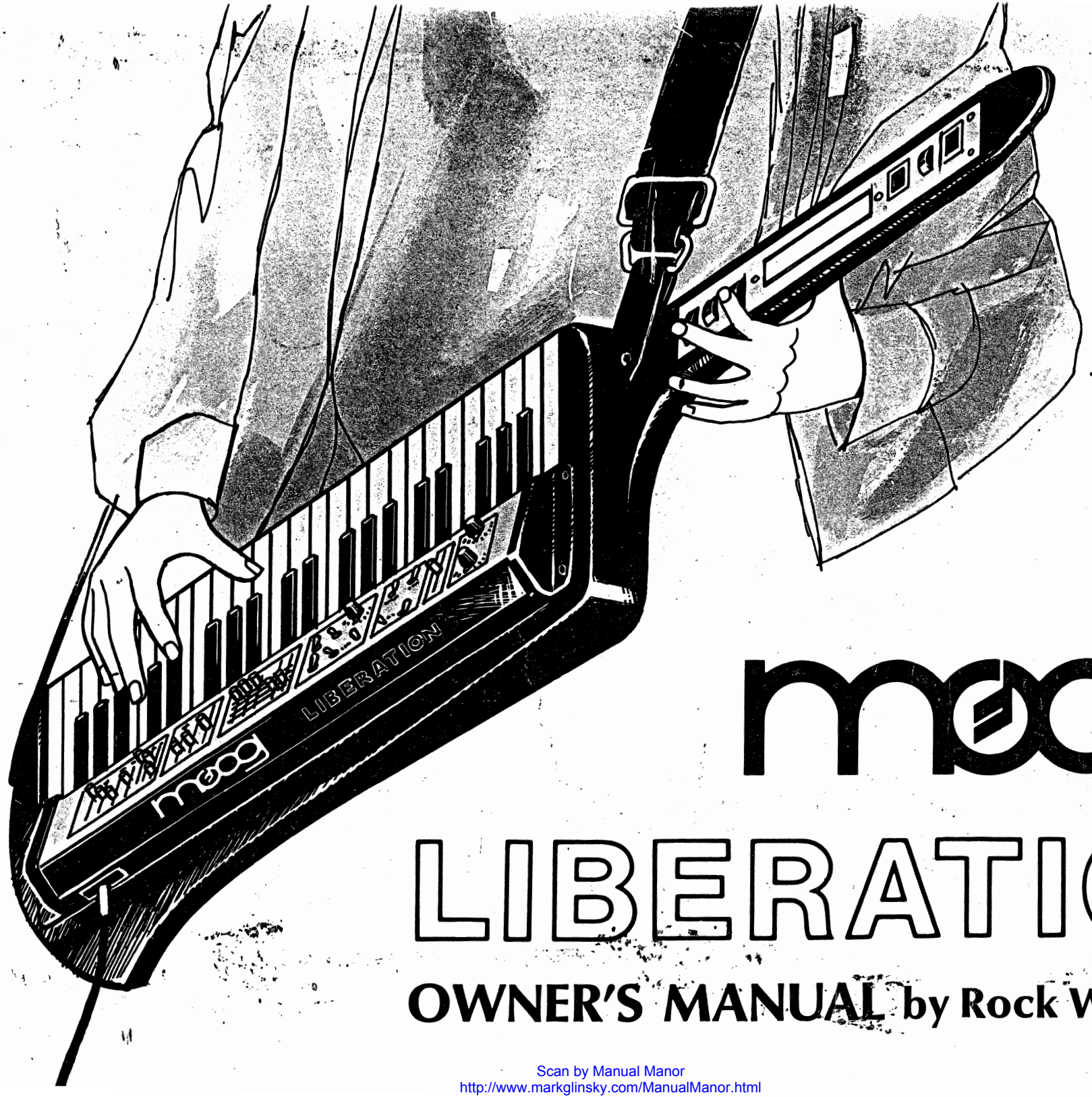


moog®

LIBERATION

OWNER'S MANUAL by Rock Wehrmann

PREVENTIVE MAINTENANCE

To keep the finish on your LIBERATION looking new, follow these steps:

1. Use only a light oil-base or cream polish on the wooden parts of the instrument. Do NOT use an aerosol polish; it contains silicone, which can discolor the finish if water is spilled on it.
2. Between polishings, to remove fingerprints, perspiration marks, and other surface dirt, use a very slightly dampened cloth. Do not use polish on the metal parts of the instrument.

If LIBERATION is subjected to extreme changes in humidity, it will expand and contract, like any wooden product. In some cases, this expansion and contraction may cause hairline cracks in the finish. This does not indicate a crack or flaw in the body itself.

INTRODUCTION

LIBERATION represents a new direction in electronic music — a sense of **instrument.**

One of the greatest advantages of synthesizers is the ability to produce widely divergent kinds of sounds. This advantage, however, is tempered by the fact that if this variety of sounds cannot be controlled correctly, the synthesizer can end up playing the performer — limiting him to only what that synthesizer can do quickly and simply.

At Moog Music, we are proud of a history of more than a decade of designing musically engineered instruments — electronic instruments with the nuances of expression associated with acoustic instruments. I believe this concept has been realized most fully with LIBERATION.

The ideas involved in the concept of "an instrument" — a definite set of playing techniques, tactile feedback, rapid access to a large variety of sound qualities, and mobility — are all embodied in LIBERATION. As you play the instrument, note how getting around the controls quickly becomes second nature, and you begin to concentrate on performing, both musically and physically. This is the true mark of a mature instrument.

As you explore this manual, keep in mind that the best music is the music you play best. So use the manual not as a crutch, but as a tool to help you get to where you'll be proud to say that, "my instrument is LIBERATION."

CONTENTS

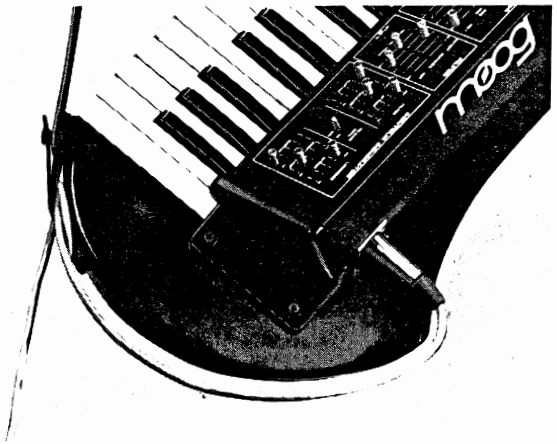
INITIAL SET UP

LIBERATION consists of three main pieces: the body, the rack-mount power supply/interface box, and the 40-foot XLR cable.

To set up LIBERATION, connect the XLR cable from the body to the power supply. Plug the power supply's AC cord into a grounded outlet. Turn on the power switch on the back of the power supply and run a 1/4" guitar cord from the AUDIO OUT jack on the power supply to the amplification system. To allow heated chip oscillators to stabilize, leave unit "on" for 10 minutes prior to tuning.

The wide end of the strap attaches to the strap extension near the master volume control; the other end should be adjusted to a comfortable length and attached to the extender at the bottom of the body. When attaching the strap, loop the XLR cable through the lower end (as shown below left). This acts as a strain relief and keeps pressure away from the connector.

Save the shipping carton in case long distance transport is required. Do not ship the instrument in a carrying case.



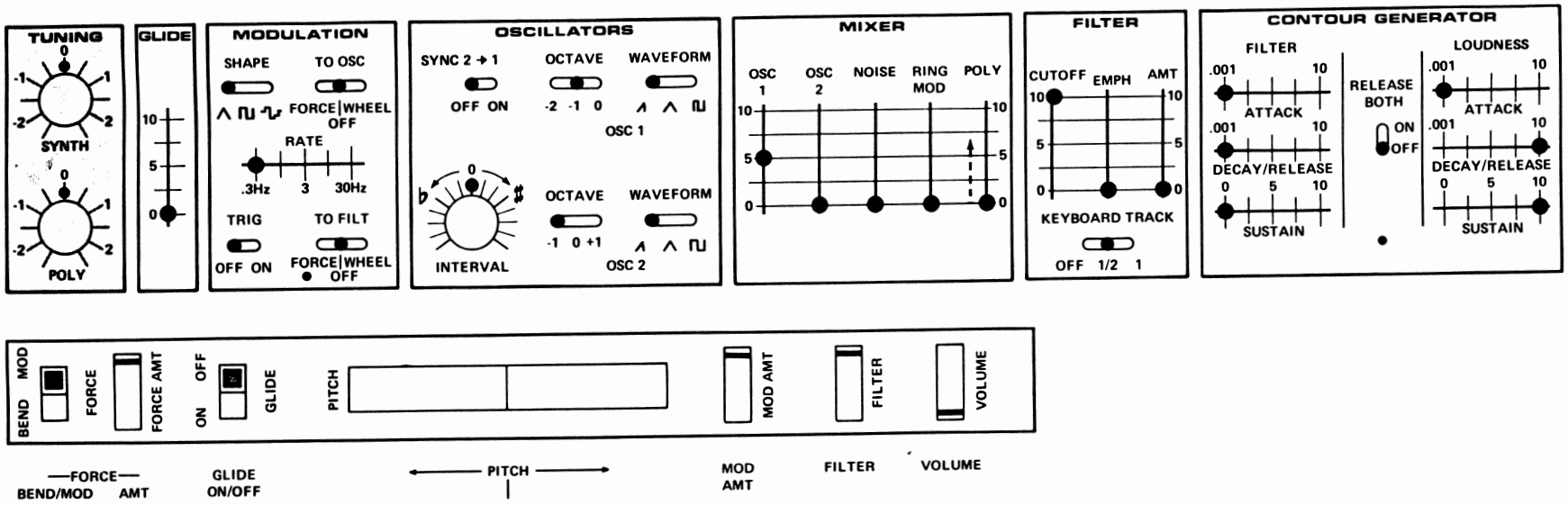
Properly worn, the instrument should hang from the strap at an angle and distance to allow easy playing of all keys.

LIBERATION, when worn correctly, should look approximately like this.

Not recommended – keyboard angle makes playing of bass notes difficult.

TUNE-UP

Set the controls as shown:



There are two sound sources on LIBERATION: SYNTHESIZER (SYNTH) and POLYPHONY (POLY).

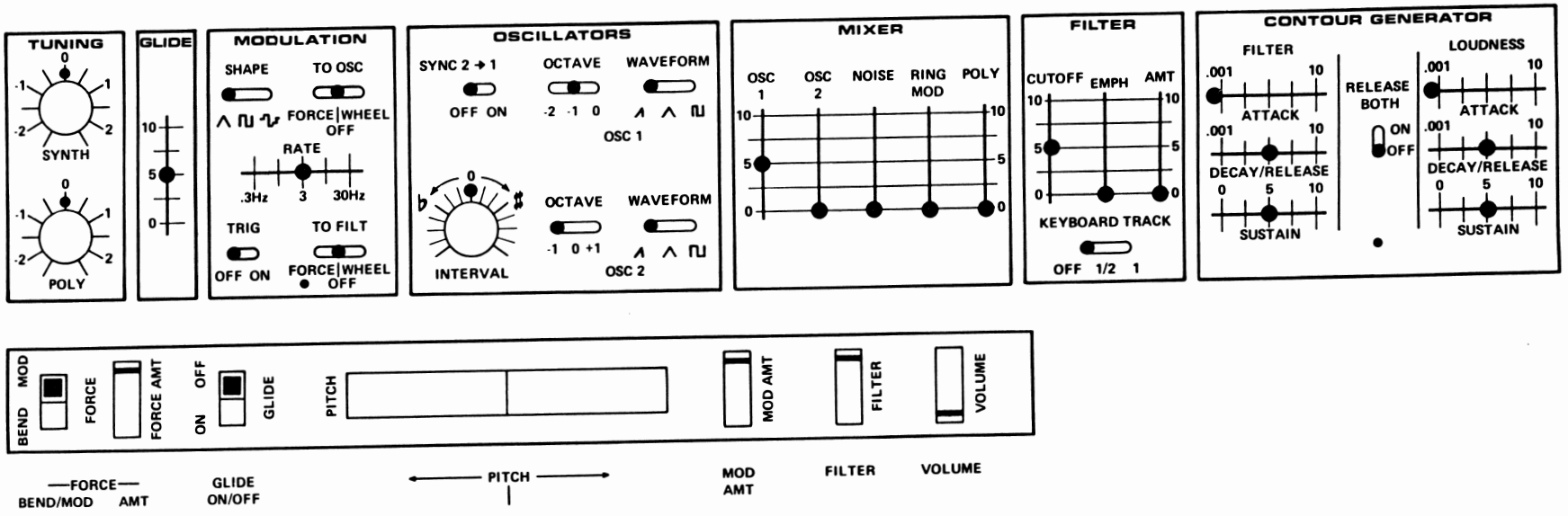
1. Holding down top E, fine tune LIBERATION with the SYNTH control.

2. To tune polyphony, turn up the POLY slider in the MIXER section. Tune POLY to the same pitch as SYNTH using the POLY control in the TUNING section. (Use top E as reference note.)

DO-IT-YOURSELF

LIBERATION is a highly versatile synthesizer; for this reason, a Basic Position, or starting point, should be established.

Set the controls as shown:



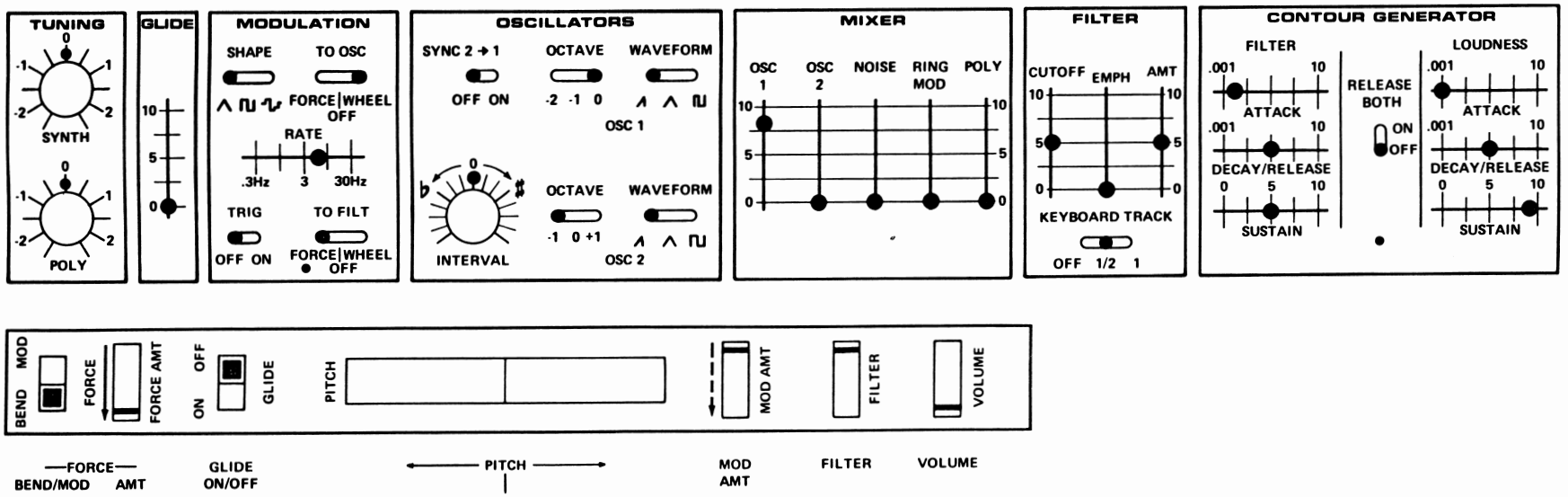
1. Change one control at a time; observe its effect and return it to the Basic Position.

2. Be sure to notice relationships between sections of the panel, particularly **amount** controls. The Mixer controls are **amount** controls because they mix amounts of signals. So, for instance, to hear the effect of the controls for OSC 2, the level control for OSC 2 must be turned up in the Mixer.

SOUND CHARTS

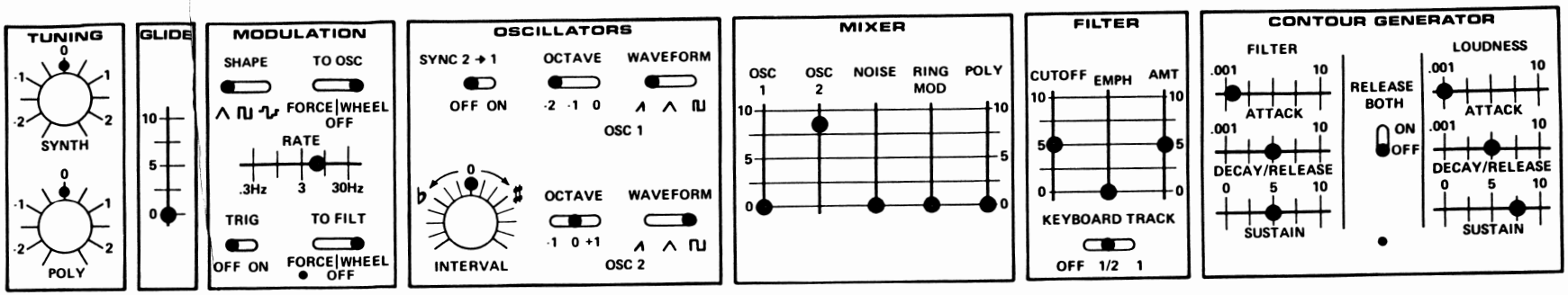
The following charts show many sounds which can be produced from LIBERATION without moving far from the Basic Position. As you set them up, notice what is changed from the Basic Position and see if you can determine what is causing the difference in sound.

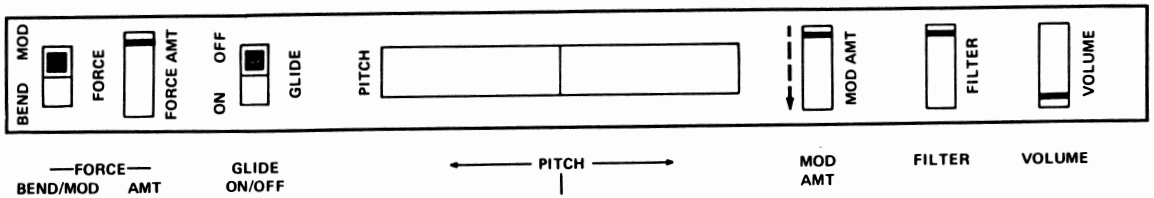
HORN



1. Use the MOD AMT wheel to introduce vibrato.
2. Press down harder on the keyboard to make notes brighter.

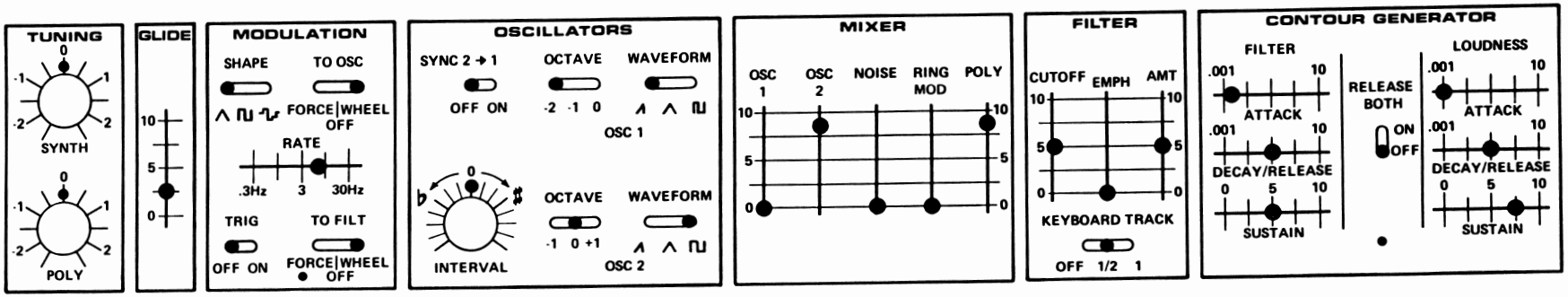
CLARINET

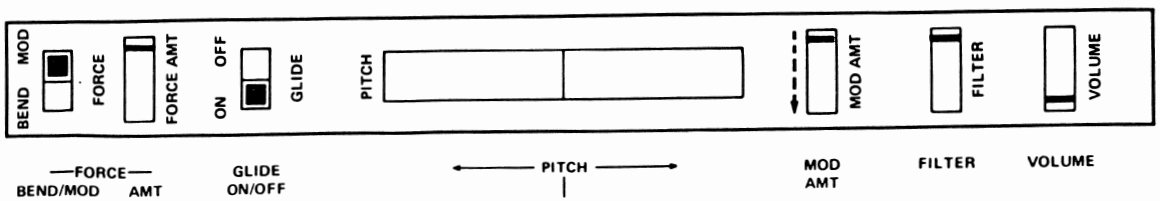




1. Use the MOD AMT wheel for vibrato.

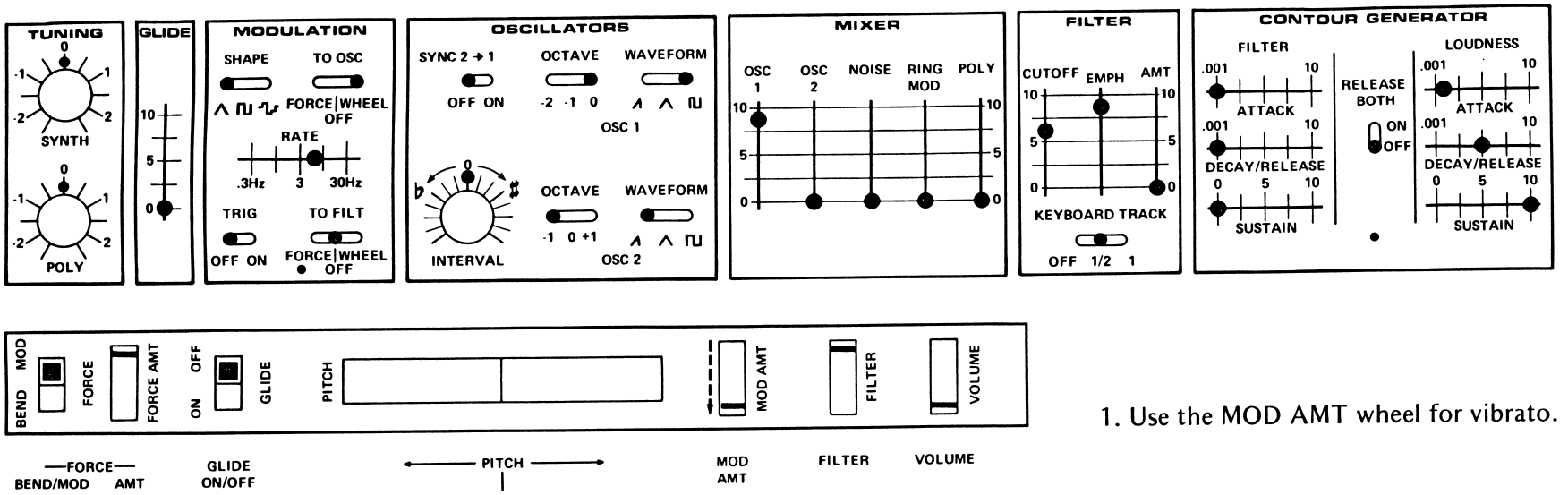
CLARINET SECTION





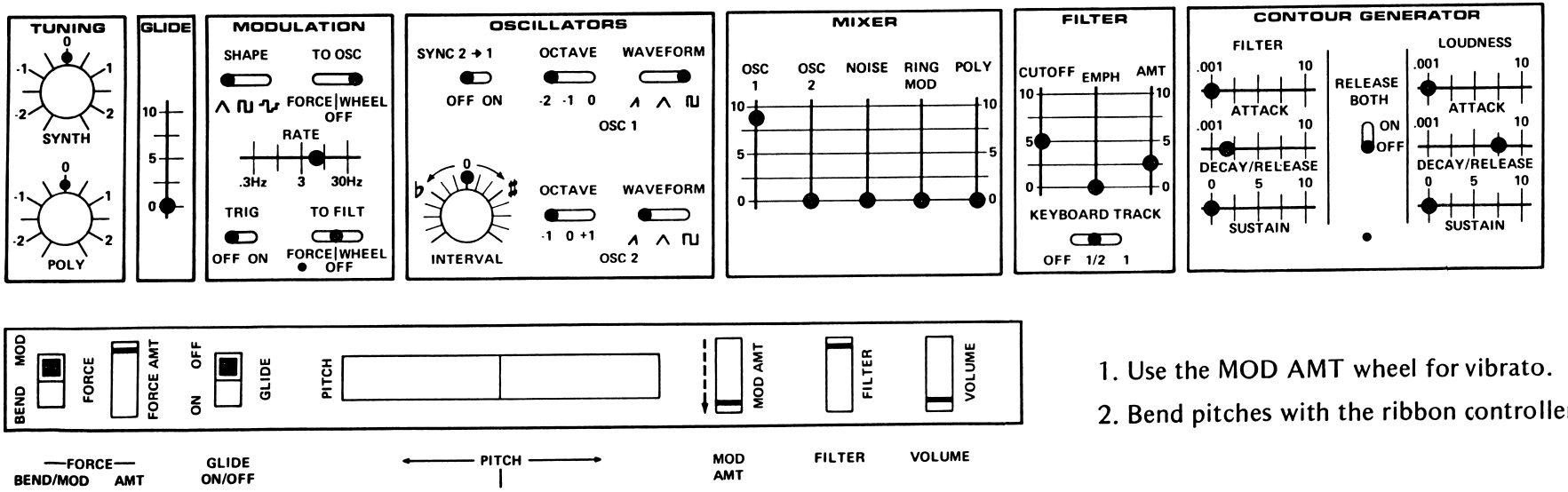
1. Use the MOD AMT wheel for vibrato.
2. Note how the "lead" clarinet glides from note to note.

OBOE



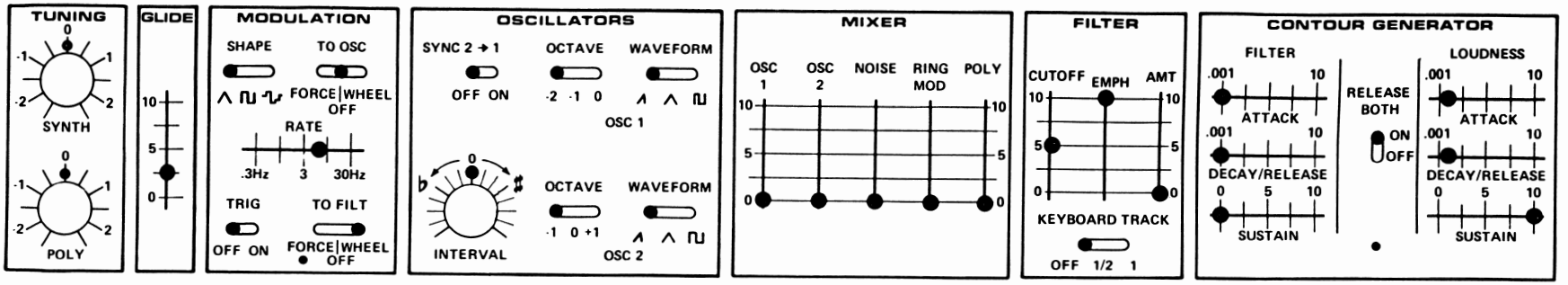
1. Use the MOD AMT wheel for vibrato.

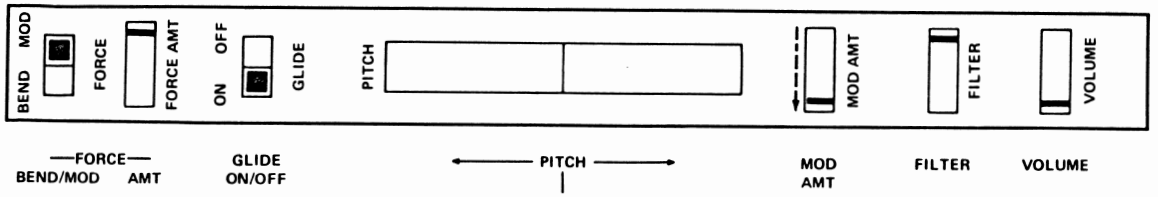
STRING BASS



1. Use the MOD AMT wheel for vibrato.
2. Bend pitches with the ribbon controller.

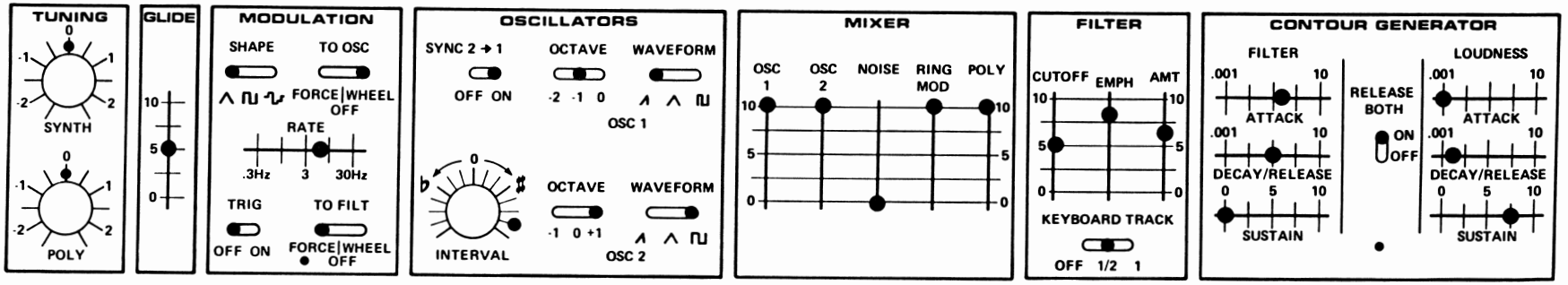
WHISTLE

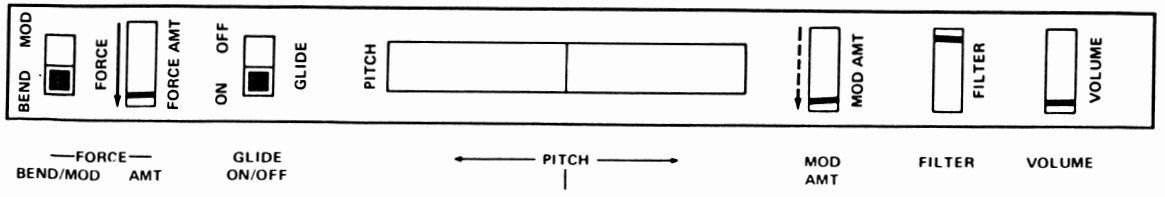




1. Tune to concert pitch with the CUTOFF slider.
2. Introduce vibrato with the MOD AMT wheel.

PHASERS ON STUN





1. Use the MOD AMT wheel for vibrato.
2. Press keys down harder for more effects.

GETTING DOWN TO BASICS

In order to discuss LIBERATION in particular, it is necessary to talk a bit about synthesizers in general.

WHY USE A SYNTHESIZER?

A synthesizer is designed to produce sounds differently than other musical instruments. Most acoustic instruments are designed and built with one kind of sound in mind. The expressive qualities of these instruments are limited to variations of that one sound. (You can play a trumpet many different ways, but it always "sounds" like a trumpet.)

A synthesizer, on the other hand, is not designed with any one sound in mind. The dictionary says to "synthesize" means "to form by bringing together separate parts." **A music synthesizer forms sounds by linking versatile electronic modules, or building blocks, each of which controls a particular quality of sound.**

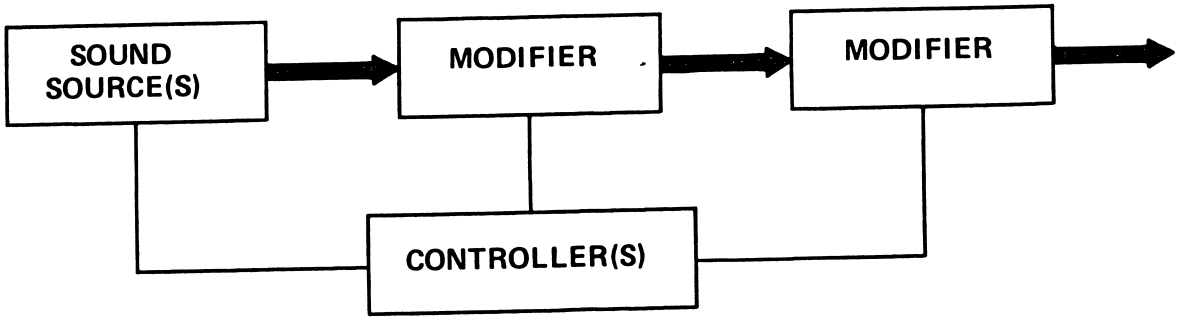
With a synthesizer, sound can be formed precisely as desired, with continuous control over all aspects of the sound.

LIBERATION SYNTHESIZER BASICS

LIBERATION can truly be called a synthesizer because its internal modules are **voltage controlled.** This means that the modules will change instantly and consistently in response to voltages sent to their **control inputs.** Voltage control is the key to the variability and versatility of synthesizers; understanding the details of how the modules function will be easier if this concept is kept in mind.

The electronic building blocks of LIBERATION can be divided into three main groups: sound sources, modifiers, and controllers.

The overall relationship of these building blocks is as follows:

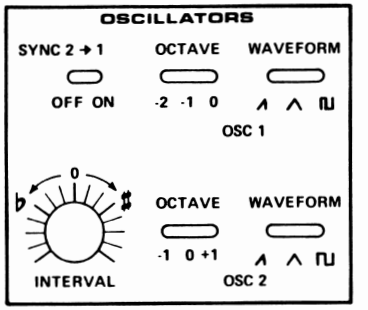


The SOUND SOURCES are the first point in the "signal path." We will begin by discussing them.

SOUND SOURCES

LIBERATION has four basic sound sources: OSC 1, OSC 2, NOISE, and POLY. These sound sources are used singly or in combination to generate all the sounds available from the synthesizer. Levels for these signals are adjusted in the MIXER section and may be used separately or in combinations.

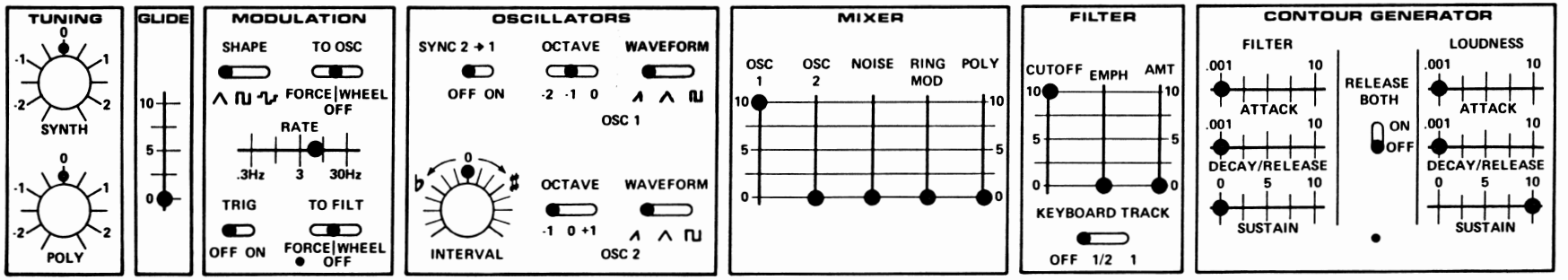
OSCILLATORS

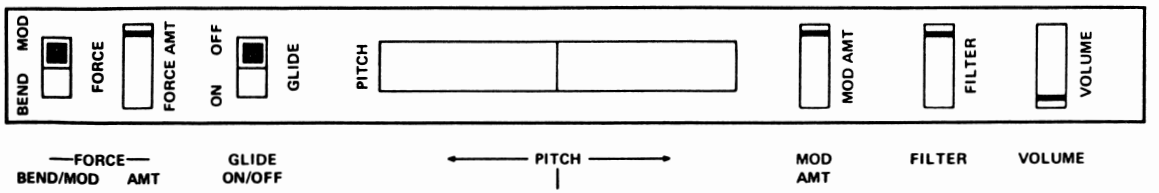


OSC is an abbreviation for OSCILLATOR. An oscillator is an electronic module that generates a signal called a **waveform**. LIBERATION has two audio oscillators.

Look at OSC 1's controls — the top row of switches in the OSCILLATORS section. In particular, look at the switch labeled WAVEFORM.

Set the controls as shown:





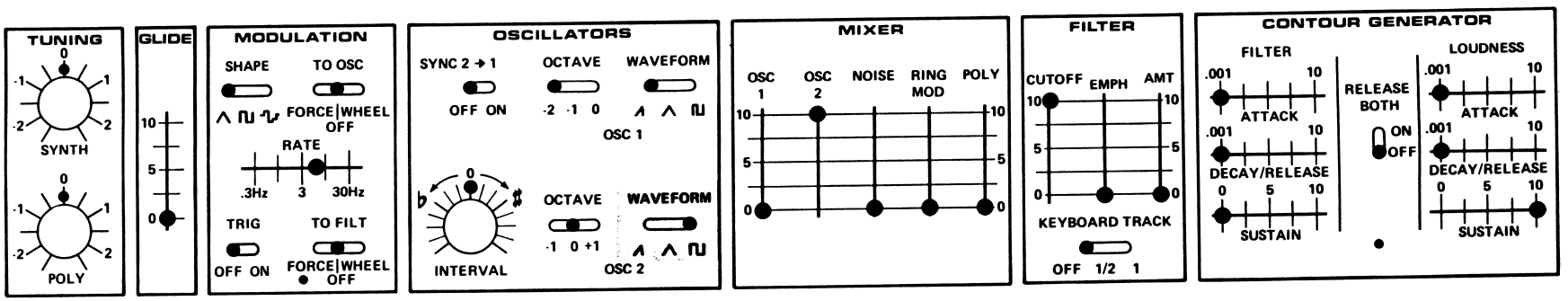
1. Hold down any key. You are hearing a **sawtooth** waveform. The sawtooth waveform is a very rich signal, and is useful for simulating strings or horns.

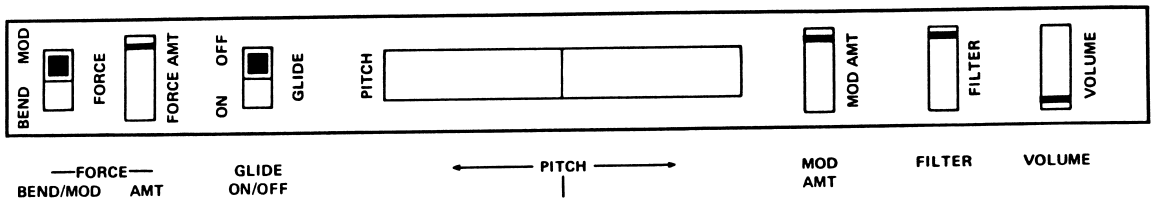
2. Move the WAVEFORM switch to the middle position. This is a **triangular** waveform. The triangular waveform has a tone color unlike any acoustic instrument. This waveform can be used to produce "electronic" sounds.

3. Move the WAVEFORM switch to the right-hand position. This is a **rectangular** waveform, which is another rich sound, but which sounds "nasal" like an oboe or other double-reed instrument.

There is one more waveform available from LIBERATION's oscillators.

Set the controls as shown:





1. Hold down any key. You are hearing a square waveform. It gets its name from its shape. The square waveform has a "hollow" sound and a clarinet-like quality. OSC 2 has a square instead of a rectangular waveform.

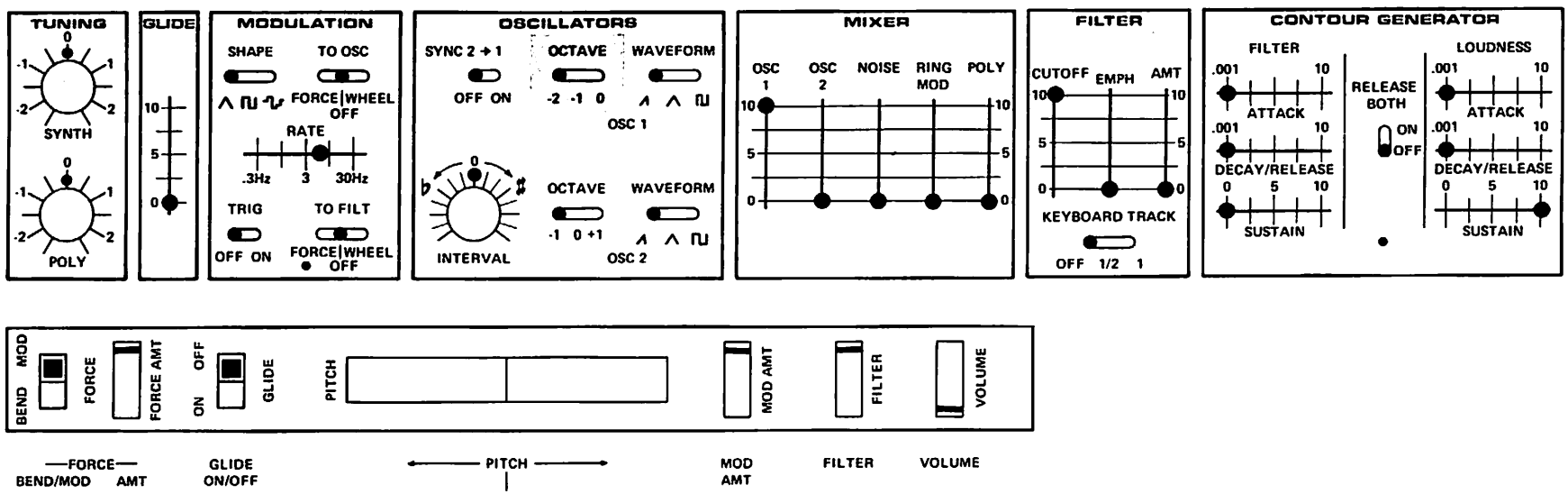
FREQUENCY AND TUNING

The oscillators generate waveforms continuously. When one complete waveform has been generated, one cycle has been completed. The number of cycles completed in a specific time period is referred to as the oscillator's frequency and is generally expressed in cycles per second (cps) or Hertz (Hz).

If the frequency of an oscillator lies within a certain range, our ears are able to perceive it as pitch. For most people, this range lies between 20Hz and 20,000Hz (20KHz).

When the frequency of an oscillator changes within this range, we hear a pitch change. LIBERATION's oscillators are voltage-controlled and are able to change frequency in several ways.

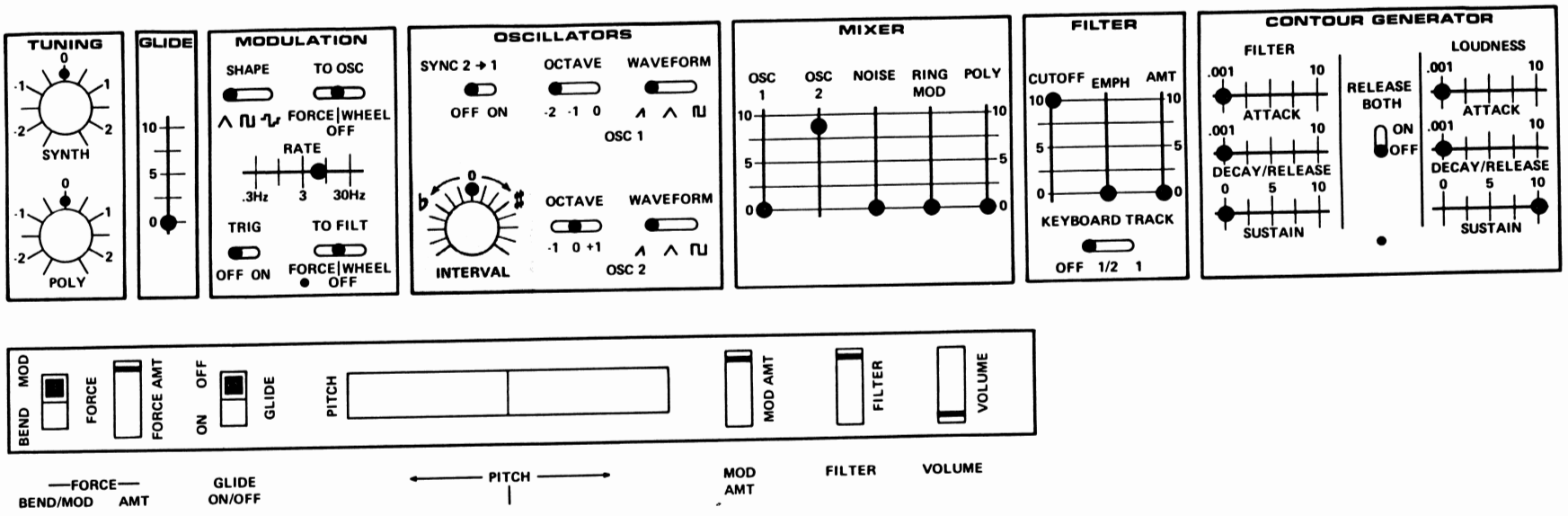
Set the controls as shown:



1. Hold down any key.

2. Move the OCTAVE switch for OSC 1 through each of its positions. The frequency of the oscillator doubles when the pitch goes up an octave, and is halved when the pitch goes down an octave.

Now set the controls as shown:



1. Hold down any key.

2. Change the setting of the INTERVAL control for OSC 2. Turning the control to the right increases the frequency of the oscillator and raises the pitch. Settings to the left of center decrease the frequency and lower the pitch.

To sum up:

1. The frequency of **both** oscillators can be adjusted with the SYNTH tuning control.

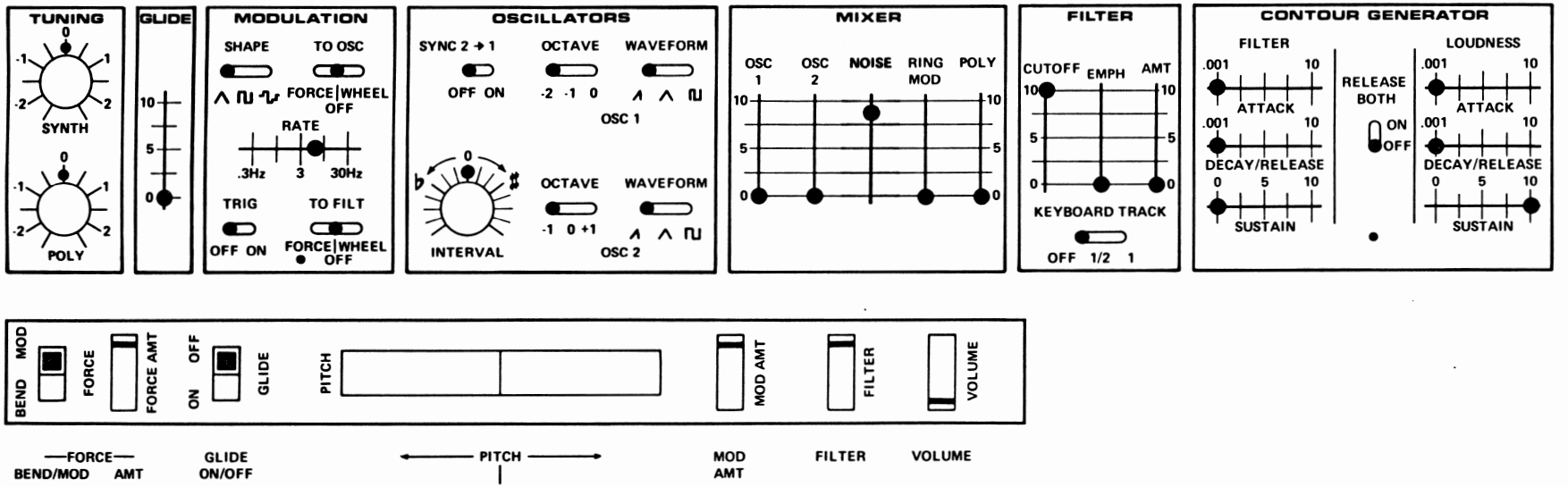
2. The frequency of **either** oscillator can be changed by its individual OCTAVE control.

3. The frequency of **OSC 2** can be adjusted with the INTERVAL control.

NOISE (THE GOOD KIND)

In many instances (high-fidelity systems, for example), noise is undesirable and efforts are made to get rid of it. On a synthesizer, noise is an important signal. In fact, LIBERATION contains circuitry that does nothing but generate noise.

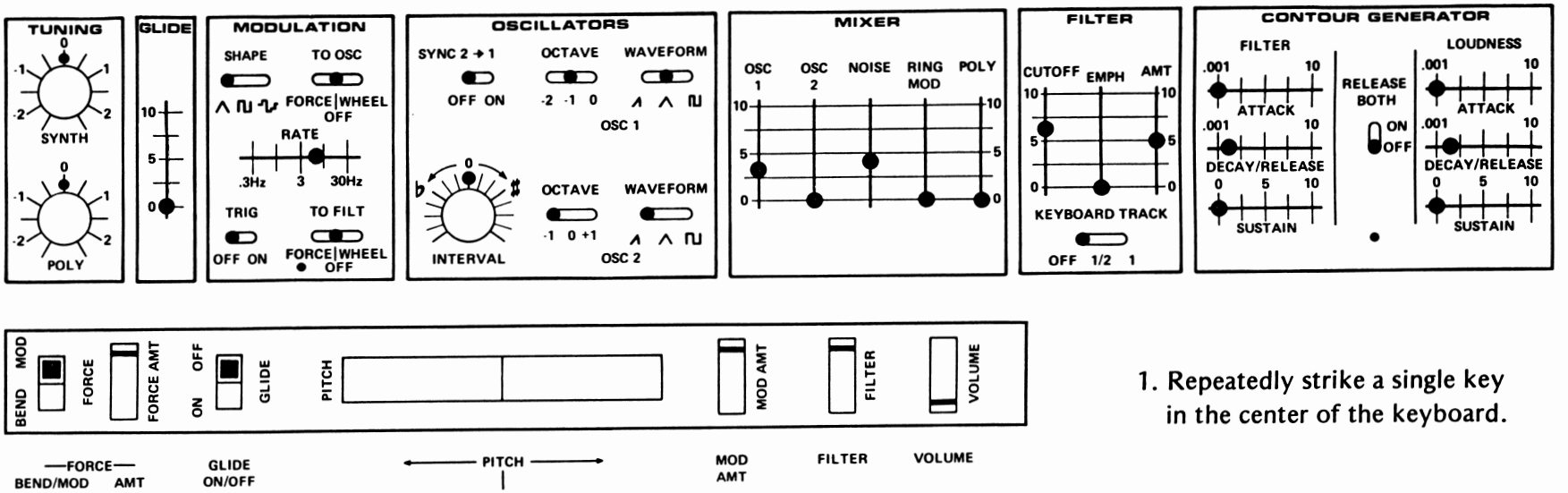
Set the controls as shown:



1. Hold down any key. This signal is technically called noise, a composite of all audio frequencies. Low, midrange, and high frequencies are all present in this signal.

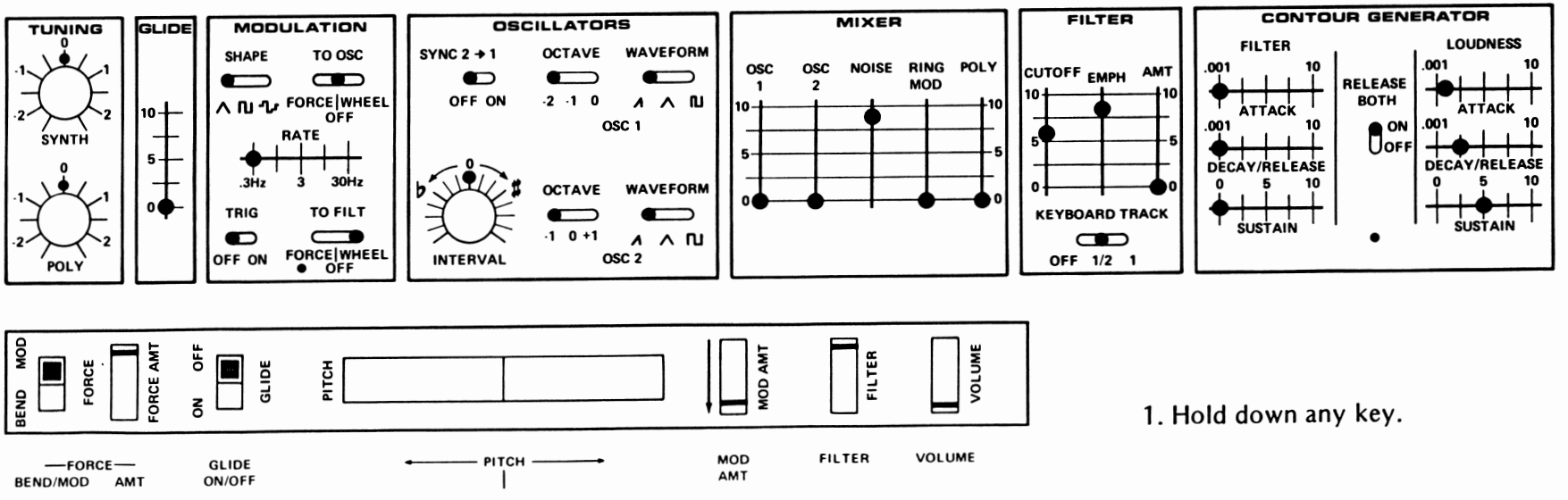
Noise can be used to simulate the qualities of non-pitched sounds. Here are two examples:

SNARE DRUM



1. Repeatedly strike a single key in the center of the keyboard.

WIND

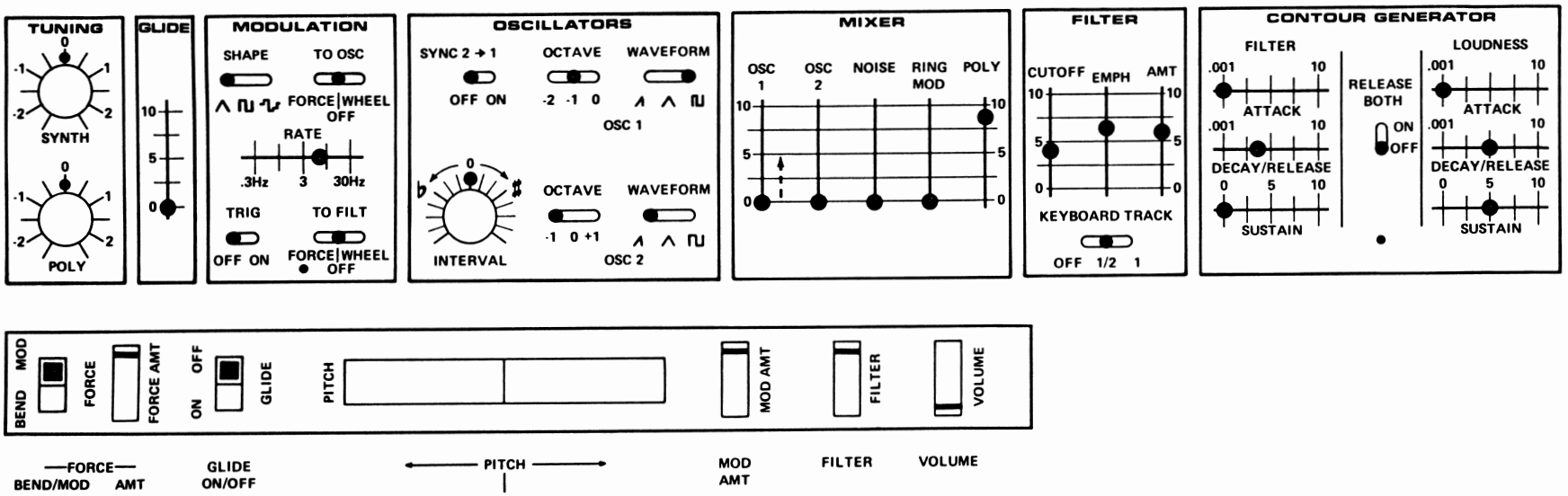


1. Hold down any key.

POLY

POLY is an abbreviation for **polyphony**, which means "many voices." The POLY output generates a signal for every key on LIBERATION's keyboard.

Set the controls as shown:

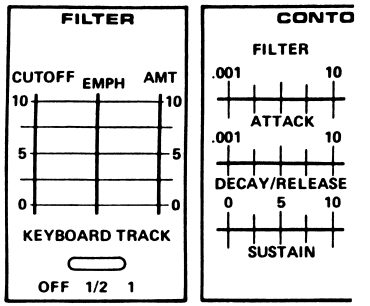


1. Play chords in different ranges of the keyboard. The POLY section is routed through the same signal path as the oscillators and noise source.

2. Bring up the level of OSC 1. Note that OSC 1 always sounds the pitch of the highest note being played on the keyboard. This is called **high-note priority** and it ensures that the oscillators will always appear as a solo line above the polyphony.

MODIFIERS

A modifier is an electronic device that inputs a signal and outputs an altered version of that signal.

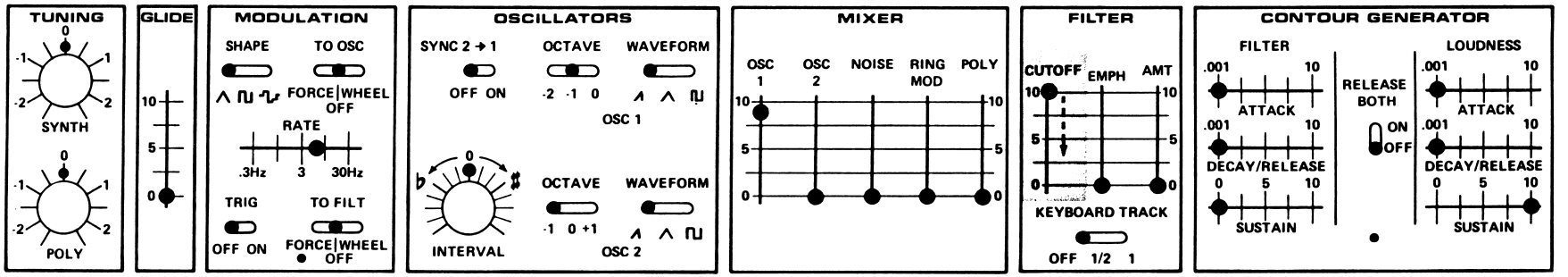


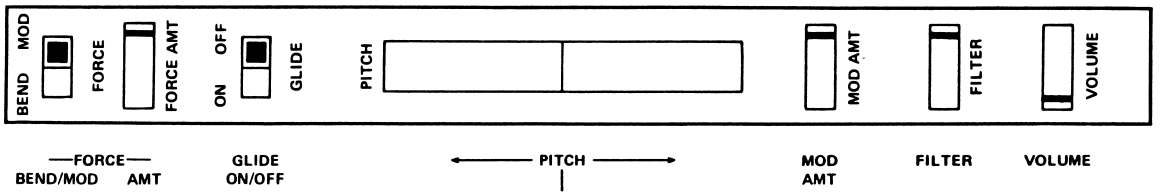
LIBERATION has three major modifiers which will be discussed individually. The first, and most distinctive modifier, is the voltage-controlled filter.

VOLTAGE CONTROLLED FILTER (VCF)

All of the audio signals that LIBERATION produces pass through the patented Moog® **lowpass resonant voltage-controlled filter.** These terms are best explained one by one.

"Lowpass" means exactly what it says - low frequencies are passed and high frequencies are cut off. The **cutoff frequency** - the point at which frequencies start to be filtered out - is adjustable. Set the controls as shown:



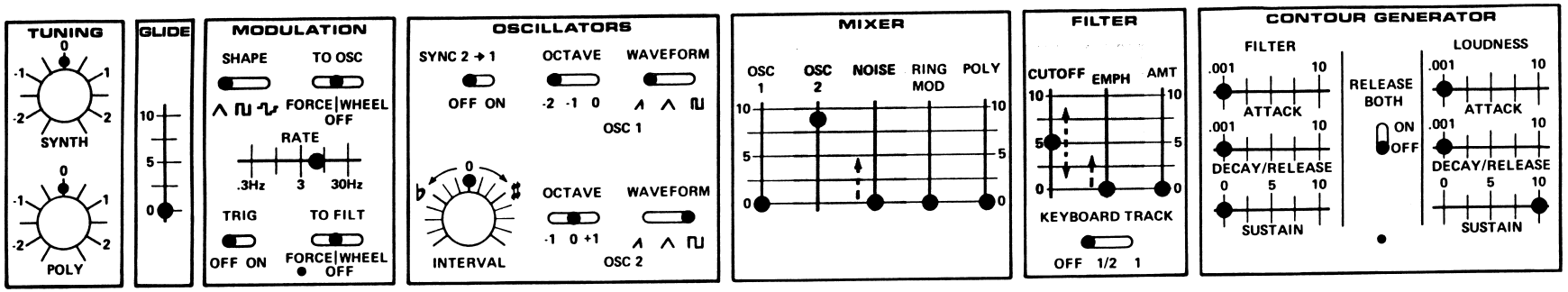


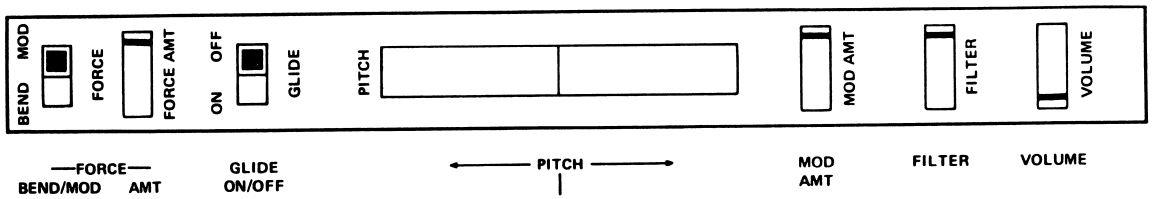
1. Hold down any key. With the cutoff frequency set at maximum, no high frequencies are cut off. This is an unfiltered sawtooth waveform.

2. Hold down any key. Slowly turn down the CUTOFF slider. The signal becomes "darker" and less buzzy as the high frequencies are gradually cut off. With the CUTOFF slider fully down, all frequencies are cut off, and the sound disappears.

"Resonant" means that the frequencies, or harmonics, around the cutoff frequency can be emphasized. This is done with the EMPHASIS control. Increasing EMPHASIS means that the harmonics at the cutoff frequency are heard more easily.

Set the controls as shown:





1. Raise and lower the CUTOFF slider. The harmonics of the square waveform are not heard individually; the sound just gets brighter and darker.

2. Raise the EMPHASIS slider to 7. Now raise and lower the CUTOFF slider. The harmonics are much more apparent.

3. Turn down OSC 2 and turn up NOISE. Repeat steps 1 and 2. As was mentioned before, noise contains all frequencies at once, so all harmonics are present at equal strengths. With no especially strong harmonics to latch onto, the filter "sweeps" smoothly up and down.

4. Turn all MIXER controls down. Raise the EMPHASIS slider to 10. In this mode, the filter oscillates and produces a sinewave whose frequency is adjusted with the CUTOFF control. Note that the filter is the only tone source.

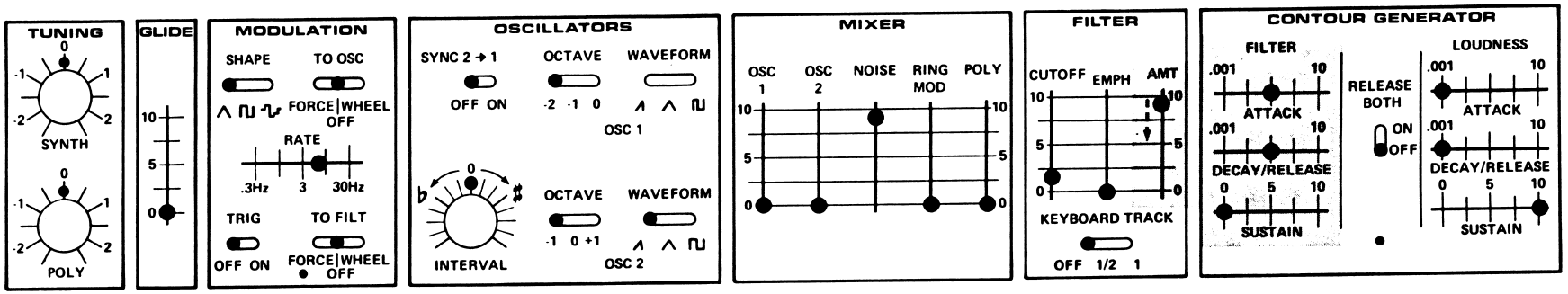
"Voltage controlled" means that the filter's cutoff frequency will change when a voltage change occurs at the filter's control input. When the voltage level increases, the cutoff frequency is raised and the filter opens up. When the control voltage decreases, the cutoff frequency is lowered and the filter closes down.

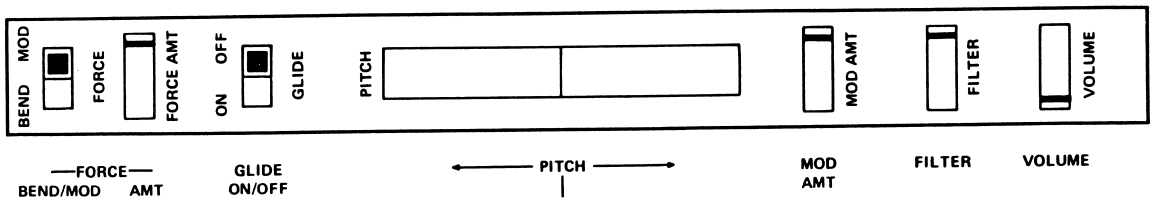
The voltage used to control the filter can come from many places in LIBERATION, but the primary controller is the FILTER CONTOUR section.

The controls for the FILTER CONTOUR are the same as the LOUDNESS CONTOUR controls. In fact, the circuitry for the two contour generators is identical. The only difference is that one is used to control loudness and one is used to control cutoff frequency.

The amount of voltage from the filter contour generator can be adjusted by using the CONTOUR AMOUNT slider.

Set the controls as shown:





1. Hold down any key. Voltage from the filter contour generator is raising and lowering the filter cutoff frequency.

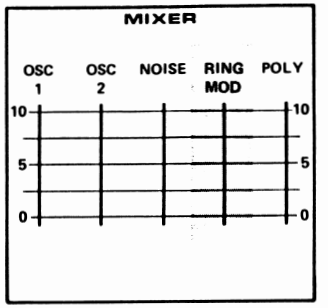
2. Adjust the AMT slide to 4. The amount of voltage from the filter contour generator to the filter has been lessened. The change in filter cutoff frequency is correspondingly less.

3. Set the AMT slider to zero. Zero voltage means zero change in filter frequency.

The filter's cutoff frequency may also be changed with the left-hand FILTER wheel. This control will change the filter cutoff frequency while performing. The FILTER wheel is spring-loaded to return to the value set up by the CUTOFF slider.

RING MODULATOR

Even though the RING MOD slider is in the MIXER section with the sound sources, it is a modifier. A **ring modulator** accepts two inputs and puts out one signal containing **sum and difference frequencies** derived from the inputs. For example:

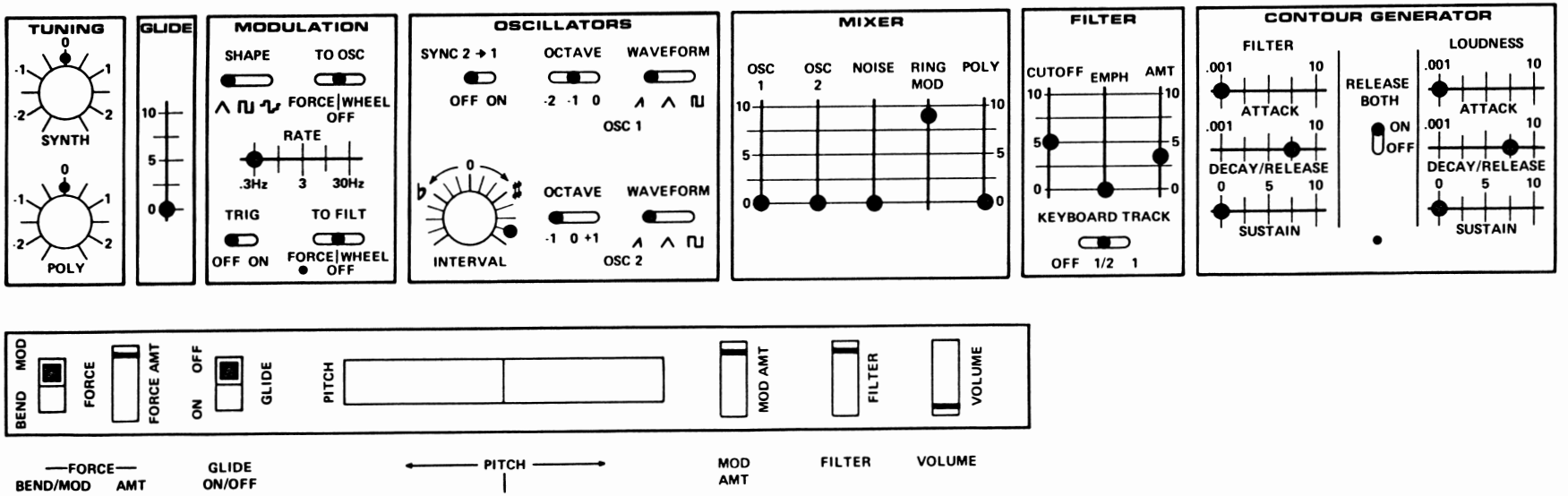


Input 1	Input 2	Output
100Hz	125Hz	225 (100 + 125) Hz and 25 (125 - 100) Hz
1200Hz	950Hz	2150 (1200 + 950) Hz and 250 (1200 - 950) Hz
6250Hz	5775Hz	12025 (6250 + 5775) Hz and 475 (6250 - 5775) Hz

The ring modulator signal enters the signal path immediately before the filter, and can be mixed in with any other signals. The ring modulator is especially useful for simulation of gong or chime sounds because its overtone structure is similar to those "clangorous" sounds.

The two inputs to LIBERATION's ring modulator are OSC 1 and OSC 2, so the frequencies of the oscillators will determine the tone color of the RING MOD output.

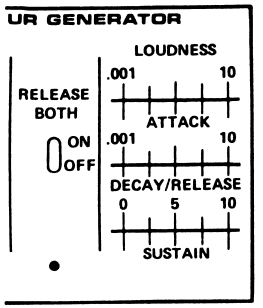
Set the controls as shown:



1. Tune OSC 2 a fifth above OSC 1. Other tunings of OSC 2 will produce different novel tone colors.

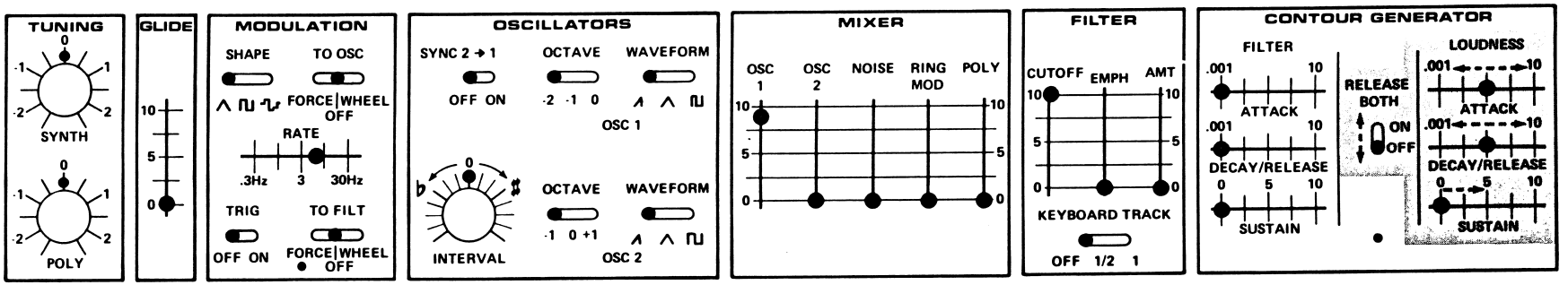
VOLTAGE CONTROLLED AMPLIFIER (VCA)

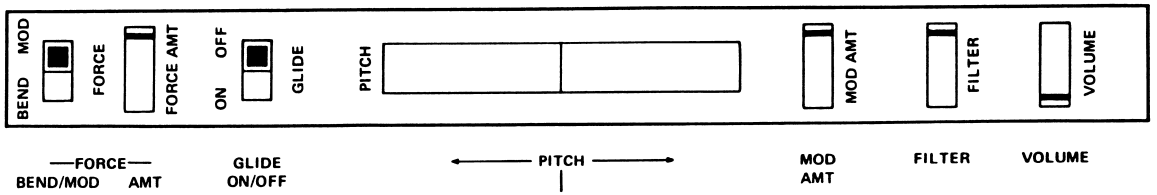
LIBERATION's voltage controlled amplifier controls the loudness of any signal. The voltage controlled amplifier (or VCA) is the last point in the signal path and, in several ways, is the most important; if the VCA is closed down, no signal will be heard regardless of what the rest of the synthesizer does.



The VCA itself has no controls on the front panel; it is opened and closed by the LOUDNESS CONTOUR controls. These controls determine the contour of a one-time, changing voltage generated whenever a **trigger** appears. If this voltage level is high, the VCA opens and allows more signal to pass through; if the controlling voltage level drops, the VCA closes and the loudness decreases.

Set the controls as shown:





1. Play any key. Note that the LOUDNESS CONTOUR controls determine the characteristics of the duration and loudness of an audio signal. Experiment with different LOUDNESS CONTOUR settings.

Remember: The VCA does not "turn on" any of the sound sources. Those modules are always operating. The VCA acts as a "gate" to selectively pass these signals to whatever sound system is in use. For this reason, the VCA has to be the last modifier in the signal path.

CONTROLLERS

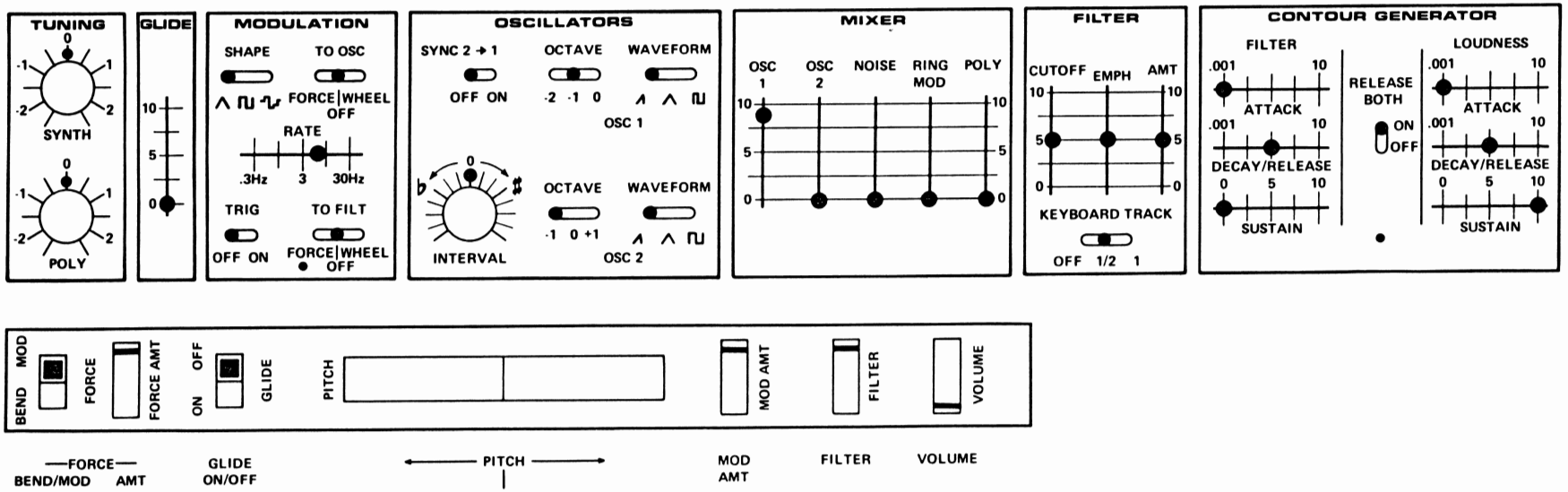
The remaining circuitry on LIBERATION can be classified under the generic title **controllers**. A controller has only an output. That output is a control voltage. This voltage can be used to control one or several functions of a synthesizer.

KEYBOARD

The primary controller in LIBERATION is the keyboard. All the major sections of the sound chain respond to information from the keyboard.

The most obvious example of keyboard control is keyboard tracking by the monophonic oscillators.

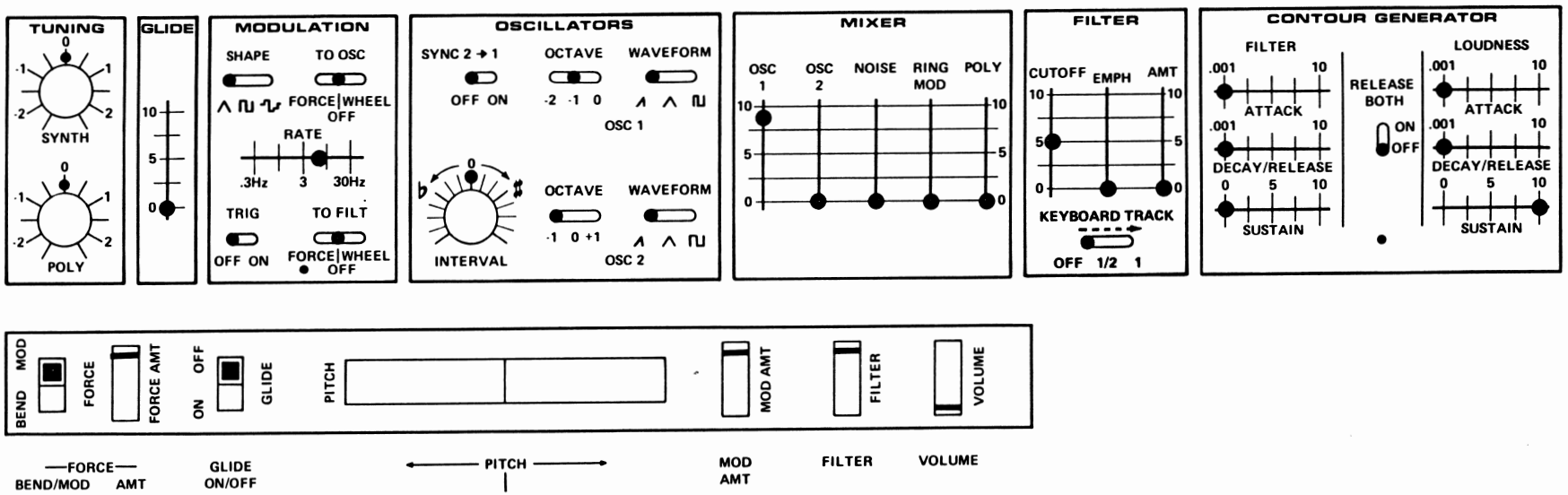
Set the controls as shown:



1. Play different individual keys. The frequency of the oscillator changes in precise amounts to match the changes on the keyboard.

Circuitry in the keyboard establishes a precise voltage level for each key on the keyboard. A one-octave change on the keyboard causes a change of 1 volt in the keyboard voltage level. LIBERATION's keyboard is high-note priority; the highest key depressed determines the keyboard voltage level.

This keyboard voltage can also be sent to the filter. Set the controls as shown:

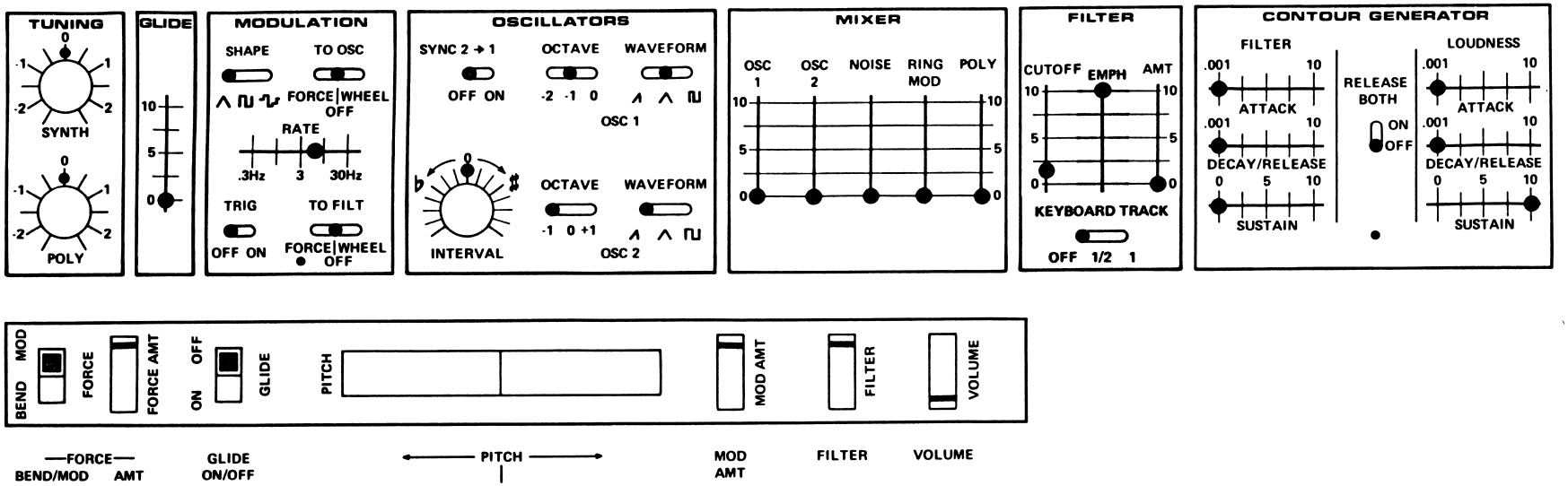


1. Play the keyboard left to right. Note that the higher-pitched notes are not as bright as the lower notes.

2. Switch the KEYBOARD TRACK to 1/2; play the keyboard left to right. The tone color is more consistent across the keyboard; the keyboard control voltage is being used to open the filter for higher notes at the rate of 1/2 volt per octave.

3. Switch KEYBOARD TRACK to 1. The brightness will now remain constant across the keyboard. The filter is tracking the keyboard at the rate of 1 volt per octave.

Now set the controls as shown:

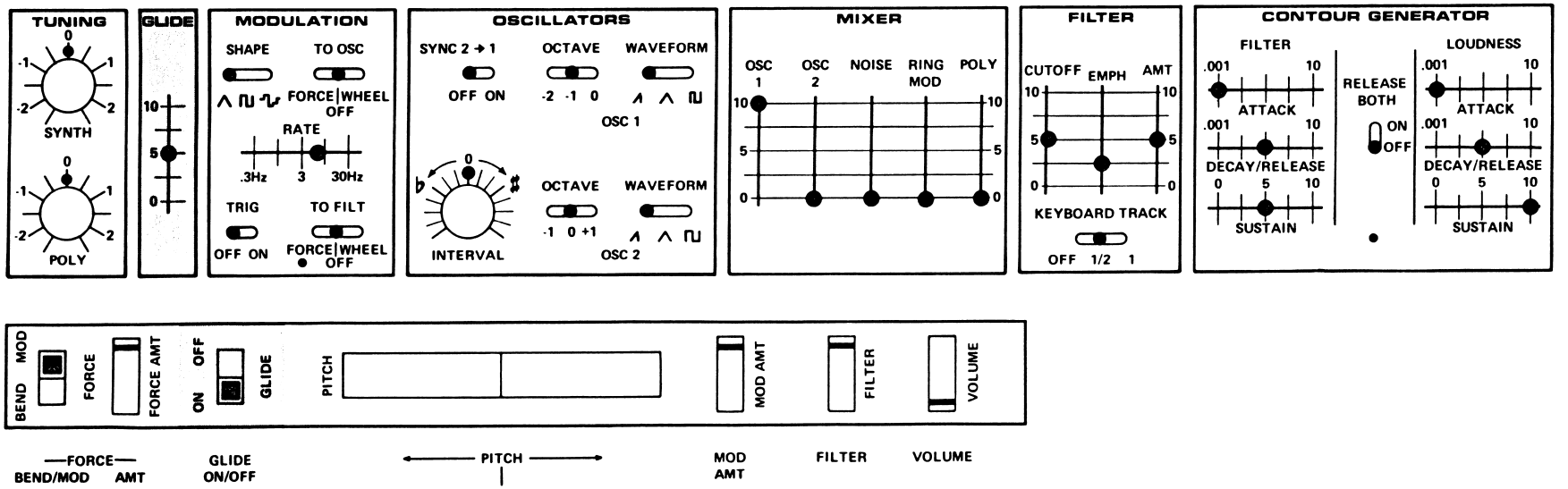


1. Repeat steps 1, 2 and 3 above. The sound source is the filter in the oscillation mode. With the KEYBOARD TRACK switch at 1/2, quarter-tone scales may be played. With KEYBOARD TRACK at 1, the filter can be "played" normally.

GLIDE

The keyboard voltage level normally changes instantly from note to note, but a delay can be set up by using the GLIDE control.

Set the controls as shown:

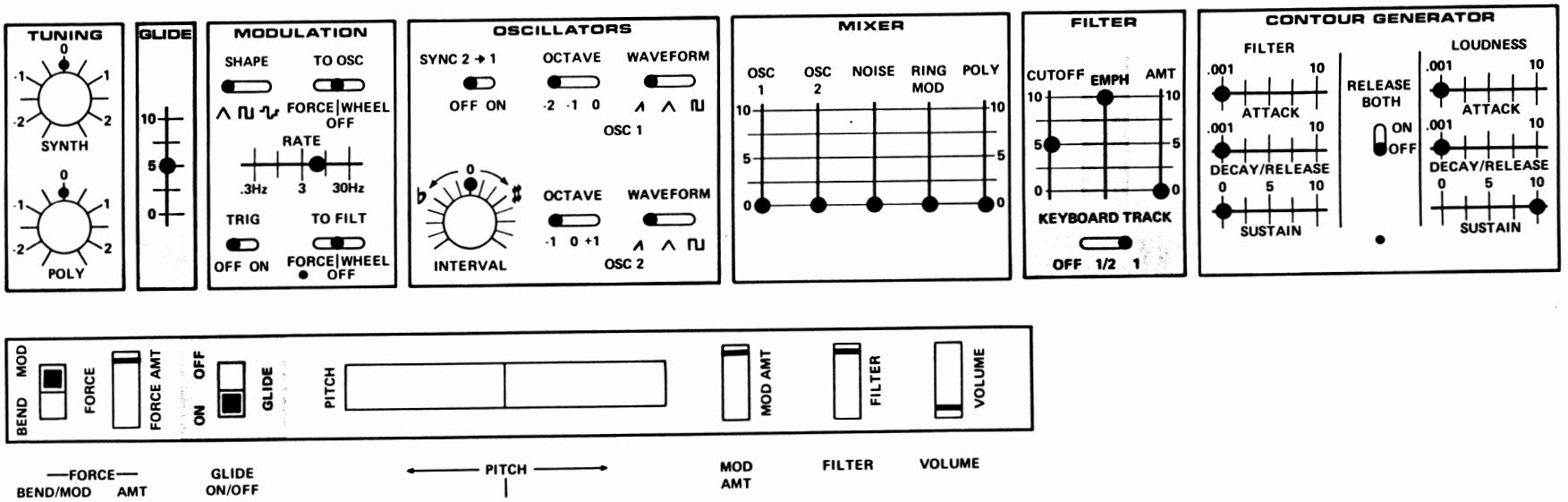


1. Play the lowest and highest keys alternately. The pitch change is immediate.

2. Turn the GLIDE switch on. The pitch moves smoothly from note to note at a rate established by the GLIDE slider.

GLIDE is a keyboard function and, as such, will affect anything controlled by the keyboard.

Set the controls as shown:

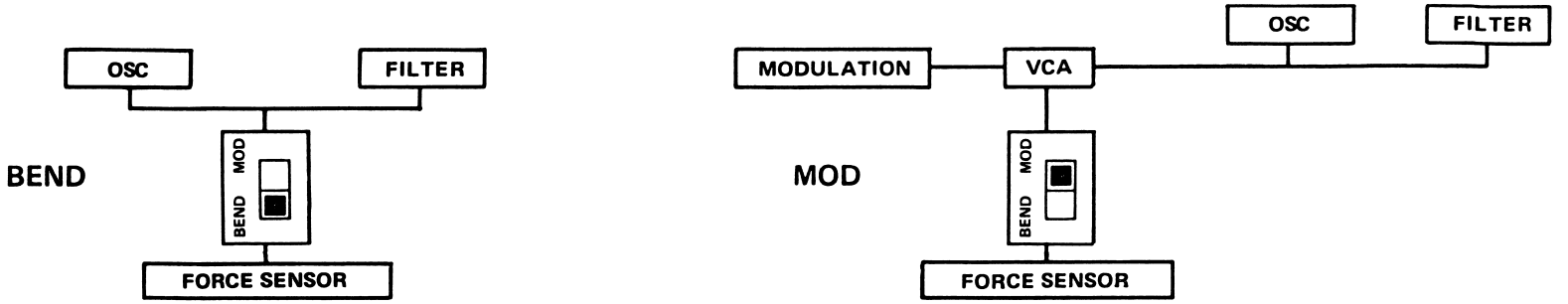


1. Play the highest and lowest keys alternately. The filter (as a sound source) is tracking the keyboard, with glide.

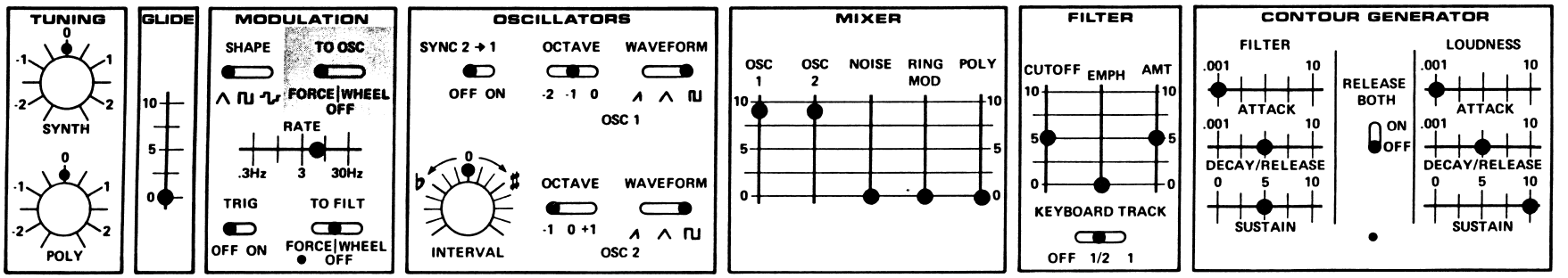
KEYBOARD FORCE SENSOR

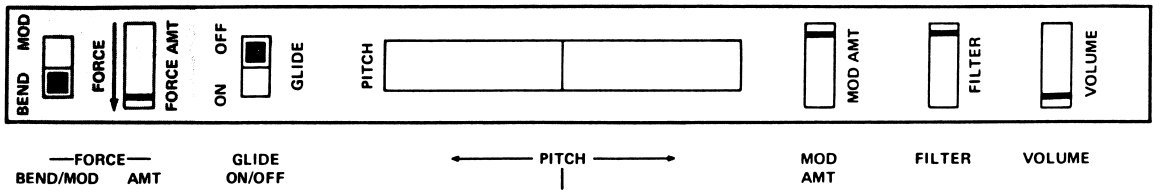
LIBERATION'S keyboard has a built-in force sensor which produces a control voltage proportioned to applied key pressure. This voltage can be routed to control oscillator pitch and/or filter cut-off frequency. The force sensor has two modes: BEND and MOD (modulation).

In the BEND position, force is used to control pitch or filter cut-off frequency — the harder you press the higher the pitch. In the MOD position, force is used to control the amount of modulation.



Set the controls as shown:

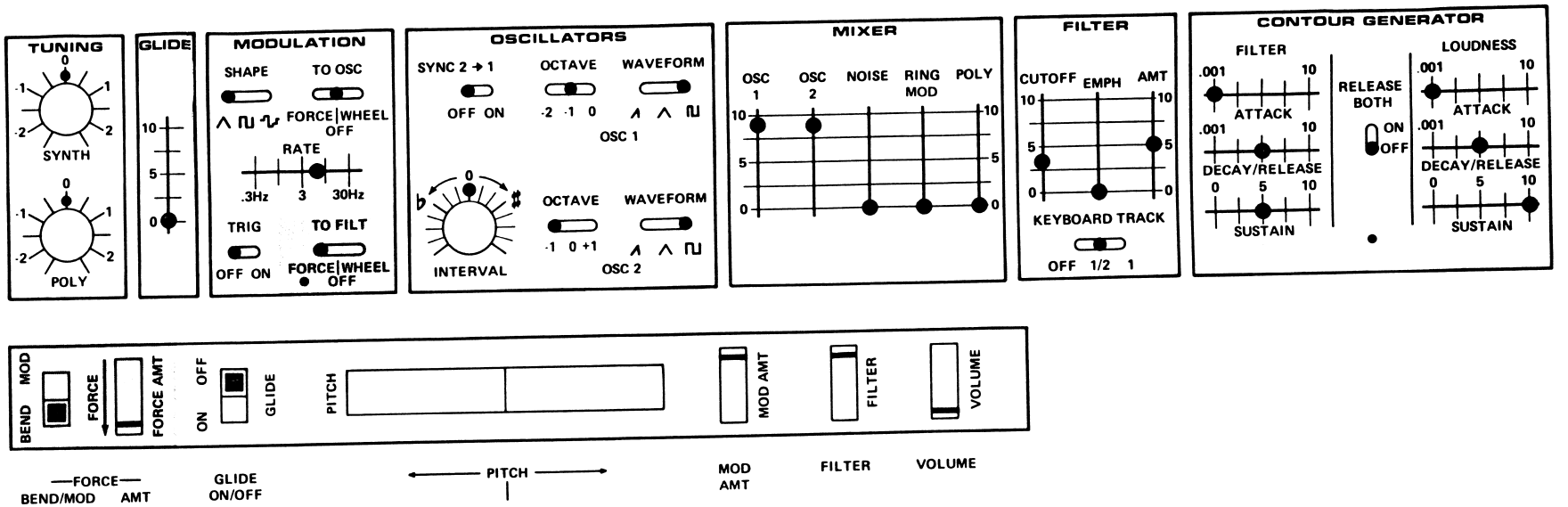




1. Play a key and then press down harder. In the BEND position, the voltage is applied directly and the oscillator frequency is raised. Adjust the amount of "bend" with the FORCE AMT wheel.

2. Switch the BEND/MOD control to MOD. Press on a key. The force sensor lets the modulation signal through to the oscillator. The sensitivity can be adjusted with the FORCE AMT wheel.

Now set the controls as shown:

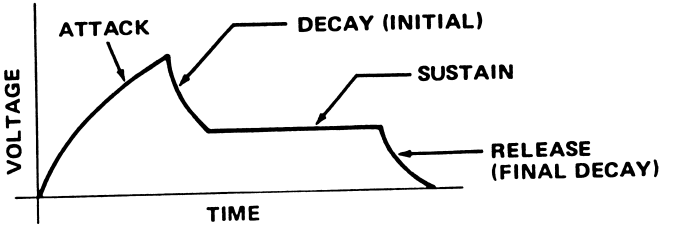


1. Repeat steps 1 and 2 above. The force sensor also controls the filter.

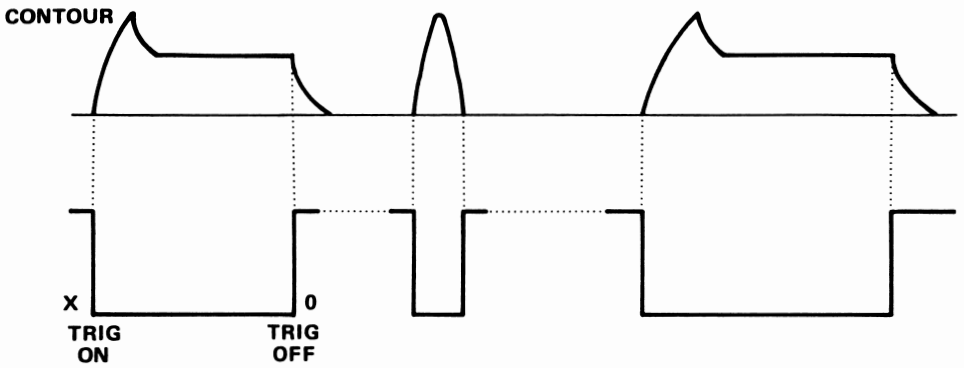
The FORCE AMT wheel enables you to adjust the sensitivity of the force sensor to your individual playing style. For example, the sensitivity of the BEND position can be set up to move the oscillators precisely one octave, or any interval you wish. The FORCE SENSOR is a powerful performance tool that can be tailored to express your own creative ideas.

CONTOUR GENERATORS

The contour generators were discussed in a very general manner in the VCF and VCA descriptions. They will be discussed in detail now because their operation is the key to developing synthesizer sounds. LIBERATION's contour generators each output a voltage signal that follows this basic contour.



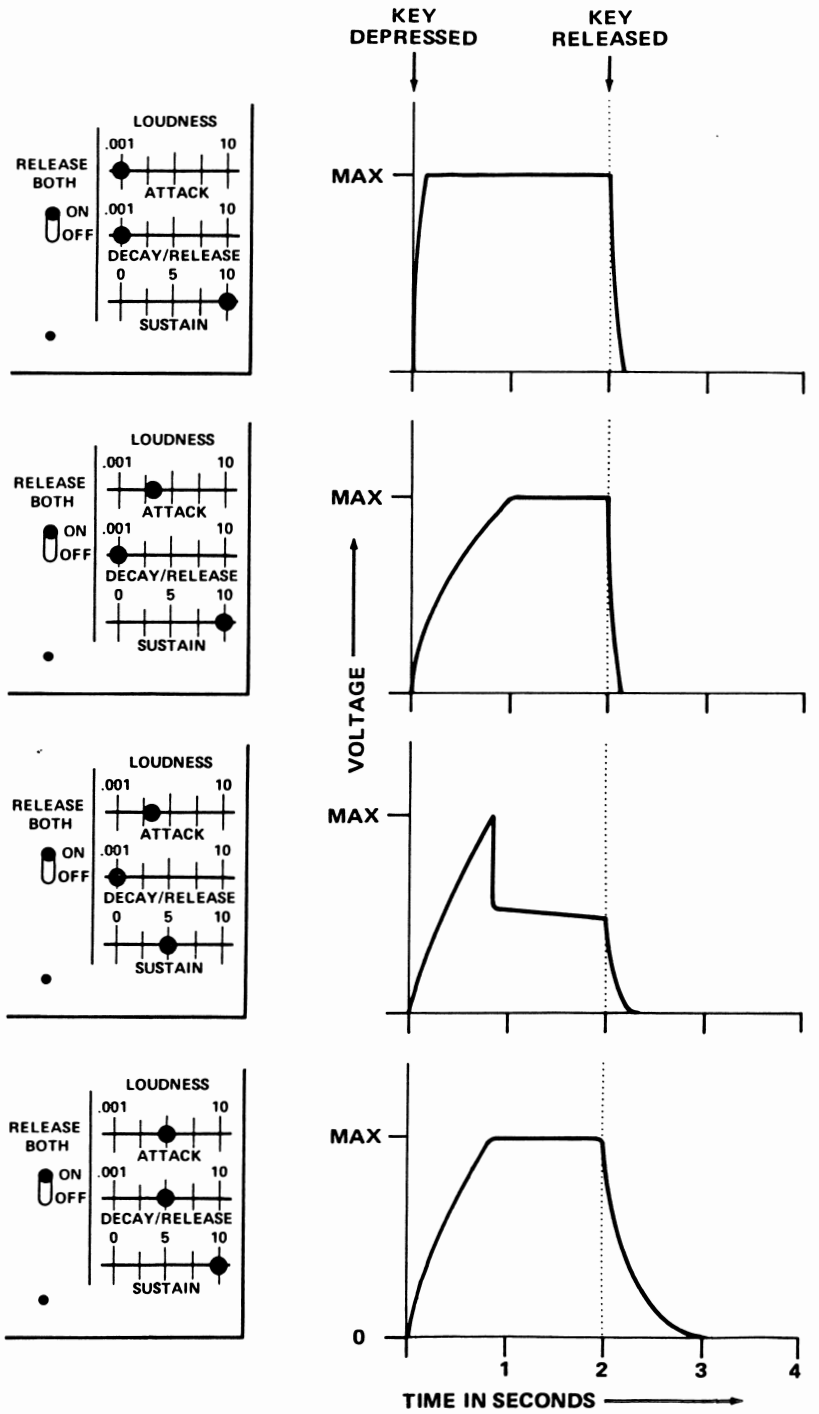
This voltage contour occurs whenever a **trigger** (a change in voltage that the contour generators understand) is generated. On LIBERATION, triggers are generated from the keyboard and/or the modulation section, and indicated by the right-hand LED (light-emitting diode). The relationship between triggers and contours is illustrated below:

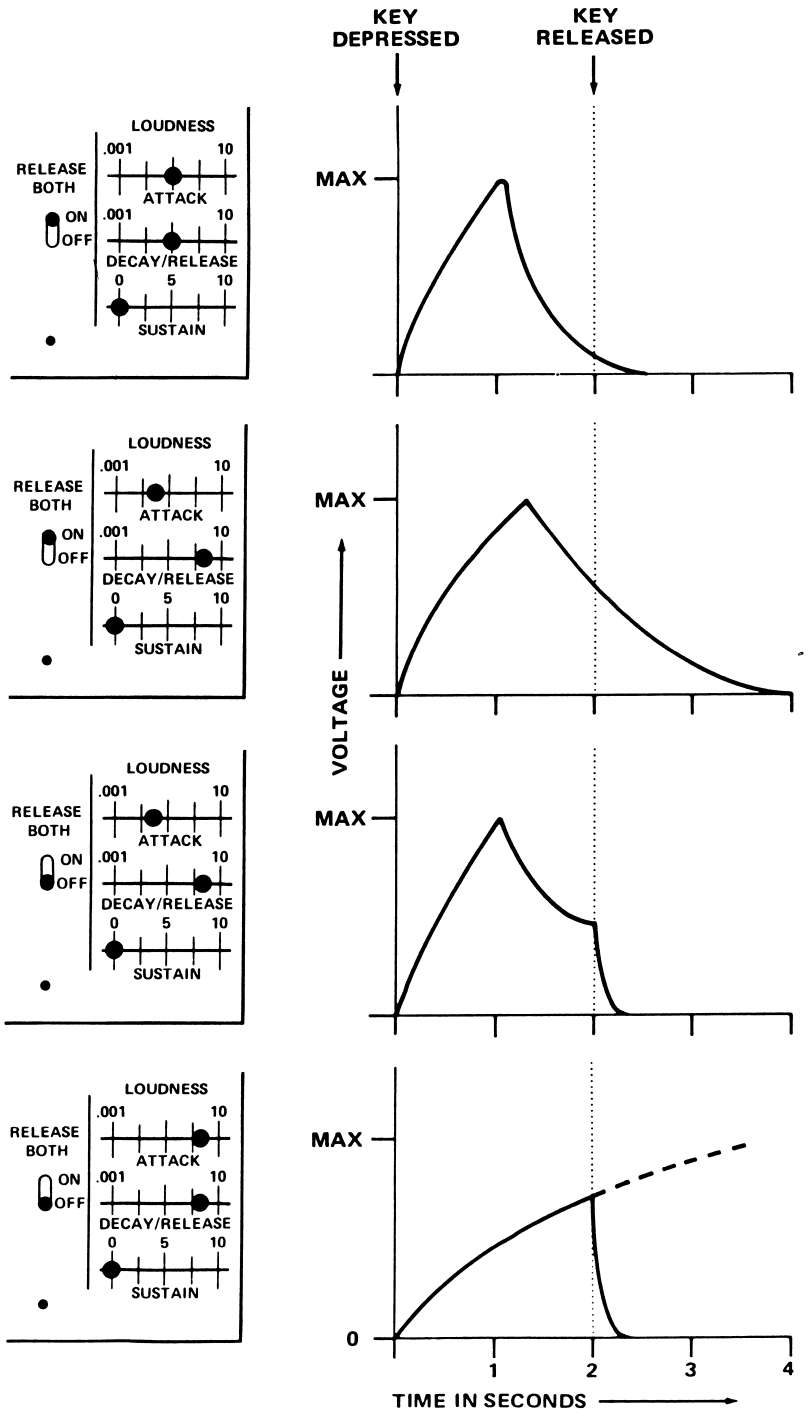


The VCA level follows the loudness contour, and the VCF cutoff frequency follows the filter contour.

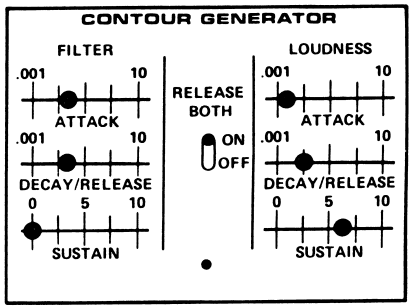
Note that the release (or final decay) time is the same as the (initial) decay time, set up by the DECAY/RELEASE slider. If the RELEASE BOTH switch is off, however, the release time is unconditionally short (approximately 15 msec.).

The following are some examples of front-panel settings and their corresponding loudness contours:

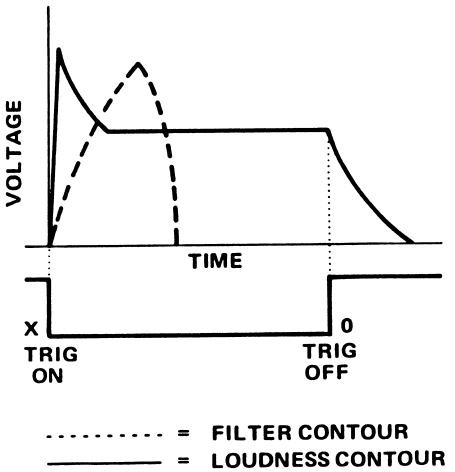




Since LIBERATION has two independent contour generators (one connected to the filter and one connected to the VCA), totally different and independent contours can be set up to produce complex, composite contours. For example, setting the contour generators as shown:



Produces this multiple contour:



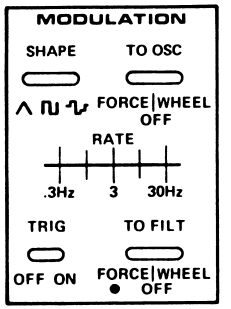
Combining the correct filter and loudness contours is one of the keys to producing sophisticated synthesizer sounds.

MODULATION

Modulation is a repetitive change. When referring to a synthesizer, modulation is the use of a control voltage to create a repetitive change in pitch or tone color.

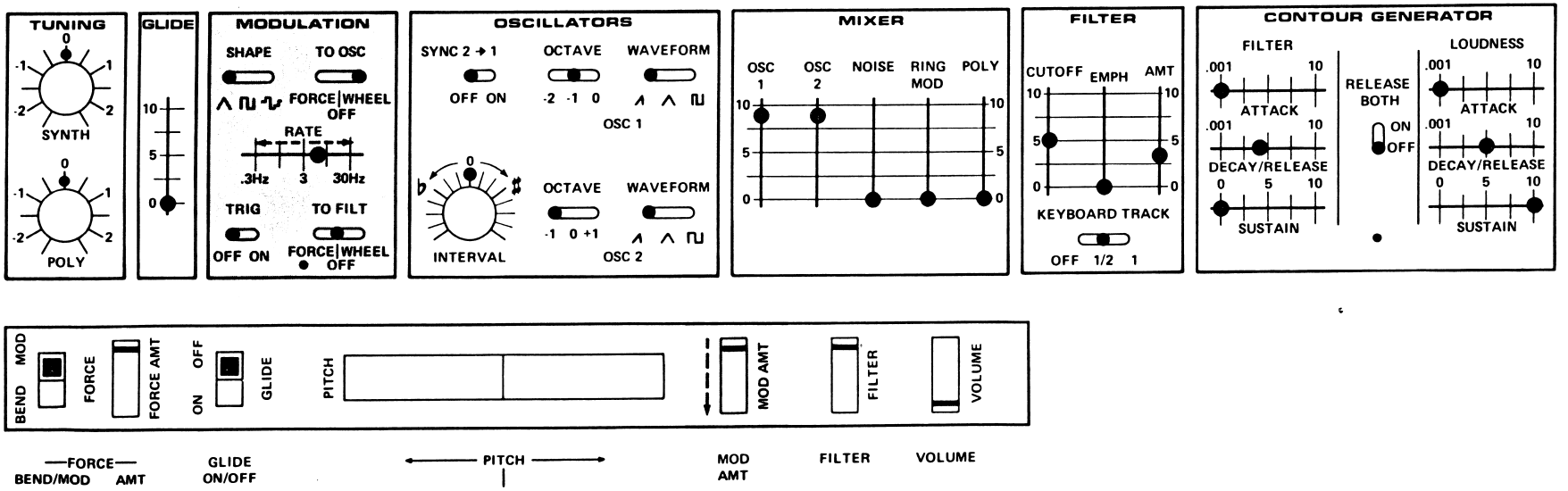
LIBERATION's modulation section uses a low frequency oscillator (LFO) to generate slowly-occuring waveform patterns that can be used to control the oscillators and/or the filter.

Note the controls in the MODULATION section:



The three positions of the SHAPE switch represent three kinds of low-frequency voltage. The first two shapes (triangular and square) should be familiar. These waveforms are the same as those available from OSC 2. The low-frequency oscillator (LFO) in the MODULATION section can generate the same signals as the audio oscillators, but at a much lower frequency (.3 to 30Hz).

Set the controls as shown:

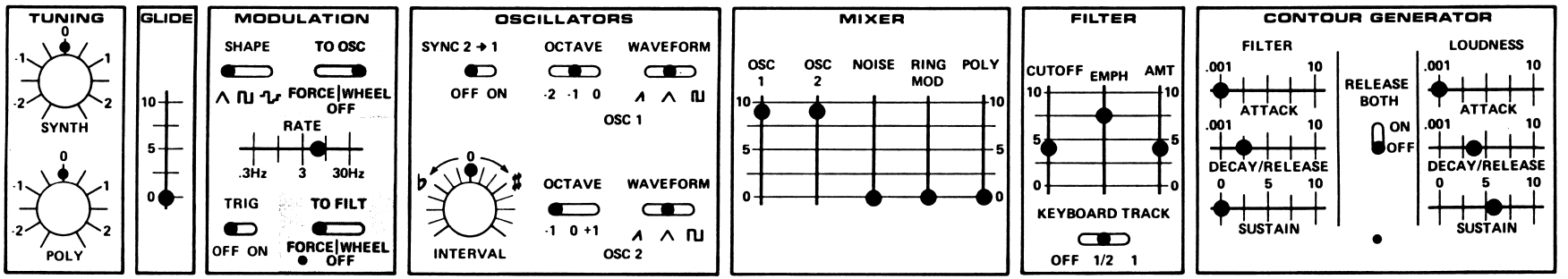


1. Turn the MOD AMT wheel toward you. This sends the voltage pattern generated by the LFO to the control input of the oscillators. Adjust the RATE slider to find a suitable vibrato rate. The LED in the modulation section flashes at the LFO rate.

2. Move the SHAPE switch to the second position. You should hear a trill whose top note can be adjusted with the MOD AMT wheel.

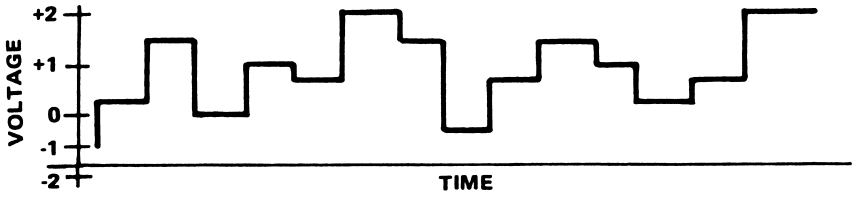
Note that the two switches labeled TO OSC and TO FILT determine if force or wheel control of modulation is sent to the oscillators and/or the filter. These are **destination** switches.

Set the controls as shown:



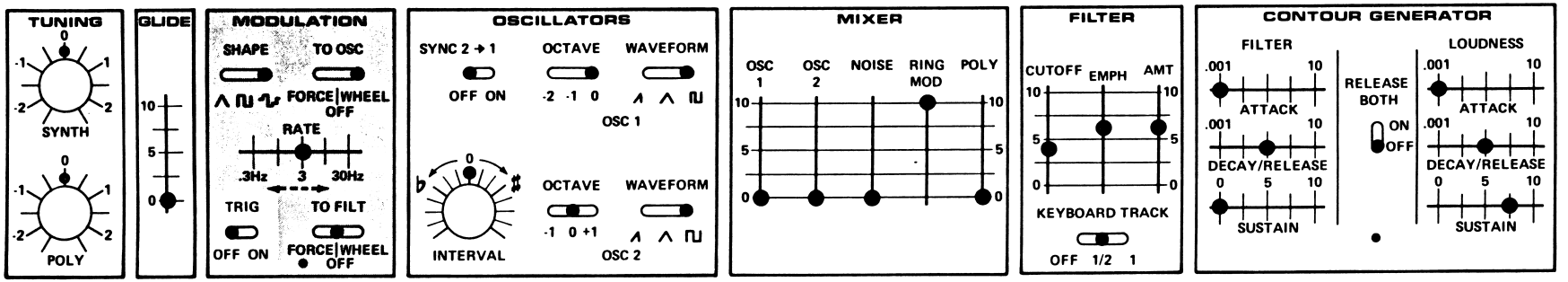
1. Use the modulation wheel and force sensor. The **modulation** signal is being routed through the wheel to one destination (the oscillators), while the **bend** voltage is routed through the force sensor to another destination (the filter). It is possible to set up entirely different performance effects on different parts of the instrument.

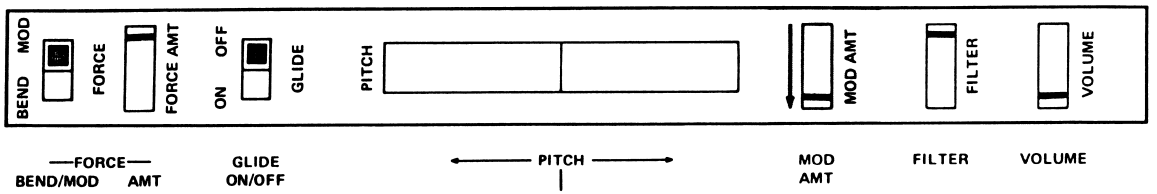
The third position on the SHAPE switch is a function called sample and hold. A sample and hold circuit takes a sample voltage level from a voltage source (in this case a noise source), holds that voltage for a certain time, and then takes another sample. The output of LIBERATION's sample and hold section is a totally random series of voltages and can be graphed like this:



The rate of the LFO determines the rate at which random samples are taken.

Set the controls as shown:





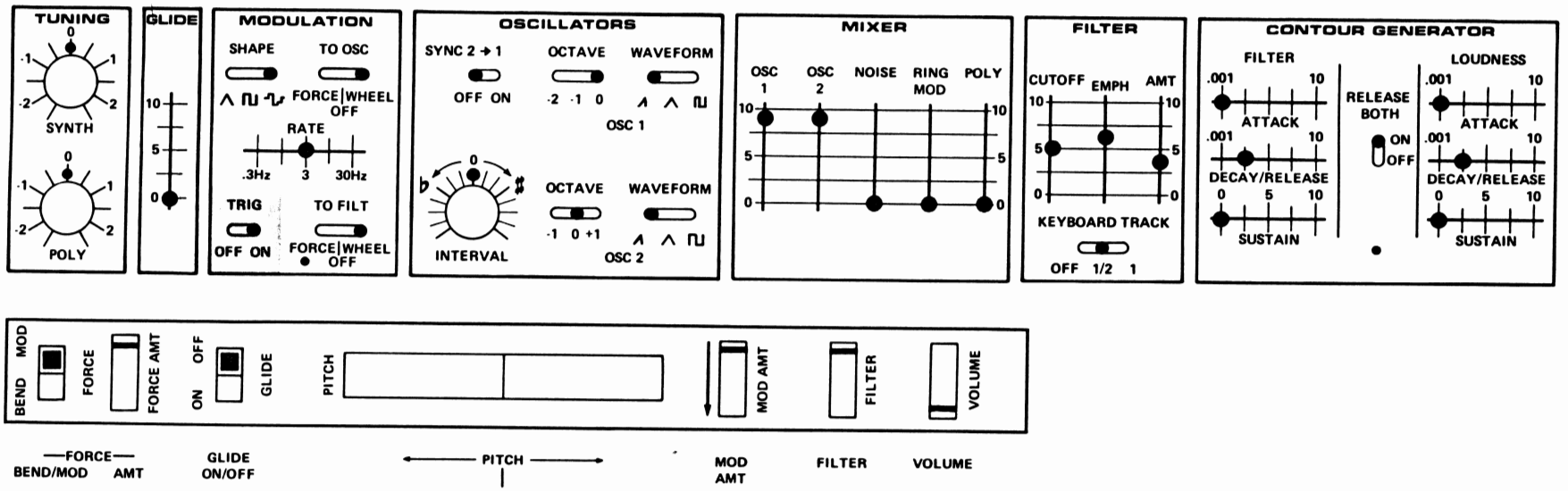
1. Move the MOD AMT wheel toward you to increase the range of the sample and hold effect.

2. Adjust the RATE slider for different rates of change.

3. Switch TO OSC to OFF and switch TO FILT to WHEEL. The modulation signal is now routed through the wheel to the filter only.

The TRIG switch sends an automatic trigger to the contour generators at the rate of the LFO. This lets LIBERATION "play itself."

Set the controls as shown:



1. The pitch of the last key depressed is articulated repeatedly. Note that the contour generators behave exactly as if a key were being depressed. Experiment with different settings of the contour generators.

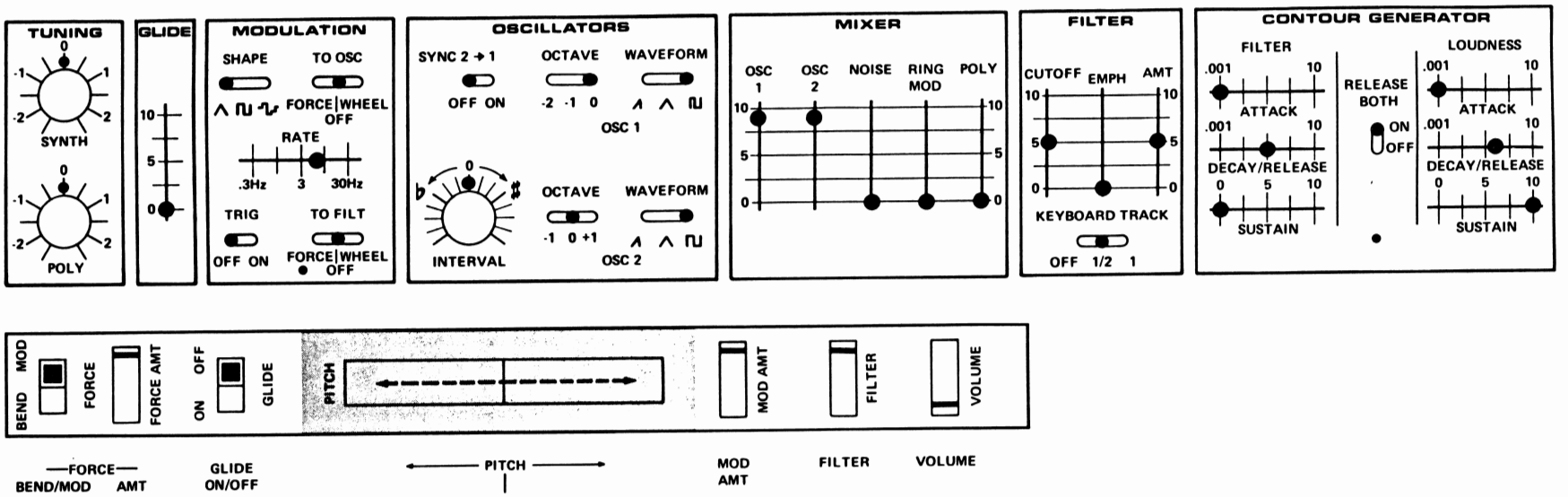
2. Move the MOD AMT wheel toward you. The pitch changes correspond with the articulations because both are controlled by the same LFO. Experiment with different modulation shapes.

PERFORMANCE CONTROLS

Performance controls, obviously, are those you use as you perform. It's not quite as simple as that, though. If the performance controls are not laid out logically, you — the performer — won't be able to make the best music possible. Moog ® instruments have always been known for their logical and efficient layout, and nowhere is this concept better demonstrated than on LIBERATION.

The performance controls are mounted in the left-hand "neck" section of the instrument. They are all positioned for maximum accessibility and ease in performance.

The most distinctive and versatile controller on the neck is the pitch ribbon. The ribbon has been mounted on the neck to correspond to a guitar string in terms of pitch change. To use the ribbon, set the controls as shown:



1. Place your finger on the bump in the center of the ribbon. This is a dead band and no pitch change should be audible when you depress a key. Press on the ribbon and move your finger up on the ribbon (toward the keyboard). The pitch of the oscillators goes up. When the ribbon is released, the oscillators instantly return to the pitch of the key being depressed. The ribbon bends pitch down the same way.

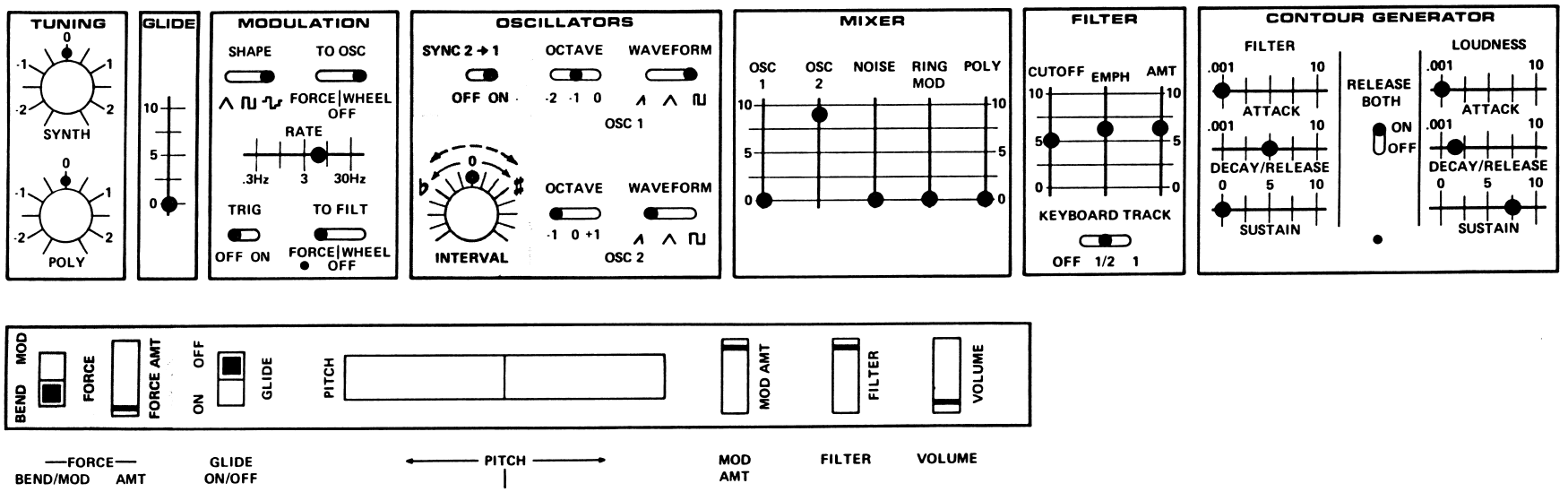
The ribbon enables you to bend pitch up or down, "scoop" up or "fall" down to and from notes, perform trills, and any other function which involves pitch change.

The remaining controls — the force sensor controls, GLIDE ON/OFF, and the MOD AMT, FILTER, and VOLUME wheels — are spaced from the center according to frequency of use. For instance, the MOD AMT wheel is probably used more often than the FILTER WHEEL, so it is closer to the center of the neck, where the left hand naturally rests.

SYNC

One very important performance aspect of LIBERATION is found not in the performance section, but on the front panel. In the OSCILLATORS section, there is a switch labeled SYNC 2–1. Turning on this switch accomplishes two things: the fundamental frequency of OSC 2 is locked to OSC 1, and the force sensor signal is routed to OSC 2.

Set the controls as shown:



1. Play any key and then press down harder. The force sensor is trying to move OSC 2 but OSC 2 is synchronized to OSC 1, which will not move. The "tearing" sound is OSC 2 trying to move away from OSC 1. Note that the force sensor voltage is always routed to OSC 2 even though the TO OSC destination switch is on WHEEL, not FORCE.

2. Any attempt to move OSC 2's frequency will produce the "sync" sound. Switch the BEND/MOD control to MOD. The sync sound will shift in response to the modulation signal. Similarly, moving OSC 2's frequency control will produce the sync sound.

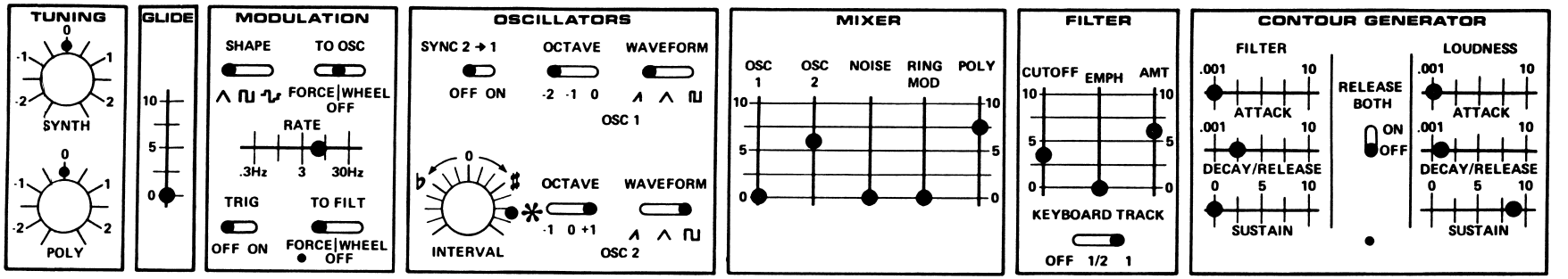
SUMMARY

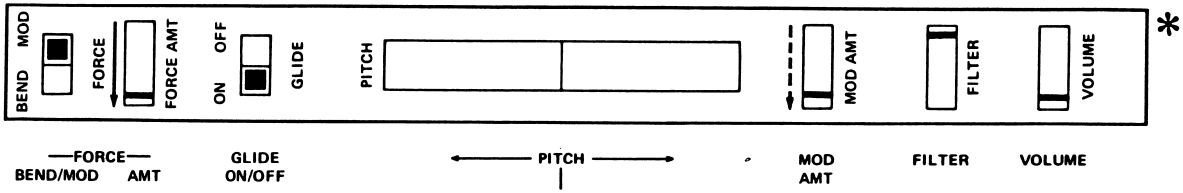
As you can see, LIBERATION is a unique instrument. On one hand, it's designed to be a versatile, sophisticated synthesizer with access to many sonic possibilities. On the other hand, it's an aggressively-designed mobile instrument that's just plain fun to play.

As you grow familiar with LIBERATION's capabilities through experimentation, be sure to review the concepts discussed in this manual. As your experimentation becomes reinforced with technical knowledge, you'll make better music and have more freedom of musical expression — literally in your hands!

SOUND CHARTS

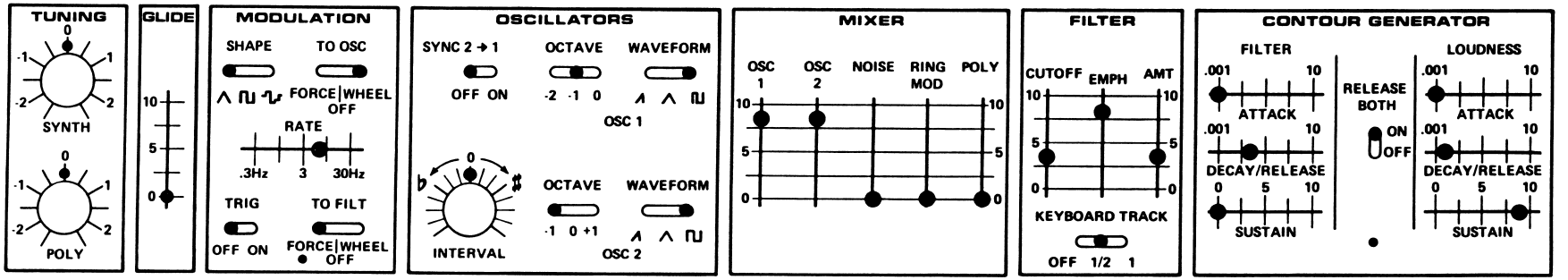
B - 4

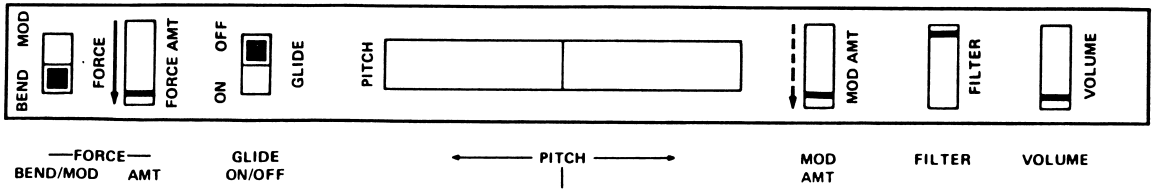




* 1. Tune OSC 2 a fifth above the POLY section.
2. Use the force sensor to bring in tremolo.

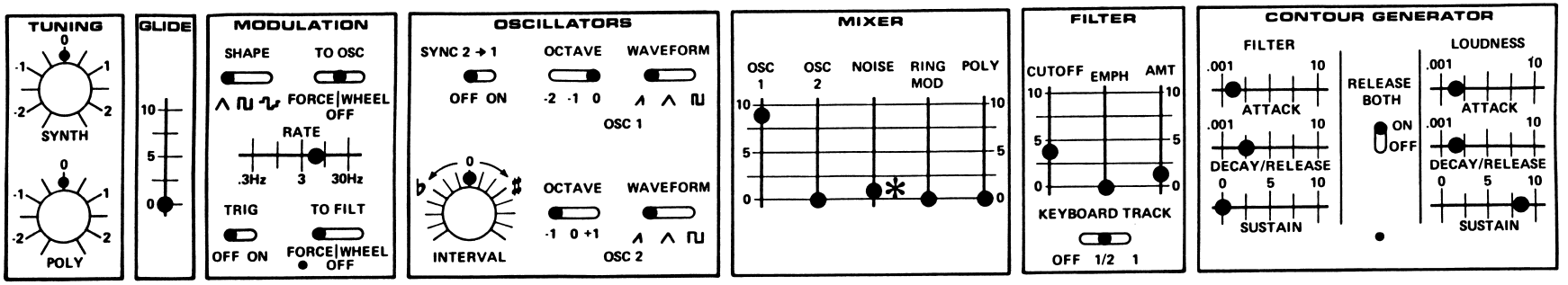
YIPES!

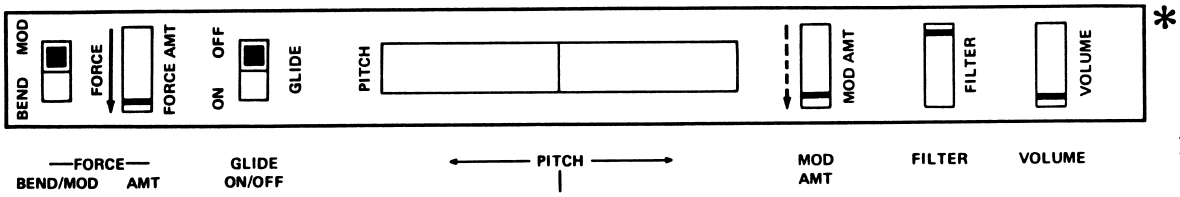




1. Use MOD AMT wheel for vibrato.
2. Use force sensor to "snap" the filter.

FLUTE

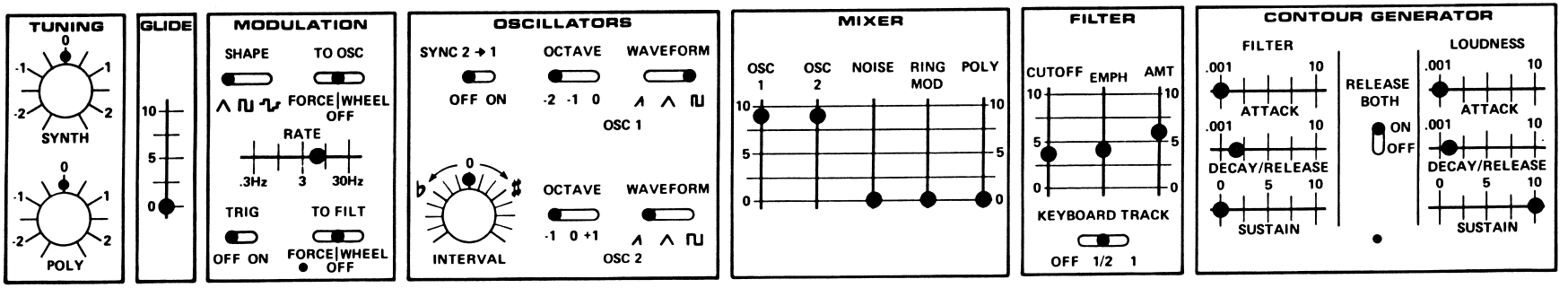


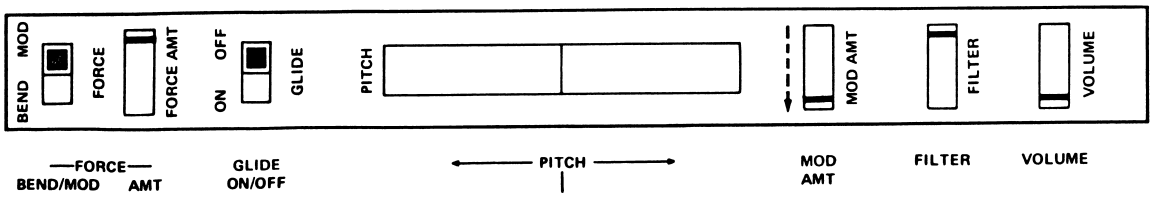


*1. In this sound, the noise signal is being used to simulate wind and breath noise in the flute. It should be almost inaudible.

2. Use the force sensor for tremolo on longer notes.

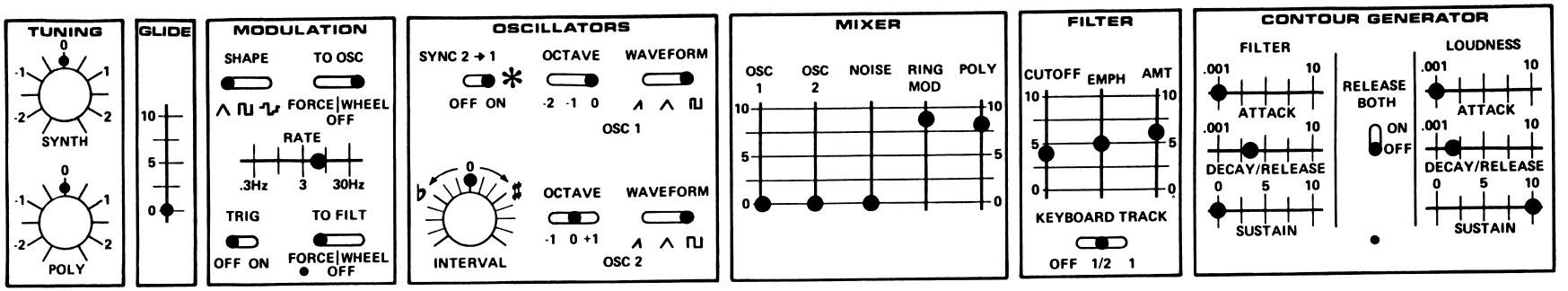
FUNK BASS

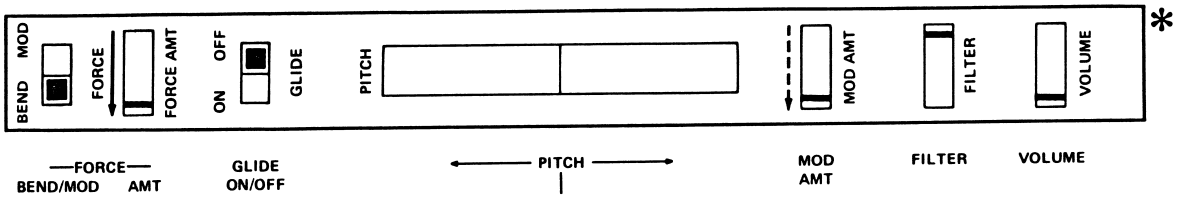




1. "Slide" up to notes with the pitch ribbon.

PEEK-A-BOO

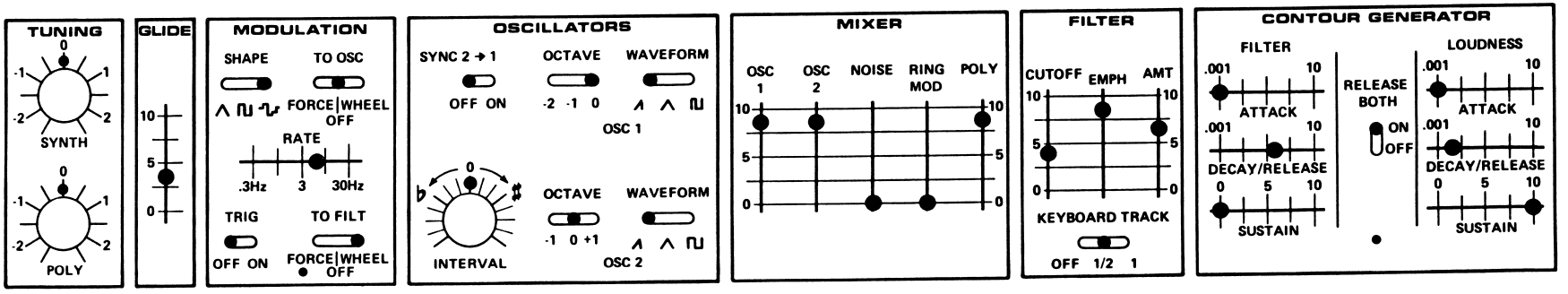


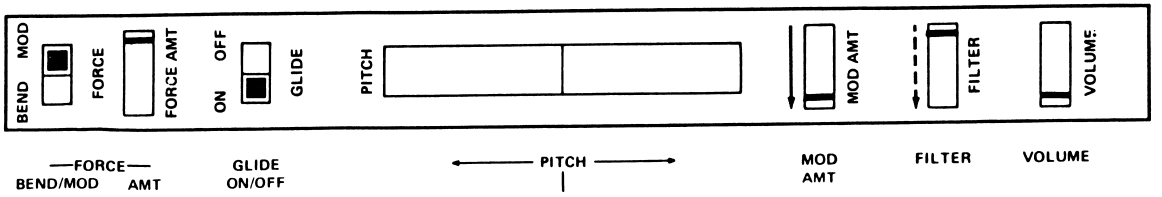


*1. Before switching on "sync," make sure OSC 1 and OSC 2 are tuned exactly to unison.

2. The RING MOD signal will be inaudible until pressure is applied to the force sensor.

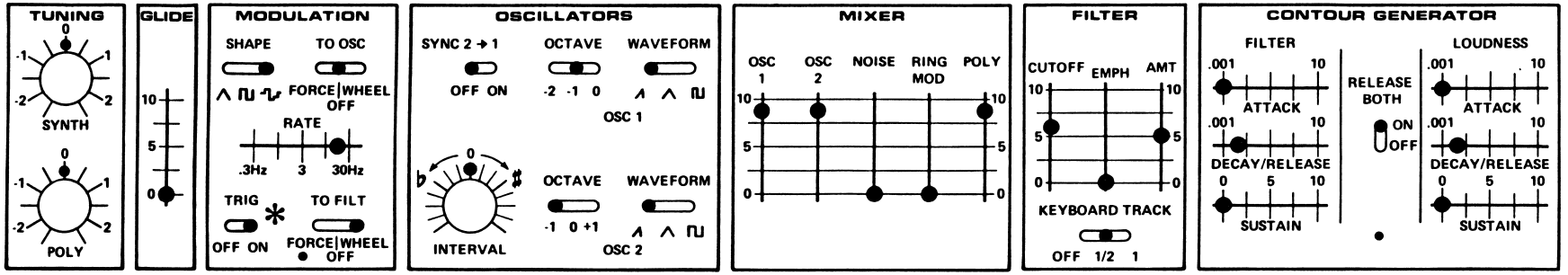
SAMPLE & HOLD

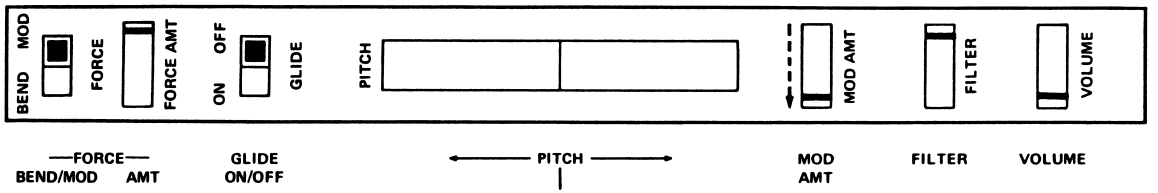




1. Leave the MOD AMT wheel set as shown. The sample and hold effect will come in as the filter contour decays. The effect can be bypassed by playing quickly or using the FILTER wheel.

TRIGGER - HAPPY



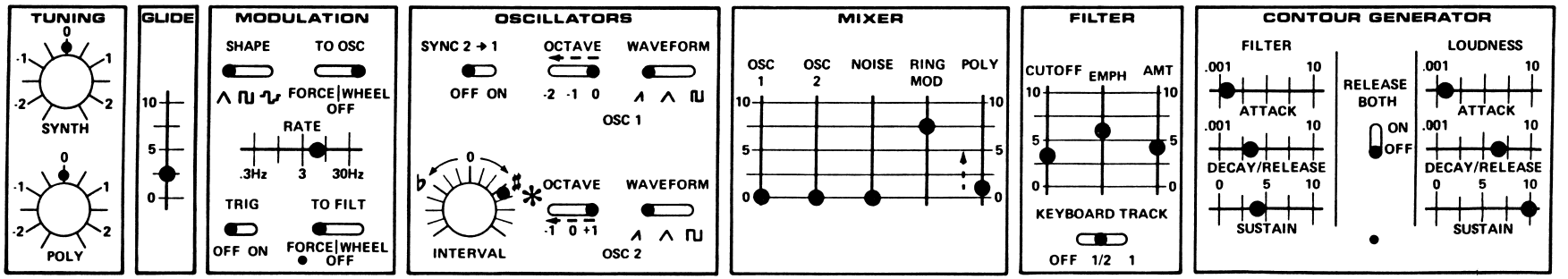


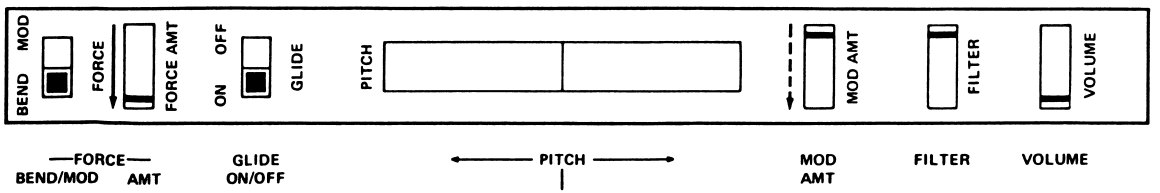
1. Set up panel then,

* 2. Turn **TRIG** switch to ON.

3. Play chords or bass lines. Remember, the pitch of the last key released will continue to be triggered.

RING MOD

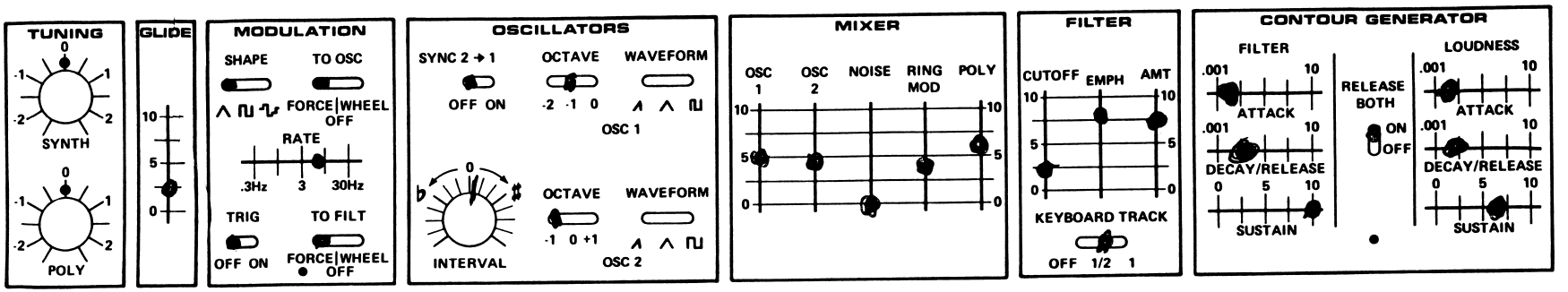


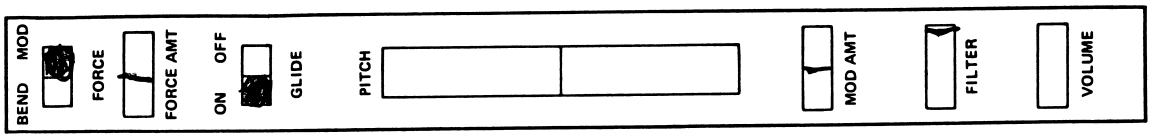


* 1. Tune OSC 2 to exactly a major third above OSC 1 (the "beating" will disappear).

2. Bring up POLY to play chords.

3. Experiment with different positions of the oscillator OCTAVE switches.





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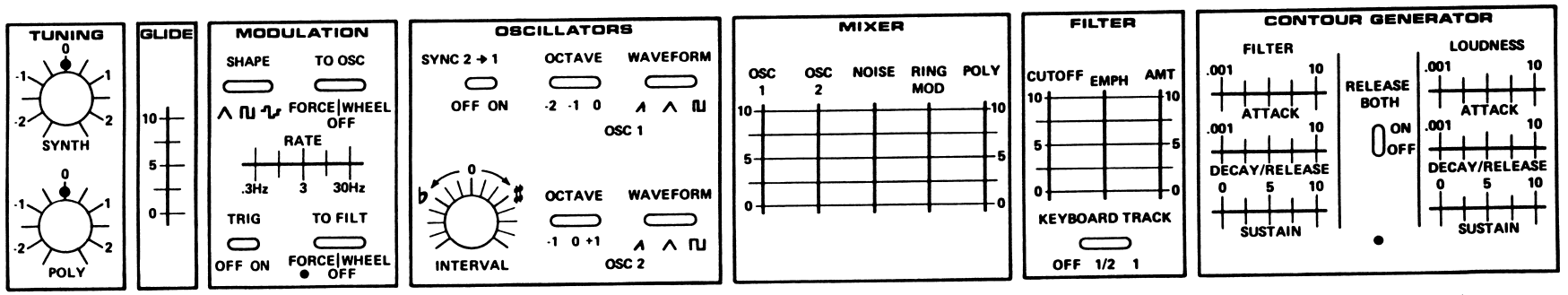
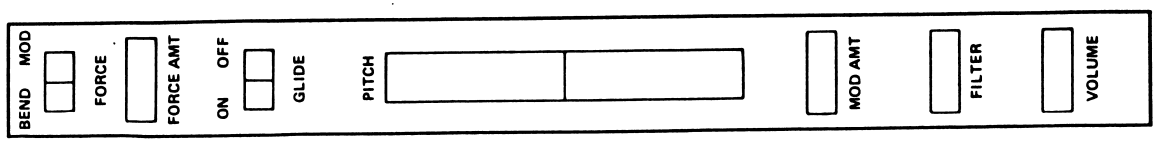
LIBERATION



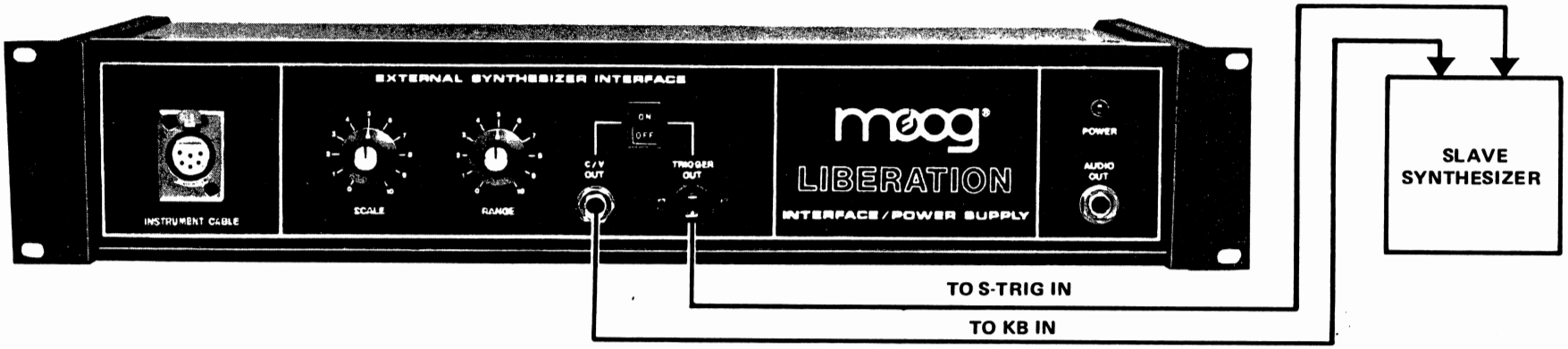


moog®
LIBERATION

INTERFACING

A point of connection between two devices is an **interface**. You've been interfacing every time you plug an amplifier into a speaker, or plug an electric keyboard into an amplifier. LIBERATION's interface controls enable you to control another synthesizer (referred to here as the "slave") from your LIBERATION keyboard.

To interface, connect a 1/4" cable from the CV OUT jack on the front of the power supply/interface to the KEYBOARD or OSCILLATOR input on the slave unit. Then connect an S-trigger cable (Moog P/N 994-041793-003) from the TRIGGER OUT jack on the power supply/interface to the S-trigger input on the slave. (If the slave has a different trigger input, consult that instrument's owner's manual.)



Now LIBERATIONS's control voltage output must be **scaled** and **ranged. Scaling** makes sure intervals are correct on both instruments and **ranging** ensures unisons are correct. The proper procedure is as follows:

1. Check that slave instrument is in tune with LIBERATION.
2. Make all interface connections.
3. Play lowest note on slave (this sets keyboard voltage to zero).
4. Set volume of slave and LIBERATION so you can hear both instruments clearly.
5. Depress top C on LIBERATION and adjust range until slave is in tune with LIBERATION (zero beats).
6. Play low F on LIBERATION and adjust scale so both instruments are in tune (zero beats).
7. Repeat steps 5 and 6 until perfect tuning is obtained.

The two interface controls contain all control voltages necessary for performance. The voltages for the ribbon, force sensor, modulation, and keyboard are all summed together, so the slave instrument now becomes as versatile as LIBERATION.

FEATURES

Temperature regulated ultra stable audio oscillators (Heated chip technology)

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

Two voltage controlled audio oscillators, each with separate three-position octave rocker 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. Force control of sync sweep.

Separate low frequency modulation oscillator with triangle and square waveshapes.

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

Separate filter and oscillator force or wheel switches.

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

Separate contour generators for VCA and VCF.

Keyboard force sensor.

Digital Ring Modulator.

44 note polyphonic oscillator bank.

Neck controls for pitch bend, filter cutoff, force sensor, modulation, glide and volume.

External synthesizer interface – 1 volt/octave output (includes pitch bend, keyboard, modulation, force).

S-trigger
On-Off Switch

40' Interconnect cable.

XLR connectors for durability.

Interface box can be rack mounted or used free standing.

Sample & Hold

LED indicates modulation rate.

LED indicates trigger.

SPECIFICATIONS

Moog reserves the right to change product specifications without notice.

POWER REQUIREMENTS

Operating voltage range
- Domestic Model 338A: 100 to 127 volts 60Hz
- Export Model 338BX: 200 to 260 volts 50Hz

Power consumption: less than 20 watts

CONTROLLERS

Keyboard: 44 note F to C Hi-note priority with monophonic glide variable from less than 2 msec. to 3 sec.

Tune control range: ± 3 semitones

Pitch ribbon range: Greater than ± fifth

Keyboard Sample & Hold drift: Less than 2mV/10 sec.

Modulation oscillator rate: From .3Hz to 30Hz

Modulation oscillator waveshapes: Triangle, square, sample & hold

Amount of modulation:
- (Square wave): Under wheel or force controller
- Oscillator: from zero to 1 octave
- Filter: from zero to 4.5 octaves

Amount of force bend:
- Oscillator: from zero to 1 octave
- Filter: from zero to 4.5 octaves

Auto trigger: Triggers contour generator from modulation oscillator

OSCILLATOR 1

Reference frequency for low F (octave = 32'): 43.65Hz

Scale factor accuracy: 0.2% from 44Hz to 1.5Hz

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

Waveforms: Sawtooth, triangle, rectangular pulse

Pulse duty cycle: 10%

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

Octave switch accuracy: 0.3%

SPECIFICATIONS (Continued)

OSCILLATOR 2:

Reference frequency for low F (octave = 16'): 87.31Hz

Scale factor accuracy: 0.2% from 88Hz to 3KHz

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

Waveforms: Sawtooth, triangle, square

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

Octave switch accuracy: 0.3%

Interval control range: Greater than ± perfect fifth

NOISE:

Type: Digital pseudorandom pink noise

RING MODULATOR:

Type: Digital exclusive "or"

Inputs: Oscillator 1 and Oscillator 2

Input waveforms: Square waves

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 force output is routed 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 AMPLIFIER:

Bleed through level: Better than -50dBm

Contour signal rejection ratio: 50dB

VOLTAGE CONTROLLED LOW PASS FILTER:

Type: 24dB/octave cutoff slope

Filter-Keyboard tracking: three position

Rocker 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

Range of neck filter cutoff control: 8 octaves

BURN-IN (AGING):

Before final calibration, units are burned in for 24 hours at ambient of approximately 72°F

POLYPHONIC OSCILLATOR BANK:

Reference frequency for Lo F: 87.31Hz

Waveform: Square

Poly Tune Range: ± 3 semitone

Keying system: on-off keyboard keying

Range: 44 note F to C

POWER SUPPLY/INTERFACE BOX:

Audio output level: 0dBm into 10K ohms

Audio output impedance = 1K ohm unbalanced

External synthesizer control voltage output: 1.00 volt/octave

External synthesizer trigger: S-trigger to ground

DIMENSIONS AND WEIGHTS:

	High	Deep	Long	Net Weight
Instrument:	5-3/8"	12-7/8"	46-3/4"	14 pounds
	13.6cm	32.7cm	118.8cm	6.35kg
Power Supply/ Interface:	3-5/8"	8"	19"	7 pounds
	9.2cm	20.3cm	48.2cm	3.18kg

GLOSSARY

The following is a list of terms used in this manual and in other publications on electronic music.

AMPLIFIER (voltage controlled) - An electronic circuit that passes a signal at a level proportionate to the level of a voltage present at its control input.

ATTACK- The amount of time taken for a sound to reach its maximum level of loudness or brightness.

ATTENUATOR - A device that cuts down the level of a signal.

CONTOUR GENERATOR - A circuit that generates a one-time, changing voltage pattern when it receives a trigger (see TRIGGER).

CUTOFF FREQUENCY - The point at which a filter starts to cut off sonic energy.

DECAY - The amount of time taken for a sound to die away; the manner in which a sound ends.

EMPHASIS - The intensity of the band of harmonics around the cutoff frequency of a filter.

FILTER - A device that selectively passes information; in synthesis, a circuit that cuts off some parts of a signal while passing other parts.

FORCE SENSOR - An electromechanical circuit that converts pressure into a usable voltage signal.

FREQUENCY - A number of events per unit of time; in synthesis, the number of cycles a waveform generator produces per second.

GLIDE - An effect produced by circuitry that establishes a time value between voltage level changes.

INTERFACE - A point at which two devices communicate with each other; in synthesis, the exchange of control voltage information between synthesizers.

KEYBOARD - A group of information-transmission devices, activated by the fingers; on a synthesizer, a source of logically-arranged control voltages.

MIXER - A circuit that selects levels of signals and routes them in a particular direction.

MODULATION - A repetitive change; in synthesis, a repetitive control voltage.

NOISE - A signal containing equal energy at all frequencies.

OSCILLATOR - A circuit that produces a continuously-occurring repetitive waveform (see WAVEFORM).

POLY - An abbreviation for "polyphony" or "polyphonic," meaning "having many voices."

RING MODULATOR - A circuit that accepts two signals and controls one composite signal consisting of sum and difference tones derived from the input.

SAMPLE & HOLD - A circuit that periodically "samples" (selects) a voltage level and "holds" that voltage for a specified period of time. Used to generate random control voltage sequences.