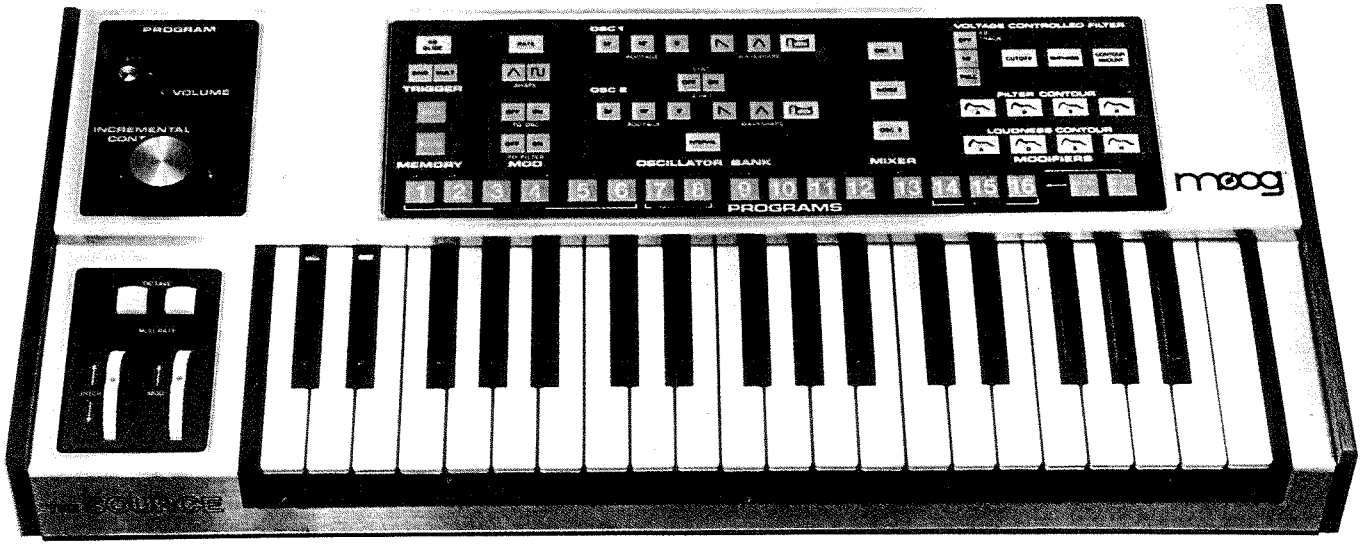


moog®

THE SOURCE

OWNER'S MANUAL by Rock Wehrmann

Congratulations!

Now, I realize that about 80 percent of all owner's manuals start with that word but, in this case, it's justified.

The fact that you've purchased THE SOURCE says several things about you as a musician:

— You're not afraid of what could be called a "computer-controlled instrument"; rather, you're ready to work with the advantages presented by a microprocessor-based synthesizer.

— You are quality and cost conscious. THE SOURCE contains a built-in sequencer, arpeggiator and program sequencer and costs less than some non-programmable synthesizers.

— Finally, and perhaps most importantly, you just want to make good music.

This manual will help you to realize just how versatile an instrument THE SOURCE truly is. Section I will show you how to use each function on the instrument; Section II explains the theory behind each function and gives tips on how to use that function more efficiently. Margin comments periodically explain, in detail, points made in the main copy.

After you've read the manual, you should have a good working knowledge of digitally-controlled synthesizers and you should realize that, rather than producing "robot music," digitally programmable synthesizers take care of the "busy work" and leave you free to make your own kind of music.

And when you're done with this manual, you'll be ready to earn the congratulations which really count — the applause of your friends and audiences for making great music with THE SOURCE.

Good playing,

Rock Wehrmann

Rock Wehrmann
MOOG MUSIC INC.

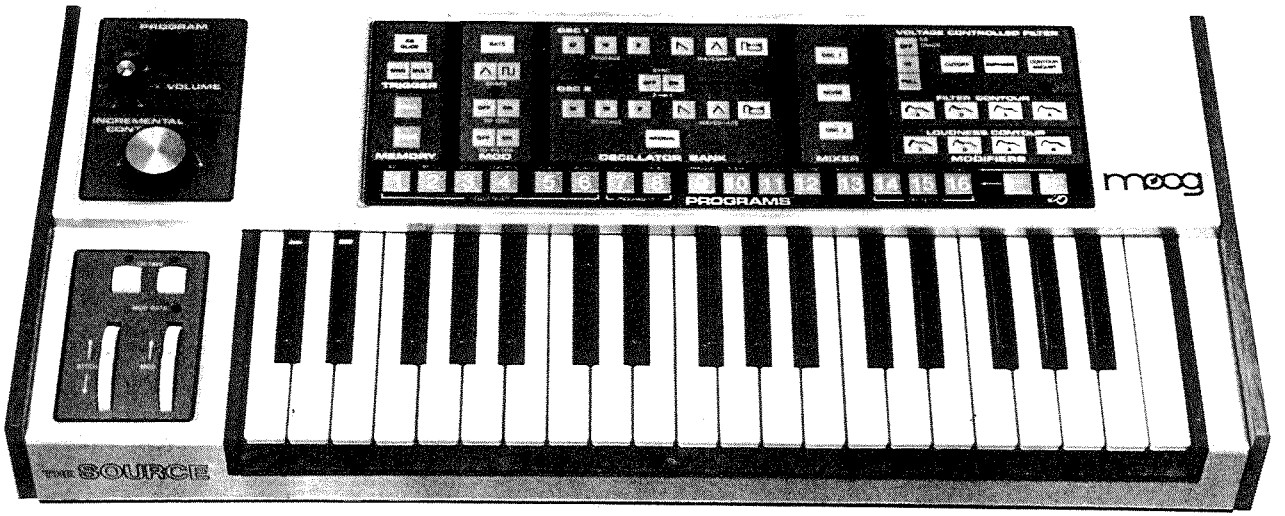
CONTENTS

SECTION I

SECTION II

SECTION I BASIC OPERATION

GENERAL MAINTENANCE



The components of the shipping carton for The Source should be saved in case short-distance transport is required. *Do not* repack The Source without surrounding it with some kind of plastic (similar to the bag in which it was shipped). Putting the instrument directly inside the styrofoam end pieces without any protection can generate harmful static changes and may also damage the wood side pieces. A carrying case is recommended for long-distance transport.

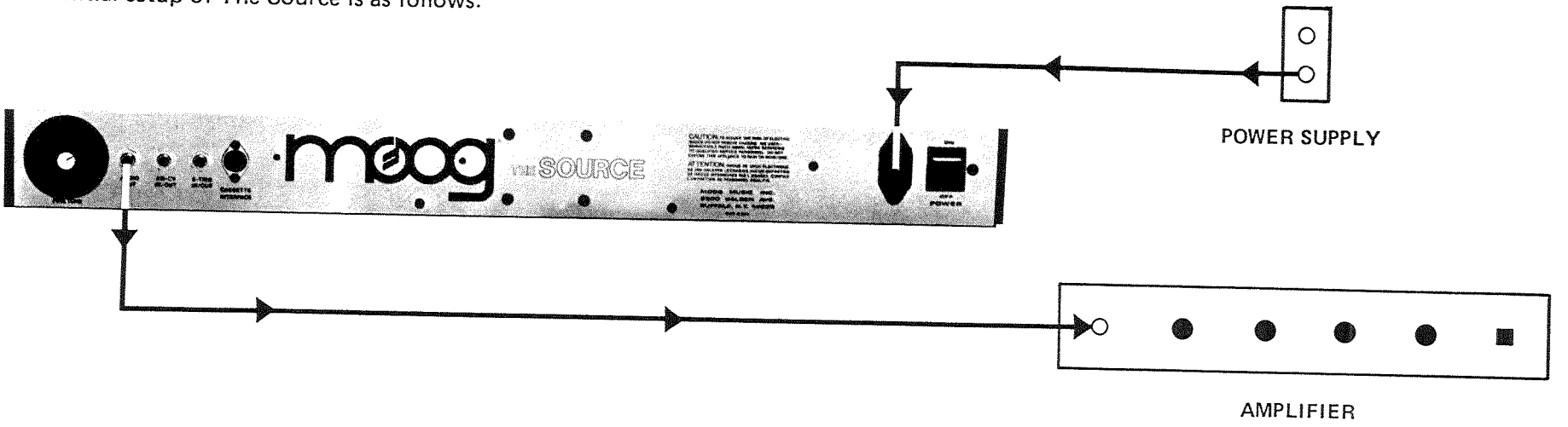
The wood side and trim pieces are walnut. These should be periodically rubbed down with linseed oil to maintain a rich finish.

The body of the instrument is constructed of brushed aluminum and, when needed, should be cleaned with a *slightly* damp (not wet) cloth. The touch panel may be cleaned in the same manner, taking care not to let water accumulate on any surfaces.

The touch panel is highly resistant to all forms of damage except heat. *Do not* allow open flame or lighted cigarettes near the touch panel.

SETUP

The initial setup of The Source is as follows:



With the power switch OFF, connect the detachable line cord first to The Source, and then to a grounded wall socket.

Run a 1/4-inch mono cable from the Source's Audio Out to the amplification system.

Connect desired interface cables. (See Interfacing, page 48, for proper procedures.)

Set amp volume and Source volume to zero.

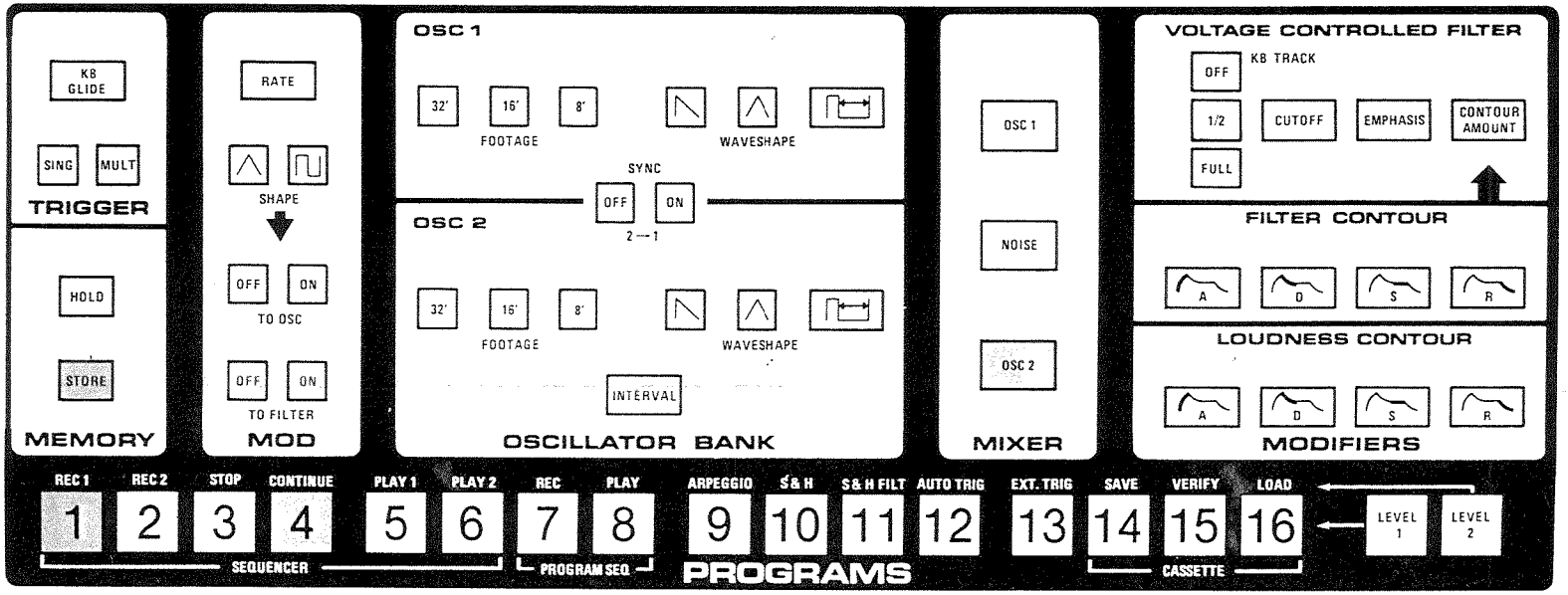
Turn the power switch on The Source ON. The numeral 1 should appear in the program display (upper left corner). Turn on the amplifier.

Turn up the volume on the amplifier to an accustomed listening level. *With the volume control on The Source still down*, depress any key. Turn up The Source's volume to a comfortable level. Note these volume settings.

Follow this procedure whenever the instrument is used.

TUNING UP

After The Source has warmed up (4 to 5 minutes), follow this tuning procedure:



Touch program **4**.

Using the rear panel FINE TUNE control, tune The Source to any reliable pitch source (an organ, piano, tuning fork, etc.).

Touch program **1**. Touch the **STORE** control and, *while still holding it down*, touch the **OSC 2** control in the Mixer section. Now hold down the top key on the keyboard, and turn the Incremental Controller until the two oscillators are exactly in tune (the "beating" effect will stop).

Touch any program number.

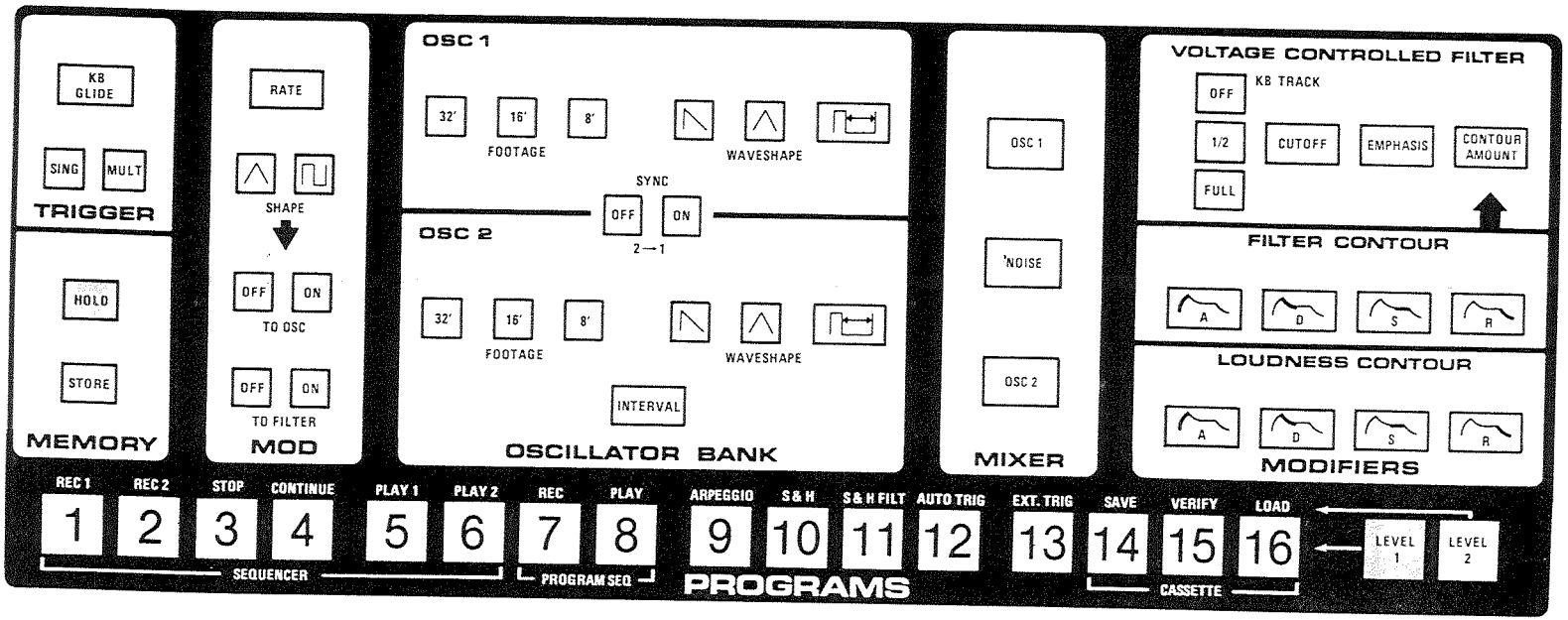
THE SOURCE IS NOW TUNED UP AND READY TO PLAY.

(If the factory programs have changed, use the tuning procedure listed in the Troubleshooting section on page 56.)

PLAYING PROGRAMS

To call up a programmed sound, touch the appropriate program. If the selected program does not come up immediately, one of two conditions exists:

Touching a program position immediately resets every circuit of the analog synthesizer and resets all digital functions.



1. The Source is in the HOLD mode (see Storing Programs on page 11).
   If this is the case, a semi-colon figure will appear in the Program Display.
   To escape the HOLD mode, touch **HOLD**. The semi-colon figure will disappear.

2. The Source is operating in Level 2 (see Level 2 Functions on page 15).
   To escape Level 2, touch **LEVEL 1**.

FACTORY PROGRAMS

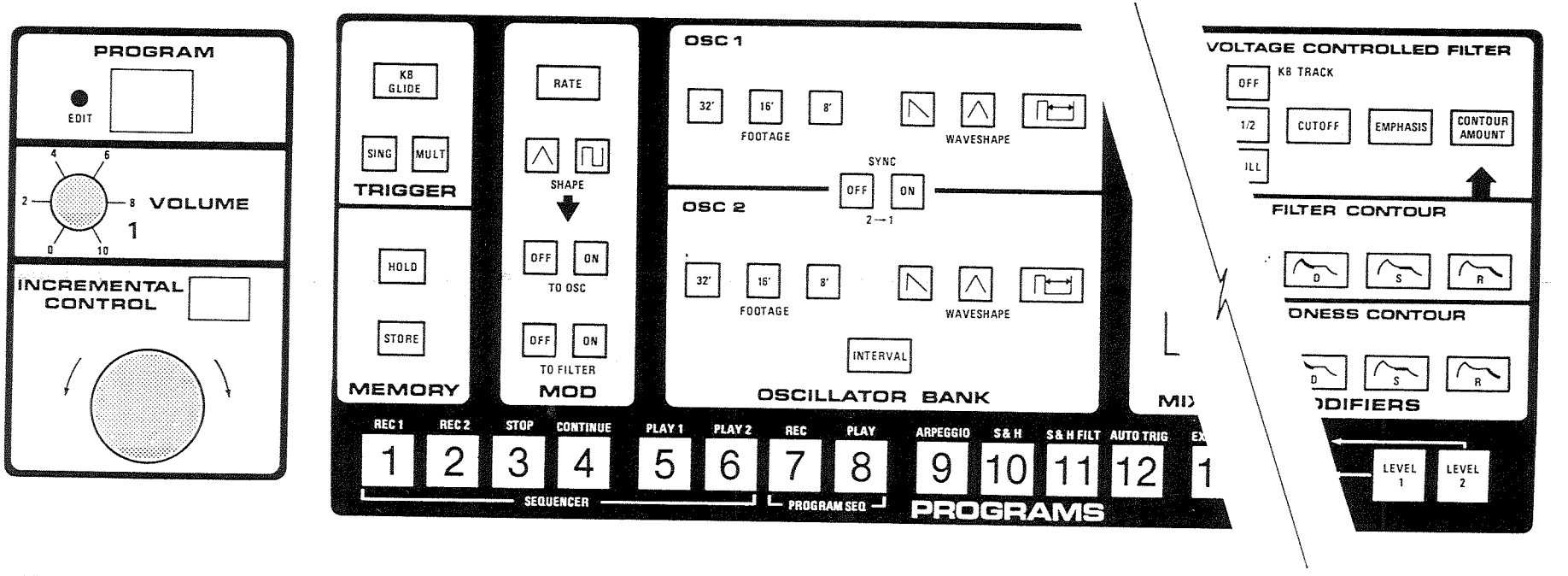
The factory programs (programs in memory when The Source is shipped) are:

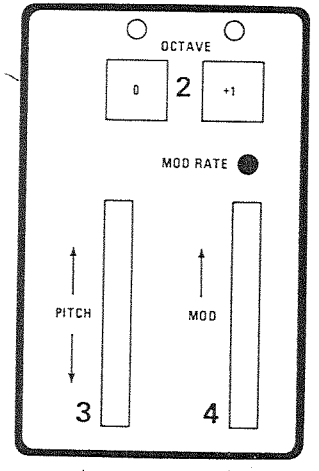
1. Lead 1: a "fat" lead sound, reminiscent of the Minimoog.
2. Lead 2: a guitarlike lead voice; effective with pitch bending.
3. Horn: a simulation of brass instruments; realistic over a wide range.
4. Flute: voiced with tremolo, this program sounds best with the modulation wheel set at approximately 75%.
5. Clav Bass: a bright, funky bass voice with a "plucked" sound.
6. Vibes: this voice has a touch-dependent envelope; playing and holding a key produces a different sound than does "tapping" and releasing a key. Set the modulation wheel to 75% for tremolo.
7. String Bass: a mellow bass sound with the touch-dependent envelope described in program 6.
8. Harpsichord: a bright, plucked sound.
9. Organ: this voice uses single triggering for a "percussive" attack when desired.
10. Trill Voice: the modulation wheel will "tune" the upper note of a trill.
11. Taurus: the same rich, deep sound as the Moog Taurus Pedal Synthesizer.
12. Synthevox: a resonant, singing lead-line sound.
13. Sax: a nasal, biting sound characteristic of an alto or soprano saxophone.
14. Wind: this voice uses noise as a signal source. Turn the modulation wheel up to full for a "sweeping" effect.
15. Snare Drum: different areas of the keyboard will produce differently "tuned" drums.
16. A duplication of program 1. Program 16 can be used as a holding position for rearrangement of program positions.

PERFORMANCE CONTROLS

THE PERFORMANCE CONTROLS ON THE SOURCE ARE NOT PROGRAMMABLE.
THEY ARE ALWAYS ACTIVE AND READY TO BE USED.

The Performance Controls are:





1. Volume — Final master gain. This determines the output level of all signals from The Source.

2. Octave — The Octave controls (Zero and +1) transpose the oscillators and filter up or down an octave.

3. Pitch Wheel — This wheel changes the pitch of the oscillators up or down.

4. Modulation Wheel — Moving this wheel up (towards the volume control) introduces vibrato or other modulation effects (see "Modulation" on page 38).

EDITING PROGRAMS

As previously shown, The Source may be used exclusively as a preset synthesizer.

However, during performance, it is desirable to change the quality of a sound. For this and other reasons, The Source has extensive editing capabilities. *Editing* may be defined as "changing the memory values of a function."

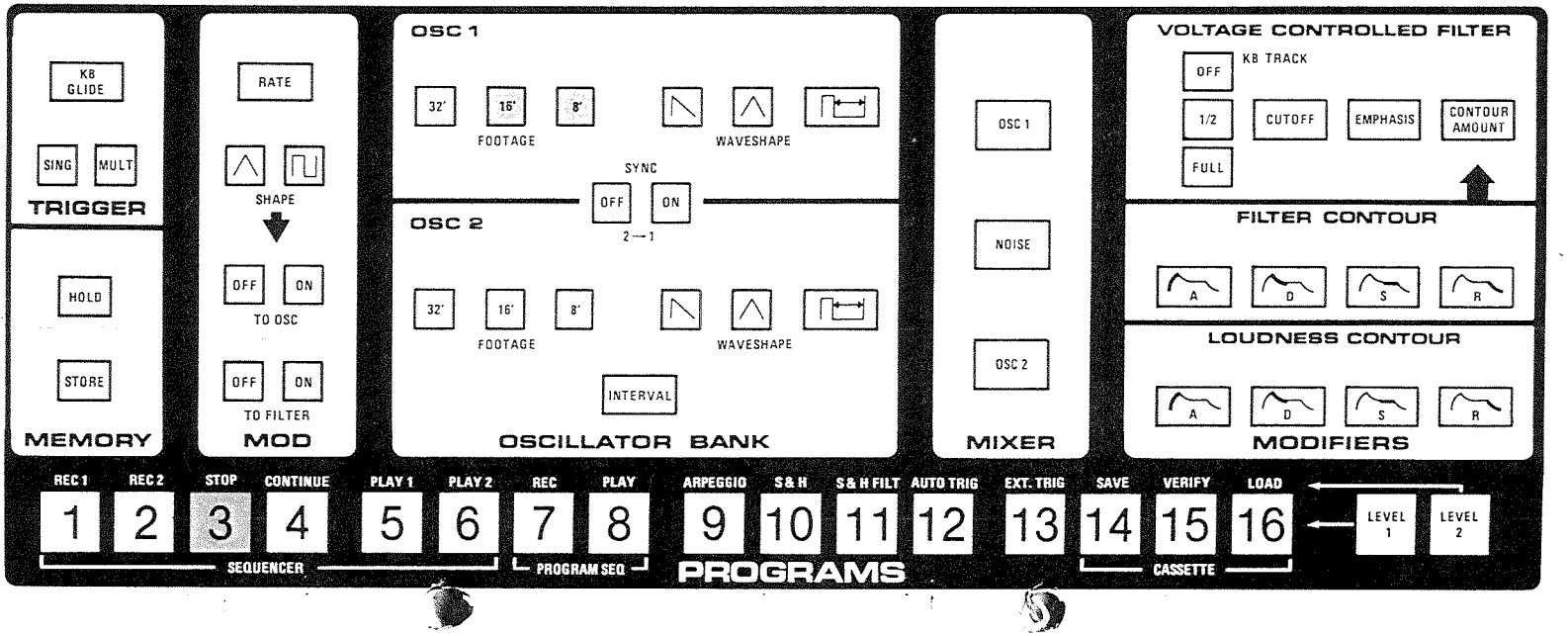
The functions on any synthesizer fall into one of two categories: Switching functions or incremental functions. The Source's touch panel and incremental controller allow access to all these functions.

The touch panel is laid out in a manner similar to a conventional monophonic synthesizer. Major function blocks — oscillators, filter, modulation — are grouped in visual sections.

Switching controls on The Source touch panel are square-shaped and are either orange (memory controls) or light blue (synthesizer controls).

To edit a switching function, touch the control positions corresponding to the desired change. For example:

The touch panel is a unique instant-access entry system. The Source's microprocessor recognizes an entry (touch) on the panel in under 3 milliseconds. For an explanation of touch panel functions, see The Analog Synthesizer on page 25.



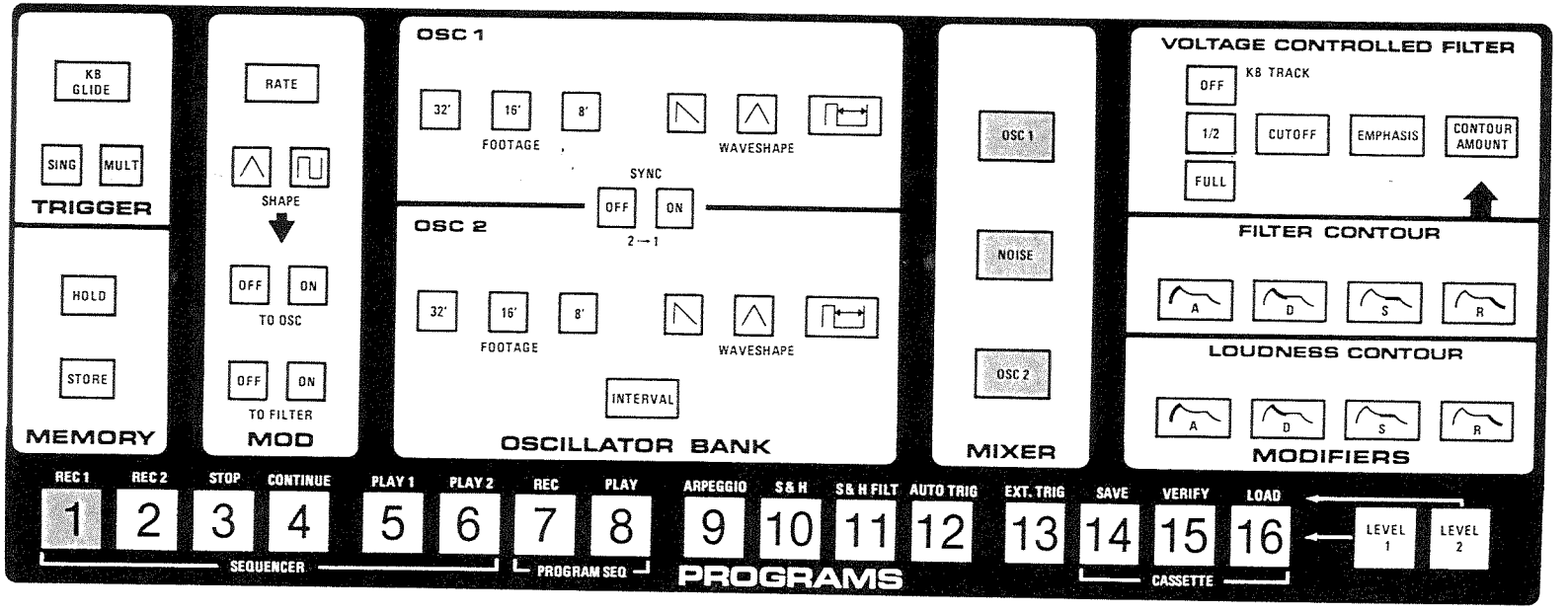
1. Touch program **3** . Hold down any key.

2. Touch **8'** in the OSC 1 section. The oscillator changes octaves immediately. (Note that the edit LED lights up.)

3. Touch **16'** in the OSC 1 section. (The oscillator returns to the lower octave.)

The edit LED illuminates after a front panel control is touched. While the control is being held down, the LED shuts off to show that contact has been made. When the control is released, the LED illuminates again.

Switching functions are unconditional; either ON or OFF, 16' or 8', etc. Incremental functions are continually adjustable, and are represented on the touch panel by yellow rectangles. Touching an incremental function assigns the incremental controller to that function. Incremental functions are adjusted as follows:



1. Touch program **1** .

Note that touching a program control cancels all previous editing.

2. Touch **OSC 1** in the Mixer section. The incremental controller is now controlling the audio level of OSC 1. The display next to the incremental controller illuminates, displaying "99." Most of the incremental controls are divided into 100 increments — 0 to 99. In this case, the display indicates that OSC 1 level is at maximum.

3. Hold down any key. Turn the incremental controller counterclockwise. As the numbers in the display decrease, the level of OSC 1 decreases. When the display shows zero, Osc 1 is inaudible. The input of OSC 1 has been turned down in the mixer.

Note that the incremental controller can still turn freely when the display reaches zero. For an explanation of the characteristics of the incremental controller, see Digital Functions on page 41.

4. Touch **OSC 2** in the Mixer section. The edit LED momentarily goes off (showing that contact has been made), and the display reads "99," showing that Osc 2 is at maximum level. *The previous editing (Osc 1 level changed to zero) is kept in memory.* At this point, turning the incremental controller will change the level of Osc 2.

5. "Review" the **NOISE** control in the Mixer section by touching it and noting the display value (in this case, zero).

6. Touch **OSC 2** again. If no changes were made in Step 4, the display should now read "99." Turn the incremental counterclockwise until the display reads zero.

Touching an incremental function, without turning the incremental controller, will display the current memory value, but will not change that value. Controls may be "reviewed" in rapid succession to get a mental picture of a particular sound.

Depress any key. No signal is heard. Why?

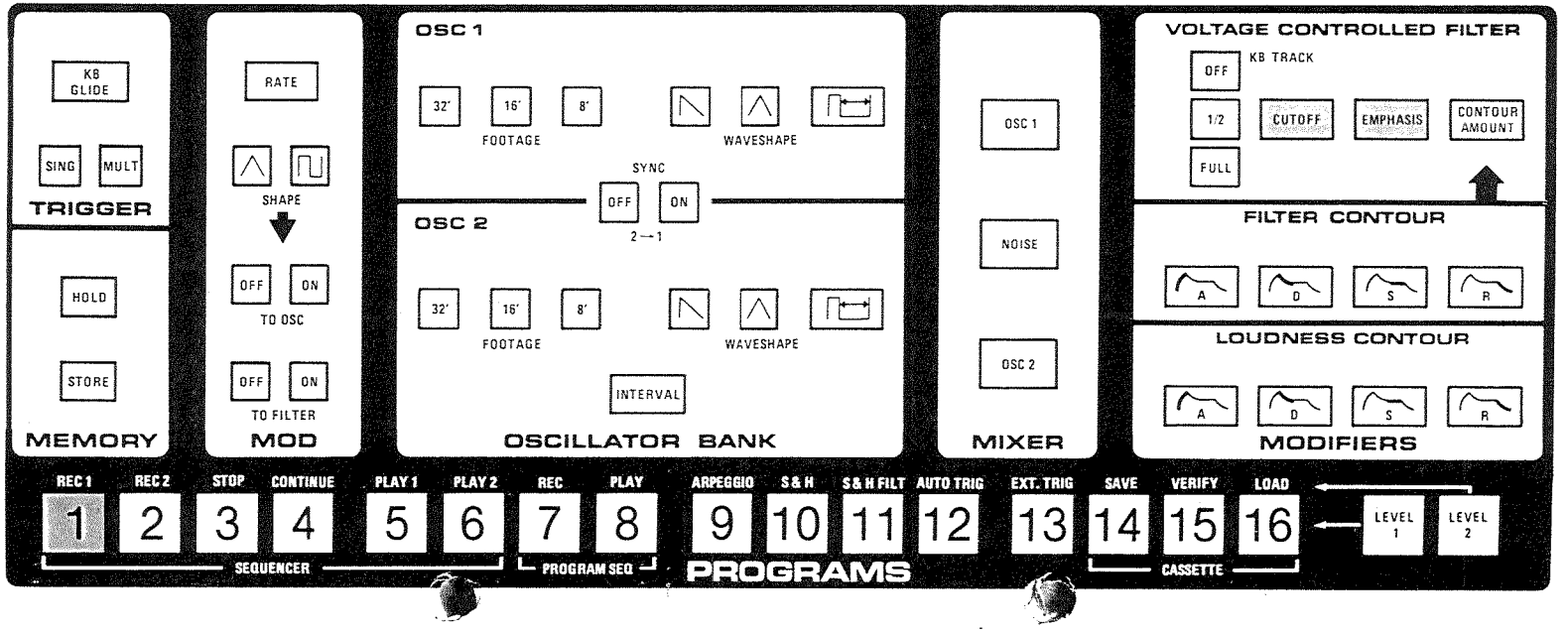
1. Osc 1 level was set to zero in Step 3. That setting was held in memory.

2. Noise level was proved to have been programmed at zero by reviewing (Step 5).

3. Current editing displays zero level for Osc 2.

All signal sources are at zero, so no output is heard.

Any incremental control may be reviewed or edited in the same way. For example:



1. Touch program **1** (this cancels all previous editing). Play the keyboard and note the quality of the sound.

2. Review **EMPHASIS** in the Filter section. The display reads zero.

3. Touch **CUTOFF** in the Filter section. The display reads 41. Turn the incremental controller while repeatedly striking a key. Note the change in sound quality. At any point, touching another control will hold the last value of the Cutoff control in memory.

SUMMARY:

1. Touching any front panel synthesizer control puts The Source into Edit mode.

2. When consecutive edit changes are made, all previous editing is held in memory.

3. Switching functions may be edited by direct entry.

4. Incremental functions may be:

   a) *Reviewed*, by touching an incremental control, noting the display value, making no changes, and proceeding to another control.

   b) *Edited*, by touching an incremental control, changing its value with the incremental controller, and proceeding to another control.

5. All editing is cancelled by touching a program control.

STORING PROGRAMS

A point mentioned several times earlier in this manual is that if a program position was touched, all previous editing was "erased." Often, however, an edited version of a program may be preferred over the original program.

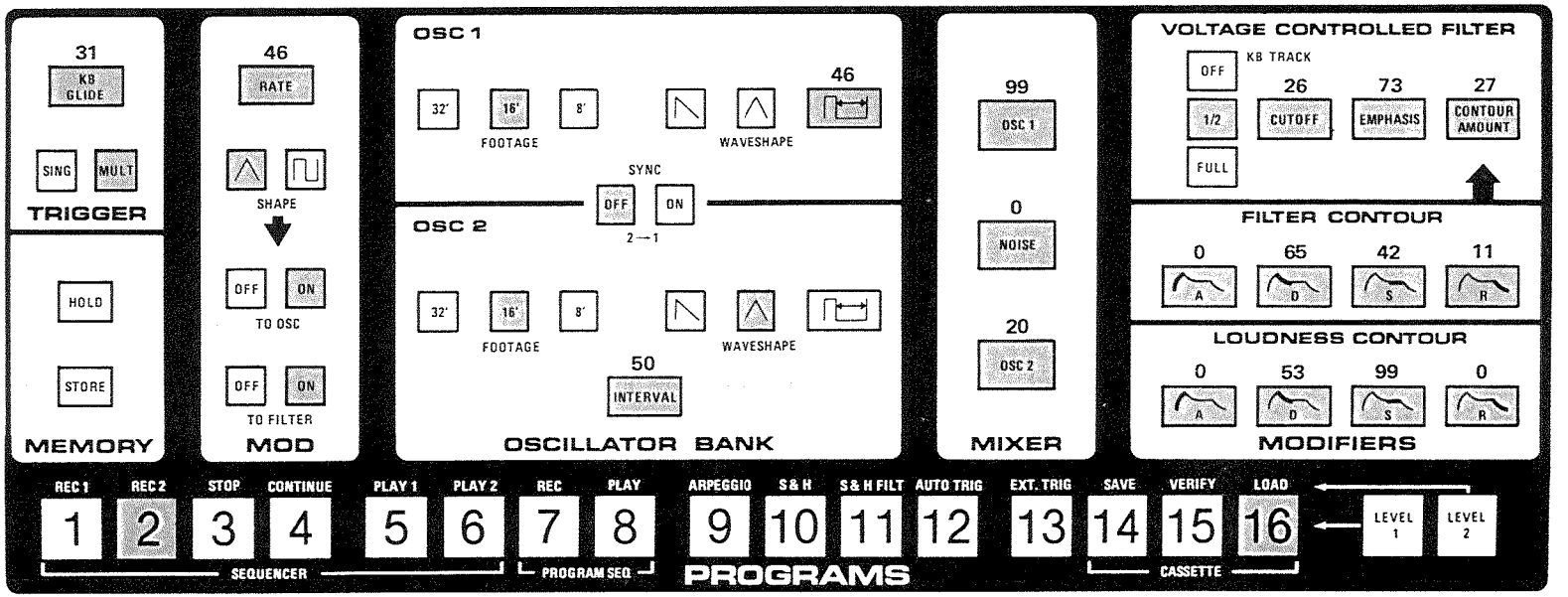
Changes made in existing programs may be stored in memory as new programs. In fact, changing existing programs is the only way to produce new sounds.

Note that in all the following examples, the final sound stored in memory began as an existing program. The existing program was substantially changed, and a new, desirable sound resulted.

TO STORE A PROGRAM, FOLLOW THIS PROCEDURE:

1. Set up the desired sound.
2. Touch **HOLD** . (Two dots light up in the program display.)
3. Touch **STORE** and the intended program location simultaneously.

For example:



1. Touch program **16** .

2. Using the previous sound chart, edit all indicated controls by touching the appropriate switching functions and adjusting each incremental function.

3. When all indicated editing has been completed, follow the storing procedure on page 11 to store the new program at program **16** .

4. Now touch program **2** . The editing in the previous sound chart equals the values in memory for factory program 2, so the program stored in 16 should duplicate the program in 2.

Note that program 16 is a duplication of program 1. No original programs are lost during this procedure.

THE HOLD CONTROL

The Hold control does two things: (1) freezes the front panel (so no further editing is possible), and (2) activates the Store control. (Normally, the Store control is "dead" to prevent accidental erasure of programs.)

Active Hold status is indicated by two illuminated dots in the program display.

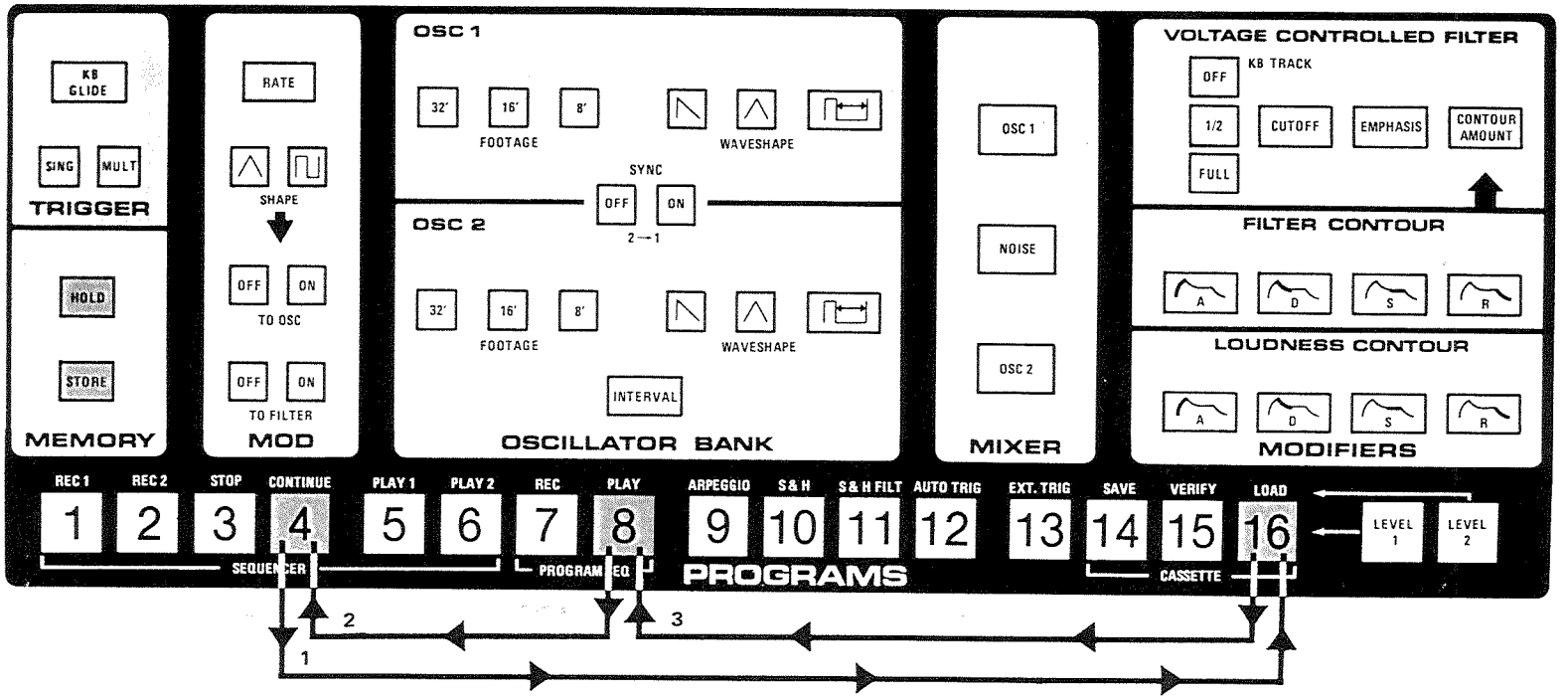
While the Hold control is active, other programs may be momentarily reviewed by touching *and holding* the program control. When the program control is released, The Source returns to the sound set up on the front panel.

The Hold control is reversible – touching it again will turn it "on" if it is "off," or vice versa.

REPOSITIONING PROGRAMS

For a particular performance, the programs may need to be put in a different order, so it's a good idea to reserve program **16** as a kind of "holding" position to allow repositioning of programs.

To switch any two program positions (4 and 8, for example), follow the procedure outlined with the next sound chart.



1. Move the first program (4) to position 16.

   a) Touch program **4** .
   b) Touch **HOLD** .
   c) Touch **STORE** and program **16** simultaneously.

2. Move the second program (8) to the original location of the first program (4).

   a) Touch program **8** .
   b) Touch **HOLD** .
   c) Touch **STORE** and program **4** simultaneously.

3. Move the first program to the original location of the second.

   a) Touch program **16** .
   b) Touch **HOLD** .
   c) Touch **STORE** and program **8** simultaneously.

Touching **HOLD** then **STORE** and a program control simultaneously will store the current front panel settings (edited or not) at the indicated program.

SUMMARY:

1. To store a program, touch **HOLD** , then touch **STORE** and a **PROGRAM NUMBER** simultaneously.

2. The **HOLD** control allows reviewing of existing programs and is reversible.

3. Reserving program **16** as a "holding" position allows relocation of programs.

LEVEL 2 FUNCTIONS

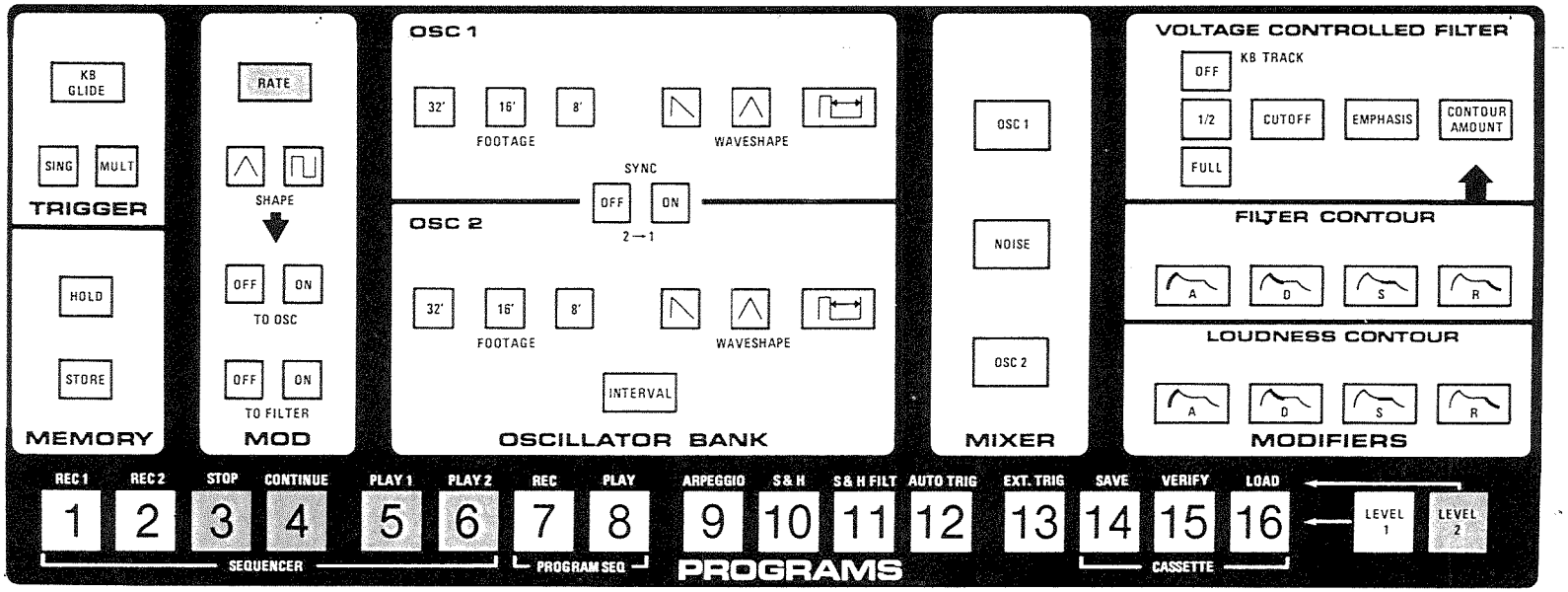
Since The Source is a microprocessor-based instrument, a single control may have several different functions, depending on the level of operation. Many of the controls on The Source have alternate functions, accessed by entering Level 2, an "expanded-operation" mode. Level 2 allows access to real-time functions such as the sequencer, the arpeggiator, and the program sequencer. The operation of these functions will be explained in this section.

Touching **LEVEL 2** converts the program selectors to the Level 2 functions written in small letters above the program number. After the Level 2 function has been activated, control generally reverts to Level 1.

USING THE SEQUENCER

The Source has a self-contained digital sequencer capable of storing 2 sequences of up to 88 events each.

The Source has been shipped from the factory with two sequences. To play back sequences, follow this procedure.



1. Touch the program number of the desired sound.

2. Touch **LEVEL 2** at the lower right corner of the touch panel.

3. Touch **PLAY 1** (program 5).

4. The Source is repeatedly playing Sequence 1. To change the playback rate, touch **RATE** in the modulation section, and adjust the sequencer rate with the incremental controller.

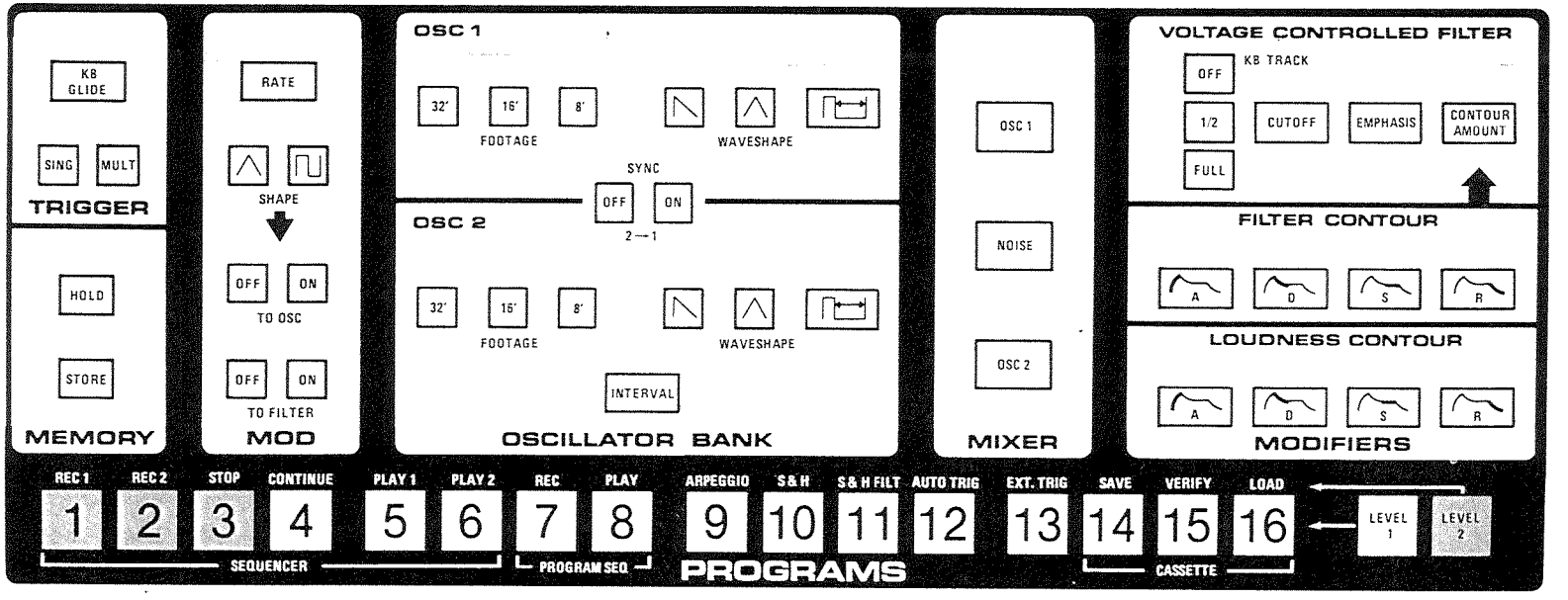
The last playback rate chosen will be held in memory when the sequencer is stopped; subsequent sequences will start at this rate.

5. While the sequencer is playing, the incremental display "counts up." Other programs may be selected and edited using editing techniques while the sequencer is running.

6. To stop the sequencer, touch **LEVEL 2** , then touch **STOP** (program 3). To continue from the last sequencer note played, touch **LEVEL 2** , then **CONTINUE** (program 4). To restart from the beginning of the sequence, touch **LEVEL 2** , then **PLAY 1** (program 5).

To hear Sequence 2, follow the above procedure using **PLAY 2** (program 6).

To record new sequences, follow this procedure:



1. Touch **LEVEL 2** , then **REC 1** (program 1). The incremental display shows 88, the number of recordable events.

Rests, or spaces between notes, are counted as events. For efficient sequencer use, see Digital Functions on page 41.

2. The sequencer will begin recording with the depression of the first key. The display counts down, continuously displaying the number of events left.

3. At the end of the last desired event, touch **STOP** (program 3).

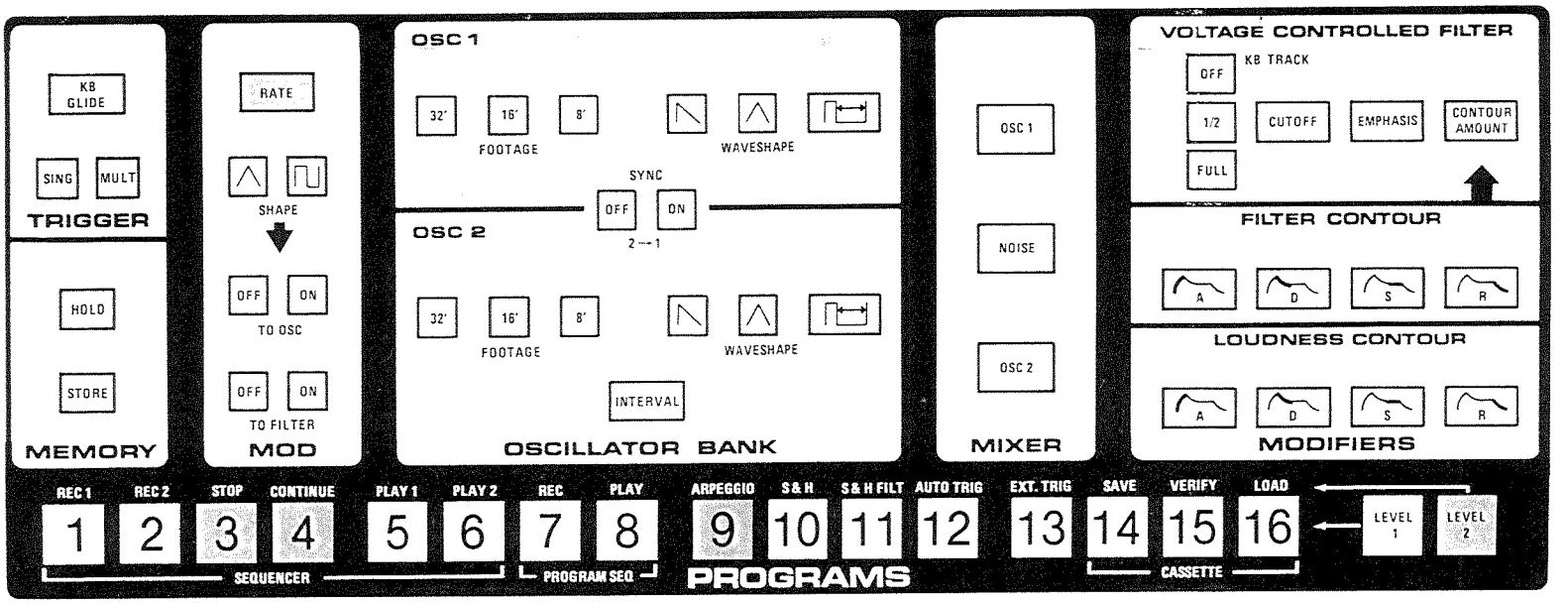
To hear a recorded sequence, follow the sequence playback procedure. The sequence plays back at the last sequencer rate entered.

To record the second sequence, follow the above procedure using **REC 2** (program 2). Playback of the second sequence is controlled by **PLAY 2** (program 6).

USING THE ARPEGGIATOR

The arpeggiator can be thought of as a kind of "instant sequencer." It performs many of the functions of the sequencer, but uses none of the sequencer memory.

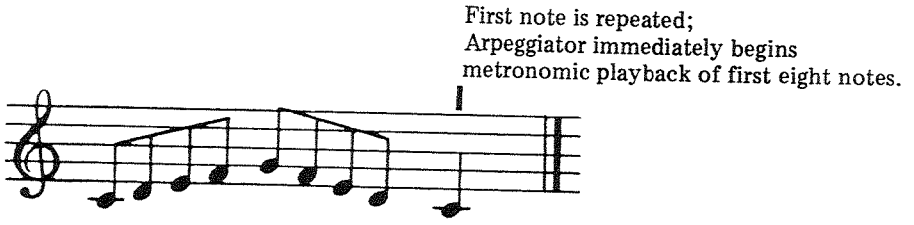
To use the arpeggiator, proceed as follows:



1. Touch **LEVEL 2**, then touch program **9** (Arpeggio). The incremental display lights up, displaying the arpeggiator playback rate.

2. Play the notes of the desired musical pattern one by one *without repeating the first note played.* As keys are depressed, the display counts down from 24. The repetition of the first note will indicate the end of the pattern and switch the arpeggiator to the playback mode.

Example:



3. To change the playback rate while the arpeggiator is running, touch **RATE** in the modulation section and adjust the playback rate with the incremental controller. While the arpeggiator is running, The Source is in Level 1; programs may be selected and/or edited.

The last arpeggiator rate used is held in memory; the arpeggiator will play at this rate the next time it is started.

4. To stop playback, touch **LEVEL 2** , then **STOP** (program 3).

5. To replay the last arpeggio stored, touch **LEVEL 2** , **ARPEGGIO** , **LEVEL 2** , then **CONTINUE** .

6. Touching any key during playback instantly switches the arpeggiator to the record mode.

If, while the arpeggiator is running, a new pattern is played on the keyboard at the current playback rate, the arpeggiator will play back the new pattern with no break in rhythm. This is an especially powerful performance feature.

SUMMARY:

1. The arpeggiator records up to 24 notes. The repetition of the first note immediately switches its function from recording to metronomic playback.

2. Playback of the arpeggiator may be stopped by touching **LEVEL 2** , then **STOP** (program 3). This does not erase the arpeggio from memory.

3. Touching **LEVEL 2** , **ARPEGGIO** , **LEVEL 2** and **CONTINUE** (program 4) will start playback of the last arpeggio stored.

4. Touching any key, during playback, immediately switches the arpeggiator from playback to record.

USING THE PROGRAM SEQUENCER

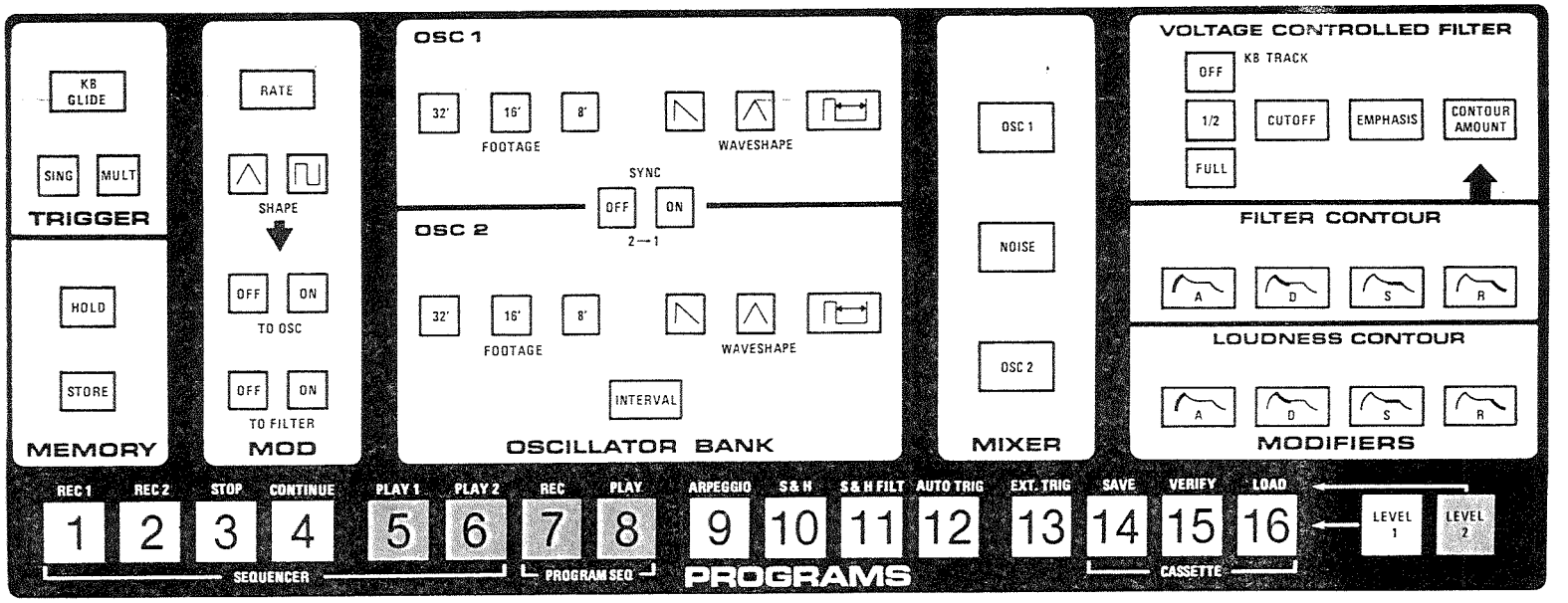
The program sequencer allows different events of the sequencer to be played with different programs. For example, a 16-note sequence can play the first four notes on program 1, the next eight notes on program 2, and the last four notes on program 3.

Each note in a sequence (up to 88 notes) has the capability of being assigned to an individual program.

To record with the program sequencer, follow this procedure:

If the factory sequences have not been changed, program sequencing can be demonstrated by touching **LEVEL 2**, **PROGRAM SEQ PLAY** (program 8), then **PLAY 1**.

The information dictating program changes is stored concurrently with the sequencer pitch and duration information; program changes may also occur during a rest.



1. Start playback of Sequence 1. (See Using the Sequencer on page 15.) Practice changing programs manually as the notes in the sequence are played (the sequence playback may be slowed using the Mod **RATE** control).

2. When the final sequence of program changes has been decided, touch the first program to be heard, then touch **LEVEL 2**.

3. Touch **PROGRAM SEQ REC** (program 7). The sequence will play once from the beginning. As the notes are played, touch programs at the appropriate times.

4. At this point, the sequencer can play back with or without program changes. For playback with program changes, touch **LEVEL 2**, then **PROGRAM SEQ PLAY** (program 12), then **PLAY 1** (or **PLAY 2**). For playback without program changes, follow normal sequencer procedure (see Using the Sequencer on page 15).

5. A different sequence of program changes may be recorded for Sequence 2.

SUMMARY:

1. The program sequencer will automatically change programs when the sequencer is running.

2. The program sequencer is loaded by touching program numbers while the sequencer plays back.

3. Sequencer playback can occur with or without program changes.

A program change recorded at any point in the duration of a note will occur at the beginning of that note during playback. (For efficient operation, see The Program Sequencer in the Digital Functions section on page 45.)

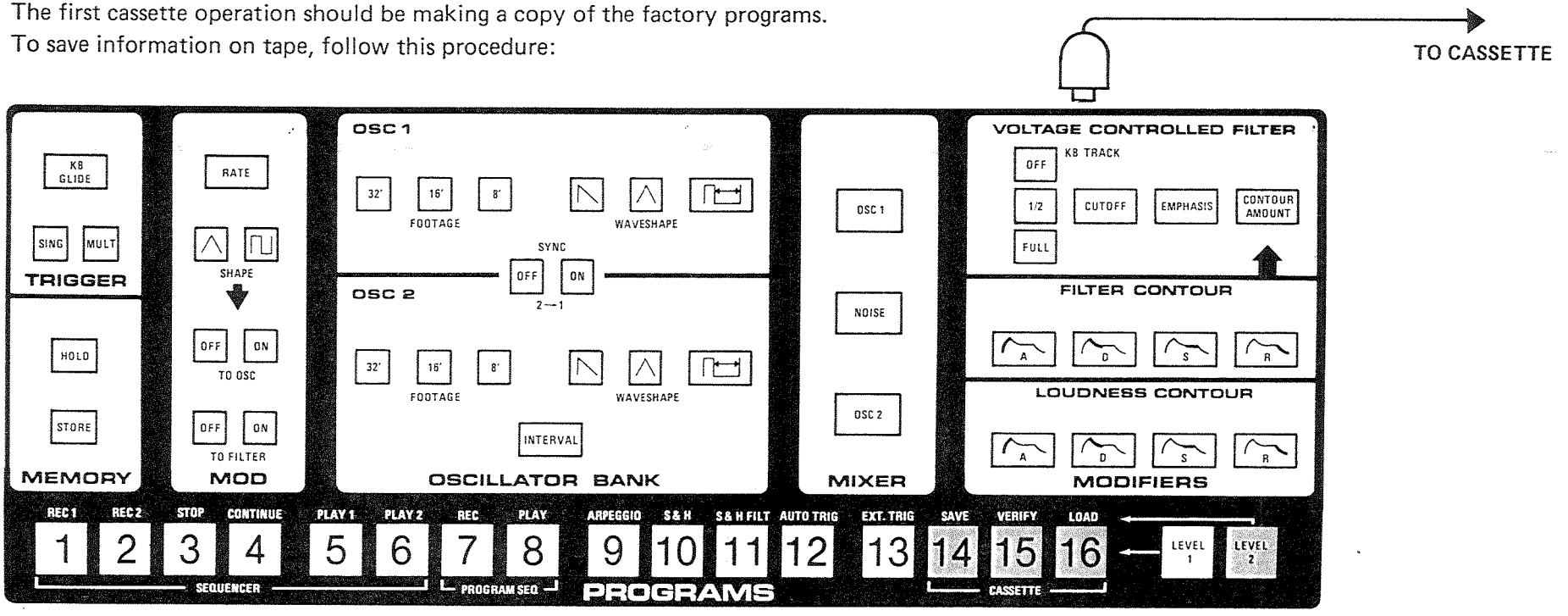
STORAGE AND LOADING OF DATA

All information held in The Source's memory may be stored on tape for reference and later use.

The following information will be saved on tape:

1. All control values for 16 programs.
2. Last two sequences entered (and sequencer playback rate).
3. Last arpeggio entered (and arpeggiator playback rate).
4. Last program sequences entered.

The first cassette operation should be making a copy of the factory programs.
To save information on tape, follow this procedure:



1. Connect a cassette recorder (Radio Shack CTR-80 or equivalent) to the rear panel Cassette Interface DIN Connector. (To connect other cassette recorders, see Cassette Operations on page 55 in the Troubleshooting section of this manual.)

2. Using a computer cassette (with no leader tape), rewind to the beginning of the tape and set the tape counter to zero.

3. Put the cassette recorder in the record mode. On The Source front panel, touch **LEVEL 2**, then **CASSETTE SAVE** (program 14).

   The cassette recorder's motor starts, and a short blank leader is recorded (with the display showing ⊏ ⊏), followed by data. As data are being saved, the display shows ⊐ ⊏ .
   (The program display will be blank during this operation.)

   When data are finished, the cassette motor stops.

To ensure that data have been saved accurately, follow this procedure:

1. Rewind the tape to an area before the data file (somewhere in the blank leader area).

2. Put the cassette recorder in the play mode. Touch **LEVEL 2**, then **CASSETTE VERIFY** (program 15). The cassette's motor starts.

   In the verify mode, the data on tape are examined for validity. If any datum is missing, or if key data are incorrect, the incremental display will show the error message ⊔ ⊔ .
   If this occurs, the data should be re-recorded. (See Cassette Operations in the Troubleshooting section of this manual.)

To load a previously recorded cassette (after saving present programs with the procedure described above), follow this procedure:

1. Rewind the tape to the beginning of the data file (in the blank leader area).

2. Set the recorder to the play mode. Touch **LEVEL 2**, then **CASSETTE LOAD** (program 16).
   The recorder's motor starts. As the data are loaded, the incremental display will show ⊏ | .
   When all information has been loaded, the recorder stops, and the program display comes on with the program most recently selected. The Source has now been re-programmed with the information on tape.

By recording new sets of programs one after another, literally hundreds of programs may be represented on the two sides of a single cassette. Arranging these data files in the right order means that an entire concert's worth of music — 120 or more programs — may be stored, and recalled, from one side of a cassette.

For more detailed explanations of the cassette functions, see Cassette Operations in the Troubleshooting section of this manual.

USING THE REMAINING LEVEL 2 CONTROLS

AUTO TRIG

The Auto Trig function generates a metronomic trigger at the LFO rate. The pitch heard is determined by the last key depressed.

To use the Auto Trig function:

1. Play the desired key.
2. Touch **LEVEL 2**, then **AUTO TRIG** (program 12).
3. Adjust trigger rate with the modulation **RATE** control.
4. To shut off the automatic triggering, touch **LEVEL 2**, then **AUTO TRIG** again.

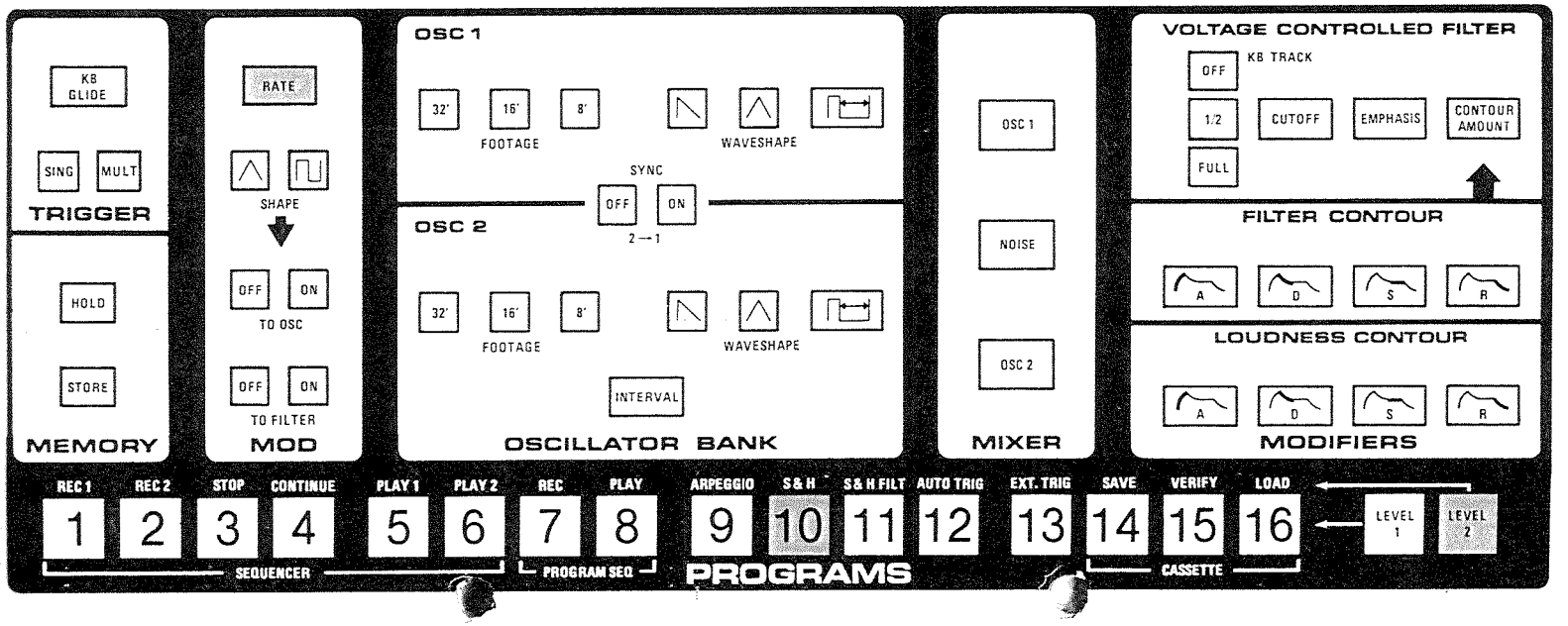
Since keyboard voltage is stored as a digital value, pitch drift cannot occur if Auto Trig is left running.

When the **AUTO TRIG** function has been activated, control returns to Level 1.

S & H (SAMPLE & HOLD)

The Sample & Hold function generates successive random control voltage amounts, which are sent to the oscillators and/or the filter. The rate of change of this voltage is determined by the rate of the low-frequency oscillator (LFO). Triggers are generated to coincide with voltage changes.

To use the Sample & Hold:



1. Play a desired key. (This sets up a general range of frequencies; it has no influence on the actual frequencies generated.)

2. Touch **LEVEL 2**, then touch **S & H** (program 10).

3. At this point, adjusting the **RATE** control in the Mod section will change the Sample & Hold rate and modify the apparent "pattern" of voltage changes.

4. To cancel the Sample & Hold effect, touch **LEVEL 2**, then touch **S & H** again.

S & H FILT

This control (program 11) routes the random Sample & Hold voltage to the filter alone. The operational procedure is the same as for program 10 (S & H).

EXT TRIG

If a slave synthesizer is interfaced with The Source (as described in the Interface section of this manual), its playing status is determined by this switch.

Note: This switch defeats triggers only. The oscillators of the slave synthesizer will always be affected by The Source's keyboard voltage. Keep this in mind when playing multi-keyboard setups.

A table is provided in Section II that lists the functions and actions of all Level 2 controls.

THE ANALOG SYNTHESIZER

The part of The Source that actually produces sound is a monophonic analog synthesizer. This synthesizer is controlled by digital devices (explained in Digital Functions on page 41), but the synthesizer itself has many points in common with existing established models such as the Minimoog.

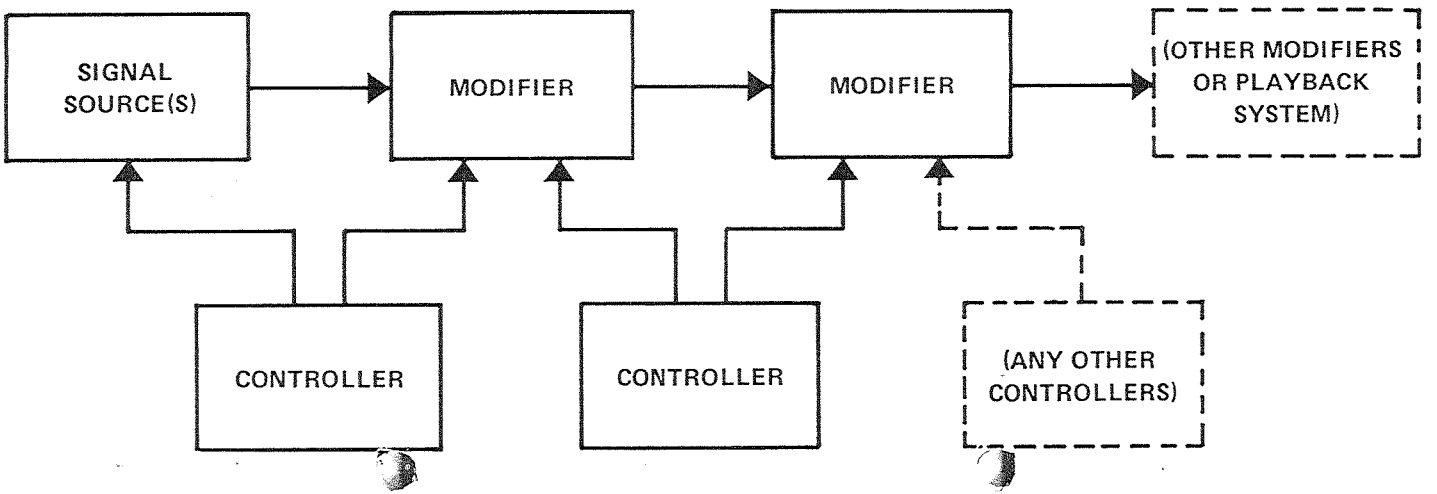
There are three major kinds of circuits in the sound chain of any synthesizer — monophonic or polyphonic. These circuits are:

1. Signal Sources: The original source of sounds in the synthesizer. Signal sources are classified as *pitched* or *unpitched*. In The Source, the pitched signal sources are two *voltage-controlled oscillators*. The unpitched signal source is a *noise generator*.

2. Modifiers: Circuits that alter the quality of the basic sound produced by the signal sources. The two main modifiers on The Source are the *voltage-controlled filter*, which produces changes in tone color, and the *voltage-controlled amplifier*, which produces changes in loudness.

3. Controllers: Circuits that control other circuits. The primary controllers are the *keyboard*, the *contour generators*, and the *low-frequency oscillator*.

The general relationship of these major circuits is illustrated below:



A synthesizer design may, in theory, incorporate any number of signal sources, modifiers, and/or controllers.
Note, also, that the output of a controller may theoretically be sent to the control input of any voltage controlled device.

The major circuits ("modules") are explained here, roughly in order of importance and occurrence in the signal path.

SIGNAL SOURCES

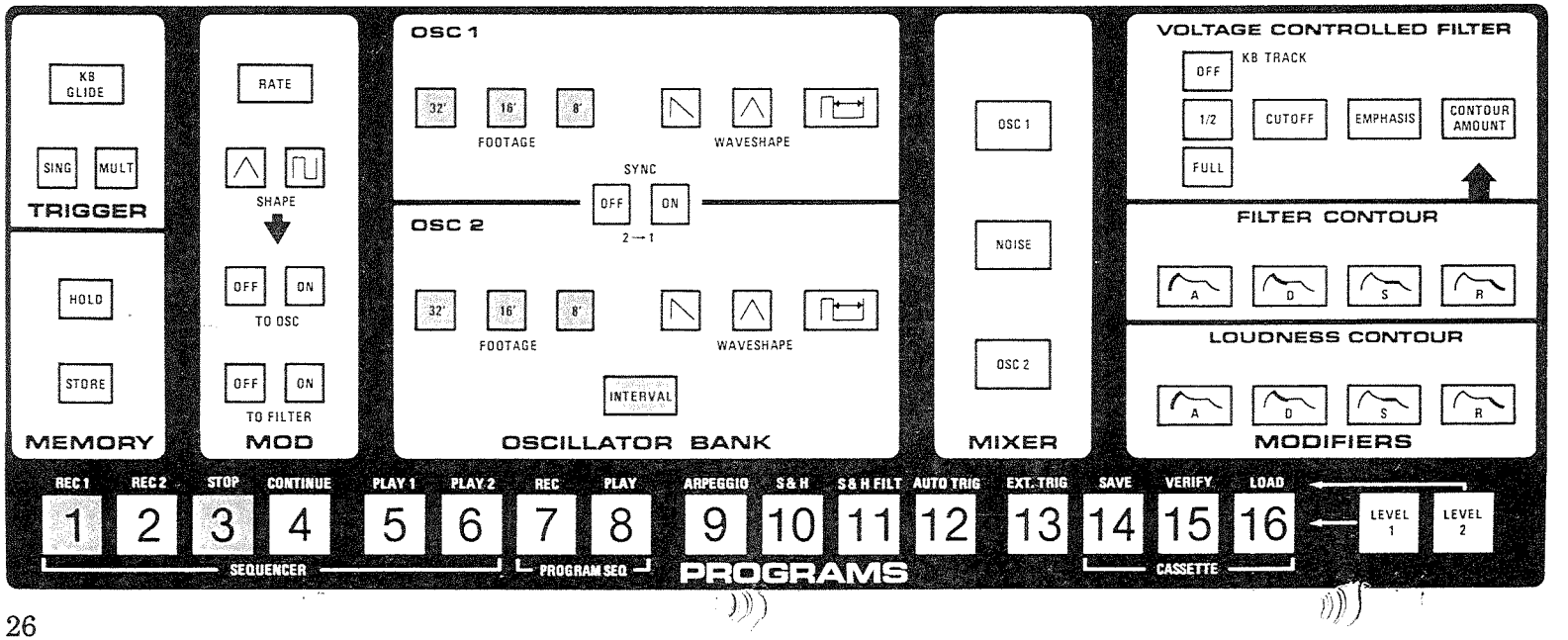
OSCILLATORS

The Source has two audio oscillators. These oscillators put out electrical signals called *waveshapes* or *waveforms*, illustrated on the waveshape controls. The oscillators generate waveforms continuously. The completion of one waveform is called a *cycle*; the number of cycles completed in a specified time period is the oscillator's *frequency* and is generally expressed in cycles per second (cps) or Hertz (Hz).

If the oscillator's frequency is between 20Hz and 20,000Hz (20KHz), human ears can perceive it as pitch.
The changes of oscillator frequency produce the different pitches heard from The Source.

The oscillators are *voltage-controlled*; applying a positive voltage to their control inputs will produce a positive change in frequency (the pitch will rise).

Touch program 3:



1. Hold down any key.
2. Touch different octave controls. Note the change in pitch.
3. Touch program **1**, then **INTERVAL** in the Osc 2 section.
4. Turn the incremental control clockwise. Note that Osc 2, in addition to octave controls, has an interval adjustment. Osc 2 may be tuned as much as two octaves up from the chosen octave control.
5. Both oscillators will be adjusted by turning the FINE TUNE control on the rear panel.

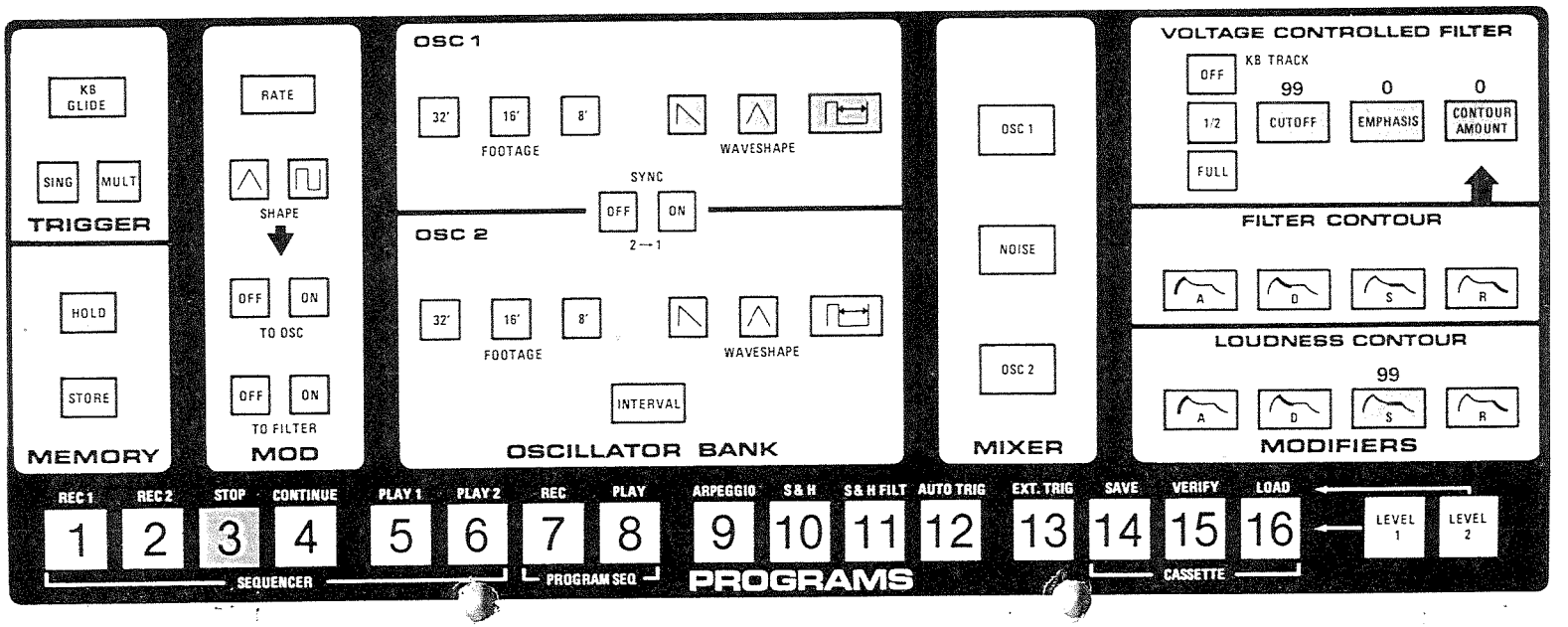
SUMMARY:

1. The Source's oscillators are *voltage-controlled*; their frequency is determined by the keyboard.
2. The frequency of both oscillators is changed by adjusting the rear panel FINE TUNE control.
3. The frequency of either oscillator can be changed by its OCTAVE controls.
4. Osc 2 may be detuned from Osc 1 by up to 2 octaves by using the INTERVAL control.

WAVESHAPES

The audio oscillators can output one of three waveshapes. The waveform selected will determine the basic tone color.

Touch program **3**, then touch the indicated controls and, using the incremental control, adjust to the values shown:



1. Touch  in the Osc 1 section. Hold down any key. This is an unfiltered *sawtooth* waveshape. The sawtooth waveform is rich in harmonics, and has a "bright" sound.

2. Touch  in the Osc 1 section. This is a *triangular* waveshape. It has a harmonic structure unlike acoustic instruments, so it sounds very "electronic."

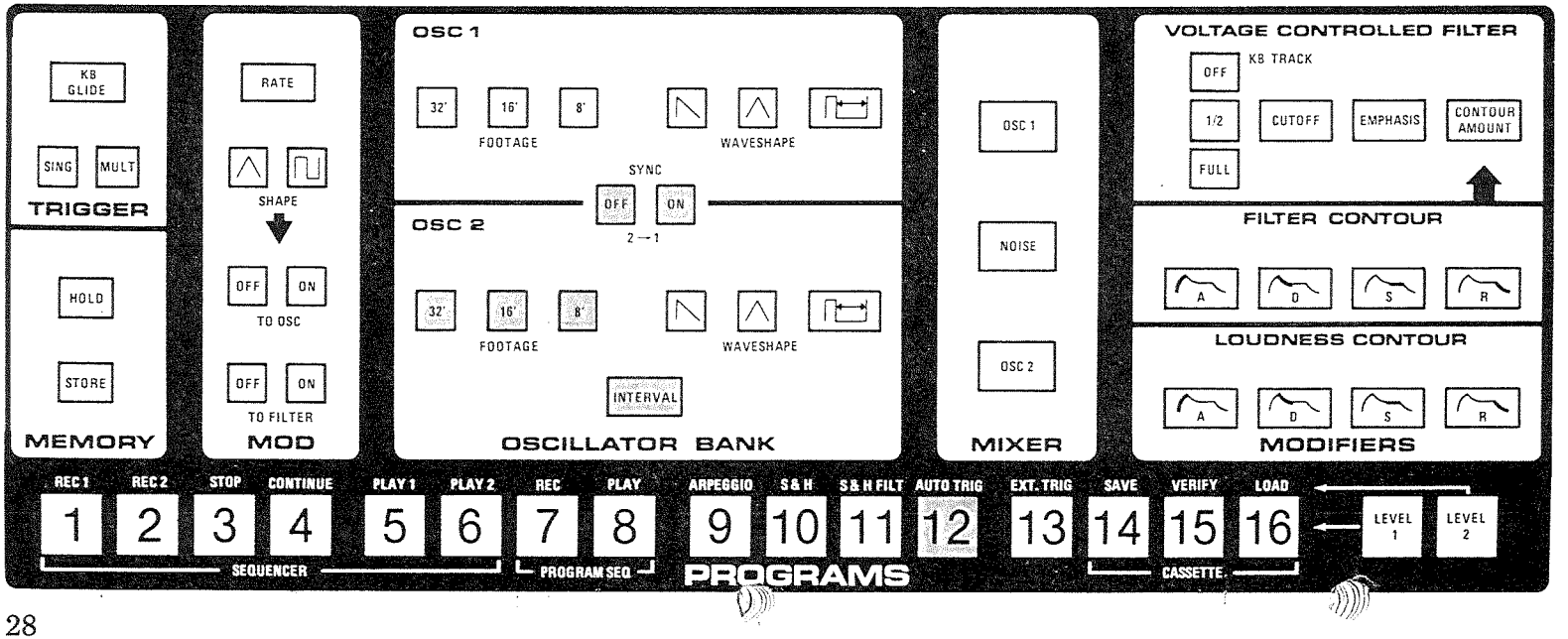
3. Touch  . The *rectangular* waveshape has an adjustable *duty cycle* (comparative time of the positive portion of the waveshape). The incremental control will change the duty cycle from 5% to 95%. Setting the duty cycle at 50% produces a *square* wave, with a characteristic "hollow" sound. Other settings produce brighter, "reedy" sounds.

SYNC

Osc 2 may be "locked" to the frequency of Osc 1 by activating the Sync function (located between the two oscillators on the front panel).

When the two oscillators are synchronized, new waveforms are produced when an attempt is made to change the frequency of Osc 2. Osc 2 may be *statically* detuned by changing the Interval and/or Octave controls, or *dynamically* detuned by moving the pitch wheel (when the Sync function is programmed "on," the pitch wheel is routed to Osc 2 only).

Touch program 12:



1. This factory program is voiced with Sync on. Change the frequency of Osc 2 (with the Octave and Interval controls) and note the change in tone color.

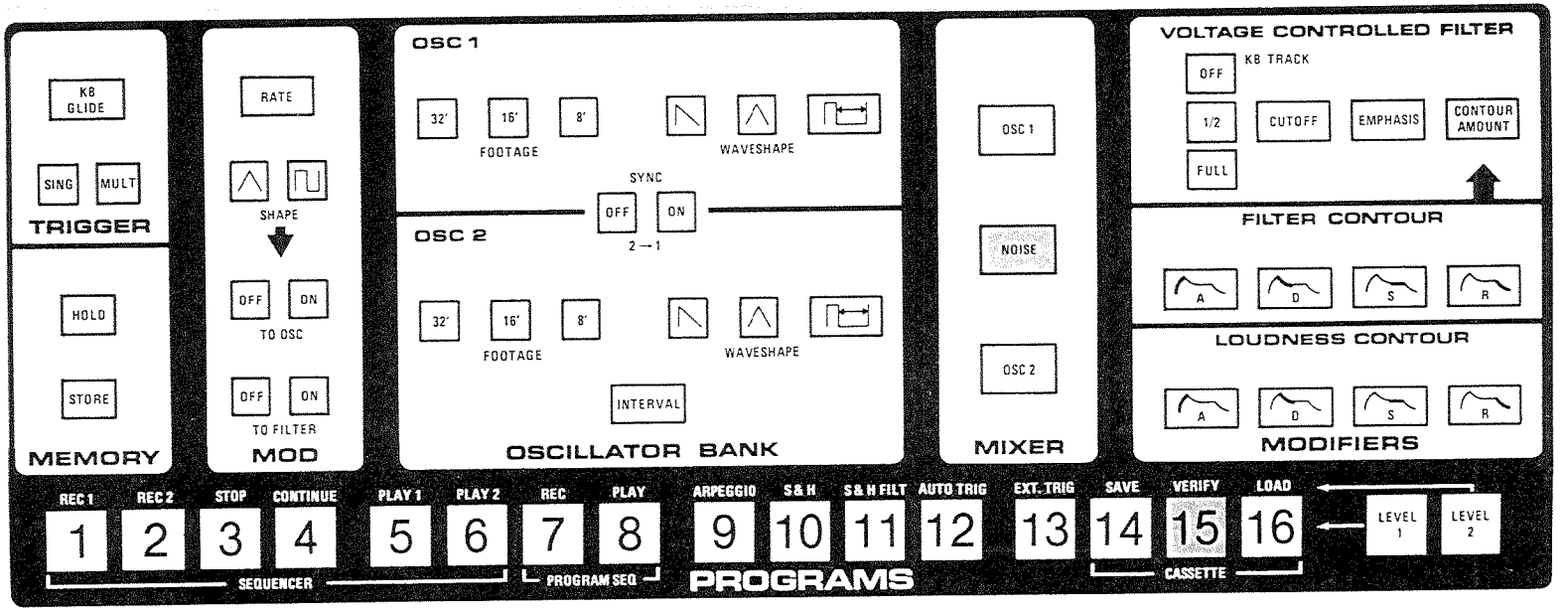
2. While holding down a key, switch **SYNC** alternately off and on. No matter how far apart in frequency the two oscillators are, turning **SYNC** on will lock them together, eliminating any "beating."

3. Hold down any key and move the pitch wheel. When Sync is on, the pitch wheel becomes a "tone color wheel." These dynamic tone color changes are useful in performance.

NOISE

Noise is an unpitched signal source. The noise generator outputs a signal called *Pink Noise*, a composite of low, mid-range and high frequencies.

Touch program **15**:



1. Play any key. This factory program uses noise as the primary signal source; no single pitch predominates.

   Factory programs 4, 14 and 15 use noise as a signal source (in varying intensities).

MODIFIERS

A modifier alters or attenuates the basic output of the signal sources. A modifier characteristically has a signal input and a signal output; the signal from the oscillator(s) and/or noise must "pass through" the modifier.

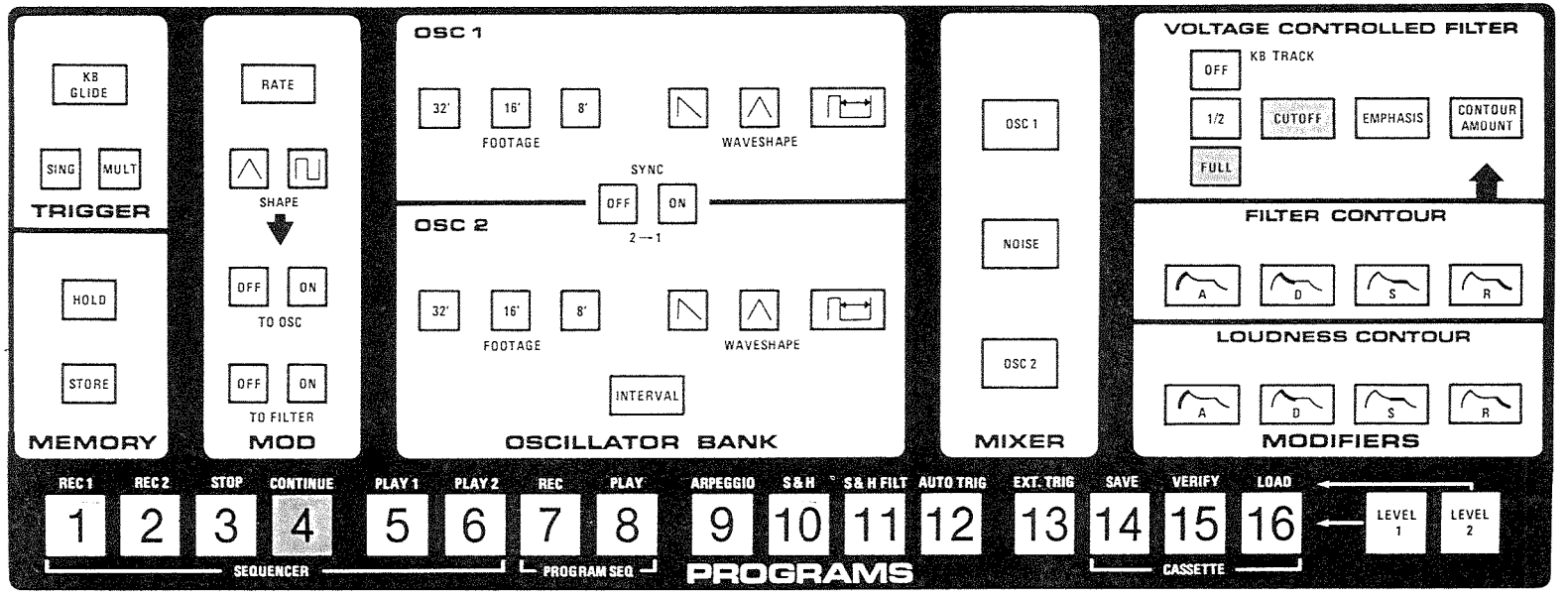
There is theoretically no limit to the number of modifiers that may be used in a synthesizer. The Source employs two: a *voltage-controlled filter* and a *voltage-controlled amplifier.*

VOLTAGE-CONTROLLED FILTER

The filter section of The Source changes the tone color of the signal sources.

The Source employs a *low-pass filter.* As the name implies, this filter passes low frequencies and rejects high frequencies. The point at which frequencies start to be rejected is called the *cutoff frequency.* This cutoff frequency may be adjusted manually or electronically.

Touch program 4 :



1. Touch **CUTOFF FREQ** in the filter section. Hold down any key.

2. Turn the incremental control clockwise. As the cutoff frequency is set higher, more of the high frequencies of the oscillator signal are heard, and the sound becomes "brighter."

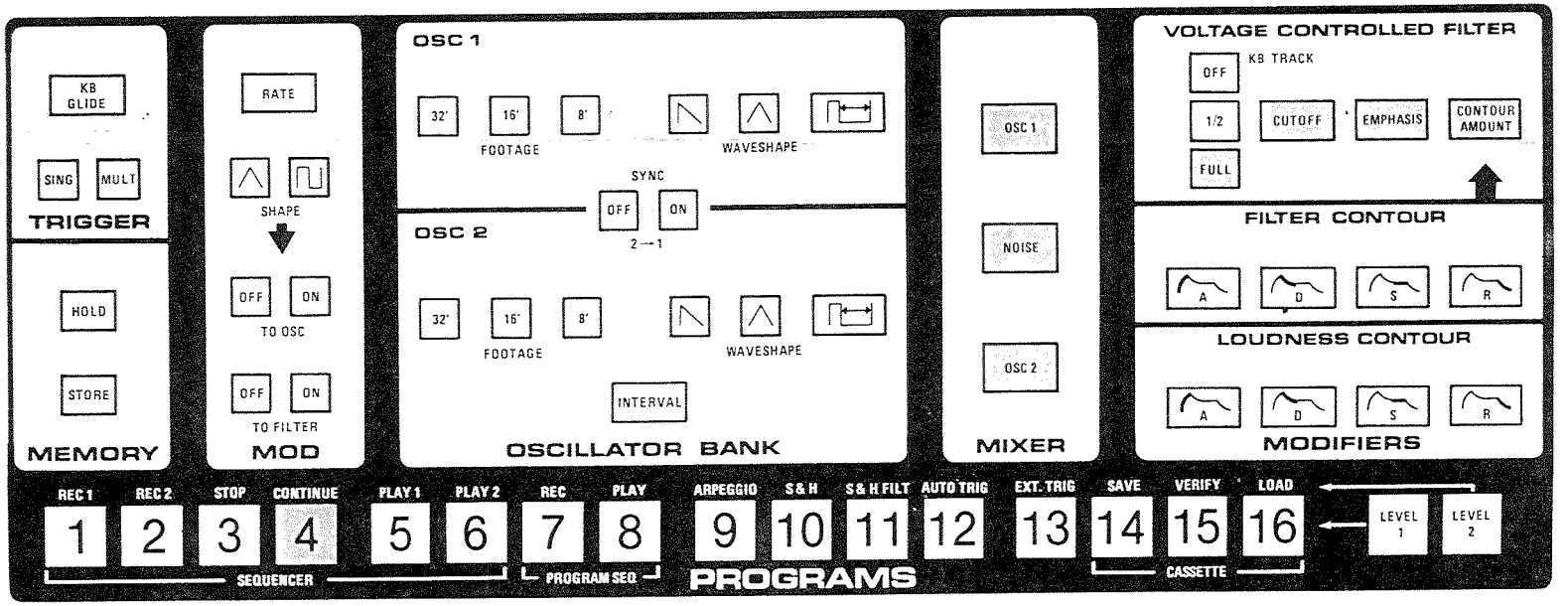
3. Turn the incremental control counterclockwise. As the cutoff frequency is set lower, more of the high frequencies are rejected, and the sound loses its "brightness" and becomes more muted.

4. Touch the **KB TRACK** position labelled **FULL**. Now turn the controller. Note that the resolution of the controller is much finer. This makes "tuning" the filter easier when the filter is used as an audio source (see *Emphasis*).

EMPHASIS

The frequencies immediately around the cutoff point can be emphasized, giving the sound a nasal, resonant quality.

Touch program **4** :



1. Sweep the cutoff frequency up and down (as in the preceding exercise). The sound smoothly becomes brighter and darker.

2. Touch **EMPHASIS** ; set the incrementer to 70.

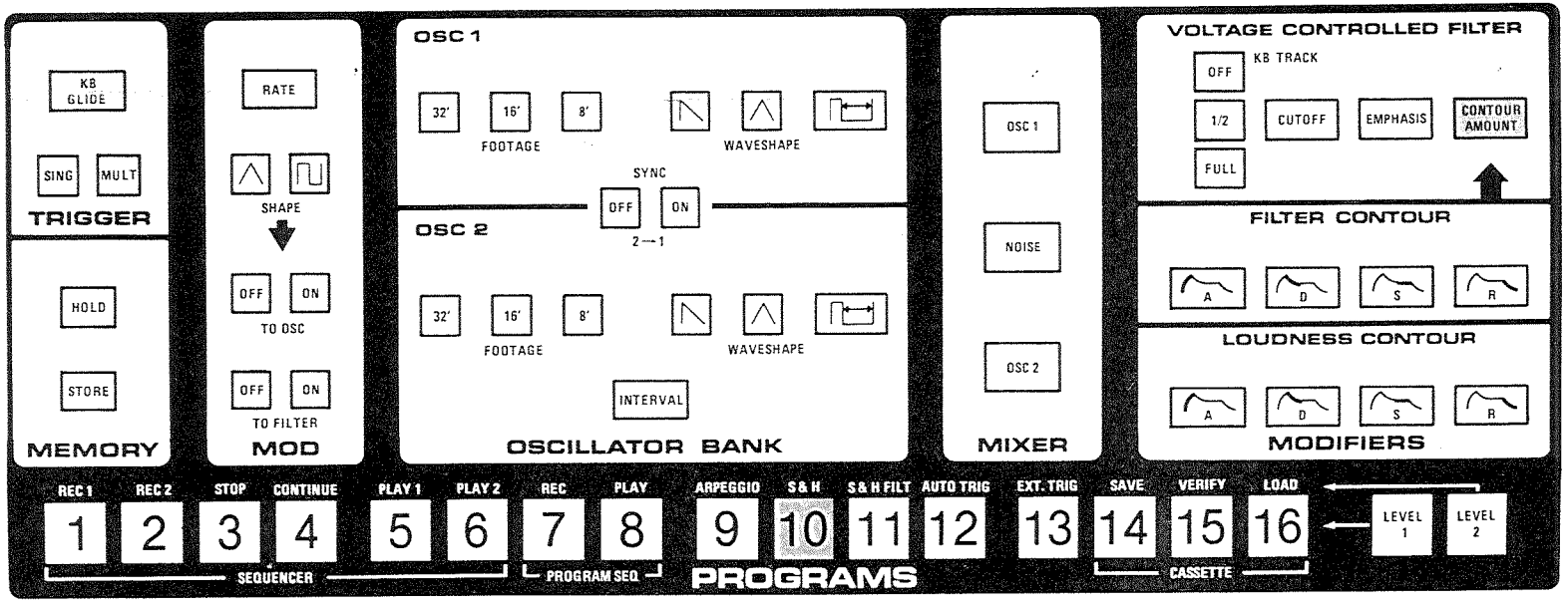
3. Now sweep the cutoff frequency again. Note how higher emphasis settings affect the sound. The harmonics near the cutoff frequency are stronger, so, as the cutoff frequency moves up and down, different harmonics are emphasized, making filter changes more pronounced.

4. Set **EMPHASIS** to 99. Touch **KB TRACK** **FULL**. Set **CONTOUR AMOUNT** and all Mixer controls to zero. Play different keys. At maximum emphasis, the filter oscillates and produces a controllable sine wave.

CONTOUR AMOUNT

The Source's filter is voltage controlled; a positive voltage at its control input raises the cutoff frequency. The filter accepts voltages from many places on The Source, but the main voltage source is the filter contour generator. The Contour Amount circuit controls the amount of voltage that goes to the filter from the contour generator. (The contour generator is explained more fully in the *Controllers* section beginning on page 35.)

Touch program **10** :



1. Set **CONTOUR AMOUNT** to zero. Hold down any key. There is no change in the brightness of the sound.

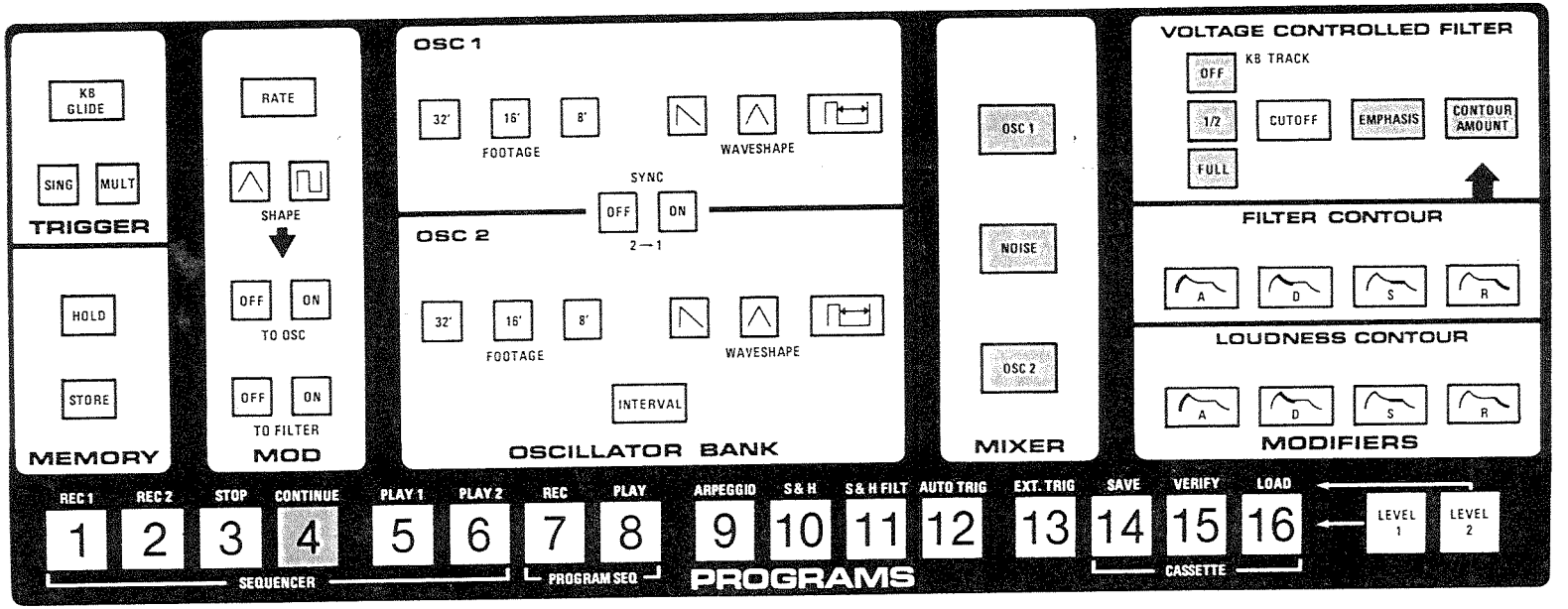
2. Now set **CONTOUR AMOUNT** to 80. Hold down any key. The voltage from the contour generator opens and closes the filter (by raising and lowering the cutoff frequency). Experiment with different settings of the Contour Amount control.

KB TRACK

As mentioned above, The Source's filter is *voltage-controlled*; voltage at its control input will raise the cutoff frequency.

The KB Track switches route the keyboard voltage (the same voltage that controls the oscillators) to the filter. Without this voltage, higher notes will sound disproportionately "dull" because the filter is not following pitch relationships. The keyboard voltage may be applied fully, attenuated to half, or cut off entirely.

Touch program **4**:



1. Touch **KB TRACK** **OFF**. Play from the lowest key to the highest. Note how the sound lessens in intensity toward the upper end of the keyboard.

2. Repeat Step 1 with **KB TRACK** at **1/2** and at **FULL**. The character of the sound is more consistent across the keyboard.

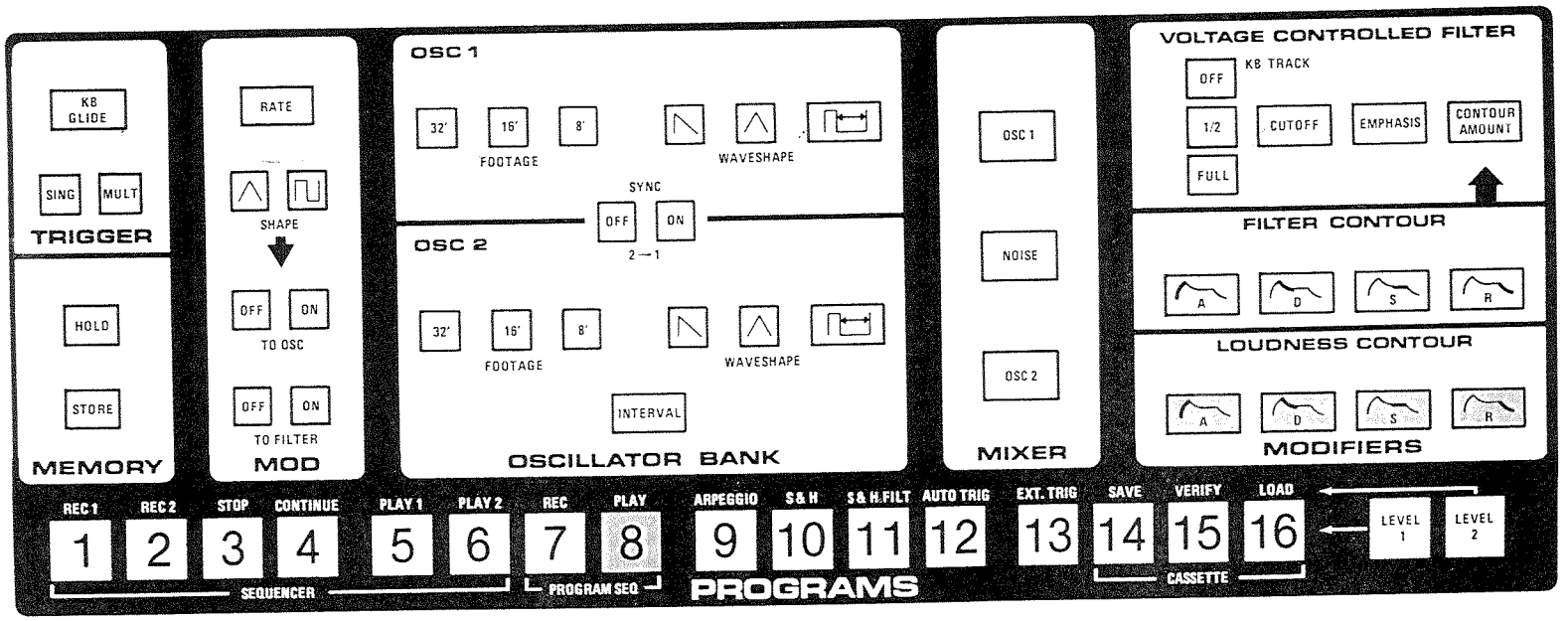
3. Set **CONTOUR AMOUNT** and all Mixer controls to zero. Set **EMPHASIS** to 99. Touch **KB TRACK** **FULL**. Play different notes on the keyboard. In this mode, the filter may be "played" in the same manner as the oscillators.

VOLTAGE-CONTROLLED AMPLIFIER (VCA)

The Voltage-Controlled Amplifier (VCA) is the final point in The Source's signal path. Like the filter, it responds to a positive voltage at its control input; the response, however, is an increase not in brightness, but in loudness.

The VCA itself is not pictured on the front panel, but its primary controller, the loudness contour generator, is. Voltage from the loudness contour generator opens and closes the VCA. (The contour generator is explained more fully in the Controllers section.)

Touch program **8** :



1. Hold down any key. The VCA opens and closes quickly. When the voltage controlled amplifier has no voltage at its control input, it closes down, shutting off all audio signals. Review the loudness contour controls to note the exact duration of each note.

   Although the VCA is represented by only four front panel controls, in many ways it is the most important circuit in the synthesizer. If the VCA is closed down, nothing will be heard. The first rule of synthesis is: Open the VCA!

CONTROLLERS

As discussed before, a *controller* is a circuit that controls another circuit. A controller usually has only an output; the audio signal rarely "passes through" a controller. A controller may control a signal source, a modifier, or another controller. The output of a controller is generally sent to the *control input* of the circuit to be controlled.

KEYBOARD

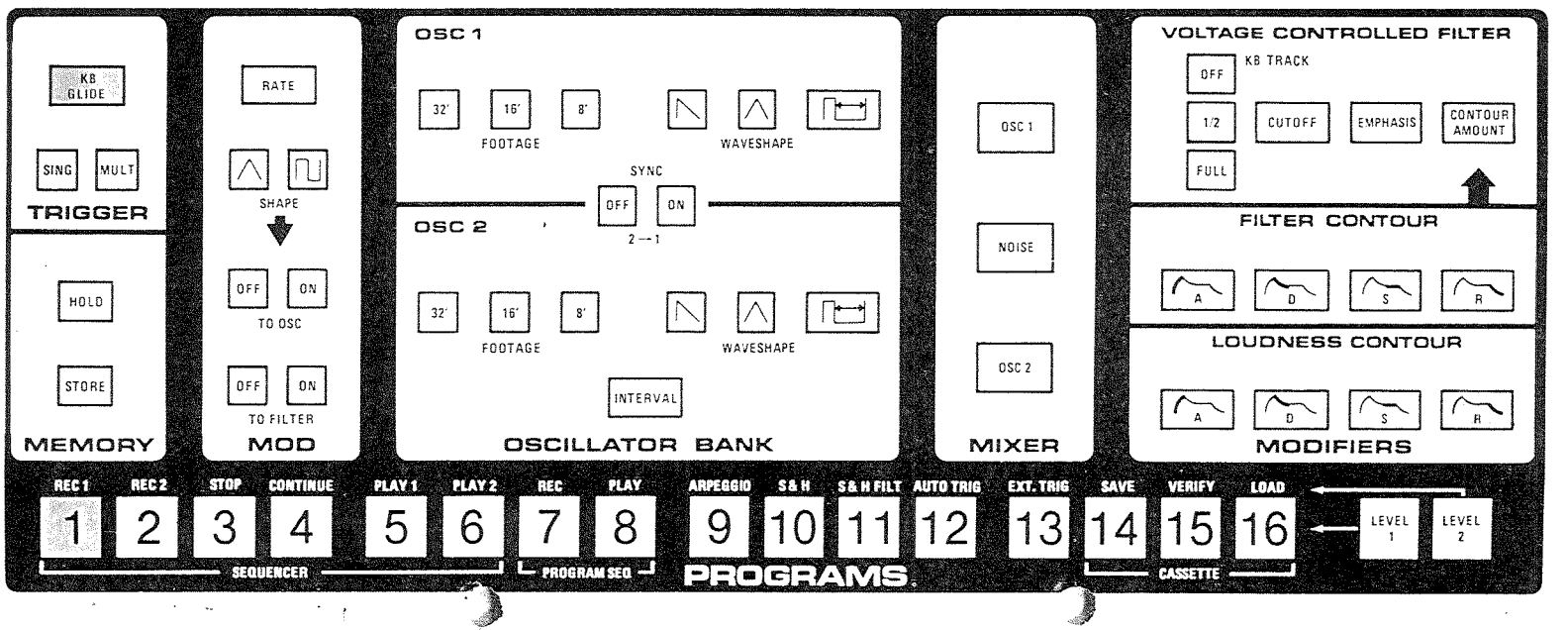
The most important controller on The Source is the keyboard. The keyboard outputs two essential pieces of information: control voltage and trigger state.

The keyboard control voltage is unique for each key, and is calibrated at 1 volt per octave, or 1/12 volt per key. If a given key generates 1 volt, the key one-half step higher will generate 1 + 1/12 volts, and so on. The voltage-controlled circuits in The Source are calibrated to this system.

The octave transpose switch labeled "+1" adds one volt to the keyboard voltage; the "zero" switch returns to nominal keyboard voltage.

The keyboard voltage determines the frequency of the oscillators and controls the filter's cutoff frequency in varying amounts. Normally, changes in keyboard voltages are instantaneous, but a lag in change rates can be applied with the KB Glide control.

Touch program **1**:



1. Set **KB GLIDE** to 60. Alternately play the lowest and highest keys. Note how the pitch glides from note to note.

2. Set **KB GLIDE** to 99; set VCA **RELEASE** to 99. Play the lowest key. After the pitch has settled, release the lowest key and quickly touch and release the highest key. Keyboard glide is unconditional; it will continue until it reaches the pitch of the last key played.

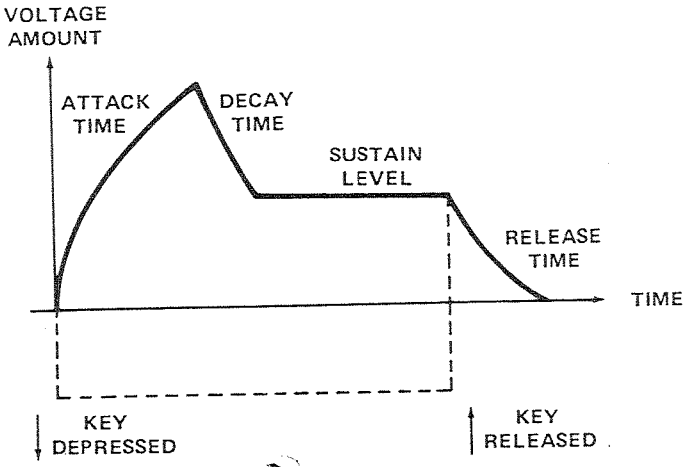
3. Simultaneously hold down two keys — one high and one low. Note that the pitch glides down to the lowest key depressed. The Source uses a *low note priority* keyboard; the lowest key depressed determines the pitch heard.

The depression of a key generates a *Trigger*, which initiates the action of the contour generators. As illustrated on the front panel, triggers can be generated in one of two fashions: *Single Triggering*, where all keys must be released before a key depression will initiate a new trigger; and *Multiple Triggering*, where a trigger is generated whenever the keyboard voltage changes.

CONTOUR GENERATORS

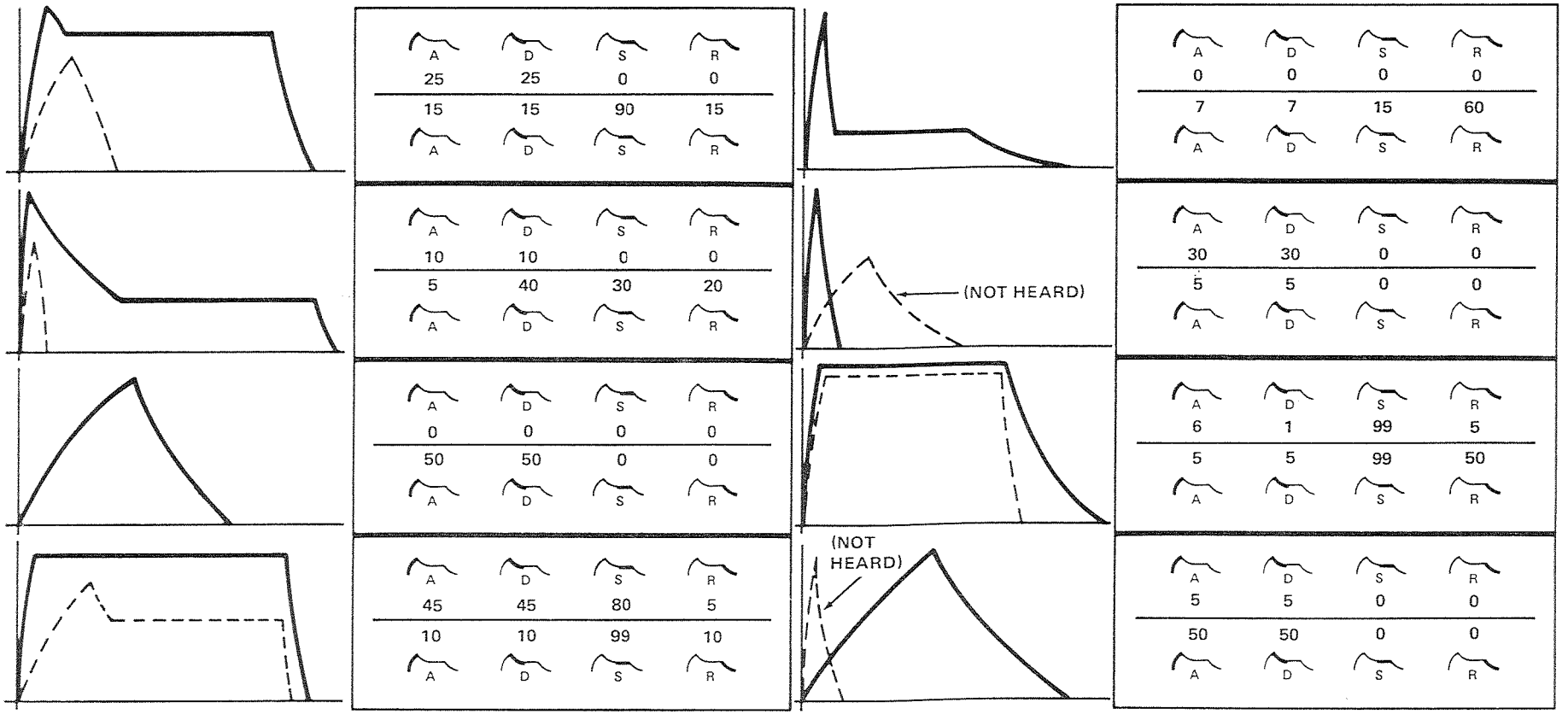
As mentioned earlier, the voltage-controlled filter and the voltage-controlled amplifier are controlled by their respective contour generators. The two contour generators function identically, and will output the same voltage patterns if their controls are set identically.

That voltage pattern is a four-part contour that can be generically graphed as shown:



1. Attack time: Time taken for voltage to increase from zero (initiated by trigger) to maximum.
2. Decay time: Time taken for voltage to decrease from maximum to sustain level.
3. Sustain level: A static voltage amount that, once initiated, continues as long as a key, or keys, is held down.
4. Release: Time taken for voltage to drop from sustain level to zero after the key is released.

Different settings of these times and levels will produce markedly different contours. Some examples are shown below:



It is important to remember that although the two contour generators can output radically different contour patterns, the loudness contour will have "priority" over the filter contour. If the filter is going through a long, involved contour, and the VCA has already closed, it makes no difference, because no audio signal is heard.

The output of the filter contour generator can be attenuated, or lessened, by adjusting the Contour Amount control (described in the Filter section on page 32). The voltage from the loudness contour generator to the VCA is not attenuated.

MODULATION (Low-Frequency Oscillator)

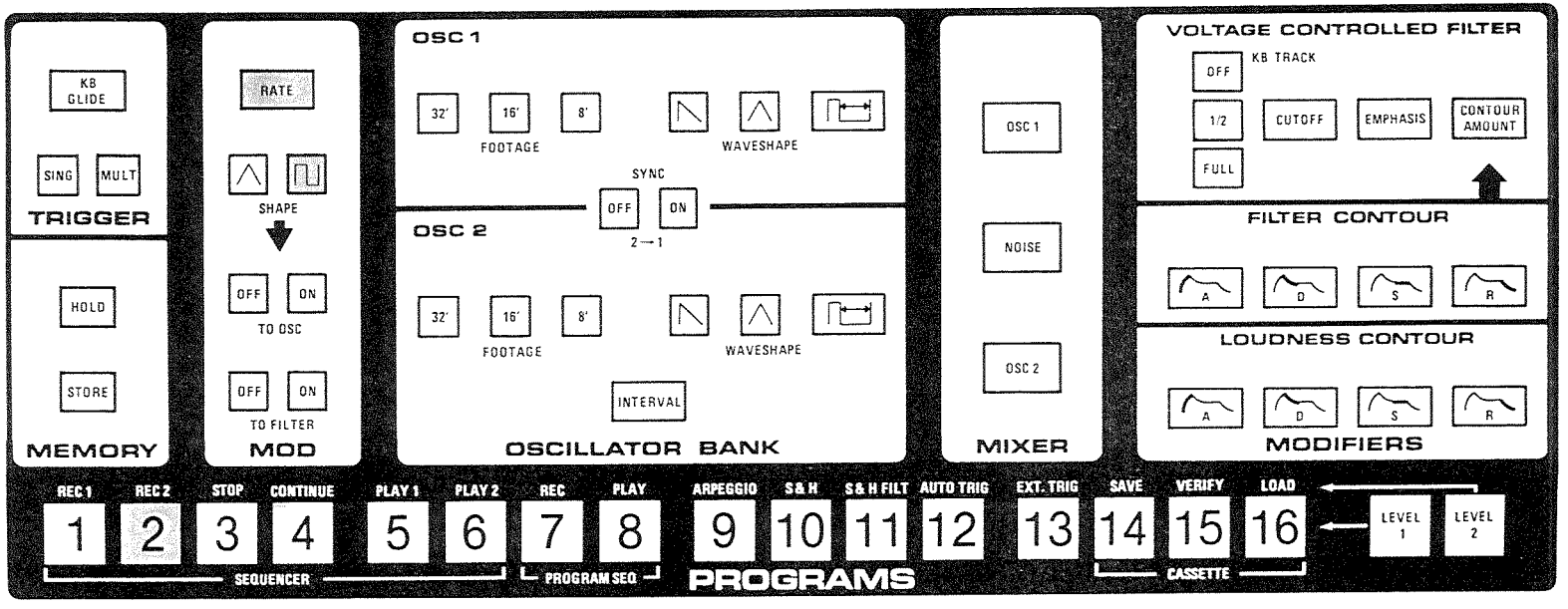
All the controllers mentioned up to this point have generated non-repetitive voltages; the keyboard generates a static voltage level for each key, and the contour generators output a "one-shot" voltage pattern.

Musical sounds demand repetitive changes such as vibrato, trills, or tremolo. On The Source, repetitive changes are controlled by a *low-frequency oscillator.*

This oscillator generates waveforms exactly like the audio oscillators, but operates in a much lower frequency range (1 cycle every 3 seconds to 30 cycles per second).

The output of this oscillator is a triangular or square waveform. This output voltage may be routed to the control inputs of the oscillators and/or filter, through the Mod wheel.

Touch program **2**:



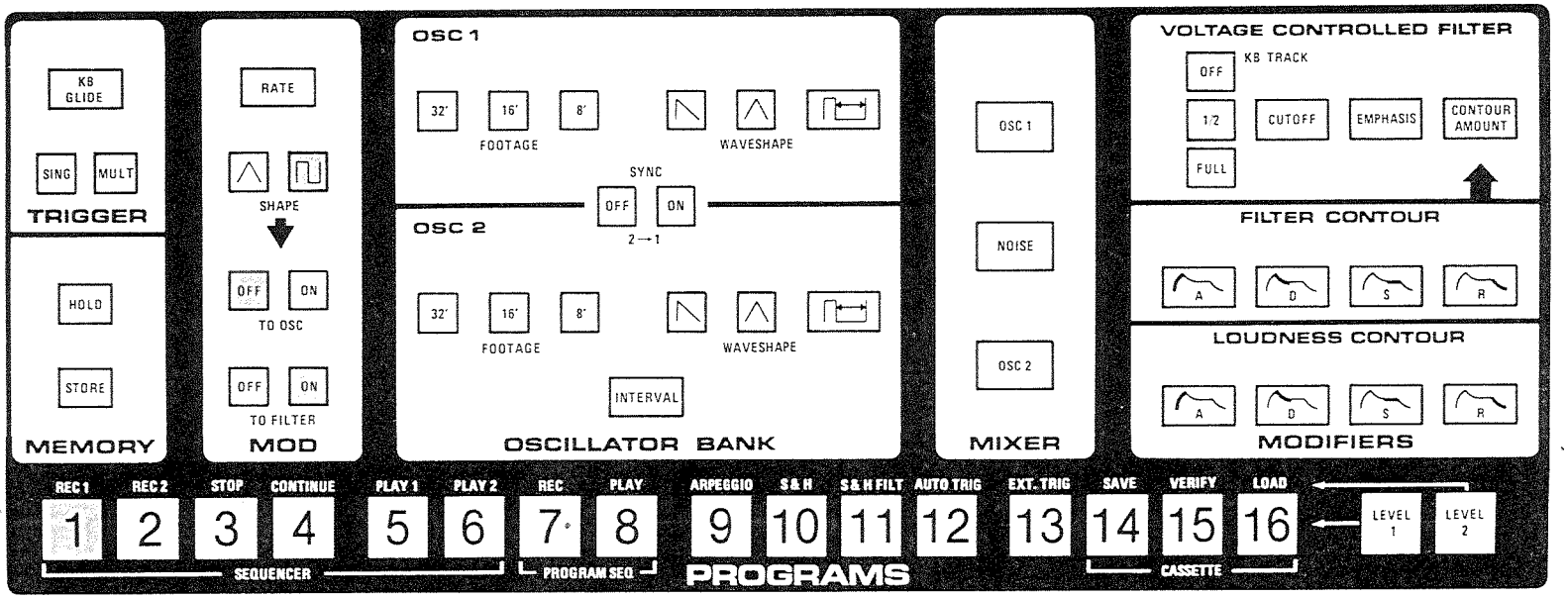
1. Hold down any key. Turn the Mod wheel up. A low-frequency triangular waveform is changing the oscillator frequency, causing the pitch to move up and down. (The Mod Rate LED flashes at the rate of the low-frequency oscillator).

2. Touch **RATE** in the Mod section. Change the incremental control. The setting of the low-frequency oscillator determines the rate of the pitch change.

3. Touch ⊓⊔ in the Mod section. The pattern of pitch change now has two distinct pitch levels, corresponding to the upper and lower voltage levels of the square waveform.

The four lowermost switching controls in the Mod section are routing controls. The switches labeled TO OSC control the routing of the modulation voltage to the oscillators; the switches labeled TO FILTER determine routing to the filter.

Touch program **1**:



1. Hold down any key. Turn up the Mod wheel. Modulation to the oscillators produces a *vibrato* effect.

2. Switch modulation **OFF** to Osc and **ON** to Filter. Modulation of the filter cutoff frequency is called *tremolo;* it is a more subtle effect and will usually be hidden by vibrato.

3. Touch  and repeat steps 1 and 2. The square wave can also control the oscillators or filter.

The Source may be thought of as having two main operating sections — the analog synthesizer and the digital control circuits. The analog functions have been described; the next section deals with the digital functions that send control signals to the analog synthesizer.

DIGITAL FUNCTIONS

The microprocessor, in addition to storing programs, directs and controls all Level 2 functions. Some of the Level 2 functions, such as Auto Trig and Interface on-off, are basically "change-of-status" functions, and require little memory. The "recording" functions — the sequencer, the arpeggiator, and the program sequencer — require recording, not only of status and voltage amounts, but of time values. This requires a time-measuring circuit, so the low-frequency oscillator (LFO) is used as a clocking circuit. The resulting pitch and timing information is stored in memory, and recalled when the appropriate "real-time" function is selected.

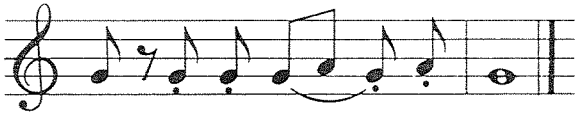
THE SEQUENCER

In the sequencer record mode, the microprocessor determines and stores trigger status and keyboard control voltage.

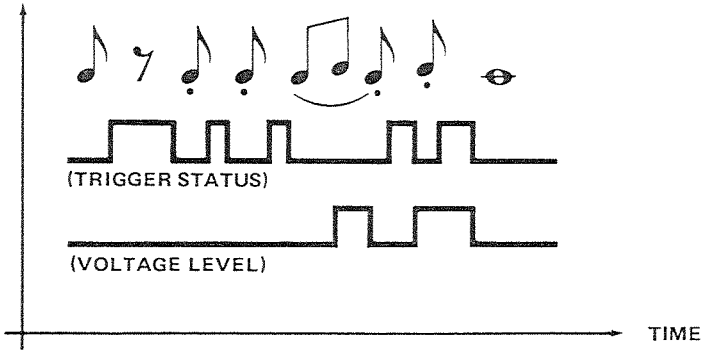
When the sequencer mode is activated, the LFO is unconditionally set at 67 Hz. This allows timing discrimination of 7.5 milliseconds (the duration of a note will never be off by more than 7.5 milliseconds).

The sequencer stores every change in trigger status and every change in keyboard voltage, whether or not they occur simultaneously.

The following musical example:



will be stored in this manner.



The absolute value of keyboard voltage is stored, so the setting of the octave transpose switch during recording will determine the octave of sequence playback.

Note that when sequences are recorded, rests, or spaces between notes, are recorded as events, and take up one event position each. To store the maximum number of actual notes in a sequence, follow this procedure:

1. When recording, play all notes in legato (smooth) style, lifting off the keys only when an actual rest is desired.

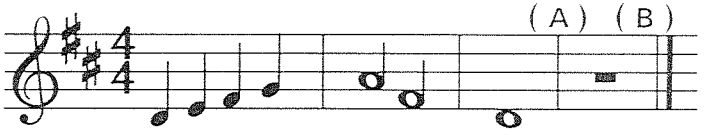
2. For playback, use a program set in the *multiple* trigger mode. This will retrigger the contour generators whenever the keyboard voltage changes.

Normally, a retrigger would be accomplished during recording only by releasing all keys between notes. Following the above procedure will prevent a loss of recording length that can run as high as 30%.

The longest time duration that can be held in one storage location is 30 seconds. If a note or rest exceeds 30 seconds, it will merely take up two event positions, and playback will exactly duplicate the recording (no "glitches" or retriggers).

Note: The sequencer will stop recording *only* when **STOP** or another Level 2 control is touched. Since the sequencer plays the sequence continuously, the duration of the final event is critical.

In this musical sequence . . .



. . . touching **STOP** (or any other Level 2 function) at beat "A" would make the sequence three measures long. To reproduce the example as written, the last key must be released at beat "A," and four beats of rest must be counted silently before touching **STOP** at beat "B."

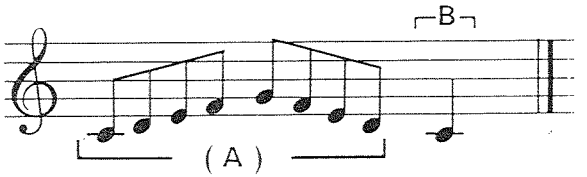
In the playback mode, the sequencer output replaces the keyboard output, and the keyboard is "dead"; the control voltage, octave transpose switches, and trigger are disconnected. Glide, however, can be applied to a sequence during playback (having Glide on during recording makes no difference).

THE ARPEGGIATOR

The Arpeggiator will store up to twenty-four control voltage values and metronomically play them back at the LFO rate. The first note recorded cannot be repeated during the arpeggio; replaying the first note shifts the arpeggiator into the playback mode.

The arpeggiator records the keyboard control voltage present at the initiation of each new note; it does not record timing information.

Note the musical pattern below:



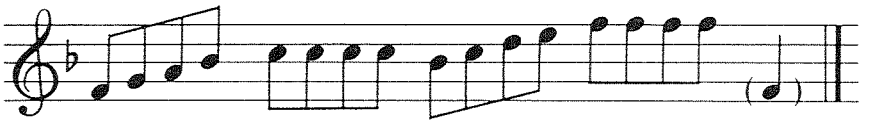
The notes in section "A" may be played in at any tempo or rhythm. After playing the last note in "A," the arpeggiator will still be in the record mode, waiting for new information. Playing note "B" (repeating the first note played) at any point afterward immediately initiates repeated playback of the first eight notes. With this technique, an arpeggio can be loaded into a kind of "holding" status, to be initiated on command.

Touching **LEVEL 2**, **ARPEGGIO**, **LEVEL 2**, **CONTINUE** will play, from the beginning, the last arpeggio entered. Once playback is initiated, operational sequence is as described in Section I.

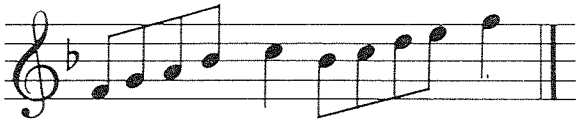
The only limitation to note entry is that the first note cannot be repeated. All other notes or combinations of notes are viable.

If a note is played several times in succession while loading the arpeggiator, it will be played back as one note with the total duration of the successive notes played. This allows a limited timing discrimination to be recorded.

In other words, entering these notes:



results in this playback pattern:



This occurs because, in the arpeggiator record mode, triggers are stored only when the keyboard voltage changes. Repetitions of the same note produce no keyboard voltage changes, so no triggers are stored. This feature can be used to produce arpeggios with rhythmic variations.

As described in the first section of this manual, touching any key while the arpeggiator is playing instantly selects the record mode, so a new arpeggio pattern may be entered without "breaking rhythm."

THE PROGRAM SEQUENCER

The program sequencer works in conjunction with the two sequencers and, in fact, stores its information in the same general memory locations.

Each event of each sequence is stored in memory as a digital value. A portion of that digital value is reserved for program sequence information. When the program sequencer playback is activated, it looks at the sequencer memory for information. If no program sequencer information has been recorded, the program will not change.

A reliable procedure for recording program sequence information is as follows:

1. After recording a sequence, play it back *very* slowly. Rehearse the intended program changes.

2. When all the program changes have been decided, touch **PROGRAM SEQ REC** . The sequencer will start over from the beginning.

3. *Don't* try to synchronize note changes with program changes. Wait until the sequencer plays a note, *then* make the program change. The program sequencer will remember the last program called during an event, so if more than one change is made during a note (or rest), make sure the final program is the desired one.

4. When the program sequencer is in the record mode, the notes in the sequencer will be played only once. At the end of one cycle, operation will revert to Level 1.

5. Note: If **PROGRAM SEQ REC** is touched and no program changes are specified, all sequencer events will be "loaded" with the program currently displayed.

   Note, also, that entering a new sequence erases the previous program sequence changes. When a sequence is entered, the program sequence information is set to a default value of program 1; i.e., if the program sequencer playback is activated without previously recording some program changes, all events in the sequencer will be played with program 1.

UNCONDITIONAL TUNING ("AUTO TUNE")

It is possible that, after warm-up and stabilization, the two audio oscillators in The Source may not be nominally tuned to exact unison.

A procedure to correct this is described in Tuning Up, on page 3 . This procedure involves unconditional access to oscillator 2 and should be explained further.

Simultaneously touching **STORE** and **OSC 2** Level connects the incremental control to the master tuning input for Osc 2. Turning the incremental control will adjust the tuning of Osc 2, relative to Osc 1, without changing the stored values for Osc 2 interval for each voice. The range of adjustment in this mode is approximately 1 semitone.

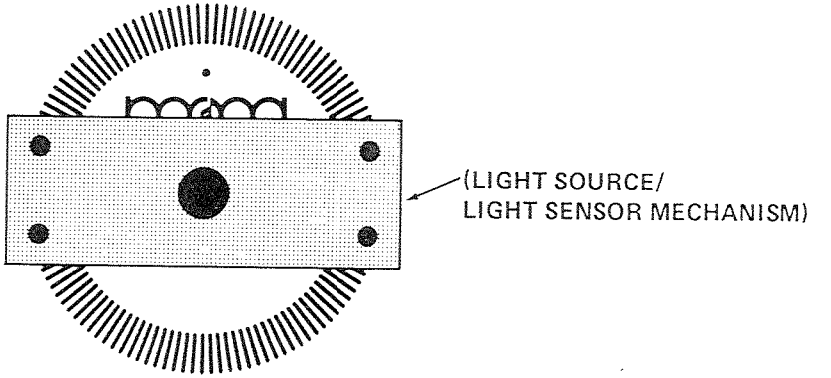
The factory programs are voiced with careful attention to the tuning of Osc 2. Osc 2 is generally tuned to some consonant interval — an octave, a major tenth, etc. These interval values are set in memory on the assumption that Osc 1 and Osc 2 are tuned as close to exact unison as possible.

A general tuning procedure is described in the Troubleshooting Section beginning on page 53.

THE INCREMENTAL CONTROL

The incremental control is the most important single control on The Source. It controls the settings of all variable parameters, and determines the rate of operation for most Level 2 functions. Its operation should be thoroughly understood.

The incrementer is a freely-turning opto-electronic controller. An optical sensor notes a change from light to dark, which is generated by passing spaced bars through the sensor (as shown in the figure below). There are 120 opaque bars on the transparent incrementer, allowing 240 changes of status.



This system permits adjustable resolution. Relatively coarse controls, such as the mixer level controls, may go from minimum to maximum in one complete turn. This means that 100 values (0 to 99) are controlled by 240 status changes, resulting in a resolution of approximately 0.41%. In other words, 12 changes of status produce a change of 5%.

On sensitive controls, such as Osc 2 frequency, minimum to maximum can take up to 16 complete turns, yielding a resolution of 0.025%. In this mode, 192 changes of status are needed to produce a 5% change.

The circuitry in the incrementer can reliably track over 300 status changes per second — much faster than the knob can normally be turned, so the incrementer always responds correctly to any movement.

"Spinning" the control knob is generally not recommended; if a second control is touched while the knob is moving freely, the setting of that control may be inadvertently altered.

A unique advantage to the "one-knob" approach appears in editing. If a control is accessed for editing, it comes up at the value in memory and is smoothly adjusted up or down from that point. On other programmable systems, a control becomes active when it is physically moved. If the physical position of that control is radically different from the value in memory, a sudden "jump" occurs. The incremental controller overcomes this limitation and ensures smooth, subtle editing changes under all conditions.

INTERFACING

The Source communicates with the outside world through its rear panel connections. The audio output has already been discussed; without it, no signals can be heard. The remaining jacks send control signals to and from The Source.

Communication between electronic devices is called *interfacing.* The audio connection between The Source and an amplifier is a very simple interface; more sophisticated interfaces will allow The Source to control, or be controlled by, other synthesizers.

OUTPUTS

Control Voltage Out

The control voltage (CV) in/out is a dual function jack that sends and/or receives control voltages, depending on the plug used.

When used as an output, the CV jack outputs all control voltages generated by The Source (except the two contour generators). This includes the keyboard, LFO, pitch wheel, both sequences, arpeggiator, and sample and hold.

The voltage at the CV output is intentionally scaled high to allow for discrepancies in other synthesizers. The output voltage may have to be run through a 10K linear potentiometer to achieve 1.00 volts/octave.

Trigger Out

Used as an output, the trigger in/out jack generates an S-Trig (switch trigger — a short to ground) when a trigger is generated in The Source. This occurs when:

1. A new key is depressed in the multiple-trigger mode, or all keys are released and a new key (or keys) is depressed in the single-trigger mode.

2. The sequencer generates a trigger.

3. The arpeggiator is running.

4. The Auto Trig is active.

5. The sample and hold is running.

Note: If the Level 2 **EXT TRIG** (program 13) is set to OFF, all external triggers are defeated.

INPUTS

Control Voltage In

As an input, the CV jack sends any control voltage received to the oscillators and filter, which track this incoming voltage at 1 volt/octave.

Any device that outputs a control voltage — a Moog 1120 Foot Pedal Controller, an external sequencer, or another synthesizer's keyboard — may be used as a control input.

Trigger In

The Source's contour generators will be triggered whenever an S-trig (a shorting connection) appears at the input portion of the Trig jack.

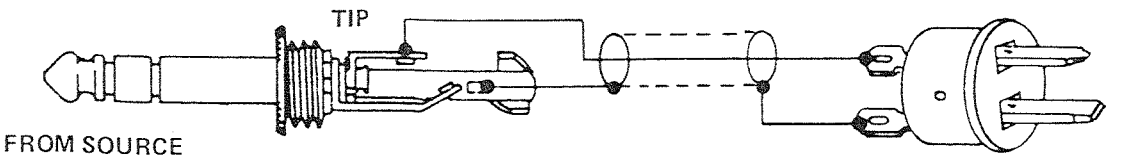
This S-trig may be generated by another synthesizer, synthesizer accessory, or a simple mechanical switch closure. Such a closure must be opened and reclosed to generate any successive triggers.

CABLES

To use the interface connections correctly, 3-conductor (stereo) plugs must be used. Input connections appear at the ring; output connections are at the tip.

Output cables should be constructed as follows:

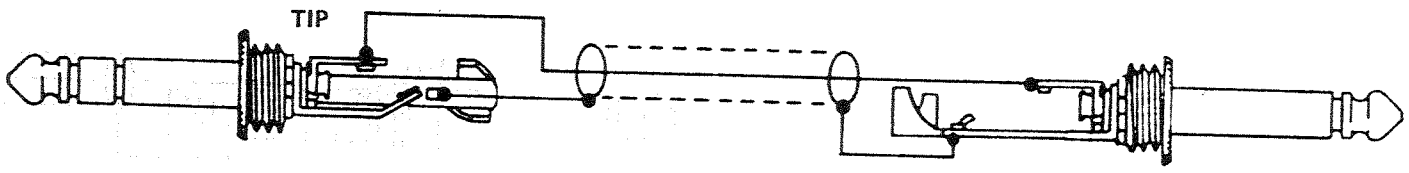
TRIGGER OUT:



(MALE CINCH-JONES CONNECTOR)

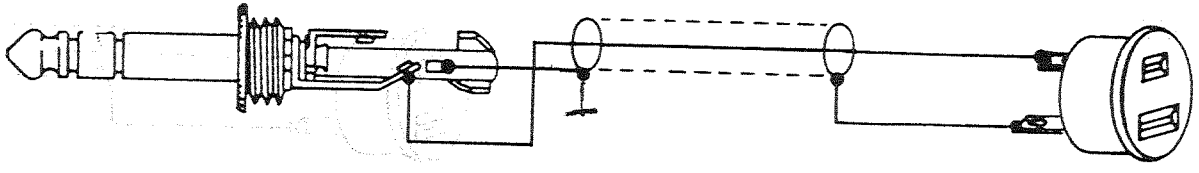
NOTE: Some other brands of synthesizers (and some newer Moog instruments) may not use the Cinch-Jones connectors. Consult the instrument's owner's manual for proper procedure.

CV OUT:



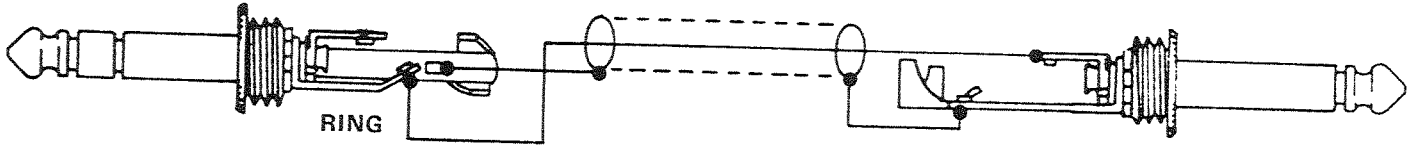
Input cables are made as follows:

TRIGGER IN:

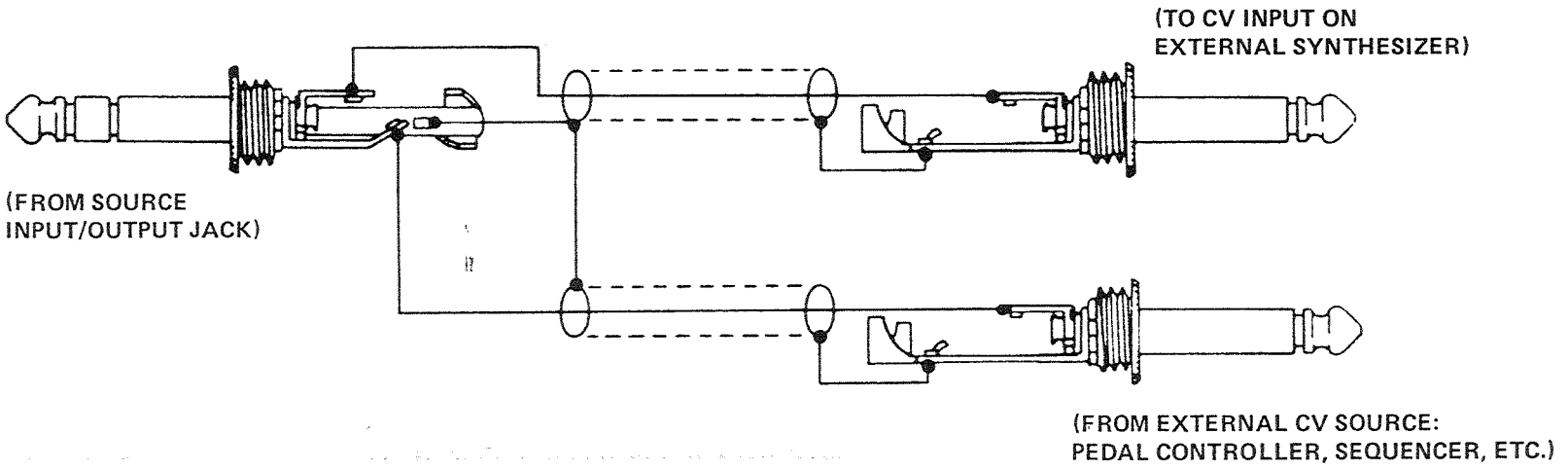


(FEMALE CINCH-JONES CONNECTOR)

CV IN:

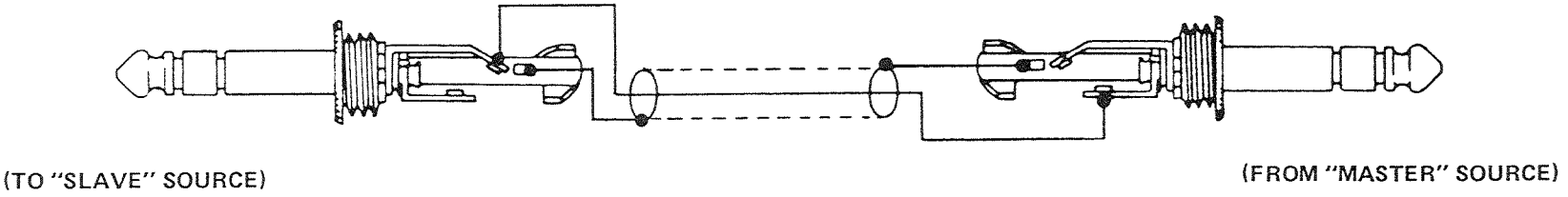


Simultaneous input/output control voltage connections can be accessed with a cable setup as shown:



The same cable could be used for simultaneous trigger input/output connections.

To interface two Sources together, two stereo (3-conductor) cables, wired ring-to-tip and ground-to-ground, will be needed. The Source at the "tip" end of the cables will be the "master" synthesizer; the other Source will be "slaved" to the outputs of the first unit.



As mentioned earlier, the Level 2 **EXT TRIG** control determines the presence or absence of triggers at the trigger output. However, switching this control off does *not* defeat the control voltage output. If an external synthesizer is connected, it will always be affected (transposed) by The Source's CV output.

To scale the CV output, follow this procedure:

1. Connect a 10K linear potentiometer in series between The Source's CV output and the second ("slave") synthesizer's OSC or CV input.

2. Connect the appropriate trigger cable; turn the **EXT TRIG** output on.

3. Turn down The Source's volume; alternately play The Source's low F and the F 2 octaves higher. Adjust the potentiometer until the two pitches sounded by the slave synthesizer are in tune.

4. Turn up The Source. Play low F and tune the slave synthesizer to unison.

The slave synthesizer will be triggered by The Source and will follow The Source's keyboard, LFO, pitch wheel, sample and hold, sequencer, and arpeggiator.

TROUBLESHOOTING

If a problem exists on The Source, check the symptoms listed below. If the solutions listed (or common sense) won't correct the problems, the instrument should be taken to an authorized service center for examination and/or repair.

PROBLEM	CAUSE	SOLUTION
NO POWER	1. Power switch is OFF. 2. Line cable is loose or disconnected 3. No power at wall socket.	1. Turn on Power Switch. 2. Check and secure line cable connection on back of Source. 3. Apply power to wall socket; use alternate socket.
NO SOUND	1. No cable or bad cable. 2. Power or volume is off somewhere. 3. Source is set to a program stored at zero volume.	1. Check for presence and condition of 1/4" mono cable at Audio Out. 2. Turn on Source and amp; turn up volume on Source and amp. 3. Select other programs.
NO TOUCH PANEL RESPONSE (Program selection or edit)	1. Source is in Hold mode. (Two dots in program display). 2. Source is in Level 2.	1. Touch **HOLD** to reverse current status. 2. Touch **LEVEL 1**.
PITCH WHEEL HAS NO EFFECT	1. Source is set to a program w/Sync On and Osc 1 only turned up.	1. Touch **SYNC OFF**; or select another program.
INCREMENTAL CONTROL NOT ACTIVE	1. Incremental function not selected.	1. Select incremental function (yellow rectangles on panel).
MOD WHEEL INACTIVE	1. Modulation routing is off. 2. Filter modulation only is on, but cutoff frequency is set high.	1. Touch **TO OSC** or **TO FILT**. 2. Turn **CUTOFF FREQ** down; or turn **ON** modulation TO OSC.

PROBLEM	CAUSE	SOLUTION
ALL PROGRAMS OUT OF TUNE	1. Osc 2 frequency has shifted. 2. Pitch wheel not centered.	1. Follow Auto-Tune procedure listed below. 2. Adjust pitch wheel to center detent.
SEQUENCER		
NO SEQUENCES	1. Source not in Level 2.	1. Touch **LEVEL 2**, **PLAY 1** or **PLAY 2**.
SEQUENCER PLAYS BACK NOTHING (Or only 1 note)	2. Nothing in sequencer memory.	2. See Using the Sequencer on page 19 for sequence recording procedure.
WRONG PLAYBACK RATE	3. Sequencer rate set wrong.	3. While sequencer is in playback mode, touch LFO **RATE** and adjust.
NO SOUND	4. Program selected has no audio.	4. Touch **LEVEL 1**, change program; restart sequencer.
ARPEGGIATOR		
ARPEGGIATOR WON'T START	1. Source not in Level 2. 2. First note played wasn't repeated.	1. Touch **LEVEL 2**, then **ARPEGGIO**. 2. Repeat first note played or touch **LEVEL 2** then **ARPEGGIO** again and start over.
ARPEGGIATOR REFUSES TO LOAD	1. More than 24 notes have been entered.	1. Touch first note played when arpeggio is desired.
ARPEGGIATOR PLAYBACK RATE IS WRONG	1. Last LFO rate entered is stored.	1. Adjust playback rate by touching LFO **RATE** and turning incrementer.
PROGRAM SEQUENCER		
SEQUENCER PLAYS BACK WITH NO PROGRAM CHANGES	1. Program sequencer not activated.	1. Touch **LEVEL 2**, **PROGRAM SEQ PLAY**.

PROBLEM	CAUSE	SOLUTION
PROGRAM SEQUENCER (Continued)		
SEQUENCER PLAYS BACK WITH NO PROGRAM CHANGES	2. Sequencer was changed and program sequence erased.	2. See Using the Program Sequencer on page 19; reload the program sequencer.
CASSETTE		
BAD CASSETTE VERIFY - BAD CASSETTE LOAD	1. Information was recorded on leader area. 2. Information already on cassette interfered with data recording. 3. Volume level on cassette adjusted incorrectly.	1. Erase tape, rewind past leader tape and re-record. 2. Erase tape with bulk eraser and re-record. 3. Consult cassette manual; see below.
INTERFACE		
SLAVE SYNTHESIZER WON'T PLAY	1. Interface cables not connected properly. 2. EXT. TRIG not turned on.	1. See Interfacing on page 48 for proper cable connection. 2. Touch LEVEL 2 , EXT TRIG .
SLAVE SYNTHESIZER IS OUT OF TUNE	1. Source KB output needs to be scaled.	1. See Interfacing for scaling procedure.

TUNING

A generalized tuning procedure is as follows:

1. Select a program using only Osc 1 as a signal source. Hold down any key and tune to the desired pitch source, using the rear panel FINE TUNE control.

2. Select a program using both Oscillators that has Osc 2 set at a known interval (fifth, octave, etc.) Touch **STORE** and **OSC 2** simultaneously. This connects the incrementer to the master tuning control for Osc 2. Adjust the incremental controller until Osc 2 is at precisely the known interval.

3. Touch any program. The interval settings for Osc 2 for each program have not been changed, so all programs should be "in tune." If a new interval tuning (or beat rate) is desired, change the setting of the Osc 2 interval control.

CASSETTE OPERATIONS

The Source outputs all pertinent data in a restorable format to a standard cassette recorder. Any cassette recorder with remote microphone start/stop capabilities will work; a special "computer cassette deck" is not necessary (but is recommended).

A standard 5-Pin DIN connector is used. Pin assignment is as follows:

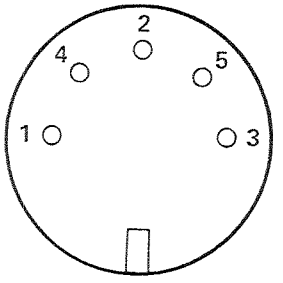
1. Pin 1: Relay (Motor On/Off — to REM jack).

2. Pin 2: Ground

3. Pin 3: Relay

4. Pin 4: Data In (from EARPHONE or LINE out)

5. Pin 5: Data Out (to AUX or LINE input)



Note: Recording and playback levels are quite different from ordinary audio recording. Recording levels should be 0 dB or higher ("into the red" on VU meters). Smaller cassette decks, or computer cassette recorders, incorporate an automatic level control that sets correct levels internally.

Playback levels should be set correspondingly higher. A good rule of thumb is to set the output level at between 60% and 75% of full volume. If cassette load operations continually fail (produce error messages), adjust the cassette output level.

As mentioned earlier, a high-quality leaderless cassette tape should be used. If the tape is to be reused, it must be totally erased with a bulk eraser or demagnetizer. Since, in the "verify" mode, each piece of data is counted and compared to a master checksum, the presence of any additional or residual data will cause an error.

LEVEL 2 FUNCTIONS

The following is a quick reference chart for the functions of the Level 2 controls. All controls in this chart are activated by touching the Level 2 control first.

Some of the controls activate a temporary function that ends when certain conditions have been satisfied; i. e., touching **ARPEGGIO** activates the arpeggiator record mode *until* 24 notes have been entered, at which time the instrument's status changes. These temporary conditions are listed in STATUS WHEN ACTIVATED; eventual status is listed under CONTINUAL STATUS.

CONTROL	STATUS WHEN ACTIVATED	CONTINUAL STATUS
REC 1 **REC 2**	Level 2 Seq Record Mode; sequence begins recording with first note depressed.	Level 2 until **STOP** or another Level 2 control is touched.
STOP	Defeats **SEQ REC**, **SEQ PLAY**, **ARPEGGIO** .	Immediately reverts to Level 1.
CONTINUE	Continues Sequencer playback from stopping point. After **ARPEGGIO**, starts from beginning of last arpeggio played.	Immediate Level 1.
PLAY 1 **PLAY 2**	Starts Sequencer playback from beginning.	Immediate Level 1 (with Sequencer playback).
ARPEGGIO	Activates Arpeggiator. If key is depressed, Arpeggiator shifts to record mode. If **CONTINUE** is touched, Arpeggiator plays back.	Arpeggiator is active; Level 1 (programs may be chosen).

CONTROL	STATUS WHEN ACTIVATED	CONTINUAL STATUS
AUTO TRIG	Triggers contour generators at LFO Rate.	Reverts to Level 1.
PROGRAM SEQ REC	If touched while sequencer is running, activates program sequencer. Plays sequence once and records last program present at each event.	After sequence plays once, Level 1 status.
PROGRAM SEQ PLAY	If touched before SEQ PLAY or while Seq is running, activates program changes. On until sequence is stopped.	Reverts to Level 1.
S & H	Activates Sample & Hold pattern sent to oscillators and filter.	Reverts to Level 1.
S & H FILTER	Sample & Hold to filter only.	Reverts to Level 1.
EXT TRIG	Reversible: Enables or disables S-Trig at Trigger Output.	Reverts to Level 1.
CASSETTE SAVE	Starts cassette motor; outputs blank leader followed by data. Display shows "⊏ ⊏" during leader; shows "⊐ □" during data.	Source is inactive until data transfer is complete; reverts to Level 1.
CASSETTE VERIFY	Starts cassette motor; checks data for validity; if invalid error message "⊔ ⊔" is displayed.	Source is inactive until verification is complete; reverts to Level 1.
CASSETTE LOAD	Starts cassette motor; accepts incoming data and replaces memory with new data. If tape is blank or cassette is disconnected, previous memory is retained.	Source is inactive until data transfer is complete; reverts to Level 1.

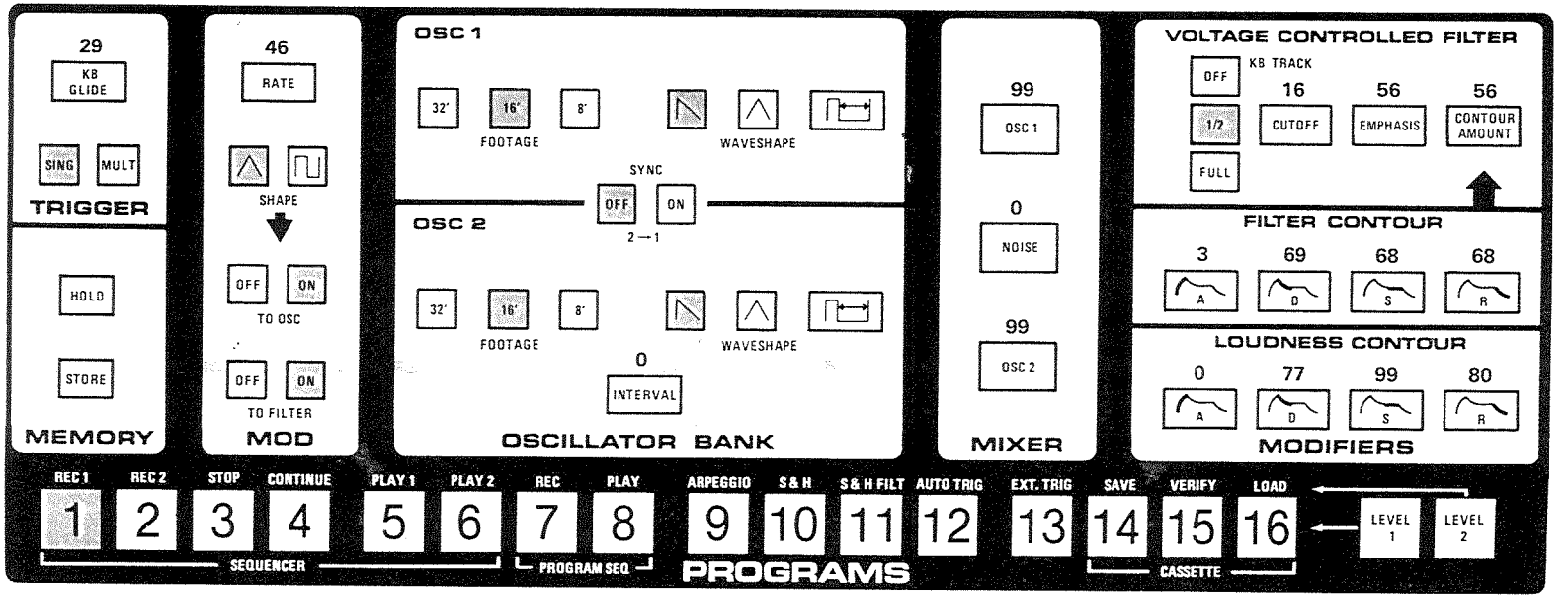
INCREMENTAL RESOLUTION

This chart shows the different resolutions present on the incremental controller when incremental (adjustable) functions are selected.

Generally speaking, if a function is critical, it will have very fine resolution. Less critical functions will generally need only one turn to cover all ranges of that function.

FUNCTION	RESOLUTION (Number Of Turns From Zero To Maximum)	SPECIFICATIONS
KB GLIDE	1	Zero to maximum
MOD RATE	1	.25Hz to 325Hz
PULSE WIDTH	1	5% to 95%
INTERVAL	16	Unison to +2 octaves
MIXER LEVEL	1	Zero to full level
CUTOFF (KB TRACK—0 or 1/2)	2	10 oct
CUTOFF (KB TRACK—FULL)	16	10 oct
EMPHASIS	1	Zero to self-oscillation
CONT AMT	1	Zero to 10 oct at maximum
ALL CONTOUR CONTROLS	1	3 ms to 10 sec

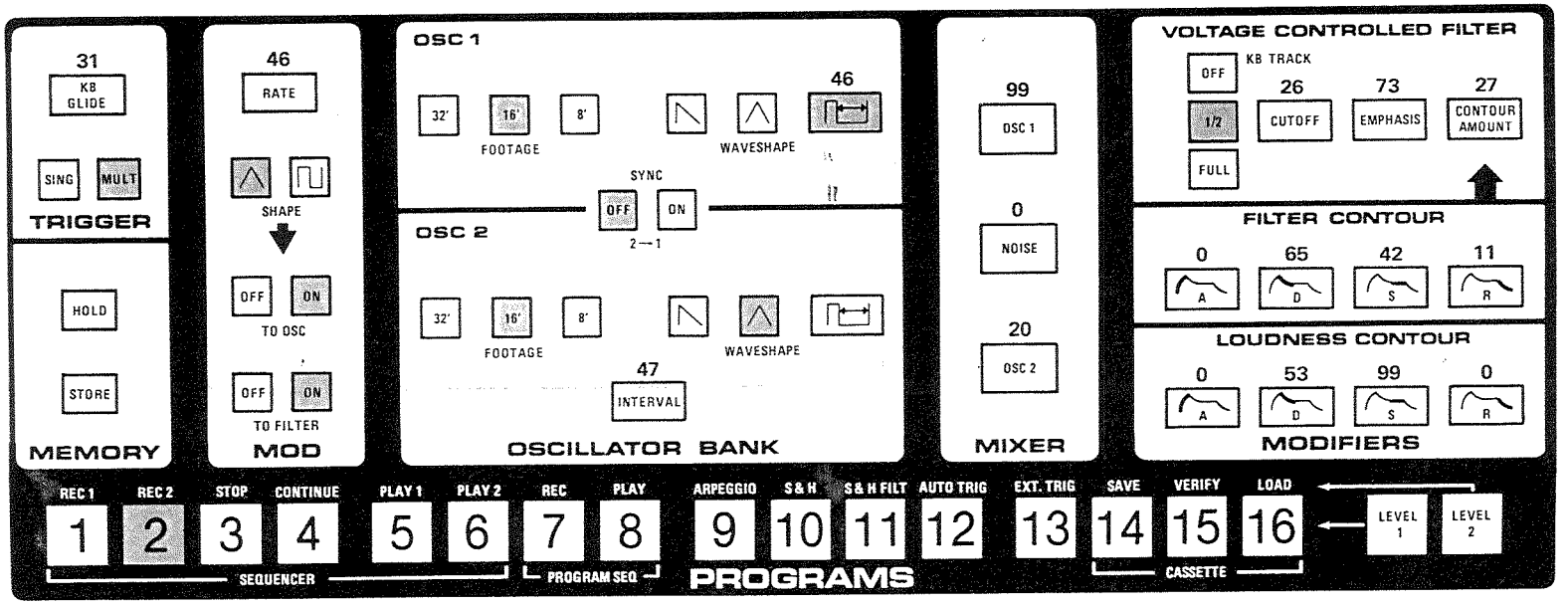
PROGRAM 1: LEAD 1



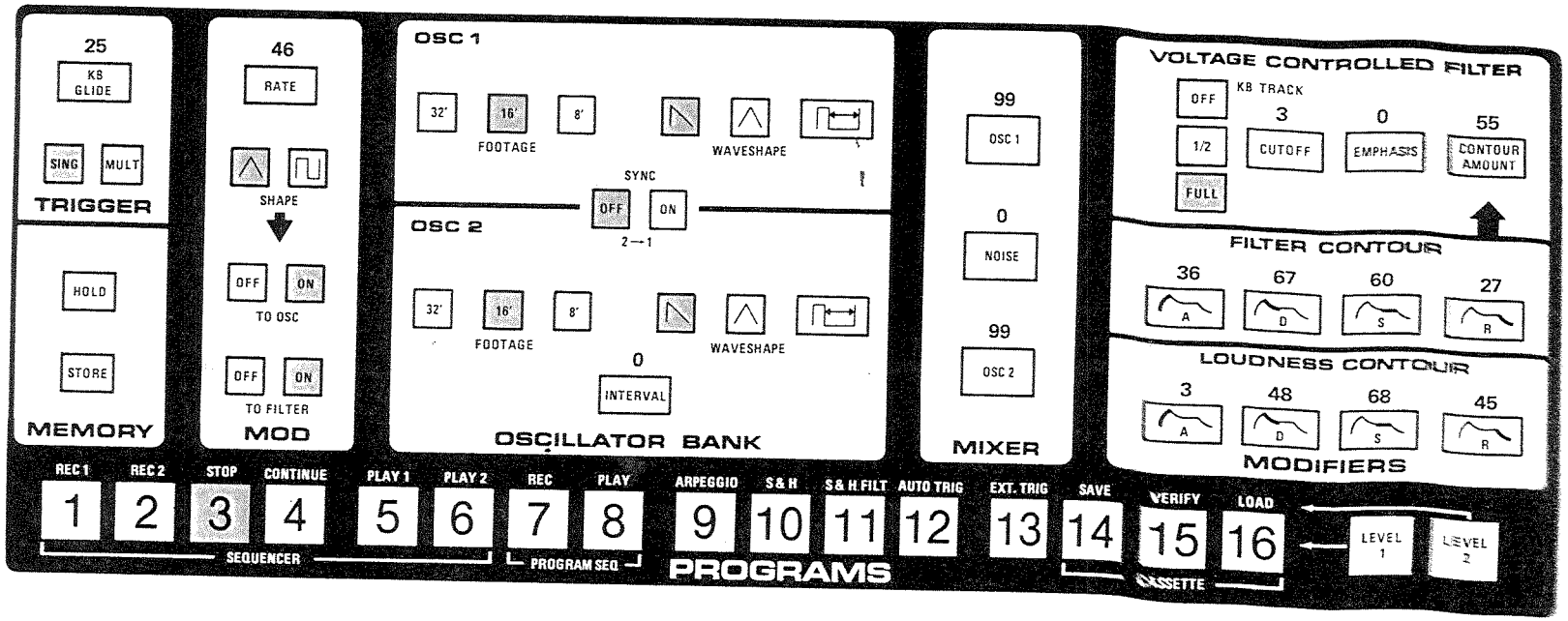
The high settings of the mixer controls (maximum for both oscillators) overdrive the filter input and produce the controlled distortion that characterizes the "Minimoog Sound."

This voice is very effective when used with the sequencer or arpeggiator.

PROGRAM 2: LEAD 2

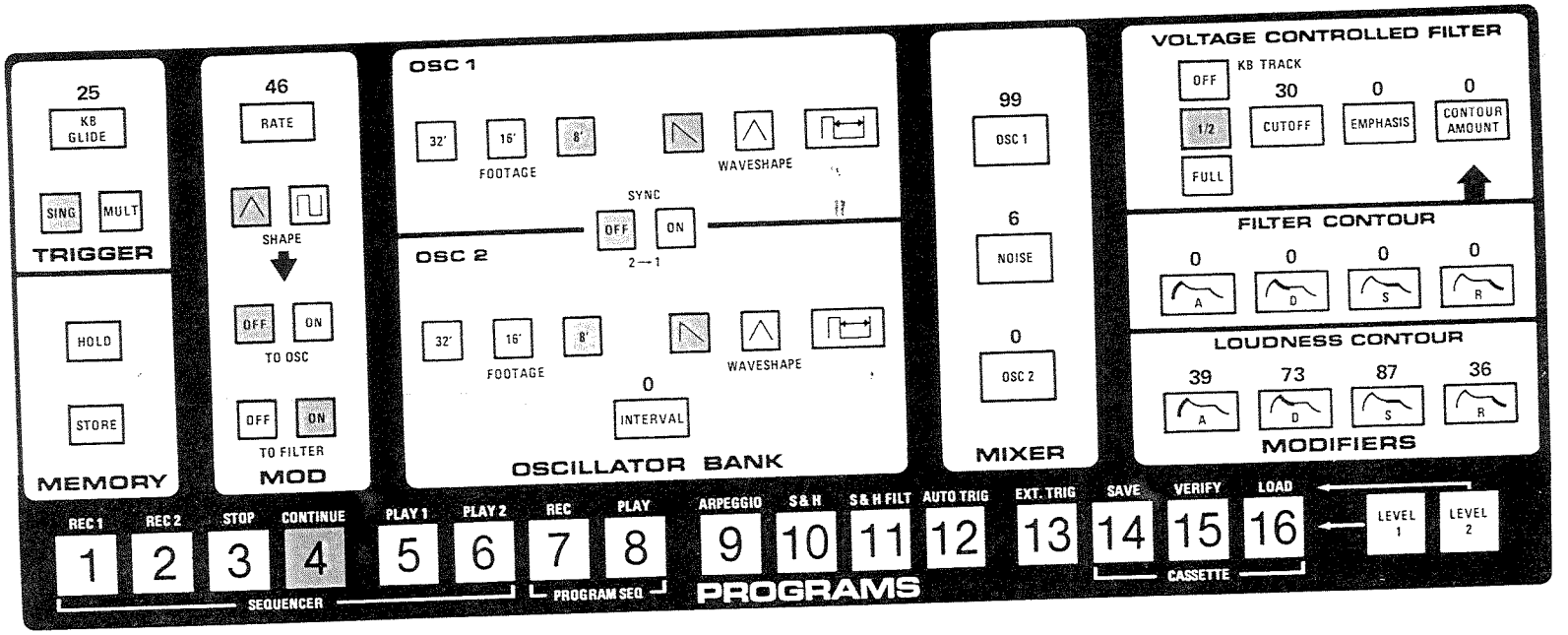


The foundation of this voice is the use of square waves through a filter with high resonance and low contour amount. Playing "guitar-like" melody lines — with pitch-bending and vibrato — produces excellent results.

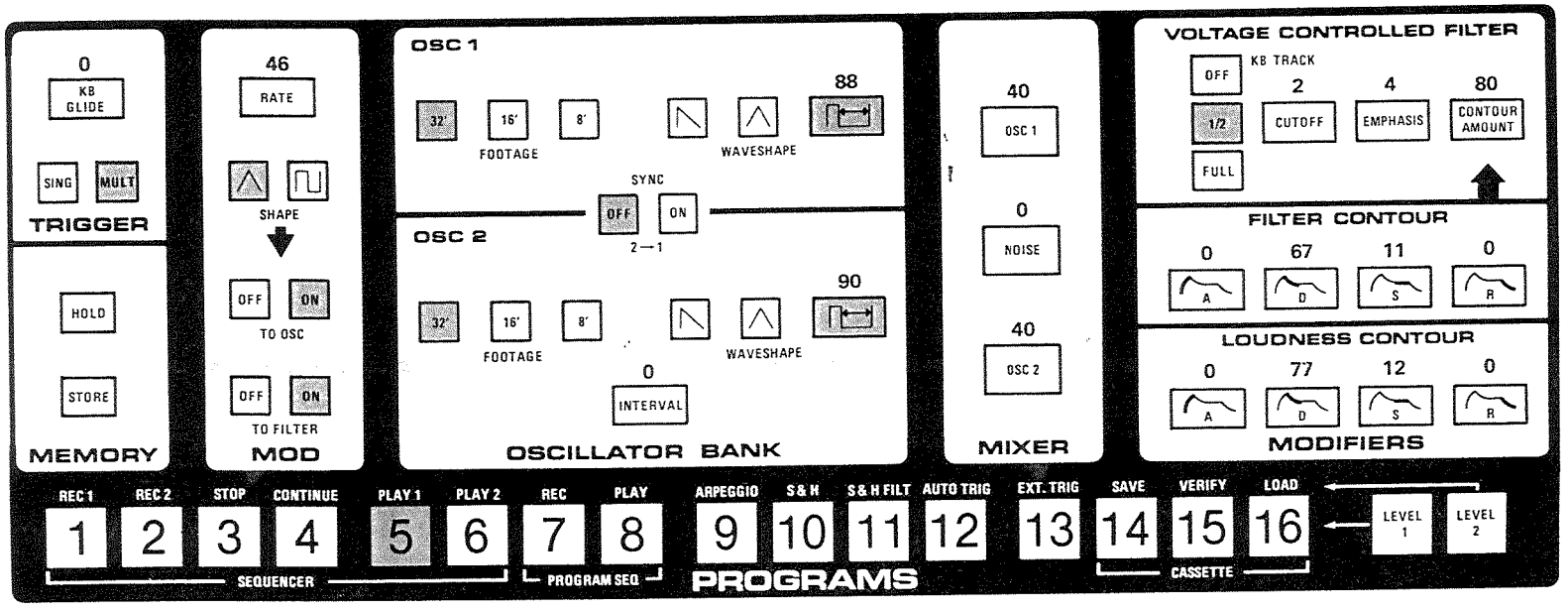


Full keyboard tracking gives this voice a tuba-like quality in the lower octaves and a brighter, trumpet-like quality in the higher registers. Vibrato is available at the modulation wheel.

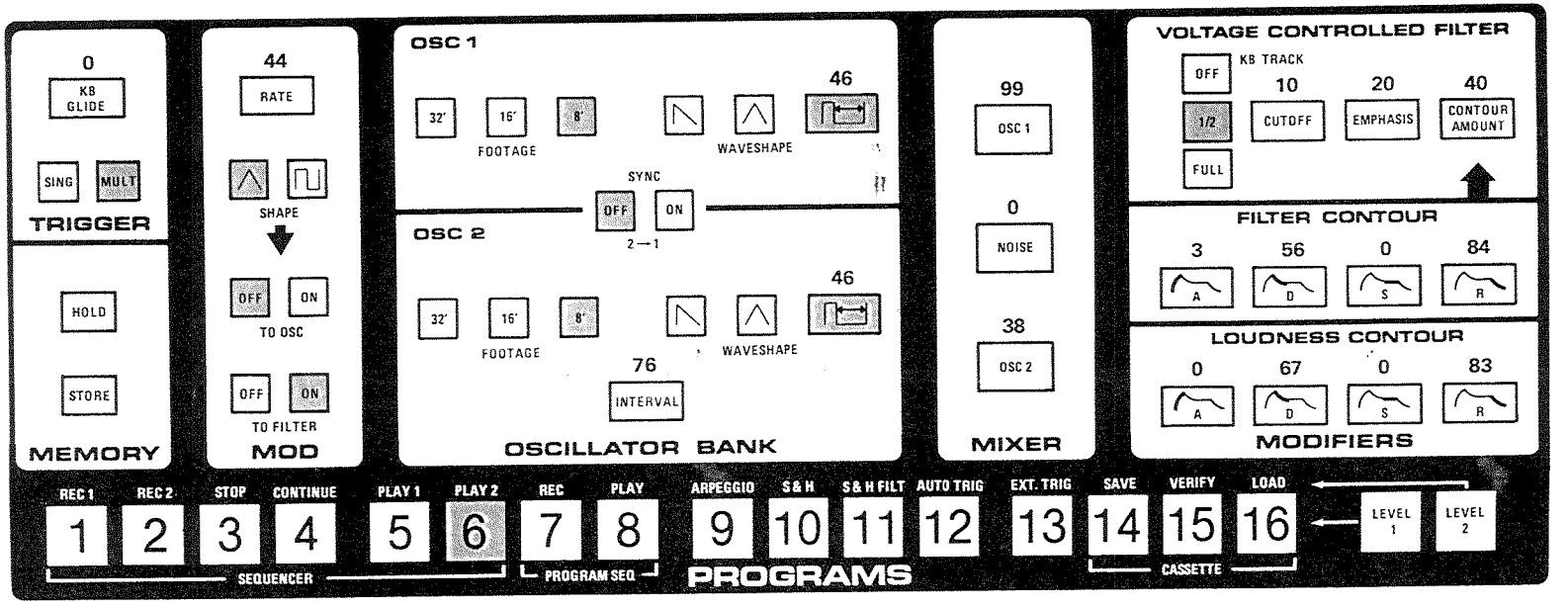
PROGRAM 4: FLUTE



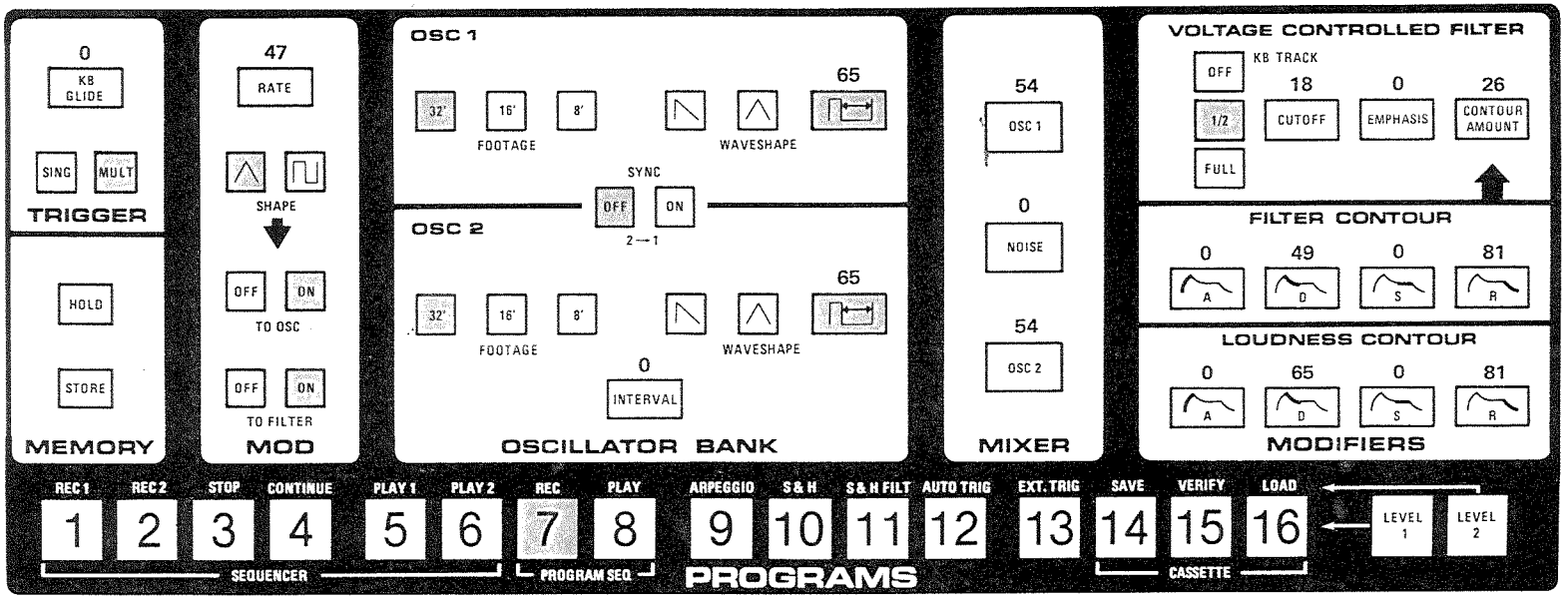
This program uses a small amount of noise to simulate the sound of air blowing over a flute mouthpiece. Tremolo is available at the modulation wheel and should be used for most authentic results.



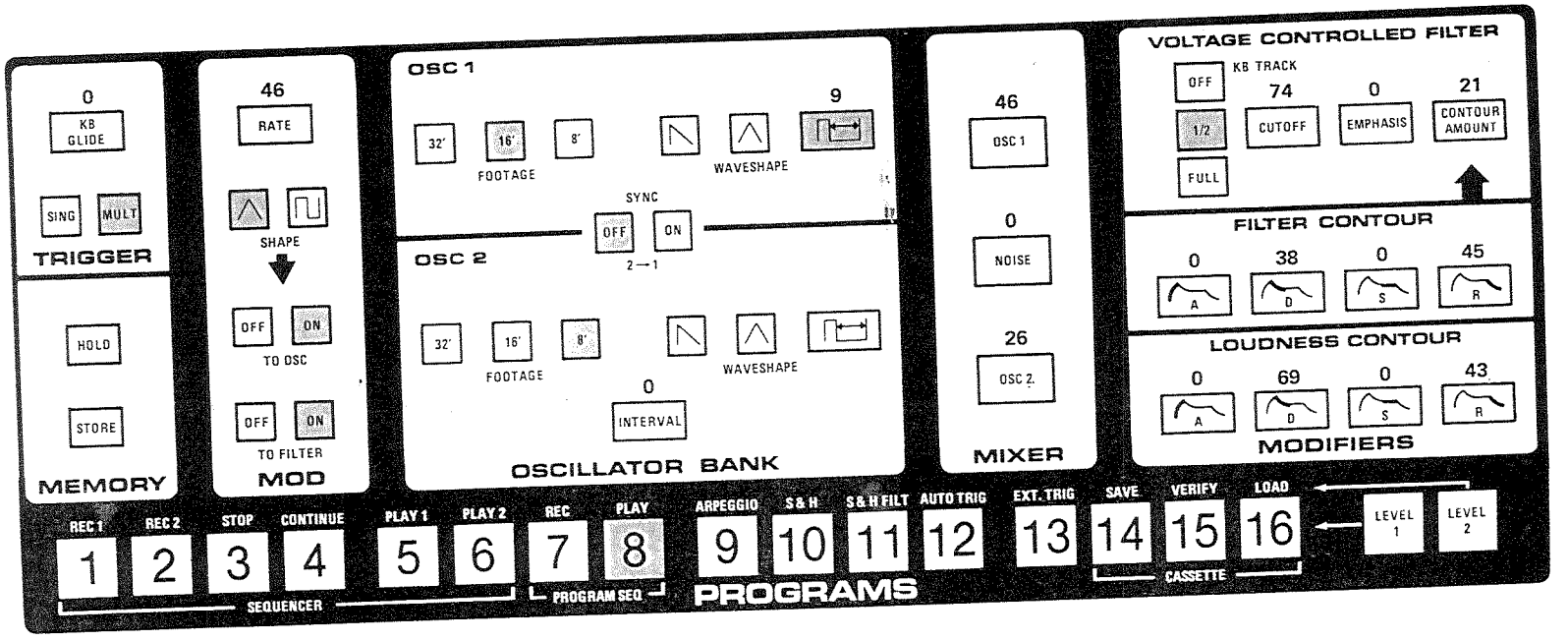
Narrow rectangular waveshapes simulate the sound of a plucked string. A high contour amount setting gives this program a very bright sound. Pitch-bending is effective with this voice.



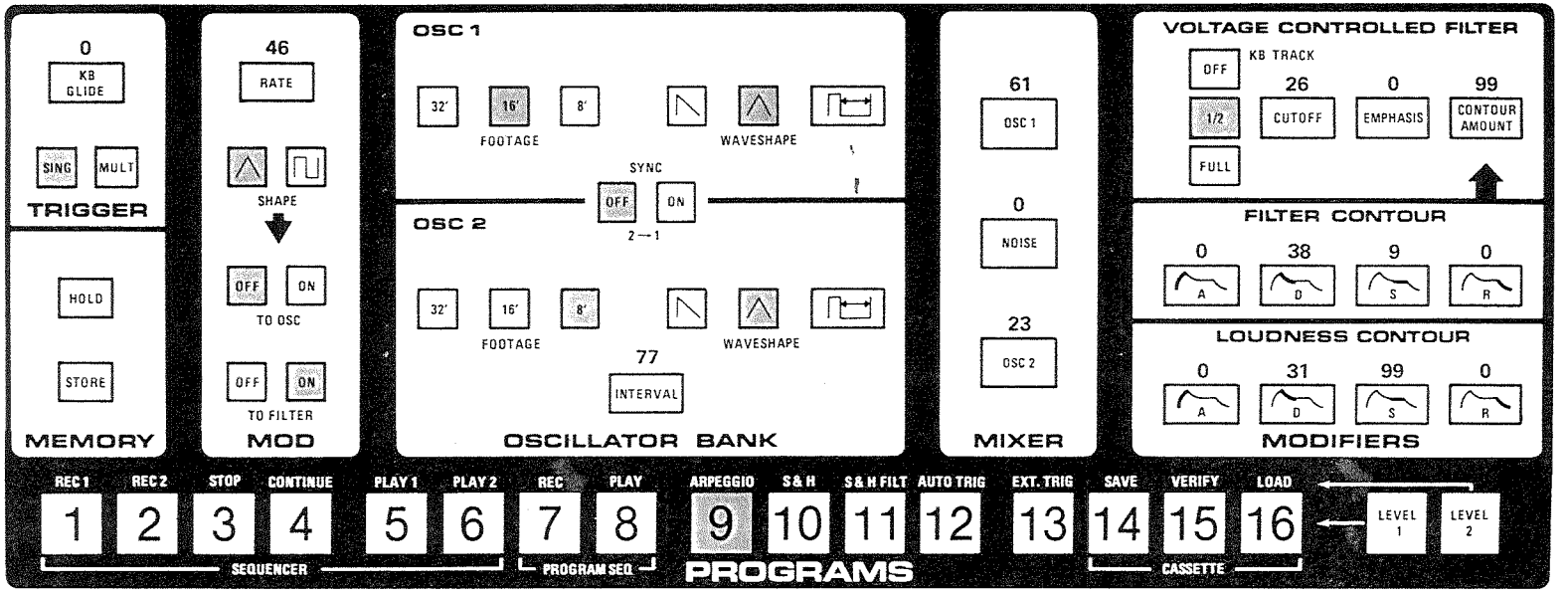
Turn the mod wheel up to approximately 75% for tremolo. Note the settings of the contour generators. If a key is depressed and held down, the contour generators reach the sustain level (zero) and stop all sound, producing a "damped" sound. If a key is tapped and released quickly, the contours "skip" the sustain setting and move immediately to the long release time, producing a "ringing" vibes sound.



This voice sounds best toward the bottom of the keyboard. This program is voiced with the same touch-dependent effect described in program 6, so certain notes may be allowed to "ring" longer than others.

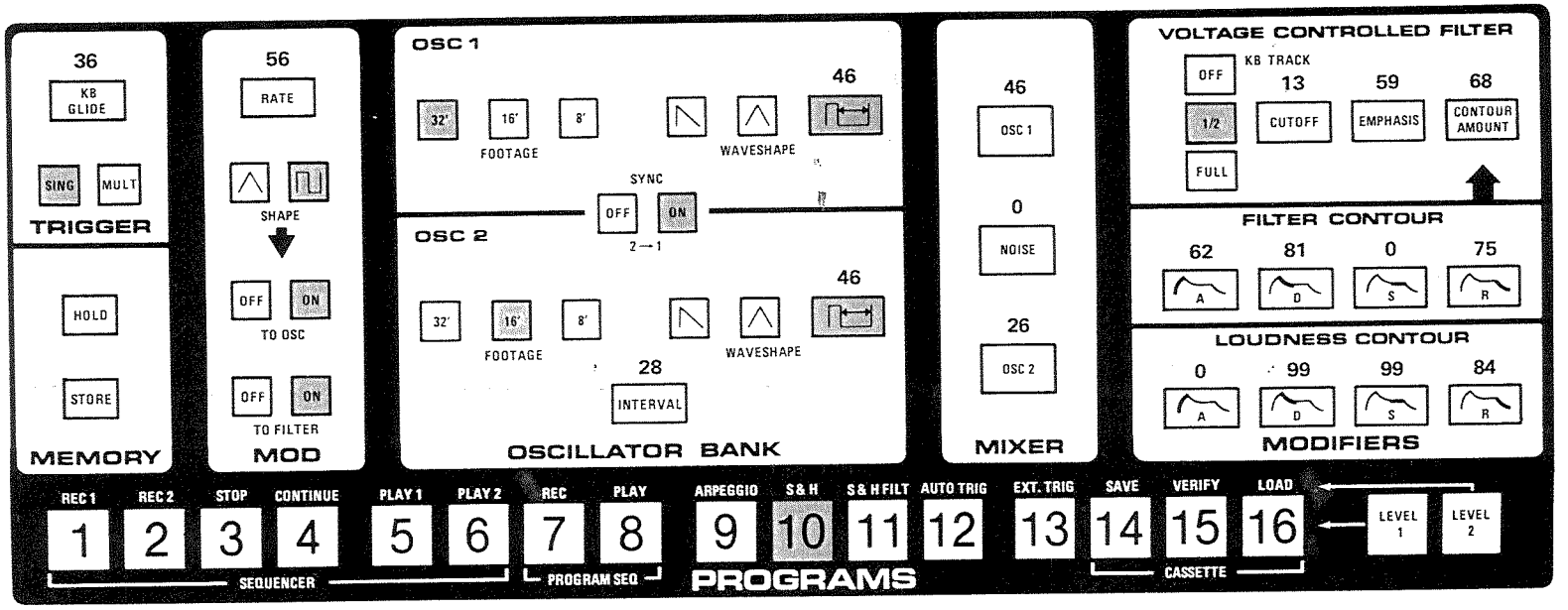


This voice pitches the second oscillator an octave higher to simulate the octave strings of full harpsichord stops. For an "absolutely in tune" harpsichord sound, touch SYNC ON. Leaving sync off, however, may produce a more authentic sound.

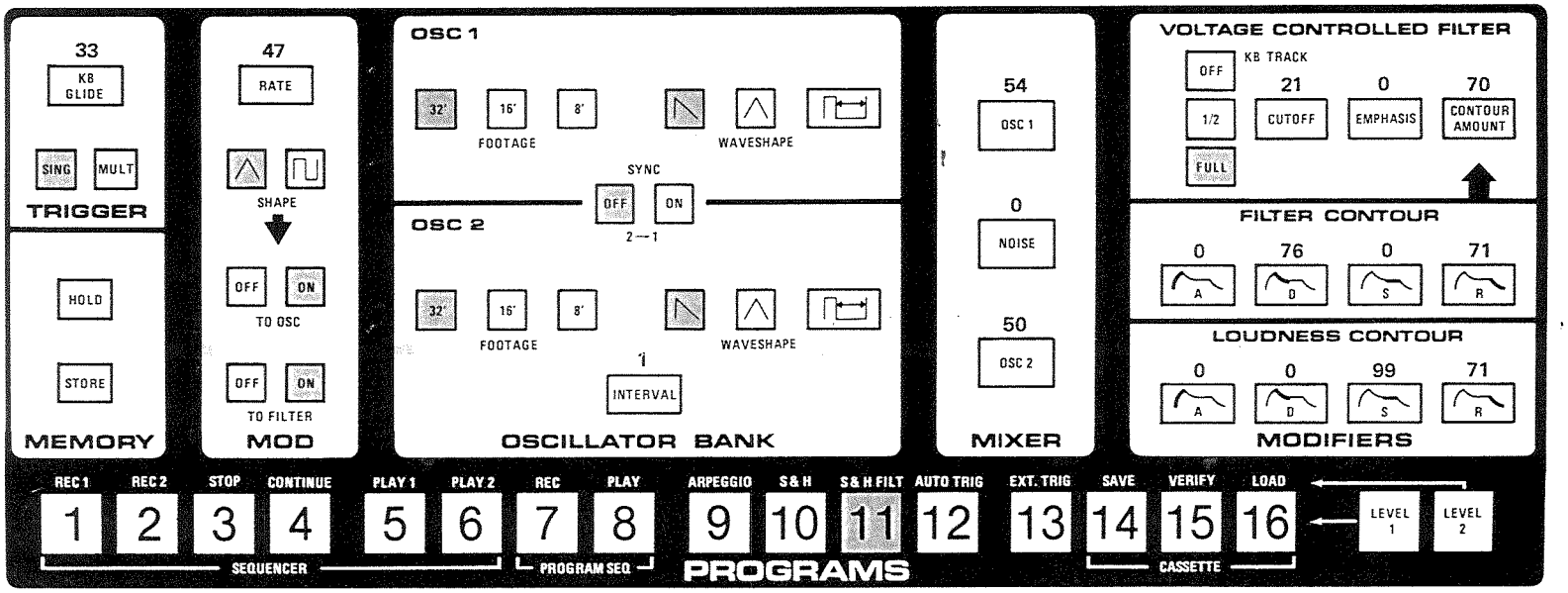


The percussive attack of the filter contour will be heard only after all keys have been released and a new key (or keys) has been played. This enables particular notes within a phrase to be accented.

PROGRAM 10: TRILL VOICE

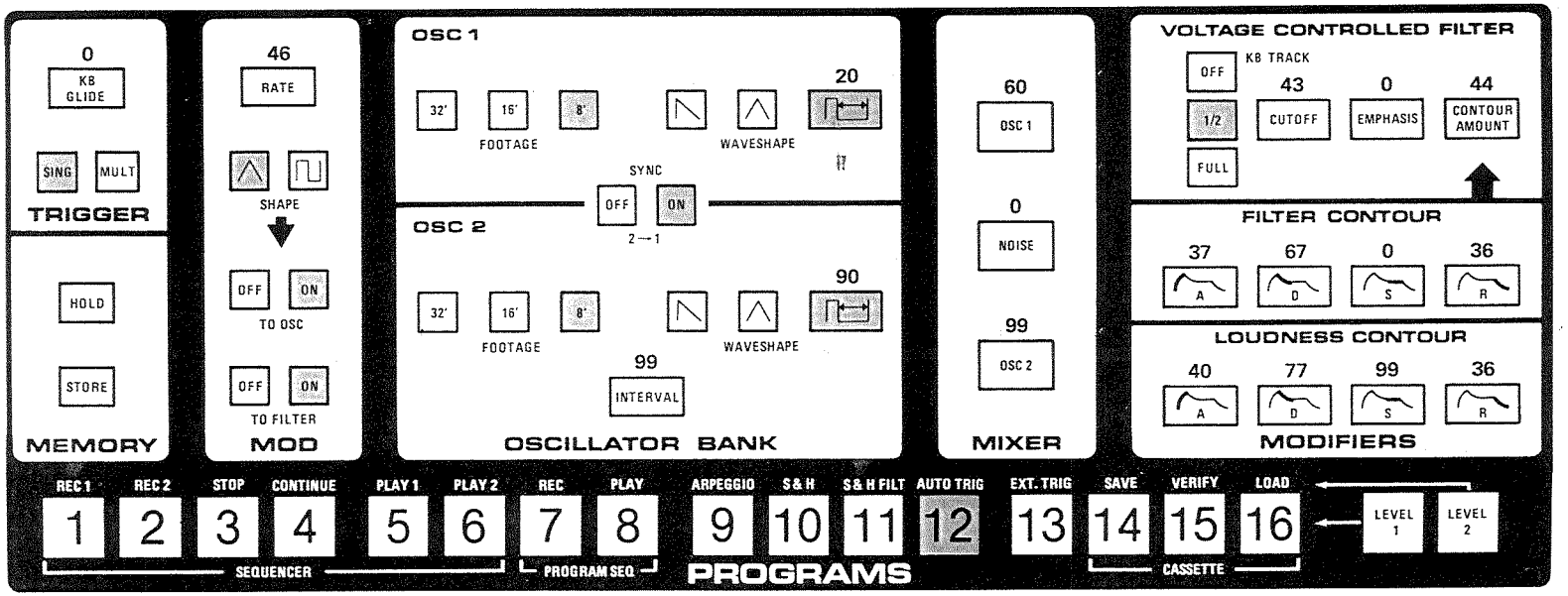


This program is one of several voiced to sound "electronic" — unlike any traditional instrument. The modulation wheel will set the upper note of a trill. Sync is voiced ON; move the pitch wheel to hear the sync effect.



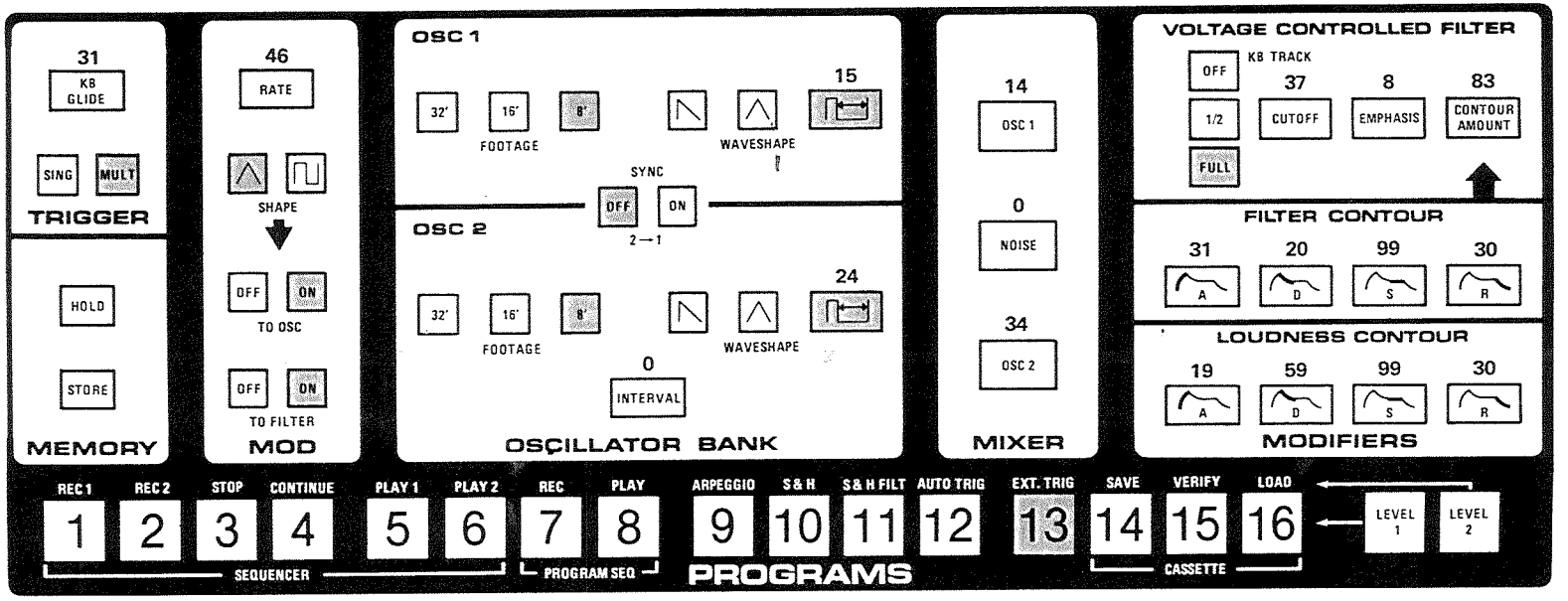
One of the keys to the power of this voice is the tuning of Osc 2. If the tuning procedure listed in the Troubleshooting Section is followed correctly, the two oscillators should be detuned just enough to produce a rich, rolling sound.

PROGRAM 12: SYNTHEVOX



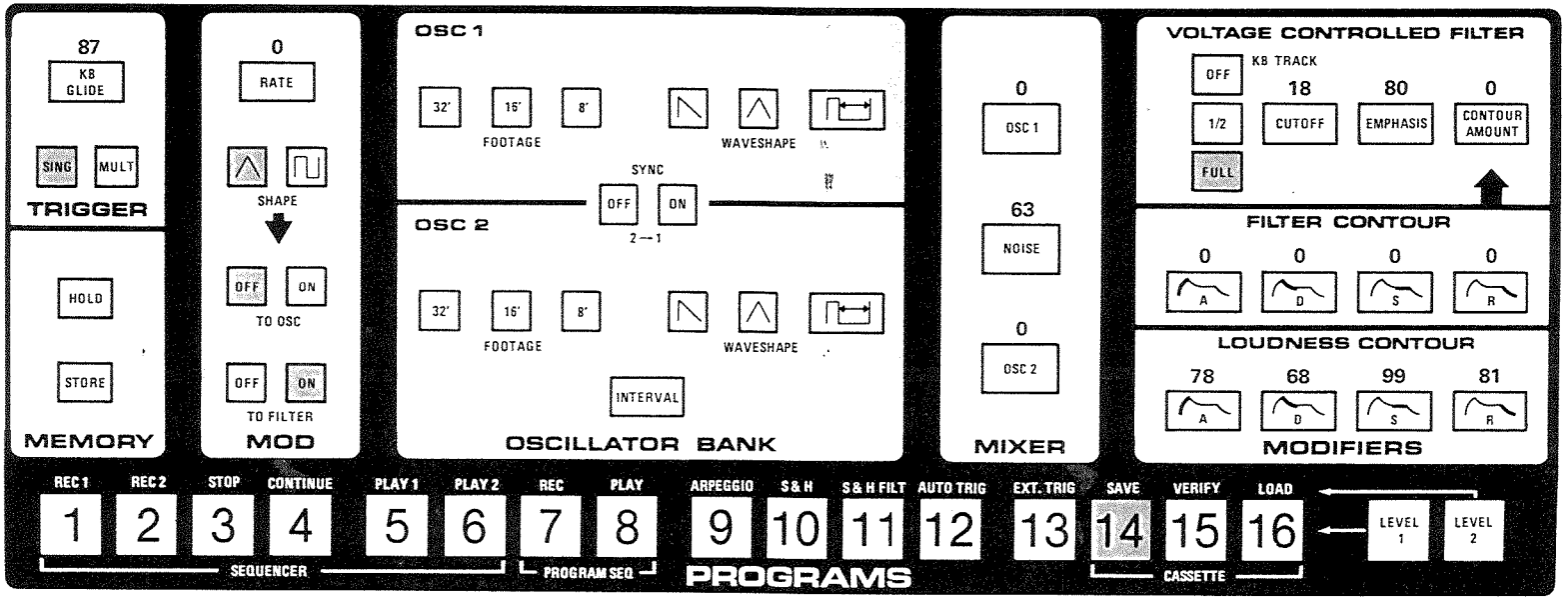
Another "electronic" voice — especially good for long, singing solo lines. The oscillators are tuned an octave apart and long attack times are set up on both contour generators.

PROGRAM 13: SAX



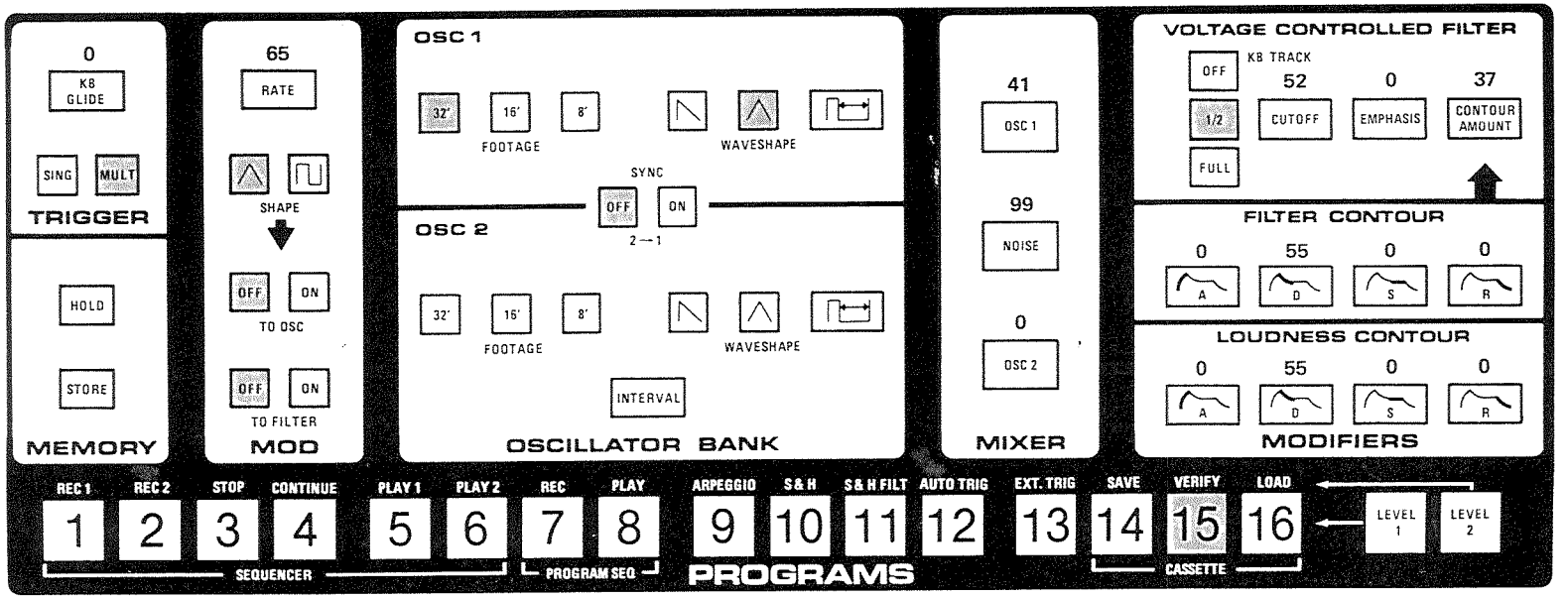
The use of narrow rectangular waveforms as audio signals gives this program the high resonance present in the sound of an alto or soprano saxophone. This voice sounds more realistic when pitch-bending and modulation are used.

PROGRAM 14: WIND



Noise is the audio signal here. Emphasis is set high to give the noise signal a "pitch" (by sharply accenting a narrow band of frequencies). The filter may be slowly moved up and down (by raising the modulation wheel) to simulate a "sweeping" wind sound.

PROGRAM 15: SNARE DRUM



A high-level noise signal is mixed with a low-level triangle wave to give the sudden drum sound a sense of pitch. The pitch, or tuning, of the drum is determined by the key played. Setting LFO rate to between 65 and 70 and turning on AUTO TRIG will produce a drum roll.

PROGRAM 16: DUPLICATION OF PROGRAM 1

Program 16 may be used to store a personal program without erasing the factory programs or can be used to rearrange programs (see Repositioning Programs, page 12).

A comprehensive Service Manual is available (Moog P/N 993-045393-001). Contact your local dealer or write to:

MOOG MUSIC INC., 2500 Walden Avenue, Buffalo, New York 14225, Attn: Service Department

Under normal playing conditions, the rear panel of The Source will feel quite warm to the touch. This is not a malfunction; The Source's internal components are calibrated to operate correctly at this temperature.

The Source is a software-based instrument. As new developments are completed, additions to the Owner's Manual will consist of drop-in sheets stating a revision number and a description of the software function changes.

Additional cassette files with voices created by prominent keyboard artists and consultants to Moog may be purchased by writing:

Moog Music Inc.
2500 Walden Avenue
Buffalo, New York 14225
Attn: Marketing Department

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