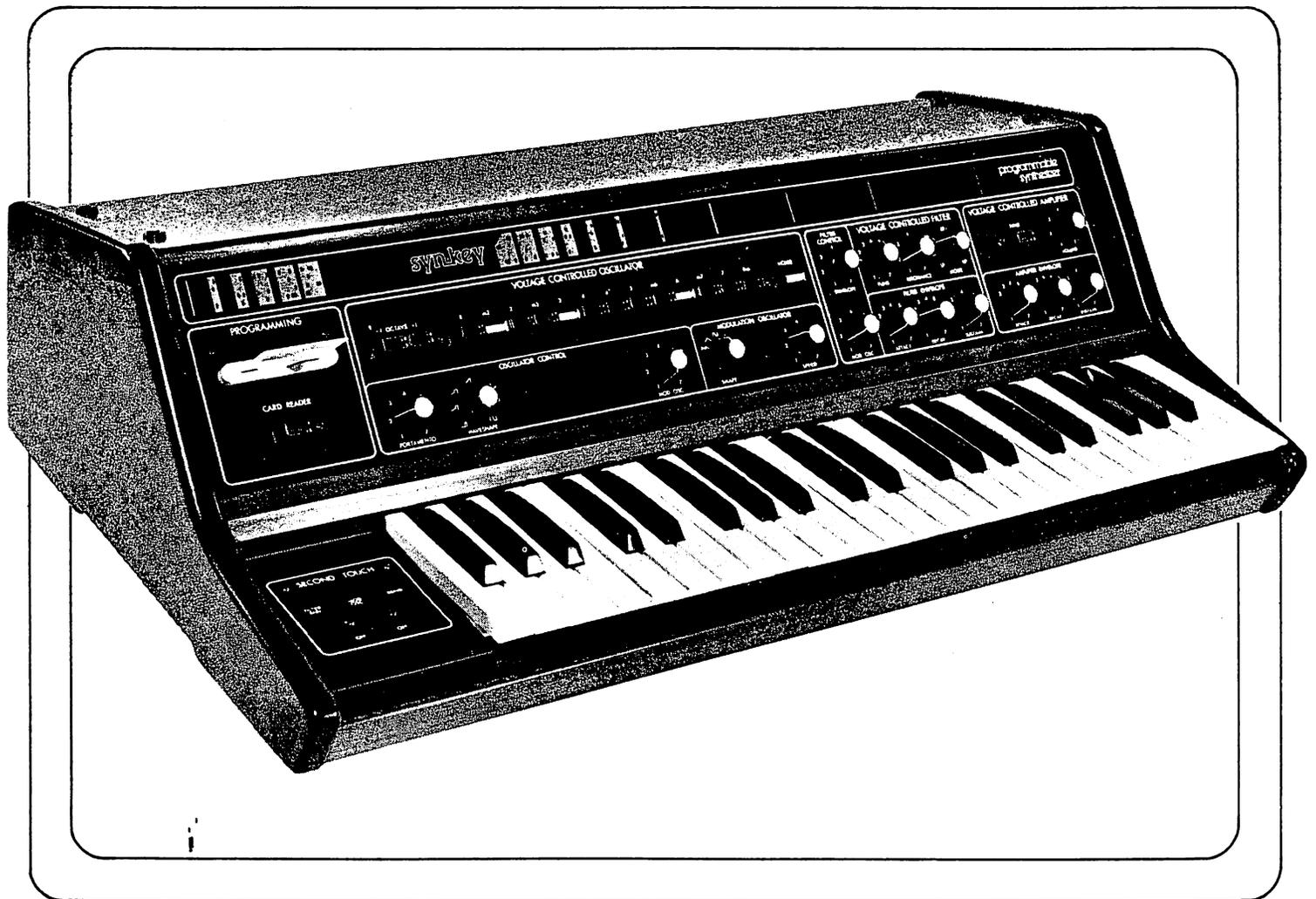
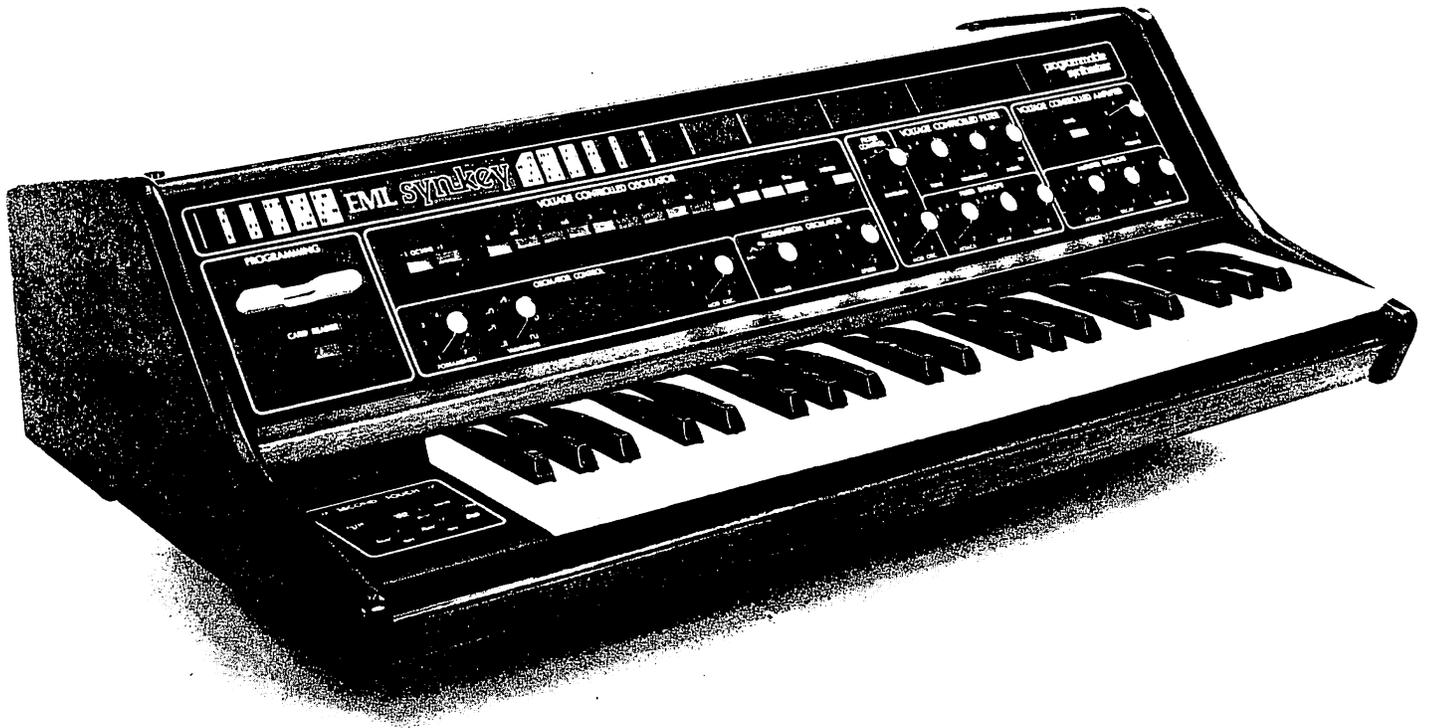


# synkey



programmable synthesizer





# Introducing SynKey. The first synthesizer you can program.

Until now synthesizers were a lot more complicated than your average musical instrument.

To play them well required a solid knowledge of electronics. To create music on them took plenty of knob twiddling and fine tuning. And to recreate a musical sound on them demanded a complicated system of notation.

SynKey by EML is different. SynKey is made for the musician who doesn't happen to have a degree in electronics.

To play SynKey takes musical ability not electronics training. To create music on SynKey requires musical imagination not a technician's skill. And to recreate a sound you've created is as simple as plugging in a SynKey Program Card and playing the keyboard.

**The SynKey programming feature gives you more time to create, more flexibility in performance.**

Spend your time creating. Once you get the sound you want, punch out the control positions in a SynKey Program Card and file it. Then start creating again. No need to spend time writing down dial positions and patches.

Every SynKey comes with a set of twenty-five blank cards and a cardpunch plus twenty-five factory-prepared cards with some voicings to set you to thinking.

When you want to recreate a particular sound on your SynKey, just plug in the card, punch on the reader and your controls are already set. You just play! On stage, that can mean more imaginative arrangements, faster changeover from sound to sound and a tremendous new potential for the synthesizer as a performance instrument.

**SynKey is the most playable synthesizer ever built.**

We've simplified the synthesizer. SynKey is easy to understand, easy to play. You can manually set the controls just like other synthesizers. The keyboard is a full 44 notes. Second-touch is available with a variety of effects. And the clearly marked, white-on-black

control panel with color-coded buttons cuts out a lot of the confusion you may associate with other synthesizers.

**A sound like thirteen oscillators.**

The more oscillators, the richer the sound. Most portable synthesizers have, at most, three oscillators. That limits the sound. But to duplicate the SynKey sound you'd need a synthesizer with thirteen oscillators, and there isn't one made.

The SynKey sound is generated by a unique top-octave divider which produces a basic tone plus the next twelve higher semitones in precise intervals.

All you do is select the semitones you want by punching the semitone select buttons. No multiple oscillators to tune. No complicated setup time.

**Carry a synthesized orchestra under your arm.**

SynKey weighs only twenty-nine pounds. Which means you can travel light.

The SynKey system may just replace two or three other keyboards you may pack. So SynKey may just be all you need to make all the music you want.

# synkey®

The first synthesizer you can program.  
A Kaman Music Product made by Electronic Music Labs, Inc.

**KEYBOARD:**

3½ octave Pratt Read keyboard with second touch and gold plated contacts. Second touch selects:

- pitch bend + a third
- filter sweep
- vibrato
- Mod. Osc. applied to filter (wah)

Any combination may be selected.

Portamento variable from 0 to 2 seconds per octave (may be selected by optional footswitch or controlled from optional pedal).

**SOURCES:**

A Master oscillator generates 13 pitches at semitone intervals. Pitches are selected by indicator push buttons. Any combination of semitones may be selected within the octave.

Accuracy of pitch interval. 1.2 cents maximum (approximately = 1/100 of a semitone).

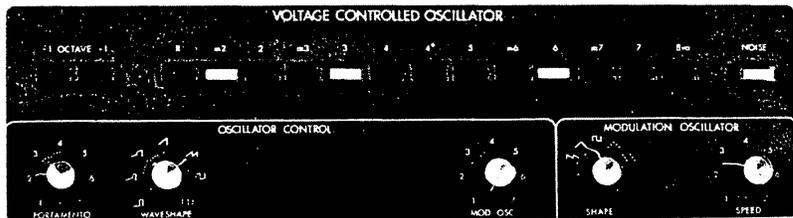
Octave select: ± 1 octave with precision digital divider.

Root pitch wave continuously variable with



and intermediate waveshapes available.

Pulse waveshape is modulated from 50% to 10% duty cycles by filter envelope for increased brightness. Remaining 12 pitch sources are bright 30% duty cycle pulses.



Frequency range without vibrato 44Hz – 4186Hz

Vibrato amount – adjustable up to ±2 octaves.

Noise: white, selected by indicating push button.

**MODIFIERS:**

Voltage Controlled Filter

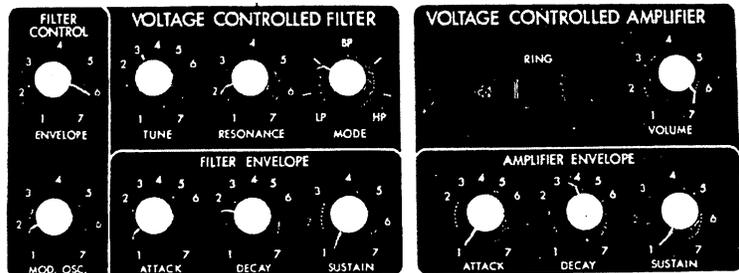
State variable filter continuously variable from low pass thru band pass and high pass modes. 12000

Frequency range 44Hz (F<sub>1</sub>) thru 12000 Hz (G<sub>9</sub>)

Inputs: (1) filter envelope 0 to +5 octave sweep.

(2) modulation oscillator 0 to ±3 octaves.

Ring modulator – Digital with modulation pitch tracking a 5th above root pitch. Other timbres may be selected by using other than root pitch source.



**CONTROLLERS:**

Envelopes – 1 for filter, 1 for voltage controlled amplifier, each with attack, decay and sustain controls.

Attack .005 to 3 sec. Decay .002 to 9 sec.

Modulation Oscillator

Variable rate from .15 cycles/second to 50 cycles/second.

5 switch selected waveshapes

plus sampled triangle and sampled sawtooth

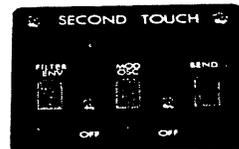
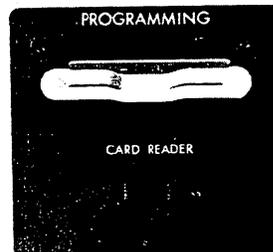
Light emitting diode indicates rate.

**CARD READER:**

40 bits with gold plated contacts. Rated for 100,000 card insertions.

**CARD PROGRAMMABLE CAPABILITIES:**

- Root waveform
- Vibrato amount
- Modulation oscillator shape
- Amount of envelope applied to filter
- Amount of modulation oscillator applied to filter
- Filter tune
- Filter resonance
- Filter mode: low pass, band pass, and high pass.
- Filter envelope: attack, decay, and sustain.
- Amplifier envelope: attack, decay, and sustain.



**NON PROGRAMMABLE CONTROLS:**

- Card reader select
- Octave select
- Semitone select
- Portamento time
- Modulation oscillator speed
- Ring select
- Output volume

Output: High and low outputs of 4 and .4 volts nominal range suitable for driving standard music and hi-fi amplifiers.

Warm-up: 3½ minutes at normal temperatures.

Synkey uses quality components throughout.

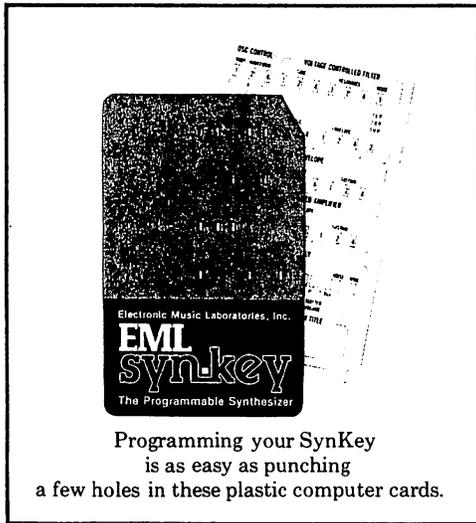
All potentiometers are Allen Bradley and are sealed against contaminants. Allen Bradley pots are rated at 100,000 rotations and become quieter with use. All switch contacts are gold and silver plated (excludes power switch).

Size 29" x 17" x 8" – Weight 26 lbs. – PWR Requirements 10 watts



Synkey  
Box 205  
Dept. E  
New Hartford, CT

# Programming, second touch and pushbutton semitone select make SynKey a true performance synthesizer.

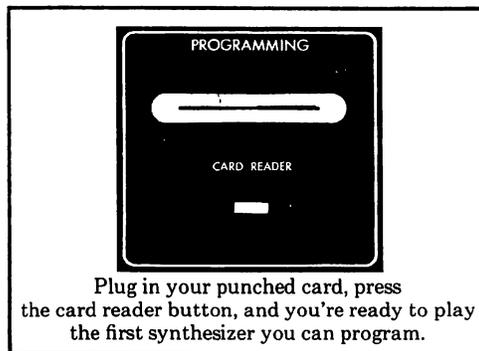


Programming your SynKey is as easy as punching a few holes in these plastic computer cards.

In the past, synthesizers were used for one, maybe two, numbers in a performance. Setting them up and getting them right made it impossible to use them more.

SynKey, with completely programmable voicings, makes it possible to change from one sound to another just by switching cards in the card reader. Pull one. Plug in another and your SynKey makes a completely different sound.

You can change sounds from one musical number to another, even within a given number. For instance, you can open as lead on your SynKey, play some, then have someone else go on lead. Then you can pull the card in the reader, put in another, and go back on lead with a completely new sound. That means flexibility and variety to your repertoire and arrangements.

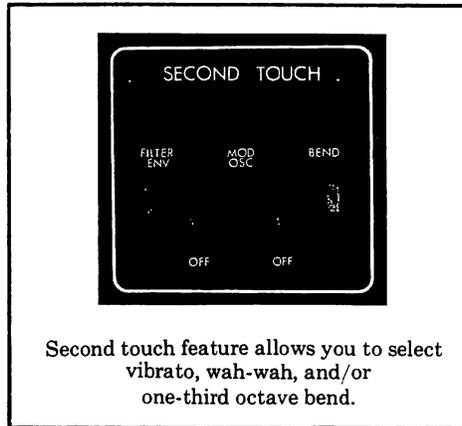


Plug in your punched card, press the card reader button, and you're ready to play the first synthesizer you can program.

## Second touch gives you selected effects played through the keyboard.

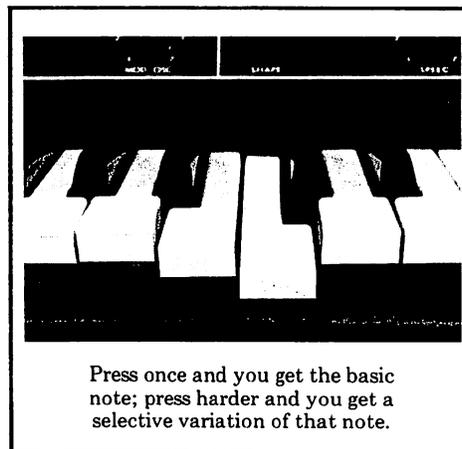
Second touch allows two distinct sounds to be produced with one depression of a given key.

Press once and you get the basic sound as programmed by the manual set of the controls or programmed on a card.



Second touch feature allows you to select vibrato, wah-wah, and/or one-third octave bend.

Press harder and you get a selective modification of the basic sound. You can choose wah-wah predetermined by the parameters set on the filter controls. Or choose selective vibrato predetermined by the parameters set on the modulation oscillator controls. Or your SynKey can produce a precise one-third octave bend of the basic note.



Press once and you get the basic note; press harder and you get a selective variation of that note.

## Tweaking your oscillators is a thing of the past.

Just punch a button for the semitone you want, from one to thirteen.

Tuning a synthesizer's oscillators used to be a time consuming job. They all had to be correct to get the harmonic sound you wanted.

SynKey's exclusive top-octave divider generates the sound of thirteen oscillators, in precise intervals, from one oscillator. So when you select the third semitone of your basic note on the SynKey chord select, you know you'll get precisely that third, no more, no less.

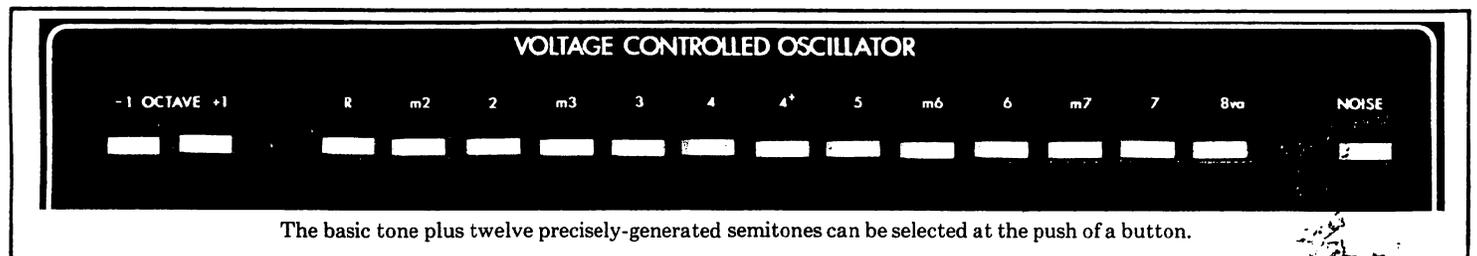
## Programmable parameters on SynKey synthesizer.

- Oscillator waveshape
- Oscillator modulation (mod osc)
- Modulation oscillator shape
- Filter envelope
- Filter envelope mod osc
- Filter tune
- Filter resonance
- Filter mode
- Filter envelope attack
- Filter envelope decay
- Filter envelope sustain
- Amplifier envelope attack
- Amplifier envelope decay
- Amplifier envelope sustain

# synkey

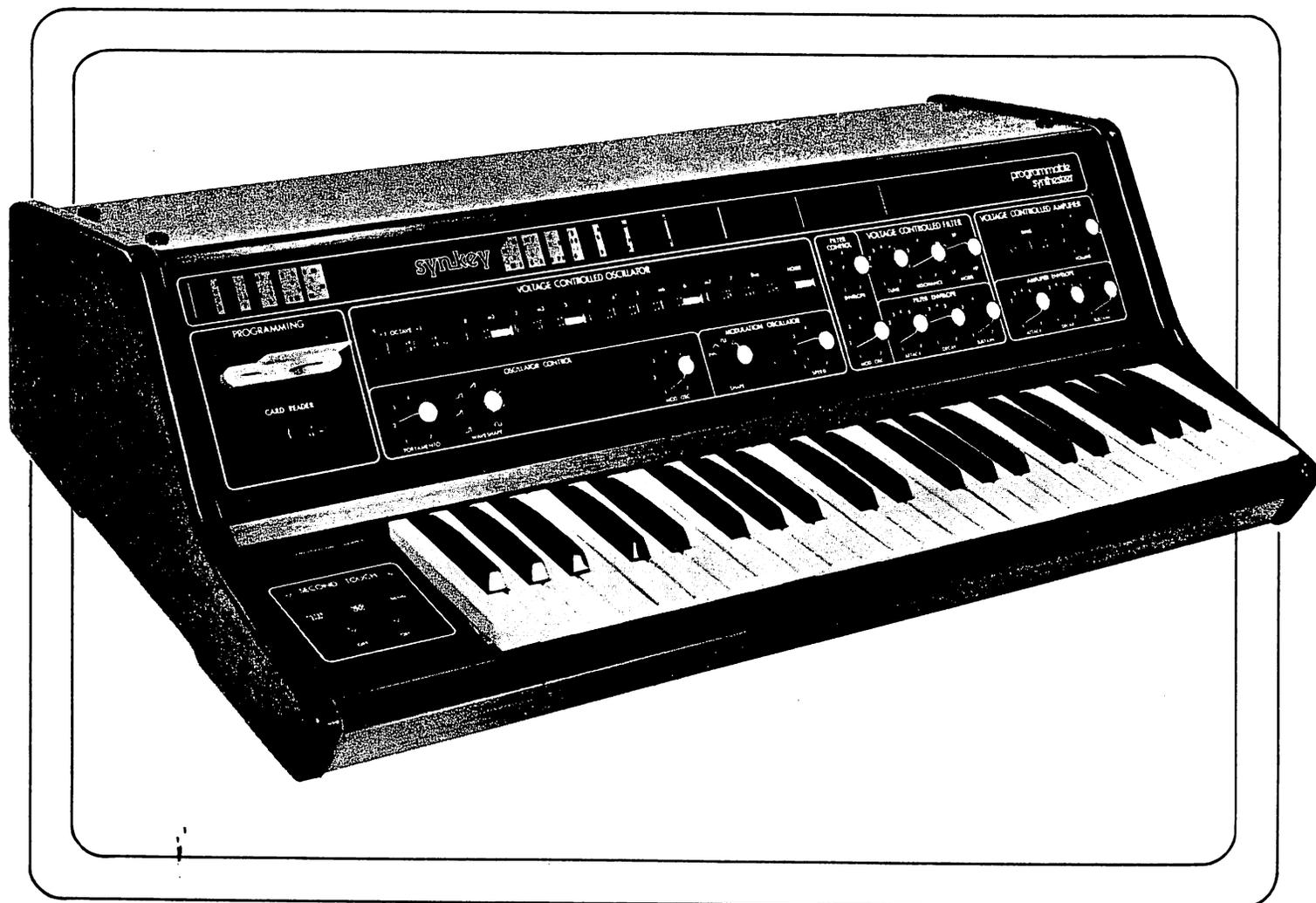
The first synthesizer you can program.  
A Kaman Music Product made by Electronic Music Laboratories, Inc.

For a free catalog, write SynKey, Dept. E, Box 205, New Hartford, CT 06057



The basic tone plus twelve precisely-generated semitones can be selected at the push of a button.

# synkey



programmable synthesizer



**KEYBOARD:**

3½ octave Pratt Read keyboard with second touch and gold plated contacts. Second touch selects:

- pitch bend + a third
- filter sweep
- vibrato
- Mod. Osc. applied to filter (wah)

Any combination may be selected.

Portamento variable from 0 to 2 seconds per octave (may be selected by optional footswitch or controlled from optional pedal).

**SOURCES:**

A Master oscillator generates 13 pitches at semitone intervals. Pitches are selected by indicator push buttons. Any combination of semitones may be selected within the octave.

Accuracy of pitch interval. 1.2 cents maximum (approximately = 1/100 of a semitone).

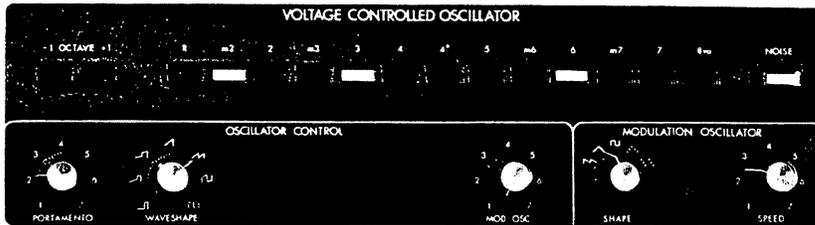
Octave select: ± 1 octave with precision digital divider.

Root pitch wave continuously variable with



and intermediate waveshapes available.

Pulse waveshape is modulated from 50% to 10% duty cycles by filter envelope for increased brightness. Remaining 12 pitch sources are bright 30% duty cycle pulses.



Frequency range without vibrato 44Hz — Hz - 4186 Hz

Vibrato amount — adjustable up to ±2 octaves.

Noise: white, selected by indicating push button.

**MODIFIERS:**

Voltage Controlled Filter

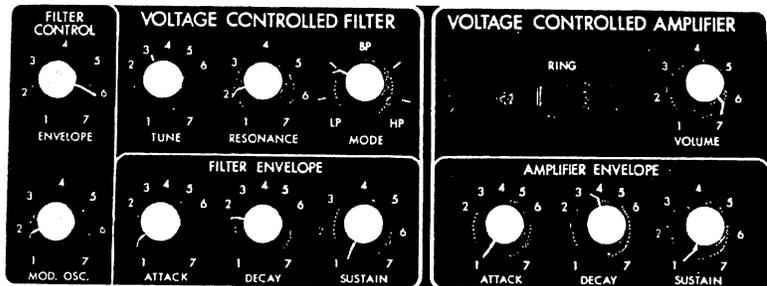
State variable filter continuously variable from low pass thru band pass and high pass modes.

Frequency range 44Hz (F<sub>1</sub>) thru 12,000 Hz (Gg)

Inputs: (1) filter envelope 0 to +5 octave sweep.

(2) modulation oscillator 0 to ±3 octaves.

Ring modulator — Digital with modulation pitch tracking a 5th above root pitch. Other timbres may be selected by using other than root pitch source.



**CONTROLLERS:**

Envelopes — 1 for filter, 1 for voltage controlled amplifier, each with attack, decay and sustain controls.

Attack .005 to 3 sec. Decay .002 to 9 sec.

Modulation Oscillator

Variable rate from .15 cycles/second to 50 cycles/second.

5 switch selected waveshapes

plus sampled triangle and sampled sawtooth

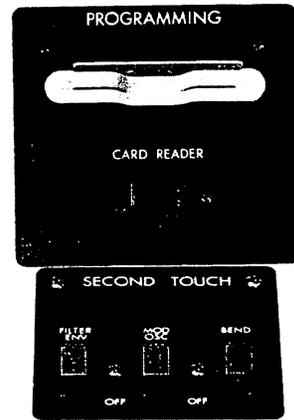
Light emitting diode indicates rate.

**CARD READER:**

40 bits with gold plated contacts. Rated for 100,000 card insertions.

**CARD PROGRAMMABLE CAPABILITIES:**

- Root waveform
- Vibrato amount
- Modulation oscillator shape
- Amount of envelope applied to filter
- Amount of modulation oscillator applied to filter
- Filter tune
- Filter resonance
- Filter mode: low pass, band pass, and high pass.
- Filter envelope: attack, decay, and sustain.
- Amplifier envelope: attack, decay, and sustain.



**NON PROGRAMMABLE CONTROLS:**

- Card reader select
- Octave select
- Semitone select
- Portamento time
- Modulation oscillator speed
- Ring select
- Output volume

Output: High and low outputs of 4 and .4 volts nominal range suitable for driving standard music and hi-fi amplifiers.

Warm-up: 3½ minutes at normal temperatures.

Synky uses quality components throughout.

All potentiometers are Allen Bradley and are sealed against contaminants. Allen Bradley pots are rated at 100,000 rotations and become quieter with use. All switch contacts are gold and silver plated (excludes power switch).

Size 29" x 7" x 8" — Weight 26 lbs. — PWR Requirements 10 watts



## SynKey: The first synthesizer you can program.

SynKey is a truly innovative synthesizer designed to make the performing musician's job easier — on the stage and in the studio.

SynKey is a full-fledged, versatile synthesizer with features of special interest to the performer.

First, SynKey is programmable. This means that you can use the front panel controls to generate just the sound you want — then reduce the front panel settings to holes on special computer punch cards. When you are performing you simply use the cards to preset the important synthesizer functions. It's fast and you never "lose" sounds you have worked hard to get.

Second, SynKey eliminates the hassle of tuning oscillators to intervals. SynKey's voltage controlled oscillator simultaneously produces 13 pitches at precise semitone intervals. You select parallel 3rds, 5ths, or chords at the touch of a few buttons — and oscillator tracking problems are a thing of the past. If you wish, you can play all thirteen pitch sources at the same time.

**Spend your time creating music.** You're for creating music. SynKey's programming system is for remembering what you have created.

SynKey's exclusive computer punched card system automatically controls over twenty synthesizer variables.

To help you get started, SynKey comes with 25 prepunched cards, each with a different SynKey voicing. You also get 25 blank cards plus a hand punch so you can start creating your own voicings. And remember, SynKey can always be operated manually, like ordinary synthesizers.

**Here's how easy it is to preserve a created SynKey sound.** Use the panel controls to find a voicing you like. Use the hand punch to code the program card for that voice. The next time you want that voicing, simply insert the card into the card reader and play. No other synthesizer has this unique feature.

**The richest sound ever in a portable synthesizer.** The more oscillators, the richer and fuller the sound. Most good synthesizers have three oscillators. But to duplicate the SynKey sound, you would need a synthesizer with thirteen oscillators.

SynKey has a unique top-octave divider which creates this dramatic multiple-oscillator effect. You get the basic pitch, plus the next twelve higher semitones in precise intervals. And, instead of manually tuning each tone, you just punch a button to select it.

In addition to SynKey's programming ability and its full 13 oscillator sound, SynKey's second touch keyboard lets you add nuance and expression to your music. Press a little harder on its 3½ octave keyboard and you can bend notes, add vibrato, filter sweeps, or any combination at once.

**A functional synthesizer for concert and recording work.** In the past, synthesizers were used for two, maybe three arrangements in a performance. The time required to change sounds made it almost impossible to use them more. SynKey's programming and playing features make it the first true live performance synthesizer you can use throughout a concert.

Programming makes it possible to change voicings from one musical arrangement to another, or even within an arrangement. All you do is pull one card from the reader and insert another, or simply alternate from program card to panel voice. SynKey does the rest.

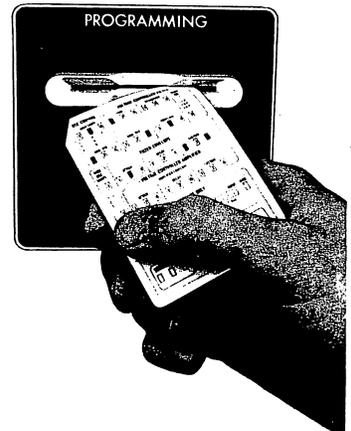
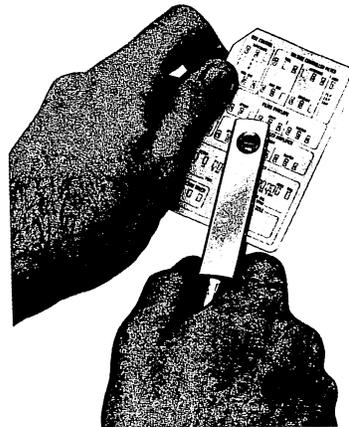
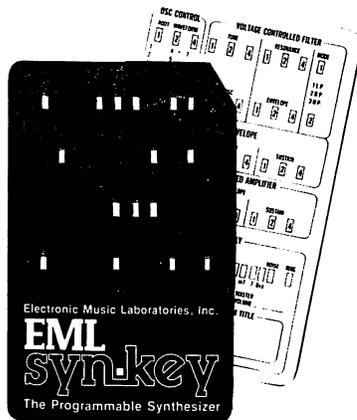
For instance, you can open as lead on your SynKey, then have someone else take the lead. You pull the card in the reader, insert another, and go back on lead with a completely different sound.

**Think of the flexibility.** Think of what variety this can mean in arranging. And think what versatility it can mean during a concert.

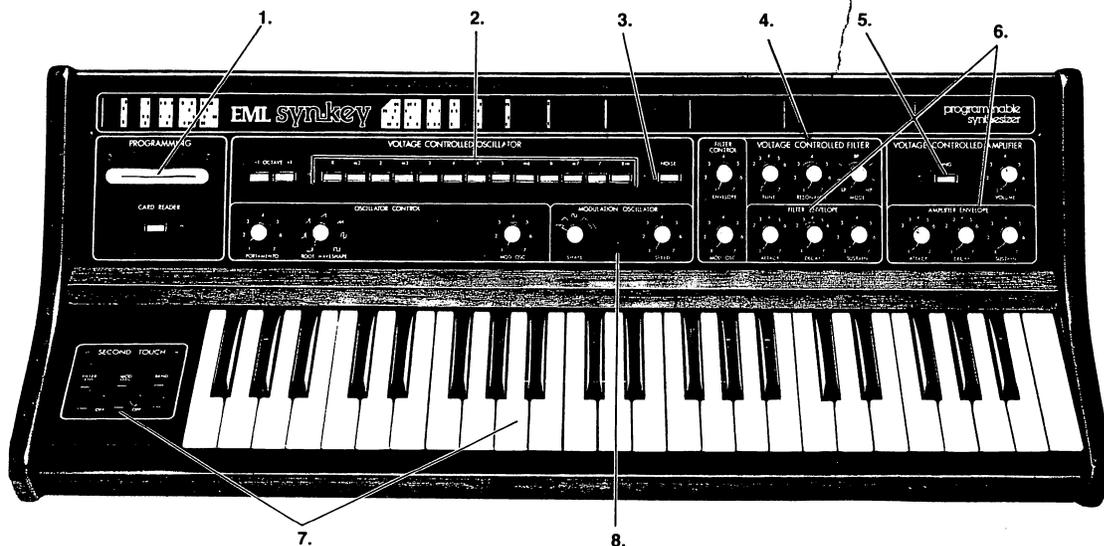
**SynKey: The most playable synthesizer ever made.** We've simplified the synthesizer so it's easy to understand and easy to play. The control panel is white on black for viewing ease under any lighting conditions. The controls are arranged logically for ease of use. SynKey uses only the finest rotary controls, and the push buttons are color keyed to show you when they're depressed.

# synkey

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## Making music with SynKey.



**1. The Card Reader** accepts SynKey programming cards which preset over 20 synthesizer variables. The card reader select switch lets you alternate between the card voice and the voice set on the front panel at the touch of a button.

**2. SynKey's wide range Voltage Controlled Oscillator** simultaneously produces 13 pitches at semitone intervals. Pitches are selected by indicating push buttons. Octave switching is accomplished with precision digital dividers. The accompanying oscillator control permits the addition of portamento and vibrato. The root waveform is

continuously variable, while the remaining 12 pitches have a bright 30% duty cycles waveform. Root waveform, including pulse width modulated pulse plus 5 others, and vibrato amount are programmable functions.

**3. Noise** produces white noise, which is used to create wind, surf, and percussive effects.

**4. The Voltage Controlled Filter** with its associated control mixer is the principal timbre modifier. SynKey has a filter mode control in addition to the normal tune and resonance controls. SynKey's filter is continuously variable from low pass through band pass and high pass modes. This means extra timbre control. Filter tune, resonance, and mode are programmable functions.

**5. The Ring Modulator** creates bell-like sounds such as chimes and gongs, as well as many new and interesting timbres.

**6. SynKey's dual Envelope Generators** provide independent control of timbre and loudness as a function of time. If filter envelope is selected on the second touch panel, filter sweep is delayed until second touch is activated. Attack, decay, and sustain are programmable in each envelope.

**7. SynKey uses a 44-Note F-C Pratt Read Keyboard** with second touch capability. Play with normal touch and SynKey behaves as you would expect — press a little harder to introduce dynamic effects and expression. The Second Touch panel switches permit the addition of pitch bend, vibrato, and filter sweeps from either (or both) the modulation oscillator or filter envelope. The amount of vibrato and filter sweep from either modulation oscillator or filter envelope are programmable functions.

**8. The Modulation Oscillator** offers a choice of five different waveshapes, including two sampled waveshapes for dramatic vibrato and filter sweep effects. The saw, triangle, and square waveshapes are programmable.

**We designed SynKey to be the Stradivarius of synthesizers.** We designed and built SynKey with the care you expect. We start with the finest components and subject each instrument to the most exacting inspection at each stage of manufacture. And with just one oscillator generating that 13-oscillator sound, you can't have tracking problems, and there isn't much to break down.

**We built SynKey to be rugged.** It's going to become the standard instrument for a lot of performers. The programming feature means you can use SynKey throughout a concert instead of just once or twice. We use Allen Bradley rotary pots, good for 100,000 rotations — and they get quieter with use. You don't have to worry about grit or dust in a slide control. And SynKey's fine hardwood cabinetry will stand up to travel, rehearsal and performance and still look great.

### The most advanced performance synthesizer made.

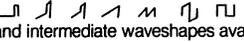
- You can't buy a performance synthesizer with more advanced features than SynKey.
- No other synthesizer has user-programming.
- No other synthesizer has push button semitone select to build parallel chords.
- No portable synthesizer has a sound like 13 oscillators.

## Technical Specifications

**KEYBOARD:** 3½ octave Pratt Read keyboard with Second Touch and gold plated contacts. Pitch bend + a third, filter sweep, vibrato, Mod. Osc. applied to filter (wah).

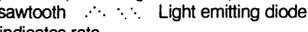
Any combination may be selected. Portamento variable from 0 to 2 seconds per octave (may be selected by optional footswitch or controlled from optional pedal).

**SOURCES:** A Master oscillator generates 13 pitches at semitone intervals. Pitches are selected by indicator push buttons. Any combination of semitones may be selected within the octave.

Accuracy of pitch interval: 1.2 cents maximum (approximately = 1/100 of a semitone). Octave select: ± 1 octave with precision digital divider. Root pitch wave continuously variable with  and intermediate waveshapes available. Pulse waveshape is modulated from 50% to 10% duty cycle by filter envelope for increased brightness. Remaining 12 pitch sources are bright 30% duty cycle pulses. Frequency range without vibrato 44Hz — 4186Hz. Vibrato amount — adjustable up to ± 2 octaves. Noise: white, selected by indicating push button.

**MODIFIERS:** Voltage Controlled Filter. State variable filter continuously variable from low pass thru band pass and high pass modes. Frequency range 44Hz (F<sub>1</sub>) thru 12000Hz, or 12KHz (Gg). Inputs: (1) filter envelope 0 to + 5 octave sweep. (2) modulation oscillator 0 to ± 3 octaves.

Ring modulator— Digital with modulation pitch tracking a 5th above root pitch. Other timbres may be selected by using other than root pitch source.

**CONTROLLERS:** Envelopes — 1 for filter, 1 for voltage controlled amplifier, each with attack, decay and sustain controls. Attack: .005 to 3 sec. Decay: .002 to 9 sec. Modulation Oscillator: Variable rate from .15 cycles/second to 50 cycles/second. 5 switch selected waveshapes  plus sampled triangle and sampled sawtooth . Light emitting diode indicates rate.

**CARD READER:** 40 bits with gold plated contacts. Rated for 100,000 card insertions.

### CARD PROGRAMMABLE CAPABILITIES:

Root waveform  
Vibrato amount  
Modulation oscillator shape  
Amount of envelope applied to filter  
Amount of modulation oscillator applied to filter  
Filter tune  
Filter resonance  
Filter mode: low pass, band pass, and high pass  
Filter envelope: attack, decay, and sustain  
Amplifier envelope: attack, decay, and sustain  
Panel control of any parameter is retained if that parameter is not programmed.

### NON PROGRAMMABLE CONTROLS:

Card reader select  
Octave select  
Semitone select  
Portamento time  
Modulation oscillator speed  
Noise  
Ring select  
Output volume.  
Output: High and low outputs of 4 and .4 volts nominal range suitable for driving standard music and hi-fi amplifiers.

**WARM-UP:** 3½ minutes at normal temperatures.

**POTS AND SWITCHES:** All potentiometers are Allen Bradley and are sealed against contaminants. Allen Bradley pots are rated at 100,000 rotations and become quieter with use. All switch contacts are gold and silver plated (excludes power switch).

**SIZE:** 29" × 17" × 8"

**WEIGHT:** 26 lbs.

**POWER REQUIREMENTS:** 10 watts

Specifications subject to change without notice.



# synkey

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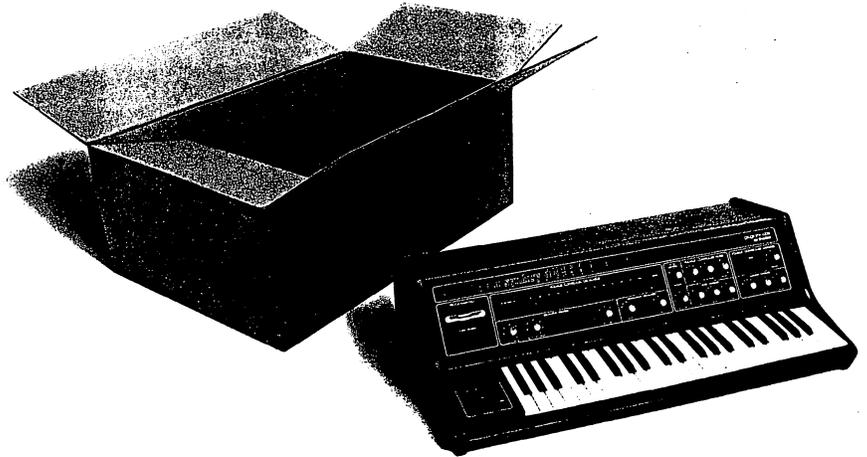
The first synthesizer you can program.

## Setting up your SynKey for play.

1. **Unpack** your SynKey and place on a **firm, flat surface**. Remove the accessories packed with the instrument.
2. **Connect** your SynKey to an amplifier/speaker system. Select the correct output on the back panel of the SynKey.
  - Use **high level** output with hi-fi amplifiers.
  - Use **low level** output with guitar-type amplifiers.
3. Plug your SynKey into a wall socket using the 3 wire cord. If the receptacle will not accept a 3 wire plug, use a properly grounded adapter. Turn on your SynKey with the toggle switch on the back panel. A red light should glow in the Modulation Oscillator section of the control panel. The light may be blinking on and off; this is normal. The light will go on and off in synchronization with the Modulation Oscillator as long as SynKey is on.

4. Set the **tuning and octavation controls** on the back panel straight up. (For tuning instructions, see page 10; tuning is not necessary for the getting-acquainted period.)

This manual is designed to lead you through SynKey in a step-by-step fashion. Do not be unnecessarily concerned with technicalities. Do move controls very slowly and listen carefully to the sounds produced. Try to determine at each step whether you are controlling pitch, timbre, or loudness. When you are able to relate the various SynKey controls to these parameters, you are well on your way to becoming an accomplished synthesist.



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# Owner's Manual



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# synkey

A Kaman Music Product  
P.O. Box 529, Bloomfield, CT 06002

The first synthesizer you can program.

## Introduction

All musical sounds may be described in terms of just four characteristics: duration, pitch, loudness and timbre. The duration, pitch, loudness and timbre of traditional instruments depend upon the size and shape of the instrument, the materials of which it is made, and the manner in which it is bowed, struck, plucked or blown.

**DURATION:** Some instruments — strings, woodwinds and brasses — produce sustained tones, limited only by bowing technique or by human lung capacity. Percussive instruments like the harpsichord or piano, bells, or plucked strings produce sounds which fade in a predictable way.

**PITCH:** Traditional instruments may be grouped according to the definiteness of their pitch. Strings, woodwinds and brasses have well defined pitch; bells, woodblocks and tympani have less well defined pitch; and snare drums and gongs have virtually no pitch.

The pitch of traditional instruments depends upon the mechanical properties of the vibrating element; for example, the length of a column of air, or the weight, tension and length of a vibrating string. Generally, to produce lower pitches, traditional musical instruments must be made larger. The cello is larger than the violin; the flute is longer than the piccolo; a tuba is larger than a trumpet.

**LOUDNESS:** Each instrument has various possibilities for loudness and for the way in which loudness changes in time. In a large horn, such as a tuba, it takes a while to get a large amount of air moving, so it takes time for the tone to reach maximum loudness. With a percussive or plucked instrument, the performer controls only the overall loudness. In an instrument with a sustained tone the

performer can control the way in which loudness changes with time. However, the loudness of the tone is somewhat coupled to the pitch of an instrument and is closely connected to the timbre of the instrument. For example, it is impossible to blow a loud low note on a recorder, and the overtones of a woodwind or brass instrument change considerably with loudness.

**TIMBRE:** Timbre is defined as the quality of a tone. Because different musical instruments have different timbre, you are able to distinguish between them. Timbre is a many-sided characteristic of sound.

Some elements of timbre depend upon the nature of the steady tone of an instrument. The quality of steady tones is determined by the presence of tones in addition to the tone which produces the fundamental pitch. These extra tones are called partials. In the case of instruments with well defined pitch, these extra tones are harmonics or overtones.

When a string player plays an A-440 (the 440 indicates the number of vibrations or cycles per second being produced by the string) he also produces  $2 \times 440$  or 880 cycles per second,  $3 \times 440$  or 1320 cycles per second,  $4 \times 440$  or 1760 cycles per second, etc. The relative strength of these harmonics or overtones determines the timbre and relative brightness of the sound. Strong overtones mean bright sound; weak overtones mean a mellow sound. A clarinet player producing an A-440 will similarly produce this overtone series; but the even harmonics  $2 \times 440$ ,  $4 \times 440$ ,  $6 \times 440$ , etc. will be very weak, while  $3 \times 440$ ,  $5 \times 440$ , etc. will be relatively strong. This is why a violin sounds different from a clarinet.

But musical timbre is not completely determined by the quality of a steady tone. At least equally important to timbre are transient effects, particularly the way in which the strengths of the overtones rise

when a note begins or change with vibrato or tremolo or with intonation. These dynamic aspects of a tone are vitally important to timbre. For example, most of the difference between a violin tone and a trumpet tone is due only to these dynamic effects.

Our forebearers have provided us with a variety of traditional instruments, each of which provides varying degrees of control over pitch, timbre, and loudness. Because these instruments depend on physical construction, each has limits on the extent of control.

**THE SYNTHESIZER:** The synthesizer is an electronic instrument which provides the performer with control over duration, pitch, loudness, and timbre. The synthesizer does not depend upon moving air columns, vibrating reeds or strings to produce sounds. The synthesizer uses a flow of electrons to create an electrical wave which can be amplified and converted into sound waves by a loudspeaker. With today's technology it is easy to manipulate electron flow.

The duration of a synthesized tone can be controlled independently of timbre characteristics so that a sound with percussive character can be sustained.

To change the pitch of a synthesizer by an octave, we do not have to stretch the instrument to twice its size, but simply push a button. The pitch of a synthesized sound can be precisely controlled, bent, or sent into motion at superhuman rates.

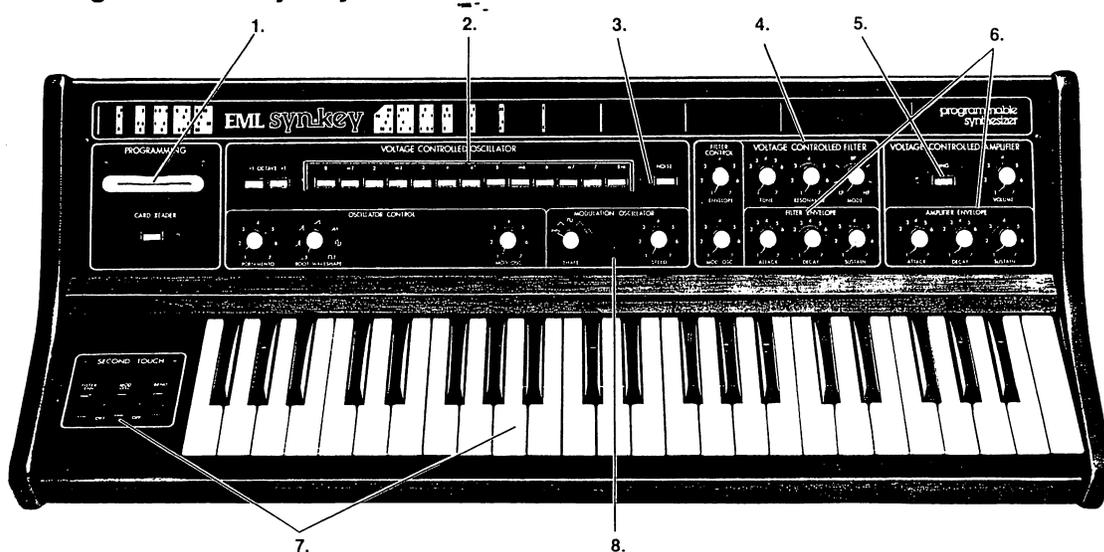
The loudness, and its variation with time, of a synthesized sound can be precisely controlled by a voltage controlled amplifier without affecting the timbre of the tone.

The timbre of a synthesized sound can be changed to simulate traditional instruments or to create sounds of instruments which never existed. The quality of the sustained sound can be changed by using different oscillator waveforms or different settings of a filter. The flexibility of control of synthesizer components allows the musician control over the important dynamic aspects of timbre.

This flexibility, achieved by voltage-controlled electronics, accounts for the major difference between a synthesizer and an electronic organ. It is this flexibility — the fact that the synthesizer is really a rubber instrument — which makes it such an attractive and useful instrument to today's musician.

Naturally, to get the most out of your instrument, you will want to learn it thoroughly — learn its capabilities and limitations — that's what the next part is about. Have fun!

## Making music with SynKey.



**1. The Card Reader** accepts SynKey programming cards which preset over 20 synthesizer variables. The card reader select switch lets you alternate between the card voice and the voice set on the front panel at the touch of a button.

**2. SynKey's wide range Voltage Controlled Oscillator** simultaneously produces 13 pitches at semitone intervals. Pitches are selected by indicating push buttons. Octave switching is accomplished with precision digital dividers. The accompanying oscillator control permits the addition of portamento and vibrato. The root waveform is

continuously variable, while the remaining 12 pitches have a bright 30% duty cycles waveform. Root waveform, including pulse width modulated pulse plus 5 others, and vibrato amount are programmable functions.

**3. Noise** produces white noise, which is used to create wind, surf, and percussive effects.

**4. The Voltage Controlled Filter** with its associated control mixer is the principal timbre modifier. SynKey has a filter mode control in addition to the normal tune and resonance controls. SynKey's filter is continuously variable from low pass through band pass and high pass modes. This means extra timbre control. Filter tune, resonance, and mode are programmable functions.

**5. The Ring Modulator** creates bell-like sounds such as chimes and gongs, as well as many new and interesting timbres.

**6. SynKey's dual Envelope Generators** provide independent control of timbre and loudness as a function of time. If filter envelope is selected on the second touch panel, filter sweep is delayed until second touch is activated. Attack, decay, and sustain are programmable in each envelope.

**7. SynKey uses a 44-Note F-C Pratt Read Keyboard** with second touch capability. Play with normal touch and SynKey behaves as you would expect — press a little harder to introduce dynamic effects and expression. The Second Touch panel switches permit the addition of pitch bend, vibrato, and filter sweeps from either (or both) the modulation oscillator or filter envelope. The amount of

vibrato and filter sweep from either modulation oscillator or filter envelope are programmable functions.

**8. The Modulation Oscillator** offers a choice of five different waveshapes, including two sampled waveshapes for dramatic vibrato and filter sweep effects. The saw, triangle, and square waveshapes are programmable.

**We designed SynKey to be the Stradivarius of synthesizers.** We designed and built SynKey with the care you expect. We start with the finest components and subject each instrument to the most exacting inspection at each stage of manufacture. And with just one oscillator generating that 13-oscillator sound, you can't have tracking problems, and there isn't much to break down.

**We built SynKey to be rugged.** It's going to become the standard instrument for a lot of performers. The programming feature means you can use SynKey throughout a concert instead of just once or twice. We use Allen Bradley rotary pots, good for 100,000 rotations — and they get quieter with use. You don't have to worry about grit or dust in a slide control. And SynKey's fine hardwood cabinetry will stand up to travel, rehearsal and performance and still look great.

**The most advanced performance synthesizer made.**

- You can't buy a performance synthesizer with more advanced features than SynKey.
- No other synthesizer has user-programming.
- No other synthesizer has push button semitone select to build parallel chords.
- No portable synthesizer has a sound like 13 oscillators.

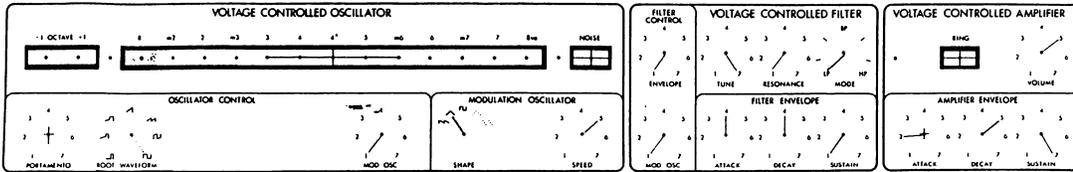


Fig. 1

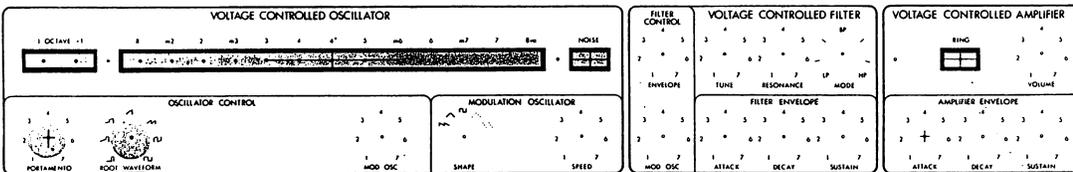


Fig. 2 Source Controls

**SOURCES:** The SynKey sources are comprised of the thirteen semitone select push buttons and the NOISE select button. The OCTAVE select push buttons, PORTAMENTO and ROOT WAVEFORM (WAVESHAPE on early instruments) are closely associated with the sources. The sources provide the raw pitches for the synthesizer.

A. Set the controls on your SynKey as shown in figure 1. Note the controls shown as SOURCE CONTROLS in figure 2.

B. Hold down a key — press the R (root) semitone select push button and adjust the level at either your amp or the VOLUME control (far right) on your SynKey to obtain a comfortable listening level. Play a little riff. (Note: if none of the semitone push buttons are selected — and the NOISE is not selected you will get no sound.)

C. Depress the -1 OCTAVE push button and play. The pitch has been transposed 1 octave lower. Push again to release and you are back where you started. Push the + 1 push button and transpose one octave

higher. Push again to release. Note that if both the -1 and + 1 octave buttons are depressed + 1 always wins!

D. Depress the m2 button and release the root. The pitch is transposed up 1 semitone. You can repeat this for each push button until you reach 8 va. Each button will raise the pitch by 1 semitone until you have covered a complete octave. With SynKey you can learn a tune in one key and play it in any other simply by selecting the proper semitone push button.

E. Now depress R, 3, 5, and play. By depressing the proper semitone select push button you can readily play any parallel chord. Try the following chords.

- Major — R, 3, 5
- Minor — R, m3, 5
- Suspended — R, 4, 5
- Major 7th — R, 3, 5, 7
- Minor 7th — R, m3, 5, m7
- Dominant — R, 3, 5, m7
- Sixth — R, 3, 5, 6
- Augmented — R, 3, m6
- Diminished — R, m3, + 4, 6

F. Now release all semitone push buttons except R and play while gradually rotating the PORTAMENTO dial clockwise. PORTAMENTO causes the pitch to glide to successive notes. The pitch will continue to glide to the last key depressed even if it is released prematurely. A footswitch or footpedal may be used to control portamento. See page 10.

G. ROOT WAVEFORM (WAVESHAPE on early instruments) determines the basic timbre or quality of sound on the SynKey. Rotate this control fully clockwise. Play a simple tune in a lower register and slowly rotate the control counterclockwise. Note that:

- the  $\square$  (square) waveform is rather "hollow" like a clarinet.
  - The  $\wedge$  (double sawtooth) is stringlike and up an octave.
  - The  $\nearrow$  (sawtooth) is string or brass like.
  - The  $\sqcup$  (pulse) is very bright — reedy.
- When listening to the pulse with the synthesizer set as in fig. 1, you should hear a change in timbre with key depression. The pulse is being "width modulated" by the Filter Envelope to make it even brighter. More about that later. As you become more familiar with SynKey you will find that the ROOT WAVEFORM control will be very useful in developing particular timbres.

H. NOISE. Release all of the semitone select push buttons and depress NOISE. Noise is really the presence of all pitches at the same time. It will prove useful later to develop surf, wind, thunder, and percussive effects. Note that if you depress all thirteen semitone select buttons the result will be rather like noise — even though you are using just 13 pitches and their overtones rather than all pitches.

**II. CONTROLLERS:** Figure 3 indicates those functions we have designated as CONTROLLERS. The controllers are used basically to introduce time varying changes in pitch, timbre, and loudness.

A. MODULATION OSCILLATOR — The MODULATION OSCILLATOR produces a voltage which varies reasonably slowly with time. The position of the SHAPE control determines the way in which the voltage changes with time, and the SPEED control determines how often the changes occur.

1. Begin with the SHAPE at  $\wedge$  and SPEED at 5. Now hold down a key and slowly rotate the modulation oscillator (MOD. OSC.) dial in the OSCILLATOR CONTROL clockwise. You will hear a vibrato which begins as a small part of a semitone and increases to about  $\pm 2$  octaves. The MOD. OSC. control determines the amount of modulation oscillator signal which is applied to the SynKey VOLTAGE CONTROLLED OSCILLATOR. The more MOD. OSC. you apply, the greater the pitch change.
2. Now slowly adjust both the SPEED control and the MOD. OSC. control (key depressed). You will be able to achieve a wide variety of effects.
3. With the SPEED set rather slow and MOD. OSC. set to about midpoint, move the shape alternately to  $\wedge$  (double sawtooth),  $\nearrow$  (triangle), and  $\square$  (square). You will hear a pitch change represented by the shapes.

4. The dotted shapes . . . and . . . signify sampled  $\wedge$  and  $\nabla$  shapes. Instead of smoothly varying, these voltages are broken into steps. As you change the SPEED control you will find that you can generate various pitch patterns for special effects.

Experiment with various combinations of MOD. OSC., SHAPE, and SPEED controls to become thoroughly familiar with them.

**B. AMPLIFIER ENVELOPE** — The AMPLIFIER ENVELOPE generates a voltage at each key depression. This voltage is applied to the VOLTAGE CONTROLLED AMPLIFIER. The VOLTAGE CONTROLLED AMPLIFIER determines how the loudness of your SynKey changes with time after you depress a key. There are three controls in the AMPLIFIER ENVELOPE: ATTACK, DECAY, and SUSTAIN. Note: no new envelope can be initiated unless all keys have been released.

1. The ATTACK control will determine how long it takes a sound to reach maximum loudness. Clockwise rotation results in longer attacks. Once the maximum loudness is reached the process is reversed and the sound level begins to decrease. The time to reach silence is determined by the DECAY control. With the SUSTAIN control off (set to 1), the envelope will always be the same regardless of when (or whether) you release the key. Experiment with various combinations of the ATTACK and DECAY controls. You should be able to make loudness versus time varies such as the following:



Don't be surprised that you can't hear how the loudness is changing at short attack and decay times — the time can be as short as 2/1000th of a second.

2. With the SUSTAIN control at other than 1 the situation is a little different. The envelope (and loudness) will attack to the maximum level and then begin to decay. If a key is not held down, the envelope will decay to zero level as before. If a key is being held down, however, the loudness will decay to the level

set by the SUSTAIN control and remain there as long as the key is depressed. Upon key release, the loudness will decay toward silence at a rate determined by the DECAY control. Holding a key down simply prevents the loudness from decreasing below the level set by the SUSTAIN control.

By experimenting with all three controls you should be able to make sounds change loudness with time as shown below.



If you read our discussion of musical instruments and are starting to think in terms of pitch, loudness, and timbre, you may have guessed that to play plucked or struck sounds you will use fast attacks, medium decays and no sustain. Horn sounds will require medium short attacks and decays with moderate to high sustain. An organ-like sound will have fast attack and decay with maximum sustain.

**C. FILTER ENVELOPE** — The FILTER ENVELOPE has the same controls and works in the same way as the AMPLIFIER

ENVELOPE. It is, however, applied to the VOLTAGE CONTROLLED FILTER. More about that in Section III.

**D. VOLUME CONTROL** — The VOLUME CONTROL is grouped with the controllers as a matter of convenience. It simply sets the overall volume of the SynKey. Generally speaking, the best signal-to-noise ratio is obtained with the SynKey VOLUME turned well up and your amp volume down. You will find that some compromise is required to accommodate different kinds of sounds. At a gig, the best bet is to set your amp for the proper level with the SynKey volume at 7 while playing your "thinnest" sounds, then you will be able to turn down the SynKey volume for songs with thicker sounds.

Now is a good time to practice what you have learned so far and let it sink in. Try combining different envelopes, root waveforms, chord structures, and varying degrees of portamento and vibrato.

**III. MODIFIERS:** There are three modifiers on the SynKey. Basically they pertain to timbre modification. They are:

- A. Voltage Controlled Filter
- B. Ring Modulator (designated by RING)
- C. Pulse Width Modulation

**A. VOLTAGE CONTROLLED FILTER** — The filter is primarily responsible for the wide variety of timbres available on your SynKey. It accomplishes this by emphasizing or de-emphasizing different overtones or harmonics naturally present in the basic pitch waveforms.

1. Begin by setting your SynKey's controls as shown in Figure 4. With resonance set to 1 and mode set to LP (low pass), gradually rotate the TUNE control clockwise while holding down a low key. Notice that the note becomes progressively brighter. As you rotate the TUNE clockwise, you are actually permitting more overtones to pass (remember overtones are integral multiples of the basic pitch) without changing the strength of the fundamental pitch.

2. Now rotate the MODE control to BP (band pass) and again rotate the TUNE control. (You can play a little riff now and then too — it helps make subtle timbre changes more evident.) Now as you rotate clockwise, you will tend to pass a band of overtones. When fully clockwise the fundamental and lower overtones will tend to be reduced — resulting in a still brighter timbre.

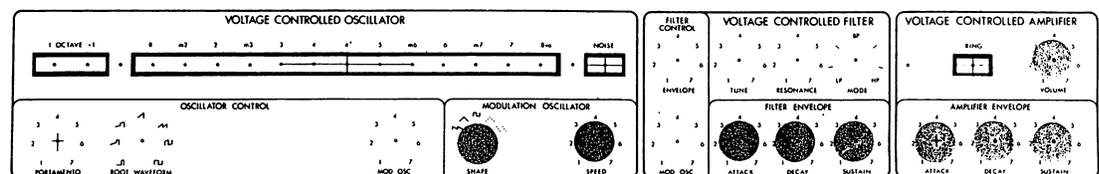


Fig. 3 Controllers

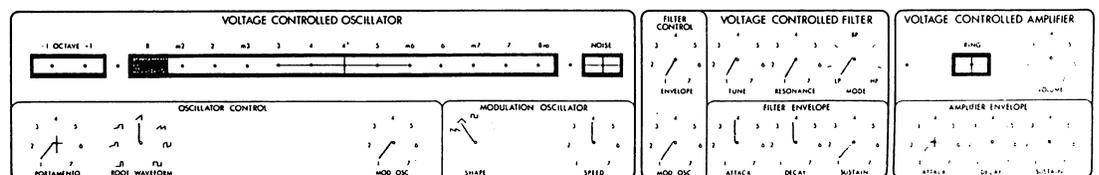


Fig. 4

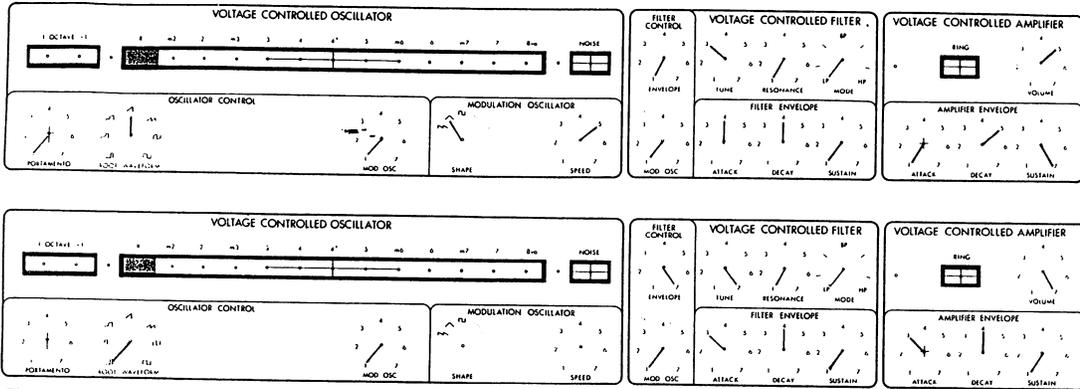


Fig. 6

3. Set the MODE control to HP (high pass) and repeat the same exercise. Here, as you rotate the TUNE control, the higher overtones remain at the same strength while the fundamental pitch and lower overtones are successively diminished in strength. In high pass mode, with the TUNE at 7, you'll have a very thin sound, depending on pitch range.

4. You have performed the preceding with the RESONANCE control set to 1. Now return the MODE to LP (low pass), set RESONANCE to 3 and rotate the TUNE control back and forth. Set RESONANCE successively to 4, 5, 6, & 7 and rotate TUNE repeatedly.

Now in addition to diminishing certain overtones, the filter is emphasizing the overtones to which it is tuned. At higher resonance you can readily distinguish the individual overtones.

5. With RESONANCE set to 5 or 6, set the ROOT WAVEFORM control to square (□) and rotate the filter TUNE. Return to the sawtooth (∧) and repeat. The difference

you hear is due to the fact that sawtooth has both even and odd harmonics; while the square wave has only odd. Each of the waveforms depicted on the ROOT WAVEFORM control has a different overtone structure and will provide somewhat different results after being modified by the filter.

The filter provides much to think about and many possibilities. Practice, with various settings of the TUNE, RESONANCE, and MODE while playing simple pieces.

6. Return all controls to positions indicated in Figure 4, except set RESONANCE to 5 and ENVELOPE in the FILTER CONTROL section to 5. Thus far you have been using static timbres — now we are going to change timbre with time.

Play a few notes and notice that the timbre changes during the note. The position of the ENVELOPE dial in the FILTER CONTROL section determines the amount of timbre change; while ATTACK, DECAY, and SUSTAIN levels of the FILTER ENVELOPE determine just how the timbre changes with time. This effect is commonly called "envelope sweep" or "filter sweep". What you are doing is using the FILTER ENVELOPE voltage to change the tuning of the filter electronically

rather than by rotating the TUNE control. It is similar to changing loudness with AMPLIFIER ENVELOPE.

7. Experiment — slowly — with various settings of the filter TUNE, RESONANCE, and MODE controls, the ENVELOPE control, and the ATTACK, DECAY, and SUSTAIN controls of the FILTER ENVELOPE.

8. Reset all controls to positions shown in Figure 4, except RESONANCE at 5. Now rotate the MOD. OSC. control in the FILTER CONTROL section clockwise. You are now using the modulation oscillator to "sweep" the filter. The modulation oscillator is now effectively changing the filter tune.

9. With MOD. OSC. in the FILTER CONTROL set to 5 or so, go to the MODULATION OSCILLATOR itself and manipulate the SPEED and SHAPE controls. You will be able to affect the rate of timbre change and how it changes with time. Notice when the SPEED is set high, the ear cannot distinguish how the timbre changes with time. The ear simply hears a new timbre. Experiment!

B. Ring Modulation — Ring modulation is a process which generates non-harmonic partials. Overtones are harmonic partials. Their frequencies are integer multiples of the fundamental pitch, hence the tone having

harmonic partials will be bright, but have a well defined pitch. A source with non-harmonic partials will tend to sound discordant. Bells, cymbals and chimes are examples of instruments rich in non-harmonic partials. They are often described as being clangorous. The ear will regard tones with non-harmonic partials as having a "different" timbre.

1. Set the SynKey's controls as shown in Figure 5. Play a little tune, then depress the RING push button.

2. Push m2 and release R while playing. Repeat the process of depressing the next semitone button and releasing the previous one. You will find a wide variety of timbres (not all will sound pleasant).

3. Experiment with various filter settings. filter control settings and root waveforms while using ring modulation.

C. Pulse Width Modulation — Pulse width modulation creates a chorus effect — the sound of a number of instruments playing together. This is accomplished electronically by using the FILTER ENVELOPE to control the width of a pulse produced by the VOLTAGE CONTROLLED OSCILLATOR. This results in the phase of the oscillator signal changing in time much like the phase variations of a chorus of instruments. Set up the SynKey according to figure 6.

Depress a key and notice the chorus effect.

Experiment with different settings of AMPLIFIER ENVELOPE and FILTER ENVELOPE ATTACK, DECAY, and SUSTAIN.

The amount of chorus effect can be decreased by moving the ROOT WAVEFORM control clockwise until it is vertical where the effect will disappear.

**IV. SECOND TOUCH:** The second touch keyboard permits you to selectively initiate pitch bend, vibrato, and timbre changes directly from the keyboard. Set SynKey as shown in Figure 5, and refer to Figure 7.

**A. BEND** — Begin with all rocker switches on the SECOND TOUCH panel **off** except the BEND switch. Depress a key slowly (use a long decay or some sustain in the amplifier envelope). As you continue to press down you will hear the pitch bend up approximately a third. Play a little riff with normal light touch, then simply press harder to initiate pitch bend on desired notes. Notice that the amount of bend is not determined by how hard you press.

**B. MODULATOR OSCILLATOR** — Turn off BEND and adjust SynKey to produce a vibrato using the MOD. OSC. control in the OSCILLATOR CONTROL section, and the MOD. OSC. SHAPE and SPEED controls. Have the MOD. OSC. dial in FILTER CONTROL set to 1.

Play a little and notice you always have vibrato. Now activate the MOD. OSC. rocker switch on the SECOND TOUCH panel. The vibrato will disappear with normal light touch and only occur when a key is depressed sufficiently to initiate second touch.

Turn the MOD. OSC. dial in OSCILLATOR CONTROL to 1 to remove the vibrato and turn up the MOD. OSC. dial in FILTER CONTROL (slow down the modulation oscillator speed too, if you wish). Repeat the previous playing exercises and you will find that you can introduce a wah-wah effect at any time by simply pressing harder.

**C. FILTER ENVELOPE** — Set the MOD. OSC. rocker switch to off. In the FILTER CONTROL section set MOD. OSC. to 1 and the ENVELOPE to 7. Set the FILTER ENVELOPE ATTACK and DECAY dials to 4. Play a riff and note that you have timbre changes (filter sweep) on each key depression. Activate the FILTER ENVELOPE rocker switch on the SECOND TOUCH panel. Note that the filter envelope and resulting timbre changes will only occur upon

sufficiently forceful key depression. You can, of course, have all 4 effects (bend, vibrato, wah-wah, and filter envelope sweep) at the same time if you wish.

Remember, if the FILTER ENVELOPE and MOD. OSC. rocker switches are **off**, you will have timbre changes and vibrato as determined by the front panel controls. If the rocker switches are **on**, you will get these effects only when a key is depressed sufficiently. Always make sure the rockers are in the position desired or you will have surprises!

**V. PROGRAMMING:** The programming feature of your SynKey is designed to make life easier when you have to go quickly from one sound to another. Making a card for sounds you particularly like will prevent "losing" them, too.

Basically what the card reader and programming cards do is preset most of the important front panel controls of your SynKey. The programmable controls are: ROOT WAVEFORM MOD. OSC. in OSCILLATOR CONTROL (vibrato amount) MODULATION OSCILLATOR SHAPE ENVELOPE in FILTER CONTROL (amount of envelope applied to filter) MOD. OSC. in FILTER CONTROL (amount of modulation oscillator applied to the FILTER) Filter TUNE Filter RESONANCE Filter MODE: Low pass, band pass, and high pass Filter Envelope: ATTACK, DECAY, and SUSTAIN Amplifier Envelope: ATTACK, DECAY, and SUSTAIN

A number of controls are not programmable. They allow you to introduce nuance and variations during a piece. They are:

CARD READER select  
SECOND TOUCH select  
OCTAVE select  
SEMOTONE select  
MODULATION OSCILLATOR SPEED  
PORTAMENTO time  
NOISE SELECT  
RING SELECT  
Output VOLUME

**A. USING PROGRAM CARDS** — Select a prepunched card from those provided. See Figure 8. Insert it firmly into the card reader slot, printing side up with the cut corner to the left. (Never put anything into the slot but a factory supplied card — make sure cards are clean and do not have bits of tape or other debris on them. The reader is a precision device and rather expensive.)

The groove running across the top of the instrument may be used to hold cards for easy access during a performance.

Set the non-programmed controls as specified on the card. The first row indicates the OCTAVE (−1, 0, +1) and semitone select push button R, m2, 2 (→). PORTAMENTO, MOD. OSC., SPEED, RING, and SECOND TOUCH selection may also be given.

Push the CARD READER select push button and play. Try various cards —

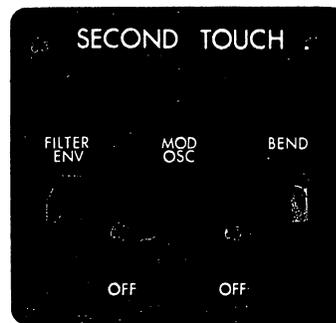


Fig. 7 Second Touch Panel

following the auxiliary instructions each time — to get an idea of the kinds of sound your SynKey can make. These sounds have been selected for variety and therefore require different playing techniques. Don't be shy about experimenting with OCTAVE select, SEMITONE SELECT, PORTAMENTO, etc. while using the cards.

Note that if no card is in the reader slot you will get the sound determined by the front panel controls regardless of the reader select push button position. If a card is in the slot, you can go back and forth between the front panel sound and the programmed sound by merely activating the reader push button.

**B. PROGRAMMING YOUR OWN CARDS** — Programming your own cards is easy. It is necessary to: (1.) set up a sound using front panel controls and (2.) translate the setting of the programmable controls into holes in a card.

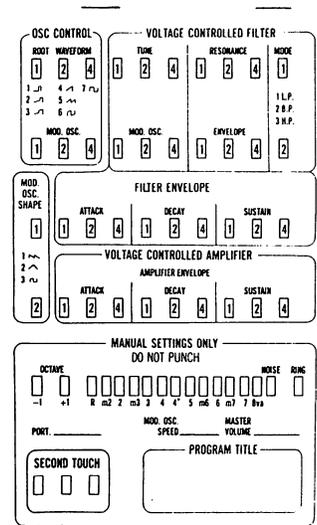


Fig. 8 Program Card

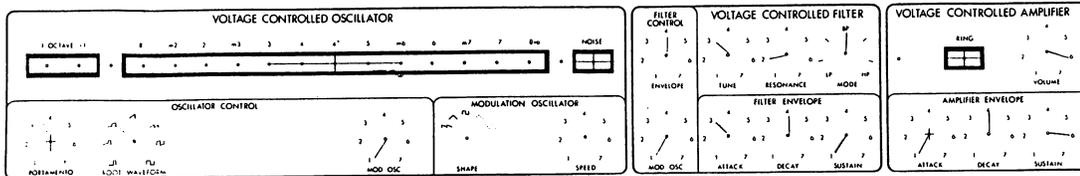


Fig. 9 Rockford Files

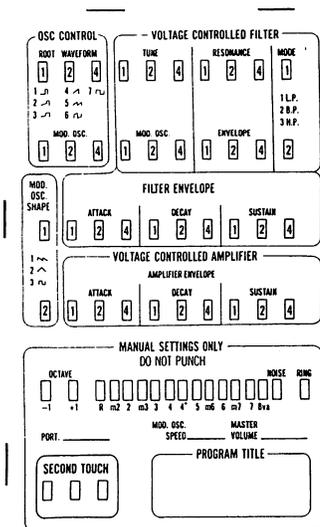


Fig. 8 Program Card

**TRANSLATING SETTINGS TO HOLES —**  
 Most controls have markings which are directly translatable to card holes. For example, consider the ATTACK control in the AMPLIFIER ENVELOPE. The ATTACK control has seven marks around it numbered 1 through 7. If the control is set to number 1, you simply punch out the 1 hole in the ATTACK portion of the VOLTAGE CONTROLLED AMPLIFIER section of the card. If the control is set to 2, punch out the 2 hole. If the control is set to 3, punch out the 1 hole plus the 2 hole ( $1 + 2 = 3$ ).

If the CONTROL setting is:	Punch holes valued at:
1	1
2	2
3	2 + 1
4	4
5	4 + 1
6	4 + 2
7	4 + 2 + 1

If no holes are punched, the ATTACK time is not programmed and the panel control setting determines the attack time. The ATTACK time can then be varied manually while using a program card.

This same procedure may be used to set the remaining programmable parameters with numbered controls. Remember, if no holes are punched, that parameter may be manually controlled.

The following programmable parameters do not have numbers on the panel face. In these cases, a code is provided for their translation.

ROOT WAVEFORM	punch 0
for panel	punch 1
for	punch 2
for	punch 3 (2 + 1)
for	punch 4
for	punch 5 (4 + 1)
for	punch 6 (4 + 2)
for	punch 7 (4 + 2 + 1)
MOD. OSC. SHAPE	punch 0
for panel	punch 1
for	punch 2
for	punch 3 (2 + 1)
FILTER MODE	punch 0
for panel	punch 1
for low pass	punch 2
for band pass	punch 3 (2 + 1)
for high pass	punch 3 (2 + 1)

**CAUTION:** When punching cards, use care to align the punch directly over the marked rectangle. Turn the card and punch so that punched rectangle is directed away from face!

**A PRACTICE TRANSLATION.** Before trying to program one of your own settings, set up your SynKey as shown in Fig. 9. Translate this setting to a blank program card. Compare what you have punched to the card that came with your instrument. The newly punched card and prepunched card should be identical.

In programming your own sounds remember the following: you cannot program "in between" settings. If you have RESONANCE set midway between 3 and 4 for instance, alternately try 3 and 4 to see which is more suitable. Usually you will find that either 3 or 4 will suffice. If not, mark the card "RES 3.5" and leave the resonance unprogrammed.

(China marking pens, such as the Sanford's Sharpie, may be used to mark cards. Do not leave the cap off as the pen tip dries rapidly.)

After a little practice you will be able to punch cards without reference to diagrams. Additional decks of blank cards are available from your dealer. If temporarily unavailable write: SynKey, Dept. E, Box 205, New Hartford, CT 06057.

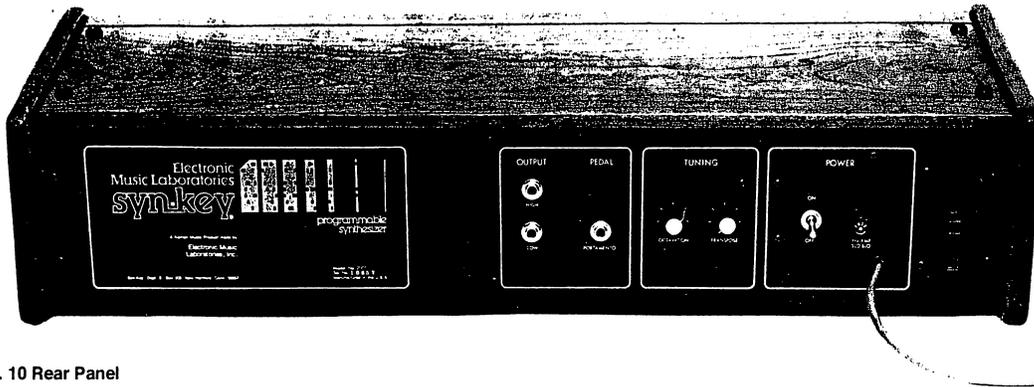
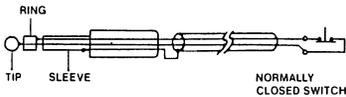


Fig. 10 Rear Panel

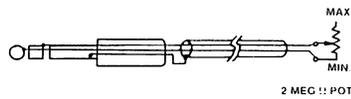
VI. **REAR PANEL:** The rear panel contains the power switch, fuse, tuning controls, portamento jack, and output jacks. See Figure 10.

- A. The power switch is on when up.
- B. The fuse is 3 AG, ¼ amp and should be replaced only with a direct equivalent.
- C. High and low outputs are provided. The low level is suitable for guitar and other amps with low level inputs. The high level is used for most high fidelity type amplifiers, tape recorders and line level mixing boards.
- D. A stereo plug, using the tip and ring may be connected to a switch to shunt the portamento control on SynKey. See below.



Stereo Plug

Alternatively a foot pedal with a 2 megohm potentiometer foot pedal wired to the tips and ring of a stereo plug may be used to directly control portamento.



Stereo Plug with Potentiometer

**TUNING** --- There are two ways to tune SynKey. Begin with both the TRANSPOSE and OCTAVATION controls straight up. If SynKey is at room temperature, a 3 minute warm-up will be sufficient. If the instrument has been stored or transported in a cold environment, a longer warm up is required.

**Method A:** Alternate between the top C key and C an octave down. Use the OCTAVATION control to get a perfect octave — do not be concerned whether C is actually a C. When a perfect octave is obtained, use the TRANSPOSE control to make the C key a musical C. SynKey will be in tune. If you must tune to other instruments use the TRANSPOSE control.

**Method B:** Tune the bottom F key to a musical F with the TRANSPOSE control. Use the OCTAVATION control to adjust the top C to the correct pitch.

## VII. RECOMMENDED BOOKS ON SOUND AND ELECTRONIC MUSIC

*Synthesizer Primer*, Electronic Music Laboratories, Inc., P. O. Box H, Vernon, Connecticut 06066

*The New World of Electronic Music*, by Walter Sear, Alfred Publishing Co., 75 Channel Drive, Port Washington, New York 11050

*Electronic Music*, by Allen Strange, Wm. C. Brown Publishing Co., 2460 Kerper Blvd., Dubuque, Iowa

*Electronic Music Synthesis*, by Hubert Howe, Jr., W. W. Norton & Company, New York, New York

*A Guide to Musical Acoustics*, by H. Lowery, Dover Publications, 180 Varick Street, New York, New York

*Music, Sound and Sensation*, by Fritz Winkel, Dover Publications, 180 Varick Street, New York, New York

*Music, Physics, and Engineering*, by Harry F. Olson, Dover Publications, 180 Varick Street, New York, New York

*The Technique of Electronic Music*, by Thomas Wells and Eric Vogel, University Stores, Inc., P. O. Box 7756, Austin, Texas 78712

*Introduction to the Physics and Psychophysics of Music*, by Juan G. Roederer, Springer Verlag, 125 Fifth Avenue, New York, N. Y. 10010

*The Development and Practice of Electronic Music*, by Jon Appleton and Ronald Peresa, Prentice Hall, Inc., P. O. Box 500, Englewood Cliffs, New Jersey 07632

*How to Make Electronic Music*, by R. Drake, R. Herder, and A. Modugno, EAV Vineyard Edition, Pleasantville, N. Y. 10570

**Viii. SAMPLE PATCHES AND MUSIC:**  
 The following sample patches and music provide you a quick feel of the capability of your SynKey. As you proceed you will undoubtedly become aware of the potential of the instrument in your own musical style.

**Square**  
**HI-DE-HO**  
**G. Goffin – C. King**

**Distortion**  
**Play your own music**

**VOLTAGE CONTROLLED OSCILLATOR**

-1 OCTAVE -1 0 +1

8 m2 7 m3 3 4 4' 5 m6 6 m7 7 8m

NOISE

**OSCILLATOR CONTROL**

PORTAMENTO ROOT WAVEFORM

**MODULATION OSCILLATOR**

MOD OSC SHAPE SPEED

**FILTER CONTROL**

ENVELOPE

**VOLTAGE CONTROLLED FILTER**

TUNE RESONANCE MODE

**FILTER ENVELOPE**

ATTACK DECAY SUSTAIN

**VOLTAGE CONTROLLED AMPLIFIER**

RING VOLUME

**AMPLIFIER ENVELOPE**

ATTACK DECAY SUSTAIN

Fantasy  
CONCERTO for ORCHESTRA  
B. Bartok

**VOLTAGE CONTROLLED OSCILLATOR**

-1 OCTAVE -1 0 +1

8 m2 7 m3 3 4 4' 5 m6 6 m7 7 8m

NOISE

**OSCILLATOR CONTROL**

PORTAMENTO ROOT WAVEFORM

**MODULATION OSCILLATOR**

MOD OSC SHAPE SPEED

**FILTER CONTROL**

ENVELOPE

**VOLTAGE CONTROLLED FILTER**

TUNE RESONANCE MODE

**FILTER ENVELOPE**

ATTACK DECAY SUSTAIN

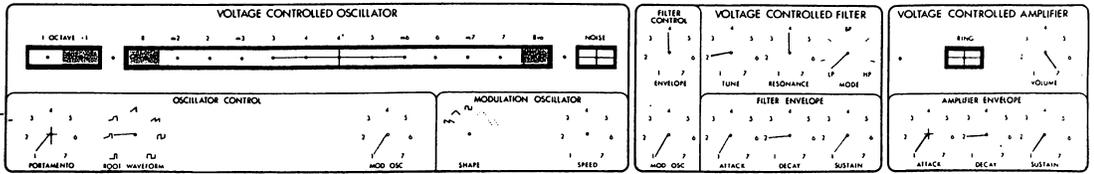
**VOLTAGE CONTROLLED AMPLIFIER**

RING VOLUME

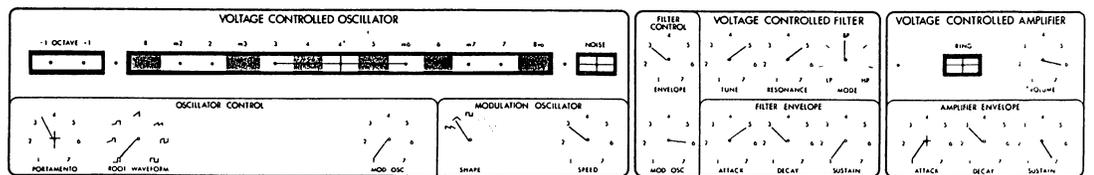
**AMPLIFIER ENVELOPE**

ATTACK DECAY SUSTAIN

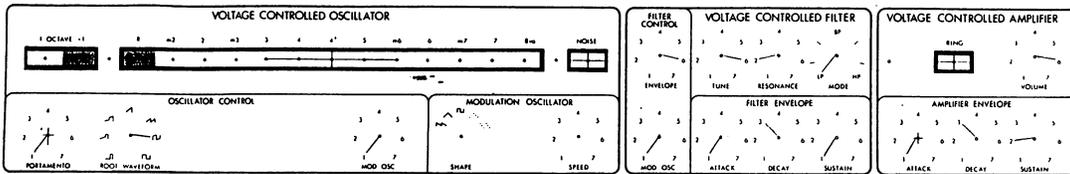
Harpichord  
MINUET in G  
J. S. Bach



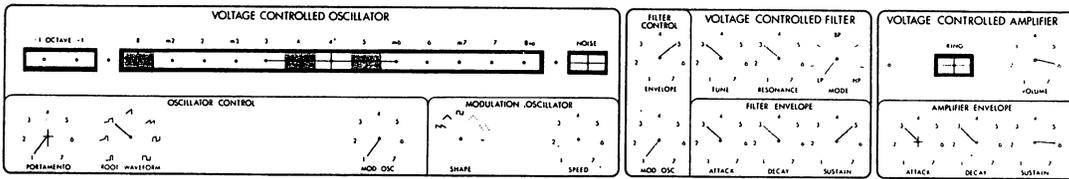
Plink  
**PENNY LANE**  
 P. McCartney — J. Lennon



Euphorie  
 play your own music



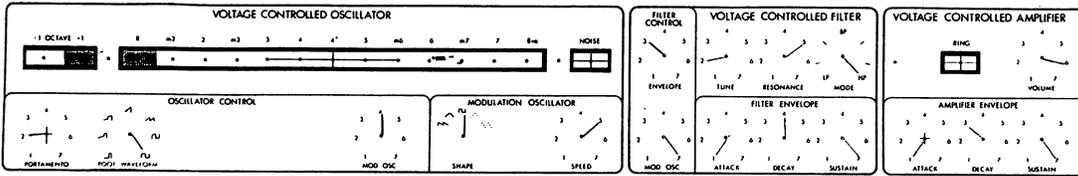
Clavier  
**PIANO CONCERTO #3**  
 L. V. Beethoven



Baroque Horns  
**PICTURES AT AN EXHIBITION**  
 M. Moussorgsky

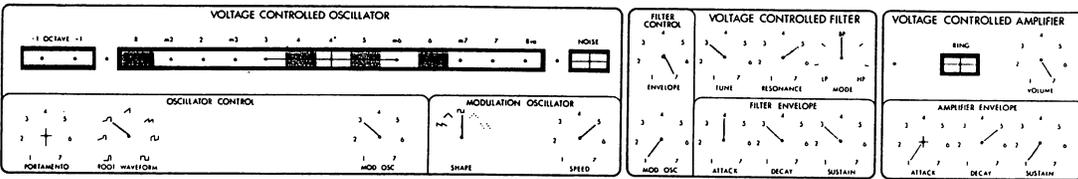
**Funky Bass**  
**CHAMELEON**  
 H. Hancock

**Soft Flute**  
**NIGHTS IN WHITE SATIN**  
 J. Hayward



**Tommy Pinball**  
**OVERTURE from TOMMY**  
**P. Townshend**

N.B. Place "HORN" card in the SynKey Card Reader. At the (\*) engage the card reader, at the (!) disengage the card reader for the panel voice.



**Regal**  
**play your own music**

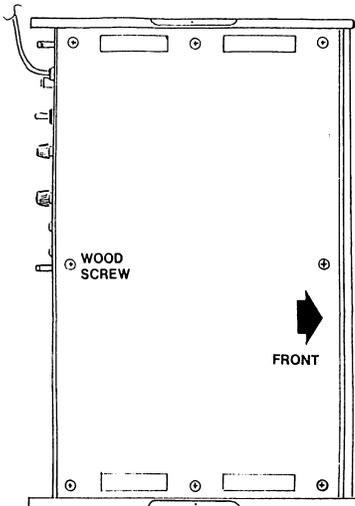


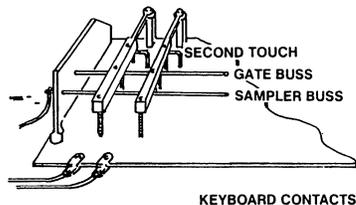
Fig. 11 Underside of SynKey

IX. MAINTENANCE: SynKey does not require any routine maintenance. You may, of course, clean the panel and keys with a clean damp cloth and care for the wood as with any fine furniture.

In the event of difficulties, the following owner maintenance may be performed (carefully) without voiding the warranty.

**Keyboard Cleaning:** The gold contacts of all synthesizer keyboards are susceptible to atmospheric contamination. Various pollutants coat the contacts and can cause problems.

The cleaning process is easy and access to contacts is provided. Here's how to tell when your SynKey needs contact cleaning:



**Symptoms:**

1. Depression of certain keys sometimes produces erratic pitch.
2. A single key depression sometimes produces **more than one envelope**.
3. Envelopes sometimes **re-attack when a key is released**.
4. Second touch erratic.

**Cure:**

1. Unplug SynKey. Turn it over and place it on a soft towel.
2. Remove bottom panel by unscrewing eight indicated screws. (See Figure 11)
3. Observe the keyboard busses. To an extent these are self-cleaning contacts. Push a key and notice how the gold spring rubs across the buss bar with a cleaning action.
4. To clean contacts, apply TV TunerSpray<sup>®</sup> or tape recorder head cleaner to a twisted pipe cleaner or Q-Tip cotton swab. Wipe the **sampler, gate, and second touch** busses with a motion paralleled to the length of the buss. **IMPORTANT:** do not apply so much pressure that the buss bends.
5. Place SynKey in playing position on flat surface. Plug in and check for proper operation. If second touch remains erratic and busses are obviously not making contact, bend U-shaped buss very slightly to ensure contact.
6. replace bottom panel.

**Fuse Replacement:** SynKey is equipped with a fuse to protect the power supply.

If the fuse fails, the front panel indicator light will go off and the instrument will produce no sound.

To replace, remove failed fuse and install a new 3 AG ¼ amp SLO BLO fuse. If the replacement fuse fails, DO NOT try another. Contact your dealer or authorized local service center.

**Trouble Shooting**

1. **No Sound.** It is possible for the SynKey to produce no sound even if the indicator light is flashing. Here are three typical causes:
  - a. Incomplete or improper patch is programmed (i.e no semitone select button down).
  - b. Failure of the patch cord itself.
  - c. Amplifier failure or nonfunction.

2. **Remedies**

- a. Program a **known** patch and listen at the SynKey's high level output with high impedance headphones.
- b. If SynKey sounds correct through headphones, reconnect it to amplifier, making sure amplifier controls are correct.
- c. If amplifier generates no sound, the problem is in the patch cord or amplifier itself.

No other user maintenance is permitted under the warranty. You have purchased an expensive precision instrument. We recommend, in the event of difficulties, that it be serviced only by factory or distributor authorized service facilities. SynKey should be shipped only in original packaging.

<sup>®</sup>EML recommends Archer's TV Tuner Cleaner, available from any Radio Shack.

## Technical Specifications

**KEYBOARD:** 3½ octave Pratt Read keyboard with Second Touch and gold plated contacts. Pitch bend + a third, filter sweep, vibrato, Mod. Osc. applied to filter (wah).

Any combination may be selected. Portamento variable from 0 to 2 seconds per octave (may be selected by optional footswitch or controlled from optional pedal).

**SOURCES:** A Master oscillator generates 13 pitches at semitone intervals. Pitches are selected by indicator push buttons. Any combination of semitones may be selected within the octave.

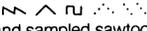
Accuracy of pitch interval: 1.2 cents maximum (approximately = 1/100 of a semitone). Octave select: ± 1 octave with precision digital divider. Root pitch wave continuously variable with

and intermediate waveshapes available. Pulse waveshape is modulated from 50% to 10% duty cycle by filter envelope for increased brightness. Remaining 12 pitch sources are bright 30% duty cycle pulses. Frequency range without vibrato 44Hz — 4186Hz. Vibrato amount — adjustable up to ± 2 octaves. Noise: white, selected by indicating push button.

**MODIFIERS:** Voltage Controlled Filter. State variable filter continuously variable from low pass thru band pass and high pass modes. Frequency range 44Hz (F<sub>1</sub>) thru 12000Hz, or 12KHz (G<sub>2</sub>). Inputs: (1) filter envelope 0 to + 5 octave sweep. (2) modulation oscillator 0 to ± 3 octaves.

Ring modulator— Digital with modulation pitch tracking a 5th above root pitch. Other timbres may be selected by using other than root pitch source.

**CONTROLLERS:** Envelopes — 1 for filter, 1 for voltage controlled amplifier, each with attack, decay and sustain controls. Attack: .005 to 3 sec. Decay: .002 to 9 sec.

Modulation Oscillator: Variable rate from .15 cycles/second to 50 cycles/second. 5 switch selected waveshapes  plus sampled triangle and sampled sawtooth. Light emitting diode indicates rate.

**CARD READER:** 40 bits with gold plated contacts. Rated for 100,000 card insertions.

### CARD PROGRAMMABLE CAPABILITIES:

Root waveform  
Vibrato amount  
Modulation oscillator shape  
Amount of envelope applied to filter  
Amount of modulation oscillator applied to filter  
Filter tune  
Filter resonance  
Filter mode: low pass, band pass, and high pass  
Filter envelope: attack, decay, and sustain  
Amplifier envelope: attack, decay, and sustain  
Panel control of any parameter is retained if that parameter is not programmed.

### NON PROGRAMMABLE CONTROLS:

Card reader select  
Octave select  
Semitone select  
Portamento time  
Modulation oscillator speed  
Noise  
Ring select  
Output volume.  
Output: High and low outputs of 4 and .4 volts nominal range suitable for driving standard music and hi-fi amplifiers.

**WARM-UP:** 3½ minutes at normal temperatures.

**POTS AND SWITCHES:** All potentiometers are Allen Bradley and are sealed against contaminants. Allen Bradley pots are rated at 100,000 rotations and become quieter with use. All switch contacts are gold and silver plated (excludes power switch).

**SIZE:** 29" × 7" × 8"

**WEIGHT:** 26 lbs.

**POWER REQUIREMENTS:** 10 watts

**Specifications subject to change without notice.**

# synkey

A Kaman Music Product  
P.O. Box 529, Bloomfield, CT 06002

The first synthesizer you can program.

Printed in U.S.A.

**OSC CONTROL**

ROOT WAVEFORM

1 2 4

1 4 7  
2 5  
3 8

MOD. OSC.

1 2 4

**VOLTAGE CONTROLLED FILTER**

TUNE

1 2 4

RESONANCE

1 2 4

MODE

1

1 L.P.  
2 B.P.  
3 H.P.

MOD. OSC.

1 2 4

ENVELOPE

1 2 4

2

MOD. OSC. SHAPE

1

**FILTER ENVELOPE**

ATTACK

1 2 4

DECAY

1 2 4

SUSTAIN

1 2 4

1 2 3

**VOLTAGE CONTROLLED AMPLIFIER**

**AMPLIFIER ENVELOPE**

ATTACK

1 2 4

DECAY

1 2 4

SUSTAIN

1 2 4

**MANUAL SETTINGS ONLY**

DO NOT PUNCH

OCTAVE

-1

+1

R

m2

2

m3

3

4

4\*

5

m8

8

m7

7

8va

NOISE

RING

PORT.

MOD. OSC. SPEED

MASTER VOLUME

SECOND TOUCH

1

2

3

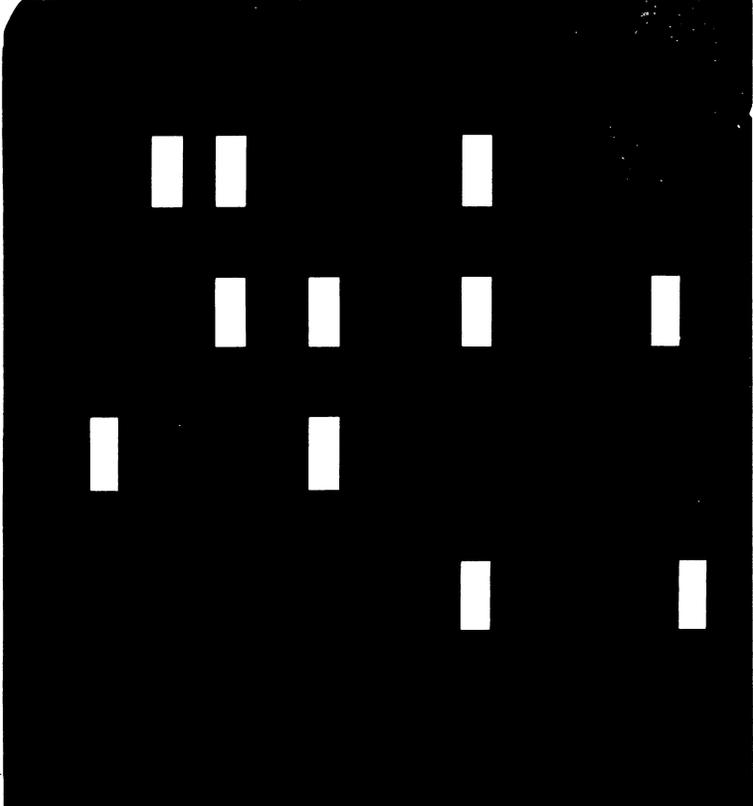
PROGRAM TITLE

Empty rectangular box for program title.

OSC CONTROL			VOLTAGE CONTROLLED FILTER						
ROOT	WAVEFORM		TUNE		RESONANCE		MODE		
1	2	4	1	2	4	1	2		
1.5	4.1	7.2							
2	5						1 L.P.		
3	6						2 H.P.		
							3 H.P.		
MOD. OSC.			MOD. OSC.		ENVELOPE				
1	2	4	1	2	4	1	2		
MOD. OSC. SHAPE			FILTER ENVELOPE						
1			ATTACK		DECAY		SUSTAIN		
1			1	2	4	1	2		
2									
3									
VOLTAGE CONTROLLED AMPLIFIER			AMPLIFIER ENVELOPE						
			ATTACK		DECAY		SUSTAIN		
			1	2	4	1	2		
MANUAL SETTINGS ONLY									
DO NOT PUNCH									
OCTAVE								NOISE	RING
-1	+1	0	1	2	3	4	5	6	
PORT.		MOD. OSC. SPEED			MASTER VOLUME				
SECOND TOUCH			PROGRAM TITLE						
1									
2									
3									

Electronic Music Laboratories, Inc.

**synkey**  
The Programmable Synthesizer



Electronic Music Laboratories, Inc.

**EMI**  
**syn-key**

The Programmable Synthesizer

# electronic music laboratories, inc.

P.O. Box H, Vernon, Connecticut 06066 Tel: (203) 875-0751

January 29, 1976

Mark S. Glincky  
620 Briercliff Drive  
Orlando, Florida

Dear Mark,

Your survey card is a big help. We thank you for completing and returning it.

Our newest product is Syn-key. Syn-key is a programmable synthesizer in that, you set up a sound you like using the synthesizer's front panel controls, then you may transfer the "panel information" via a card punch onto a plastic computer card. When complete your "sound" is stored forever. No more lost sounds, no more jungles of patchcords.

To retrieve the sound simply insert the card into Syn-key's card reader and engage it.

Also, the Syn-key has a semitone select feature which allows you to precisely and quickly set chords. If you want a major chord just depress R, 3, 5. A suspended chord R, 4, 5.

Enclosed you will find a preliminary sheet on Syn-key for a complete catalog write to: Syn-key  
Box 205  
Department E  
New Hartford, CT.

Take care and have a good year.

Best,



John Borowicz  
Customer Service

JB:mam