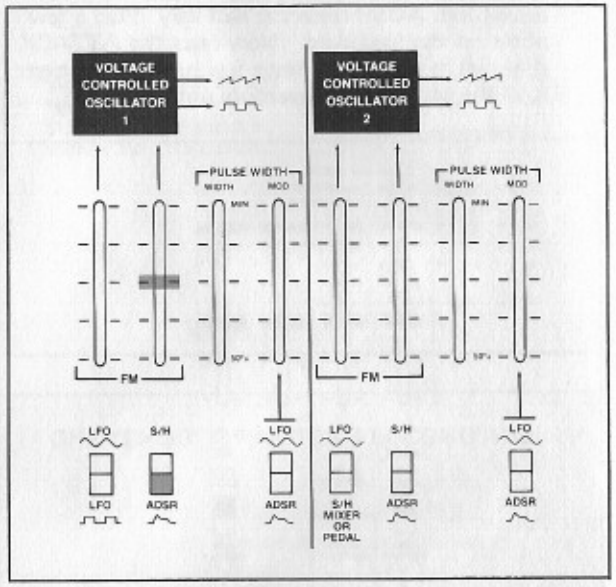
1. Set the controls as shown in Figure C. Raise the VCO 1 (square wave) slider in the AUDIO MIXER. (Remember, you can only modulate the pulse width of the square wave.) Lower the red ADSR slider in the VCA and raise the VCA GAIN slider. Raise the second pink slider in VCO 1 all the way. Set the switch below the slider to the ADSR position. Set the four ADSR sliders to half way.



2. When you play a key, the ADSR control voltage will open and close the pulse width in exactly the same way it opened and closed the filter. Raise and lower the four ADSR sliders as you did in the first experiment. This function is exactly the same in VCO 2 as in VCO 1. The ADSR sliders in VCO 1 and VCO 2 control the depth of this effect.

Frequency Modulation with the ADSR

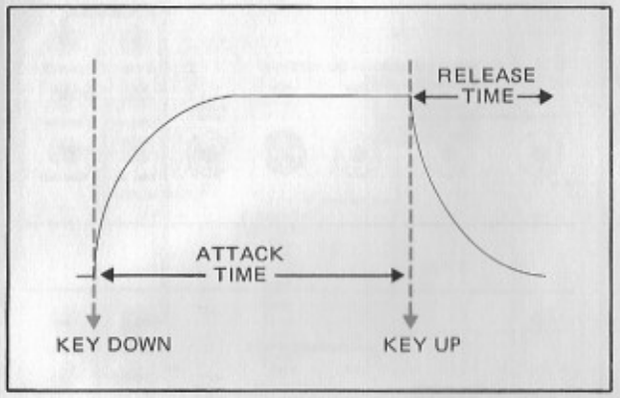
1. Set the controls as shown in Figure C. Raise the VCO 1 (sawtooth) slider in the AUDIO MIXER. Lower the red ADSR slider in the VCA and raise the VCA GAIN slider. Raise the yellow slider under the VCO 1 box to about half way. Change the switch beneath the slider to the ADSR position. Set the four ADSR sliders to half way.



2. Now, when you play a key the ADSR control voltage will raise and lower the pitch of the VCO just as it opened and closed the filter, the VCA, and the pulse width. Raise and lower the four ADSR sliders as you did in the first experiment. This function is exactly the same in VCO 2 as it is in VCO 1. The yellow ADSR slider controls the depth of this effect.

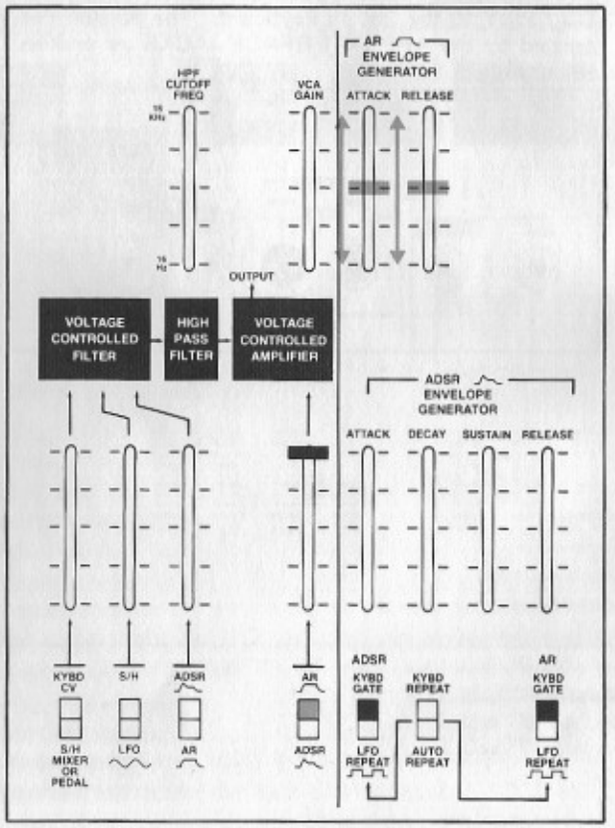
AR

The AR Envelope Generator consists of only two controls; the ATTACK and RELEASE. There is no DECAY control and the SUSTAIN level is preset to maximum. Also, you can only use the AR in two places on your ODYSSEY; the VCF and the VCA. This greatly simplifies the operation of the AR, and having two envelopes at your disposal greatly increases your control over the sounds you create.

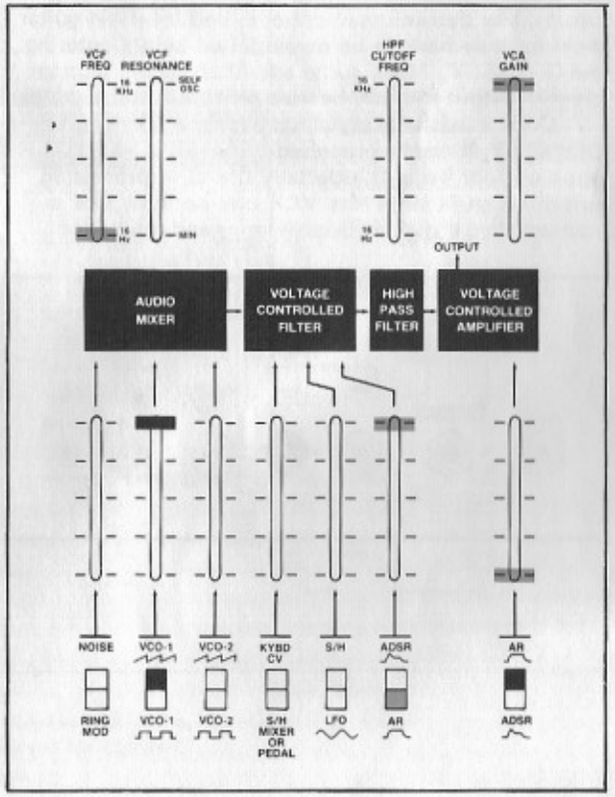


AR Modulation of the VCA & VCF

1. Set the controls as shown in Figure C. Raise the VCO 1 (sawtooth) slider in the AUDIO MIXER. Change the switch below the red slider under the VCA box to the AR position. Set the two AR sliders to half way and play a few notes on the keyboard. The control exercised by these sliders is identical to the ATTACK and RELEASE sliders in the ADSR.



2. Lower the AR slider in the VCA and raise the VCA GAIN slider. Lower the VCF FREQ slider all the way. Raise the red slider under the VCF box, and set the switch below the slider to the AR position. Set the two AR sliders to half way. The AR is now opening and closing the filter in the same way you used it to raise and lower the volume in the VCA.



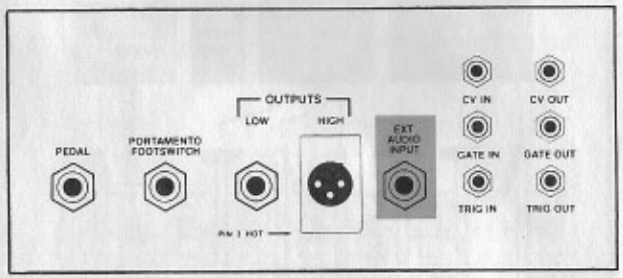
THE BACK PANEL

EXTERNAL AUDIO INPUT

On the back of your ODYSSEY you will see a jack labeled EXTERNAL AUDIO INPUT. This jack is used to bring an external signal, such as the output of an organ, electric piano, other synthesizers, etc., into the VCF in your ODYSSEY.

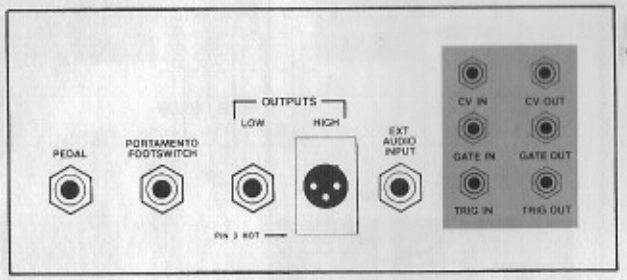
The EXTERNAL AUDIO INPUT is fixed in sensitivity. The sensitivity is adequate for use with most electronic instruments, however some very low level signals, like dynamic microphones and low-level guitar pickups, may have to be preamplified before entering the ODYSSEY. Many guitar amplifiers have a separate preamp output that can be used for this purpose.

Once an external signal has been brought into the ODYSSEY, it can be processed through the VCF. The optional foot pedal is especially useful in processing external signals since the VCF can perform like a wah-wah pedal with adjustable range and resonance.

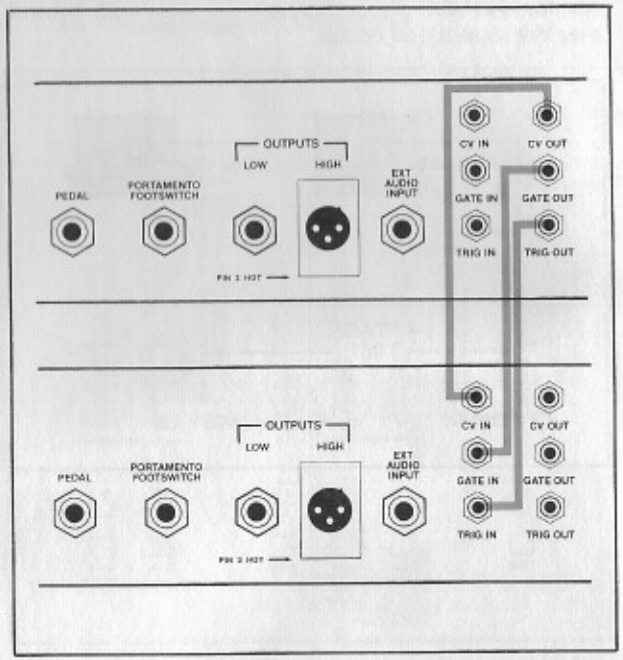


INTERFACE JACKS

Your ODYSSEY is one member of a whole family of ARP synthesizers and synthesizer accessories. As such, it is equipped with input and output jacks that allow your ODYSSEY to control other ARP synthesizers or to be controlled by other ARPs. For instance, you can use two ODYSSEYs together and play both of them from one keyboard. Or you can hook up your ODYSSEY to control an AXXE or 2600. Similarly, if you already own a 2600, you can remotely slave your ODYSSEY to the 2600's keyboard. The possibilities created by the ARP INTERFACE JACKS are endless.

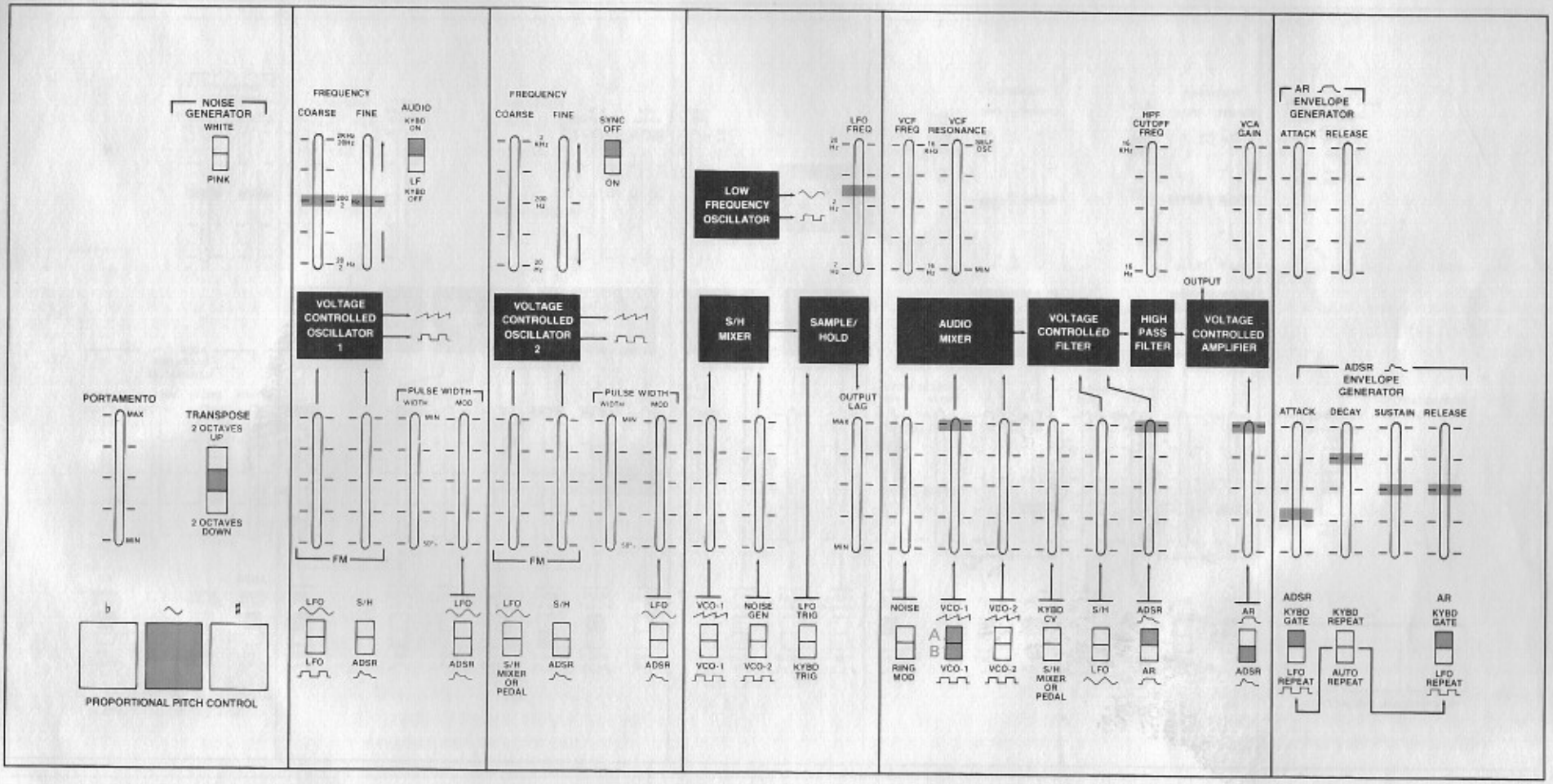


If you wish to hook up two ODYSSEYs in a master-slave relationship where one ODYSSEY is controlled by the other's keyboard, simply connect the jacks labeled CV OUT, GATE OUT, and TRIG OUT on the master to the CV IN, GATE IN, and TRIG IN jacks on the slave.



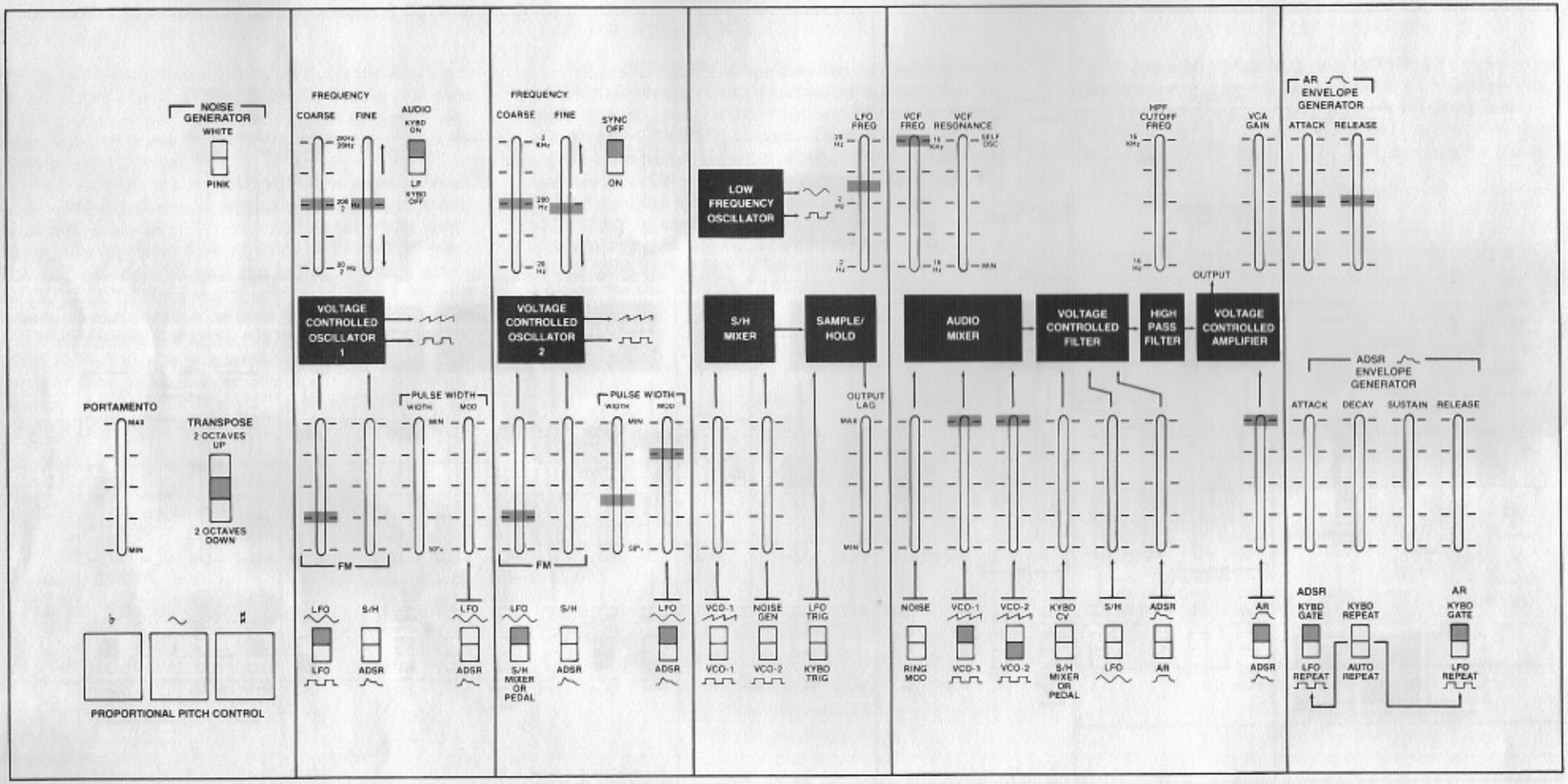
PATCHES

1. CLARINET or BRASS



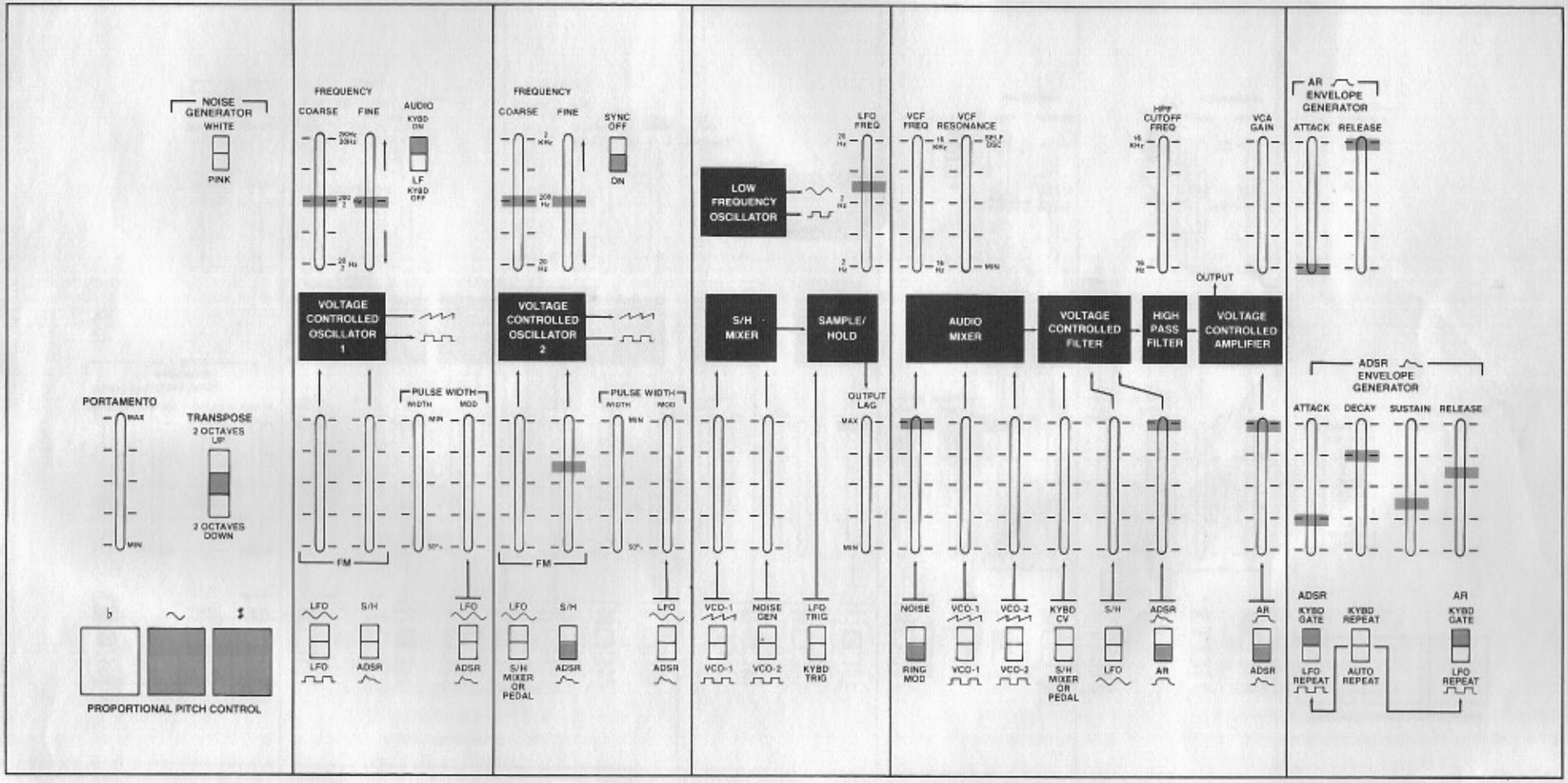
1. Use "A" (sawtooth wave) for brass.
2. Use "B" (square wave) for clarinet.
3. Use PPC for vibrato.

2. SWEET STRINGS



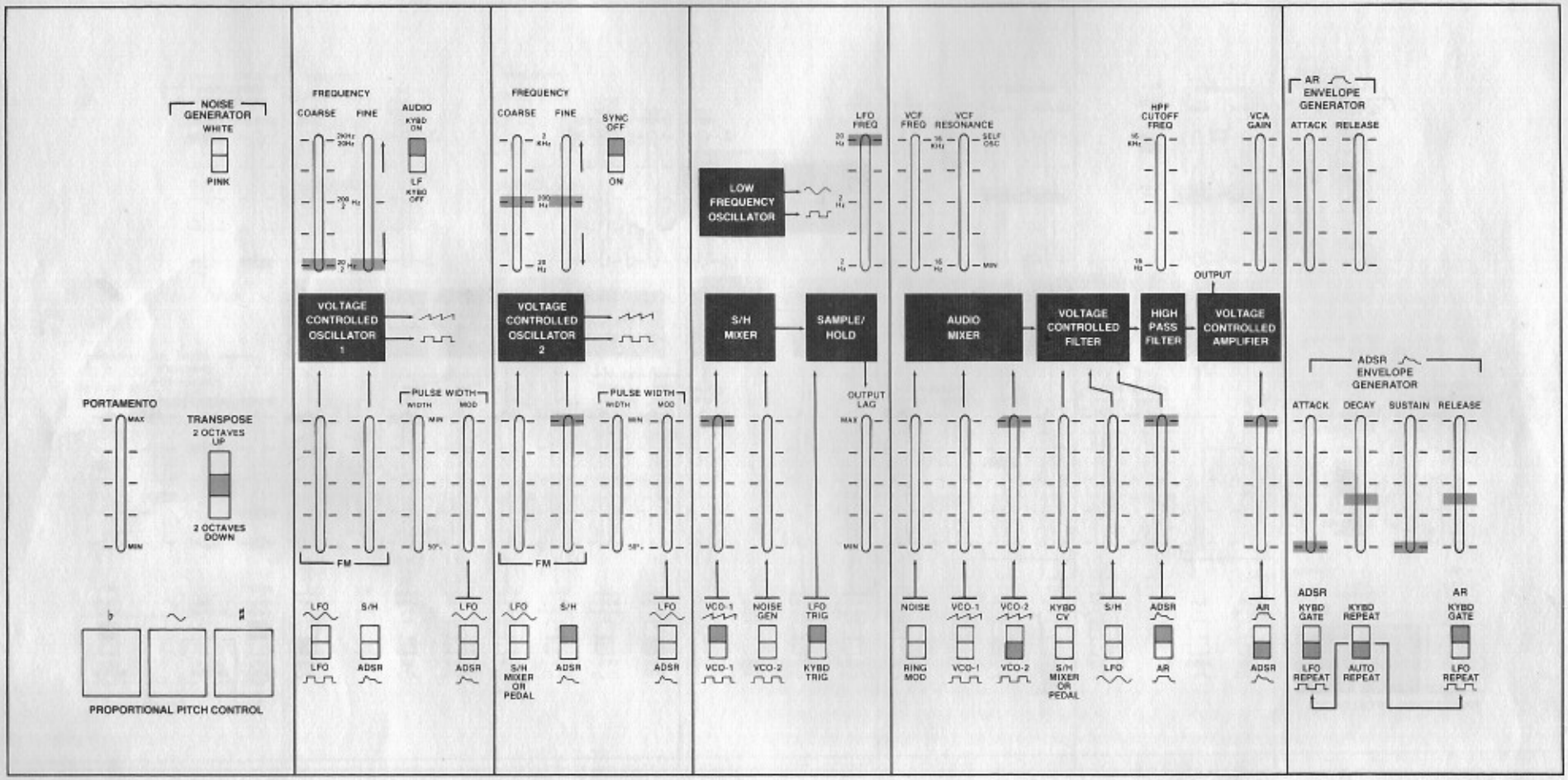
1. Tune oscillators slightly out of unison.
2. Use external reverb for rich effect.
3. Lower VCF FREQ slider for darker string sound.

3. MODULATED PHASE-SYNC

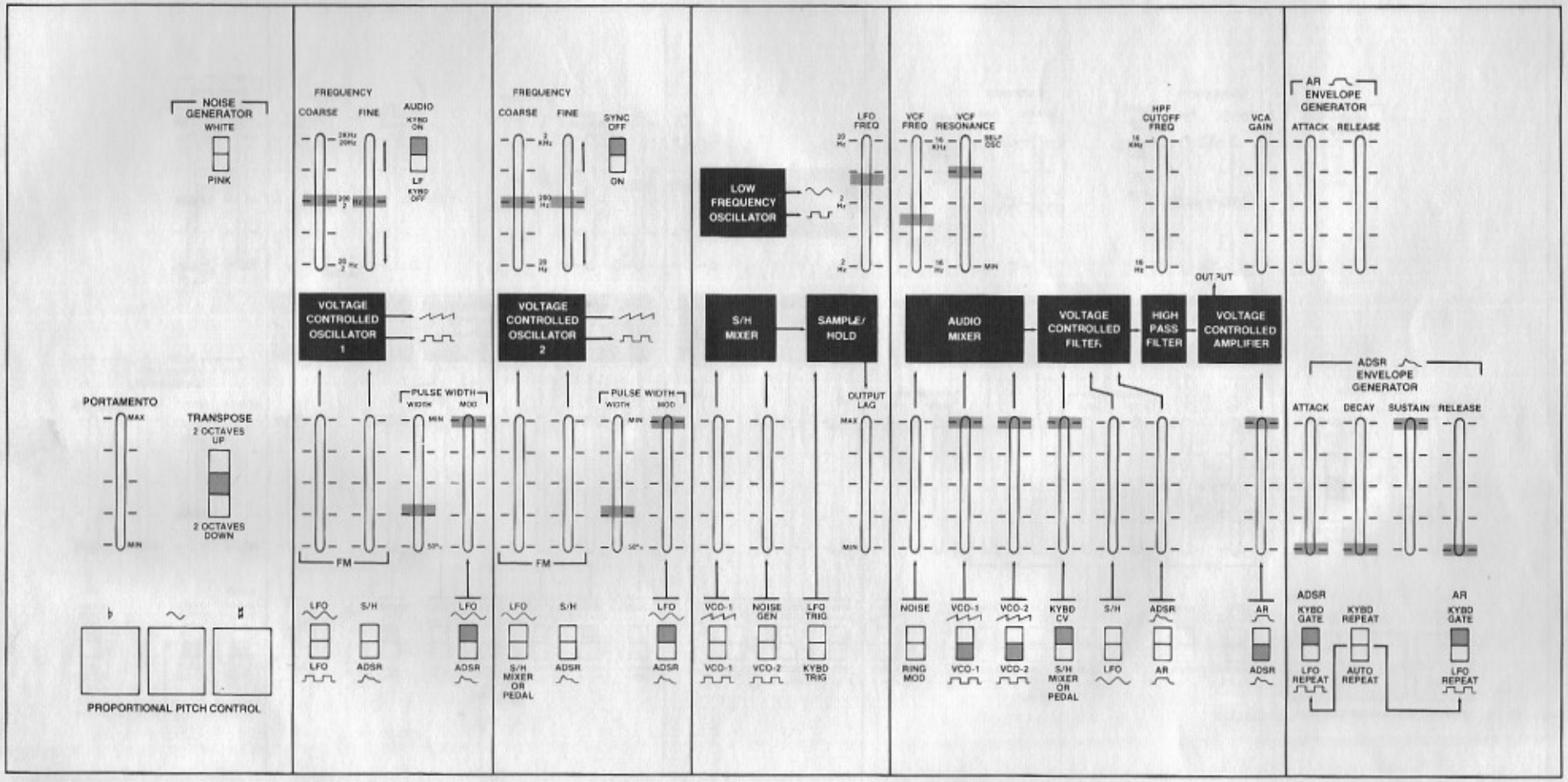


1. Use PPC (sharp) to bend pitch.
2. Use PPC (sine wave) for vibrato.

4. KEYBOARD-CONTROLLED ARPEGGIOS

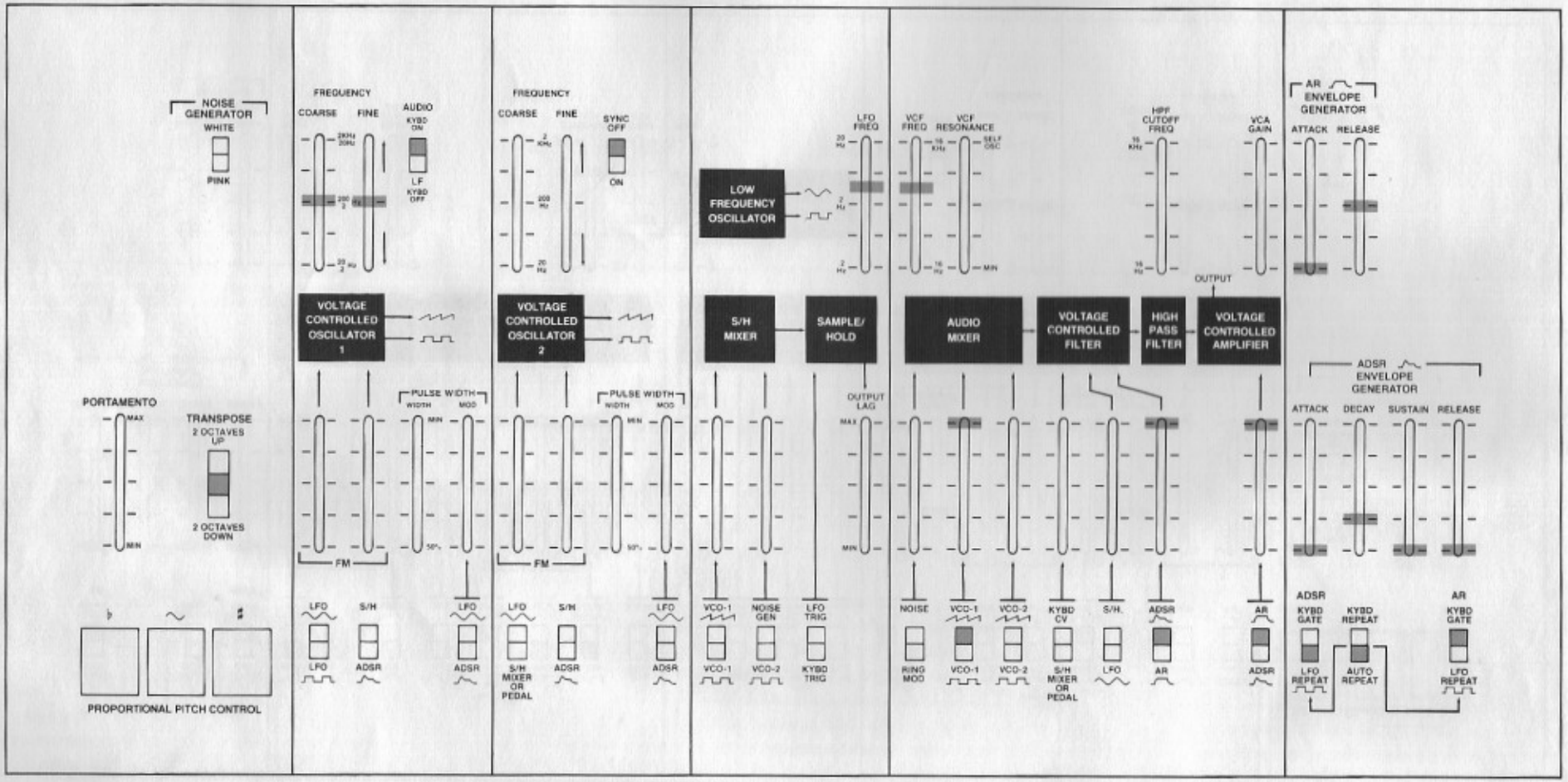


1. Play different notes for different patterns.



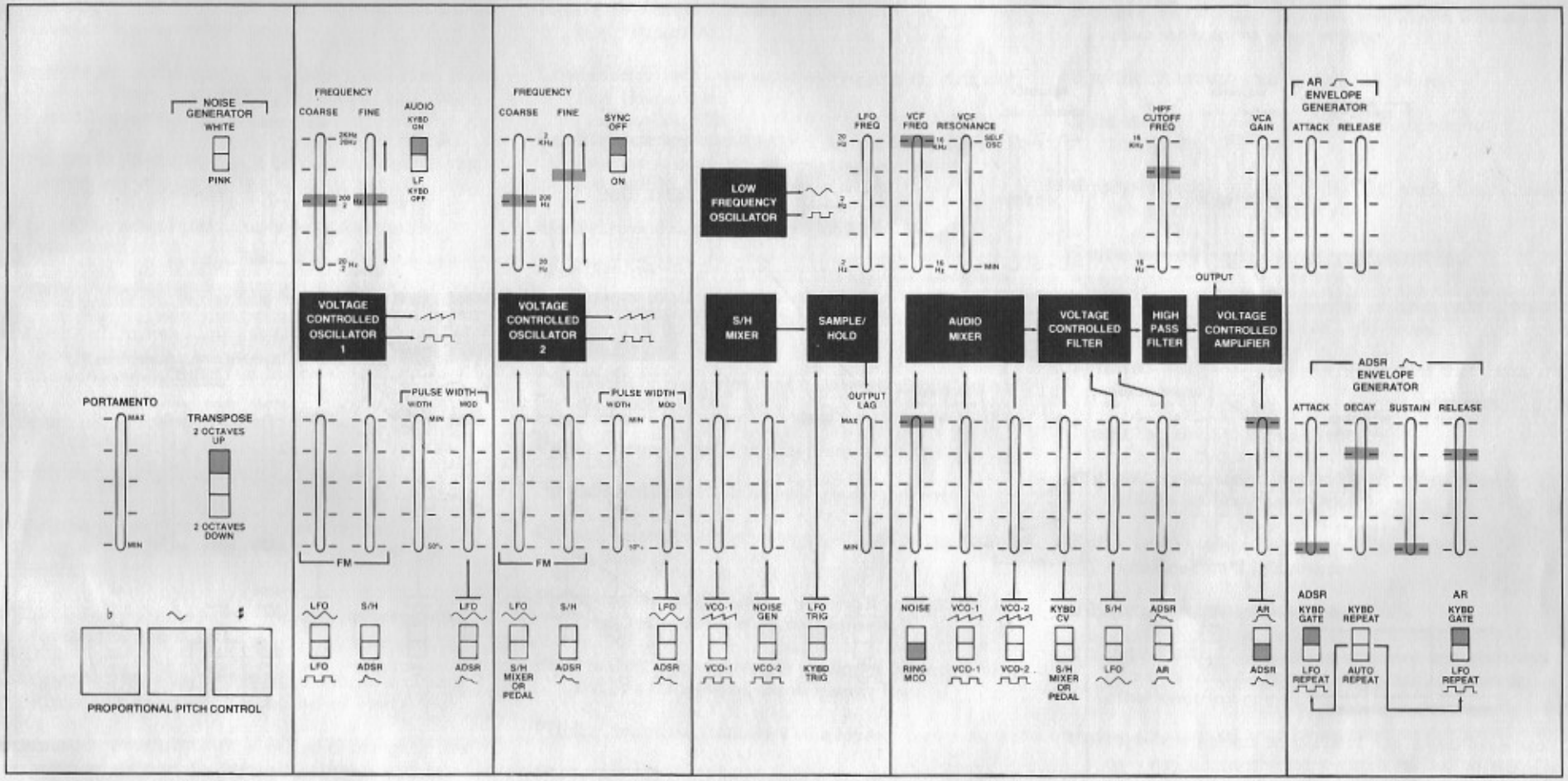
1. Tune VCOs 1 & 2 to unison.
2. Tune VCF FREQ slider to a fifth above VCOs.
3. Adjust LFO FREQ slider for a whirling effect.

6. PSEUDO ECHO



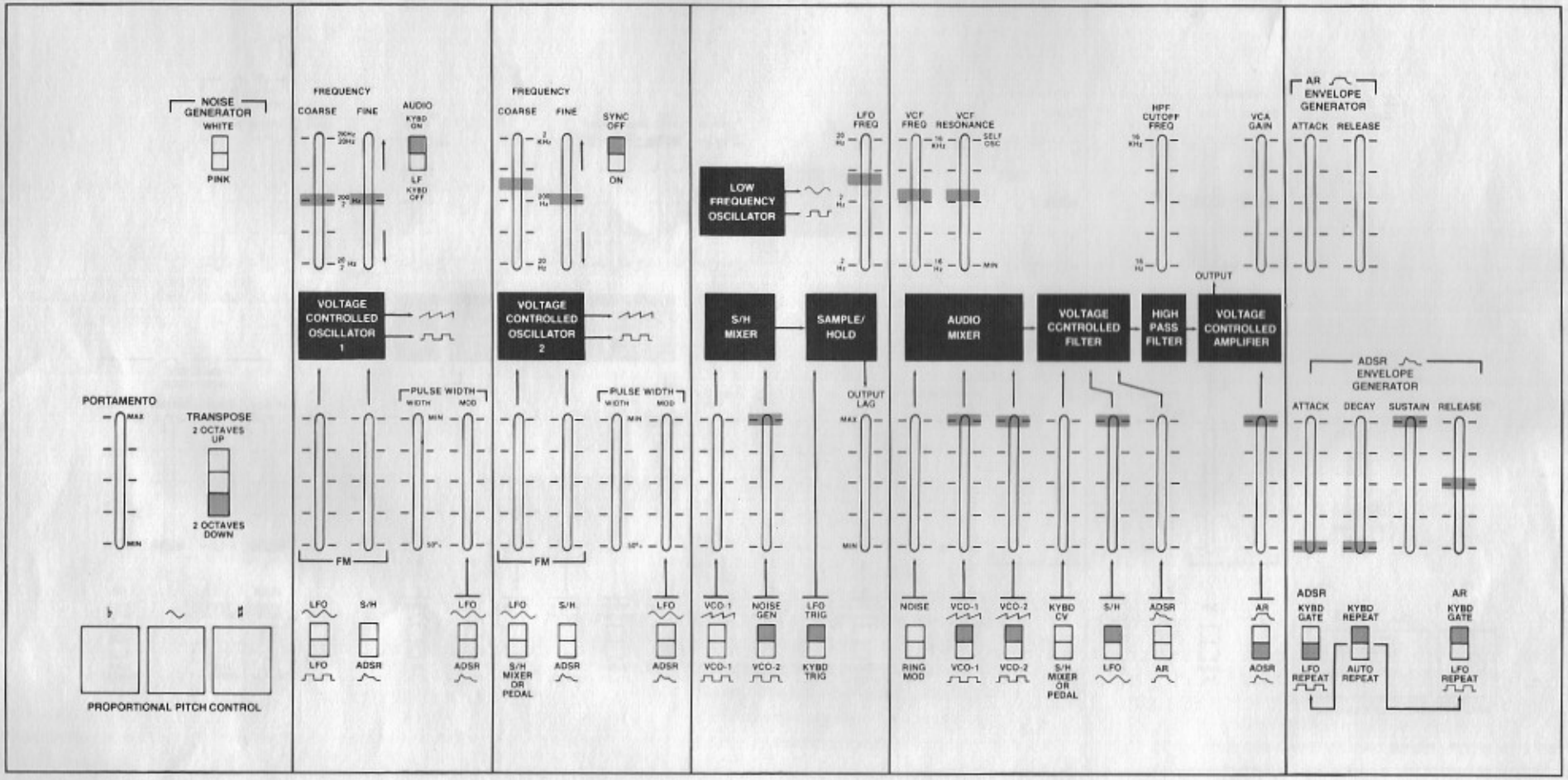
1. Vary AR RELEASE slider to change echo delay time.
2. Vary LFO FREQ slider to change echo speed.

7. CHIMES



1. Tune VCO 2 to a third above VCO 1 (a little flat).

8. SYNCOPATED HEAVY BASS FUNK



1. Play C2.
2. Tune VCO 2 one ocatave higher than VCO 1 (slightly out of tune).

GLOSSARY OF TERMS

Amplifier: an electronic circuit which increases the power of an electrical signal.

Amplitude: amount of a waveform's deviation from center. When used to describe sound, amplitude means volume.

Amplitude modulation: a periodic change in the amplitude of a sound; for instance, tremolo.

Aperiodic waveform: irregular, nonrepeating waveform.

Attack: beginning of a sound.

CV: control voltage—any electronic signal generated at one source and used to modify the electronic signal from another source.

Decay: initial fading of sound (after attack).

Envelope: attack and decay of a sound.

Envelope generator: produces transient voltages useful in creating attacks and decays and special effects.

Filter: changes tone color (timbre) by removing selected harmonics.

Frequency: rate at which a waveform oscillates. Expressed in cycles per second or Hertz (Hz).

Frequency modulation: a periodic change in the pitch of a sound; for instance, vibrato.

Gate: on/off signal indicating beginning, duration, and end of an event.

Harmonics: overtones that give a tone a particular sound or timbre. Harmonic frequencies are always exact multiples of the fundamental.

Hertz (Hz): term for cycles per second.

High-pass filter: passes high frequencies, cuts out low frequencies.

Low-pass filter: passes low frequencies, cuts out high frequencies.

Low-frequency oscillator: an oscillator which is designed specifically to operate at subsonic frequencies.

Mixer: combines signals.

Modulation: any periodic change in a waveform.

Noise: random signals which contain all audio frequencies.

Oscillator: generates tone or low-frequency periodic waveform.

Patch: connection of two or more functions.

Periodic waveform: repeating wave pattern.

Phase: relationship between waveforms at any moment in time.

Phase-synchronization: forcing a fixed phase relationship between two waveforms.

Pink noise: noise which is musically balanced; high and low frequencies sound equally loud.

Pitch: perceived frequency of a sound.

Portamento: sliding between notes.

Pulse wave: family of waveforms with square corners.

Release: ending of a signal.

Resonance: amplifies a band of harmonics.

Ring modulator: produces a complex output from two simple input signals.

Sample and hold: a circuit which can be used to store, or hold, an input voltage.

Sawtooth wave: sounds rich, full, brassy.

Sine wave: sounds smooth and pure; has no harmonics.

Square wave: sounds hollow and reedy. Square wave is a special kind of pulse wave.

Static waveform: unmodulated waveform.

Sustain: describes the level at which a note is held following the initial attack and decay.

Timbre: all those qualities of a sound that make it distinctive.

Tremolo: amplitude modulation.

Trigger: electronic impulse used most often to activate envelope generators.

Trill: rapid jumps in audio frequency (VCO modulated by a square wave).

Vibrato: frequency modulation.

Voltage control: a process whereby one electrical circuit is used to control the function of some other electrical circuit.

Voltage-controlled amplifier: an amplifier whose gain can be controlled by an external voltage.

Voltage-controlled filter: a filter whose cutoff frequency can be controlled by an external voltage.

Voltage-controlled oscillator: an oscillator whose operating frequency can be controlled by an external voltage.

Waveform: characteristic shape of a wave; helps determine timbre.

SPECIFICATIONS

VOLTAGE CONTROLLED OSCILLATOR
Frequency Range: 20Hz to 20KHz (.2Hz to 20Hz in Low Frequency mode)
Waveforms: Sawtooth, Square, Pulse
Maximum Vibrato Depth: +1 octave
Maximum Trill Depth: +1.2 octaves
Maximum ADSR Frequency Shift: +10 octaves
Pulse Width: 5% to 50%
Pulse Width Modulation: LFO, +25%
ADSR: +45%

VOLTAGE CONTROLLED FILTER
Type: Low pass 24 dB/oct.
Frequency Range: 16 Hz to 16 KHz
Resonance: Maximum Usable Q, Approximately 30
Maximum LFO Modulation: 1.5 octaves
Maximum ADSR Sweep: 10 octaves

VOLTAGE CONTROLLED AMPLIFIER
Dynamic Range: 80dB

NOISE GENERATOR
Noise Spectrum Type: White, Pink

MANUAL CONTROLLED FILTER
Type: High pass

LOW FREQUENCY OSCILLATOR
Waveforms: Square, Sine
Frequency Range: .2 Hz to 20 Hz

ADSR ENVELOPE GENERATOR
Attack Time: 5 msec. to 5 seconds
Decay Time: 10 msec. to 8 seconds
Sustain Level: 0 to 100% of peak
Release Time: 15 msec. to 10 seconds

AR ENVELOPE GENERATOR
Attack Time: 5 msec. to 5 seconds
Release Time: 10 msec. to 8 seconds

PORTAMENTO
Maximum Speed: About .01 msec./oct.
Minimum Speed: About 1.5 seconds/oct.

SAMPLE AND HOLD
Maximum Pitch Deviation in VCO: 2.5 octaves
Maximum Frequency Deviation in VCF: 2.5 octaves

PROPORTIONAL PITCH CONTROL
(Three separate touch pads)
Sharp: Maximum +5 semitones, Minimum +4 semitones
Flat: Maximum 5 semitones, Minimum 4 semitones
Vibrato: +4 semitones, rate controlled by LFO slider

INTERFACE JACKS
Control Voltage In/Out: 1V/oct.
Gate Out: Approximately +10 volts
Gate In: (Minimum) 8 volts
Trig Out: 10 volt pulse, 20 microseconds duration
Trig In: 8 volt pulse,10 microseconds minimum duration
External Audio Input Sensitivity: 50 mV for full output

OUTPUTS
XLR Cannon: High level, 2.5V PP maximum; 100K ohm impedance
1/4" Phone: Low Level, .25V PP maximum; 10K ohm impedance


ARP