moog®

PRODIGY

OWNER'S MANUAL

by Tom Rhea

introduction

Welcome to the world of Moog®. Your Prodigy has been musically engineered to be a powerful and particularly *colorful* musical instrument. The sound and playability of the Prodigy make it an instrument that will always be useful.

This manual is both an introduction to the instrument, and a source of further information. If you leaf through, you'll see that we begin with the most intuitive approach, and end with a more systematic approach.

There are sound charts to introduce you to the vocabulary of the Prodigy. They are arranged randomly; I hope they will be a *learning* experience – not a lifetime crutch! Set each up and experiment; you'll probably learn a lot of what you want to know. After all, experimentation is a time-honored tradition among musicians!

Next, do the step-by-step experiments in the "Synthesizing By Ear" section. They are designed to lead you to make your own conclusions about how to use the Prodigy.

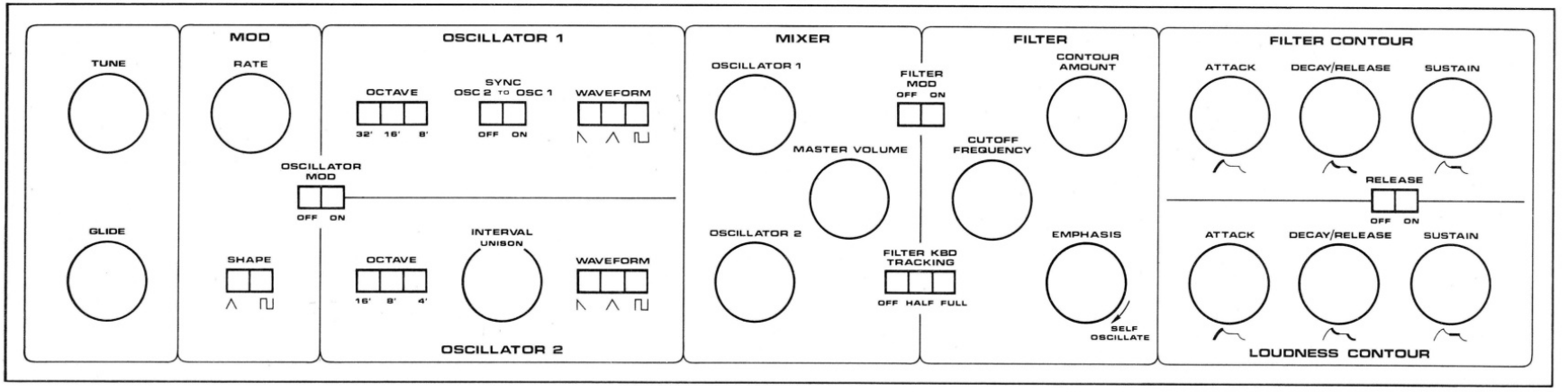
Finally, study the "Understanding Synthesis" and "A Closer Look At The Prodigy" sections. They will teach you how the instrument's parts function. When you *really* understand your instrument you can go quickly from conception to realization of a sound.

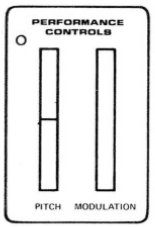
Above all, don't forget that the Prodigy is a *musical instrument*. Those PITCH and MODULATION wheels were put there to let you create an expressive musical line. Use them!

Happy music-making with your Prodigy. When you discover something beautiful, share it with your friends.

Tom Rhea

Thomas L. Rhea, PhD
Electronic Music Consultant

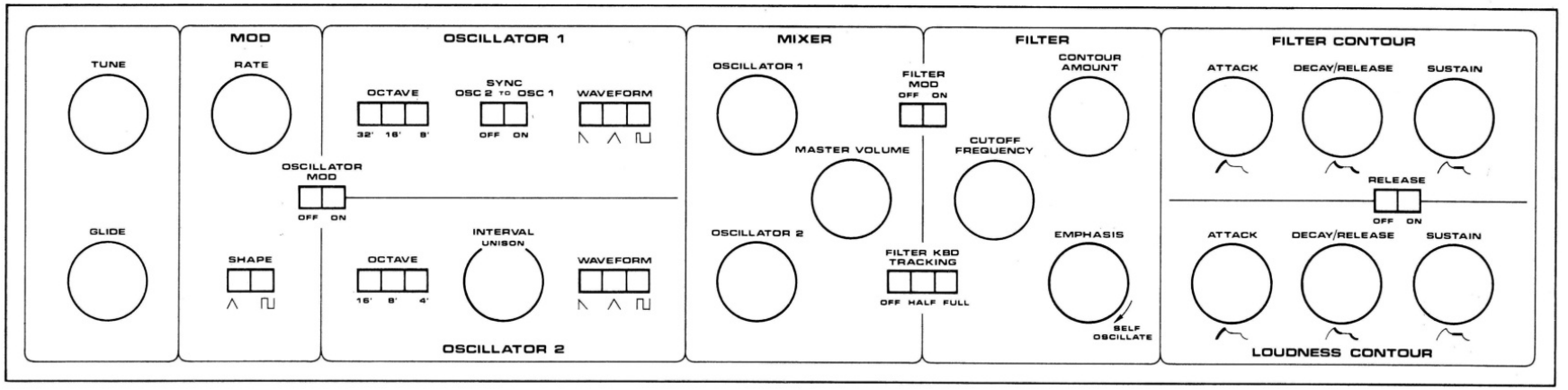


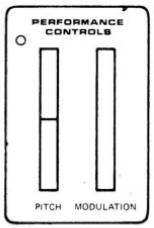


SOUND CHARTS

A sound chart is a "picture" of how the front panel of your Prodigy looks when you produce a certain sound. Sound charts are a handy way to remember and store sounds. We've included a page in the manual that has *two* blank sound charts; this can be photocopied to give you an endless supply of blank sound charts.

Prodigy sound charts are line drawings of the front control panel and the lower Performance Controls panel. Rotary pots are represented by circles; slide switches are represented by segmented rectangles:

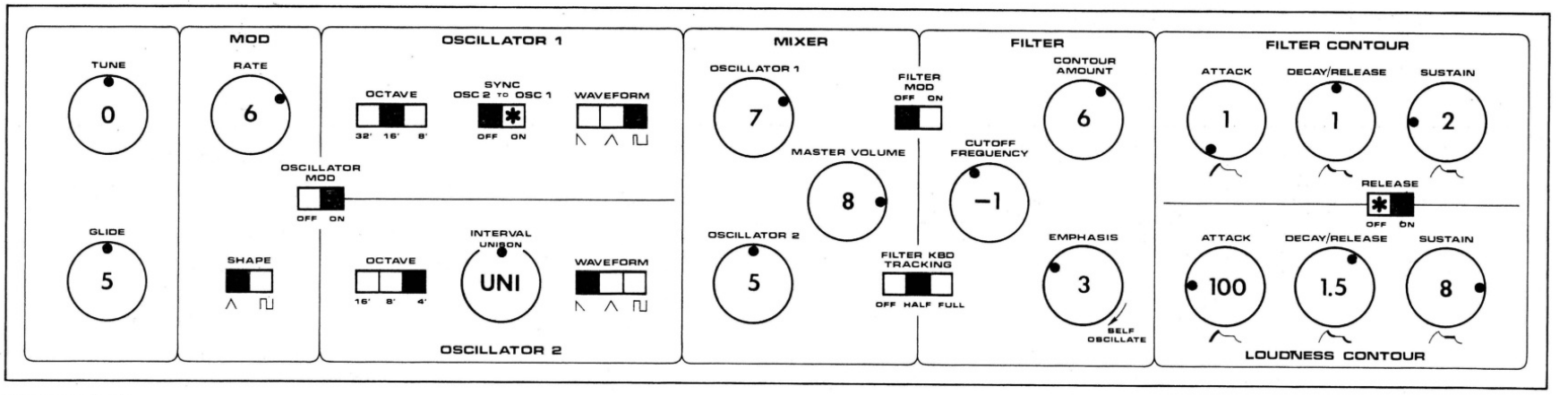


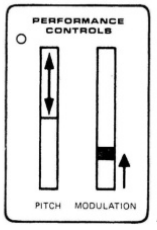


The setting for a rotary control appears within the circle in numbers or characters appropriate to the control. That setting is also indicated by a dot on the edge of the circle. Any blank circle should be left at the 12 o'clock position – straight *up*;

The position of a slide switch is always indicated by blacking in the position *in use.*

An asterisk * in any control indicates an *alternative* position that should be tried.



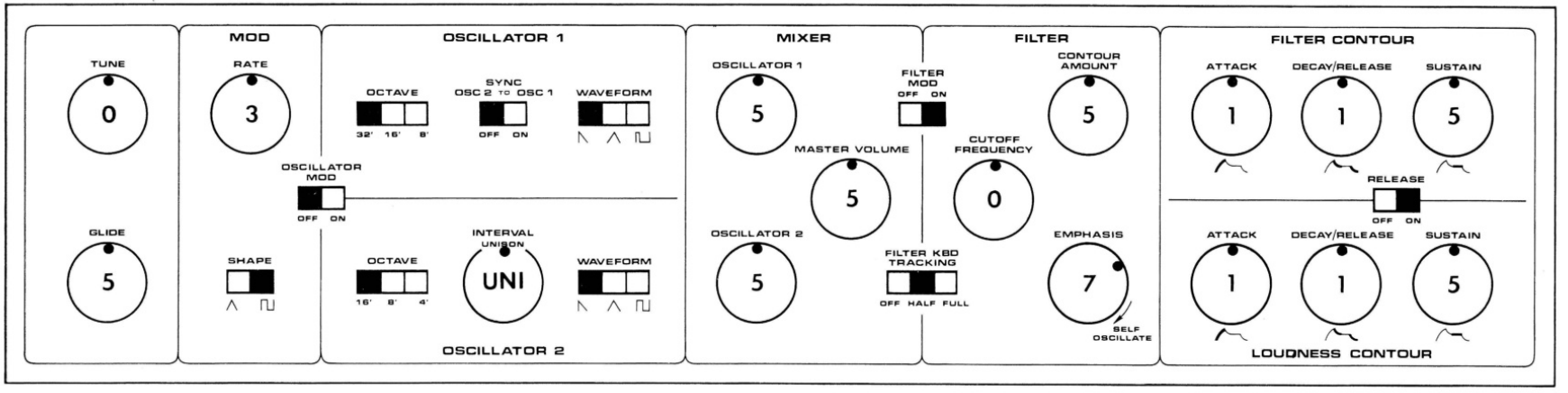


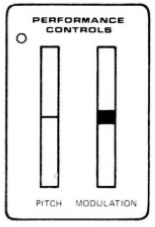
Use of the PITCH and MODULATION wheels is indicated by arrows indicating movement, and a heavy black line(s) showing positions.

Like any musical notation, sound charts are approximate, particularly when they represent simulations of acoustic instruments. To get the most from the sound charts, several things may be helpful:

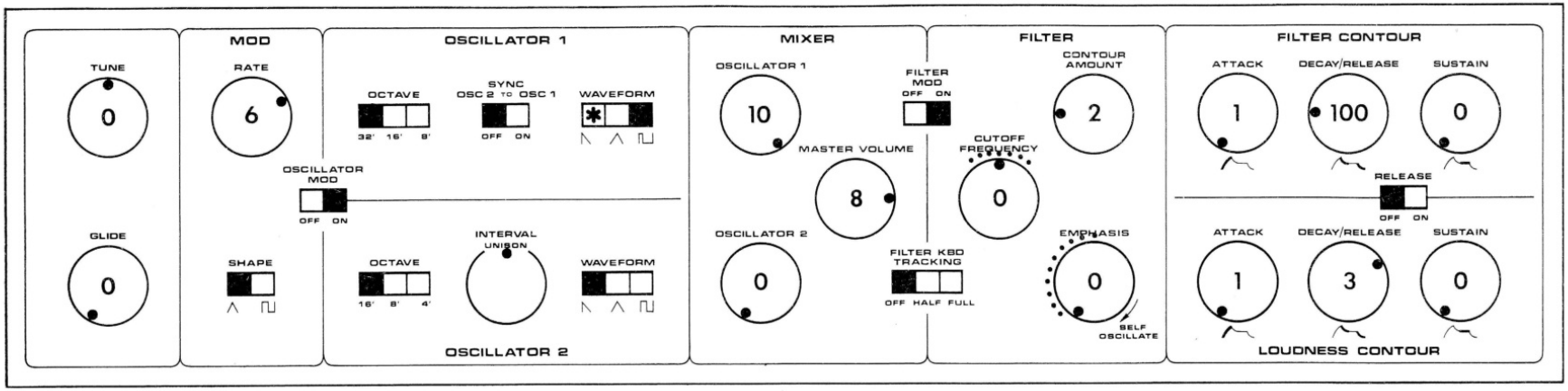
1. Start from the Preparatory Patch with all rotary controls at 12 o'clock and all slide switches to the left.
2. Set up the sound chart accurately for a point of reference.
3. Adjust the CUTOFF FREQUENCY control first to govern overall tone color.
4. When trying to sound like an acoustic instrument, play music in a pitch range appropriate to that instrument.
5. Adjust the MASTER VOLUME control to a reasonable level for the type of sound produced.
6. Use the PITCH and MODULATION wheels for soloistic expression: bend pitch and introduce vibrato selectively.

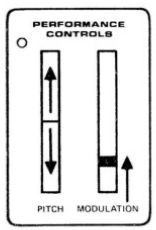
THRILLER





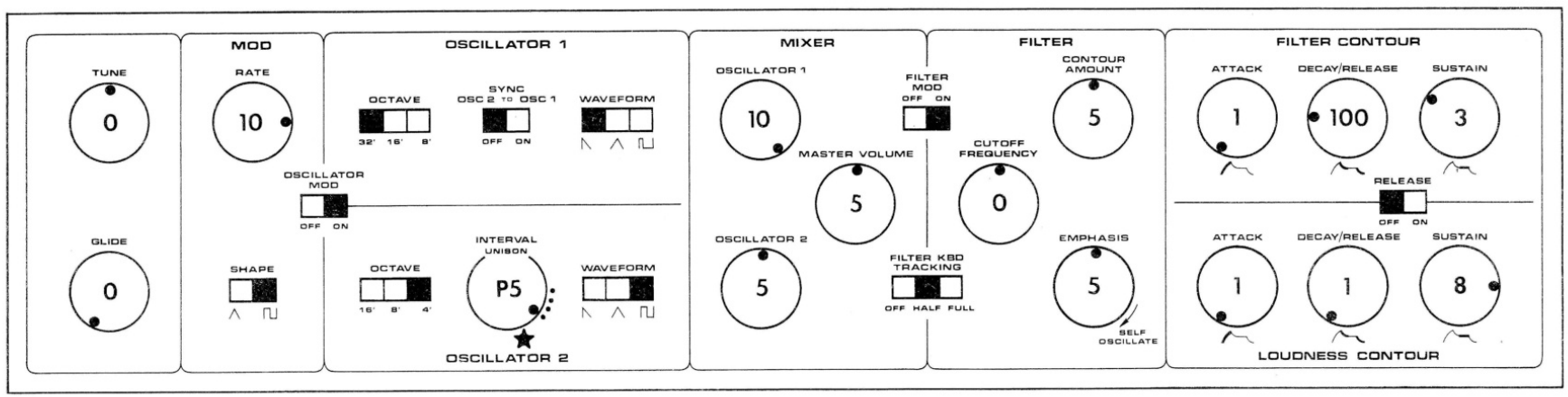
BASS

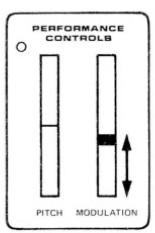




Vibrato amount

TRILL BENDER

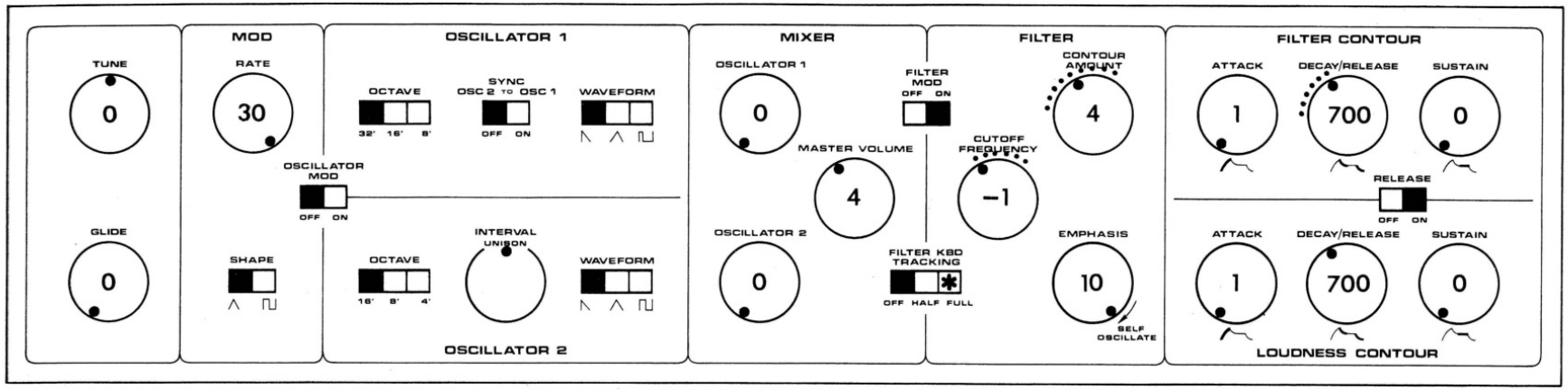


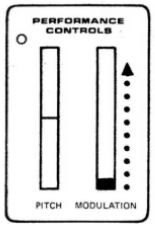


★Tune to perfect fifth
(like violin strings)

"Trill bending"

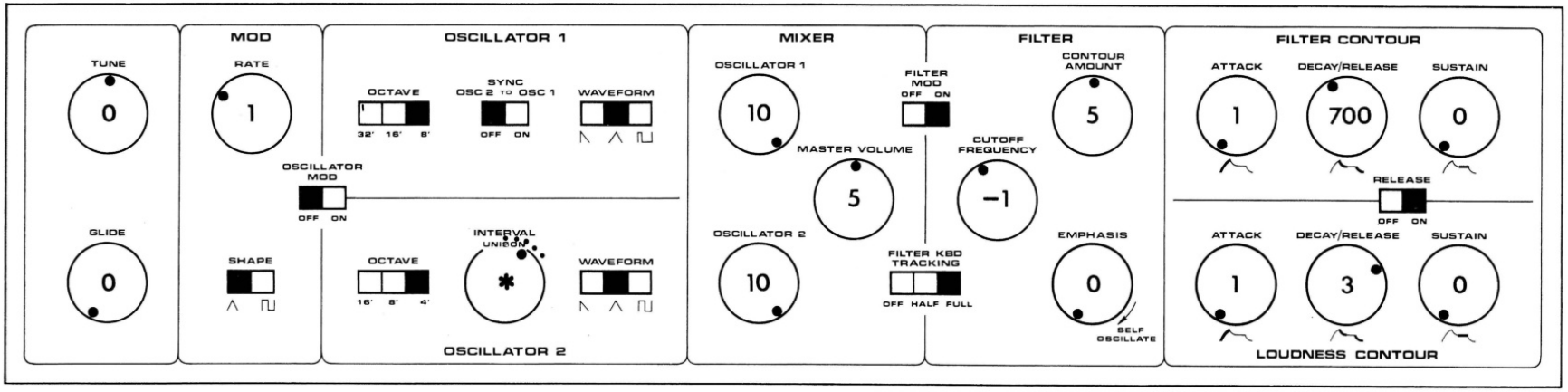
SYNTHEDRUM

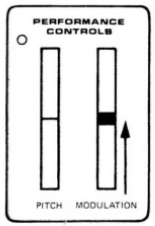




"Tune" drum with CUTOFF FREQUENCY control.

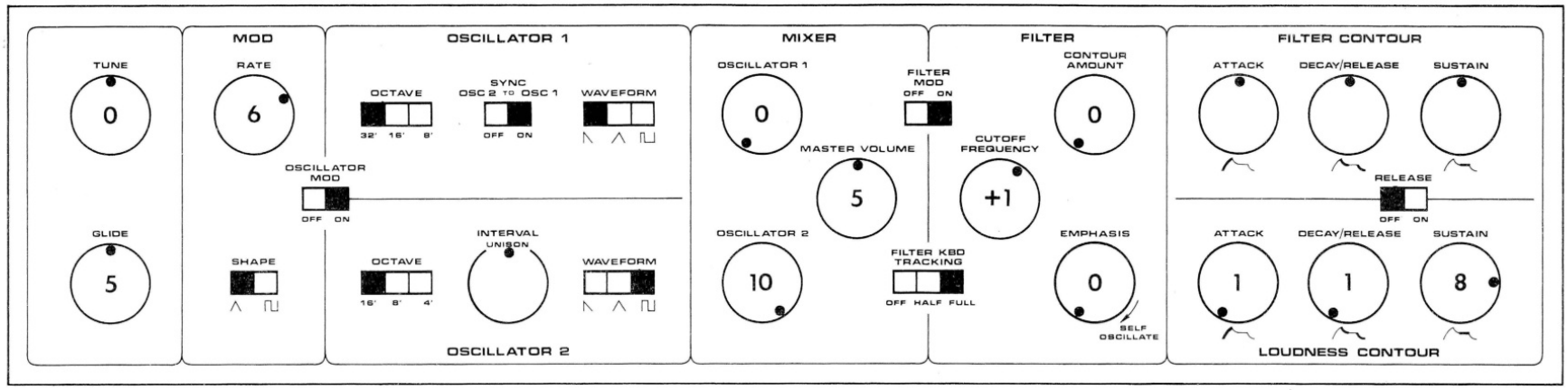
RING MOD EFFECTS: GONG/CHIME

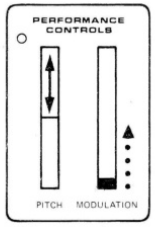




*Deliberately mistune INTERVAL control for various klang sounds.

SYNC

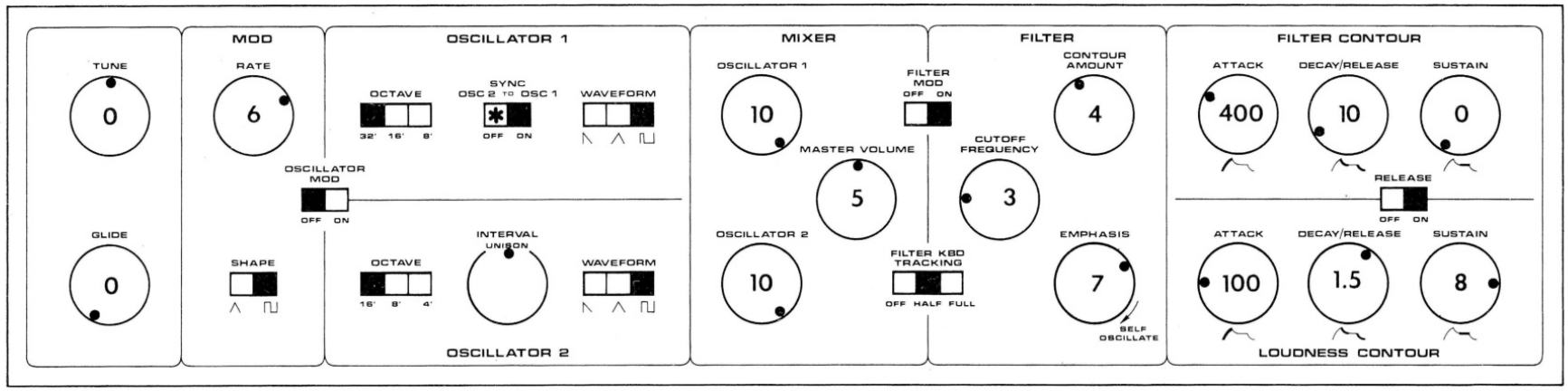


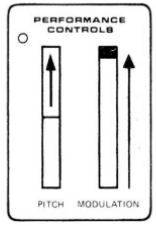


Move PITCH wheel for sync sound.

Vibrato amount

SAMPLE AND GOLD



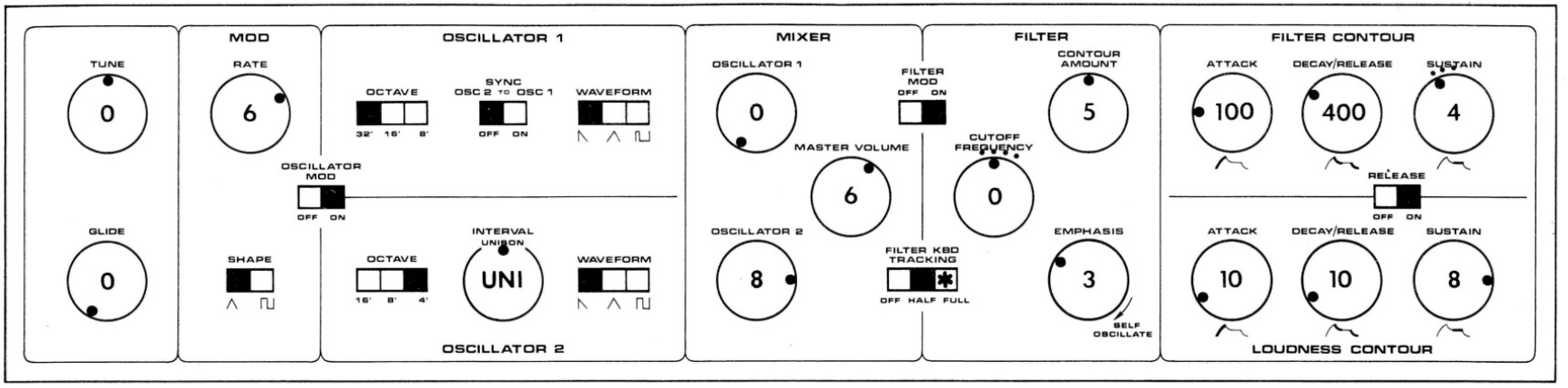


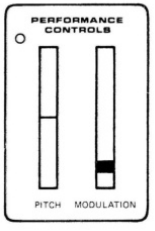
Full MODULATION. Drum any key repeatedly
but *without* definite rhythm. Play keyboard with this technique.

Move PITCH wheel randomly above its center position.

Experiment with MOD RATE control.

BAROQUE TRUMPET

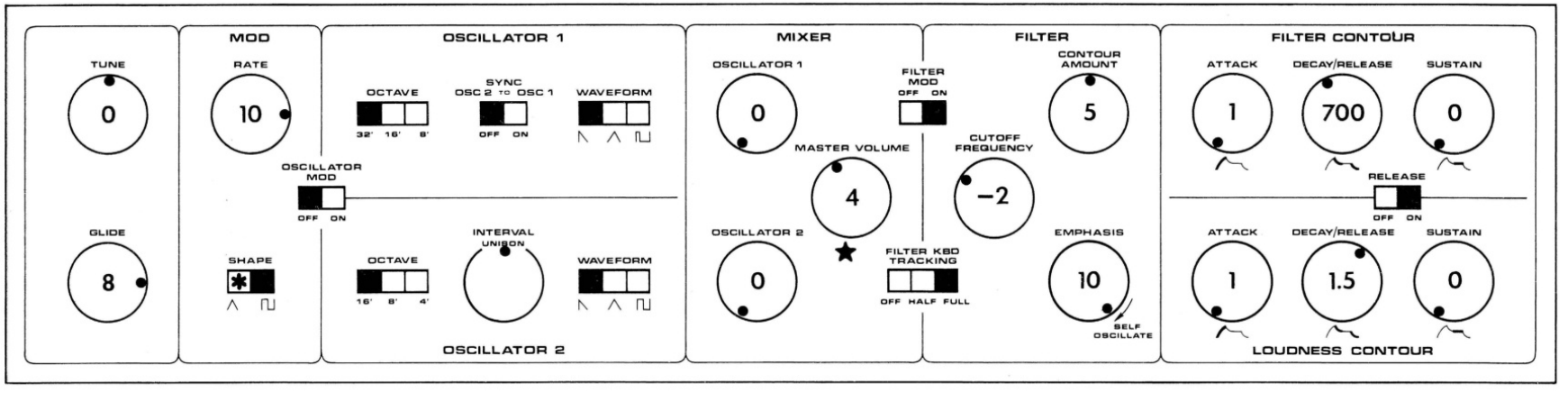


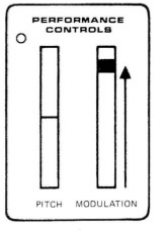


Requires marcato (non-connected) playing style.

Vibrato amount

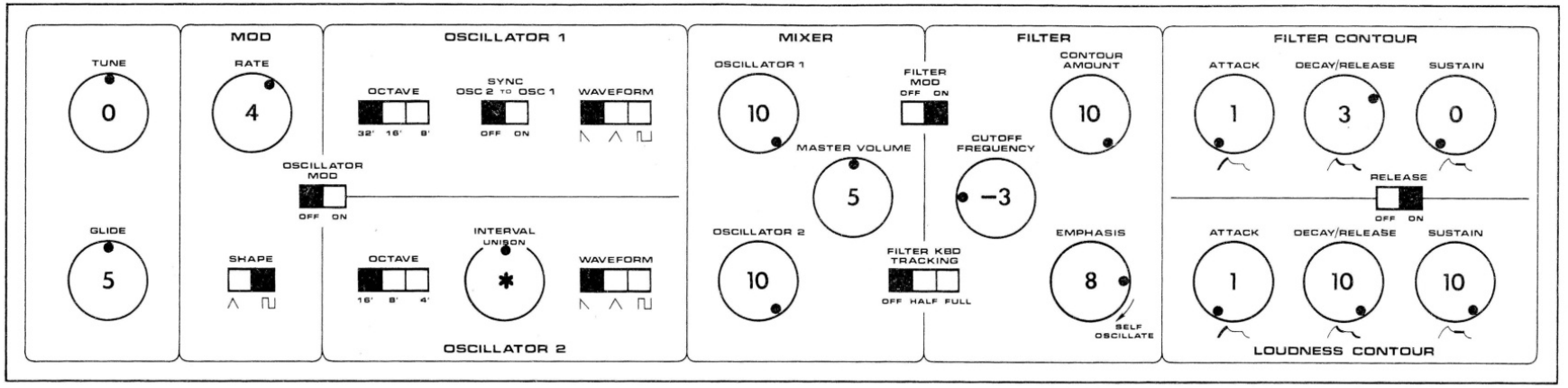
FILTER DOODLE

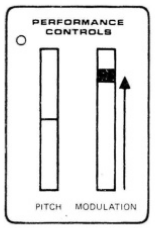




★ Watch your ears!

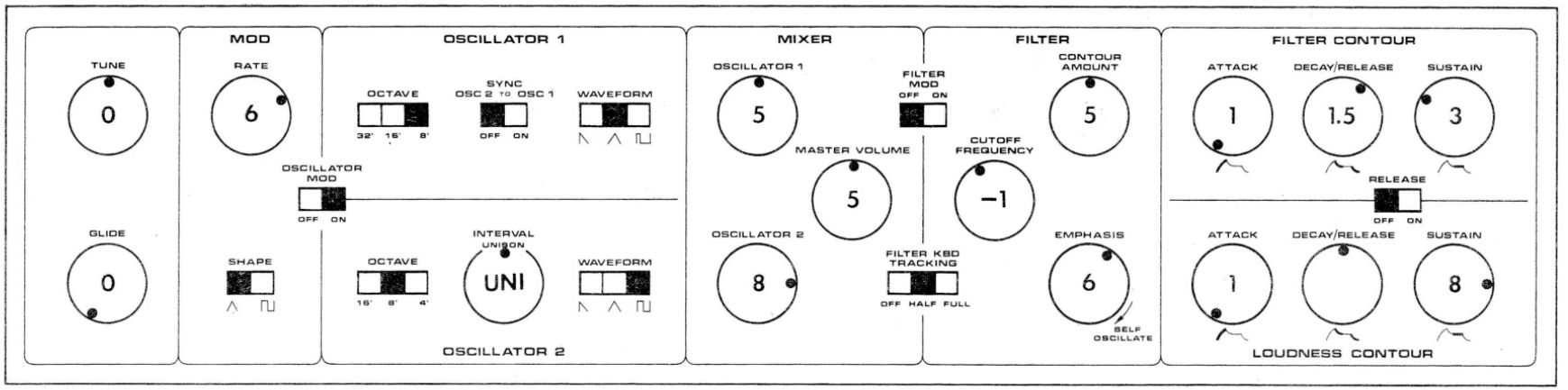
FRANKENFUNK

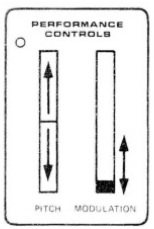




*Mistune OSCILLATORS slightly using the INTERVAL control.
Experiment with EMPHASIS control.

HEAVY HAMMER

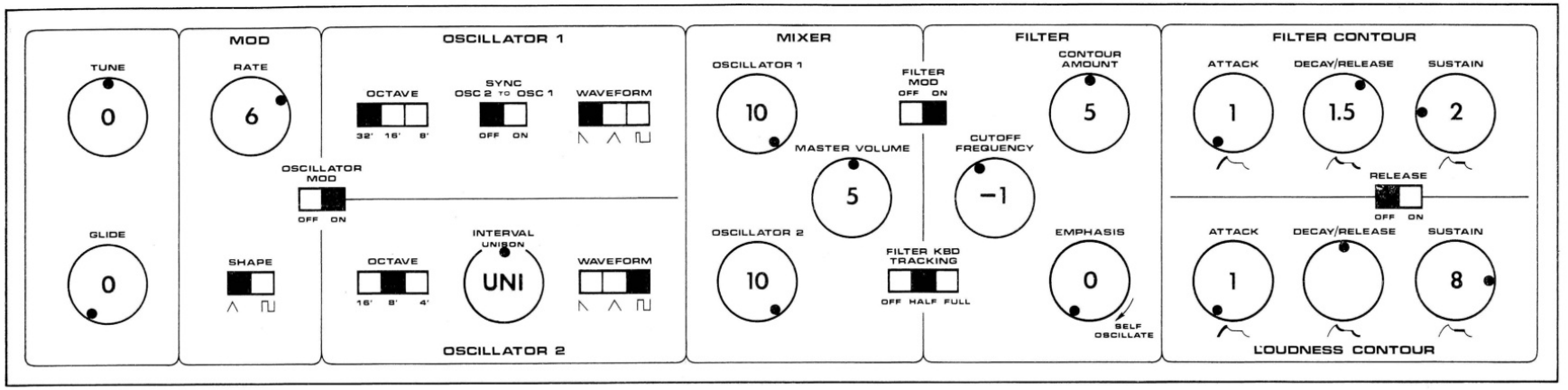


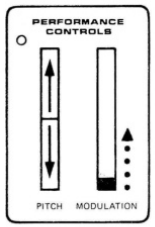


Mistune with INTERVAL control for slow "beats".

Vibrato amount

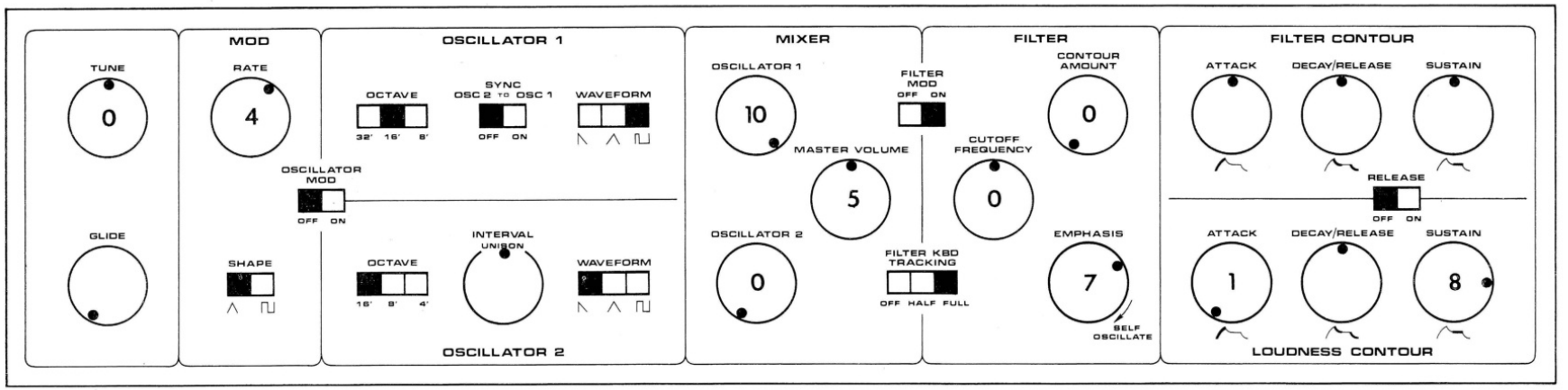
POWER DUO

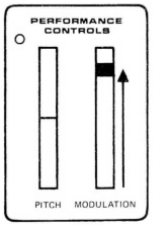




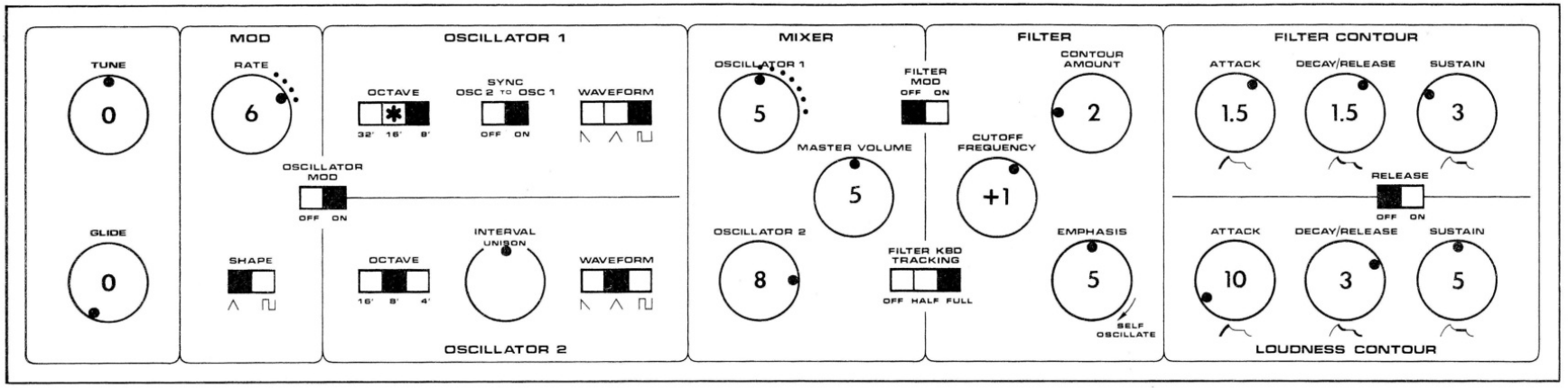
Vibrato amount

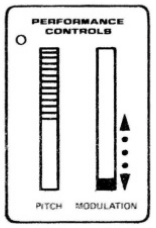
PULSAR





THIN REEDS (SYNC)

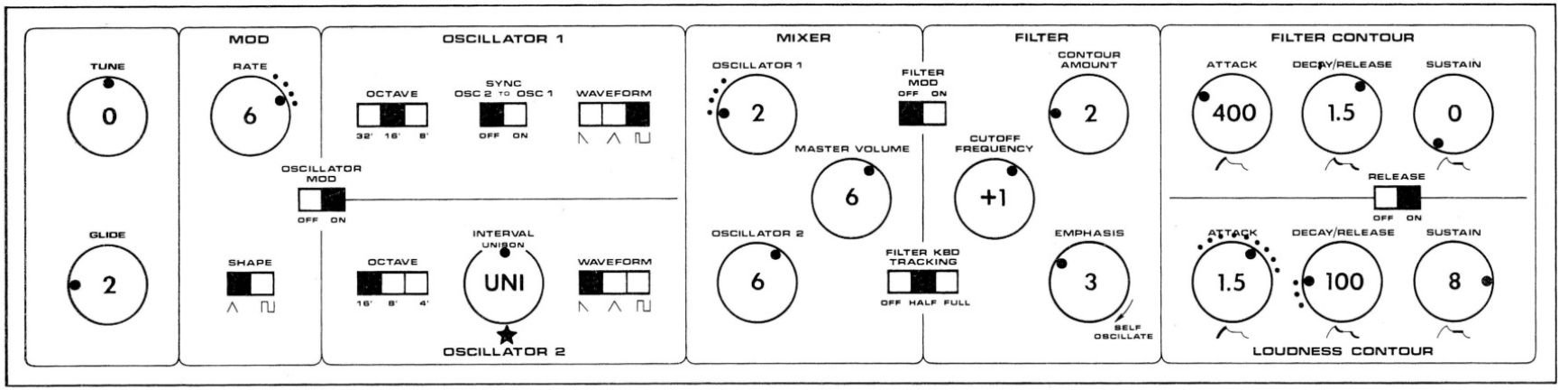


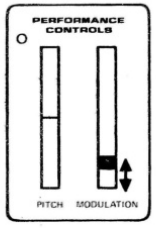


Set PITCH wheel to various positions above center and play.
Change pitch range using OSCILLATOR 1 OCTAVE switch.

Vibrato amount

BOWED STRINGS

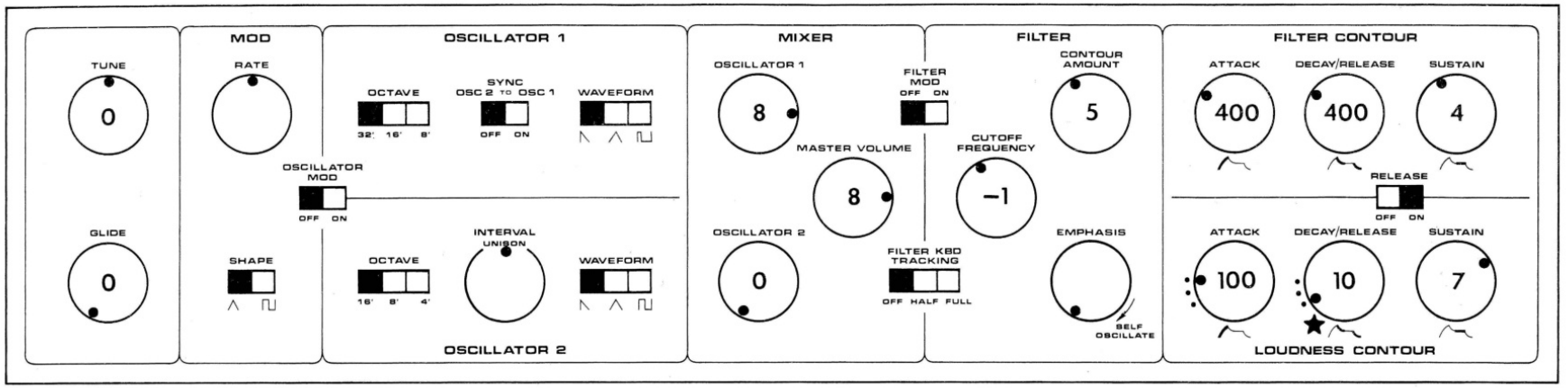


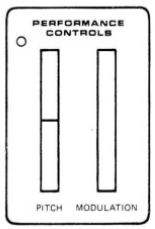


★ Tune to UNISON

Adjust CUTOFF FREQUENCY.
DECAY/RELEASE in LOUDNESS CONTOUR is a critical setting. Experiment.
Play with *non-legato* technique: *Quickly* hop from key to key.
Vibrato amount critical; must be introduced selectively.
For high strings place both OCTAVE switches to 8'.

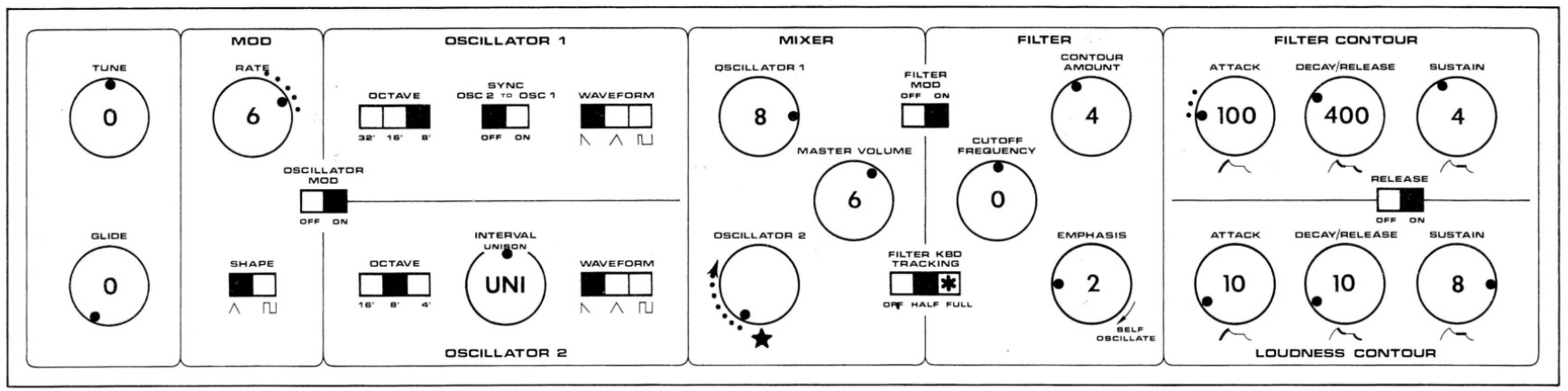
TUBA

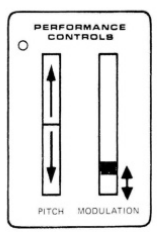




★ Critical adjustment

TRUMPETS

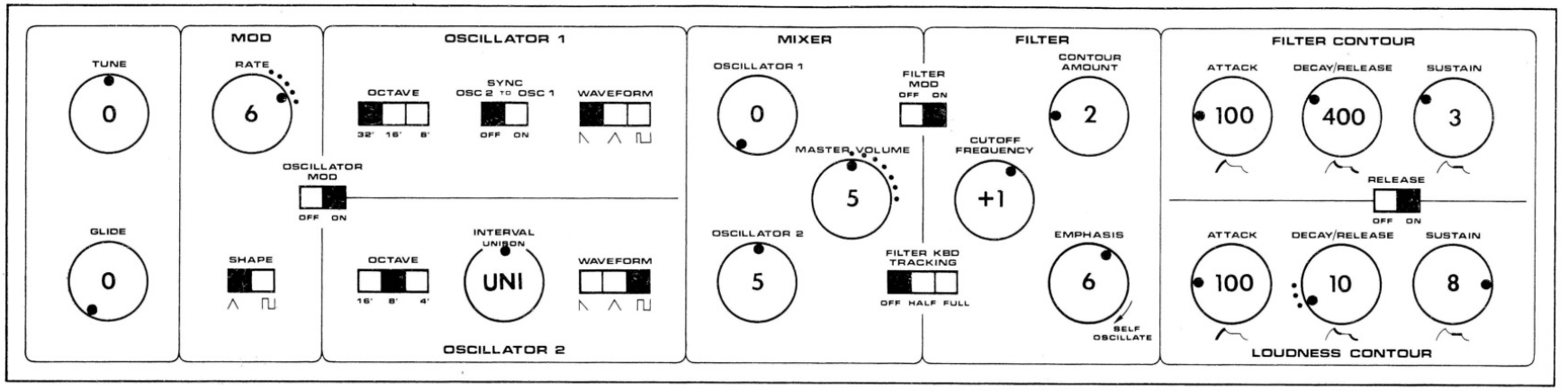


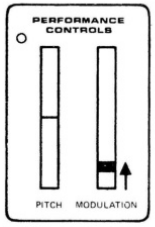


Vibrato amount

★ Add OSCILLATOR 2
for chorus effect

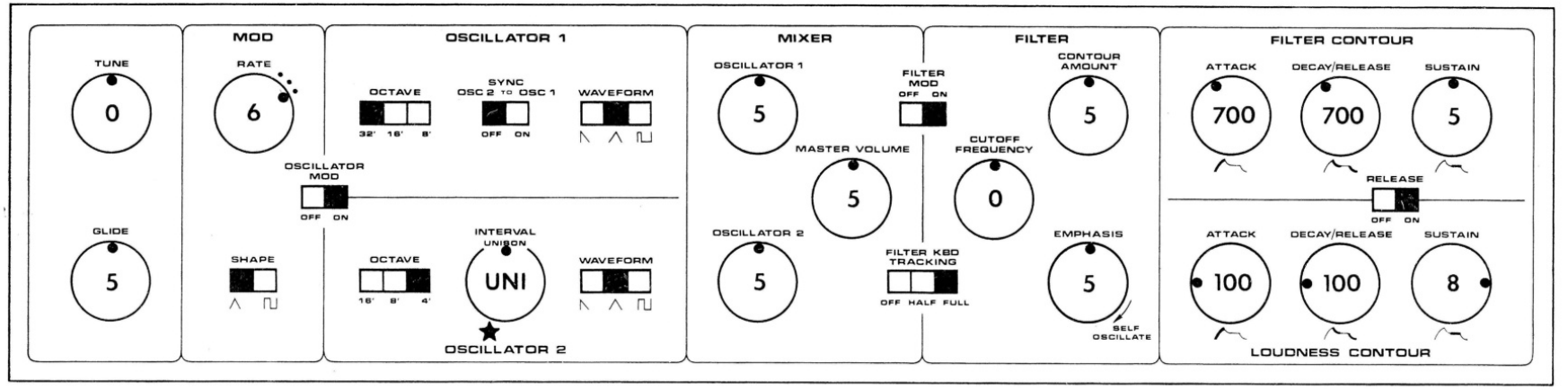
DOUBLE WHISTLE

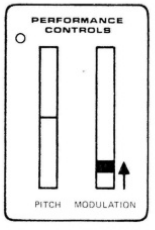




Vibrato amount

CLARINET

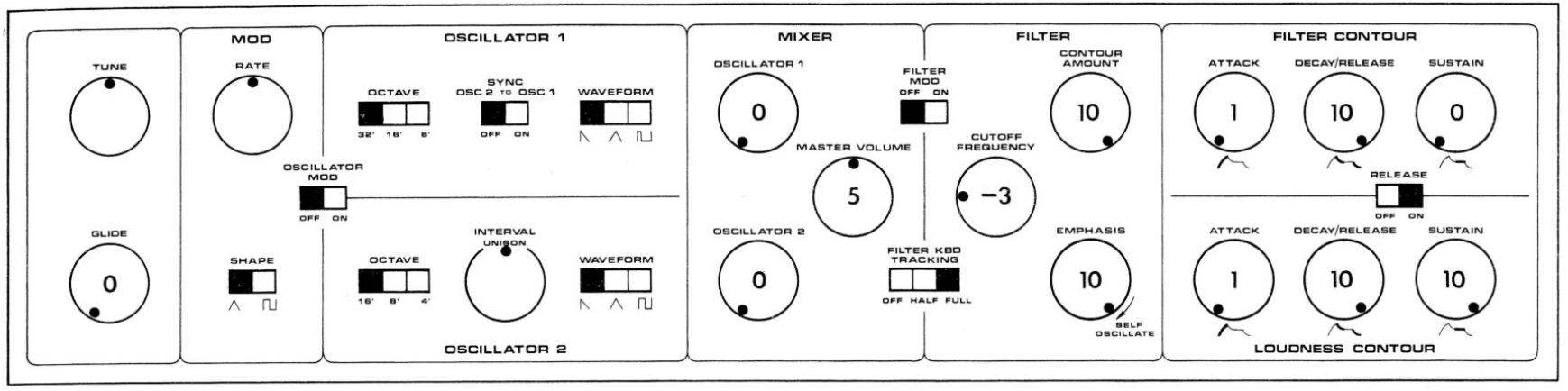


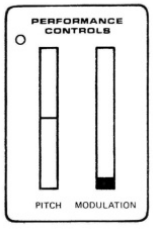


★Adjust for no beats

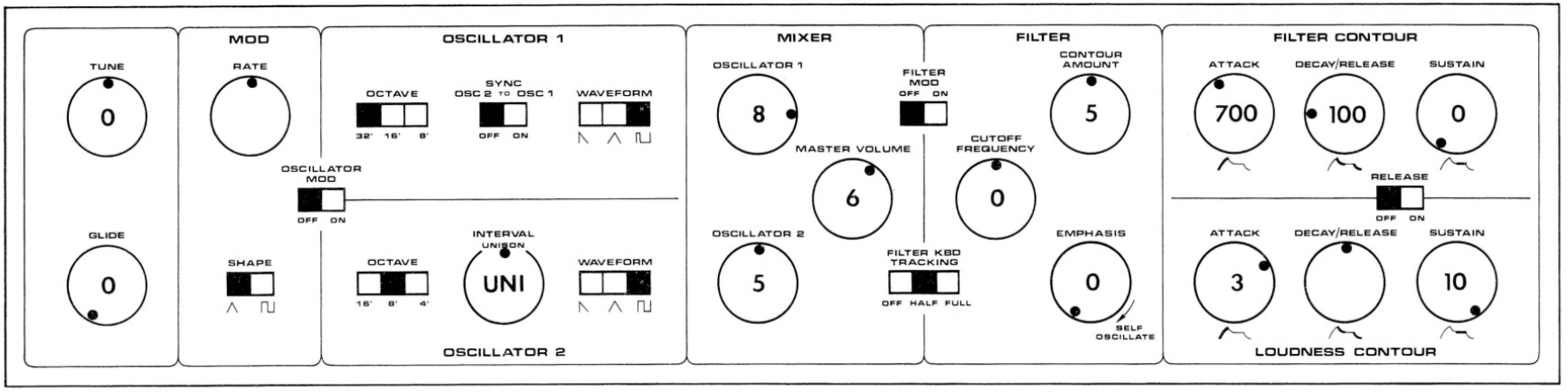
Vibrato amount

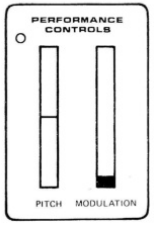
LONG FALL



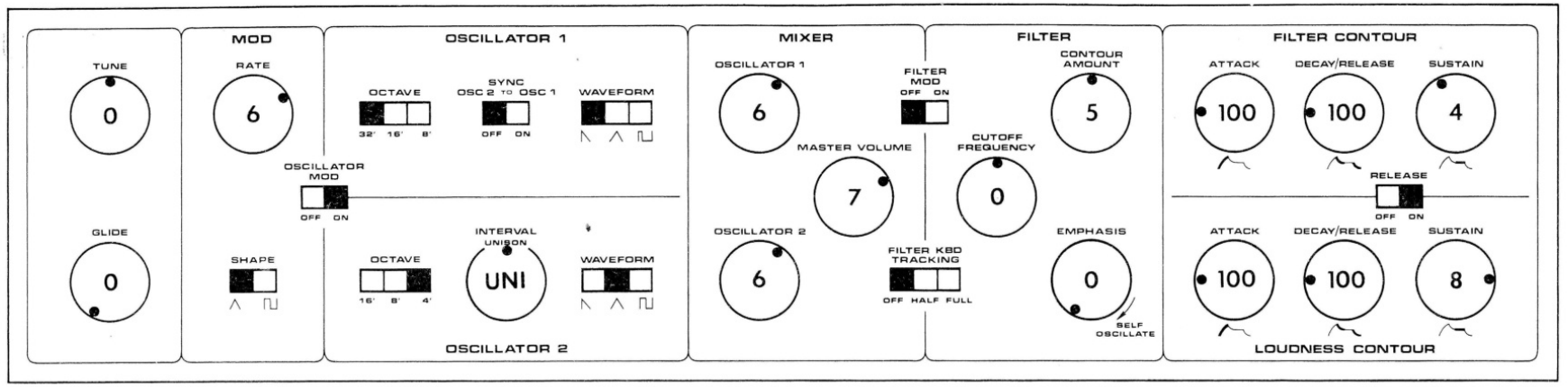


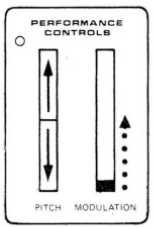
DOUBLE ENVELOPE



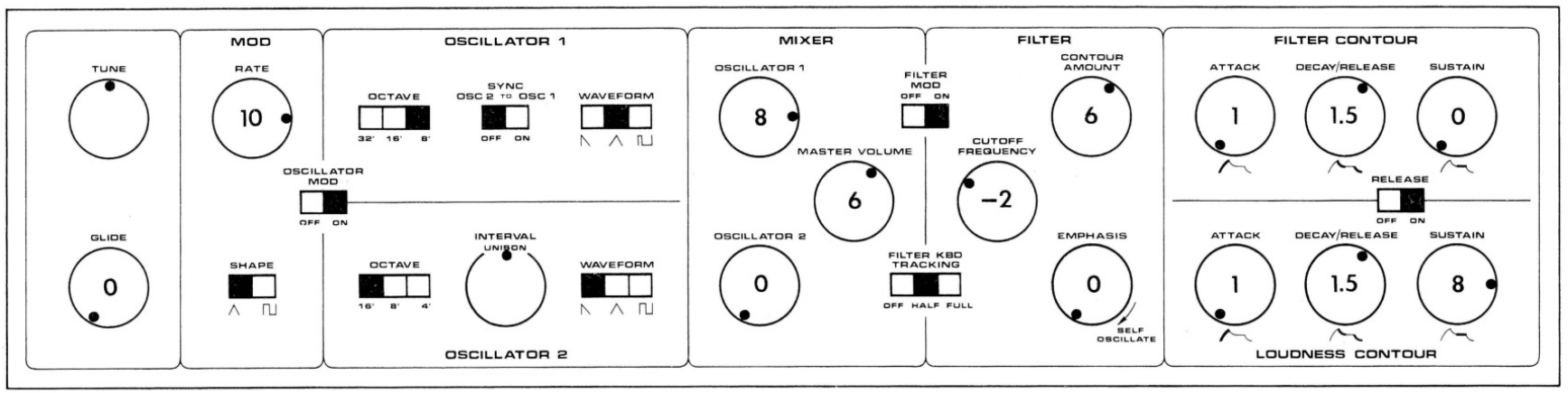


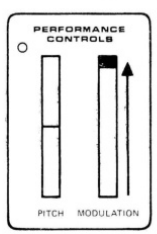
ELEPHANT AND FLEA



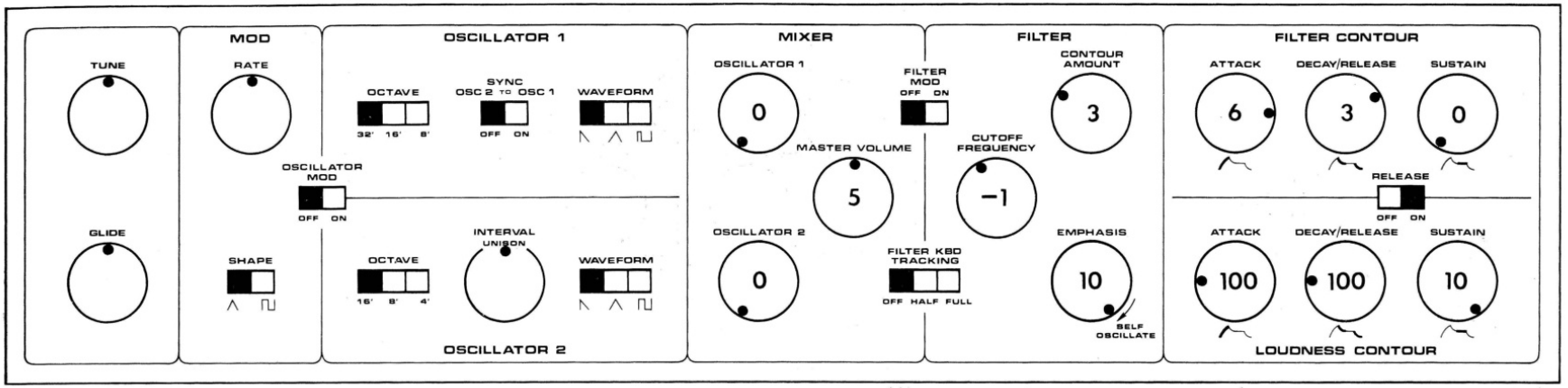


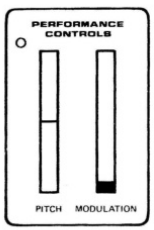
QUIVER ECHO



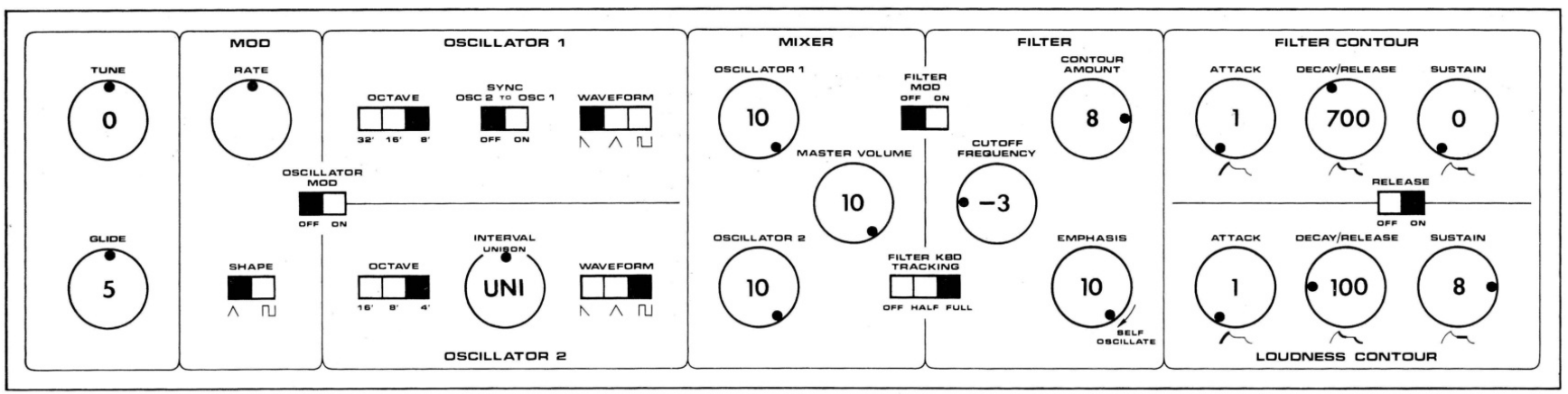


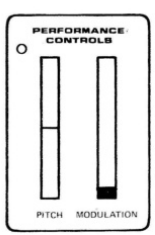
SIREN

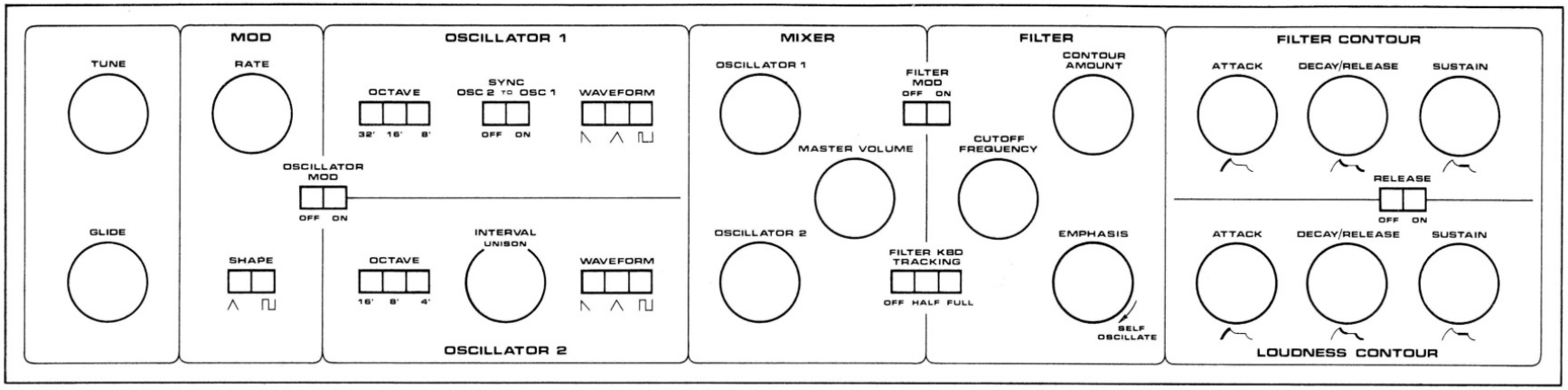


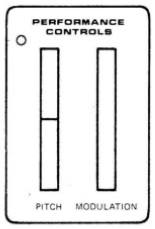


GO QUICK

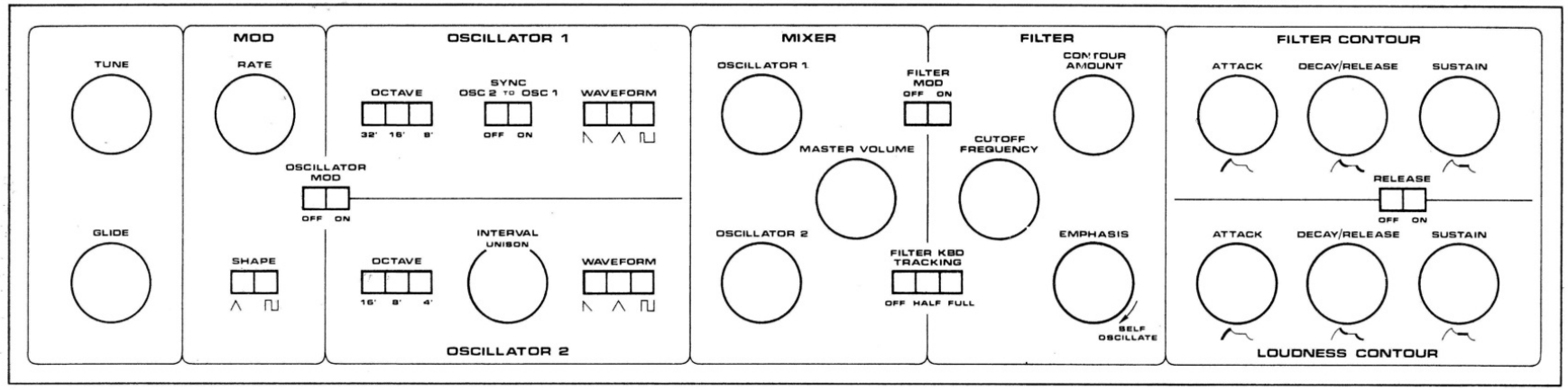


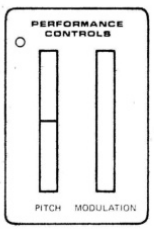






moog PRODIGY





moog PRODIGY

SYNTHESIZING BY EAR

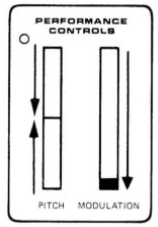
You may not be familiar with the synthesizer, but all of us have had some experience with sound. It's possible to explore a synthesizer just as you would any other musical instrument — by *ear*. This part of the manual presents experiments that let you synthesize by ear, relating changes of front panel controls to what you *hear*. At this point we aren't trying to understand exactly how the Prodigy works, just how you can *use* it. After all, most pianists don't really understand the excapement mechanism used to key their instrument; but this does not keep them from playing it well!

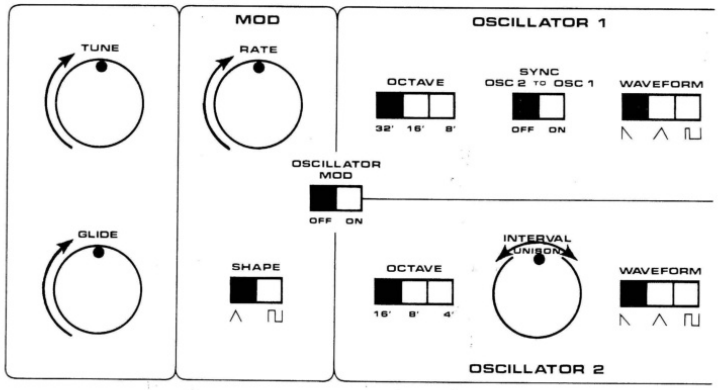
You will deal with the elements of sound: pitch, loudness, and tone color. We'll also touch on the concepts of *articulation* and *modulation*, or how the elements of sound are moved in time. Don't strain to *understand* everything you experience — let your intuitive musical sense guide you. However, it is *most important* that you do each exercise exactly as prescribed to experience its full impact. Go!

THE PREPARATORY PATCH

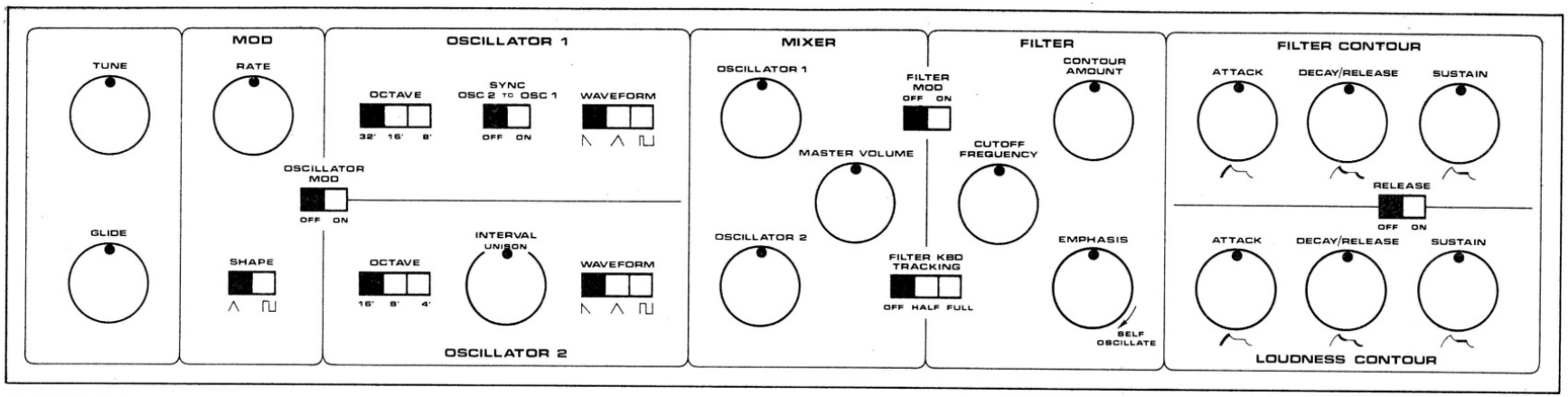
We call a control panel setup a "patch." This name comes from the fact that the first synthesizers had individual modules that were connected — or "patched" together — using wires called *patch*cords. The Preparatory Patch is a useful way to start exploration; it insures that you will always get a sound and that most panel controls will be "live." Practice setting up the Preparatory Patch. It takes only 5 steps:

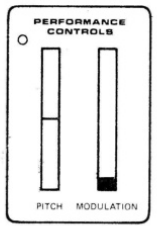
1. Roll the PITCH wheel to its center position.
2. Roll the MODULATION wheel completely toward you.
3. Turn all rotary controls (potentiometers) on the front panel "up" to the 12 o'clock position.
4. Switch all slide switches completely to the *left*.
5. Tune oscillators to "zero beats" using the INTERVAL control.





Your Prodigy should now look like this:





PREPARATORY PATCH

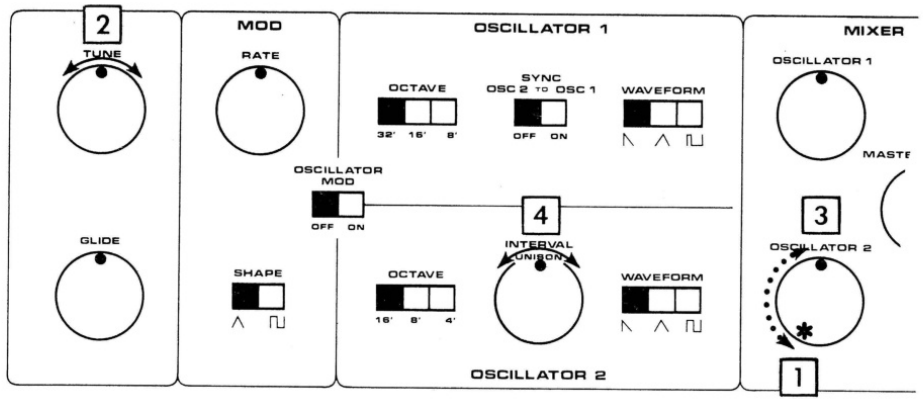
PITCH

TUNING

If you are *not* playing with other instruments, simply setting up the Preparatory Patch will be sufficient, since this procedure insures that the Prodigy's two pitch sources (oscillators) are in tune with each other. This is all the tuning that is required for these experiments.

If you *are* going to play with other instruments follow this procedure *after* the Preparatory Patch:

1. Turn the OSCILLATOR 2 control to zero. Now you hear *only* Oscillator 1.
2. Adjust the TUNE control to match the pitch of the other instrument.
3. Turn OSCILLATOR 2 control back up in order to hear *both* oscillators.
4. Adjust the INTERVAL control to tune Oscillator 2 to Oscillator 1. (Eliminate "beats.")



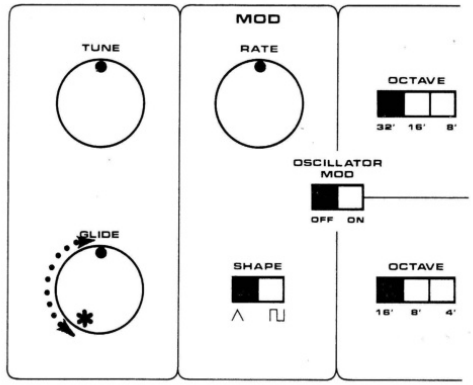
KEYBOARD CONTROL OF PITCH

1. Set up Preparatory Patch.
2. Play a key in *middle* of keyboard and *hold.*
3. While holding that key – depress any key above that key (no effect).
4. While holding that key – depress any key *below* that key (lower note sounds).

The Prodigy's keyboard is monophonic – plays one key at a time. If more than one key is depressed, the lowest key sounds.

KEYBOARD GLIDE, OR PORTAMENTO

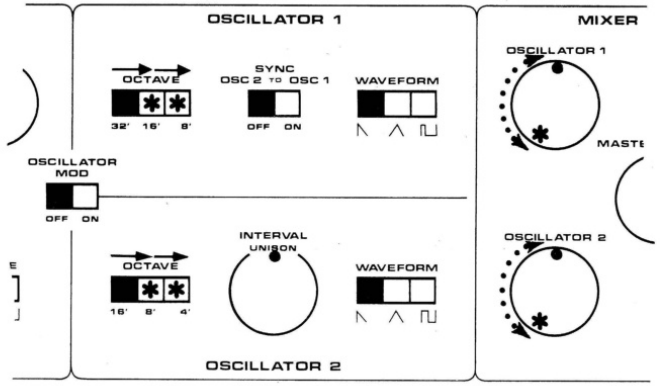
1. Set up Preparatory Patch.
2. Play highest key and *hold.*
3. While holding highest key, strike and release slowly the lowest key. Change in pitch glides rather than leaps.
4. Turn the GLIDE control to its *zero* position. Repeat action on keyboard (no glide).
5. Play the keyboard. Experiment with GLIDE control settings.



The GLIDE control may be used to introduce portamento to a musical line.

OCTAVATION

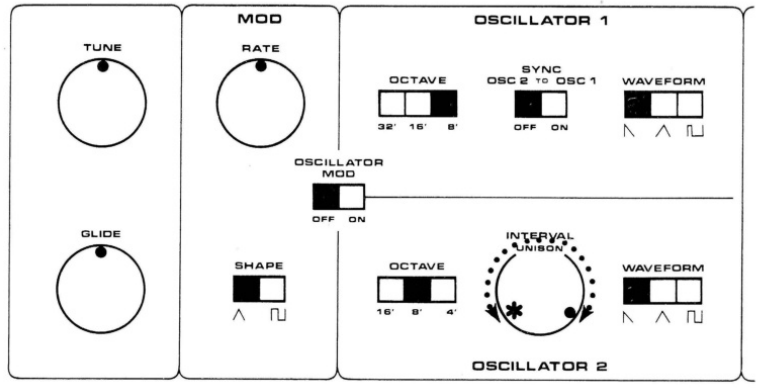
1. Set up Preparatory Patch.
2. Play a key in middle of keyboard and *hold.*
3. Listen first to one oscillator, then the other. (Use OSCILLATOR 1 and OSCILLATOR 2 controls in Mixer section).
4. Switch OCTAVE switch in first oscillator to the 16' position. Repeat listening procedure. Try the 8' position and repeat procedure.
5. Switch OCTAVE switch in second oscillator to the 8' position. Confirm that both oscillators are in the same (8') octave range. Try the 4' position.
6. Experiment with various combinations of OCTAVE settings. Play the keyboard.



The Oscillators on the Prodigy are sources of pitched sound. The Oscillators overlap, but do not completely duplicate pitch ranges.

PARALLEL INTERVALS

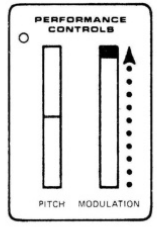
1. Set up Preparatory Patch.
2. Switch both OCTAVE switches to 8' position.
3. Play highest key and hold.
4. Turn the INTERVAL control clockwise (to right) to tune the second oscillator *higher* than the first oscillator. Try interval (distance) of a perfect fifth — like violin tuning.
5. Play up and down keyboard. Notice that the oscillators retain their interval as tuned over the entire keyboard. Try negative setting of INTERVAL control.

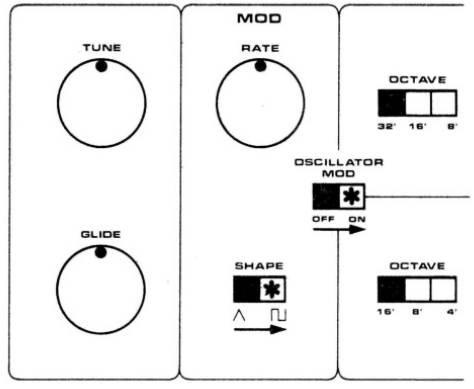


Oscillators tuned to an interval will maintain that interval when keyboard is played.

VIBRATO AND TRILL

1. Set up Preparatory Patch.
2. Play highest key and hold.
3. Roll MODULATION wheel toward panel with left hand (no change yet).
4. Switch OSCILLATOR MOD switch ON (to right).
5. Adjust vibrato *rate* with RATE control in the MOD section. Try around position "6."
6. Adjust vibrato *amount* by rolling the MODULATION wheel back toward you. Experiment.
7. Switch the SHAPE switch to the right. Repeat experiment starting from step #2.



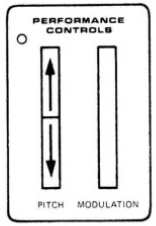


Vibrato and trill are repetitive changes of pitch.

Vibrato or trill can be produced when the OSCILLATOR MOD switch is ON and the MODULATION wheel is rolled forward.

PITCH BENDING

1. Set up Preparatory Patch.
2. Play highest key and hold.
3. Bend pitch of (both) oscillators *up* by rolling the PITCH wheel toward the control panel.
4. Bend pitch of (both) oscillators *down* by rolling the PITCH wheel away from the control panel.
5. Return to original pitch by returning the PITCH wheel to the (normal) center position.



The PITCH wheel can be used to bend the pitch of both oscillators.

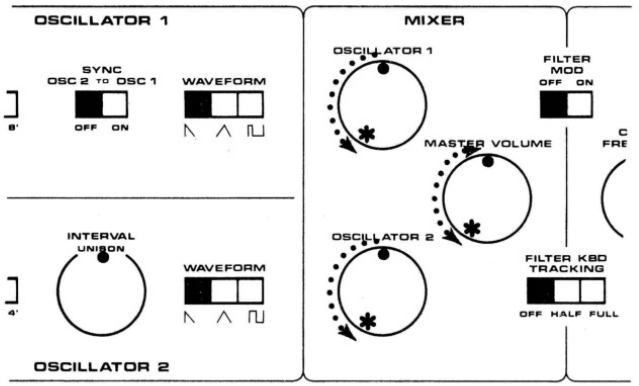
Return to original pitch (tonal center) can be seen and felt.

The PITCH wheel can be left above or below tonal center to transpose pitch.

LOUDNESS

MIXING SOUNDS

1. Set up Preparatory Patch.
2. Play highest key and *hold*.
3. Turn the MASTER VOLUME control to zero. Return that control to normal position.
4. Turn OSCILLATOR 1 control to *zero*. Play.
5. Turn OSCILLATOR 2 control to *zero*. Play.



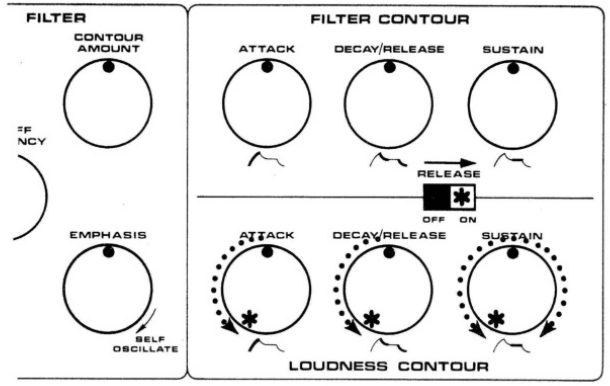
Overall loudness depends on the MASTER VOLUME control in the Mixer section.

Each oscillator has an individual loudness control in the Mixer section.

No sound will be heard when the MASTER VOLUME control is set to zero.

CONTOURING LOUDNESS – ARTICULATION

1. Set up Preparatory Patch.
2. Repeatedly strike and release highest key.
3. As you repeat note, slowly turn the ATTACK control in the Loudness Contour section toward the "1 MSEC" position. Leave in that position and continue experiment.
4. Play and *hold* highest key. Notice that the sound lasts, or sustains as long as you hold the key down.
5. While holding note, turn the SUSTAIN control in the Loudness Contour through its possibilities.
6. Turn that SUSTAIN control to its *zero* position.
7. Play and *hold* key. (Tone will *not* sustain).
8. Return the SUSTAIN control to its original position. (approximately "5").
9. Play and release key. End of note is abrupt.
10. Switch the RELEASE switch ON (to right).
11. Play and release key. Notice the gradual fall to silence – a long release.
12. Repeatedly strike and release key.
13. As you repeat note, slowly turn the DECAY/RELEASE control in the Loudness Contour toward its "1 MSEC" position.



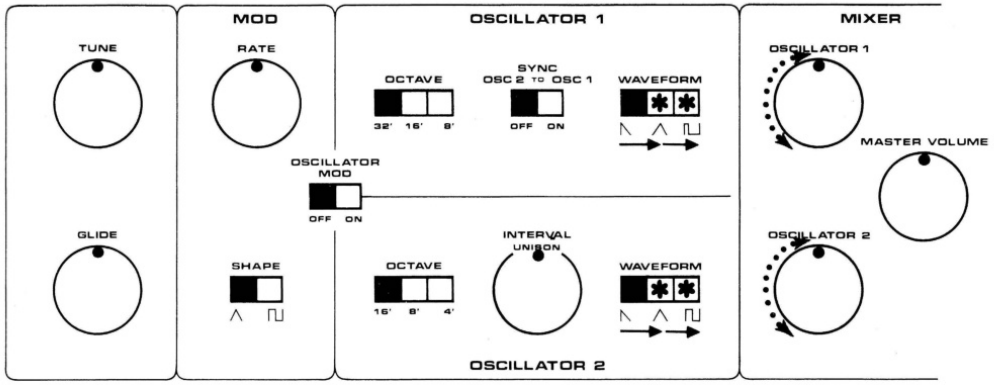
The Loudness Contour section can shape the beginning, middle, and end of the loudness characteristic of a sound.

The ATTACK and DECAY/RELEASE controls govern rise and fall times for loudness contours; the SUSTAIN control determines an amount, or level of loudness.

TONE COLOR

OSCILLATOR WAVEFORMS

1. Set up Preparatory Patch.
2. Play *lowest* key and hold.
3. Switch the WAVEFORM switches for both oscillators to their *center* positions. Listen.
4. Switch both WAVEFORM switches to the *right.* Listen.
5. Listen to each oscillator individually to compare waveforms when WAVEFORM switches are placed to the right. (Use Mixer controls).

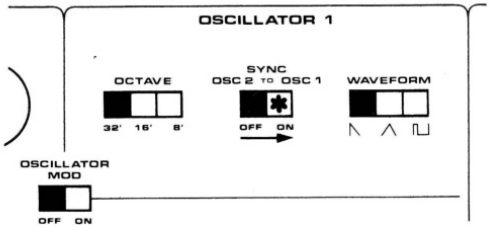


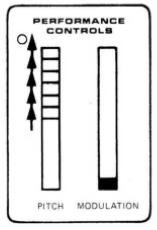
Different waveforms produce different tone colors.

The Prodigy's oscillators produce 4 different waveforms. (Look closely). These waveforms may be mixed to produce other waveforms.

OSCILLATOR SYNC SOUNDS

1. Set up Preparatory Patch.
2. Switch the SYNC OSC 2 TO OSC 1 switch ON (to right).
3. Roll the PITCH wheel toward the control panel. (new tone colors!)
4. Listen to the first oscillator only and move the PITCH wheel. (no effect).
5. Listen to the second oscillator only and move the PITCH wheel. (strong sync effect).
6. Switch the WAVEFORM control for the second oscillator fully to the right. Repeat experiment starting with step #2.

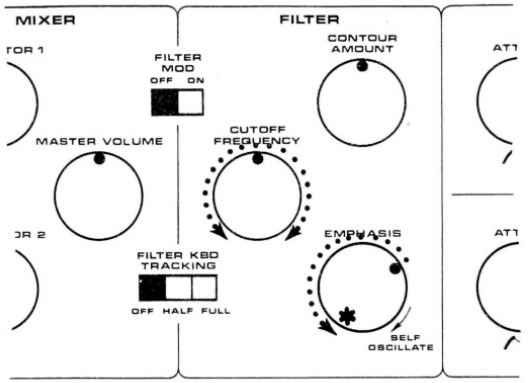




When the oscillators are synchronized, the PITCH wheel can be moved to create many novel tone colors. Sync affects the second oscillator's tone color.

FILTERING SOUND – REMOVING HIGHS

1. Set up Preparatory Patch.
2. Play *lowest* key and hold.
3. Turn the CUTOFF FREQUENCY control throughout its possible positions.
4. Turn the EMPHASIS control to 7. Repeat action with the CUTOFF FREQUENCY control.
5. Turn the EMPHASIS control to 0. Repeat action with the CUTOFF FREQUENCY control.

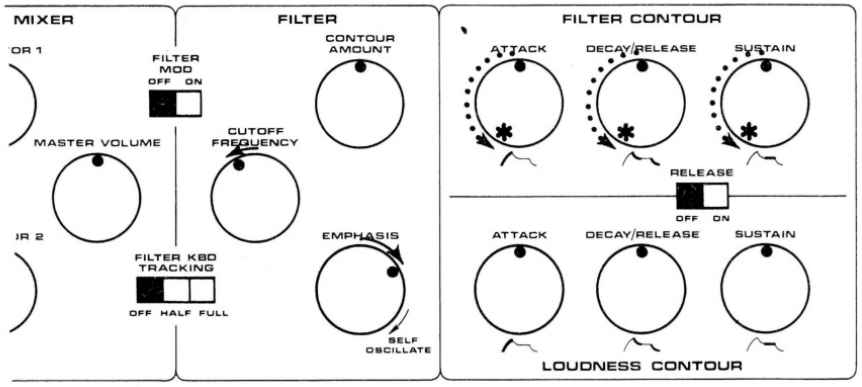


The CUTOFF FREQUENCY control can determine the amount of "highs" in a sound.

High settings of the EMPHASIS control emphasize the presence of harmonics in a sound, creating a more nasal sound.

TONE COLOR CONTOURS

1. Set up Preparatory Patch.
2. Play *lowest* key and hold.
3. Turn the CUTOFF FREQUENCY control to –1. Turn the EMPHASIS control to 7. Play and hold key.
4. While holding note, turn the SUSTAIN control in the Filter Contour section slowly to *zero*. Experiment with the SUSTAIN control.
5. With the SUSTAIN control at zero, repeatedly strike and release the lowest key.
6. Continue striking key repeatedly, and slowly turn the ATTACK control in the Filter Contour section (counterclockwise) to its "1 MSEC" position. Notice the change on the *beginning* of the filter contour produced.
7. Continue striking key repeatedly, and slowly turn the CONTOUR AMOUNT control in the Filter section to *zero*. Experiment with CONTOUR AMOUNT settings.
8. Return the CONTOUR AMOUNT control to position "5."
9. Striking key repeatedly, slowly turn the DECAY/RELEASE control to its "1 MSEC" position.

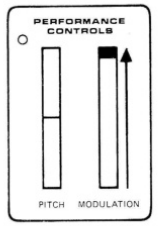


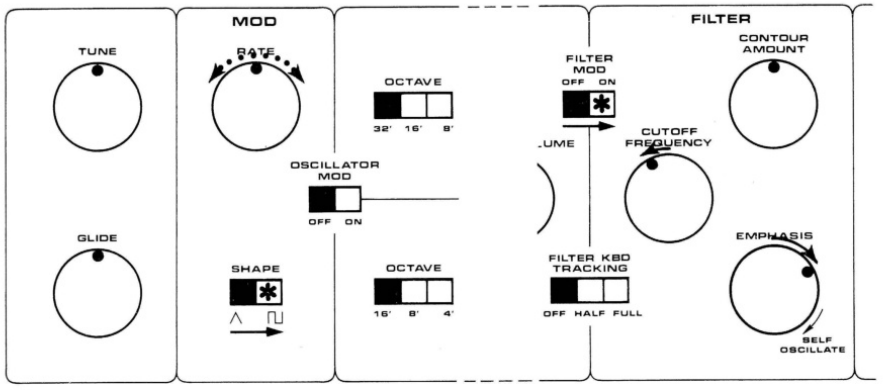
The Filter Contour section can move the CUTOFF FREQUENCY control (internally).

The Filter Contour section is in use only when the CONTOUR AMOUNT control is turned above its zero position.

WAH-WAH-WAH-WAH . . .

1. Set up Preparatory Patch.
2. Play *lowest* key and hold.
3. Roll MODULATION wheel toward the control panel.
4. Switch the FILTER MOD switch ON (to right).
5. While holding key turn the CUTOFF FREQUENCY control to –1. Turn the EMPHASIS control to 7.
6. Use the RATE control in the Mod section to control *rate* of filter modulation.
7. Use the MODULATION wheel to control the *amount* of filter modulation.
8. Switch the SHAPE switch in the Mod section to the right. Repeat this experiment; start with step #2.





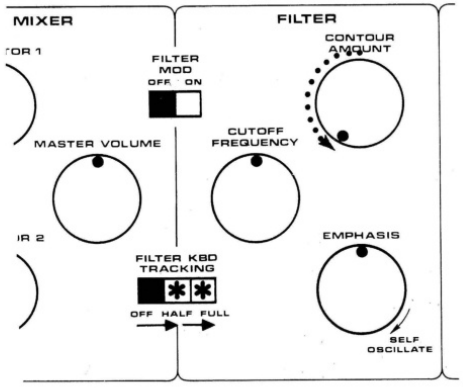
Filter modulations can be introduced when the MODULATION wheel is forward and the FILTER MOD switch is ON.

The shape and rate of modulation are determined by the MOD section controls.

The amount of modulation is determined by the MODULATION wheel.

KEYBOARD BRIGHTNESS CONTROL

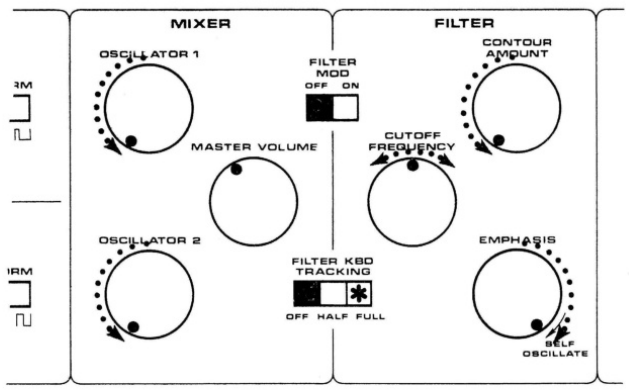
1. Set up Preparatory Patch.
2. Turn the CONTOUR AMOUNT control in the Filter section to *zero.*
3. Play first the lowest, then the highest key. Listen to difference in brightness between low and high notes.
4. Switch the FILTER KBD TRACKING switch to the HALF position. Repeat previous step and listen.
5. Switch the FILTER KBD TRACKING switch to the FULL position. Repeat action on keyboard.



The FILTER KBD TRACKING switch selects brightness differences between low and high parts of the keyboard.

FILTER WHISTLE

1. Set up Preparatory Patch.
2. Turn both oscillators off. (Turn OSCILLATOR 1 and OSCILLATOR 2 controls in Mixer section to zero.)
3. Turn CONTOUR AMOUNT control to *zero*.
4. Play and hold *any* key.
5. Turn the EMPHASIS control clockwise until a sound is heard (past 8).
6. Play keyboard. (Filter whistle is not controlled in pitch by keyboard at this point.)
7. Switch FILTER KBD TRACKING switch to FULL position. Now play keyboard.
8. Tune filter whistle using the CUTOFF FREQUENCY control.



When the EMPHASIS control is set to SELF OSCILLATE the Filter makes a sound.

UNDERSTANDING SYNTHESIS

Now that you've learned something about the Prodigy by the intuitive approach, let's give the *other* side of your brain a workout. In this section of the manual we will deal not so much with sound, but with the *signals* that the synthesizer makes to create and control sound. Don't stop here! It's very useful to understand how the Prodigy works, for then you can anticipate any action on the front panel, and *realize* the sounds that you conceive. Even though we will be dealing with the Prodigy on a slightly more technical level, we will continue to relate sections of the synthesizer to familiar instruments.

Any section of the Prodigy (and generally, any synthesizer) will fall into one of several categories:

SOUND SOURCES

MODIFIERS

CONTROLLERS

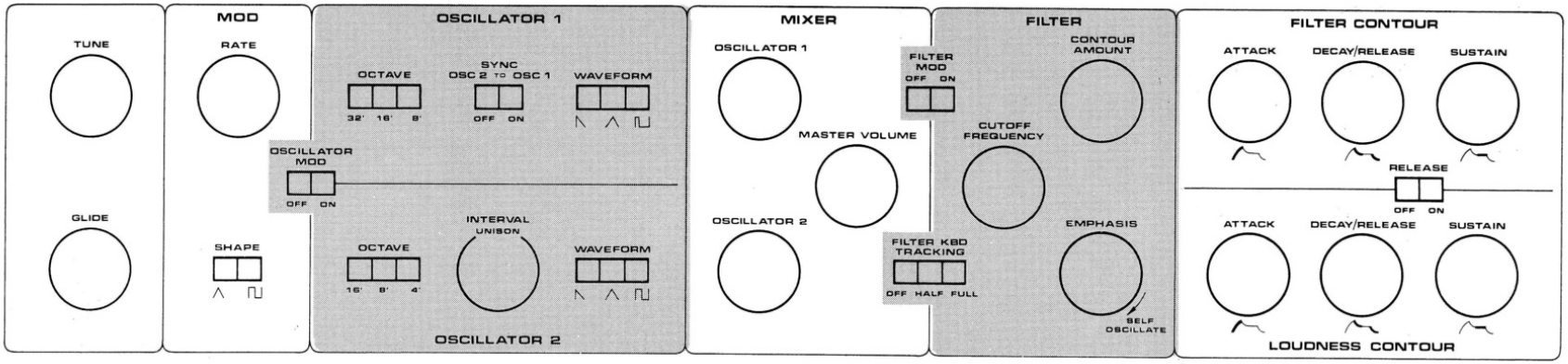
TRIGGERING DEVICES

PERFORMANCE CONTROLS

Any section is categorized by how it is *used*. For instance, the FILTER may be a sound source *or* a modifier, according to how *you* use it.

SOUND SOURCES

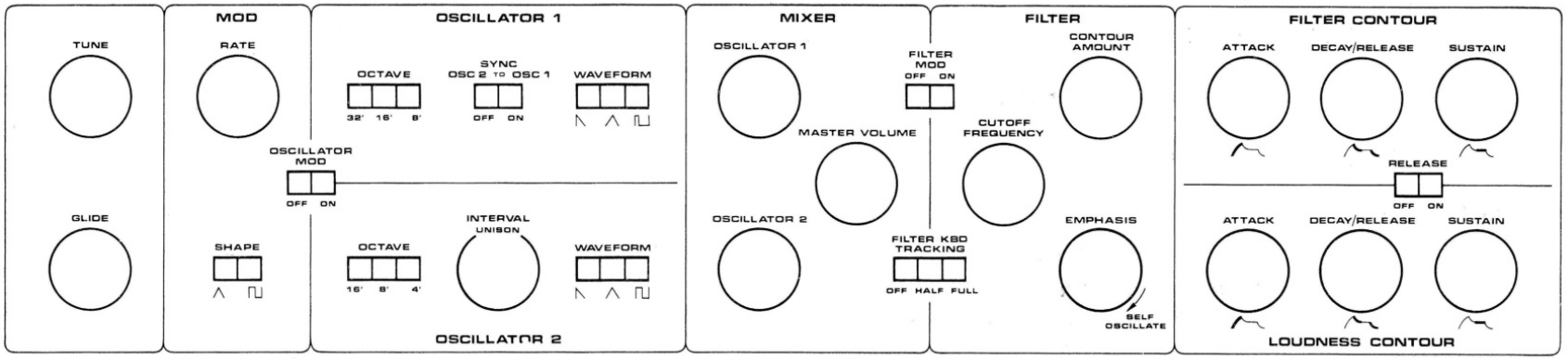
The synthesizer is electric; it deals with electrical signals — sound is generated by the speaker. To make sound, one of the Prodigy sections must generate an electrical signal that can drive the speaker to make sound — an *audio* signal. Not surprisingly, we call this type of device an *audio signal generator.* Since an audio signal eventually becomes a sound, an audio signal generator is commonly referred to as a "sound source." A sound source generates the "raw" tone or noise that can be shaped into musical sound. You can take the mouthpiece off a trumpet and "buzz" tunes with it. That would be a *very* raw sound source!



The Prodigy provides two basic sources of pitched sound: OSCILLATOR 1 and OSCILLATOR 2. In addition, the FILTER can be a pitched sound source.

MODIFIERS

A modifier also does what its name implies. It acts on or modifies a signal that passes *through* it. Signals pass through modifiers, so any modifier will have both an input and an output. The Prodigy's modifiers include the MIXER, FILTER, and an internal VCA, or voltage controlled amplifier.



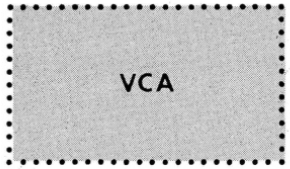
A mixer does just what the name suggests. It mixes, or balances the relative strengths (or *amplitudes*) of two or more signals. The output of a mixer is a *sum* of the input signals. In the case of mixing *audio* signals, the mixer would govern the relative *loudness* of each signal. An audio mixer blends sounds.

It is difficult to draw a clear analogy between a mixer and some part of an acoustic instrument. But we might consider the *bridge* of a stringed instrument as a mixer. For instance, when you play double stops (two notes) on a violin, *both* notes are transmitted to the body of the instrument by the bridge, "mixed" in loudness.

The MIXER on the Prodigy governs the relative loudness of OSCILLATOR 1 and OSCILLATOR 2. (MASTER VOLUME is an overall loudness control.)

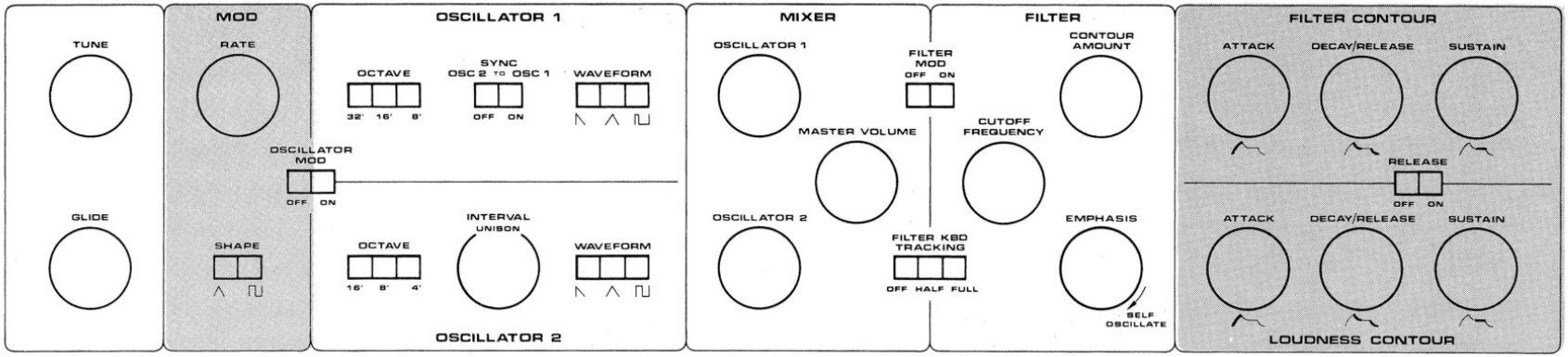
The FILTER removes a portion of sound – just as the paper filter in your coffee pot removes coffee grounds. The Prodigy's filter removes "highs" *above* a point set by the adjustable CUTOFF FREQUENCY control. Sound *below* that point is *passed.* In fact, this is the world-famous Moog resonant *lowpass* filter! A *mute* for a brass instrument is also a filter.

Another modifier — not depicted on the front panel — is an internal voltage controlled amplifier, or VCA. The VCA articulates sound by modifying the *gain* or loudness of the audio signal that passes through it. The bell of a trumpet can be considered an amplifier.

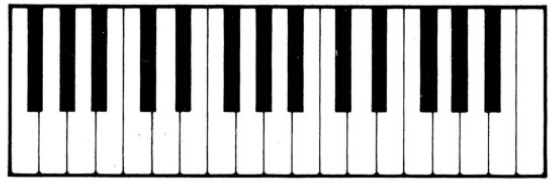


CONTROLLERS

Controllers create signals that aren't heard, but influence the operation of sound sources and/or modifiers. When a section is used as a controller, its *control voltage* may be used to *control* the frequency (pitch) of the oscillators; *control* the cutoff frequency (tone color) of the filter; and *control* the gain (loudness) of the internal VCA to articulate the sound. Your *hands* are controllers!



On the Prodigy the keyboard always controls the frequency (pitch) of the oscillators *in steps,* and may control filter cutoff frequency as well.



Keyboard

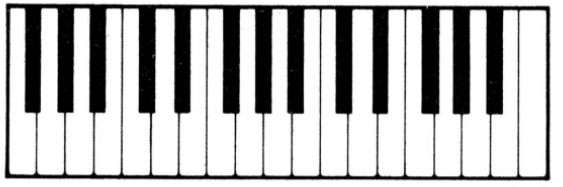
The contour generators produce a rising and falling voltage pattern — a contour, or envelope. The FILTER CONTOUR controls filter cutoff frequency only when the CONTOUR AMOUNT control is above zero. The LOUDNESS CONTOUR is permanently connected to the control input of the internal VCA and controls its gain, or loudness.

The MOD section is a "low frequency oscillator." It generates slow-moving, repeating waveforms. The MOD section can control the oscillators (when the OSCILLATOR MOD switch is ON) to create vibrato and trill. The MOD section can control the filter cutoff frequency (when the FILTER MOD switch is ON) to create wah-wah, tremolo, and other tone color effects.

TRIGGERING DEVICES

A trigger is a signal (again, that is never heard) that tells the contour generators when to start and end their action.

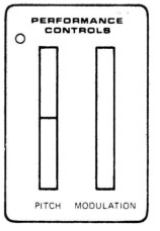
The keyboard is the sole source of triggers on the Prodigy, and is permanently connected to the contour generators.



PERFORMANCE CONTROLS

Performance controls are devices on the synthesizer specifically designed — musically engineered — to enhance the musicality of the instrument.

On the Prodigy, the PITCH wheel is connected to the oscillators to allow subtle bending of the pitch. The center "detent" position allows easy return to the original note — a must for return to the tonality (key) in which you are playing. The PITCH wheel acts as a *tone color control* when the oscillators are "synched" (SYNC OSC 2 TO OSC 1 switch ON).



The MODULATION wheel allows you to govern the amount of vibrato (trill, etc.) and introduce it selectively while playing a melodic line.

These performance controls require a specific performance technique for mastery of the melodic line. Don't neglect them!

SOUND SOURCES

VOLTAGE CONTROLLED OSCILLATORS

We hear pitch as the highness or lowness of a sound. The piccolo plays high pitches; the tuba plays low pitches. Our perception of pitch is complex, but depends mostly on how frequently and how regularly pressure waves strike our ears. Strum a guitar and watch a string vibrate. The *number* of times it moves back and forth is literally its *frequency*. Frequency is defined as the *number* of times a pattern repeats in a given period of time, say a second. This number is expressed in "Hertz," abbreviated Hz; the symphony tunes to an "A" that has a frequency of 440 Hz.

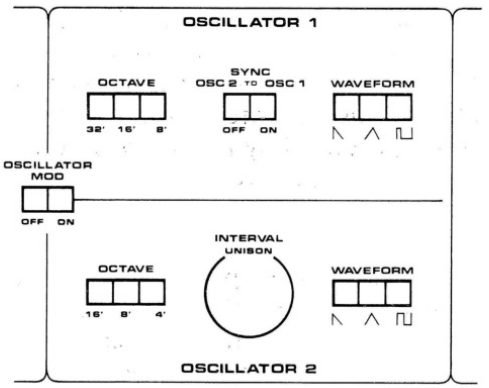
The Prodigy provides for both manual and voltage control of oscillator frequency. The OCTAVE switches tune the oscillators in octave increments covering a *total* span from 32' to 4'. (The ' symbol means "footage," borrowed from organ terminology that literally means the length of pipes).

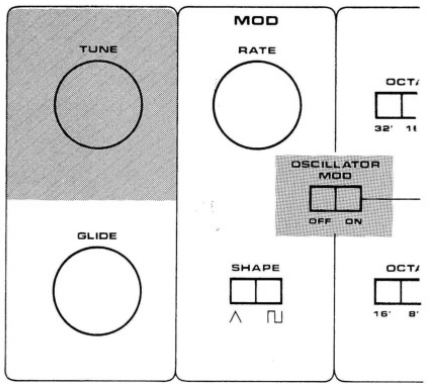
The INTERVAL control tunes *only* the second oscillator variably ±P5 (at least a perfect fifth — like violin tuning — above and below the first oscillator. (see TRILL BENDER sound chart).

The TUNE control affects both oscillators equally over a narrow range to provide for overall tuning of the Prodigy.

The oscillators may also be controlled by applying a voltage to an (unseen) control input. The *keyboard* is permanently connected to this control input, and will always move the frequency (pitch) of the oscillators in discrete steps when it is played. (See POWER DUO sound chart.)

The MOD section *can* be connected to this control input, when the OSCILLATORS MOD switch is ON. In this case, the slow-moving waveform produced by the MOD section *may* move the frequency of the oscillators up and down. This is possible *only* when the MODULATION wheel has been rolled forward toward the control panel. (See BOWED STRINGS sound chart).





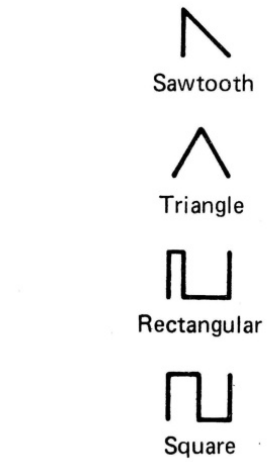
We've referred to the audio signal generated by the oscillator(s) as a *waveform.* What *is* a waveform? A waveform is simply a way of picturing a sound; the waveform of an acoustic instrument *or* an oscillator can be seen on an oscilloscope.

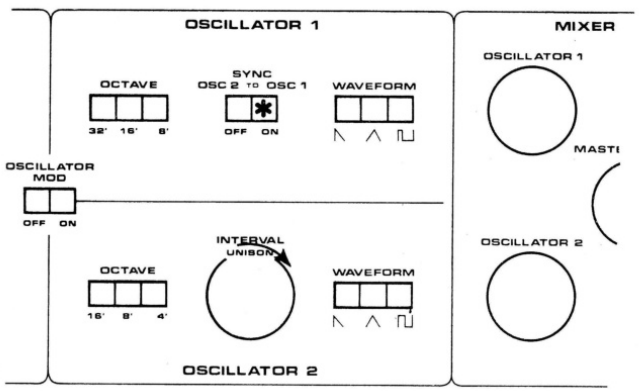
Most traditional instruments have a distinctive waveform that helps us identify their tone colors. The oscillators on the Prodigy produce electrical waveforms that are translated by the speaker into a variety of tone colors. If the waveform produced by an oscillator looks like the waveform of a traditional instrument, their sounds can be similar.

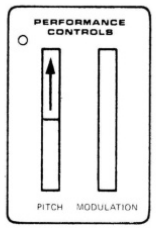
The oscillators on the Prodigy produce sawtooth, triangle, and rectangular waveforms; they are named after their shapes. The second oscillator produces a particular kind of rectangular waveform that is equal on top and bottom — a *square* waveform.

The WAVEFORM switches allow independent selection of waveforms for each oscillator. When two different waveforms are mixed in the MIXER section, a new waveform results, therefore a different tone color. (See TRILL BENDER sound chart).

When the oscillators are locked together, or SYNC is ON, the second oscillator may be *detuned* to create novel waveforms. This may be accomplished using the INTERVAL control or the PITCH wheel. (In this case the PITCH wheel controls the frequency of *only* the second oscillator.) (See SYNC sound chart).







FILTER AS SOUND SOURCE

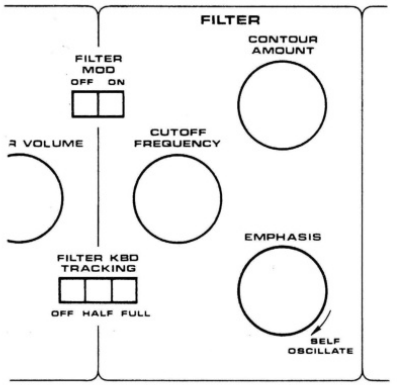
Although the primary purpose of the FILTER is tone modification, it will also act as a sound source. When the EMPHASIS control is turned high enough (past 8) the filter will oscillate, producing a pure sine waveform. A sine waveform is a whistle-like sound that has no harmonics — it is comprised of only the fundamental. The MASTER VOLUME control will govern loudness of this sound, even though it appears to occur in the signal chain before the filter. The filter sine waveform may be used in conjunction with the oscillators, but careful tuning must be performed to avoid "beats."

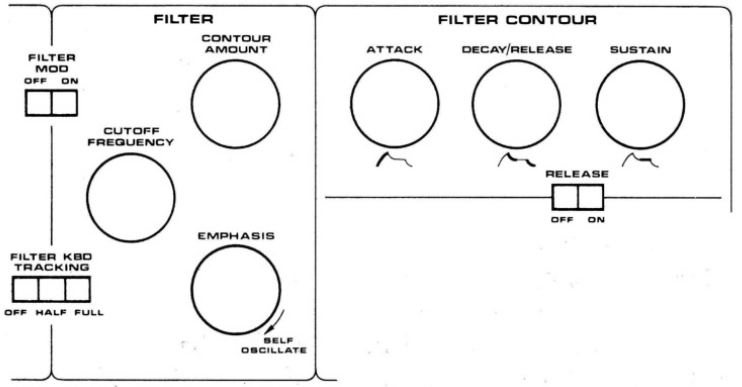
When the filter "SELF-OSCILLATES" it acts like an oscillator. There is no waveform control for this "oscillator," since it produces only the sine waveform. But there is both manual and voltage control of frequency. (See FILTER DOODLE sound chart).

When the filter oscillates, the CUTOFF FREQUENCY control acts as a wide range tuning control, tuneable by hand. The keyboard may be used to control filter frequency, and will produce the familiar diatonic scale when the FILTER KBD TRACKING switch is to FULL.

The FILTER CONTOUR may be used to contour the filter frequency when the CONTOUR AMOUNT control is placed above zero. This will produce siren and other contoured pitch effects (see SYNTHEDRUM sound chart).

The filter frequency may be modulated when the FILTER MOD switch is ON and the MODULATION wheel is rolled forward toward the control panel. Since the filter is acting like an oscillator, you will get vibrato and trill when you do this.





MODIFIERS

MIXER

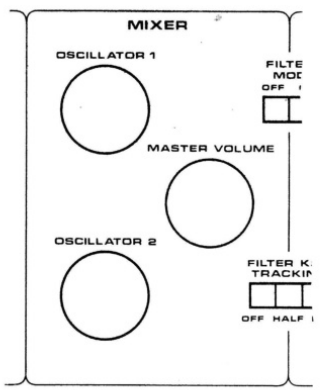
The MIXER section modifies the amplitude of audio signals generated by the voltage controlled oscillators and the filter when in its tone mode. (That means the MIXER controls the loudness of the sounds made by the Prodigy; see, it's easy to talk "synthesizerese!")

The MASTER VOLUME control is a final volume control and actually occurs at the end of the sound chain. For purposes of playability we have placed the MASTER VOLUME control central to either hand and in a especially easy to see place on the panel.

When the filter is the only sound source, the MASTER VOLUME control is its volume control.

When the oscillators are the only sound sources, their individual loudnesses are controlled by the OSCILLATOR 1 and OSCILLATOR 2 controls in the MIXER section, and overall loudness is governed by the MASTER VOLUME control. This lets you balance the output of the oscillators and have overall loudness control. It is recommended that you use fairly high settings on all the MIXER controls (above 5). Then the Prodigy will output a strong signal with little noise; and your amplifier can be run at a low level where it produces little noise.

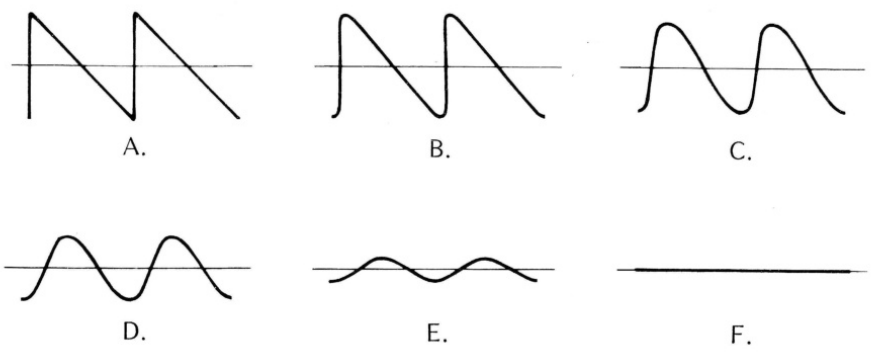
The MIXER and FILTER sections are designed to produce desireable distortion of the sound when the MIXER OSCILLATOR 1 and OSCILLATOR 2 controls are turned fully to 10. By mistuning the oscillators a wide range of bell and gong (see RING MOD EFFECTS in sound chart section of manual) sounds can be made.



VOLTAGE CONTROLLED FILTER

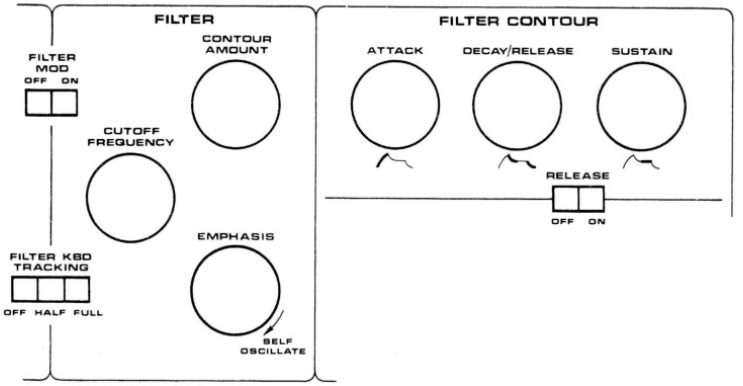
A filter modifies sound by removing a portion of the sound. The Prodigy features the patented Moog wide-range lowpass resonant filter. This unique filter plays a role in creating the distinctive and recognizable "Moog Sound" that has become popular.

The Prodigy's FILTER section is a lowpass filter; it acts to attenuate or "cut off" the higher frequency components in a sound and pass the lows. As the CUTOFF FREQUENCY is turned counterclockwise, the more highs are reduced; the waveshape passing through the filter is rounded and smoothed as the CUTOFF FREQUENCY control is lowered. The following diagram depicts the progressive cutting off of upper frequency components of a sawtooth waveform as the CUTOFF FREQUENCY control is rotated counterclockwise:



In addition to this way of controlling the cutoff frequency by hand, it may be contoured by the FILTER CONTOUR when the CONTOUR AMOUNT control is greater than zero. (See HEAVY HAMMER sound chart).

Filter cutoff frequency may be moved in steps using the keyboard. When the FILTER KBD TRACKING switch is to the FULL position, all of the control voltage generated by the keyboard will move the filter cutoff frequency in steps from bottom to top of keyboard. When in the HALF position, the effect is halved. In the OFF position the keyboard is not controlling the filter whatsoever.



The filter cutoff frequency may be moved up and down repetitively when the FILTER MOD switch is ON and when the MODULATION wheel is forward. The filter will follow the shape selected in the MOD section. (See PULSAR sound chart.)

The EMPHASIS control is used to emphasize, or feed back energy exactly at the cutoff frequency. This makes the presence of harmonics more apparent when the CUTOFF FREQUENCY control is moved according to filter contour settings.

VOLTAGE CONTROLLED AMPLIFIER (VCA)

This modifier is not shown on the front panel. It is permanently connected to the LOUDNESS CONTOUR and changes the gain (loudness) of the audio signal according to loudness contour settings.

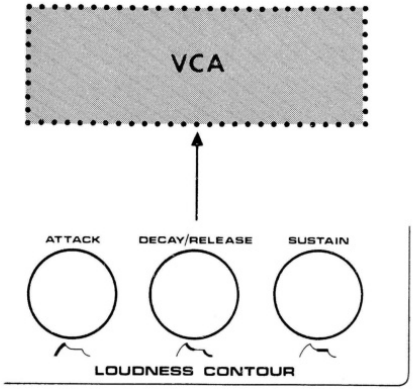
CONTROLLERS

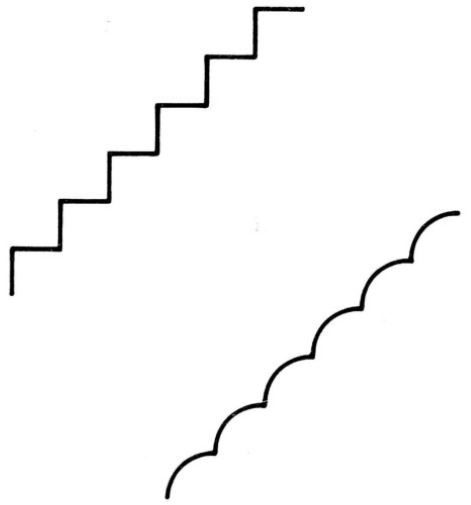
A controller generates a signal (voltage) that is used to control modifiers and/or sound sources. This should be the most intuitively understandable thing about the synthesizer. Think of your hands. When you play an instrument, your hands don't make the sound, but they *control* the sound. The violin makes the sound, but your finger controls the string to create a vibrato. That is an example of controlling a sound source. When you play a trumpet with a Harmon (wah-wah) mute, your hand waving in front of the plunger on the mute acts as a controller. In this case the mute acts like the FILTER section and your hand is the FILTER CONTOUR.

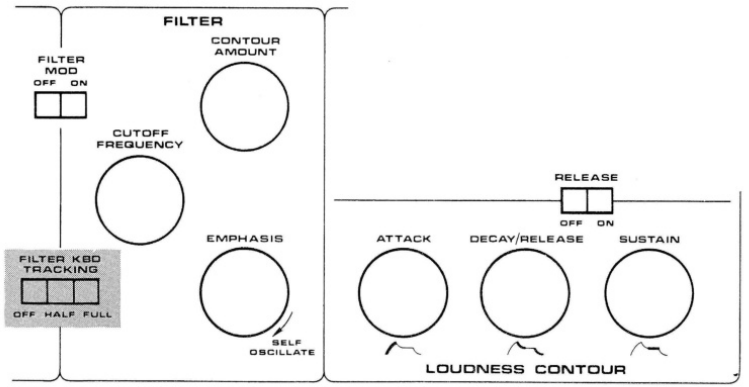
The controllers are the keyboard, the two contour generators, and the modulation oscillator in the MOD section.

The keyboard generates a rising staircase of voltage steps starting from zero volts on the lowest key. For each octave of keys there is an increase of one volt — the Prodigy uses the volt/octave ratio that has become an industry standard. The output of the keyboard is always connected to the two oscillators, so they will be controlled in pitch by the keyboard. The staircase of voltage is scaled or calibrated internally to create proper tuning. When GLIDE is set above zero, any changes in the staircase of voltages are slowed down so the keyboard responds by gliding from note to note rather than leaping from note to note. Gliding pitch is a *keyboard* response, not something that is caused by manipulating the oscillator *controls*.

The keyboard can be used to control the filter cutoff frequency, when the FILTER KBD TRACKING switch is placed to HALF or FULL. Those positions represent having half or all of the voltage staircase connected to the filter control input. The effect on sound is an increase in brightness as one ascends the keyboard.





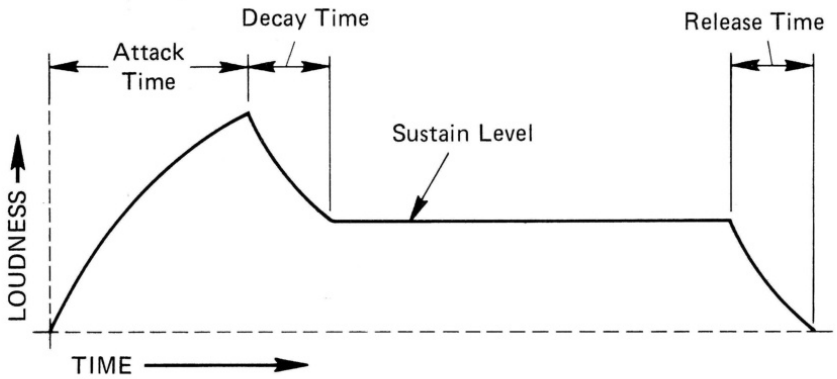


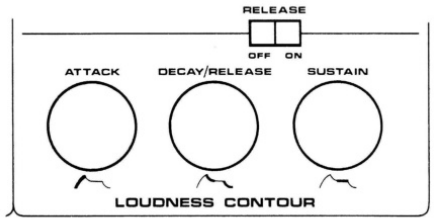
A contour generator — also called an envelope generator — acts only when *triggered*. On the Prodigy the contour generators are triggered from the keyboard.

Contour generators act to articulate the sound. In particular the LOUDNESS CONTOUR section provides control of the shape (or *envelope*) of the loudness of a sound source. It does this by controlling the gain of the VCA through which the sound passes. The LOUDNESS CONTOUR produces a rising and falling voltage pattern that creates a rise and fall in the loudness.

The shape of a contour is determined by the settings within that contour generator. The ATTACK, DECAY/RELEASE and SUSTAIN controls that fluctuates in shape. The diagram depicts its general form: Each contour comprises four parts; the initial rise *time* — set by the ATTACK control; the initial decay or subsiding to sustain level — set by the DECAY/RELEASE *time* control; the *level* at which may be held indefinitely; and the final release, or dying away of the tone — *also* set by the DECAY/RELEASE control.

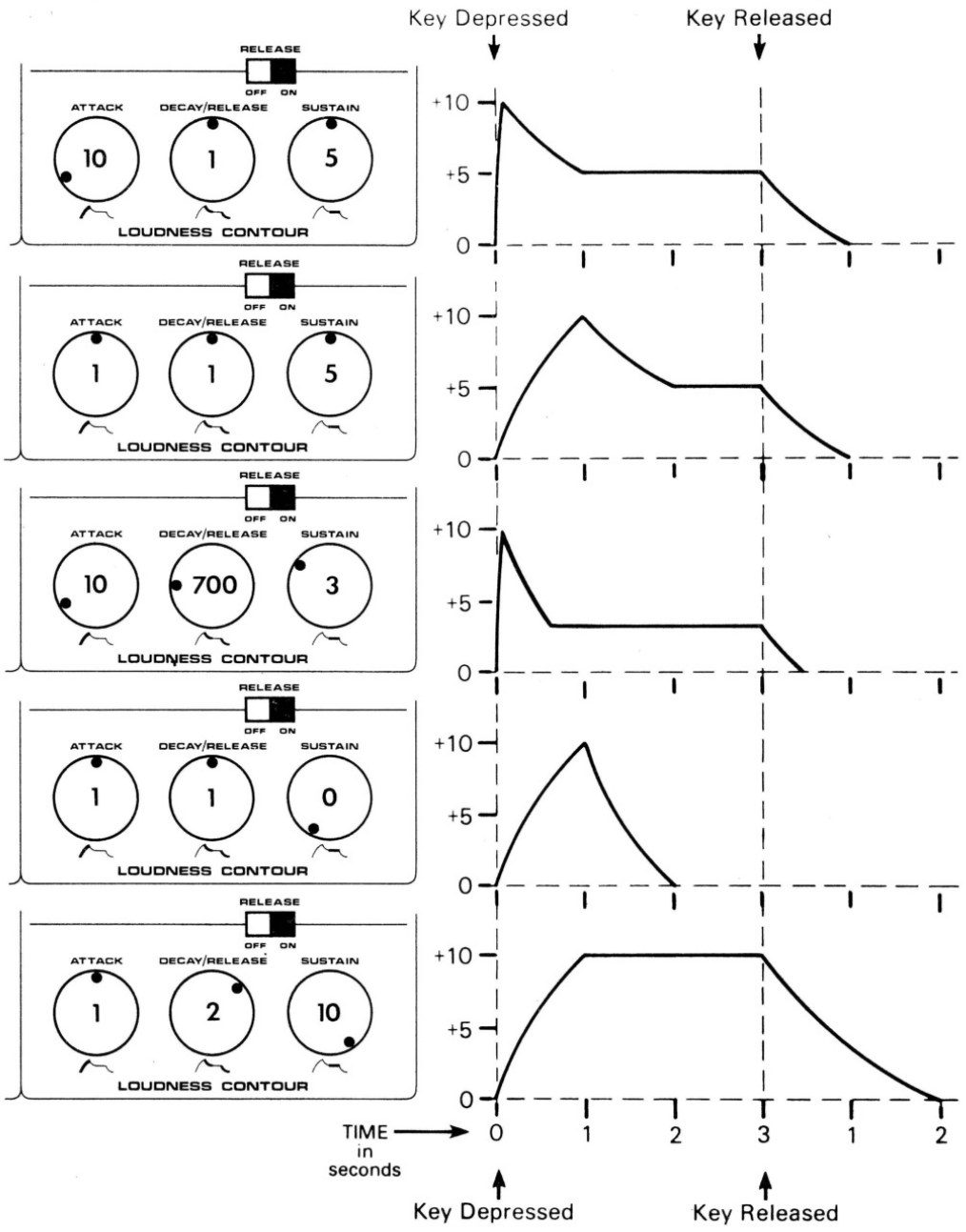
It is important to understand a special feature of this four-part contour: the final release of a sound will be abrupt when the RELEASE *switch* is OFF. When the RELEASE switch is ON, the final release time is determined by the DECAY/RELEASE control. Since most instruments have quick releases, this use of the RELEASE switch has been found to be valuable in performance.





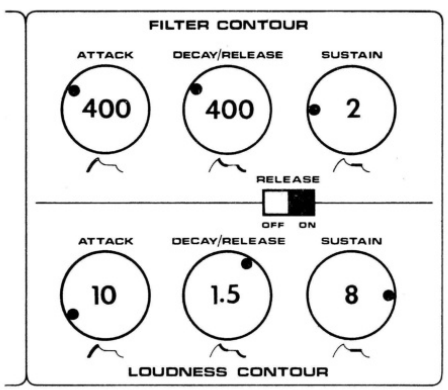
The controls of the LOUDNESS CONTOUR may be varied to create various contour shapes. Select a sound source; turn the FILTER CONTOUR AMOUNT to zero so you will hear *only* the action of the LOUDNESS CONTOUR and try the following settings:

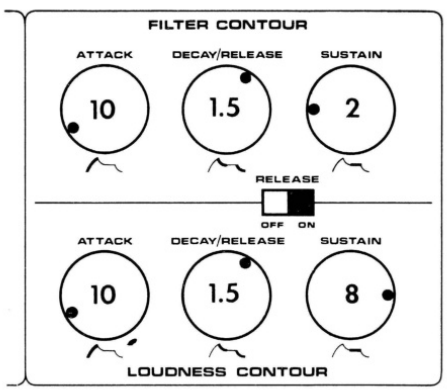
The FILTER CONTOUR controls the cutoff frequency of the filter. This filter contour operates exactly like the loudness contour, providing the same characteristic "ADSR" (ATTACK, DECAY, SUSTAIN, RELEASE) pattern. But here we have an *attenuator* that regulates the *amount* of this control voltage that is allowed to contour or move the filter cutoff frequency. It is most important to remember that the cutoff frequency of the filter can be contoured by the filter contour *only* when the CONTOUR AMOUNT control is set greater than zero. The *pattern* of filter contouring is determined by FILTER CONTOUR controls. The *amount* of this filter contouring is determined by the CONTOUR AMOUNT control.

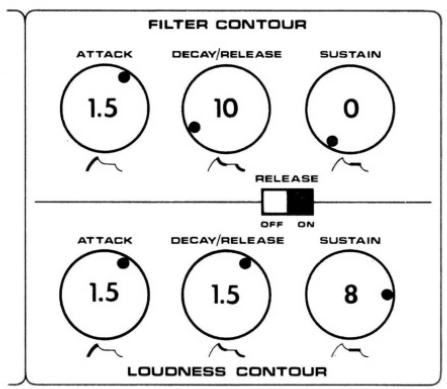


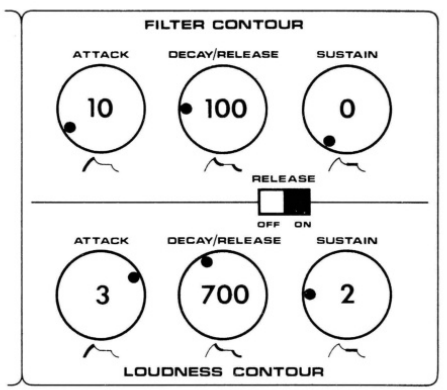
The *interaction* of loudness and tone color is an interesting thing musically, and that is why it is necessary to have separate contour generators for the two functions. Try the following experiment:

1. Set up Preparatory Patch (see earlier part of manual).
2. Turn CUTOFF FREQUENCY control to –1. Turn the EMPHASIS control to 7. Now the interaction between the two contour generators can be heard easily.
3. Set up the contour generators as shown in each example and play. Try to visualize what each contour looks like and compare to what you hear.









Several general rules for contouring may be stated:

A. The LOUDNESS CONTOUR reigns supreme. If it is not making a sound, no action of the filter contour will be heard.

B. When LOUDNESS CONTOUR SUSTAIN is set to zero, no tone can be held indefinitely.

C. When the FILTER CONTOUR SUSTAIN control is set *greater* than zero, the filter cutoff frequency will sustain *above* its setting on the CUTOFF FREQUENCY control on the front panel.

D. Very long ATTACK times will make you think that no sound can be made by pressing a key, because it takes such a long time for the sound to grow.

E. Because of "rules" B and D, it is recommended that you use extremely low LOUDNESS CONTOUR SUSTAIN and long ATTACK settings on either contour generator *with caution.*

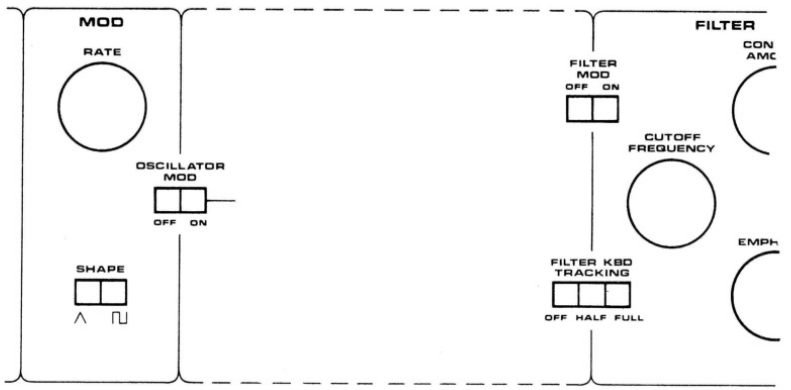
If you lose your way, where do you turn — right! The PREPARATORY PATCH.

Modulation is the use of a control voltage to create a repetitive pattern. In the Prodigy the oscillators can be modulated to create vibrato and trill and the filter can be modulated to create wah-wah and other repeating effects.

The MOD section contains an oscillator that is restricted to low frequencies (.3 to 30 Hz) controlled by the RATE control. The "modulation oscillator" produces the triangle and square waveforms, selectable with the SHAPE control.

The output of the MOD section can be applied to the control inputs of both oscillators by switching the OSCILLATOR MOD switch ON. The output of the MOD section can be applied to the filter control input by switching the FILTER MOD switch ON. Both forms of modulation can be used simultaneously.

All modulations are controlled in amount by the MODULATION wheel. It is a performance control meant to be played to make a more expressive line.



TRIGGERING DEVICES

The only triggering device on the Prodigy is the keyboard (as is the case with many synthesizers). The Prodigy has *single* triggering. That is, a new trigger and hence restart of both contour generators occurs only when you release all keys and then play another. If you are using a deep filter contour this fact will become most apparent. Single triggering makes the keyboard responsive to your touch, legato and staccato. The music is in your hands!

FEATURES

Temperature regulated ultra stable audio oscillators (Heated chip technology)

Logical control panel layout with signal progressing from left to right.

Two voltage controlled audio oscillators, each with separate three position octave slide switches, waveform selectors, and volume controls. Oscillator two has separate interval control. (Both oscillators one and two are tuned with Master tune control).

Switchable oscillator synchronization.

Pitch bend wheel with easy to find detent at center position. Can also be used to sweep sync.

Separate low frequency modulation oscillator with both triangle and square waveshapes.

Variable modulation amount wheel controls amount of vibrato, trills, wah-wah and/or tremolo.

Separate filter and oscillator modulation ON/OFF switches.

Voltage controlled amplifier

Patented Moog voltage controlled filter, 24dB/octave, with self oscillation feature.

Separate contour generators for VCA and VCF.

32 F-C keyboard with variable glide.

E-Z-SEE™ control knobs designed so that position of indicator line can be viewed from any playing angle.

Maple side panels and front support.

Single printed circuit board, easily removable for fast, reliable maintenance and service, if ever required.

SPECIFICATIONS

POWER REQUIREMENTS:

Operating voltage range

Domestic	95 to 135 volts	60Hz
Export	200 to 270 volts	50Hz

Power consumption: less than 10 watts

CONTROLLERS:

Keyboard:	32 note F to C
Glide:	Linear, continuously variable from less than 2 msec to 3 sec. (10% to 90%, bottom to top of keyboard).
Tune control range:	±3 semitones
Pitch wheel range:	Greater than ± perfect fifth
Keyboard Sample & Hold drift:	Less than 1mV/10 sec.
Modulation oscillator rate:	From .26Hz to 31HZ
Modulation oscillator waveshapes:	Triangle and square
Amount of modulation (Square wave):	
Oscillator:	from zero to 1 octave
Filter:	from zero to 4.5 octaves

OSCILLATOR 1:

Reference frequency for low F (octave = 32'): 44.4 ±0.1Hz

Scale factor accuracy: 0.1% from 44HZ to 1.5KHz

Range drift due to temperature: 32°F to 100°F less than .02%/°C

Waveforms: Sawtooth, triangle, rectangular

Pulse duty cycle: 10%

Octave Switch footages: 32', 16', 8'

Octave switch accuracy: 0.3%

Oscillators will not lock when not in sync.

OSCILLATOR 2:

Reference frequency for low F (octave = 16'): 88.8 ±0.2Hz

Scale factor accuracy: 0.1% from 88Hz to 3KHz

Range drift due to temperature: 32°F to 100°F less than .02%/°C

Scale factor drift due to temperature: 32°F to 100°F less than .02%/°C

Waveforms: Sawtooth, triangle, square

Pulse duty cycle: 50%

Octave switch footages: 16', 8', 4'

Octave switch accuracy: 0.3%

Interval control range: Greater than ± perfect fifth

OSCILLATOR SYNCHRONIZATION:

In the sync mode, Oscillator 2's sawtooth wave can be reset by itself or by the reset pulse from Oscillator 1. This locks the fundamental frequency of Oscillator 2 to Oscillator 1 generating a complex waveform. When in the Sync mode the pitch wheel is rerouted only to Oscillator 2.

CONTOUR GENERATORS:

Number: Two (one for controlling the filter through an attenuator, the other for controlling the voltage controlled amplifier)

Range of Attack times: From 1 msec to 10 sec.

Range of Decay/Release times: From 1 msec to 10 sec minimum.

Range of Sustain level: From 0 to 100% of contour peak

VOLTAGE CONTROLLED LOW PASS FILTER:

Type: 24dB/octave cutoff slope

Filter-Keyboard tracking: three position

Slide switch allows routing of control voltage to filter.

0	filter does not track keyboard
½	2 octaves of keyboard equals one octave on filter
1	filter tracks keyboard within 1%

Cutoff frequency (with control set to zero, in self oscillating mode) 666 ± 50Hz

Range of filter cutoff control: 8 octaves

Maximum sweep of cutoff frequency by filter contour generator: 8 octaves

VOLTAGE CONTROLLED AMPLIFIER:

Audio output level:	0dBm
Bleed through level:	Better than −75dBm
Output offset:	less than 100mV

BURN-IN (AGING):

Before final calibration, units are burned in for 72 hrs. at ambient of approximately 72°F

Domestic version at 115VAC @ 60Hz

Export version at 208VAC @ 50Hz.

DIMENSIONS AND WEIGHT

Overall size: 5-5/8" high, 14-15/16" deep, 23-1/4" wide.

Net weight: 16 lbs.

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