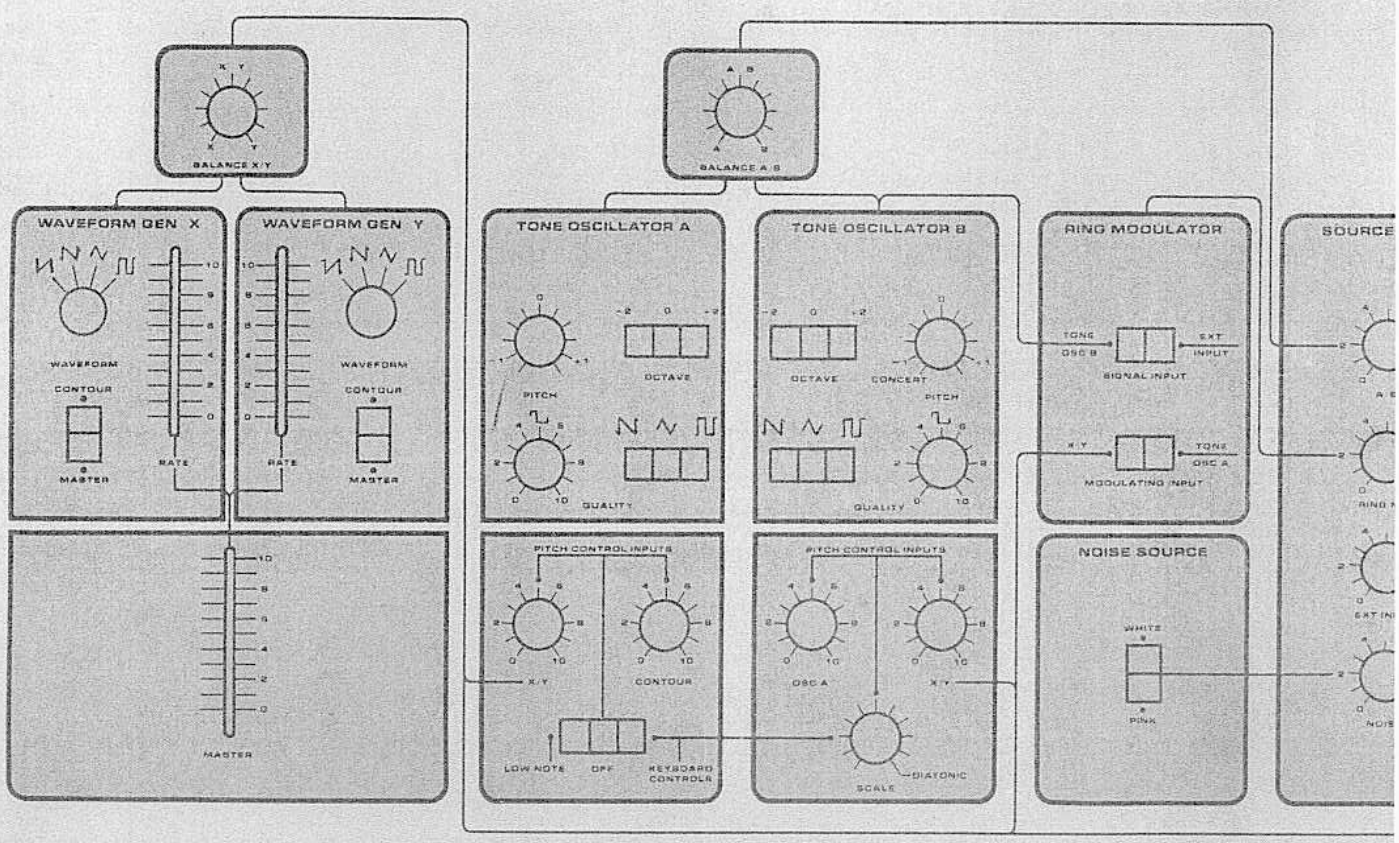
The MOOG

sonic six

OPERATION MANUAL

by Thomas L. Rhea, Ph.D.



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introduction

An electronic music synthesizer is a *modular* musical instrument capable of simulating conventional sounds and producing novel sounds. Synthesizer modules may be connected in a variety of ways to produce a broad spectrum of musical sounds.

The *Moog Sonic Six* makes use of technology and design features found on the largest studio-oriented Moog Synthesizers. Connection of the modules on the Sonic Six can be accomplished efficiently and quickly with rotary knobs and slider controls. The Moog Sonic Six can therefore function equally well as the heart of an electronic music studio or as a live-performance instrument. This flexibility and modular construction mark the synthesizer as uniquely twentieth-century in concept.

This manual will explain, in musical terms, the functions of each module on the Sonic Six. Once the performer/composer understands these, he is free to explore intelligently the hundreds of possible module settings and interconnections.

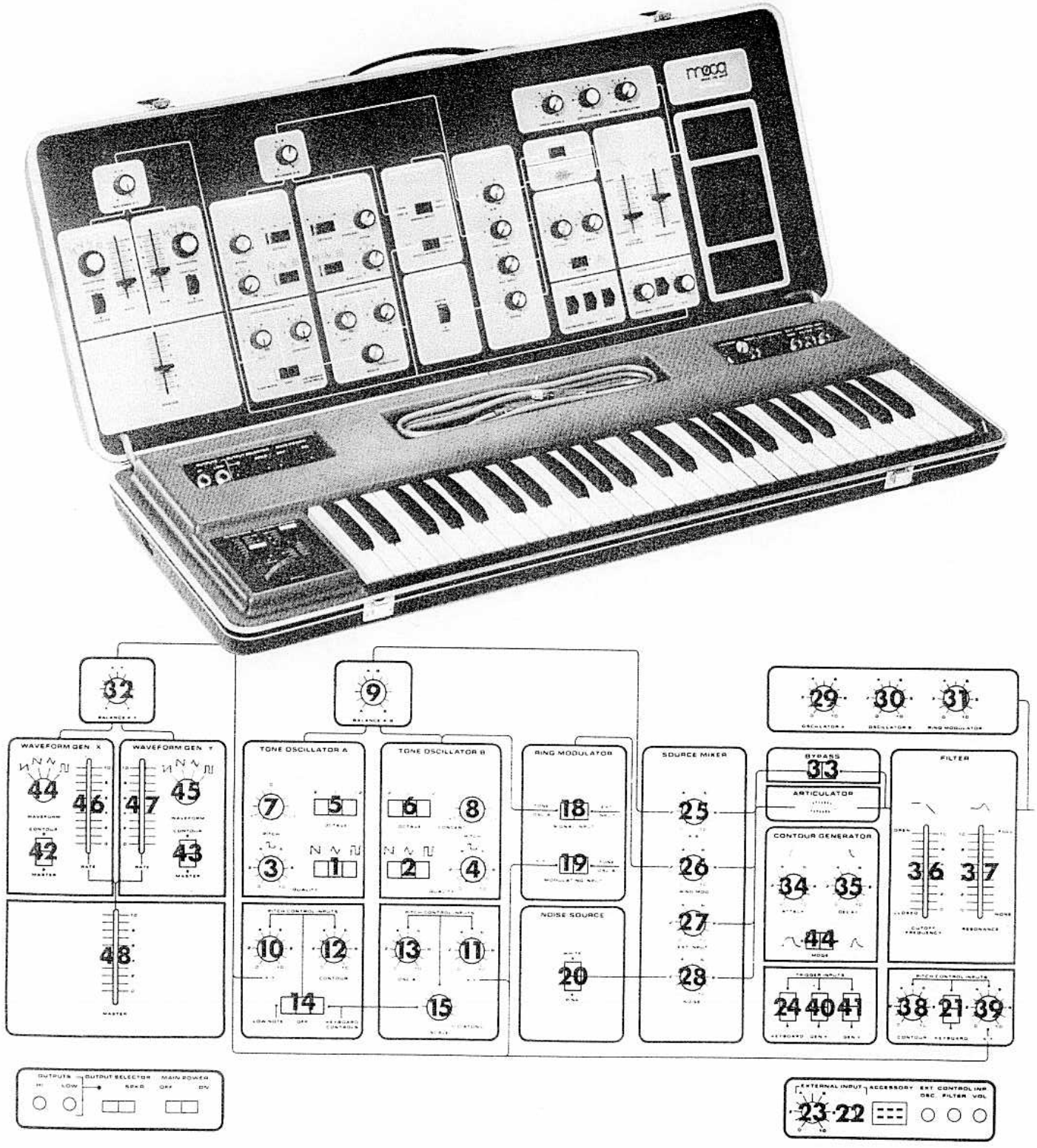
Technical sophistication is not required to use the Sonic Six — it is a *musical* instrument. Whether one is creating avant-garde sound events for tape compositions, or performing tonal music live, the basic constituents of musicianship are still desirable: an ear, good time, a sense of proportion and form, musical creativity.

To facilitate a musical introduction to the Sonic Six, four brief instructional sequences leading to the production of Moog sounds are included. You will quickly produce the Moog Sound that has become popular on records, commercials, and film scores. A discussion of basic synthesizer principles and a thorough description of each module will follow the instructional sequences.

The electronic music synthesizer is important — it is this century's contribution to the development of musical instruments. More than any other instrument, the synthesizer reflects our life style today: portable, modular, electronic, immediate, switched-on, and most important — *exciting.*

Tom Rhea

Thomas L. Rhea, Ph.D.



CONTROL PANEL DIAGRAM

Numbered controls (shown above) are described in detail in the ensuing sections.

instructional sequences

I. PREPARATION

The Sonic Six opens into a convenient position; the keyboard is faced by the module control panel in an upright position. To place the Sonic Six in a pattern to start the demonstration perform the following:

Control Panel:

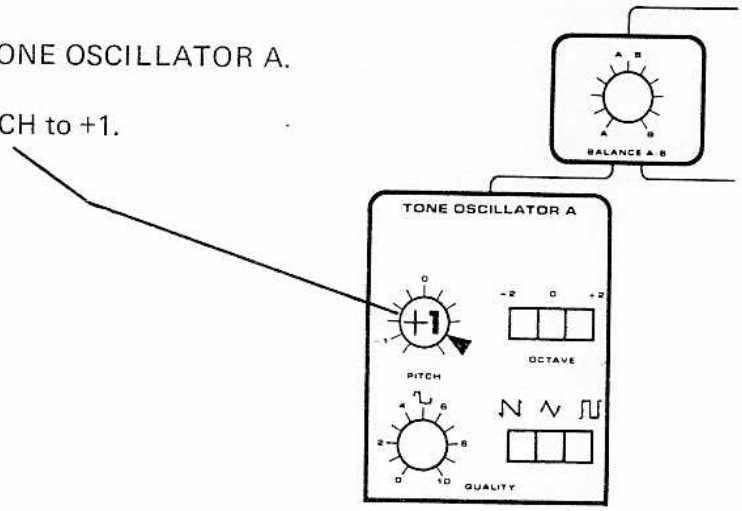
1. Turn all rotary knobs fully counterclockwise. (Some will click.)
2. Click all switches to left or down.
3. Move all sliders to 5.

Keyboard Panel:

1. Switch on MAIN POWER.
2. Move MASTER VOLUME to 8. (Leave Glissando at 0.)
3. Switch OUTPUT SELECTOR to SPKR (unless external amplifier is used).

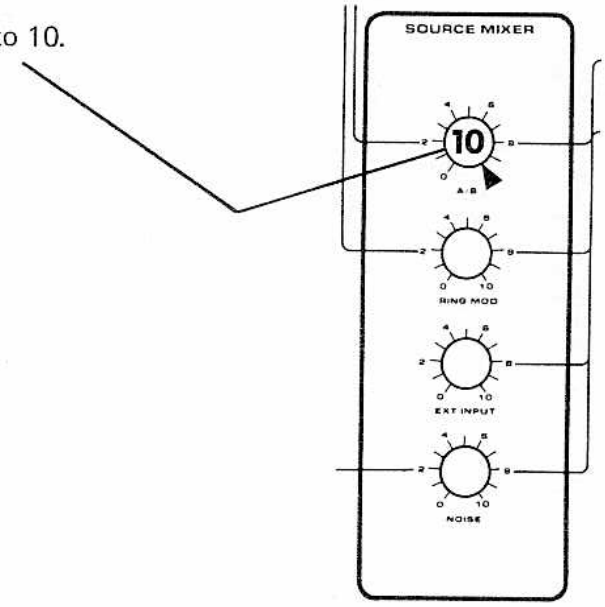
II. FORMING AND ARTICULATING A SOUND

1. Locate TONE OSCILLATOR A.
2. Turn PITCH to +1.



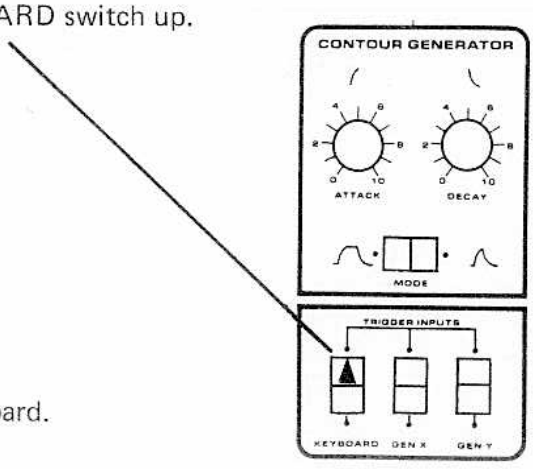
TUNING

3. Locate SOURCE MIXER.
4. Turn A/B to 10.



MIXING

5. Locate TRIGGER INPUTS under CONTOUR GENERATOR.
6. Click KEYBOARD switch up.



TRIGGERING

7. Play the keyboard.

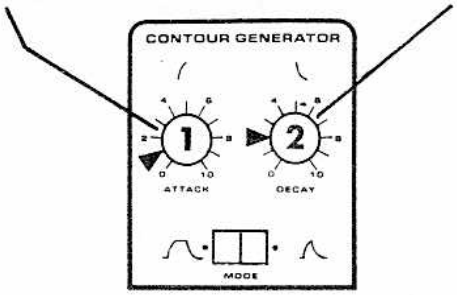
III. MODIFYING THE SOUND

This sequence provides more control over attack and release (decay), and explores tone color possibilities.

1. Locate CONTOUR GENERATOR.

ATTACK / DECAY

2. Vary ATTACK. Vary DECAY. Play the keyboard.

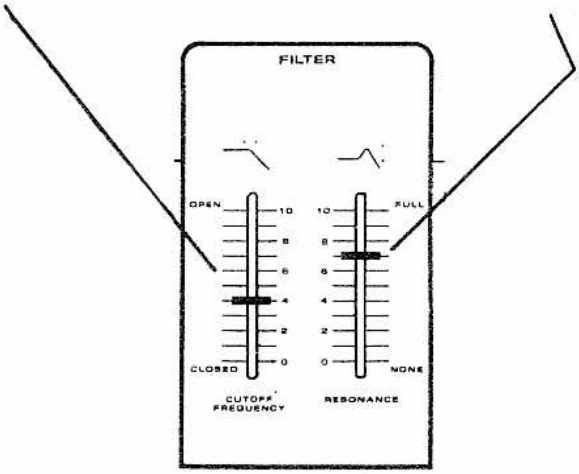


3. Turn ATTACK to 1. Turn DECAY to 2.

4. Locate FILTER.

TONE COLOR

5. Vary CUTOFF FREQUENCY. Vary RESONANCE. Play.



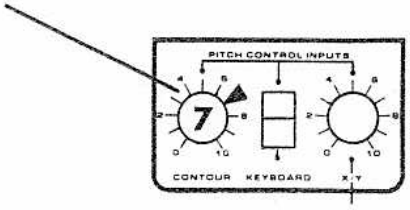
6. Move CUTOFF FREQUENCY to 4.

7. Move RESONANCE to 7.

FILTER SWEEP

8. Locate PITCH CONTROL INPUTS under FILTER.

9. Turn CONTOUR to 7. Play!



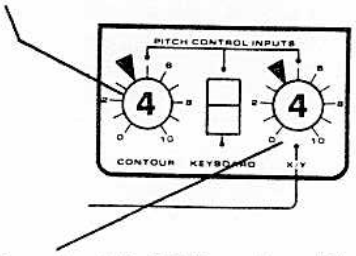
10. Vary ATTACK, DECAY, CUTOFF FREQUENCY, RESONANCE, and CONTOUR – one knob at a time to see what effect each has.

IV. FURTHER MODIFICATIONS

1. Turn ATTACK to 1. Turn DECAY to 4.

2. Leave CUTOFF FREQUENCY at 4. Leave RESONANCE at 7.

3. Turn CONTOUR under FILTER to 4.

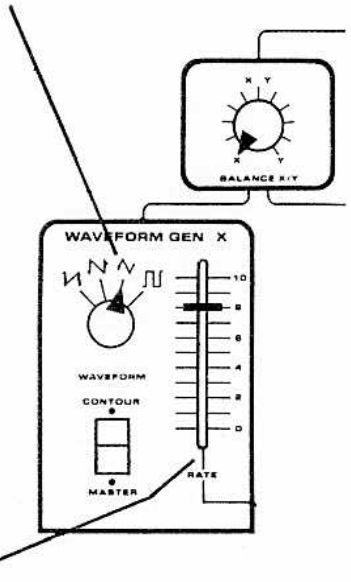


REPETITIVE FILTER SWEEP

4. Turn X/Y under FILTER to 4. Play a single note.

5. Locate WAVEFORM GEN X.

6. Turn WAVEFORM to select triangle wave.

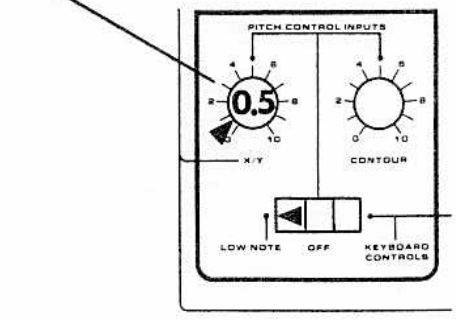


"WAH-WAH"

7. Move RATE to about 8 for "wah-wah" sound. Play!

8. Return X/Y under FILTER to 0.

9. Locate X/Y under TONE OSCILLATOR A. Turn it clockwise. Adjust for amount.



VIBRATO

10. CONTOUR will cause a single sweep of the oscillator or filter. X/Y causes a repetitive pattern. Try different combinations on each module.

basic principles of the synthesizer

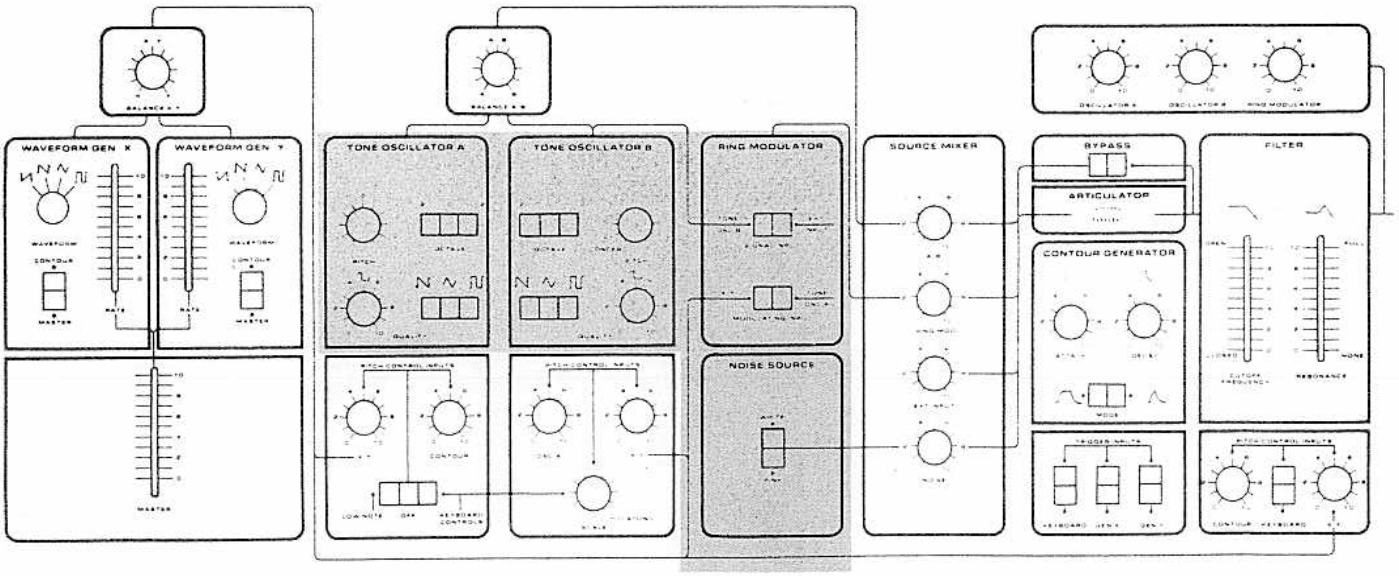
It is possible to learn a great deal about the Sonic Six by experimentation, but it is practical to learn the capabilities of the modules in an orderly way.

The Sonic Six modules fall into the following categories:

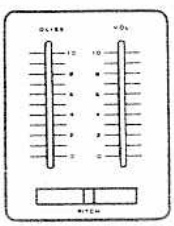
Tone Sources
Mixers
Modifiers
Control Generators
Triggers

TONE SOURCES

Tone Sources provide the basic audio signals that are to be modified and controlled. Tone Oscillators A and B provide pitched sounds; the Noise Source provides static-like white or pink noise; the Ring Modulator produces bell-like clangorous sounds; an external input is provided to mix in sounds from guitars, microphones, combo organs, electric pianos, with the other Tone Sources found on the synthesizer.

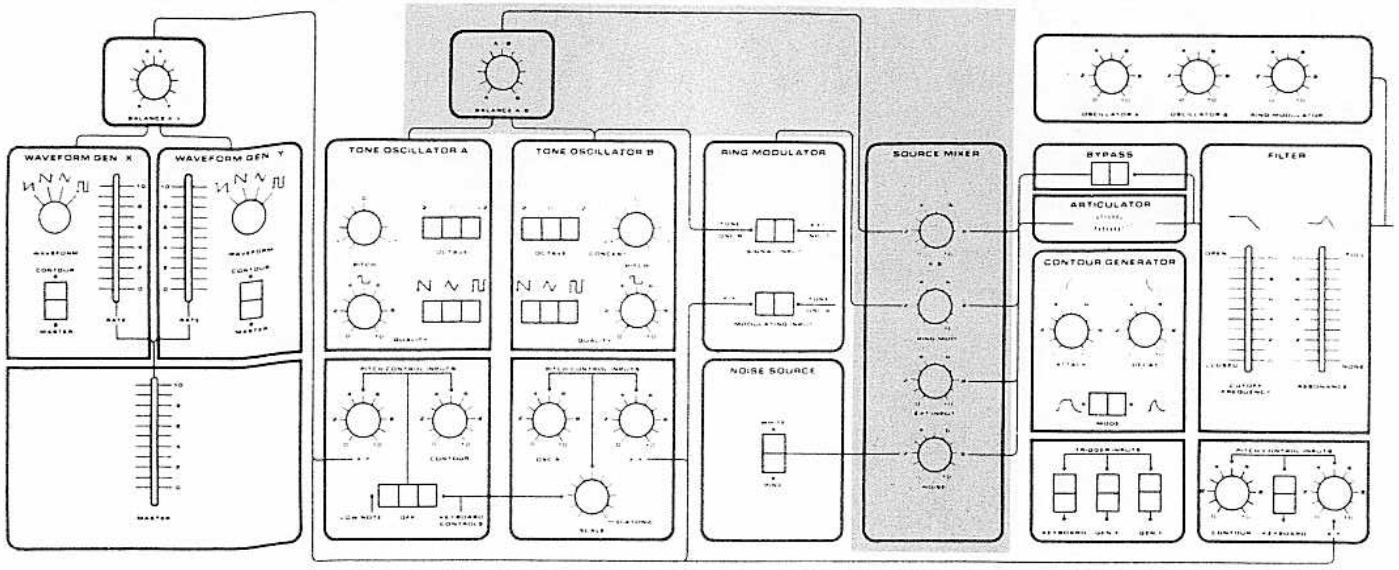


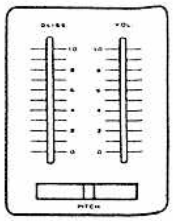
TONE SOURCES



MIXERS

Mixers are usually used to combine the various Tone Sources into numerous combinations by controlling their relative loudnesses.

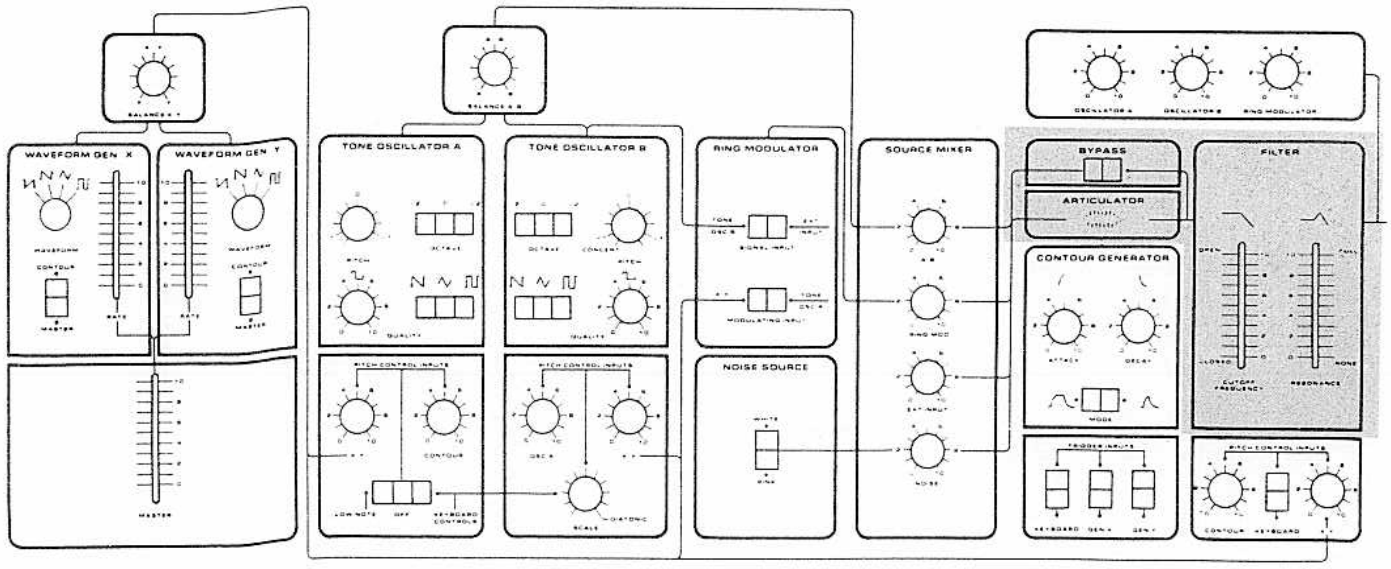


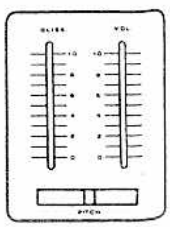


MIXERS
(Tone Sources)

MODIFIERS

Modifiers: The Filter modifies the Tone Sources by altering their tone color, or harmonic content. The Articulator amplifies the sound in a pattern set by the Contour Generator.

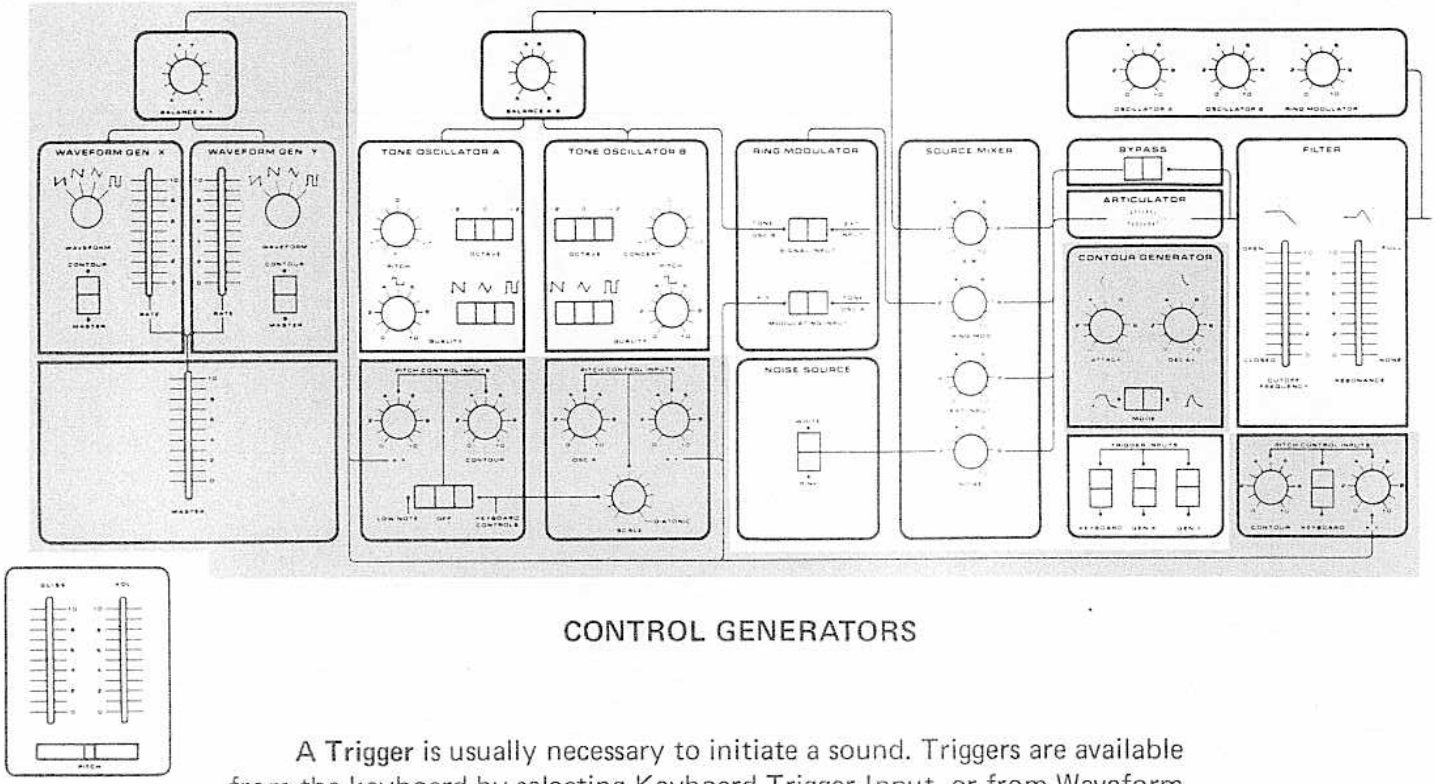




MODIFIERS

CONTROL GENERATORS

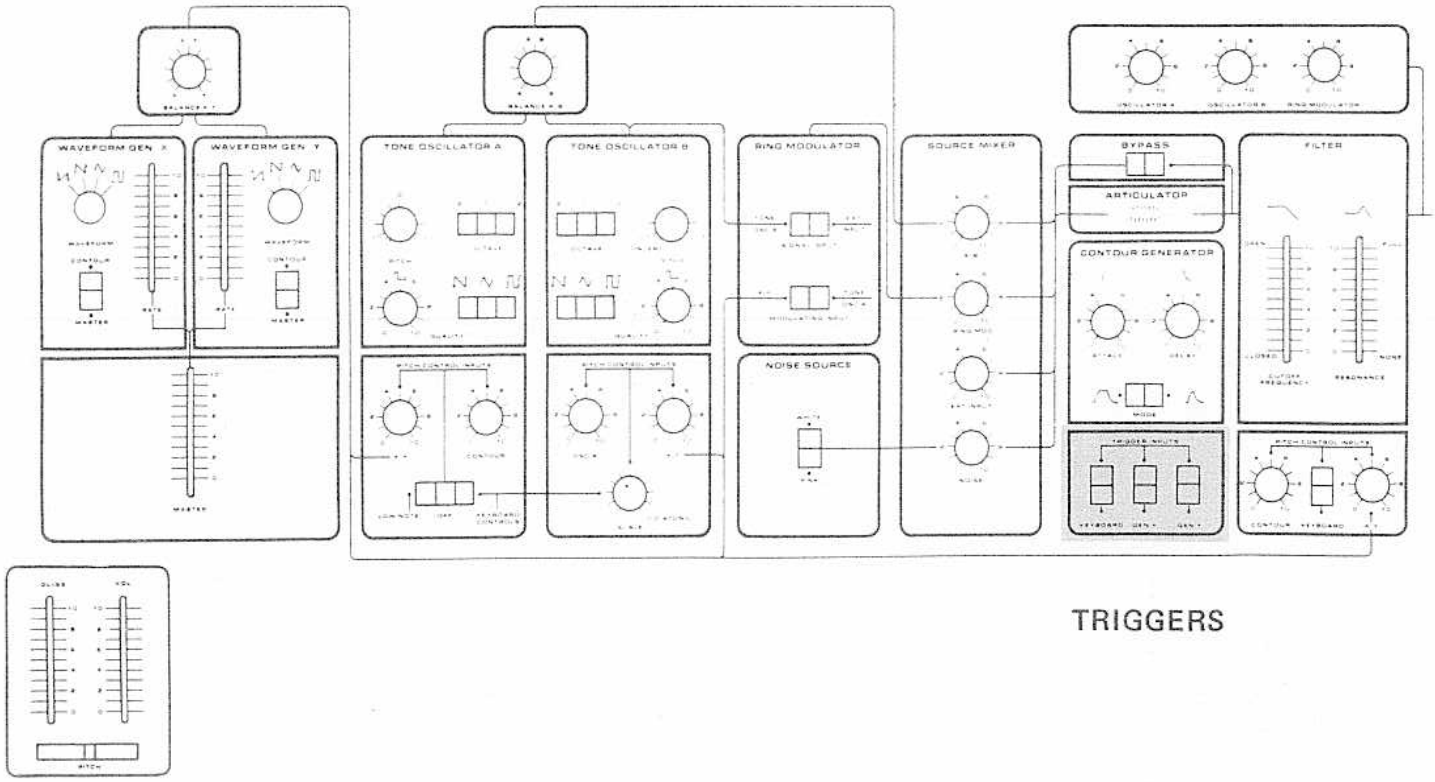
Control Generators create sweeping contours and repetitive waveform patterns used to automatically manipulate Tone Source and Modifier modules. The Contour Generator creates a single contour used to sweep the Filter, Oscillator, or Articulator. The Waveform Gen X and Y create repetitive waveforms that create vibrato (by controlling an oscillator), "wah-wah" effects (by controlling the Filter), and more complex sounds. The keyboard controls the pitch of the oscillators in discrete steps; and adds brilliance as one ascends the scale if applied to the Filter.



CONTROL GENERATORS

TRIGGERS

A **Trigger** is usually necessary to initiate a sound. Triggers are available from the keyboard by selecting Keyboard Trigger Input, or from Waveform Gen X or Y by selecting the appropriate switch. Gen X and Gen Y will cause the synthesizer to repeat a sound at the rate set on the Waveform Generator Rate sliders. The waveform selected in this case is unimportant.



TRIGGERS

AUDIO SIGNAL PATH

MANUAL CONTROL OF SOUND

The control panel of the Sonic Six has lines that provide visual cues for module connection. In a typical setup, one or more Tone Sources are combined in the Source Mixer, routed through the Articulator (Bypass causes a continuous sound), through the Filter, and finally to the output speaker. This left-to-right path is referred to as the *Audio Signal Path* — the signal is *audible*. In this path the sound can be altered by *manually* manipulating the knobs and sliders on the modules involved.

CONTROL VOLTAGE PATH

ELECTRICAL (VOLTAGE) CONTROL OF SOUND

It is useful to be able to control the modules in the Audio Signal Path automatically. To accomplish this, inaudible control voltages are routed to the Pitch Control Inputs of modules in the Audio Signal Path. In essence, these control voltages *electrically* manipulate internal controls in modules in the Audio Signal Path. Control voltages by themselves are inaudible, but their effect can be heard if they control modules in the Audio Signal Path. Control voltages are generated by the Control Generators (Contour Generator, Waveform Gen X and Y, Keyboard); this bottom-to-top path is called the *Control Voltage Path* — the voltages produced are *inaudible*. This path supplies control voltages that *electrically* (and internally) manipulate modules in the Audio Signal Path.

The instructional sequences I-IV offer examples of use of control voltages from the Contour Generator, and Waveform Gen X; repeat the sequences and generalize your discoveries.

tone sources

TONE OSCILLATORS A AND B

Tone Oscillators A and B provide for manual control of timbre (tone quality), and both manual and automatic control of pitch.

TONE COLOR SELECTION

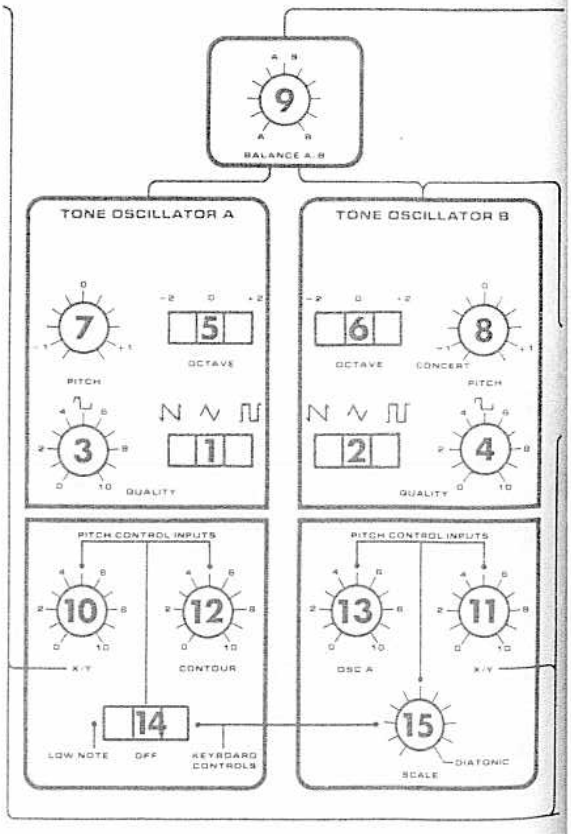
Waveforms with different harmonic content may be selected with the Waveform Selectors (1 and 2). The simple triangle wave is used to produce flute-like sounds. The sawtooth wave has all harmonics, and is useful in producing string and brass-like sounds. The rectangular wave has a more complex spectrum. When the Waveform Selectors (1 or 2) are set for the rectangular wave, the Width Controls (3 and 4) are used as a variable tone control. When the rectangular width is the same on top as it is on bottom (on "0"), the waveform is called a square wave. The square wave has only odd numbered harmonics, and is used to simulate "hollow" sounding instruments such as the clarinet.

MANUAL CONTROL OF PITCH

Pitch may be controlled manually by using the Octave Selectors (5 and 6), which move in increments of two octaves. The Pitch controls (7 and 8) provide continuous tuning over the octave range selected. When the Pitch control (8) of Tone Oscillator B is clicked to the extreme counterclockwise position, the keyboard is tuned to concert pitch.

MIXING OSCILLATORS A & B

The outputs of Oscillators A and B may be balanced (mixed) using Balance A/B (9). In the counterclockwise position only A will be heard. In the A=B position, the outputs are mixed equally.



REPETITIVE PITCH MODULATION X/Y

The pitch of Oscillators A and B may be controlled automatically by routing a control voltage to Pitch Control Inputs X/Y (10 and 11). The pitch will be modulated and will reflect the waveshape and rate of the Waveform Generators X and Y. The amount of modulation is set with the X/Y knob.

PITCH CONTOUR

SIREN EFFECT

Tone Oscillator A can be controlled by the Contour Generator with the Contour knob (12). The oscillator will then be swept in pitch according to the settings on the Contour Generator. A slow Attack  and Decay will produce a siren effect.

OSC. A GROWLING EFFECT

Tone Oscillator B can be controlled by Osc A (13), which is the output of Oscillator A. In this context Oscillator A is a Control Generator — its output controls Oscillator B. Use of Osc A produces a growling sound, the quality of which depends on the pitch interval between Osc A and Osc B.

KEYBOARD CONTROLS FOR PITCH

Both Oscillators are controlled by the Keyboard Controls, Switch (14) and Scale (15). If Scale is placed in the normal position marked "Diatonic," the following is true: In the *Low Note* position Oscillator A will play the lowest note depressed, Oscillator B the highest. In the *Off* position, only Oscillator B will follow the keyboard. In the rightmost position both oscillators will follow the keyboard and remain in the interval to which they are tuned. Here are some possibilities offered by the keyboard controls:

Keyboard Controls:

CONTROLLING TWO NOTES

1. Play two independent lines by tuning Oscillators A and B to unison, selecting "Low Note," and "Diatonic."

DRONE

2. Play above a drone by tuning Oscillator B to a low note, selecting "Low Note," and turning Scale fully counterclockwise.

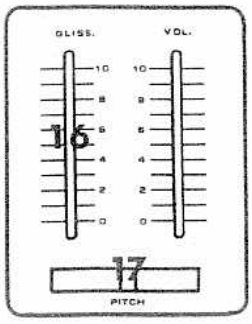
PARALLEL INTERVALS

3. Play parallel intervals by tuning Oscillators A and B to an interval, selecting rightmost switch position, and "Diatonic" on Scale.

SCALE CONTROL

The Scale Control (15) will produce a traditional twelve-tone scale in the "Diatonic" position. As the control is moved counterclockwise, intervals are reduced in size creating scales with more than twelve tones to the octave. Quarter tones can be produced by using the Scale Control to tune a two octave interval on the keyboard to *sound* like one octave. Other microtonal scales are possible though each interval per half-step on the keyboard remains equal in size for a given setting. Notice that middle C remains stationary regardless of the Scale setting.

MICROTONAL SCALES



GLISSANDO

The Glissando (16) Control to the left of the keyboard controls the rate of sliding from one pitch to the next. (0 is fastest, 10 is slowest.)

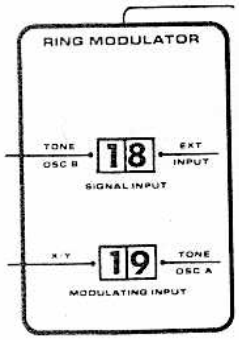
BENDING THE PITCH

The Pitch Wheel (17) is used to bend the pitch during performance for expressive effects. Movement to the right raises the pitch; to the left lowers pitch. With some practice, a sensitive vibrato can be produced with the Pitch Wheel.

RING MODULATOR

UNUSUAL TONE COLORS

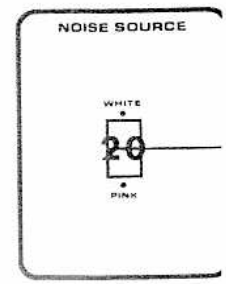
The Ring Modulator accepts two signals and outputs the sum and difference tones of these signals. For instance, if the simple frequencies 400 Hz. and 700 Hz. were used, the output would be the sum (400+700) or 1100, and the difference (700—400) or 300, tones of the input frequencies. When complex waves such as the sawtooth wave are used, the Ring Modulator will produce clangorous tone colors. Each combination of input frequencies and wave shapes will produce a different tone color or texture.



The Ring Modulator on the Sonic Six allows four different combinations of inputs by using the selector switches for Signal Input (18), and Modulating Input (19). EXT INPUT may be used only when a signal is being fed into the synthesizer through the external input on the keyboard panel. Remember, the Ring Modulator must have *two* inputs.

The output of the Ring Modulator passes through the Source Mixer and may be mixed with other Tone Sources.

NOISE SOURCE



WHITE NOISE

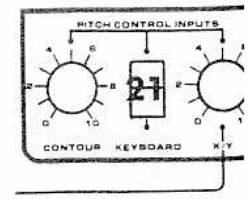
The Noise Source Selector (20) allows selection of White or Pink Noise. White Noise is the presence of all frequencies in equal amounts — just as white light represents all colors. Pink Noise is balanced to create an equal amount of energy in each octave of the frequency spectrum, creating a muting effect.

PINK NOISE

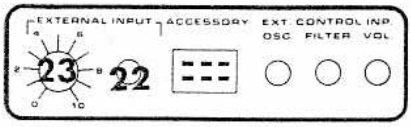
SOUND EFFECTS

White and Pink Noise are usually filtered and contoured to imitate wind, surf, jet planes, and create other sound effects. As Filter Resonance is set higher, Noise begins to take on a definite pitch determined by the position of the Cutoff Frequency. Under these conditions, if the Keyboard Pitch Input (21) under the Filter is clicked up, Noise can be played from the keyboard. Try it — it's an unusual sound.

PITCHED NOISE



EXTERNAL INPUT



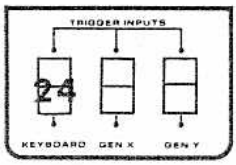
An External Input jack (22) and control knob (23) are provided in order to route sounds from guitars, microphones, combo organs, electric pianos and other instruments, through the Ring Modulator and Filter.

FILTERING EXTERNAL SOUNDS

External sounds are routed through the Filter by turning on EXT INPUT on the Source Mixer and switching Bypass to the right.

RING MODULATING EXTERNAL SOUNDS

External sounds may be Ring Modulated if EXT INPUT is selected as the Signal Input of the Ring Modulator. Ring Mod should be opened on the Source Mixer, and Bypass should be switched to the right.



TRIGGERING EXTERNAL SOUNDS

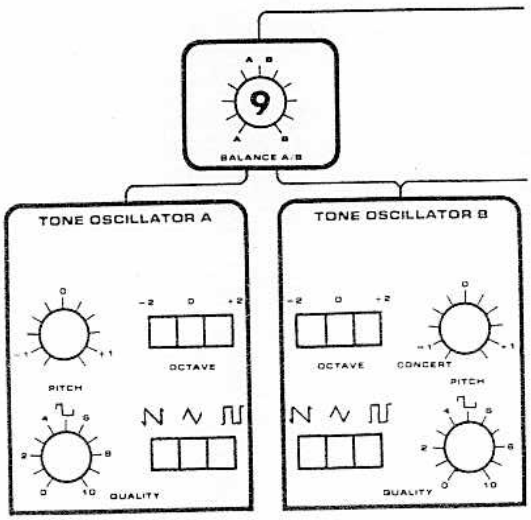
If Bypass is not used, sound will be heard only when the Contour Generator is triggered. This can be accomplished by switching up Keyboard (24) Trigger Input and striking the keyboard, or by use of Gen X or Gen Y for automatic triggering.

MODIFYING EXTERNAL SOUNDS

External sounds can be swept by the Filter Cutoff Frequency just as any other Tone Source may be (refer to instructional sequences III and IV.) For best results set the Resonance high and use a low Cutoff Frequency.

mixers

BALANCE A/B

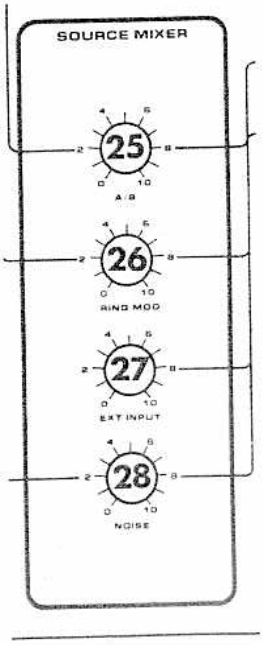


MIXING THE TONE OSCILLATORS

The Balance A/B knob (9) mixes the sounds of Tone Oscillators A and B. If the oscillators are set on dissimilar waveforms, the Balance A/B can be used to create various tone colors (mixtures of the two waves.)

In the A position only Oscillator A will be heard; in the full B position only Oscillator B will be heard. A=B represents a position in which oscillator outputs are mixed equally.

The output of the Balance A/B knob passes through the Source Mixer and is controlled by knob A/B (25).



SOURCE MIXER

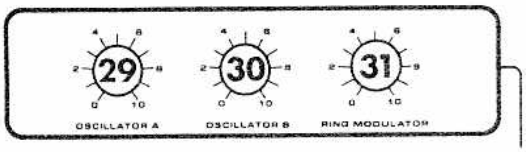
MIXING TONE SOURCES

The Source Mixer is used to combine (mix) any or all of the available Tone Sources. The output of these combined Tone Sources is routed through the Articulator and Filter. The knobs A/B (25), RING MOD (26), EXT INPUT (27), and NOISE (28) control the relative loudnesses of each Tone Source.

If all knobs on the Source Mixer are turned off (counterclockwise), no sound will be heard unless the Output Mixer is used.

OUTPUT MIXER

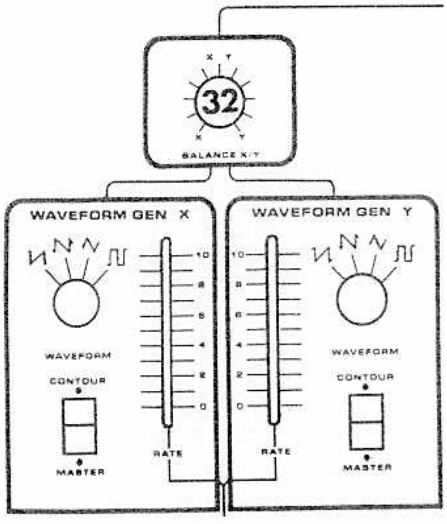
The Output Mixer bypasses all modifiers and outputs the sounds of Tone Oscillators A and B and the Ring Modulator directly.



Knobs Oscillator A (29), Oscillator B (30), and Ring Modulator (31) provide means of mixing unmodified sounds from those tone sources. This is useful to check the condition of the Tone Sources, and can sometimes be used for musical effects — it is possible to mix in unmodified sound as needed. This sound will be continuous since the Articulator is bypassed.

MIXING IN UNMODIFIED SOUND

BALANCE X/Y



Balance X/Y (32) mixes the control voltages produced by Waveform Generator X and Waveform Generator Y. To verify this, sweep the Filter by turning on X/Y under the Filter. *(Repeat instructional sequences I-IV if necessary.)* Turn Balance X/Y first to X, then to Y, then to X=Y. The rates of Waveform Gen X and Waveform Gen Y can be controlled independently with their respective Rate controls. By manipulating these controls, varying the waveshapes, and adjusting Balance X/Y, many complex control voltages may be produced.

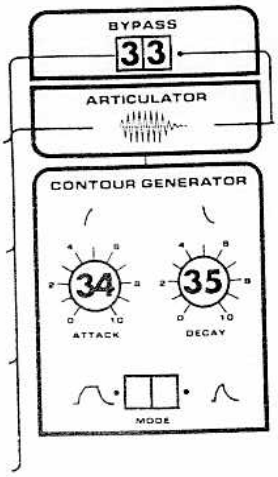
COMPLEX REPETITIVE CONTROL VOLTAGES

modifiers

ARTICULATOR AND BYPASS

BYPASS FOR TUNING

If Bypass (33) is clicked to the right, sound will bypass the Articulator and be heard continuously. This is a useful feature for tuning the instrument since a key does not have to be depressed.



ARTICULATING THE SOUND

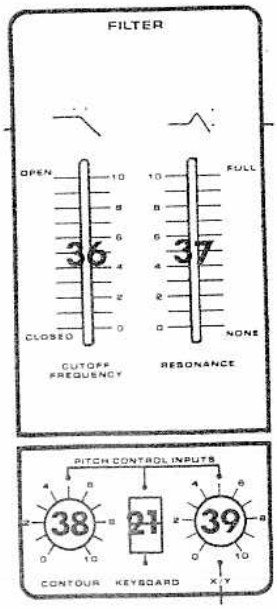
When Bypass is not being used, the Articulator will amplify a sound according to the control voltage generated by the Contour Generator. The connection between the Contour Generator and the Articulator is automatically made when the Bypass switch is clicked to the left. The control voltage is determined by the settings of Attack (34) and Decay knobs (35). A setting for a slow Attack ⌒ and Decay will create a control voltage that opens the Articulator in that pattern, causing a *sound* with that pattern to be heard.

In either Bypass position, the sound passes through the Filter and may be modified in tone color. If you wish to bypass the Filter and the Articulator, turn the knobs on the Output Mixer. Sound will then be unfiltered and not articulated (continuous).

FILTER

CREATING TONE COLORS

The Filter modifies tone color by altering the harmonic content of the Tone Source. Since the Triangle ∿ wave has few harmonics, filtering has little audible effect. Sawtooth ⩘ waves and square ⎍ waves are usually filtered to remove upper harmonics.



CUTTOFF FREQUENCY

The Cutoff Frequency (36) eliminates upper harmonics as the slider is moved toward "closed;" only sound *below* the Cutoff Frequency passes through.

Waveforms are rounded and smoothed out when the Cutoff Frequency is set low to filter out some of the upper harmonics. As the Cutoff Frequency is lowered and more and more harmonics are filtered out, bright, "open" sounds become increasingly muted and "closed".

RESONANCE

The use of Resonance (37) sharply emphasizes the Cutoff Frequency to give a more nasal sound.

FILTER SWEEP

The Pitch Control Inputs – Contour (38), Keyboard (21), and X/Y (39) provide automatic control of the Cutoff Frequency. High control voltages provide a high Cutoff Frequency; the converse is true.

REPETITIVE FILTER SWEEP

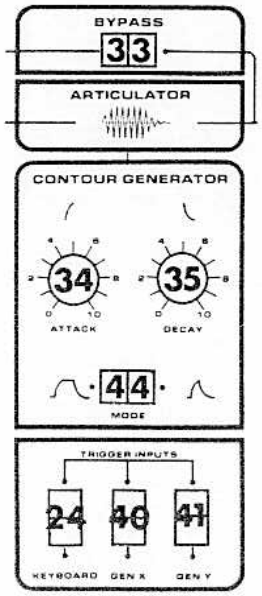
The Contour knob supplies a control voltage from the Contour Generator which is used to sweep the Cutoff Frequency of the Filter (refer to instructional sequence III). X/Y provides repetitive waveforms from the Waveform Generators X and Y, that do the same (see instructional sequence IV.) The Keyboard supplies a set of discrete control voltages that move the Cutoff Frequency. The highest key on the keyboard provides the highest Cutoff Frequency, and the converse. Controlling the Filter with Keyboard (21) adds brilliance as one ascends the keyboard.

BRILLIANCE

FILTER AS OSCILLATOR

At very high Resonance levels, the Filter will oscillate and produce a pitch that varies as the Cutoff Frequency is changed.

control generators



CONTOUR GENERATOR

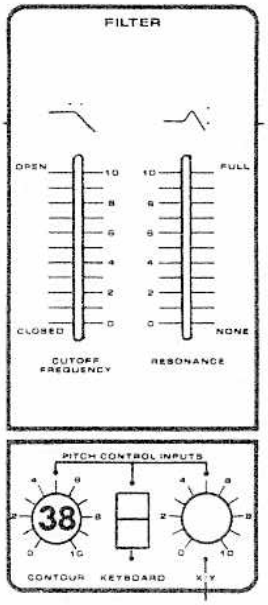
The Contour Generator develops a control voltage in various patterns set by Attack (34) and Decay (35) control knobs. A slow Attack and long Decay will produce this kind of control: ⌒ (one of numerous possibilities). Since the Contour Generator is internally connected to the Articulator (unless Bypass (33) is used), the control voltage will create a rise and fall in *loudness* (see instructional sequence I and II) that mirrors the control voltage. The Contour Generator creates a control voltage that opens and closes the Articulator.

ATTACK / DECAY

CONTROLLING THE ARTICULATOR

The same control voltage ⌒ can be used on Oscillator A to create a rise and fall in *pitch* by turning the Contour knob (12).

PITCH CONTOUR



The control voltage can also be used to create a rise and fall in Cutoff Frequency on the Filter. The Filter Contour knob (38) controls the amount of contour imparted to the Filter.

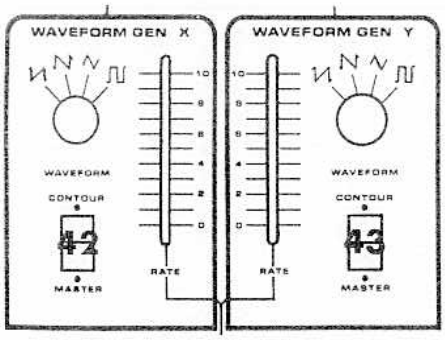
FILTER CONTOUR

The Contour Generator begins a contour, or control voltage, when it receives a Trigger from Keyboard (24), Gen X (40), or Gen Y (41).

TRIGGERING THE CONTOUR GENERATOR

Just as the Contour Generator controls the pitch of Oscillator A, it can control the tempo (Rate) of Waveform Gen X and Y by selecting Contour on the appropriate switches (42 and 43).

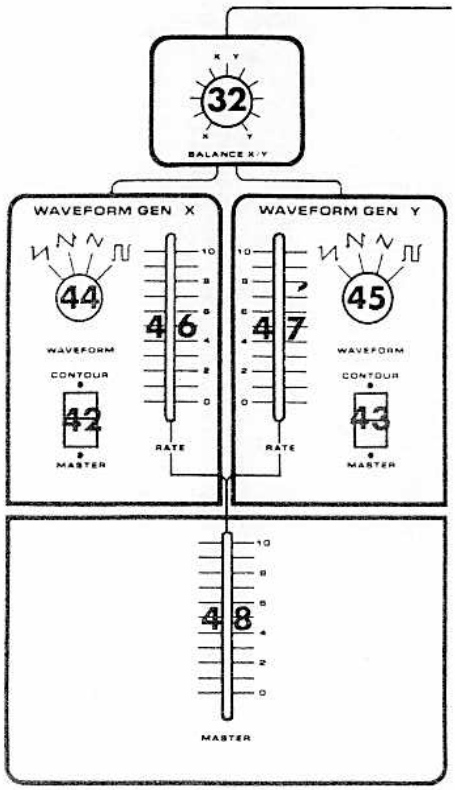
CONTROLLING WAVEFORM GEN. X & Y RATE



The Contour Generator has two modes of operation selected by the Mode switch (44). In the left position, any sound played will be sustained as long as a key is depressed. In the right position, the Contour Generator acts strictly as a timer, and the sound will last only for a duration set by Attack and Decay. This position is useful for the production of plectrum, or plucked string sounds.

PLUCKED STRING SOUND

WAVEFORM GEN. X AND Y



WAVESHAPE SELECTION

The Waveform Generators create repetitive control voltages of several shapes selected by the Waveform Selectors (44 and 45). The outputs of Gen X and Gen Y are balanced by Balance X/Y (32) to create unusual combinations of wave shapes.

BALANCE X/Y

MANUAL CONTROL OF RATE

The Rate, or speed of each generator is controlled by the Rate sliders (46 and 47). The overall rate is controlled by Master (48). The Rates may also be controlled automatically by the Contour Generators by clicking up the Master-Contour switches (42 and 43).

AUTOMATIC CONTROL OF RATE

REPETITIVE FILTER SWEEP

These repetitive ⋀⋀⋀ control voltages may be used to sweep the Filter Cutoff Frequency (see instructional sequence IV), or modulate Tone Oscillators A and B, creating vibrato and other frequency modulations.

REPETITIVE PITCH MODULATION

VISUAL CUES

The output of the Waveform Generators X and Y is routed (see lines) to the tone oscillators and is controlled by knobs X/Y (10 and 11). X/Y (39) under the Filter controls the amount of Filter modulation, or sweep.

BALANCE X/Y IN "CLICK" POSITION

When Balance X/Y is in the "click" off position, Waveform Gen X is routed to Tone Oscillator A, and Waveform Gen Y is routed to Tone Oscillator B. This allows independent amounts and speeds of vibrato or other frequency modulation on two separate notes.

OSCILLATOR A AS CONTROL GENERATOR

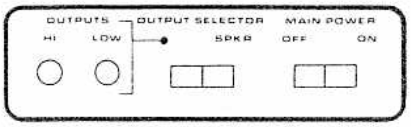
OSC. A

The output of Oscillator A may be used to control the pitch of Oscillator B. Osc A (13) knob controls the amount of modulation, and the knobs and switches on Oscillator A control the speed and shape of modulation. Since Oscillator A is an audio oscillator, the modulation produced is usually so fast as to amount to a growl.

GROWLING EFFECT

keyboard panel controls

OUTPUT SECTION

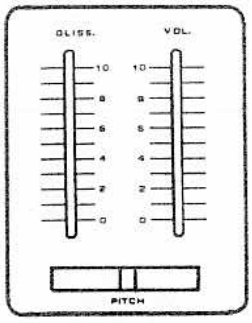


MAIN POWER turns the Sonic Six on and off.

OUTPUT SELECTOR selects the inboard speaker (SPKR) or routes the audio signal from the Sonic Six to an external amplifier and speakers.

OUTPUTS HIGH and LOW are phone jacks used to route the audio signal from the Sonic Six to external amplifier and speakers. The HIGH OUTPUT has a nominal level of 1 volt rms and is suitable for driving home music or professional audio amplifiers. The LOW OUTPUT has a nominal level of 30 millivolts rms and is suitable for driving musical instrument amplifiers.

PERFORMANCE CONTROLS



MASTER VOLUME controls the overall loudness of the entire synthesizer output, whether the internal, or external speakers are used.

MASTER VOLUME

GLISSANDO controls the amount of *glissando* or sliding from one pitch to the next. The glissando control is located to the left of the keyboard so glissando may be controlled during performance. A setting of 0 produces fastest gliss; 10 is slowest.

GLISSANDO

PITCH is a wheel that may be used to "bend" the pitch during performance. Rotation to the right raises the pitch; rotation to the left lowers pitch. With some practice a sensitive vibrato can be produced with this control.

PITCH

KEYBOARD

The keyboard produces control voltages that may be applied to the Tone Oscillators and/or the Filter.

CONTROLLING OSCILLATOR PITCH

The most common use of the keyboard is the control of the Tone Oscillators A and B. The Keyboard controls are found under the oscillators, and consist of a selector Switch (14), and a knob marked "Scale" (15).

The Switch selector and Scale knob offer several possibilities for Tone Oscillator control.

If Scale is turned *off* (fully counterclockwise):

1. With "Low Note" selected—
   Oscillator A will follow the keyboard.
   Oscillator B will not be affected.
2. With "Off" selected—
   The keyboard has no effect on either oscillator.
3. With the rightmost position selected—
   The keyboard has no effect on either oscillator.

If Scale is turned to *Diatonic:*

1. With "Low Note" selected—
   Both oscillators will follow the keyboard; Oscillator A will play the lowest note depressed; Oscillator B will play the highest.
2. With "Off" selected—
   Oscillator B will follow the keyboard.
   Oscillator A will not be affected.
3. With rightmost position selected—
   Both oscillators will follow the keyboard and play the highest note depressed.

The Keyboard Controls offer several musical possibilities for Tone Oscillator control; here are a few:

MUSICAL USES OF KEYBOARD CONTROLS

1. Play two independent lines by tuning Oscillators A and B to unison, selecting "Low Note", and "Diatonic."
2. Play above a drone by setting Selector Switch (14) to "Off", tuning Osc A to drone pitch desired and setting scale to "Diatonic".
3. Play parallel intervals by tuning Oscillators A and B to an interval, selecting rightmost switch position, and "Diatonic" on Scale.
4. Play microtonal scales by varying setting on Scale.

In the "Low Note" position Oscillator A will play the lowest key depressed. If Oscillator B is following the keyboard, it will play the highest key depressed. When the rightmost position is selected, both Oscillators A and B will play the highest key depressed.

NOTE: With Selector Switch in "Low" position, Osc A will not be affected by "Glissando" Control (16).

The keyboard can be used to alter the Cutoff Frequency of the Filter in discrete steps through use of the Keyboard switch (21) found under the Filter. If you press the lowest key the Cutoff Frequency is lowest; if you press the highest key the Cutoff Frequency is highest. By manually varying the Cutoff Frequency Control (36) you add or subtract control voltage to that of the keyboard which in turn raises or lowers the range of cut-off frequencies. Controlling the Filter with the keyboard adds brilliance or brightness as one ascends the scale.

CONTROLLING THE FILTER

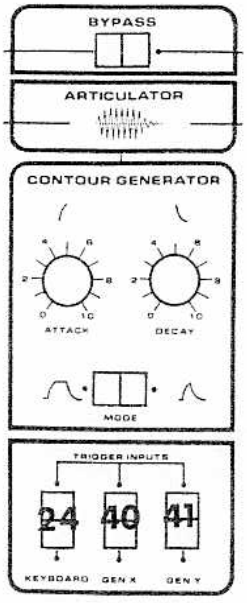
MUSICAL EFFECT OF BRILLIANCE

In addition to creating control voltages the keyboard outputs a Trigger that is used to start the action of the Contour Generator. This Keyboard Trigger Switch (24) allows one to start contours at will by striking the keyboard.

TRIGGERS

A Trigger is a surge of voltage that starts the action of the Contour Generator. A Trigger is therefore necessary for the production of articulated sound.

NECESSITY OF TRIGGER



The Trigger Inputs are located under the Contour Generator. Triggers may be received from the Keyboard (24), Gen X (40), or Gen Y (41).

The Trigger from the keyboard tells the Contour Generator *when* the keyboard is being struck. Triggers from Gen X and Y (Waveform Generators X and Y) may be used to cause a repetition of sound. The rate of repetition is dependent on the Rate sliders on the Waveform Generators. The waveshape is unimportant since the Trigger occurs when the square ⎍⎍ wave starts the positive plateau and that happens exactly once each cycle for any waveform.

Triggers from Gen X and Y may be used to create strumming sounds like banjo playing. Rhythmic percussive sequences can be created by setting the Rate of each Waveform Generator at different positions and triggering the Contour Generator with both Gen X and Gen Y.

MUSICAL USES FOR REPETITIVE TRIGGERS

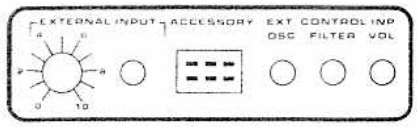
INPUT SECTION

INPUT SECTION

The INPUT SECTION allows the input of external sounds and provides control inputs for external controllers such as pedals, percussion controllers, etc., used to control loudness, pitch, and tone color during performance.

EXTERNAL INPUT

EXTERNAL INPUT is a jack which allows the input of external sounds from devices such as guitars, organs, tape recorders, and high level microphones, to be fed through the modifying devices on the Sonic Six. The input is provided with a control knob to govern the level of input.



EXT. CONTROL INP./OSC. accepts a control voltage that can be used to control the pitch of the Tone Oscillators.

EXT. CONTROL INP./FILTER accepts a control voltage that controls the position of the Cutoff Frequency of the Filter.

EXT. CONTROL INP./VOL. accepts a control voltage that controls the overall volume of the Sonic Six.

ACCESSORY

ACCESSORY is used to power special Moog accessory controllers such as the percussion controller.

MUSIC INC.

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