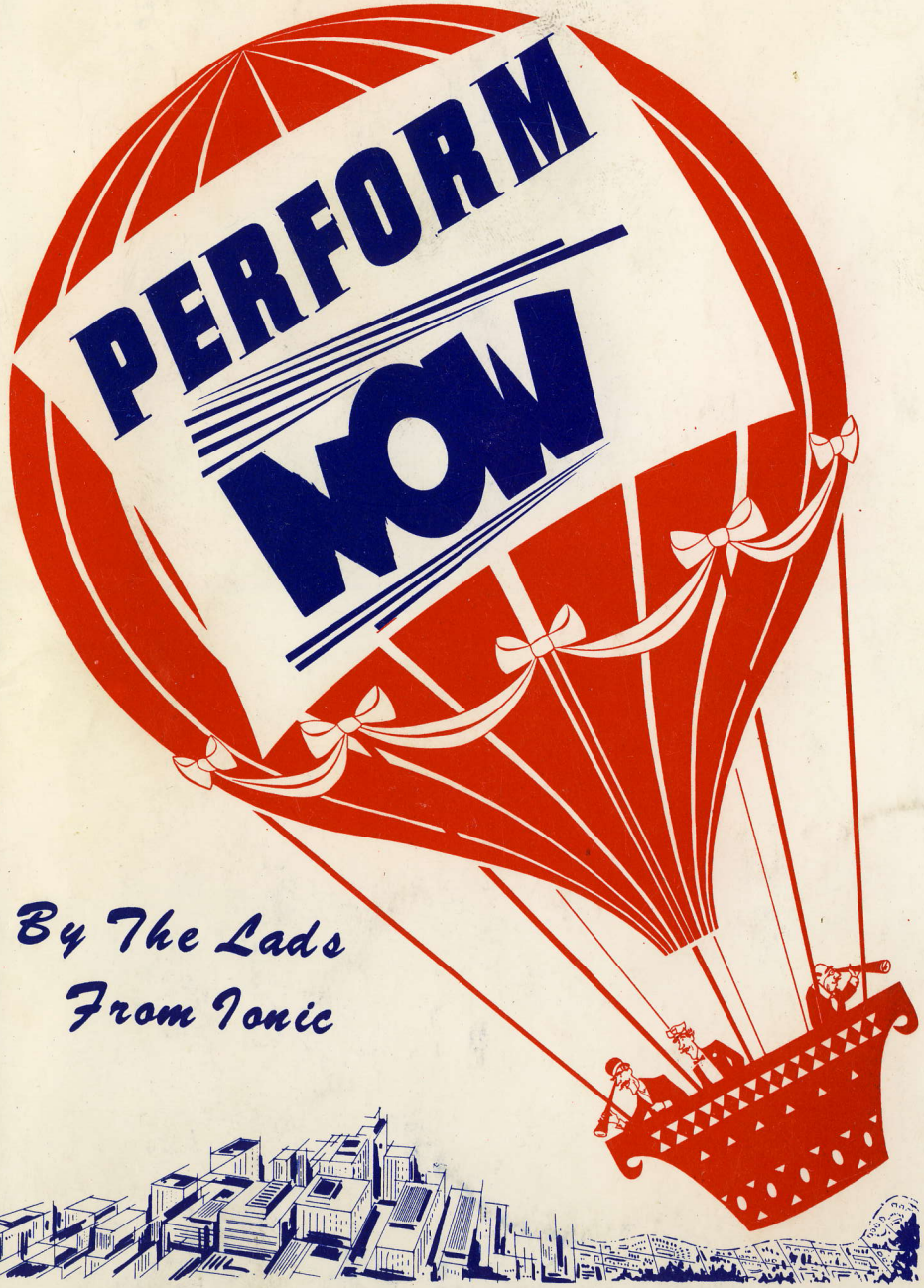
a non-technical approach to electronic music synthesis



By The Lads From Ionic

instant realization

no requisites

no talent

no math

no physical development

Anyone can get involved

all ages

color coding (a visual approach)

all arts . . . all sciences

Morristown, New Jersey 07960

PRICE $2.50

CONTENTS

performer
by ionic

 Morristown, New Jersey 07960

FOREWARD

Synthetic sound has been around for lo these fifty years. The sound itself has proved intriguing; it grows more popular, daily. However, the hardware involved in achieving the sound and the texts that have appeared on the market, merely make the involvement in the field, by any great numbers, unlikely. The pioneers and practitioners have succeeded in maintaining an elite, obtuse understanding.

With this in mind, we, at Ionic, have designed and produced the PERFORMER. Frankly, we feel the mystery is over. Involvement need not be that difficult, the instrument to perform on need not be complicated and expensive and, further, we're out to demonstrate that the greatest boon to come forth from this endeavor is INSTANT REALIZATION. Traditionally, the study of music, as we have known and experienced it, is a practise of a period of servitude for the development of the fingers or embouchure; the goal and hope was that, at some time in the future, the musical caterpillars would bud into musical butterflies. The track record speaks for itself; along the route, the bulk of the novitiates were slaughtered and sacrificed for the very few that endured the process. In other fields of endeavor, the pursuits of study have been updated and reflect modern man's development and achievement. Synthesis is not only an expansion of music as we've known it, it is also technology catching up with music and the arts. The Neanderthal notion that one must be a musical athlete in order to be involved is sheer nonsense, today. In place of the process of attrition described, synthesis substitutes instant achievement!

This volume is an approach to have any individual, with or without inclination, ability or understanding to follow the simple directions and achieve desired aural and visual effects. Like smearing the paint around in a finger painting process, we can all become involved to the extent of our interest and awareness. We'll produce a great many sounds on the spot; the challenge can inspire us to further become involved and understanding will follow. This is a true learning process and we envision the PERFORMER as an experience amplifier. Turn the pages, press the color coded switches and ENJOY!

ALFRED MAYER

TO START

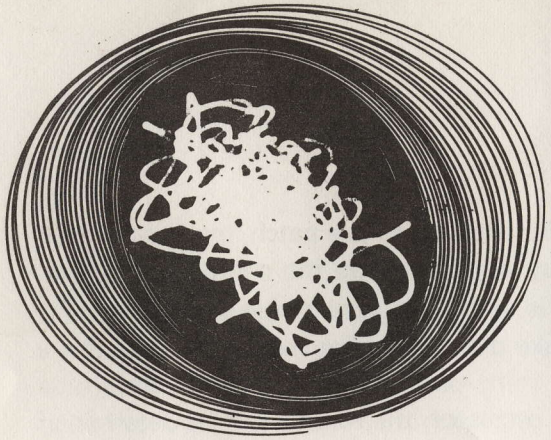
Electronic music requires first and foremost, electricity. The first step in getting involved is to have the power cord connected to an electrical outlet. The power switch is located in the upper right hand corner of the PERFORMER. When turned to ON, the PERFORMER logo in the lower left hand corner will light up to indicate the power is ON. If there is no light, you can check the cord, the outlet, the light or the fuse. Beyond that point, you'd have to consult your dealer, serviceman or distributor.

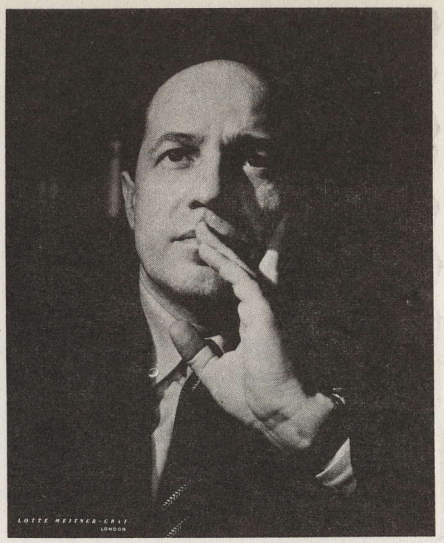
There is nothing that can be harmed on this unit by pressing in switches. However, the one problem that can manifest itself is the possibility of overpowering external speakers. If the volumes are turned up too high, it is possible to send forth a blast of a strong sine wave, for example and blow your speakers. Make certain your volume controls are not set too high before making any sounds. It is better to set them at lower volumes and turn them up when power is desired. The over-all volume is controlled by the pan controls on the lower left cheek block of the keyboard. The two slide pots control the sound in the left and right channels; the pan slide controls can change the sounds from left to right or combine them in either of the two channels. The quad sound connections in the rear will further extend the sound about the room. In addition, the automatic pan on the lower right of the control panel will cause the sound to automatically shift from right to left at a rate determined by the setting of the rate knob. This spatial approach to music is more in tune with today's experimental sound and total environmental involvement. It is nearer to a natural sound as we hear it; it creates a new vocabulary for greater expression.

When a number of switches are used in one patch, many times the volume can be controlled by some items on the control panel. For example, when the reverb is used in a circuit, the volume control knob of the reverb may take over the entire volume; when using a low frequency of say the third oscillator to create an amplitude modulation of say the first oscillator, the volume will be determined by the intensity of the wave being generated. Make certain the wave is not at maximum volume at such time; turn it down and increase the volume, if need be, after you hear it.

No apparent damage can be done to the terminals in the rear of the PERFORMER if used properly. Telephone jacks are used throughout. It would be a good idea to have an assortment of cables to connect up to various type equipment. Ionic has available cables in a variety of colors so that you can trace the connections made in the rear by color. If you hook up amps, speakers, mikes, scopes, Ionicamera, Digionic, external sources etc., you'll be glad you used color coded cables. You might also get an assortment of adaptors for RCA type connectors for equipment not using telephone jacks. Some caution should be used in using the headset jack; it is stereo and headphones used with it should be stereo. The use of a monaural headset can short out this terminal. Also, the trigger terminal is for use with the Digionic and it might be a good idea to cover over this terminal with tape if not in use.

ionicamera*





Famed conductor, Pierre Boulez said, ***"Woods, strings and reeds are far more artificial than the wind in the leaves....."***

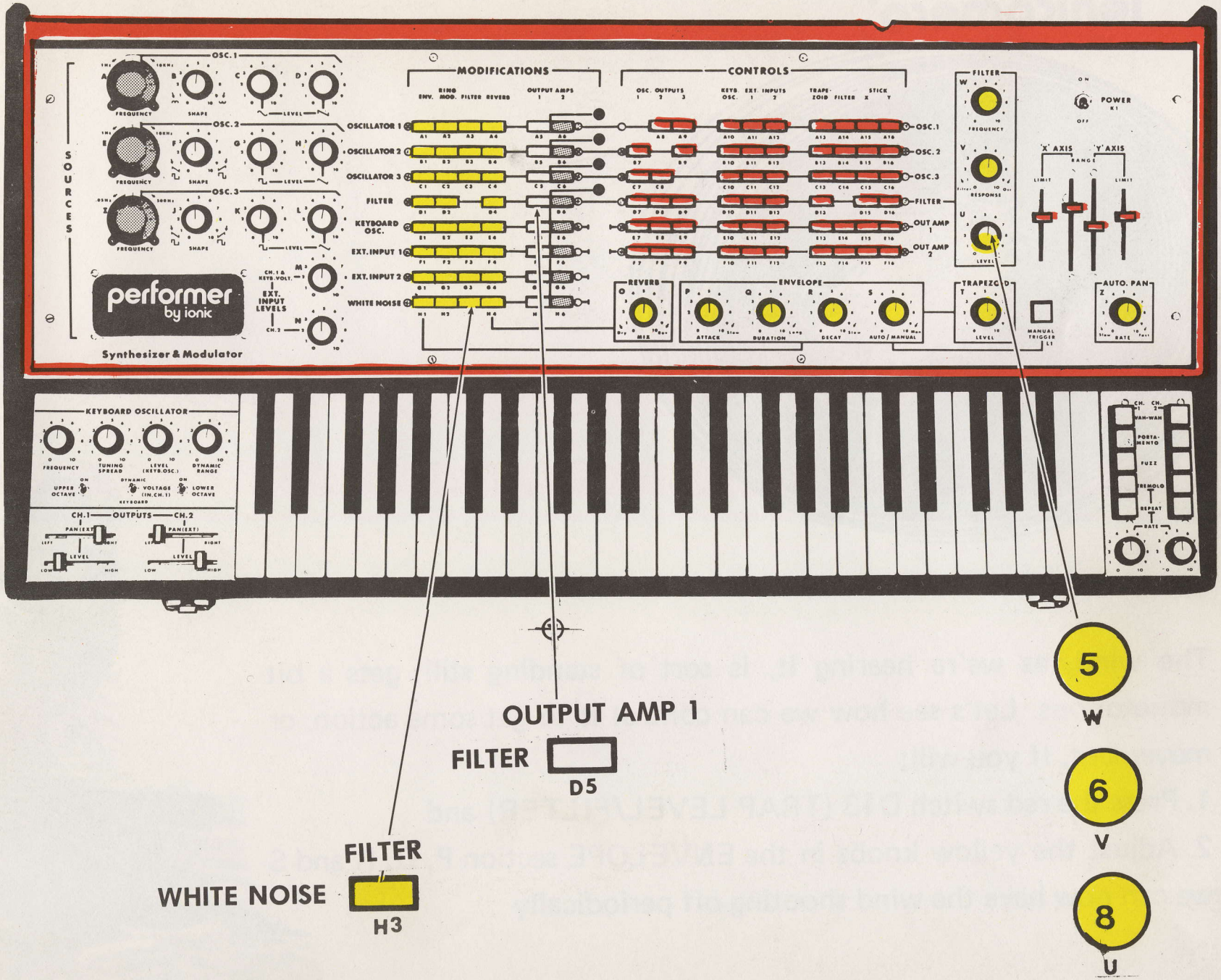
To create the

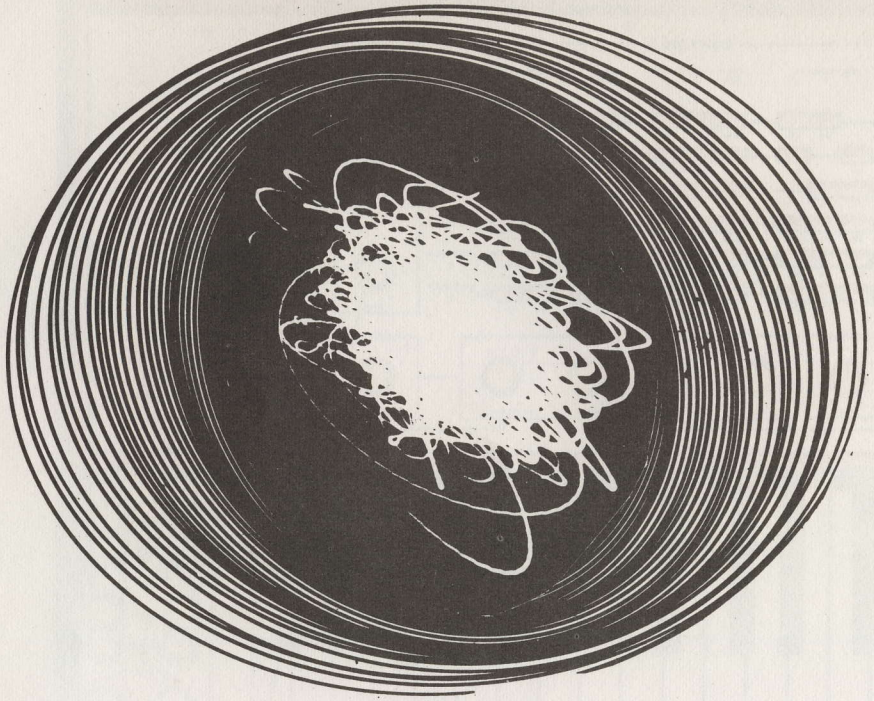
WIND IN THE LEAVES:

1. Press the Yellow Switch H3 (White Noise/Filter)

2. Press the White Switch D5 (Filter/Output Amp)

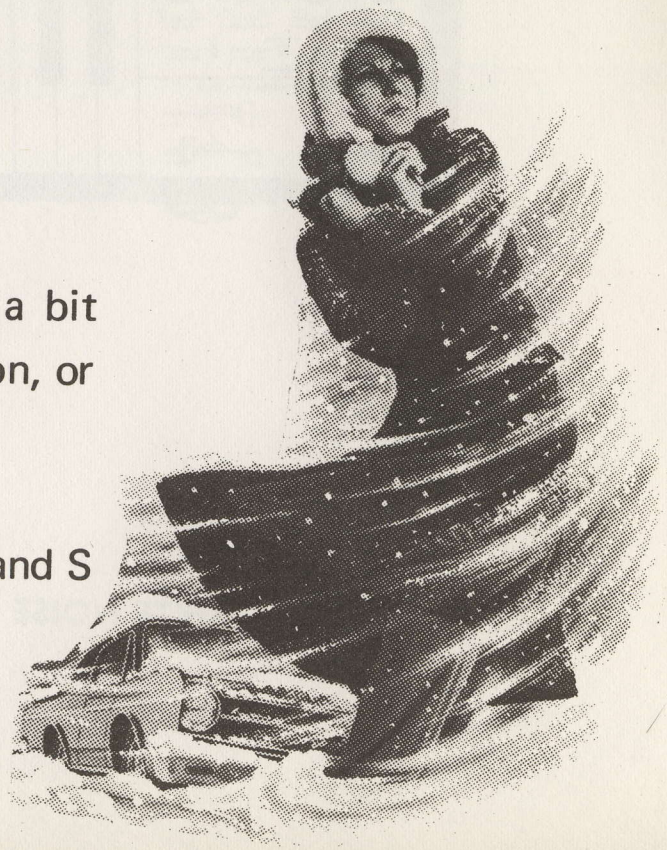
This is the wind. Adjustments to make it more whooshy can be found by adjusting the Yellow Knobs in the FILTER PANEL marked W, V and U

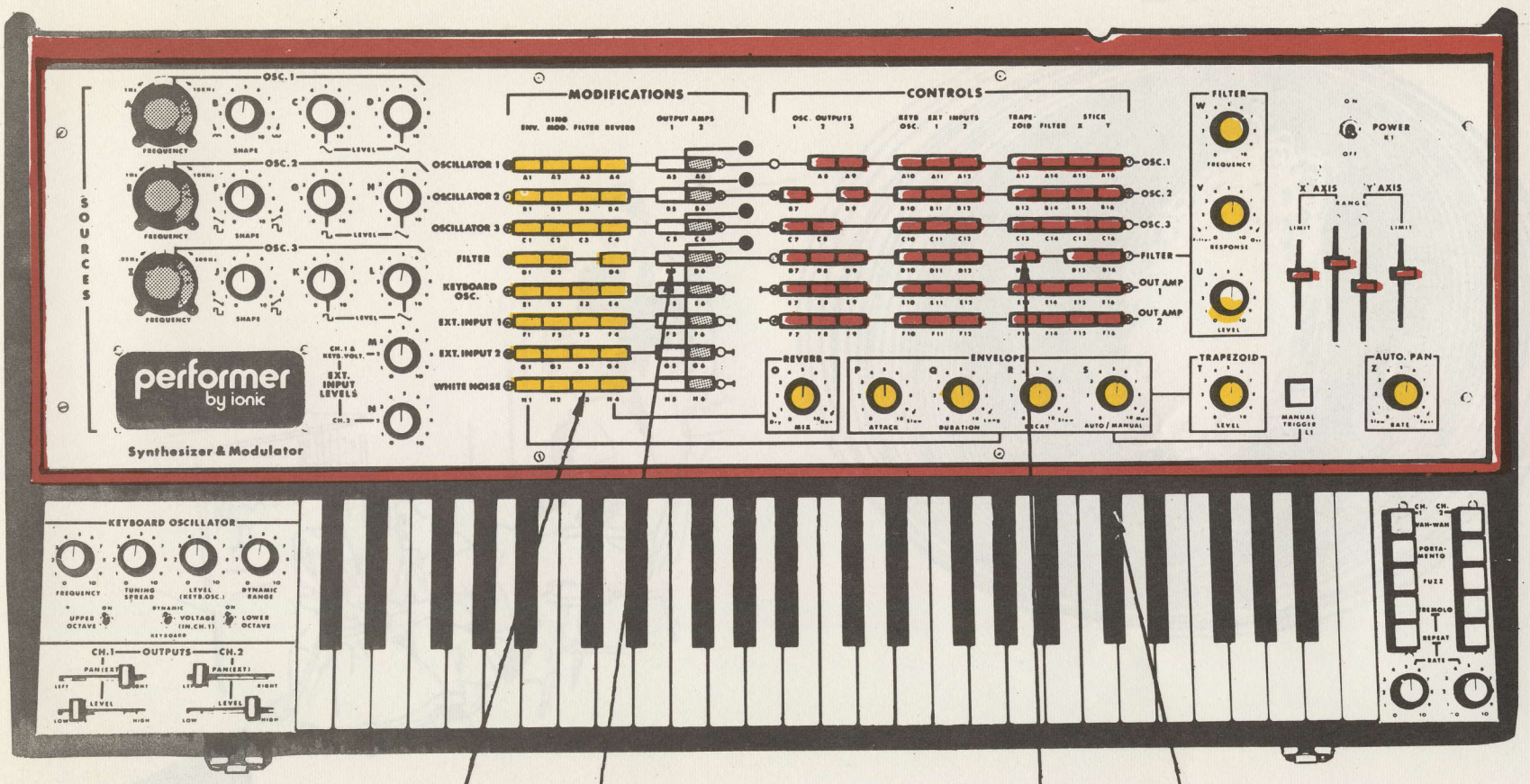

performer
by ionic
Synthesizer & Modulator
SOURCES
OSC. 1
OSC. 2
OSC. 3
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
REVERB
ENVELOPE
FILTER
TRAPEZOID
AUTO. PAN
POWER
'X' AXIS
'Y' AXIS
MANUAL TRIGGER
KEYBOARD OSCILLATOR
CH.1 OUTPUTS CH.2
OUTPUT AMP 1
FILTER
D5
FILTER
WHITE NOISE
H3
5
W
6
V
8
U

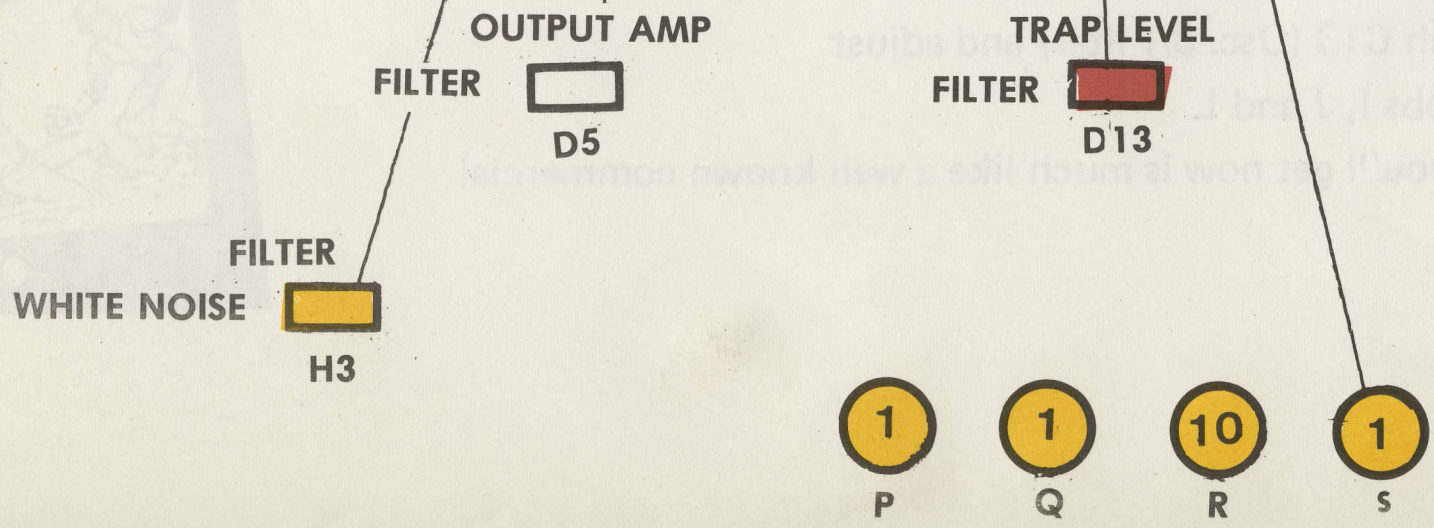


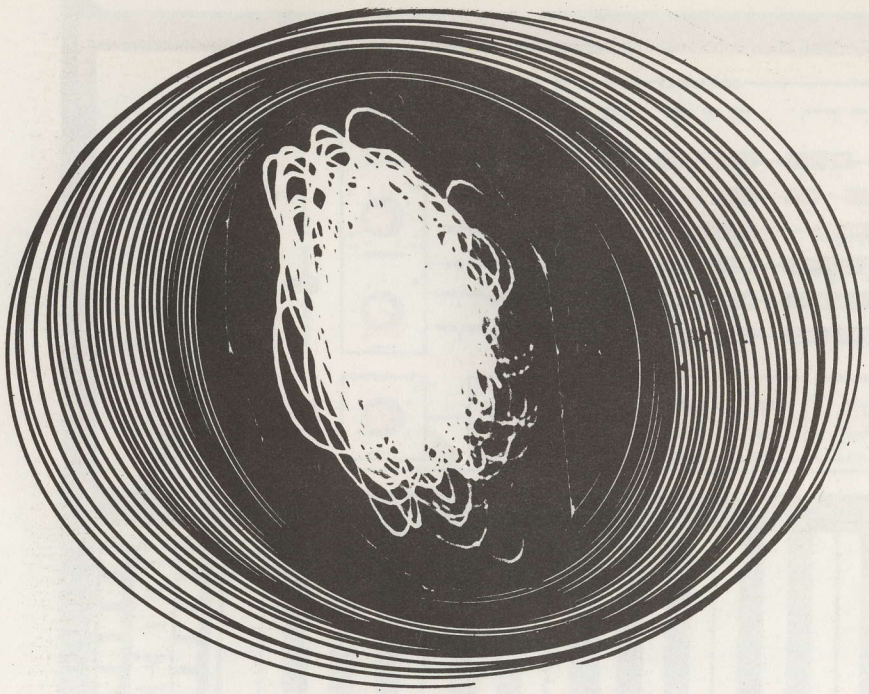
The wind, as we're hearing it, is sort of standing still; gets a bit monotonous. Let's see how we can control it to get some action, or movement. If you will;

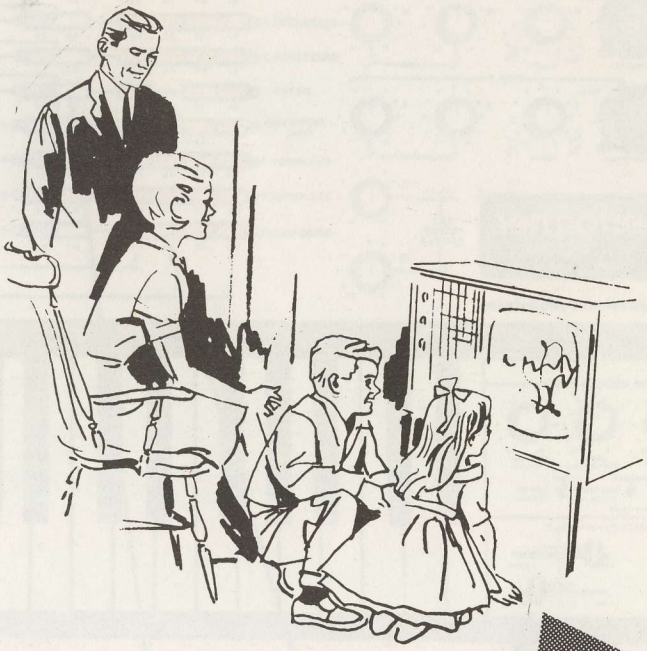
1. Press the red switch D13 (TRAP LEVEL/FILTER) and
2. Adjust the yellow knobs in the ENVELOPE section P, Q, R and S we can now have the wind shooting off periodically




performer
by ionik
Synthesizer & Modulator
SOURCES
OSC. 1
OSC. 2
OSC. 3
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
REVERB
ENVELOPE
TRAPEZOID
FILTER
POWER
X AXIS
Y AXIS
AUTO. PAN
KEYBOARD OSCILLATOR
OUTPUTS
MANUAL TRIGGER


OUTPUT AMP
FILTER
D5
TRAP LEVEL
FILTER
D13
FILTER
WHITE NOISE
H3
1
P
1
Q
10
R
1
S

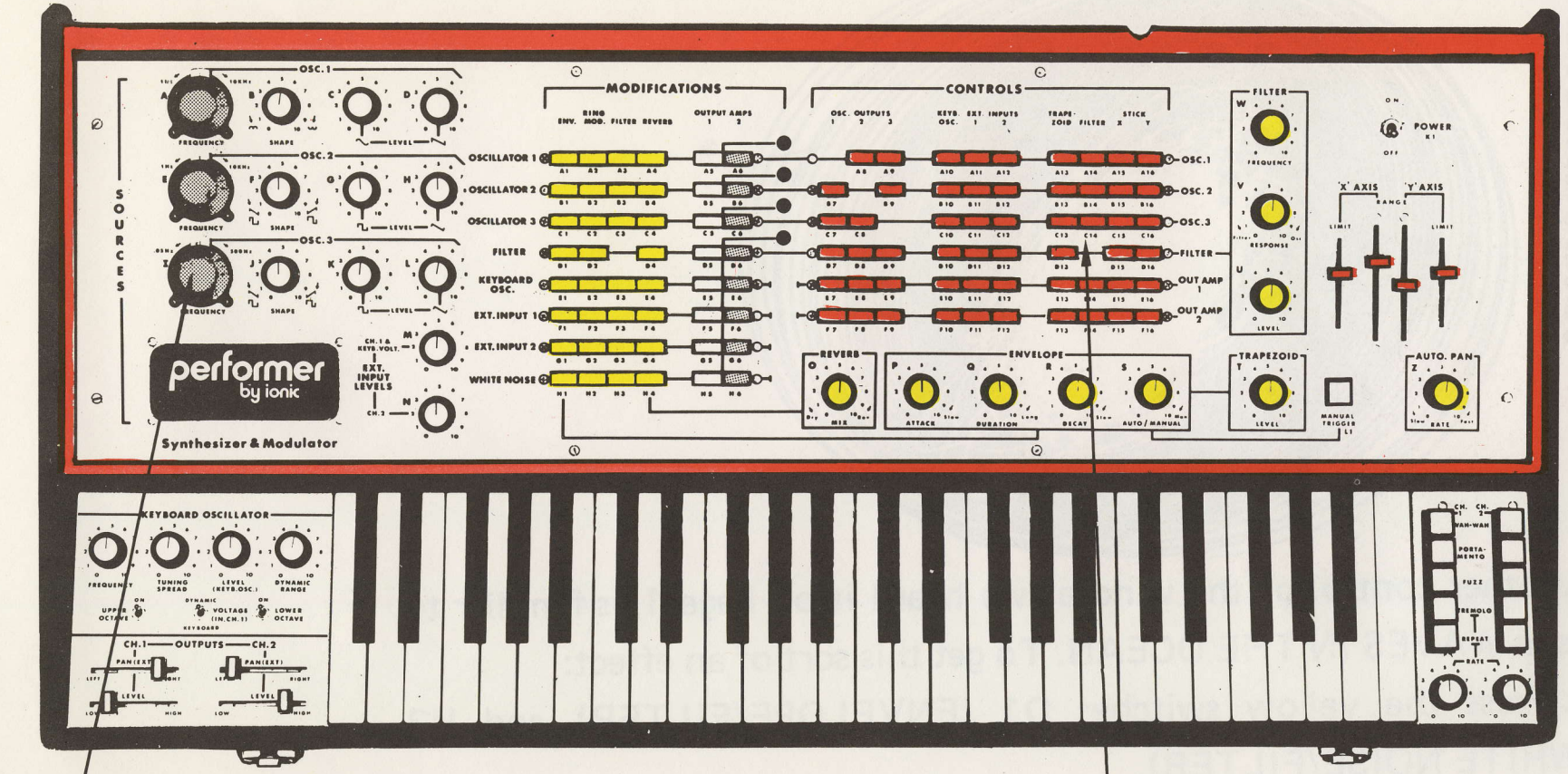


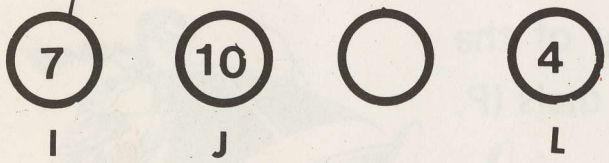


If you'd like to make this STILL more interesting, add

1. Red switch C13 (Osc. 3/Filter) and adjust
2. Silver knobs I, J and L

The sound you'll get now is much like a well known commercial

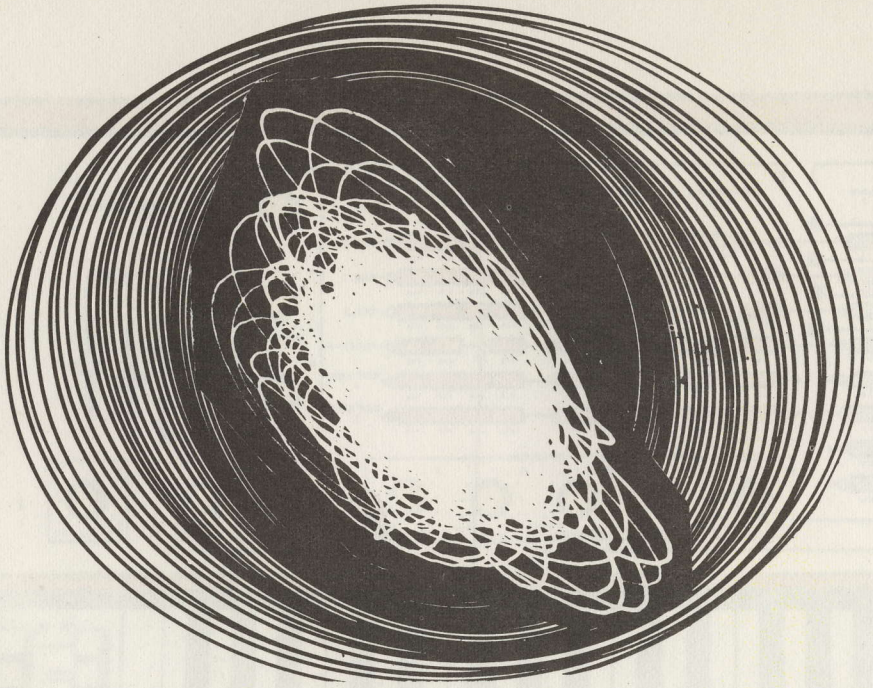




FILTER

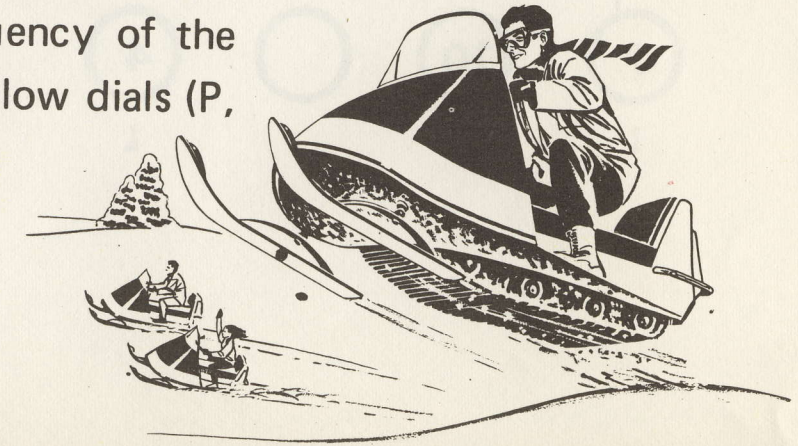
OSC 3

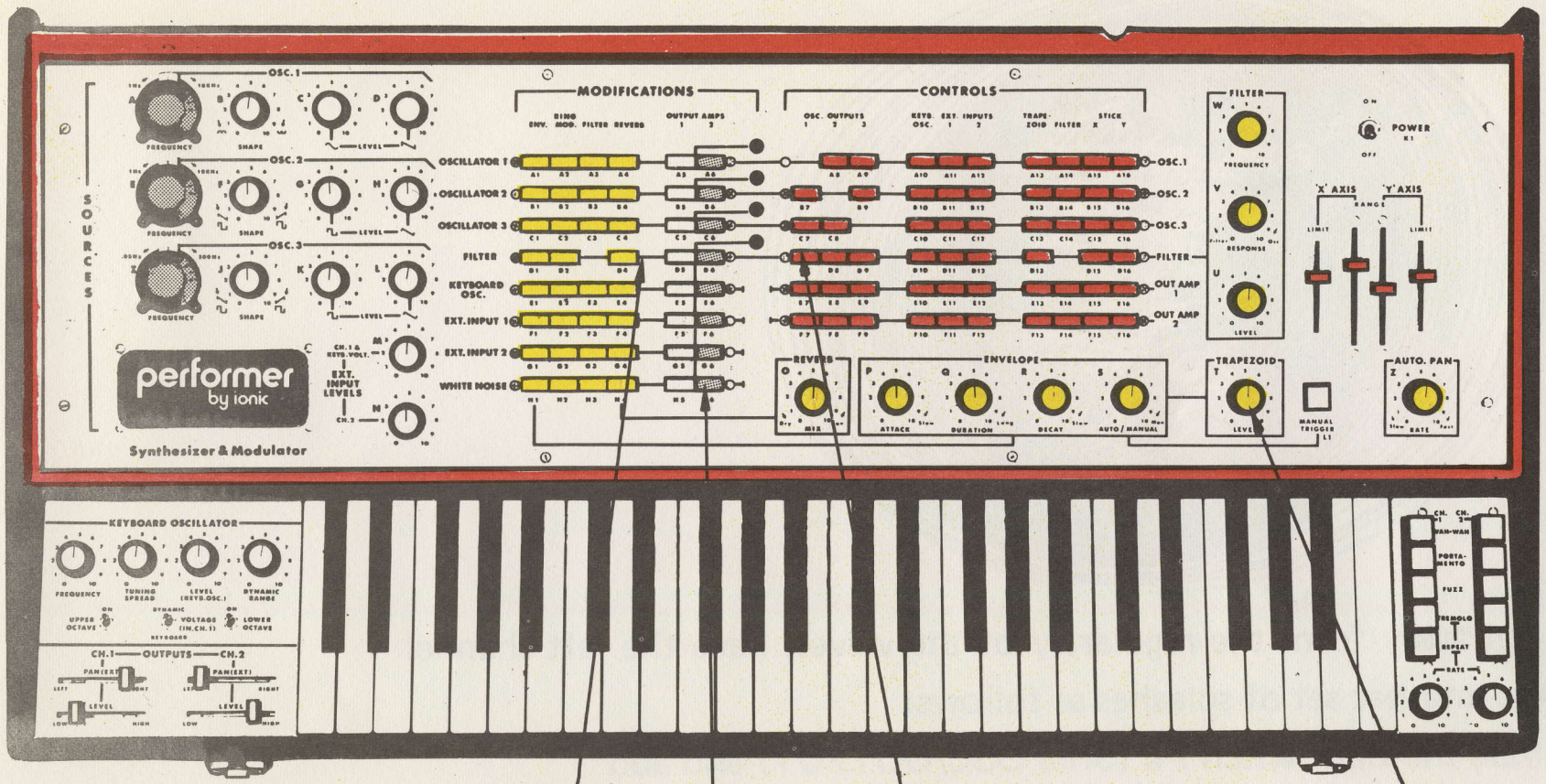
C13



Another control of the wind as we heard it on Page 1, is familiar to us as WAVES IN THE OCEAN. To get this sort of an effect:

1. Press the yellow switches D1 (ENVELOPE/FILTER) and H3 (WHITE NOISE/FILTER).
2. For the sound, add the White switch D5 (FILTER/OUTAMP).
3. Adjustments and variations in the length and frequency of the waves can be made with the ENVELOPE SECTION yellow dials (P, Q, R and S) as follows:





ENVELOPE

FILTER

D1

OUTPUT AMP 1

D5

FILTER

WHITE NOISE

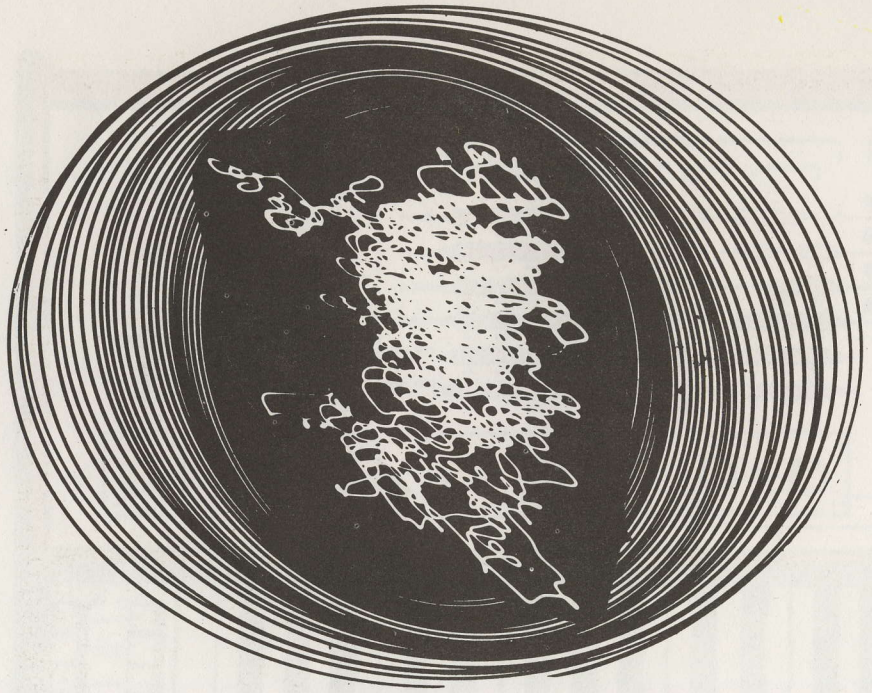
H3

6 P

6 Q

10 R

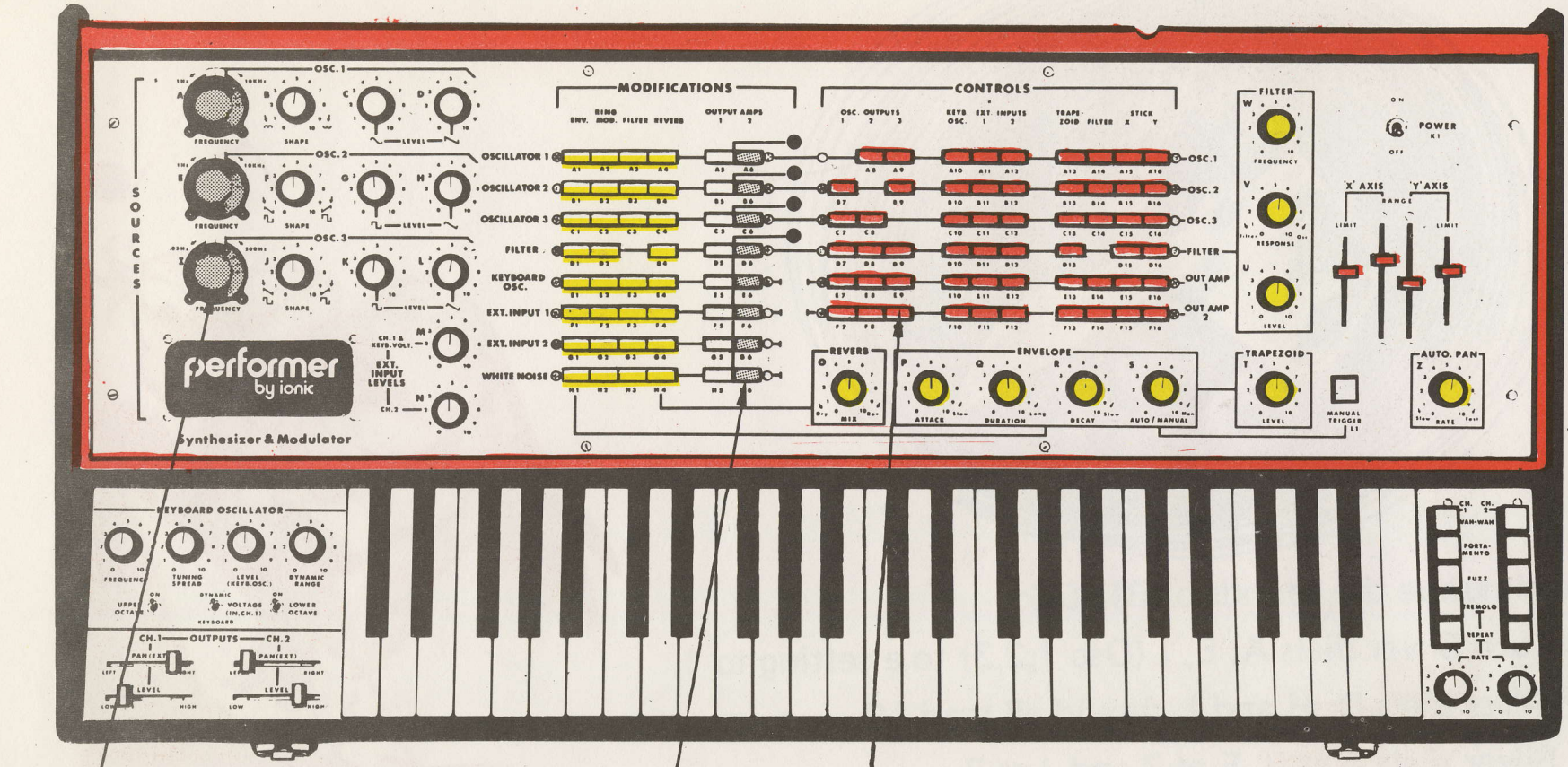
0 S

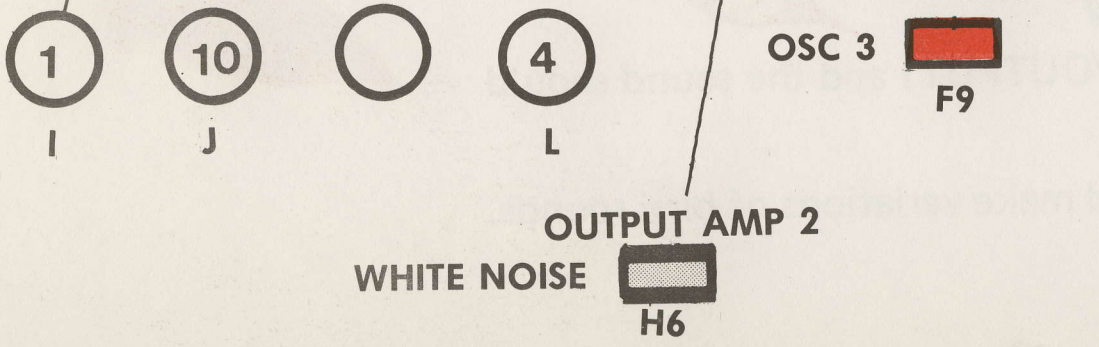


To get away from the regularity of the waves, have the left channel create another set of splashes as follows:

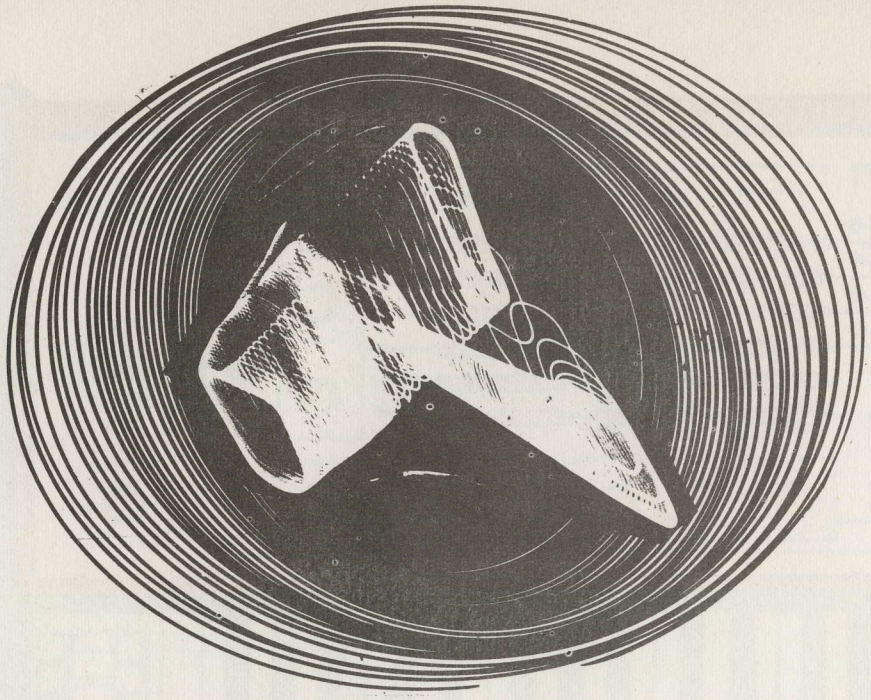
1. Press the Red switch F9 (3RD OSC/OUTPUT) and add
2. The Grey switch marked H6 (WHITE NOISE/OUTPUT AMP)

Adjust rate with Silver knobs I, J and L (Third Oscillator)


performer
by ionik
Synthesizer & Modulator
SOURCES
OSC. 1
OSC. 2
OSC. 3
FREQUENCY
SHAPE
LEVEL
MODIFICATIONS
RING MOD.
FILTER
REVERB
OUTPUT AMPS
CONTROLS
OSC. OUTPUTS
KEYB. OSC.
EXT. INPUTS
TRAPEZOID
STICK
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
OSC.1
OSC. 2
OSC.3
FILTER
OUT AMP 1
OUT AMP 2
EXT. INPUT LEVELS
REVERB
MIX
ENVELOPE
ATTACK
DURATION
DECAY
AUTO / MANUAL
TRAPEZOID
LEVEL
MANUAL TRIGGER
FILTER
FREQUENCY
RESPONSE
LEVEL
POWER
X AXIS
Y AXIS
RANGE
LIMIT
AUTO. PAN
RATE
KEYBOARD OSCILLATOR
FREQUENCY
TUNING SPREAD
LEVEL (KEYB.OSC.)
DYNAMIC RANGE
UPPER OCTAVE
DYNAMIC VOLTAGE (IN.CH.1)
LOWER OCTAVE
KEYBOARD
CH.1 OUTPUTS CH.2
PAN (EXT)
LEVEL
WAH-WAH
PORTA-MENTO
FUZZ
TREMOLO
REPEAT
RATE


1
10
4
I
J
L
OSC OUTPUT
OSC 3
F9
OUTPUT AMP 2
WHITE NOISE
H6

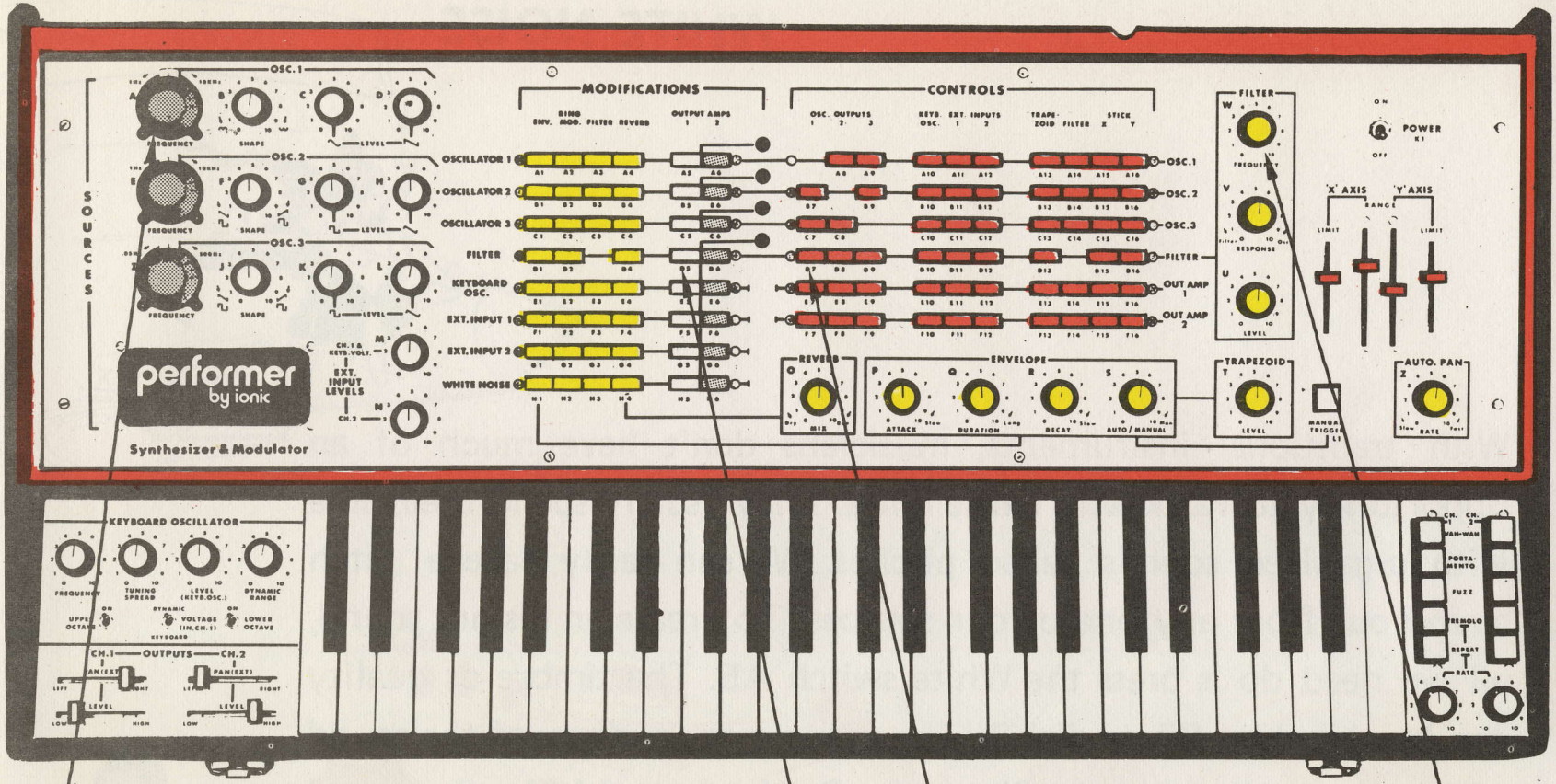
ionicamera*

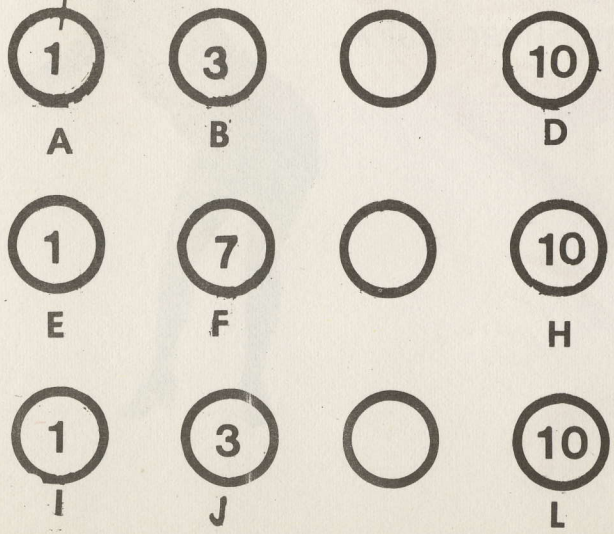


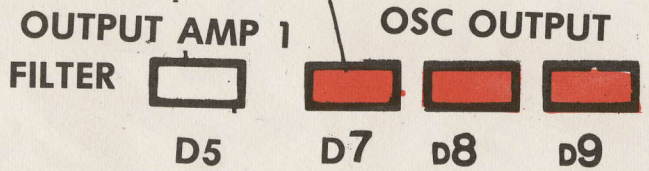
To simulate the sounds of BIRDS:

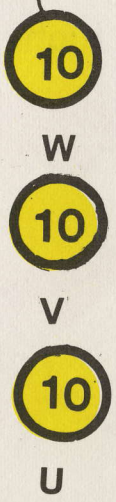
1. Turn Silver dials A, E, I (Osc 1,2,3) to a setting to 1
2. Silver dials D, H and L should all read 10
3. Silver dials B at 3, F at 7 and J at 3
4. Push in Red switches D7, D8, D9 (FILTER/OSC OUTPUTS 1, 2 and 3)
5. Turn Yellow dials WV and U to 10
6. Press Yellow switch D5 (FILTER/OUTPUT) and the sound should be of birds.

Wiggle and adjust dials F and J and make variations of bird sounds.

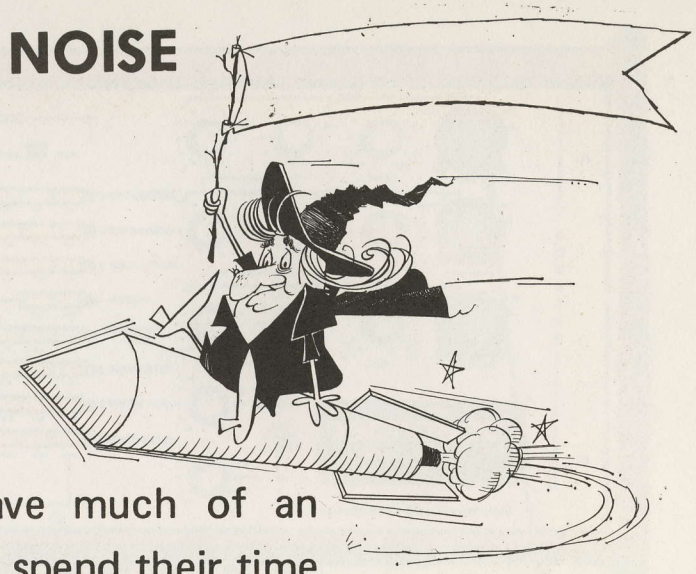

performer
by ionic
Synthesizer & Modulator
SOURCES
OSC. 1
OSC. 2
OSC. 3
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
OSC.1
OSC.2
OSC.3
FILTER
OUT AMP 1
OUT AMP 2
REVERB
ENVELOPE
TRAPEZOID
AUTO. PAN
POWER
KEYBOARD OSCILLATOR
OUTPUTS
CH.1
CH.2


1
A
3
B
10
D
1
E
7
F
10
H
1
I
3
J
10
L

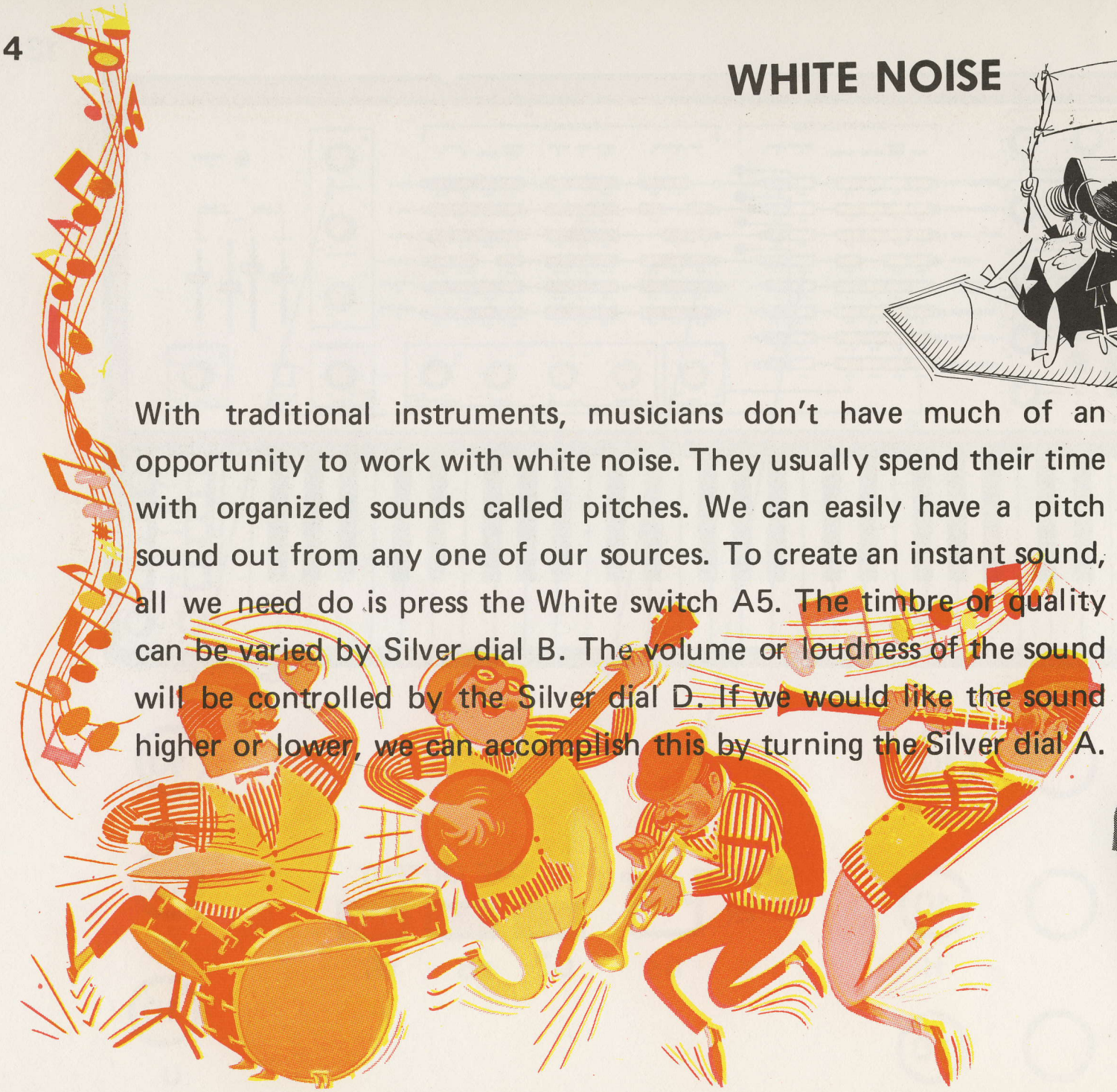

OUTPUT AMP 1
FILTER
OSC OUTPUT
D5
D7
D8
D9

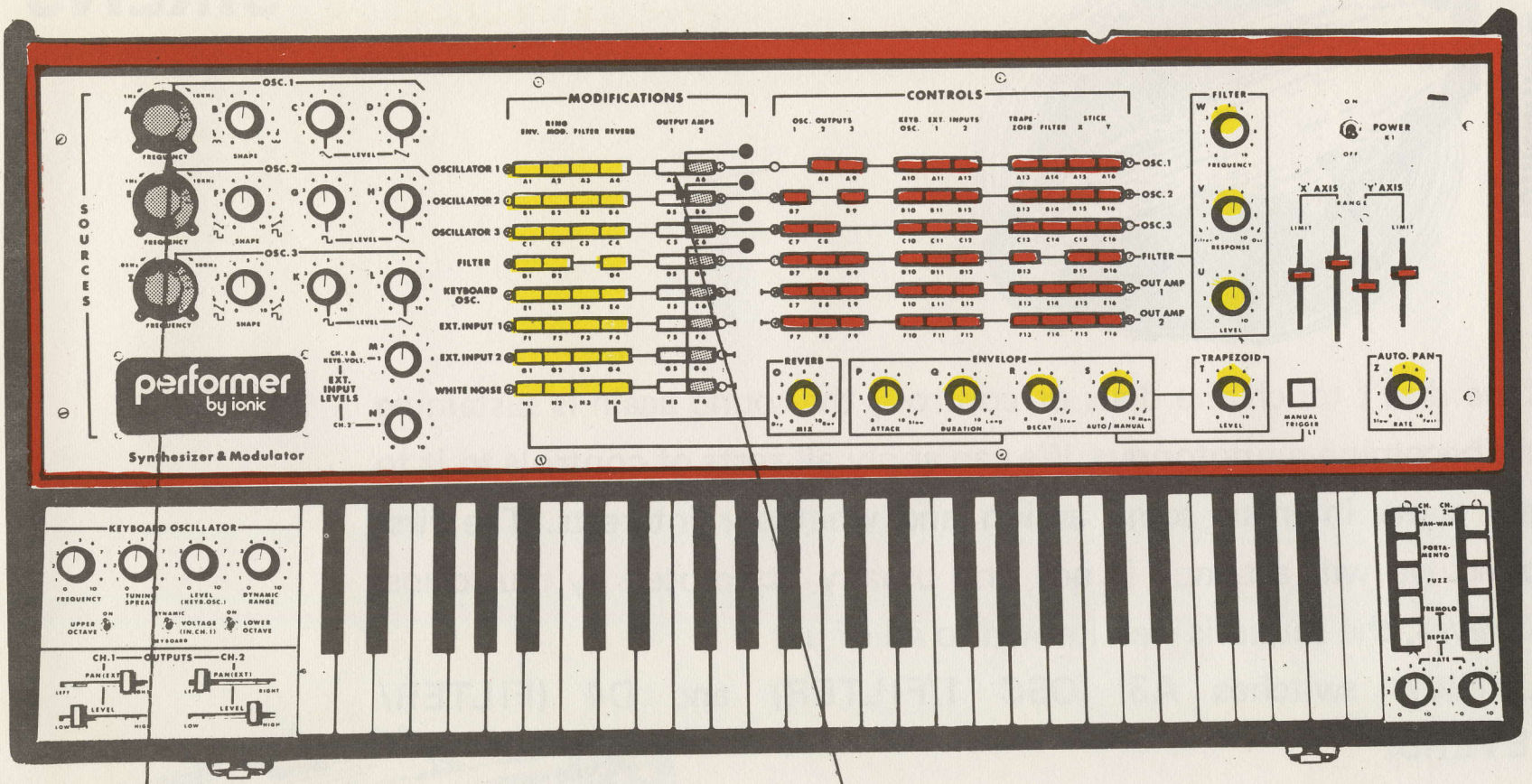

10
W
10
V
10
U

WHITE NOISE



With traditional instruments, musicians don't have much of an opportunity to work with white noise. They usually spend their time with organized sounds called pitches. We can easily have a pitch sound out from any one of our sources. To create an instant sound, all we need do is press the White switch A5. The timbre or quality can be varied by Silver dial B. The volume or loudness of the sound will be controlled by the Silver dial D. If we would like the sound higher or lower, we can accomplish this by turning the Silver dial A.




performer
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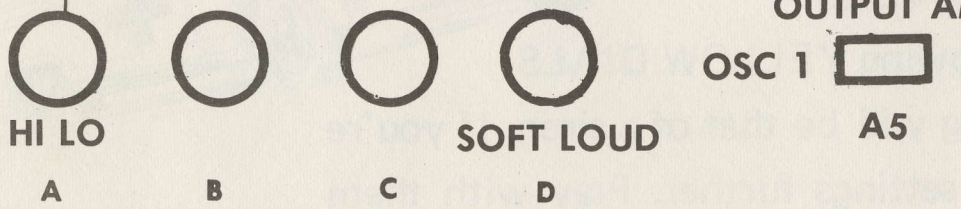
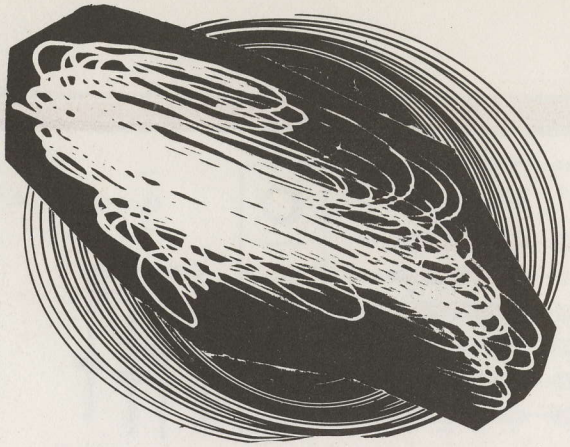
Synthesizer & Modulator
SOURCES
OSC. 1
OSC. 2
OSC. 3
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
EXT. INPUT LEVELS
REVERB
ENVELOPE
FILTER
TRAPEZOID
AUTO. PAN
POWER
X AXIS
Y AXIS
KEYBOARD OSCILLATOR
OUTPUTS
CH.1
CH.2
WAH-WAH
PORTA-MENTO
FUZZ
TREMOLO
REPEAT

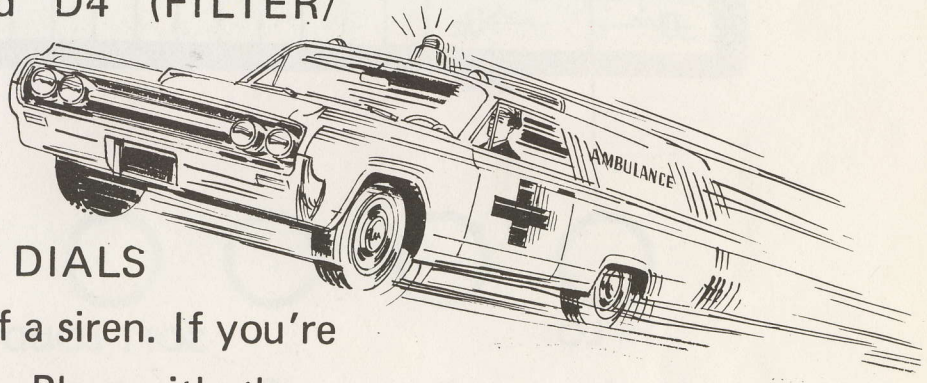

HI LO
SOFT LOUD
A
B
C
D
OUTPUT AMP 1
OSC 1
A5



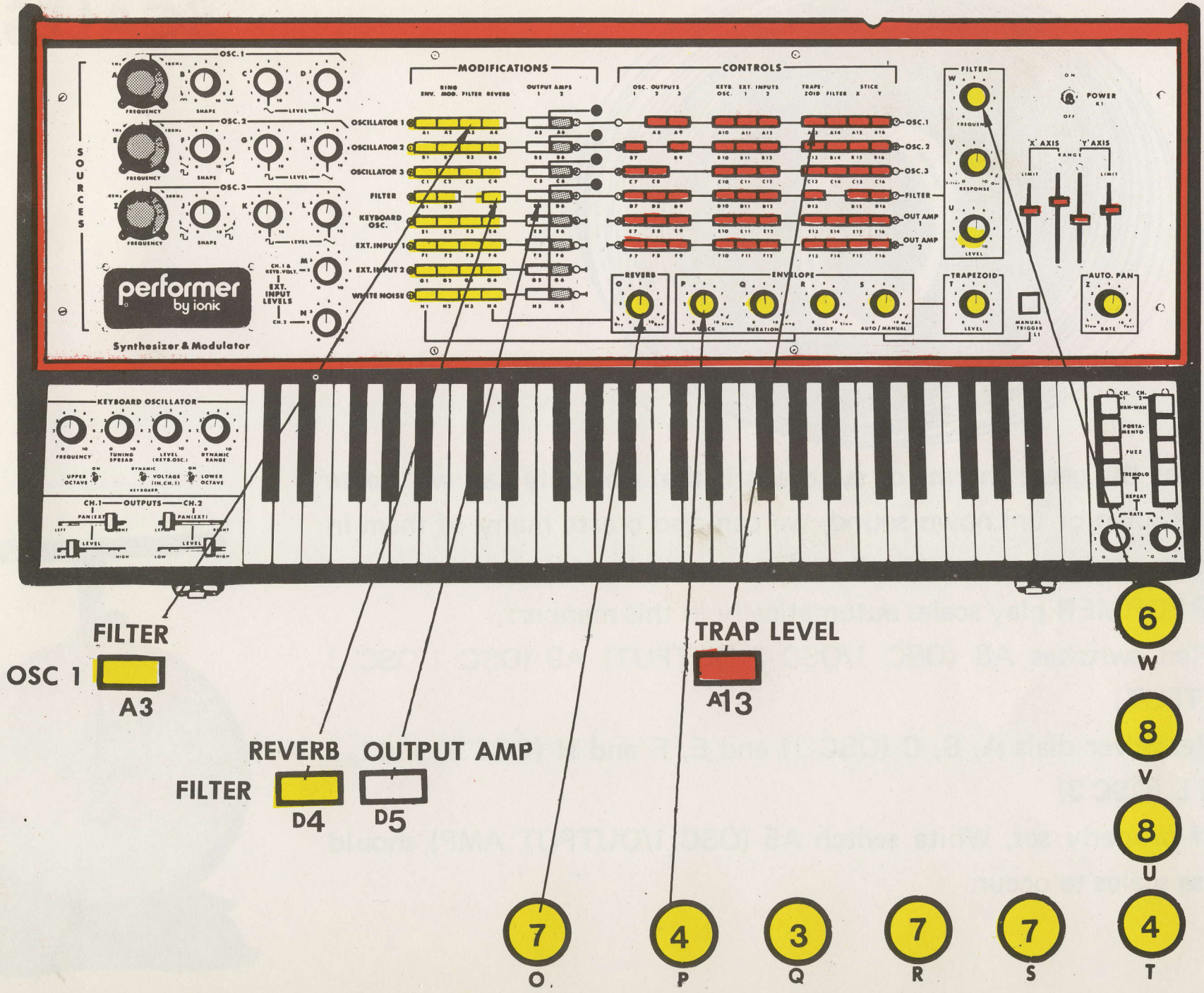
SIRENS

If we don't touch the dials or controls, the sound again is sustaining and becoming monotonous. We can apply all sorts of controls to it to gain some interest, some action and whet our interests. The first sound we will attempt is not one usually attempted by musicians; however, the sound is well known to all of us.

1. Yellow switches A3 (OSC 1/FILTER) and D4 (FILTER/REVERB)
2. White switch D5 (FILTER/OUTPUT AMP)
3. Red switch A13 (OSC 1/TRAP LEVEL)
4. For accurate settings use the following YELLOW DIALS



The sound you SHOULD be getting will be that of a siren. If you're NOT getting this adjust the dial settings further. Play with them more and see if you can get the faster swooping of the newer ambulance or fire trucks that all but shock you with their rapid sweeps.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OSC. 2
OSC. 3
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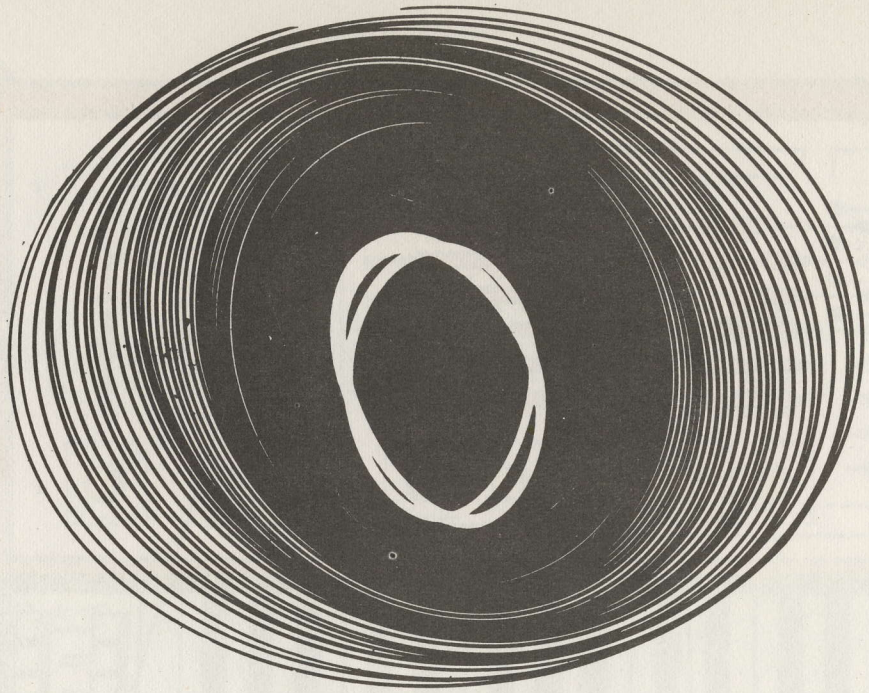
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
REVERB
ENVELOPE
TRAPEZOID
FILTER
POWER
X AXIS
Y AXIS
AUTO. PAN
KEYBOARD OSCILLATOR
CH.1 OUTPUTS CH.2
FILTER
OSC 1
A3
REVERB
FILTER
D4
OUTPUT AMP
D5
TRAP LEVEL
A13
7
O
4
P
3
Q
7
R
7
S
4
T
8
U
8
V
6
W

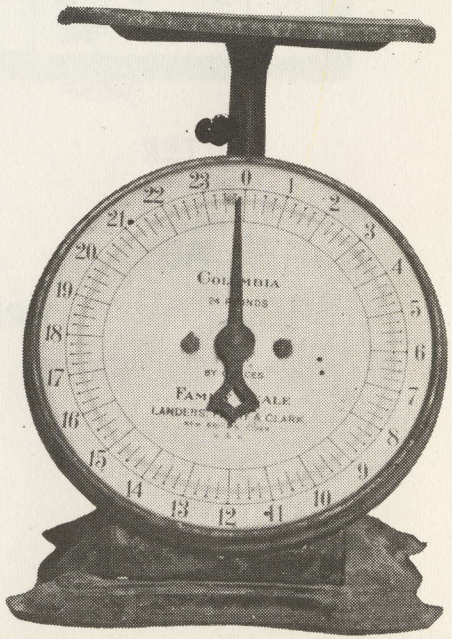
ionicamera*

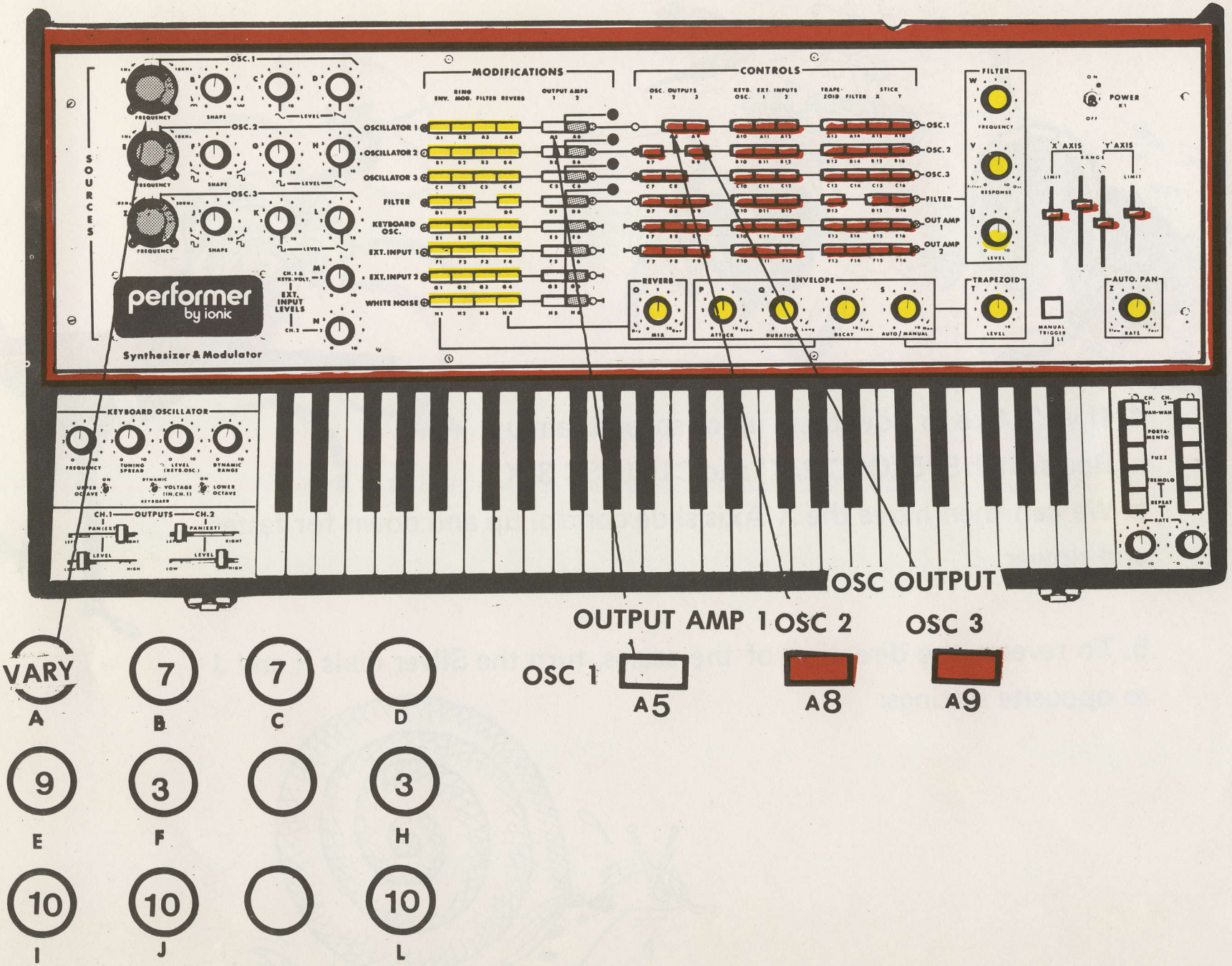


SCALES

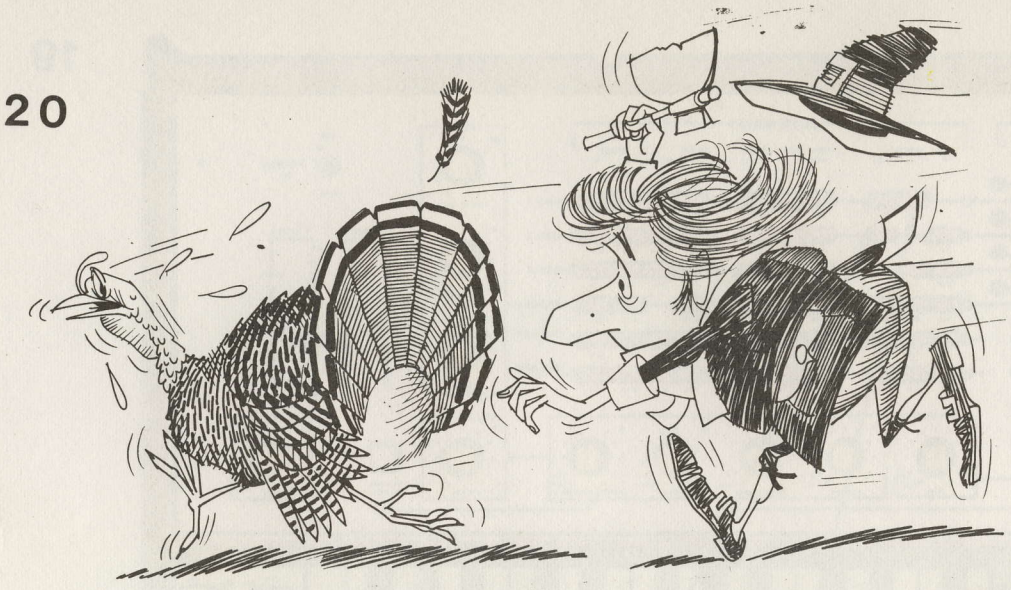
One of the great charms of synthesis is that not only can we create any known or unknown sound, we can also create many of them in certain orders, automatically. For example, we can have the PERFORMER play scales automatically in this manner:

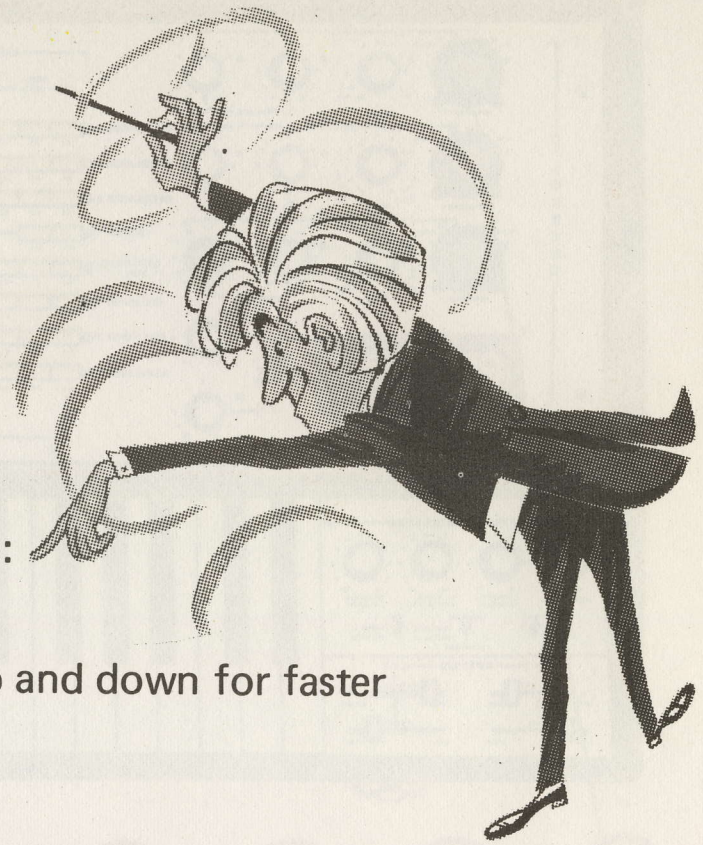
1. Red switches A8 (OSC 1/OSC 2 OUTPUT) A9 (OSC 1/OSC 3 OUTPUT)
2. Set Silver dials A, B, C (OSC 1) and E, F and H (OSC 2) and I, J and L (OSC 3)
3. If properly set, White switch A5 (OSC 1/OUTPUT AMP) should cause scales to occur.




performer
by ionic
Synthesizer & Modulator
SOURCES
OSC.1
OSC.2
OSC.3
FREQUENCY
SHAPE
LEVEL
MODIFICATIONS
RING MOD.
FILTER
REVERB
OUTPUT AMPS
CONTROLS
OSC. OUTPUTS
KEYB. OSC.
EXT. INPUTS
TRAPEZOID
STICK
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
OUT AMP 1
OUT AMP 2
EXT. INPUT LEVELS
REVERB
MIX
ENVELOPE
ATTACK
DURATION
DECAY
AUTO / MANUAL
FILTER
RESPONSE
TRAPEZOID
MANUAL TRIGGER
POWER
X AXIS
Y AXIS
RANGE
LIMIT
AUTO. PAN
RATE
KEYBOARD OSCILLATOR
TUNING SPREAD
LEVEL (KEYB.OSC.)
DYNAMIC RANGE
UPPER OCTAVE
LOWER OCTAVE
CH.1 OUTPUTS CH.2
PAN(EXT)
WAH-WAH
PORTAMENTO
FUZZ
TREMOLO
REPEAT
OSC OUTPUT
OUTPUT AMP 1
OSC 2
OSC 3
OSC 1
A5
A8
A9

VARY
A
7
B
7
C
D
9
E
3
F
3
H
10
I
10
J
10
L



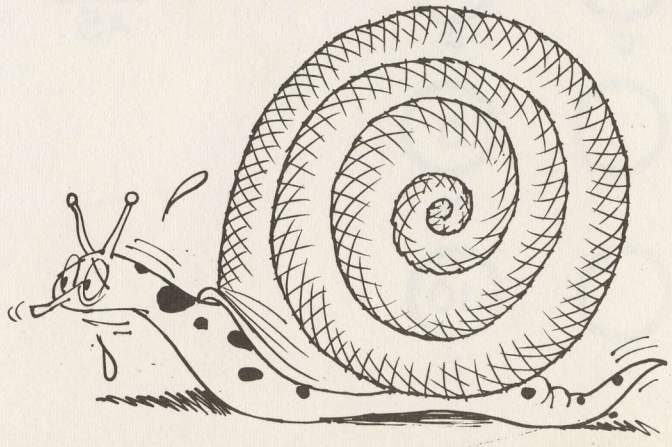


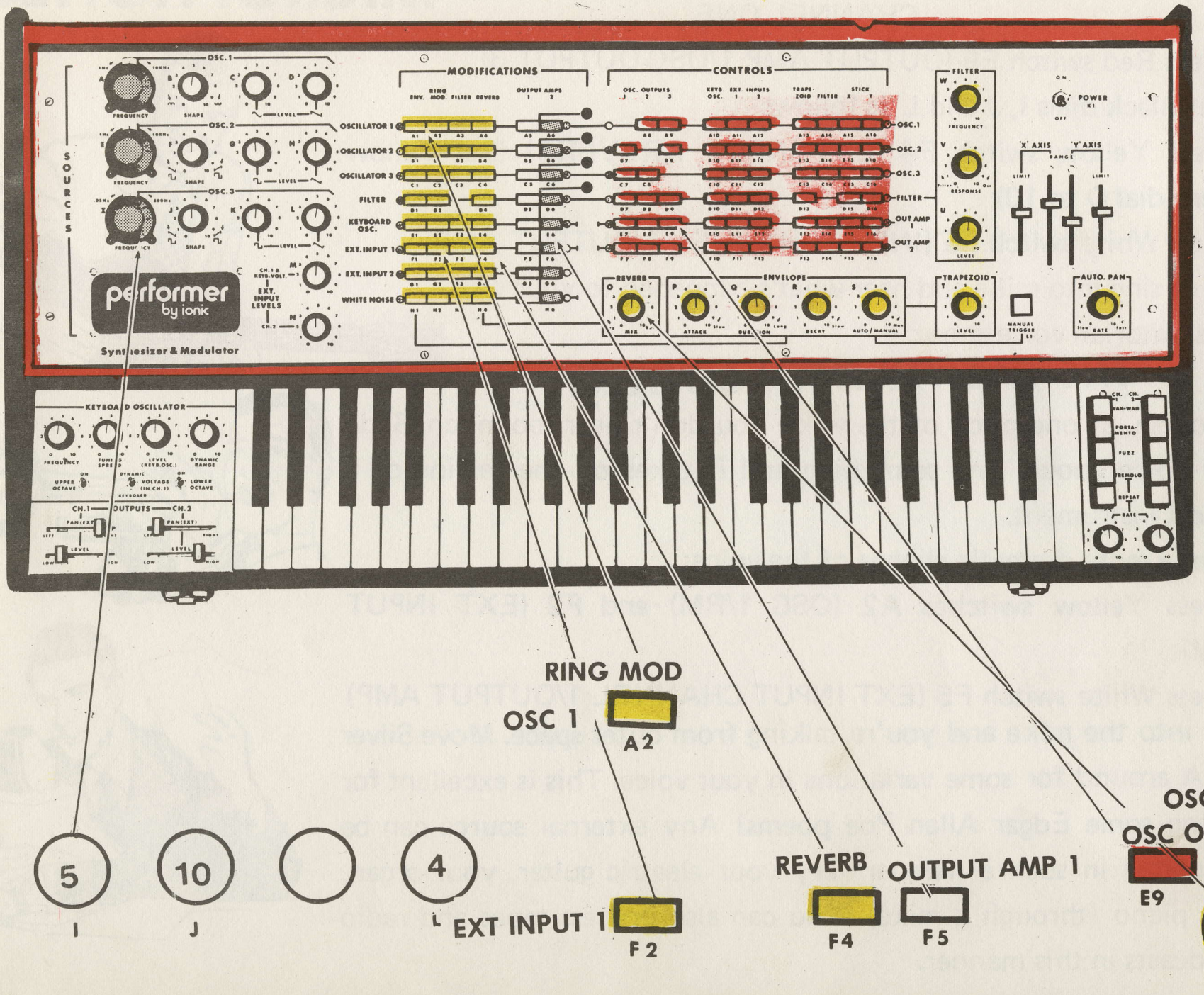
4. If we'd like to slow them up or speed them up:

a. Red switch B15 (OSC 2/X) and C15 (OSC 3/X)

b. We can then move the X Axis slide control up and down for faster and slower

5. To reverse the direction of the scales, turn the Silver dials F and J to opposite settings:




performer
by ionic
Synthesizer & Modulator
SOURCES
OSC. 1
OSC. 2
OSC. 3
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
OSC.1
OSC.2
OSC.3
FILTER
OUT AMP 1
OUT AMP 2
REVERB
ENVELOPE
TRAPEZOID
AUTO. PAN
POWER
X AXIS
Y AXIS
KEYBOARD OSCILLATOR
OUTPUTS
RING MOD
OSC 1
A2
OSC 3
OSC OUTPUT
E9
REVERB
F4
OUTPUT AMP 1
F5
EXT INPUT 1
F2
5
I
10
J
4
L
10
O

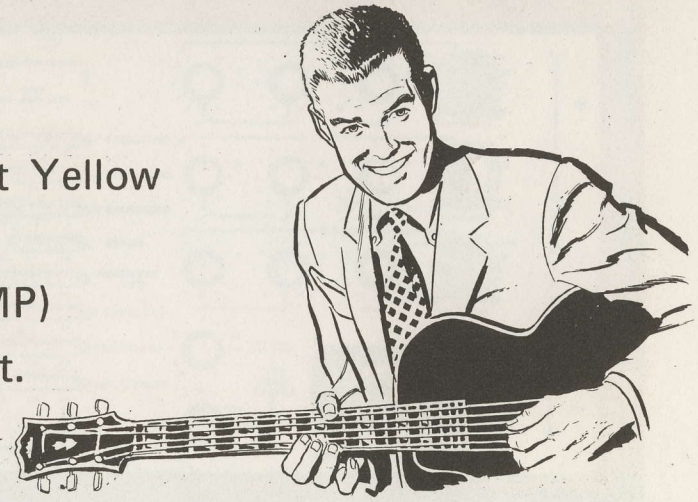
MICROPHONES

22 Insert your microphone into the rear terminal marked CHANNEL ONE

1. Press Red switch E9 (OUTPUT AMP 1/OSC OUTPUT 3)
2. Set Black dials I, J and L as follows
3. Press Yellow switch F4 (EXT INPUT 1/REVERB) (Set Yellow Reverb dial O to 10)
4. Press White switch F5 (INPUT CHANNEL 1/OUTPUT AMP)

Talk or sing into mike and hear what's happened to your visit.

In a stentorian voice shout



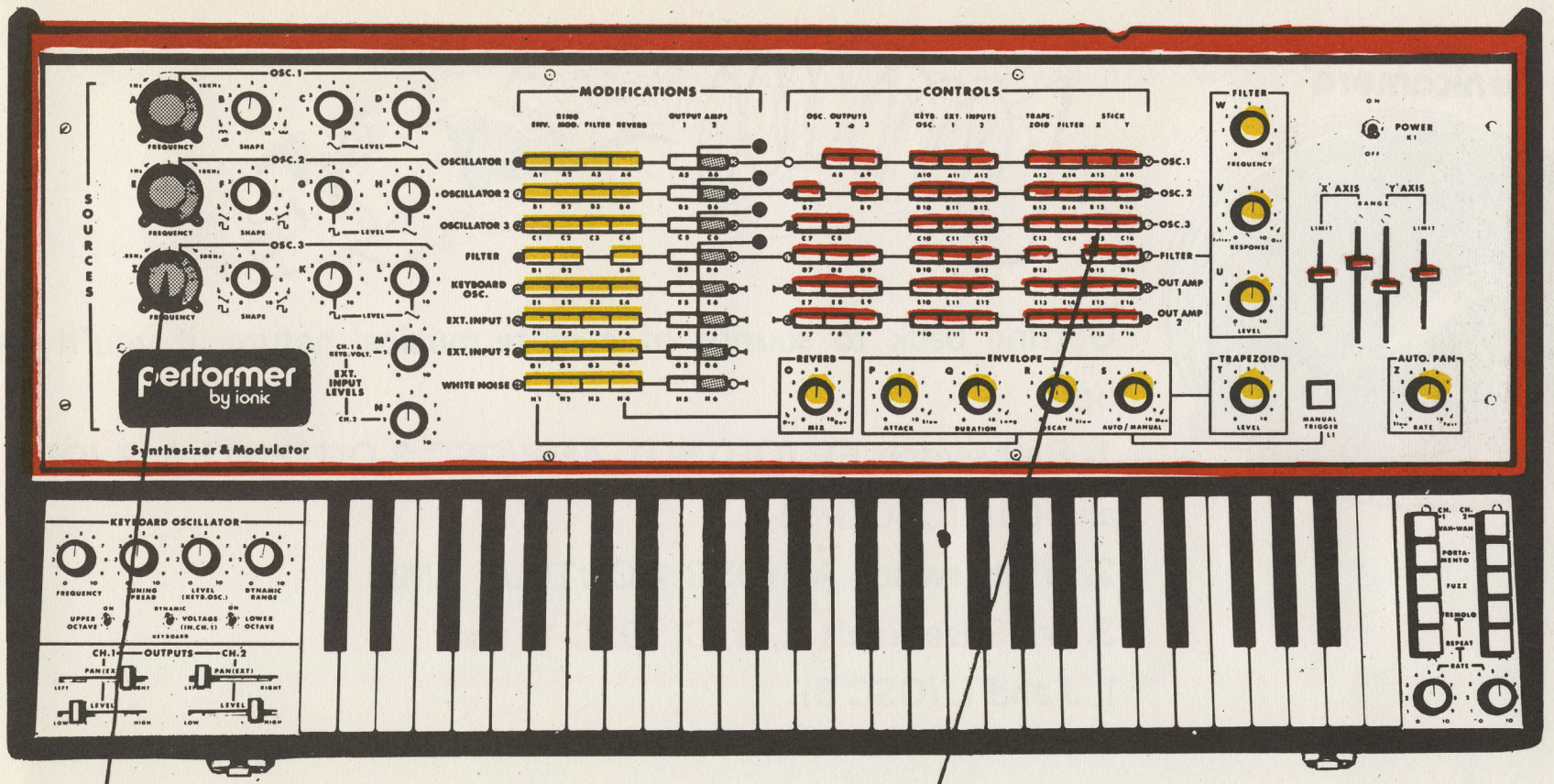
THE TWENTY-FIFTH CENTURY

Of course, at one pitch of the voice you don't hear too much. Slide your voice about, sing something and it takes on the feeling of a musical instrument.

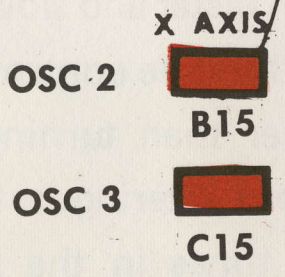
To get a more dramatic change of the voice:

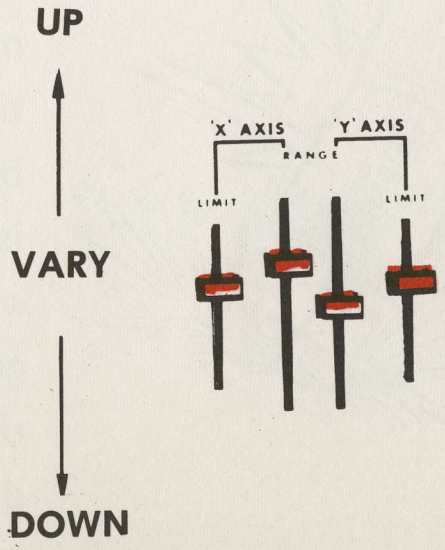
1. Press Yellow switches A2 (OSC 1/RM) and F2 (EXT INPUT 1/RM)
2. Press White switch F5 (EXT INPUT CHANNEL 1/OUTPUT AMP)

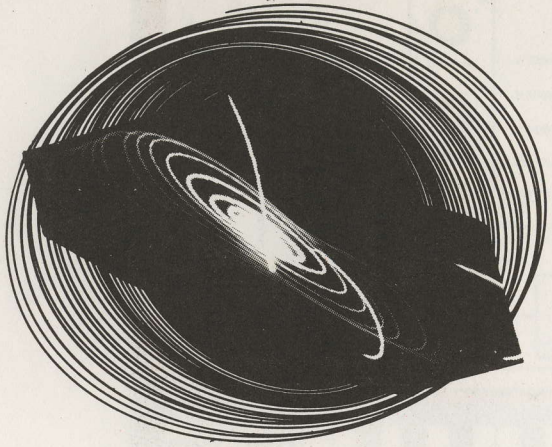
Talk into the mike and you're talking from outer space. Move Silver dial A around for some variations in your voice. This is excellent for reading some Edgar Allan Poe poems! Any external source can be modulated in such a manner. Try your electric guitar, your organ, your piano (through a mike). You can also process tapes and radio broadcasts in this manner.

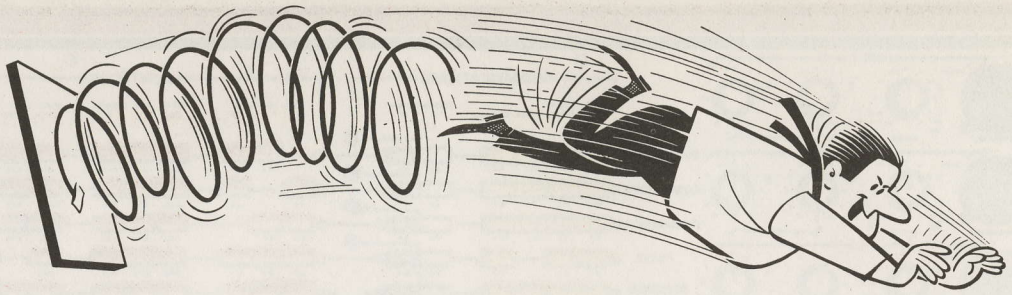

performer
by ionik
Synthesizer & Modulator
OSC.1
OSC.2
OSC.3
SOURCES
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
OUT AMP 1
OUT AMP 2
REVERB
ENVELOPE
TRAPEZOID
AUTO. PAN
POWER
KEYBOARD OSCILLATOR
CH.1 OUTPUTS CH.2


3
F
10
J


X AXIS
OSC 2
B15
OSC 3
C15


UP
VARY
DOWN
'X' AXIS
'Y' AXIS
RANGE
LIMIT
LIMIT

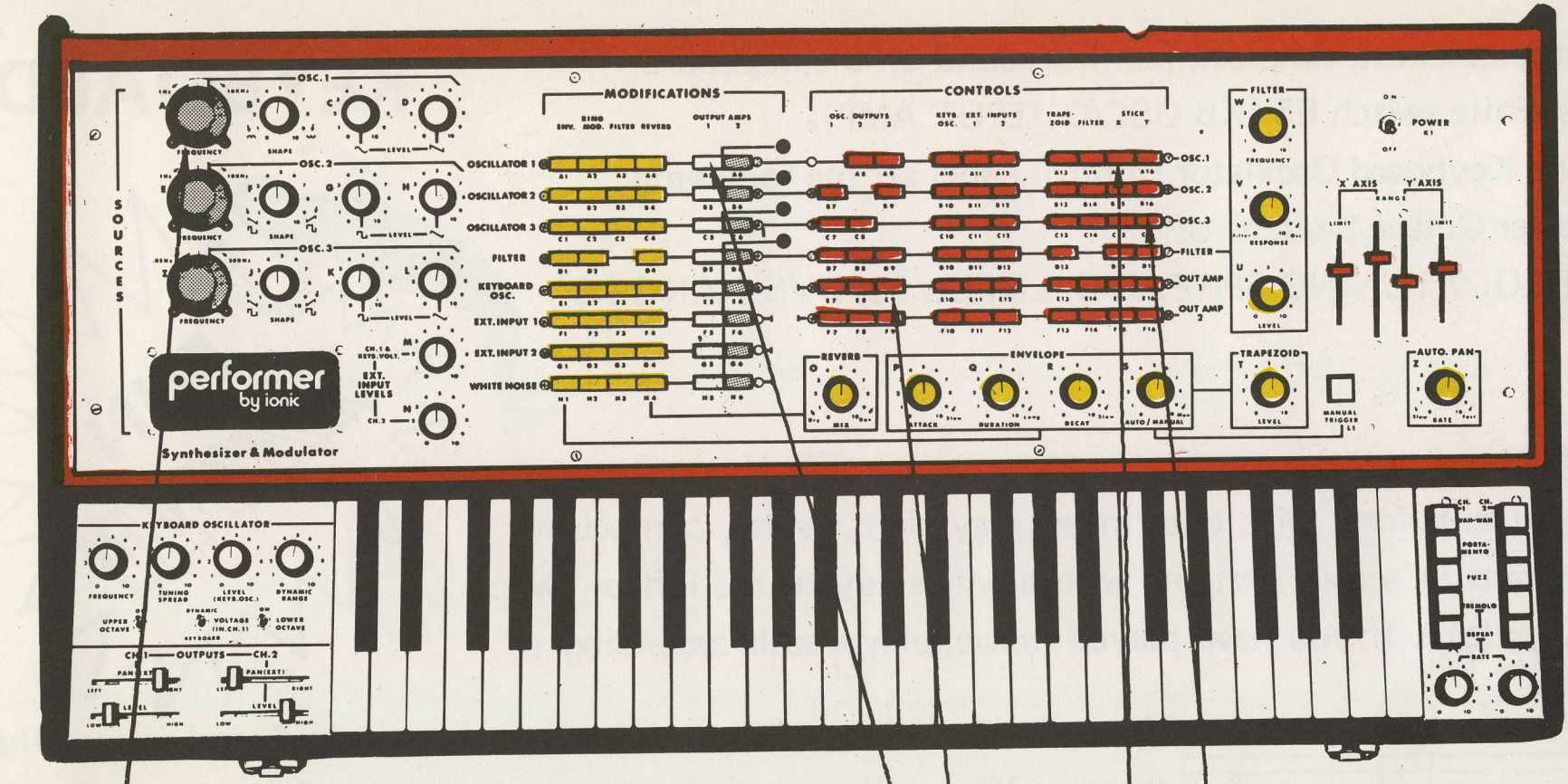




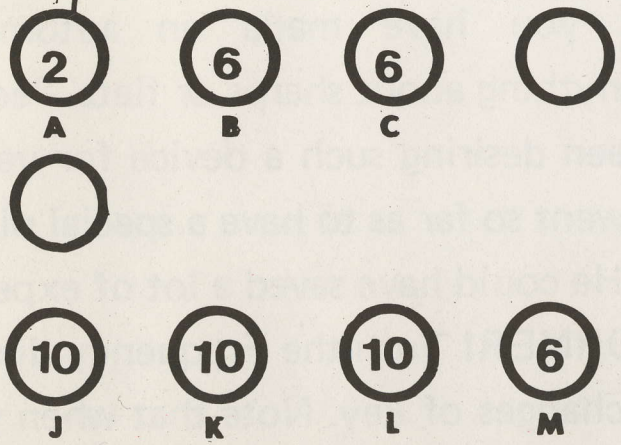
Getting back to sounds of a more musical nature, if you'll set this up:

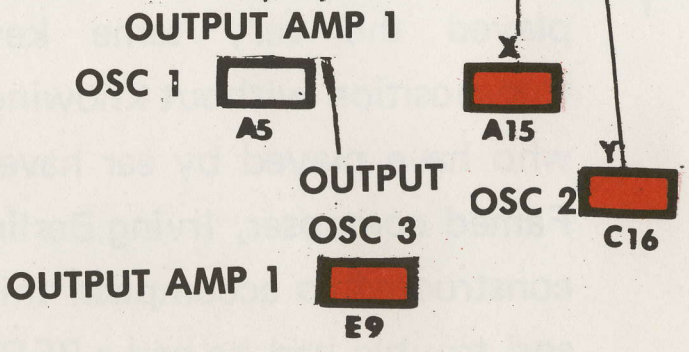
1. Red switch E9 (OUTPUT AMP/OSC 3 OUTPUT) A15 (OSC 1/X) and C16 (OSC 3/Y)
2. White switch A5 (OSC 1/OUTPUT AMP)
3. Set Silver dials A, B, C, (OSC 1) and I, J and L (OSC 3)

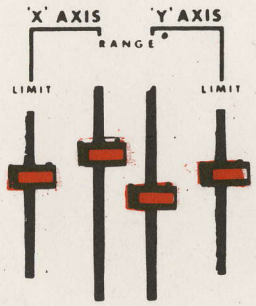
This will cause the first Oscillator to repeat. By turning A, we can make the pitches higher and lower; by manipulating J, we can make the repetition faster and slower. We can easier make these adjustments by working the slide controls for the X and Y Axis up and down; this is much easier than turning dials and can permit us to make a dial setting without altering it. If we play with the X slide control we can get to play tones in the scale as well as tones in between. It is difficult, though, to get any great accuracy and it would take a great deal of work. An easier, better known control, is the keyboard.


OSC. 1
OSC. 2
OSC. 3
SOURCES
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
OSC.1
OSC. 2
OSC.3
FILTER
OUT AMP 1
OUT AMP 2
REVERB
ENVELOPE
TRAPEZOID
AUTO. PAN
POWER
'X' AXIS
'Y' AXIS
performer
by ionik
Synthesizer & Modulator
KEYBOARD OSCILLATOR
OUTPUTS
EXT. INPUT LEVELS

VARY


2
A
6
B
6
C
10
J
10
K
10
L
6
M


OUTPUT AMP 1
OSC 1
A5
X
A15
OUTPUT
OSC 3
OUTPUT AMP 1
E9
Y
OSC 2
C16

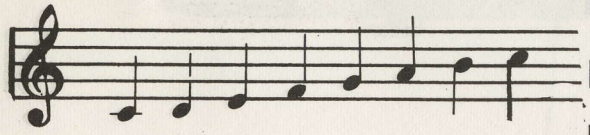

'X' AXIS
'Y' AXIS
RANGE
LIMIT
LIMIT

KEYBOARD

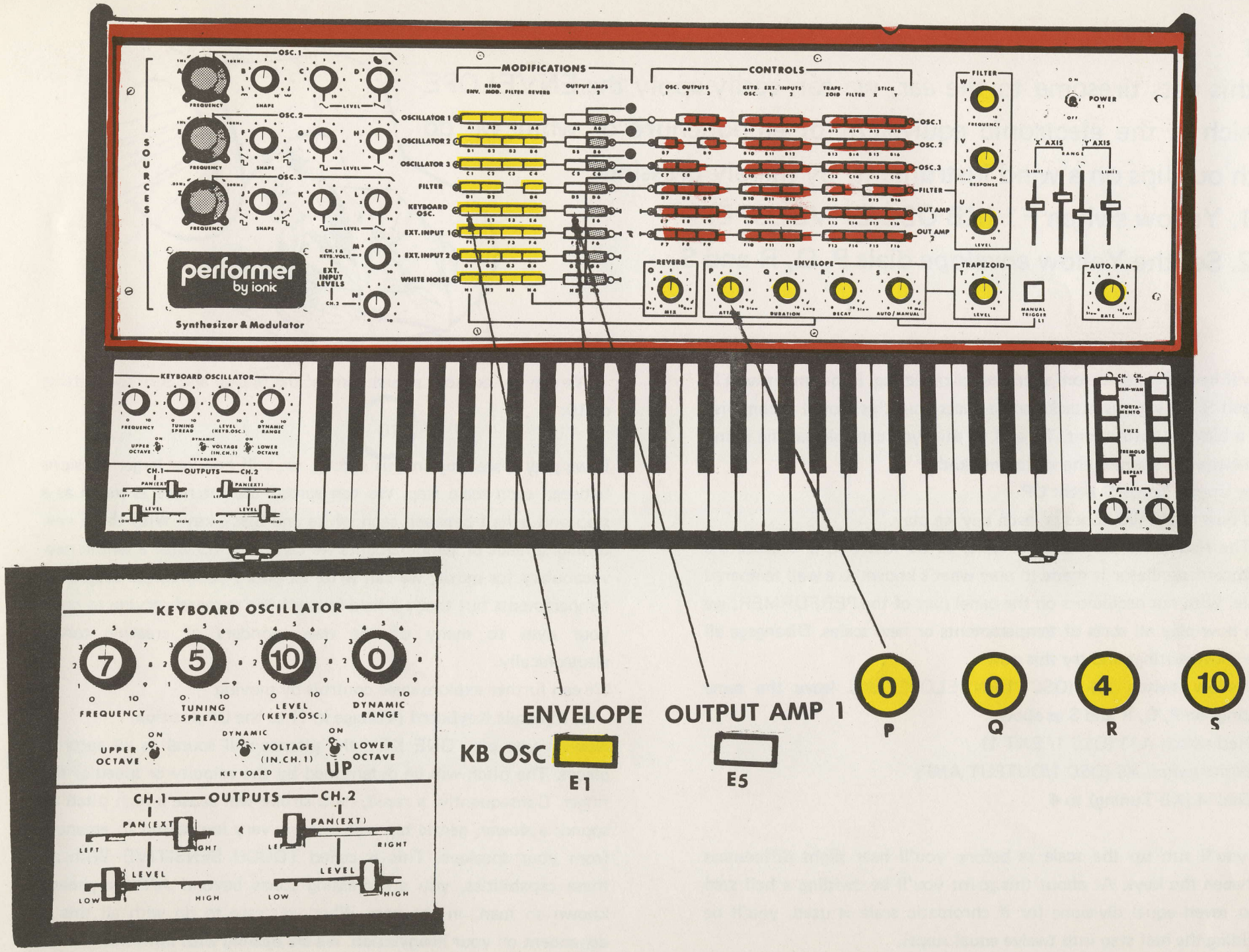
To get the quickest, simplest, familiar sound on the keyboard,

1. Press White switch E5 (KB OSC/OUTPUT AMP).
2. On the Keyboard Oscillator Control Panel set the following:
   a. Lower Octave Switch: UP
   b. FREQ: 7 TUNING SPREAD 5, LEVEL 10, DYN RANGE 0

You will hear a sound immediately on pressing in E5. If you have not played music before, with one finger, play eight, white, consecutive keys upward in a row (starting with a white key to the left of two black keys (c)). If you have played music, play a scale ascending, as follows:



Move the frequency dial to a setting of number 5 and repeat the process. You will note that you are in another key although you played the very same keys; you have made an automatic transposition without knowing anything about sharps or flats. People who have played by ear have been desiring such a device for years. Famed composer, Irving Berlin, went so far as to have a special piano constructed to accomplish this. He could have saved a lot of expense and trouble had he had a PERFORMER! Turn the Frequency dial to various points and listen to the changes of key. Note that when you release your finger, the keyboard continues to sound the very last note played (it memorizes the last voltage).


OSC.1
OSC.2
OSC.3
SOURCES
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
OSC.1
OSC.2
OSC.3
FILTER
OUT AMP 1
OUT AMP 2
REVERB
ENVELOPE
TRAPEZOID
AUTO. PAN
FILTER
POWER
X AXIS
Y AXIS
performer
by ionik
Synthesizer & Modulator
EXT. INPUT LEVELS
KEYBOARD OSCILLATOR
FREQUENCY
TUNING SPREAD
LEVEL (KEYB.OSC.)
DYNAMIC RANGE
UPPER OCTAVE
DYNAMIC VOLTAGE (IN.CH.1)
LOWER OCTAVE
CH.1 OUTPUTS CH.2
PAN(EXT)
LEVEL
LOW
HIGH
WAH-WAH
PORTAMENTO
FUZZ
TREMOLO
REPEAT
RATE

KEYBOARD OSCILLATOR
7
5
10
0
FREQUENCY
TUNING SPREAD
LEVEL (KEYB.OSC.)
DYNAMIC RANGE
UPPER OCTAVE
DYNAMIC VOLTAGE (IN.CH.1)
LOWER OCTAVE
KEYBOARD
UP
CH.1 OUTPUTS CH.2
PAN(EXT)
LEFT
RIGHT
LEVEL
LOW
HIGH

ENVELOPE
OUTPUT AMP 1
KB OSC
E1
E5
0
P
0
Q
4
R
10
S

If this gets tiresome to the ear, we can easily apply the ENVELOPE (which is the electronic equivalent of embouchure or what we do with our lips on a wind instrument) by merely pressing:

1. Yellow switch F1 (KB OSC/ENVELOPE)
2. Set the Yellow envelope dials P, Q, R and S

S will keep the tone from sounding or repeating. Experiment with P, Q and R for various attacks and effects your lips would accomplish on a blowing instrument. To add to this, you can thicken the sound somewhat by pushing the switch marked

a. Upper Octave Switch: UP

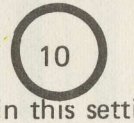
and now hear TWO tones on each key we play.

The reason we played up a scale, as we know it, is because the keyboard oscillator is made to play what's known as a well tempered scale. With our oscillators on the panel part of the PERFORMER, we can now play all sorts of temperaments or new scales. Disengage all the above settings and try this now:

1. Yellow switch A1 (OSC 1/ENVELOPE) and leave the same settings on P, Q, R and S as above.
2. Red switch A11 (OSC 1/ EXT 1)
3. White switch A5 (OSC 1/OUTPUT AMP)
4. Dial M (KB Tuning) to 4

If you'll run up the scale as before you'll hear slight differences between the keys. At about this point you'll be dividing a half step into seven equal divisions (or if chromatic scale is used, you'll be dividing the half step into twelve equal steps).

We can try another adjustment of the M Dial and turn to a setting of 10:

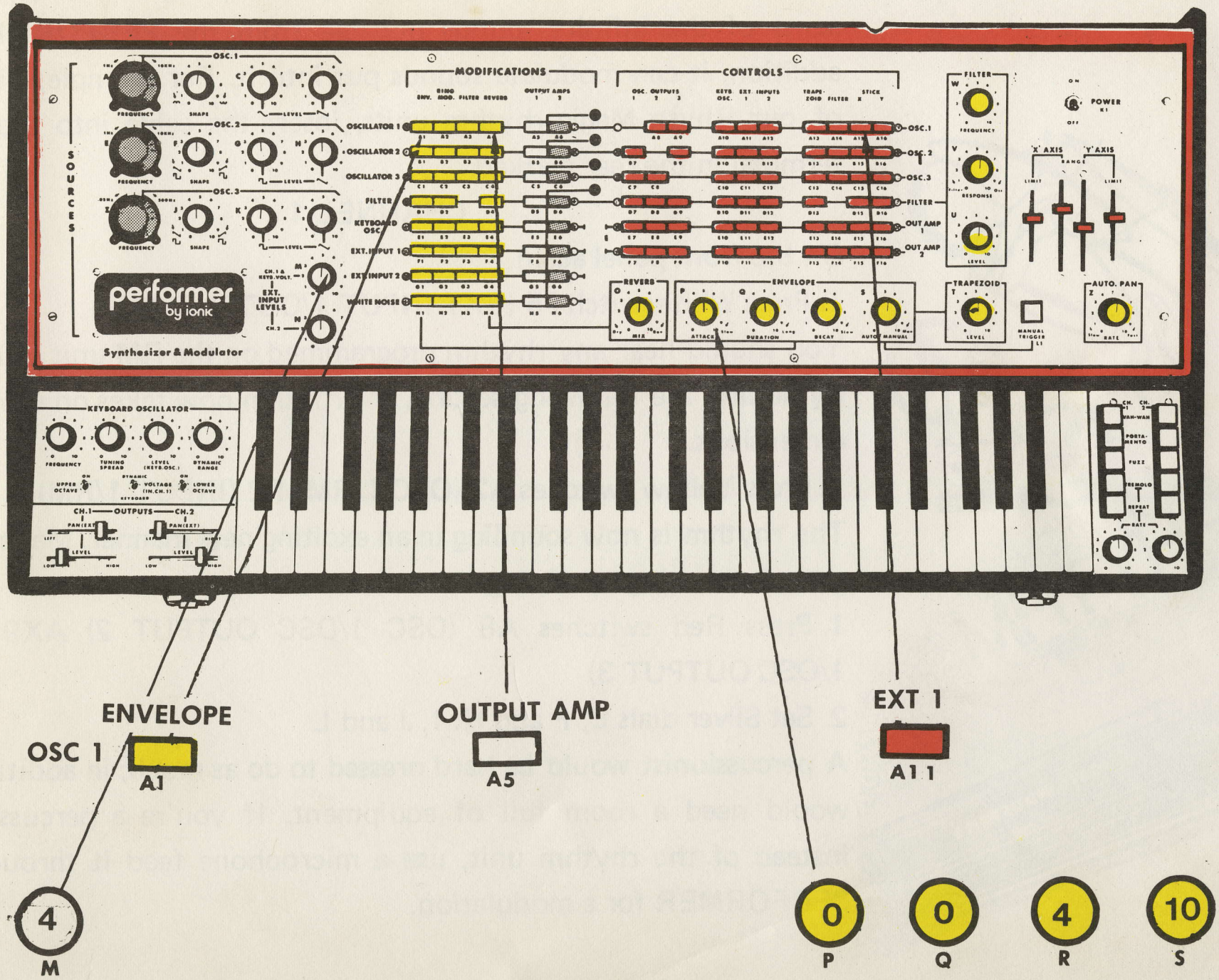


If we play a scale up in this setting, we will now get larger divisions between each scale step. We can spread the intervals as much as a step and a half between each white and black key! With these new tuning spreads or temperaments we can come up with a whole new vocabulary for music; we can write an entire book on the subject of temperaments but that's a field in itself. We're merely trying to open your eyes to many of the new wonders of creating tones, electronically.

We can further explore scale controls by moving

a. Dynamic Keyboard (Voltage in 1) to the UP position

Now as you play ONE KEY the pitches will sound in all sorts of places. The pitch will be determined by the velocity or speed of the finger. Consequently, a rapid, hard stroke will cause a high pitch to sound; a slower, gentle tap will create a very low sound to emanate from your speakers. This is called TOUCH SENSITIVE. With all these capabilities, you are creating tones beyond ANY keyboard known to man, in the past. What you care to do with all this is dependent on your imagination. We are dealing with infinities.


performer
by ionic
Synthesizer & Modulator
SOURCES
OSC.1
OSC.2
OSC.3
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
REVERB
ENVELOPE
TRAPEZOID
FILTER
POWER
X AXIS
Y AXIS
AUTO. PAN
KEYBOARD OSCILLATOR
OUTPUTS
ENVELOPE
OUTPUT AMP
OSC 1
A1
A5
EXT 1
A11
M
4
P
0
Q
0
R
4
S
10

With the foregoing, we've been merely attempting to briefly indicate some of the infinite sounds possible from the PERFORMER. In addition, it can modulate sounds put into it. For example, with one of our Rhyth Magic rhythm units, insert the cable into the input terminal in the rear marked

CHANNEL 1

On the front panel again

1. Press White switch F5 (EXT INPUT 1/OUTPUT AMP)

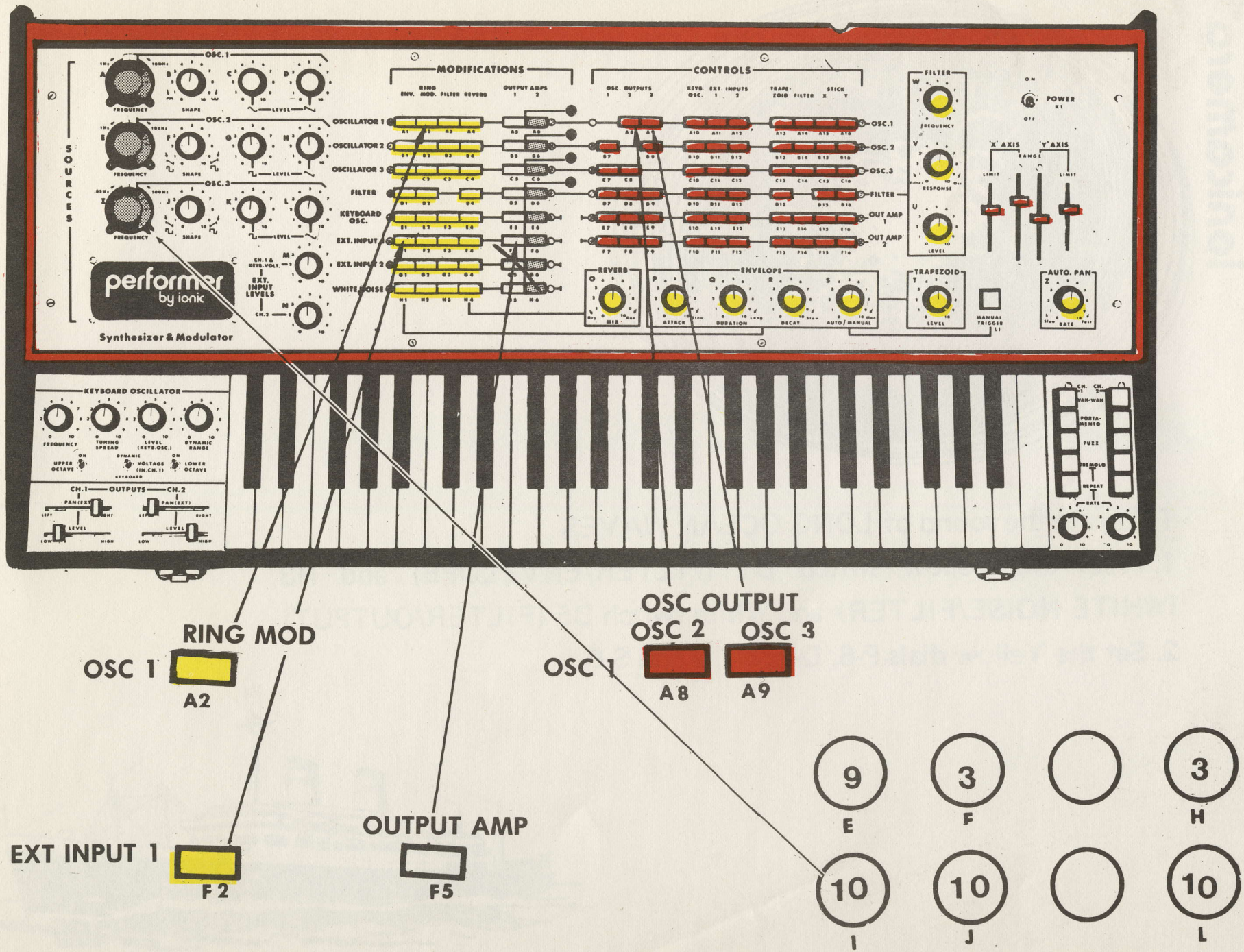
You should hear any rhythm programmed on the RM unit sounding. By adding the following setting, the rhythm now takes on some new dimensions.

1. Press Yellow switches A2 (OSC 1/RM) F2 (INPUT 1/RM)

The rhythm is now sounding in an exciting new manner. Make it still more interesting by adding

1. Press Red switches A8 (OSC 1/OSC OUTPUT 2) AX9 (OSC 1/OSC OUTPUT 3)
2. Set Silver dials E, F and H: I, J and L

A percussionist would be hard pressed to do as much; in addition, he would need a room full of equipment. If you're a percussionist, instead of the rhythm unit, use a microphone feed it through the PERFORMER for a modulation.


performer
by ionic
Synthesizer & Modulator
SOURCES
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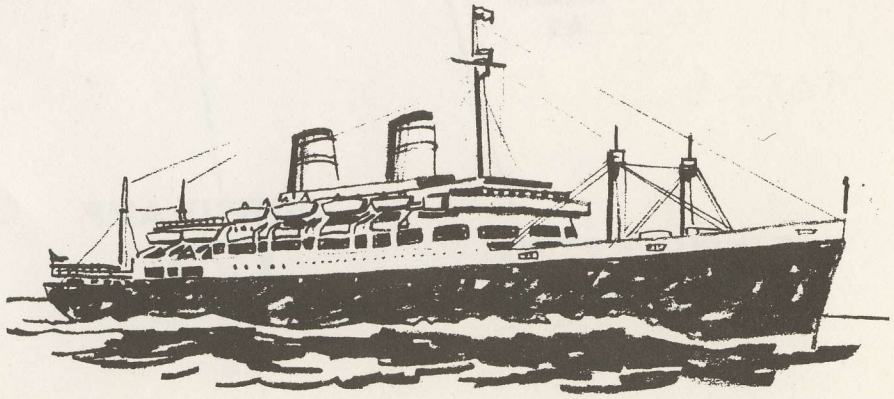
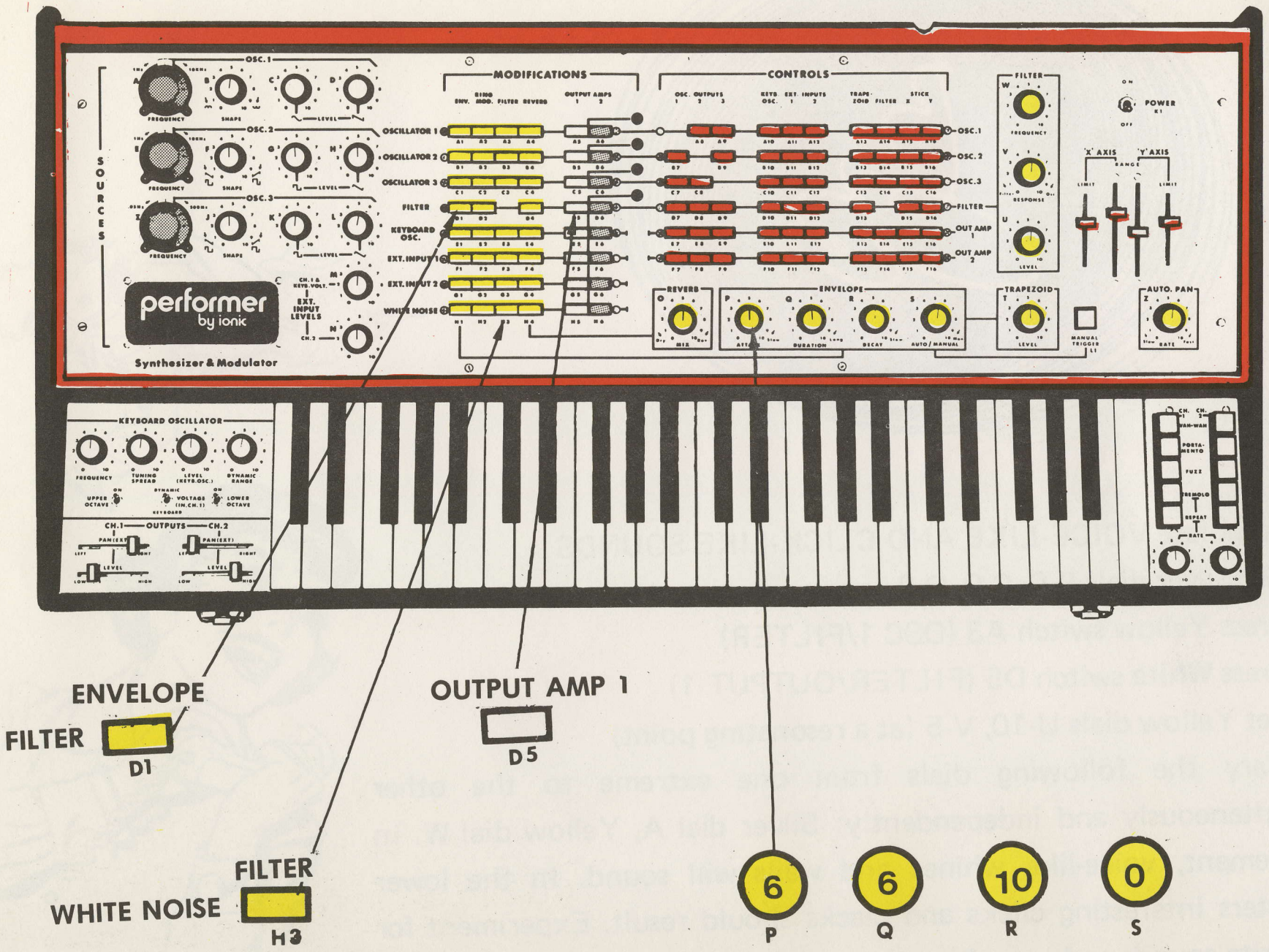
OSC. 2
OSC. 3
FREQUENCY
SHAPE
LEVEL
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT
EXT. INPUT 2
WHITE NOISE
REVERB
MIX
ENVELOPE
ATTACK
DURATION
DECAY
AUTO / MANUAL
FILTER
RESPONSE
TRAPEZOID
MANUAL TRIGGER
POWER
X AXIS
Y AXIS
AUTO. PAN
RATE
KEYBOARD OSCILLATOR
TUNING SPREAD
DYNAMIC RANGE
UPPER OCTAVE
LOWER OCTAVE
CH.1 OUTPUTS CH.2
PAN (EXT)
LEVEL
WAH-WAH
PORTAMENTO
FUZZ
TREMOLO
REPEAT
RING MOD
OSC 1
A2
OSC OUTPUT
OSC 2
OSC 3
OSC 1
A8
A9
EXT INPUT 1
F 2
OUTPUT AMP
F5
9
E
3
F
3
H
10
I
10
J
10
L

To create the sound of LONG OCEAN WAVES

1. Press the Yellow switch D1 (FILTER/ENVELOPE) and H3 (WHITE NOISE/FILTER) and White switch D5 (FILTER/OUTPUT)
2. Set the Yellow dials P-6, Q-6, R-10 and S-0




performer
by ionik
Synthesizer & Modulator
SOURCES
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OSC.2
OSC.3
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
OUT AMP 1
OUT AMP 2
REVERB
ENVELOPE
TRAPEZOID
AUTO. PAN
KEYBOARD OSCILLATOR
OUTPUTS
POWER
ENVELOPE
FILTER
D1
OUTPUT AMP 1
D5
FILTER
WHITE NOISE
H3
6
P
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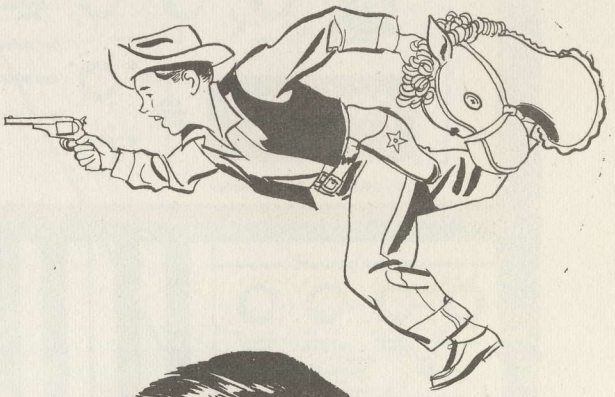
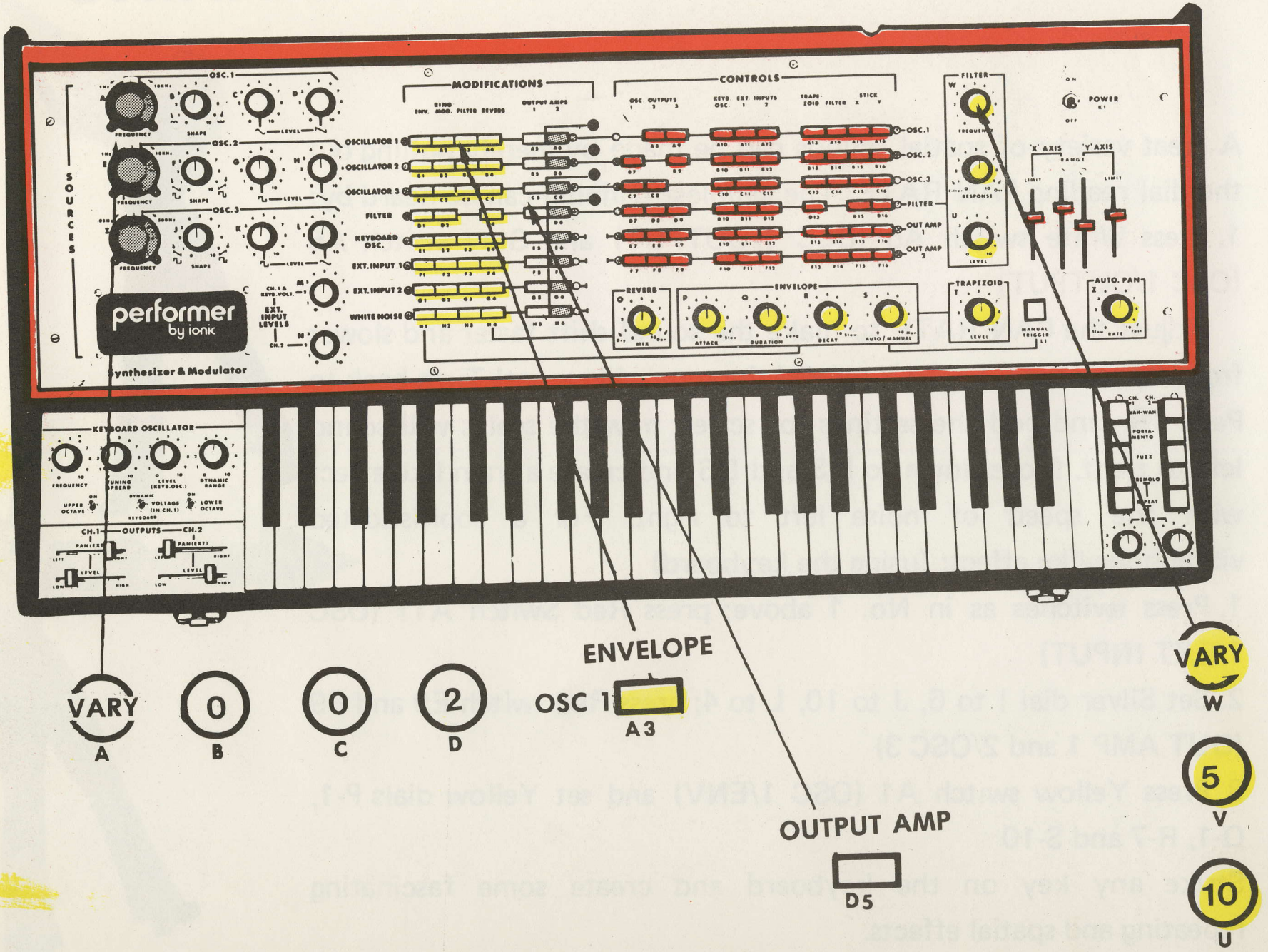
Q
10
R
0
S

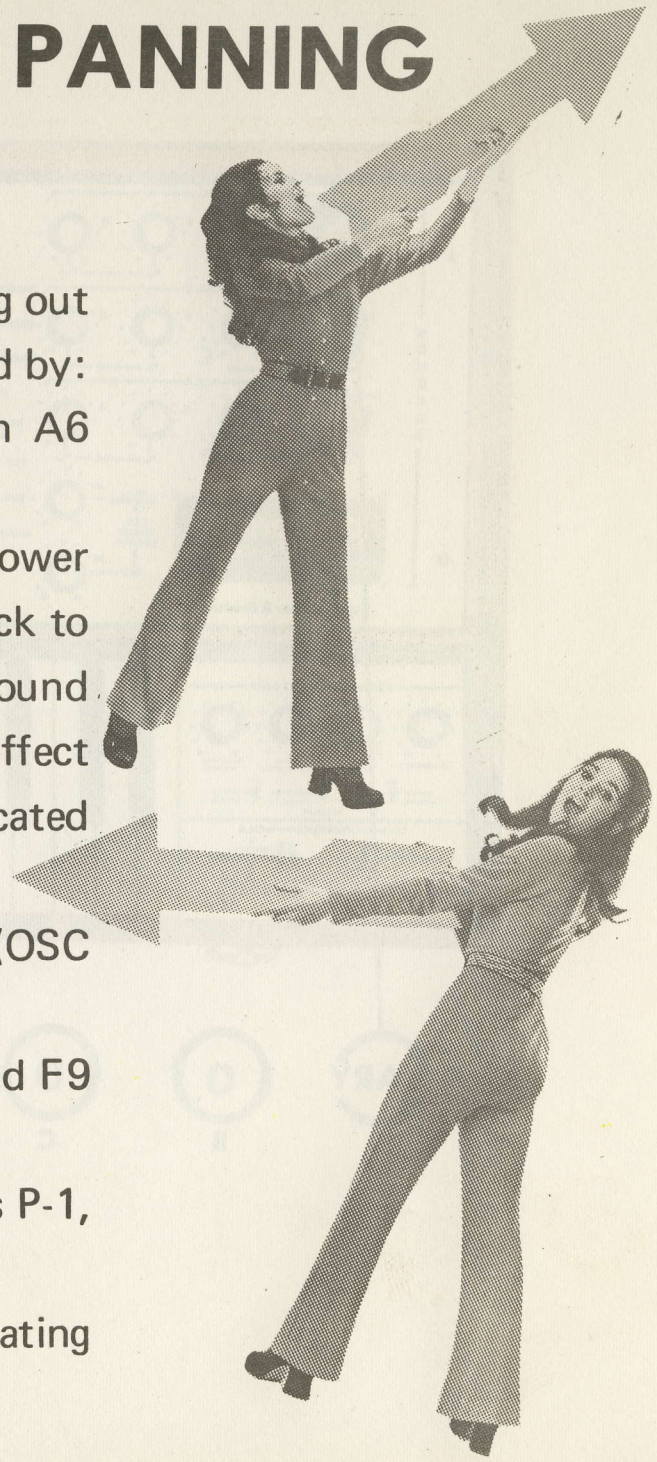


To simulate VOICE-LIKE AND CLICK-LIKE SOUNDS

1. Set Silver dials B-0, C-0, D-2
2. Press Yellow switch A3 (OSC 1/FILTER)
3. Press White switch D5 (FILTER/OUTPUT 1)
4. Set Yellow dials U-10, V-5 (at a resonating point)
5. Vary the following dials from one extreme to the other simultaneously and independently: Silver dial A, Yellow dial W. In movement, voice-like whines and wails will sound. In the lower registers interesting clicks and clacks should result. Experiment for favorite sounds and sonorities.


performer
by ionik
Synthesizer & Modulator
SOURCES
OSC.1
OSC.2
OSC.3
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
OSC.1
OSC.2
OSC.3
FILTER
OUT AMP 1
OUT AMP 2
REVERB
ENVELOPE
FILTER
TRAPEZOID
AUTO. PAN
POWER
X AXIS
Y AXIS
KEYBOARD OSCILLATOR
OUTPUTS
CH.1
CH.2
VARY
A
0
B
0
C
2
D
ENVELOPE
OSC 1
A3
OUTPUT AMP
D5
VARY
W
5
V
10
U

AUTOMATIC PANNING



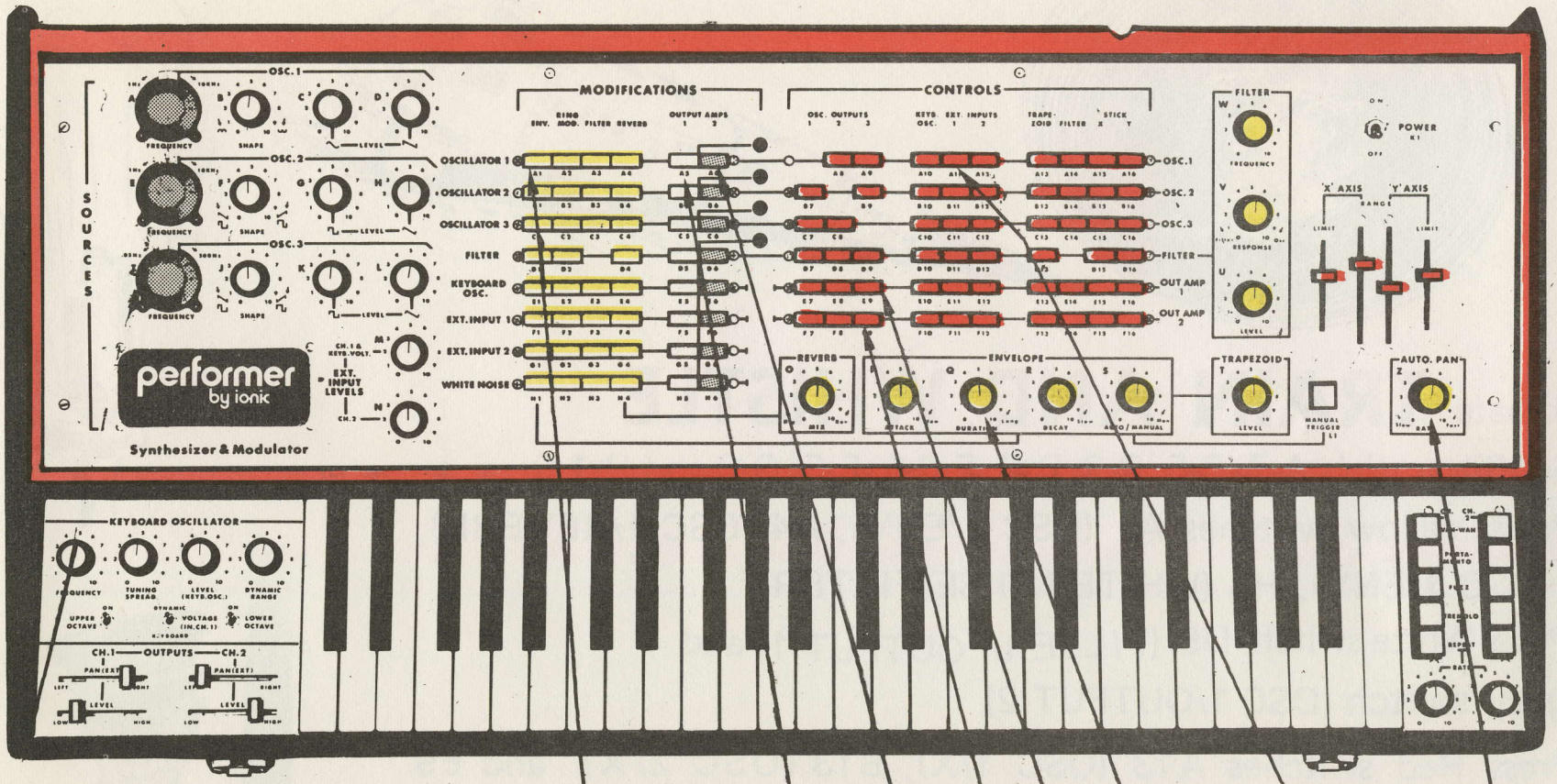
A great variety of spatial sounds can be made by merely pulling out the dial reading PAN RATE. The simplest panning can be heard by:

1. Press White switch A5 (OSC 1/OUTPUT) and Gray switch A6 (OSC 1/OUTPUT)

Adjust the PAN RATE to make the sound shift faster and slower from left to right. Speed it up and the tone will repeat! Turn back to Page 19 and add the settings for scales; now the scales will sound left to right. Move down to H3 and D6 and create a train like effect with the speed of noise left to right. For a sophisticated vibraphone-like effect: (using the keyboard)

1. Press switches as in No. 1 above; press Red Switch A11 (OSC 1/EXT INPUT)
2. Set Silver dial I to 6, J to 10, L to 4; press Red switch E9 and F9 (OUT AMP 1 and 2/OSC 3)
3. Press Yellow switch A1 (OSC 1/ENV) and set Yellow dials P-1, Q-1, R-7 and S-10

Strike any key on the keyboard and create some fascinating repeating and spatial effects.



ENVELOPE

OSC 1 A1

OUTPUT AMP 1

OUTPUT AMP 2

A5 A6

EXT 1

A11

AUTO. PAN

RATE

6 I

10 J

4 L

OSC 3

OUTPUT AMP 1 E9

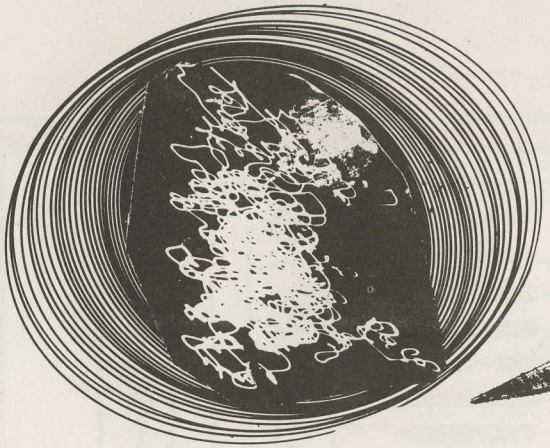
OUTPUT AMP 2 F9

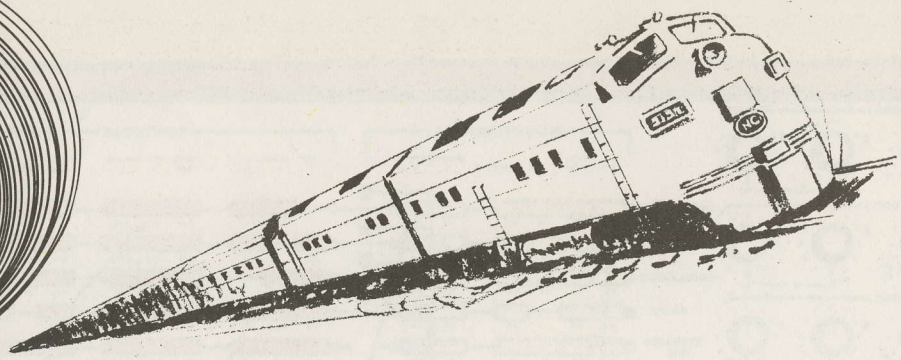
1 P

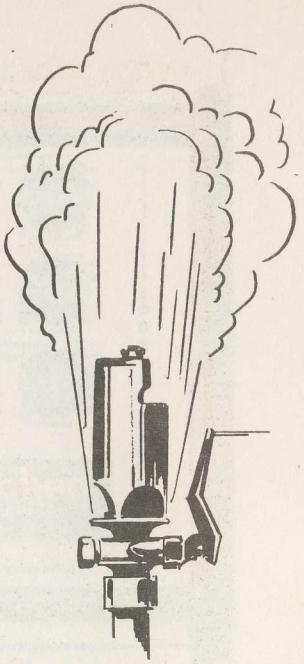
1 Q

7 R

10 S





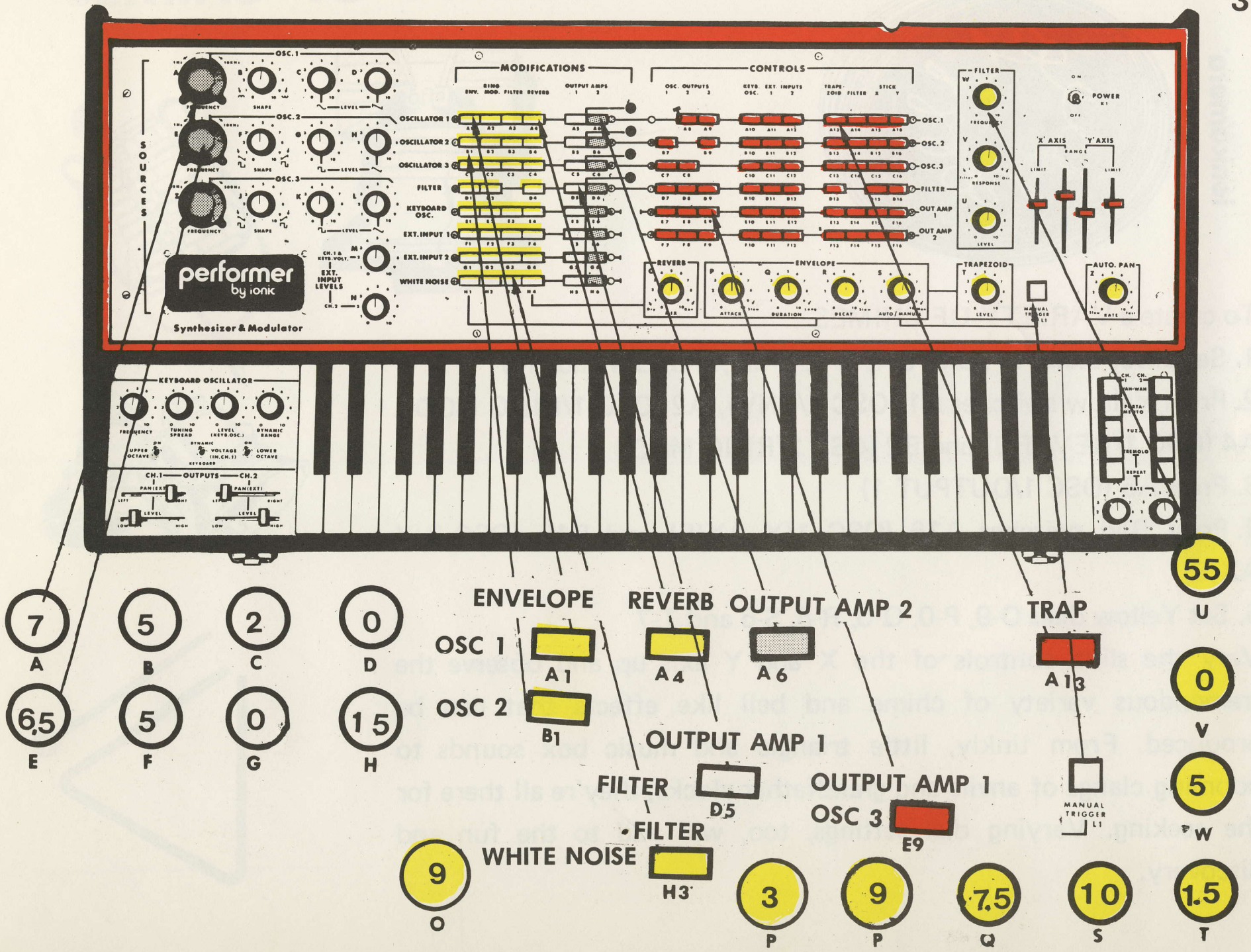


To create **TRAIN AND WHISTLE**

1. Set Silver dials A-7, B-5, C-2, D-0, E-6.5, F-5, G-0 and H-1.5
2. Press Yellow switches A1 (OSC 1/ENV), A4 (OSC 1/REVERB), B1 (OSC 1/ENV), H3 (WHITE NOISE/FILTER)
3. Press White switch D5 (FILTER/ OUTPUT 1) and grey switch (OSC 1/OUTPUT 2)
4. Press Red switches A13 (OSC 1/X), B13 (OSC 2/X) and E9 (OUTPUT AMP 1/OSC 3)
5. Set Yellow dials O-9, P-3, Q-1.5, R-7.5, S-10, T-1.5, U-5, V-0 and W-5.5

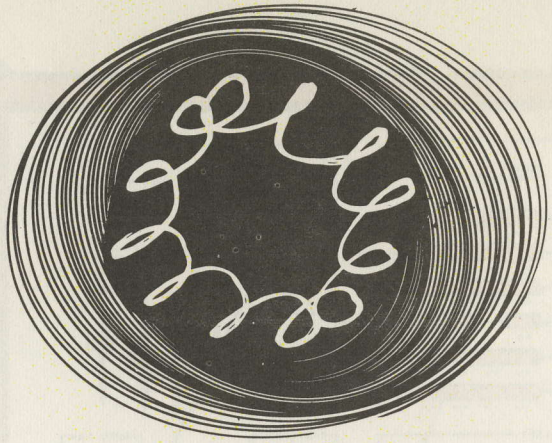
To control and vary the speed of the train, move the slide control of X up and down. When you wish to sound the train whistle, press the MANUAL TRIGGER. Each press will cause a blast of the whistle!

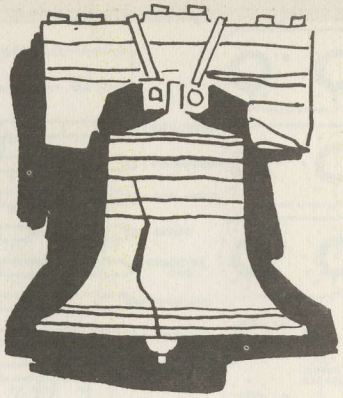
See page 36 for some ideas of setting this sound into automatic panning. Experiment with variations between the two controls.

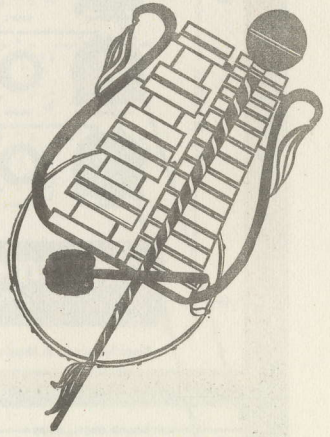

performer
by ionic
Synthesizer & Modulator
SOURCES
OSC. 1
OSC. 2
OSC. 3
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
REVERB
ENVELOPE
FILTER
TRAPEZOID
AUTO. PAN
POWER
KEYBOARD OSCILLATOR
CH.1 OUTPUTS CH.2
ENVELOPE
REVERB
OUTPUT AMP 2
TRAP
OSC 1
A1
A4
A6
A13
OSC 2
B1
OUTPUT AMP 1
FILTER
D5
OUTPUT AMP 1
OSC 3
E9
FILTER
WHITE NOISE
H3
MANUAL TRIGGER
L1
7
A
5
B
2
C
0
D
6.5
E
5
F
0
G
15
H
9
O
3
P
9
P
7.5
Q
10
S
1.5
T
55
U
0
V
5
W

VARIETY OF CHIMES

ionicamera*



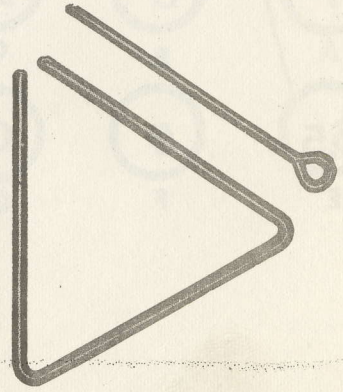


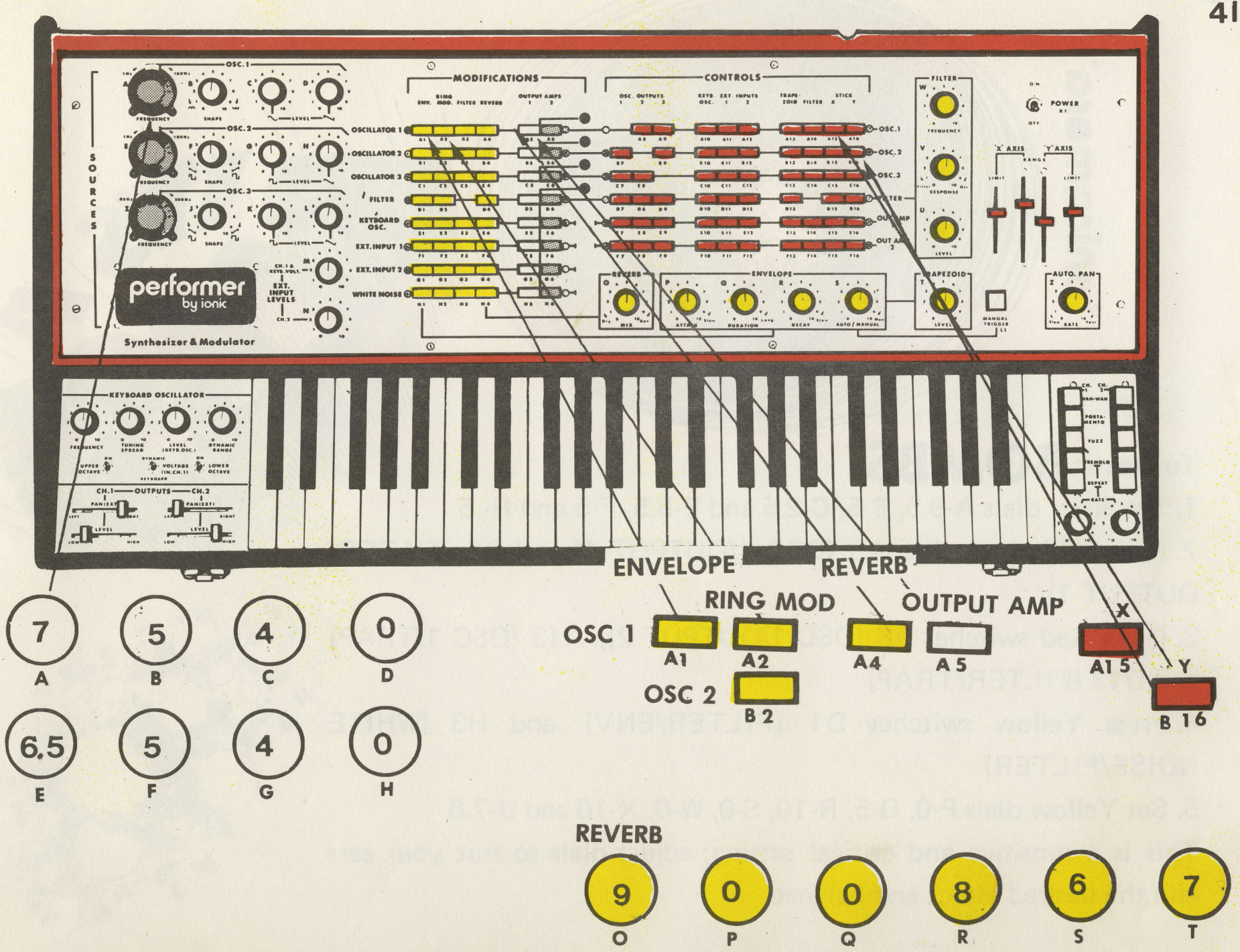


To create a VARIETY OF CHIMES

1. Set Silver dials A-7, B-5, C-4, D-0, E-6.5, F-5, G-4 and H-0
2. Press Yellow switches A1 (OSC 1/ENV), A2 (OSC 1/RING MOD), A4 (OSC 1/REVERB) and B2 (OSC 2/RING MOD)
3. Press A5 (OSC 1/OUTPUT 1)
4. Press Red switches A16 (OSC 1/Y AXIS) and B15 (OSC 2/X AXIS)
5. Set Yellow dials O-9, P-0, Q-0, R-8, S-6 and T-7

Vary the slide controls of the X and Y axis up and observe the tremendous variety of chime and bell like effects that can be produced. From tinkly, little triangle and music box sounds to booming clangs of anvils and grandfather clocks; they're all there for the seeking. Varying dial settings, too, will add to the fun and discovery.



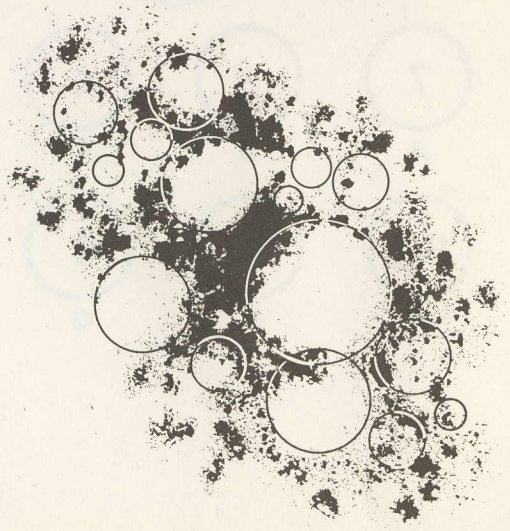

performer
by ionic
Synthesizer & Modulator
SOURCES
OSC. 1
OSC. 2
OSC. 3
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
EXT. INPUT LEVELS
KEYBOARD OSCILLATOR
CH.1 OUTPUTS CH.2
ENVELOPE
REVERB
TRAPEZOID
AUTO. PAN
FILTER
POWER
'X' AXIS
'Y' AXIS
MANUAL TRIGGER
7
A
5
B
4
C
0
D
6.5
E
5
F
4
G
0
H
ENVELOPE
REVERB
RING MOD
OUTPUT AMP
OSC 1
A1
A2
A4
A5
OSC 2
B 2
X
A1 5
Y
B 16
REVERB
9
O
0
P
0
Q
8
R
6
S
7
T

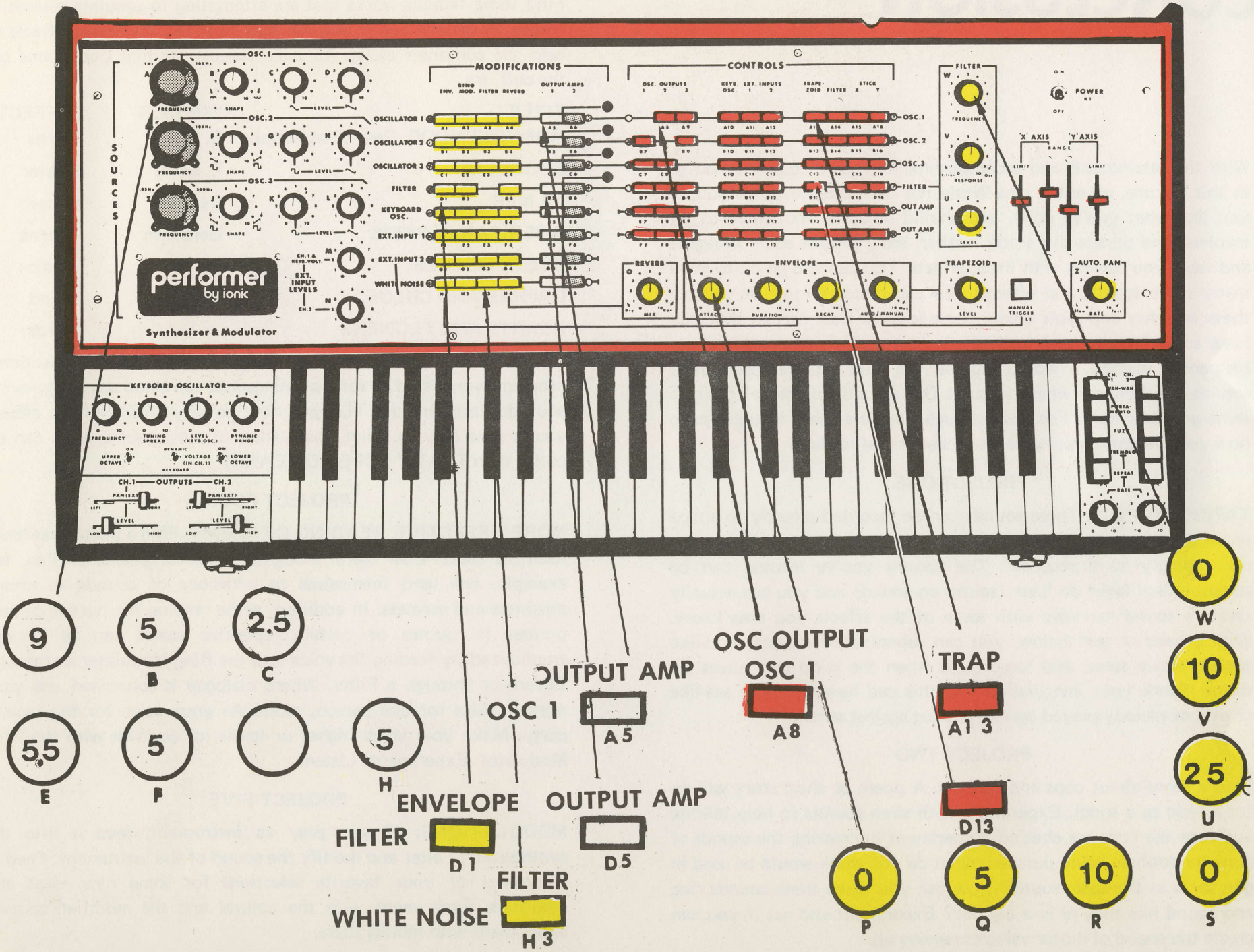
ionicamera*

To create **BOMBS**

1. Set Silver dials A-9.5, B-5, C-2.5 and E-5.5, F-5 and H-.5
2. Press White switches A5 (OSC 1/OUTPUT 1) and D5 (FILTER/OUTPUT 1)
3. Press Red switches A8 (OSC 1/OUTPUT 2), A13 (OSC 1/TRAP) and D13 (FILTER/TRAP)
4. Press Yellow switches D1 (FILTER/ENV) and H3 (WHITE NOISE/FILTER)
5. Set Yellow dials P-0, Q-5, R-10, S-0, W-0, X-10 and U-7.5

This is a sensitive and critical setting; adjust dials to suit your ears and the desired effect and balance.




performer
by ionic
Synthesizer & Modulator
SOURCES
OSC. 1
OSC. 2
OSC. 3
MODIFICATIONS
CONTROLS
OSCILLATOR 1
OSCILLATOR 2
OSCILLATOR 3
FILTER
KEYBOARD OSC.
EXT. INPUT 1
EXT. INPUT 2
WHITE NOISE
REVERB
ENVELOPE
TRAPEZOID
FILTER
POWER
X AXIS
Y AXIS
AUTO. PAN
KEYBOARD OSCILLATOR
CH.1 OUTPUTS CH.2
9
5
2.5
B
C
55
5
E
F
5
H
OUTPUT AMP
OSC 1
A5
OSC OUTPUT
OSC 1
A8
TRAP
A13
D13
ENVELOPE
FILTER
D1
OUTPUT AMP
D5
FILTER
WHITE NOISE
H3
0
P
5
Q
10
R
0
S
0
W
10
V
25
U

CONCLUSION

With the attainments and accomplishments you've been exposed to in this volume, an entire new World has been opened up to you. If you like what you've done, you should be better motivated to get involved and pursue this study further. We'll suggest some thoughts and what you can do with these effects. You can also go on to learn many more sounds and effects; you can discover more as to why these switches and dials create these sounds. I am certain that you have some feelings and inclinations as to why certain things are happening, already. I would suggest, too, that you memorize these sounds as a basis on which to build. Our second volume will go in to some greater details. For now, though, here are some thoughts as to how you can apply your present vocabulary of sounds:

PROJECT ONE

TAPING SOUNDS. These sounds can be recorded directly to a tape recorder (without a mike). Merely use an output terminal from the rear directly to a recorder. The sounds you've learned can be superimposed layer on layer (sound on sound) and you can actually create a sound narrative with some of the effects you now know. With a basis of surf below, you can superimpose various wind-like sounds above same; add some birds when the wind and waves die down. Spark your imagination and this can have a simple sea-like chanty or melody played against or sung against same.

PROJECT TWO

Find a story about cops and robbers. A poem or short story will do (or a lyric to a song). Experiment with siren sounds to help tell the audience the cops are chasing. Experiment in creating the sounds of guns for robbers being pursued. What do you think would be used in gun shots as the basic sound? How can you make these sounds ring and sound like they're in a big hall? Experiment and see if you can create the sound of motor vehicles revving up.

PROJECT THREE

Find some famous works that are attempting to simulate sounds in nature, musically. See if you can add more realistic sound effects to help the composer along. As some suggestions that I can name off the cuff, try

TITLE	COMPOSER	EFFECT
MORNING MOOD (Peer Gynt Suite)	E. Grieg	Birds
BROOKLET	E. Grieg	Water
LA MER	Debussy	Ocean
AMERICAN IN PARIS	Gershwin	Horns
BYE BYE BLUES		Trains
DAPHNE AND CHLOE	Ravel	Wind
HEARTS AND FLOWERS		Birds

I'm certain if you'll listen to many of your favorite selections, programs you'll find all sorts of things that can stand some improving and additions. In fact, you will now be very critical of the effects you're now hearing. First observation of most people is, "I can do better than THAT!" HOPE YOU CAN!!!

PROJECT FOUR

MORE EFFECTIVE READING OF POEMS: Find a poem that lends itself to more than mere thoughts. Colorful poems of Poe, for example, can lend themselves to additions of sounds to create mistiness and eeriness. In addition, while reading the poems, certain phrases in quotes or certain repetitive words can be further emphasized by feeding the voice into the Ring Modulator or through Reverb or through a Filter. Where dialogue is concerned, use your normal voice for one person, modulate your voice for the second party. Make your voice higher or lower for contrast with the Ring Modulator. Experiment! Listen!

PROJECT FIVE

MODULATIONS: If you play an instrument, feed it into the synthesizer to alter and modify the sound of the instrument. Feed in recordings of your favorite selections for some new ideas and additions. Experiment with the natural and the modified sounds; experiment with mixing them.

PROJECT SIX

KEYBOARD EXPERIMENTS: If you can play a simple melody on the keyboard, experiment with transposing to keys three whole steps and five steps down. (If you start in C move up to E and then down to A). Experiment with two oscillators with the same melody. Attempt to play them in unison, in octaves, in fifths, thirds. Try intervals at great extremes on the keyboard. Experiment with the attack and decay of the envelope for more instrumental-like sounds. With the oscillator on the panel board, play with the tuning spread and tune an octave from say C to G. With new space relationships, try a simple tune you know and find how strange it becomes with new spacings. For more advanced thoughts on temperaments, experiment with an octave spread between 19 keys, 43 keys, 53 keys. You can now play literature on the keyboard never before possible! Mix well-tempered and microtunings, simultaneously. With two tonalities, move one around for some unusual effects. Blow your mind!

Records are available with missing instrumentation; have fun adding the missing part and simulating the instrument. Make certain you are in tune. There are a variety of play-along and sing-along records.

PROJECT SEVEN

TUNING: One of the most obvious musical benefits to be derived from intimacy with a synthesizer is explorations of pitch and tuning. Two oscillators can be sounded and controlled by the X and Y Axis slides controls. It's a good thought to use similar waves. Students can explore unison tunings; this will enable them to develop abilities to tune up traditional instruments and to sing in pitch. This is an effective complement to ear training. Picture-wise, when tones are modulating each other, elaborate and fuzzy patterns will appear; when unisons will be tuned accurately, the viewer will be rewarded with simpler visuals, circles, ellipses etc. The shifting of the phases will be readily observed. Students can learn to observe beats orally and visually. In teaching intervals, there is no possibility to fake one's way through the equipment. The skill and ability must be perceived and achieved. At the "Q" or resonating point of the filter, students can learn much more about the harmonic series. He can hear and see each step in the series and will better retain the phenomenon. Pitch-wise, a group can compare how much of the spectrum they can hear; a comparison between male and female ranges can be set up in a class as a project. Awareness of pleasing registers and decline of sharpness in age can be discussed. Not only can the ears be studied and compared, one can examine the quality of speakers and amplifiers in both extremes. At low points, one can note where the oscillations repeat and where they first become steady tones. All these thoughts and explorations will make a finer potential for musical study and deeper observations. Whether one is of a scientific bent or not doesn't matter; anyone involved in sound to any extent should have the curosity to know more about what constitutes the phenomenon.

PROJECT EIGHT

AURUAL-VISUAL IDENTIFICATION: After you've played with your synthetic equipment you should be better aware of the sounds and sights that surround you in your daily routines. The following projects may help you better organize what you've digested and learned in your explorations:

SOUND: Select a number of established, early works in electronic music and play the recording for a group. As each sound is played, stop the recording and see if you can identify how the sound or effect was produced. For example, an early Stockhausen work KONTAKTE Nr. 12 (1959/60) demonstrates many known and unknown sounds. He uses electronic sounds on tape (in 4 channels, by the way). He then explores the imitation rhythmically, tonally, timbre-wise by a live pianist and percussionist. He is playing with and experimenting with known and unknown sounds. He is attempting to relate them to traditional musical instruments. With your EM experiences, you can discuss how the electronic sounds were produced. At different points in the tape, experiment with your synthesizer and see if you have any ideas on how you'd go about making the same or similar sounds and effects. It's almost like practising with a master. The insights you've gained will be quickly evident. The state of the art and progress in so short a time will be apparent, too, when you discuss the expensive equipment Stockhausen and early pioneers used and how cheaply and readily available similar gear is today. In a group discussion, you can discuss the sounds made, the equipment used then and now; comparing costs and availability might be of concern. New areas of exploration and

expression can be noted; the influence of this early piece and what imitators have wrought in the repertoire.

VISUAL IDENTIFICATION: Feed your synthesizer into an Ionicamera; shut off the sound portion of your equipment. (You can also do this with a tape recording). As each image appears on the screen, identify the source. Take a simple wave and attempt a profile. See if your shaping of waves can produce the desired contours.

As further evidence of your prowess, explore making pictures of what you think the sound will produce. Compare your drawings with what the camera will display. An interesting project would be to make a series of images on paper and then see if you can create a series of sounds that will produce the desired effect. Although many people regard the sounds and sight as mere chance, you can now forecast the sounds and sights if you've really absorbed the experience. If you have not achieved this level of attainment, don't get discouraged. Keep listening and viewing and insights will follow. You'll grow and expand with the experience of trial and error.

PROJECT NINE

DRAMATIC EXPLORATIONS: Select an old film in a nearby library that is of silent vintage; dig out some home movies. Find a colorful nursery rhyme you enjoy; rummage through some science-fiction lore for a dramatizeable potential. Select a scene from Macbeth that lends itself to further dramatization (the Witch's brew, for example). Find some old radio scripts; look through some new ones; write some new ones. Select some dull lectures on tape or film. After going through this exploration, imagine what you can do to add to any of the foregoing with your synthesizer. You can modulate the talk or parts of it; you can modulate the music, if any. To better dramatize the action, add effects or add music. Capture the attention of an audience that is talking with a commanding overture or attention getter. In an orchestra they will play a drum roll, play a fanfare or strike a gong or cymbal. You can simulate any of these sounds or create explosive, attention-getting effects to command the attention of your listeners. Add humour as is done in many a cartoon. Prepare a presentation of sight minus speech (a la silent films) and create music and sound that can add much more than those old, tinkly pianos. Listen to such fare and let your imagination run rampant. Experiment with recorded additions, live additions and a combination of both.

INSTRUMENTAL SIMULATIONS

A synthesizer has a potential of creating and simulating all known and unknown sounds. With an infinity of variables, just about anything is possible if you search long enough for it. Basically, most sound is not simple and is a combination of a number of items and some are static and others move. Rather than state here that this is how one makes a violin and then have the listener remark, "That's not a violin!", we'd prefer spelling out properties of some known instruments and areas you can explore to achieve a similar or desired effect. In reading through patents, I've noted that early explorations in technology in music always discussed new and better means of making a vibrato. We can cause a vibrato of, say, the first oscillator by modulating it with the third oscillator in a very low frequency. By adjusting the shaper dial of the third oscillator and the volume of the ramp wave dial we can effect any type of vibrato. However, this is a great deal of bother when you'll need vibratos most frequently. Because of this, we've built our pre sets which will create the vibrato for you immediately; the rate dial will vary the amount of vibrato; by this means you can have a slow vibrato on one channel and rapid one on the other whenever you need it. (Actually, the pre set performs the functions of additional oscillators, envelopes and filters; this leaves the items on the panel board free to do whatever you elect). Now that we've discussed the availability of vibrato, the next judgment to make is when to use it or not. Below are some known and suggested ideas of how to achieve somewhat desired sounds and when to use and when not to use treatments or modifications:

GENERAL SUGGESTIONS

Effect	Vibrato	Wave	Envelopes
VIOLIN	None when moving rapidly Much when sustaining	Ramp	None (unless pizzicato)
CLARINET	None	Square	Attack about 3 not too much sustain
TROMBONE	Not much, if at all On long tones, vibrato can be added and sped up; then remove	Ramp	Slow attack

TUBA	Very similar to trombone; more explosive in sound and more reverb use wah		
OBOE	None	Square + Triangle	Attack about 3 not too much sustain
TRUMPET	None; add on long tones; vary, remove	Ramp/ Square	Fast attack short sustain
TYMPANI	None	Noise/ Sine	Attack 2-4; sustain about 6
PORTAMENTO (A sliding to a pitch)	Your taste	(Sine)	Your taste

The range you're working in has much to do with simulations. Upper ranges create violins; mid ranges violas and cellos, low ranges string bass. All of this is on one dial. The lower we go, the slower and less the vibrato. Much can be said in a similar fashion for reeds, brass, etc. Listen to the performances of acoustical instruments; the better you can analyze, the better you can simulate. Developing this sense of sound is a joy and revelation.

A further aid to precise timbres can be more readily attained by the use of a filter bank. By manipulation of the slides in the various octaves and registers, timbres can be shaped and humored to a great variety of shades and nuances. This is a great time saving addition when wanting to zero in on exactly what your inner ear tells you.

These are some brief, simple thoughts that you can play with, experiment with, grow with and expand your experience and creativity. The suggestions here are merely scratching the surface. Mix all the projects up and we think you'll be busy for quite a while. You'll be a keener and better listener. You should excite your interests and curiosities. We hope you've enjoyed these experiences and want to learn more. ENJOY!

IONICAMERA

VISUALIZATIONS

Throughout this text, we've ATTEMPTED to give you SOME idea of what the waves and events look like on our screen. These can't really tell the story since the picture is generally in movement. Of course, if you're sustaining a tone, the picture will remain static except for phase shiftings, beats etc. However, most of the items in the book are set in motion. The pictures shown are only one point in the entire movement. The beauty is the constant changing of the visual to accompany and translate the audio. To better identify with these images, learn the basic waves and modifications; you will then quickly learn and identify their appearance when viewed on the screen. Adjust knobs on the TV and on your volume pans so that the picture will be centered on the TV screen. For those of you with scopes, you can make similar observations and learn more about the waves and shapes you are generating. A first-hand knowledge of both is essential and helpful. The origins of much of this lore hearkens back to an old Greek philosopher, Heracleitus. It proceeds from today into Moire, Alpha Wave and bio-feedback and into lasers and holography. It spills over into some of our more hip and lucid film and A/V creators.

SPECIFICATIONS

GENERAL

The Performer by Ionic (PBI) Synthesizer and Modulator is a self-contained package consisting of sound sources, (coded in silver), modifications of these sources (coded in yellow), amplifiers for bringing signals and controls (coded in red) in from, and leading them out to external equipment. The unit operates on 117V A.C.

The Performer may be used as:

1. A COMPLETE UNIT IN ITSELF; using its own self-contained speakers, no other external equipment is necessary.

2. AS A LIVE PERFORMANCE INSTRUMENT: As a sound source in itself and a modifier of externally fed signals. For a greater reproduction of the extremities of the sound spectrum and for sufficient power to match other instruments, external amplifiers and speakers would prove very attractive. Its feature, the Quad sound capability demands external speakers and amplifiers.

3. AS A SOUNDS EFFECT DEVICE: Hardly an effect known can not be made on this equipment with far greater ease than has been done conventionally in the past. Theatrical or broadcasting presentations will demand this sort of a device for all future development.

4. AS THE CENTER OF AN ELECTRONIC MUSIC LAB: As the main sound source, the addition of tape recorders, rhythm, radio, phono, electronic instruments, microphones etc. can all add up to a fairly competent, efficient studio for a total price of less than the sound source cost a mere two years ago. Updated technology now brings the lab price and understanding to everyone's doorstep. Composers on any level can now dream and compose with this equipment without longing for gear beyond their financial grasp.

5. AS A TEACHING AID: All fundamentals of music and acoustics can be easily demonstrated on the Performer. Music students can now learn more about traditional manifestations through this compact piece of technology. The tuning and pitch manifestations, for example, far surpass any known musical instrument. The Performer is the most outstanding means of commencing the musical experience known. By eliminating all physical development (fingers, embouchure etc.) and by avoiding all complicated explanations through color coding, the Performer now will enable anyone regardless of age, ability or background to achieve instantly.

The circuitry of the Performer is complete solid state and integrated circuits. All components are mounted on modular, removable cards and can be easily removed for replacement.

The cabinetry is of wood covered with a lustrous, vinyl covering to withstand the abuse of transportation. The panel is mounted on a brushed aluminum sheet with silk screened points of reference; this, in turn is epoxy coated to protect the screening and sheen from wear. A sturdy cover protects the unit in transit and houses four legs for mounting the Performer when in the field.

KEYBOARD (see notes)

DETAILED SPECIFICATIONS

Input: 105-115V, AC 60 Hz. Connection by a three pin plug.
Fuse: 1A ($_{Slo}$-Blo) access on rear panel.

Oscillator 1:

Max. Output Levels: sine — 3V p–p
ramp — 4V p–p

Frequency Range: (dial only) — greater than 1Hz–10KHz

Dial relationship is 1.5 octaves +2% per major division, and the actual dial calibration, when properly set up, is as follows (the extreme positions may be outside the tolerance):

DIAL NO.	0	1	2	3	4	5
FREQ (Hz)	(0.6)	1.7	4.1	11.6	32.7	92.5

DIAL NO.	6	7	8	9	10
FREQ (Hz)	261.6	740	2,093	5,920	(16,750)

Voltage control sensitivity = 0.32V/octave. External voltages through input channel give 0.16V/octave since input channels have a voltage gain of 2.

General Note on Control Voltages: Specifications give ranges for manual control of v.c. parameters. The ranges can be extended by additional control voltages.

Oscillator 2:

Max. Output Levels: square/pulse output — 4V p-p
triangle output — 3V p-p
ramp positions of triangle — 6V p-p

All other details are the same as Oscillator 1.

Oscillator 3:

Max. Output Levels: square/pulse output — 4V p-p
triangle output — 3V p-p
ramp positions of triangle — 6V p-p

Frequency Range: (dial only) greater than 0.025Hz (40 secs per cycle) to 500 Hz

Calibration of dial as follows (extreme low frequency varies slightly from example to example):

DIAL NO.	0	1	2	3	4	5
FREQ (Hz)	(0.015)	0.043	0.122	0.344	0.975	2.76
PERIOD (Secs)	(65)	23.2	8.2	2.9	1.02	0.36

DIAL NO.	6	7	8	9	10
FREQ (Hz)	7.82	22.2	62.5	177	500
PERIOD (Secs)	0.128	0.045	0.016	0.0056	0.002

Voltage Control sensitivity: 0.26V/octave

Noise Generator:

Max. Output Level: 3V p-p

Ring Modulator:

Max. Input Levels for undistorted output: 1.5V p-p

Max. Output Level with 1.5V on both inputs: 6V p-p

Above this level there will be some breakthrough of spurious overtones. Breakthrough with 1.5V p-p to one input only is 5mV p-p (–60dB)

Filter/Oscillator

Frequency Range in all functions: (knob control only) greater than 5Hz to 10KHz

As a Low Pass Filter (Response knob at 0 — 'Low Pass Position') Cut off rate 12dB for first octave and 18dB per octave thereafter

As a Resonator (Response knob about halfway — 'Hi-Q Position') Max. stable Q factor: 20

As a Sine Wave Oscillator (Response knob to about 7 or more) Low distortion sine wave output over whole frequency range.

Voltage Control sensitivity: 0.2V/octave.

Envelope Shaper and Trapezoid Output:

Max. Repetition Rate: 60Hz

Attack Time:	variable from 2mS to 1 second
On Time:	variable from 0 to 2.5 seconds
Decay Time:	variable from 3mS to 15 seconds
Off Time:	variable from 10mS to 5 seconds

Decay sensitivity is 0.4V/octave — i.e. an increase of 0.4V will double the Decay Time.

Trapezoid Output Voltage Range: from —3V (ON) to +3V (OFF)

Reverberation Unit:

Folded Line type with wide bandwidth and good signal to noise ratio.
Frequency response: 80Hz - 6000 Hz
Delay time: 30-35 in sec, up to 2 sec nom. decay
Amplitude is preset in the unit for optimum performance.
Mix control adjusts from no reverb to full reverb.

Input Amplifiers:

Microphone Inputs (MIC jack sockets)

Sensitivity: (2X) 5mVAC into 600 ohms

In fact the input characteristics are flexible enough to provide satisfactory results with most devices, even if the impedance is considerably higher than 600 ohms (e.g. crystal microphones). Low impedance microphones and pick-ups, however, should be fitted with transformers and/or preamplifiers.

High Level Inputs Cassette and Rhythm

Sensitivity: (2X) max. 1.8VAC (r.m.s.) or +2.5VDC into 50K ohms

These are the normal inputs from a tape recorder or ratio. Since they are directly coupled they can also be used for a DC control input. There is no objection to one channel being used for a signal and the other for a control, since they are separate circuits.

The three inputs to each channel must be used separately — e.g. if Channel 1 MIC input is busy the cassette or rhythm input to Channel 1 cannot also be used. But different kinds of input can be applied to each channel;

General Note on Arrangement of Jack Sockets: The jack sockets are arranged so that Channel 1 (or in one case L for Left) is in its correct position viewed from the FRONT. For this reason they may at first seem to be the wrong way round when viewed from the BACK.

Output Amplifiers:

Two amplifiers with Manual and Voltage Control of gain

Signal Outputs (SIGNAL OUTPUTS jack sockets)

QUAD CAPABILITY

FRONT

Level (2X) 2V p-p max. into 600 ohms

REAR

Level (2X) .4V p-p into 600 ohms

These outputs are marked L and R (instead of 1 and 2); they are under control of the pan slide controls on the left cheek block of the keyboard. These are the usual outputs for tape recorders and amplifiers. They should be connected to high level inputs and never to an input with built-in compensation for a non-linear device such as microphone or tape head input.

For stereo when only two speakers are available, use the two front outputs. To utilize the rear outputs, two additional speakers and an amplifier are required to create a matrix-type quad reproduction of the audio.

AUTO PAN

.6 Hz-20 Hz

The push pull knob on the lower right of the main control panel will create an automatic panning from left to right when pulled out. When pushed IN, the audio is normal. The rate of the pan is controlled by turning the dial of the knob, clock-wise to increase the rate and vice versa to slow it down. At the extreme speed it can cause a repeat and a vibrato to sound. Acting much like an additional envelope, it is completely variable. Adding two speakers to each of the channels will create a vibrato much like a well-known doppler effect.

High Level Signal Outputs (HEADPHONES (STEREO) jack socket)

Level: (2X) 10V p-p max. into 50 ohms

These outputs go to a stereo jack socket. Do not use a 2-way jack in this socket or one side of the high level output will be short-circuited.

The tip of the jack is connected to the left channel, the ring to the right channel, and the main body to ground.

This is a non-panning output, and although intended principally for headphones it can be used wherever an especailly high level output is required. The outputs to the internal speakers are also non-panning, and for this reason the PAN controls are marked (EXT.).

DC Outputs (CONTROL OUTPUTS jack sockets)

Level: Depends on the setting of the device from which a control is being taken. It is approximately the same as the figures given for each device. The optimum load for this output is 10K ohms, and it should not be less than 2K ohms.

X and Y AXIS CONTROLS (Red)

Manually operated slide controls with two slides and two limiters of the span. Controls of the three oscillators filter and two output amps on either or both the axis. There are also input jack terminals in the rear for these same devices. Range (2X) X+X +2 VDC

PRE SET PANEL (Right hand keyboard cheek block) Optional

REPEAT, TREMOLO

Rate 3-10 Hz

WAH

Duration 100 mSec (Nominal)

PORTAMENTO, FUZZ

Separate controls for left and right channels. First two items are actually additional low frequency oscillators; the second item WAH serves as additional envelopes and may be used independently or combined with the variable envelope of the unit.

SWITCH PANEL

102 switches of push-push variety located on the panel above the keyboard. Basically, divided into two sections, the yellow switches are MODIFICATIONS of the sources; the red switches are controls of same. These devices create rapid and instant connections of all the devices.

KEYBOARD

Introduction

The keyboard contains an oscillator producing tones on the well tempered scale. It also produces control voltages which control any of the devices in the synthesizer.

The keyboard consists of 49 piano-sized keys (C to C) with electronics producing the following controls:
1. A control voltage proportional to the highest note pressed. The keyboard retains or remembers the last voltage produced.
2. A second control voltage proportional to the velocity with which a key is struck. As in 1, the last voltage is remembered.
3. A sawtooth signal (and a square wave, one octave lower) from the keyboard's oscillator. The pitch and loudness of same are controlled by the key struck.
4. A trigger signal for the envelope shaper.

Controls

Frequency – This shifts the tuning of the keyboard oscillator to give a total range covering 30 to 2000 Hz.

Tuning Spread – This trims the tuning of the internal oscillator over a narrow range allowing one to 'stretch the octaves'. This control should normally be set halfway.

Trimpot Level – This control sets the level of the internal oscillator. As it duplicates the function of the input channel level control it should normally be set near maximum, accesible only from inside. (Preset to optimum value.)

Dynamic Range – The dynamic range control determines the variations of loudness of the internal oscillator in response to key velocity. At minimum, the signal output will be independent of key velocity. At maximum the loudness will vary by more than 40db depending on the players' touch.

SELECTOR SWITCHES

UPPER OCTAVE: Will sound the ramp wave when in the ON position

VOLTAGE 1: In the DOWN POSITION the voltage is controlled by the keyboard in a well tempered fashion; in the UP POSITION it is dynamic or touch sensitive to the proportion of the finger velocity.
LOWER OCTAVE: Will sound a square wave in the ON position one octave lower than the UPPER OCTAVE switch.

OPERATION

KEYBOARD TUNING: Set the keyboard oscillator UPPER OCTAVE switch UP; on the control panel, press E5 (KB OSC/OUTPUT 1). Press A6 (OSC1/OUTPUT 2). Turn the silver dial plus C (sine wave) to about 5. Turn the A dial (OSC 1) to a point where this pitch coincides with the keyboard pitch. Press the red switch A 11 (OSC 1/OUTPUT 1) and start sounding an octave on the keyboard. To achieve an octave work the M (Tuning dial) to a point where you achieve an octave. If your ear cannot assure you of the exact tuning, compare with the octave on the keyboard oscillator or check with a scope or Ionicamera.

LEVEL (PLAYING TECHNIQUE): The keyboard oscillator level signal is proportional to the finger velocity striking the key. The level established will be maintained until another level is established by the striking of another key.

ENVELOPE USE WITH KEYBOARD: Since the pitch established by the key is remembered, it will continue to sound. By adding the envelope to the keyboard control, setting the timing dial on the envelope to MANUAL, the oscillators will only sound when the key is pressed (as when one presses the MANUAL TRIGGER). In reality, the keyboard is a series of triggers.

Specification

Power supply

+12v + 5% and -9v +5% at 500 mA.

Keyboard (pitch) voltage

+1.5v +7%) Output is 1V per octave. Middle F gives 0 volts. Impedance 100

Dynamic Voltage

+1.5v with approx. 30% over range for very hard or very soft playing. Impedance 100

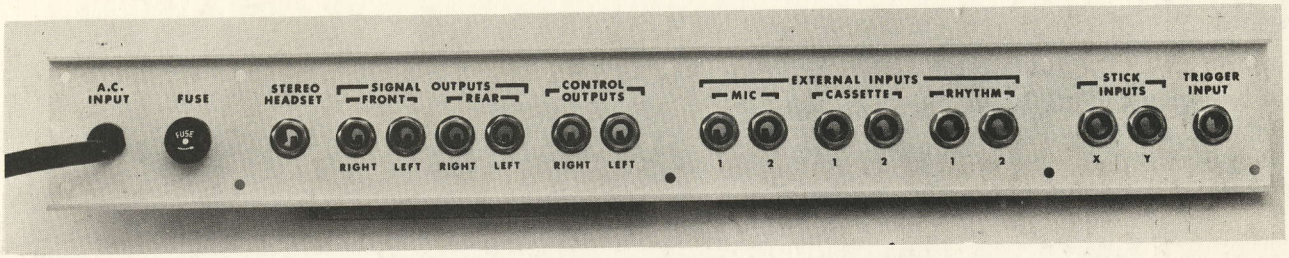
Signal

Maximum of 10v p-p. For medium touch, or with dynamic range control, at min., output is .5v p-p. Output impedance 4.7K

Ext. input 1Vp-p for low distortion. Max. dynamics modulator gain, (i.e. for heaviest touch) is +15dB above this input.

PRE SET

INFORMATION



The pre set is an instant setting of a modification of whatever is set up on the unit. Of course, with dials and switches you can program exactly what you want and what your ear dictates. However, the time that is consumed in such a set-up is not conducive to any performance; it certainly is time consuming when working in studios and lab-type environments. The luxury of having instant, organ-like tabs is quite a convenience; it is also a compromise. The mere fact that we have something SET and CONSTANT is contrary to the synthesizer philosophy. Thus the compromise.

Whatever the setting, you can make better ones with the dials and switches; they will take much more time. Thus we have to accept the pre set version for the convenience. The PORTAMENTO tab will be short on one side and long on the other offering a variety between the two settings. A voice-like function, it can add much charm and humor to set-ups on the unit. The WAH will work better sans other modifications. It's most effective with square waves; it's least suitable for sine waves. Adding filters or envelopes will, more or less, cancel out the effect. In other words, it will be of most use in a legato or sustained fashion. The effect will best be produced by striking the keys with the fingers.

The convenience of having a set TREMOLO in each channel is very convenient. It can be identical or at variance. An interesting effect is to play one oscillator at a rapid rate and another oscillator, in the other channel, at a slower rate; together, they make new and interesting effects. The same can be said for the REPEAT tabs. The third oscillator can create many of these modifications at very low frequencies. However, when used on the panel, they can be utilized for merely one effect at a time and ties up much of the hardware. In most devices of electronic tone production, tremolo and repeat are primary considerations. The PERFORMER is one of the first to take note of this fact. Aside from PORTAMENTO, do not use more than one pre set in a channel, at a time; otherwise, one tends to cancel the other out. As in organ playing, too many tabs or effects tend to over-ride each other and the net result is blah. The more taste manifested in your choice, the more pleasant will be the result. Judicious use is a rare talent worth developing. A brisk, lively Mozart simplicity sounds to the ear as if it were rattled off in a casual manner; investigate the process or attempt an imitation and you will develop some new respect for the master. In the pop field, a Count Basie would be a fine example of judicious, sparing taste and selectivity.