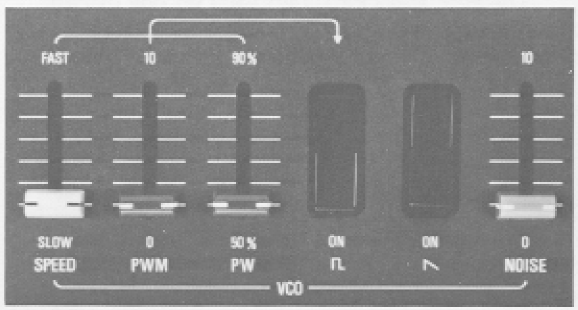
# SECTION III – DESCRIPTION OF PROGRAMMABLE PANEL, MEMORY, HOW TO PROGRAM & SUGGESTED PATCHES

This section details the function of the synthesizer's programmable PANEL [15-36], and how to program your own patches, creating sounds literally "from scratch." Also discussed is the CS-60 MEMORY panel [37] –a miniaturized version of the larger programmable panel, used for storing one of your own programmed patches for instant recall at the touch of a button.

## What the Panel Controls Do

The PANEL lets you select the waveform, harmonic structure, changes in harmonics, and volume changes to program an infinite variety of sounds. The same circuits controlled by the PANEL are internally controlled to obtain the preset patches; each TONE SELECTOR button simply recalls an internally-stored pattern of PANEL settings. Thus, with the PANEL, it is possible to manually duplicate any of the presets, to vary them slightly, or to depart drastically for totally unique sounds.

NOTE: To hear what effect the PANEL controls have as you read this section, set **all** synthesizer controls at their nominal positions (as indicated on the inside cover photos), with one exception: SET THE **BRILLIANCE** LEVER [5] AT minimum brightness (up). Normally, BRILLIANCE is centered when programming, but this setting is better for initial demonstrations of filter effects.

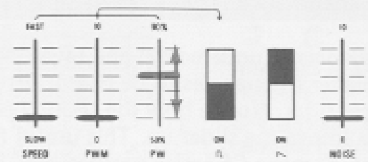



[15-20 and 31] **The VCO –**
**WAVEFORMS:** The VCO, or **V**oltage **C**ontrolled **O**scillator section, creates the CS-80's four basic sounds: SQUARE WAVE, SAWTOOTH WAVE, WHITE NOISE, and SINE WAVE. Turn ON the square wave ⊓ [18] and play a note. Turn OFF the square wave and turn on the sawtooth wave ⟍ [19]. Turn OFF the sawtooth, and bring up the NOISE slider [20]. Bring down the NOISE slider, and bring up the sine wave ∿ slider [31]. Observe the difference between these sounds. (The sine wave slider, even though it is part of the VCO electronics, is located in the VCA section because pure sine waves have no harmonics, and would therefore not be changed by VCF processing.)

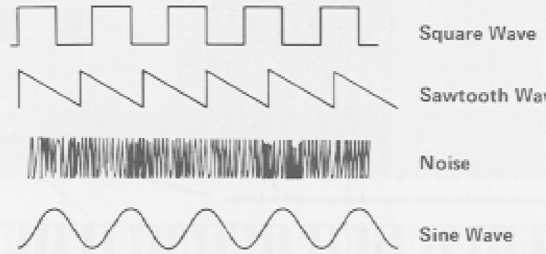
[17] **PULSE WIDTH** – The square wave [18] had a particular sound that might be described as "hollow." However, you can vary the sound of the square wave with the adjacent PW slider [17]. This slider affects **only** the sound of the square wave; it has no effect on the sawtooth, sine wave or noise.

With the square wave ON, play a note and very gradually push the PW slider up to 90%. This changes the **P**ulse **W**idth of the square wave, which changes the harmonics for a more "nasal" sound. Now move the PW slider down to 50% again as you continue playing a note.

Try moving the PW slider back and forth (50% to 90%), doing it faster and faster as you play a note, and observe the phasing-like sound. You can have the synthesizer do the same thing for you automatically, using the adjacent PWM [16] and SPEED [15] sliders.



[16] **PWM** (Green) & [15] **SPEED** (White) – **PWM** stands for **P**ulse **W**idth **M**odulation. Set the PW slider at 75%, and move the PWM slider [16] up to maximum modulation (#10). Now play a note and you will hear an effect that is identical to manually moving the PW

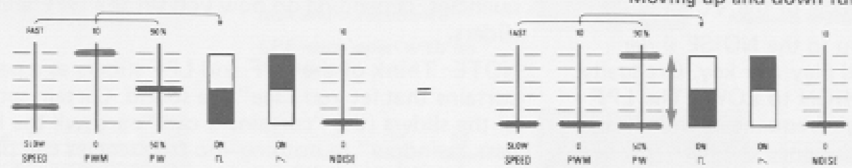


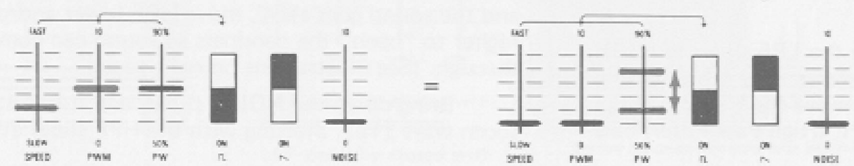

slider back and forth all the way, but very slowly. Gradually push the SPEED slider [15] from SLOW toward FAST, and notice what happens; pulse width modulation occurs faster and faster. Eventually, you will reach a speed that is much faster than you could possibly achieve by moving the PW lever back and forth with your hand. At the point when the SPEED of modulation approaches audio frequencies (20 times per second or faster), a secondary tone will be heard.

You need not use maximum effect. With SPEED at a SLOW setting, try moving the PWM slider to its mid position. This effect is like moving the PW slider only part way up, and then back down. You can also vary the basic setting of the PW slider; try setting it at mid position and then use different PWM and SPEED settings. Together, the PW, PWM and SPEED sliders are one of the keys to achieving realistic string sounds.

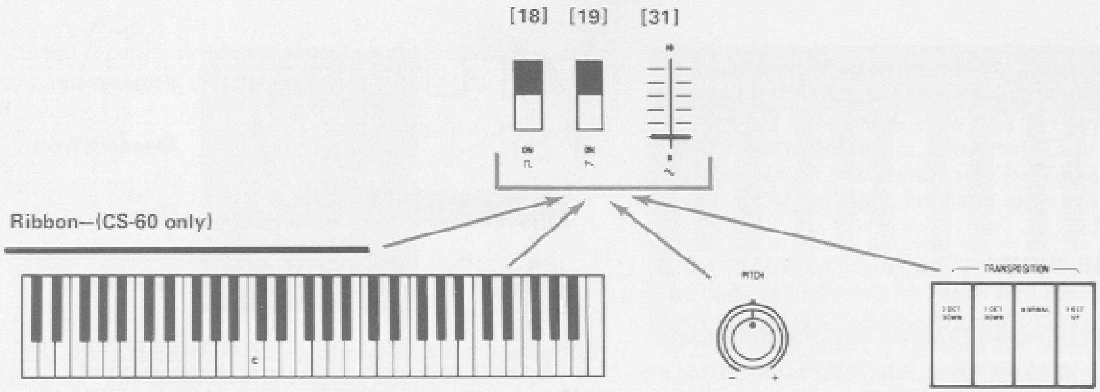
As you have heard, the VCO produces different basic timbres (tones), but it is equally important for it to produce pitch. Therefore, when you play various notes on the keyboard, the VCO produces different pitches. The TRANSPOSITION pushbutton also affect the VCO pitch, just as they did the preset patches.

Moving up and down fully.

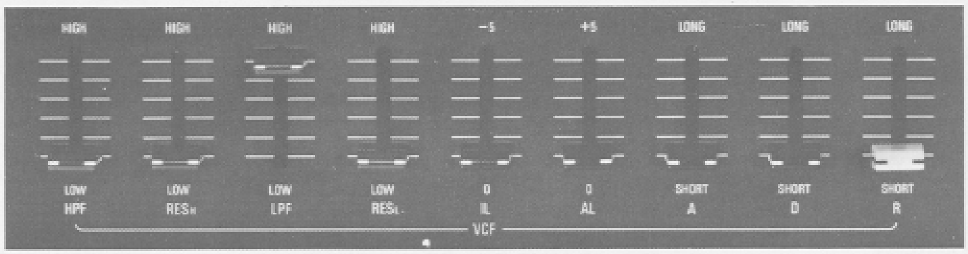




Moving up and down part way.




Several "Controls" set the pitch of the wave you select on the VCO.




[21–29] **VCF** — The **V**oltage **C**ontrolled **F**ilter section (**VCF**) lets some of the frequencies generated by the VCO be heard and cuts out others; hence the term **filter.** The action of the filter modifies the timbre (tone) by altering the harmonic structure of the basic sounds.

All the sounds created by the VCO, except SINE WAVE, are immediately processed by the VCF section. Of the basic sounds available from the VCO, NOISE is the richest in harmonics. White noise appears to be a combination of all audio frequencies—all harmonics and fundamentals—occuring in a continuous, random pattern. Thus, noise makes an excellent sound with which to demonstrate the effects of the VCF.

[21] **LPF** — (Green) Bring up to the NOISE slider [20] to maximum (#10), and play any key. Gradually move the LPF slider down (HIGH to LOW). **The LPF (Low Pass Filter) cuts the high frequencies and allows lower frequencies to be heard:** hence the term low pass filter. Notice how the sound becomes more "dull" as you move the slider down.

[23] **HPF** — (Green) Return the LPF slider to HIGH, thus allowing all noise frequencies to get through the VCF section. Now gradually move the HPF slider up from LOW to HIGH. **The HPF (High Pass Filter) cuts the low frequencies (fundamental and lower harmonics) and allows higher frequencies to be heard:** hence the term high pass filter. Notice how the sound becomes "thin" as you move the slider up. This useful filter, standard with Yamaha CS-series synthesizers, is seldom included in other synthesizers.

Together, the HPF and LPF sliders create a **band-pass** filter; that is, only frequencies above the HPF cut-off and below the LPF cutoff are heard.

This lets you "focus" or emphasize a narrow range of frequencies, perhaps only a few harmonics without the fundamental, or a wide range of frequencies, depending on how you set the HPF and LPF sliders.

NOTE: Think of the HPF and LPF sliders as a pair of curtains that let you "see" the sound. Certain settings of the sliders (the "curtains") can "narrow" the band-pass "window" to nothing—no frequencies can pass through the filters. If you are adjusting these sliders and the sound goes away, move HPF lower and/or LPF higher to "open" the bandpass so sound can come through. (See illustrations on next page.)

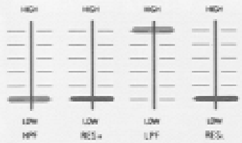
Bring down the NOISE slider, and turn on a saw-tooth wave [19]. Starting with the HPF slider at LOW and the LPF slider at HIGH, gradually move the LPF slider up and down. Then move the HPF slider up and down. You are probably beginning to grasp how the VCF's two filters, HPF and LPF, affect the sound.

The HPF and LPF sliders each set one of two basic filter characteristics, the cutoff frequency. The other basic filter characteristic is **RESONANCE.** Rather than explain resonance at this point, it is easier to demonstrate the effect. (Further explanations of filter characteristics are presented in Sections IV and V of this manual.)

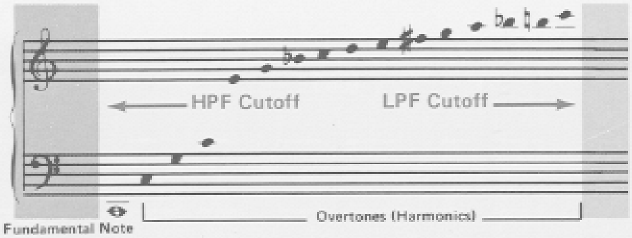
[22 & 24] **RES** — (Red) **H**igh **P**ass **F**ilter **RES**onance is set with the **RESH** slider [22], and **L**ow **P**ass **F**ilter **RES**onance is set with the **RESL** slider [24]. Move both these sliders up to HIGH for maximum resonance effect, and then gradually move the HPF and LPF sliders back and forth, one at a time, while playing a series of notes. Observe the "twang" or "wah" provided by the resonance.

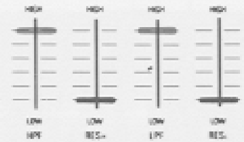
NOTE: There are additional sliders in the VCF section [25–29], but it will be easier to demonstrate their purpose if we first explain what the VCA section does.

Musical examples of filter action. Shaded areas are NOT audible because they are blocked by the filters. Edge of shaded areas represent filter cutoff point.



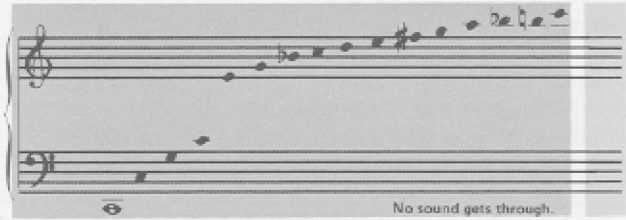
HPF & LPF filters wide open.

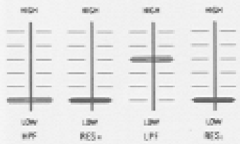


HPF completely closed

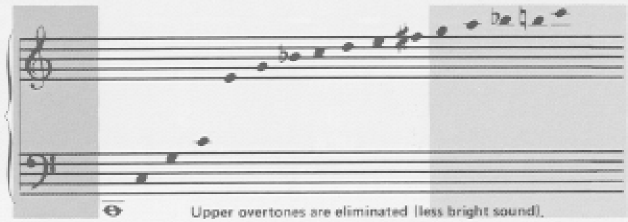
LPF wide open

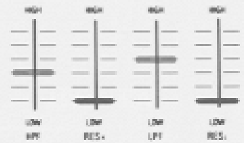


HPF wide open

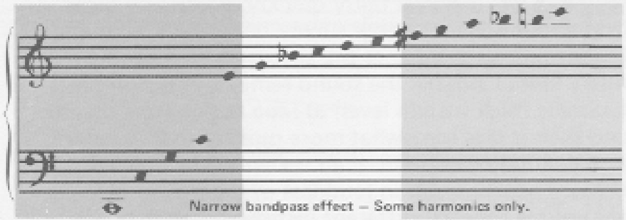
LPF partially closed

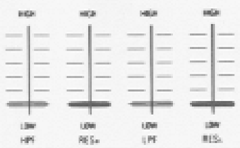


HPF partially closed

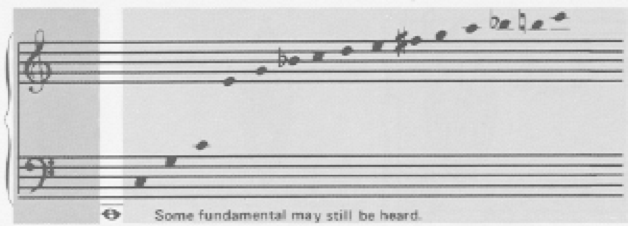
LPF partially closed

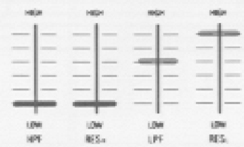


HPF wide open

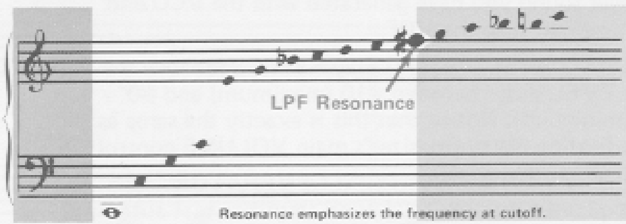
LPF completely closed



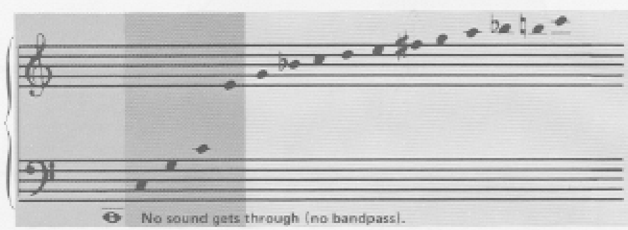
HPF wide open with no resonance

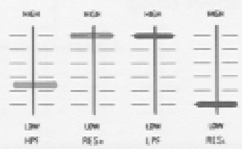
LPF partially closed with maximum resonance




HPF partially closed

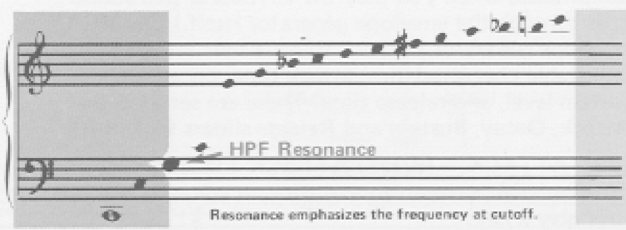
LPF completely closed

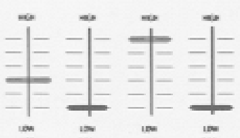


HPF partially closed with maximum resonance

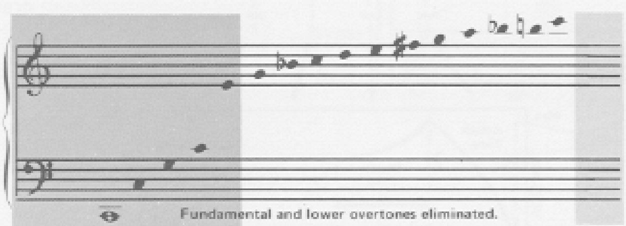
LPF wide open with no resonance

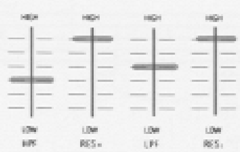


HPF partially closed

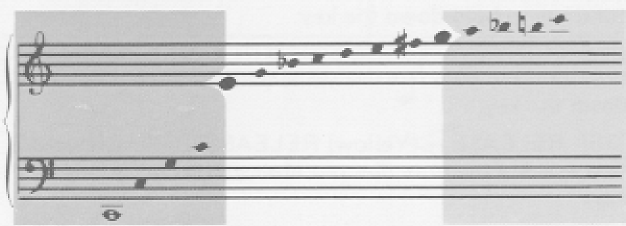
LPF wide open



HPF partially closed with maximum resonance

LPF partially closed with maximum resonance



Narrow bandpass with resonance (move BRILLIANCE [7] for a "wah-wah").

[30-36] **VCA** – The VCA, or **V**oltage **C**ontrolled **A**mplifier, sets the volume (loudness) of the sound. The reason for using a VCA rather than a volume control, however, is that it automatically changes the volume when you play a note. This is a natural characteristic of any instrument, and is therefore important to the realism or effect of the sounds you program.

Consider the sound of a harpsichord, for example. When you play a note, the strings are plucked, so sound starts at maximum loudness (fast attack) and then falls off (decays) fairly quickly. When you blow into a trombone, the note slowly builds to maximum loudness (slow attack) as the air passes through the many feet of tubing; the sound remains at maximum loudness (high sustain level) as long as you have breath, and then it dies somewhat more quickly than it began as the vibrating column of air collapses (fast release time). These changes in loudness over a period of time are unique for each different instrment and they are known as the amplitude or volume **envelope.** The VCA is used to create an amplitude envelope for whatever sound you have generated with the VCO and modified with the VCF.

[36] **LEVEL** – (Gray) Play a note, and move the VCA LEVEL slider between #10 (maximum) and #0 (minimum). Notice that this is exactly the same as adjusting the synthesizer's main VOLUME control [2].

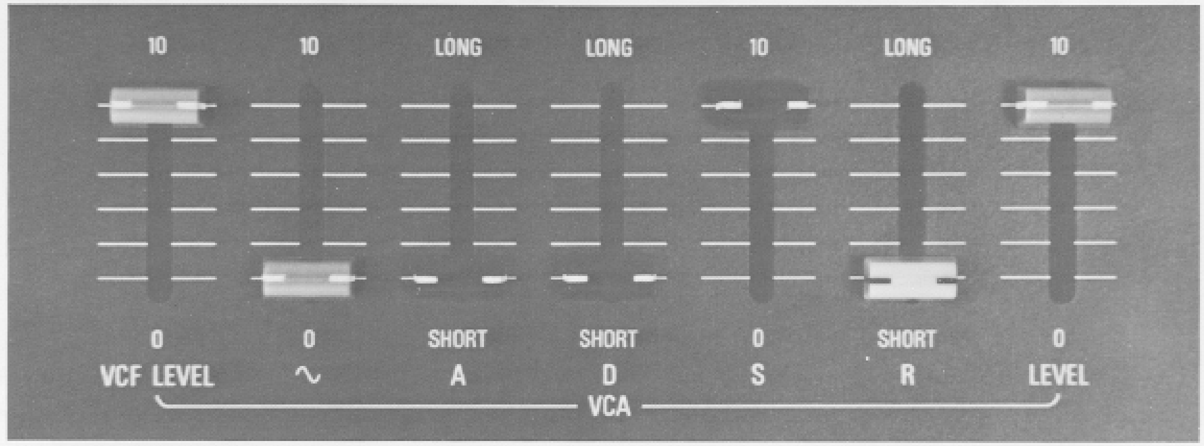
[32-35] **VCA ENVELOPE GENERATOR** – We explained that the VCA is an amplifier that automatically changes the volume; the Envelope Generator (EG) is the circuit that controls the VCA's volume (amplitude) when you play the keyboard. (No sound goes through the envelope generator itself.) The VCA's envelope generator happens to have four independently adjustable characteristics: attack time, decay time, sustain level, and release time. These are set with the **A**ttack, **D**ecay, **S**ustain and **R**elease sliders (A-D-S-R).

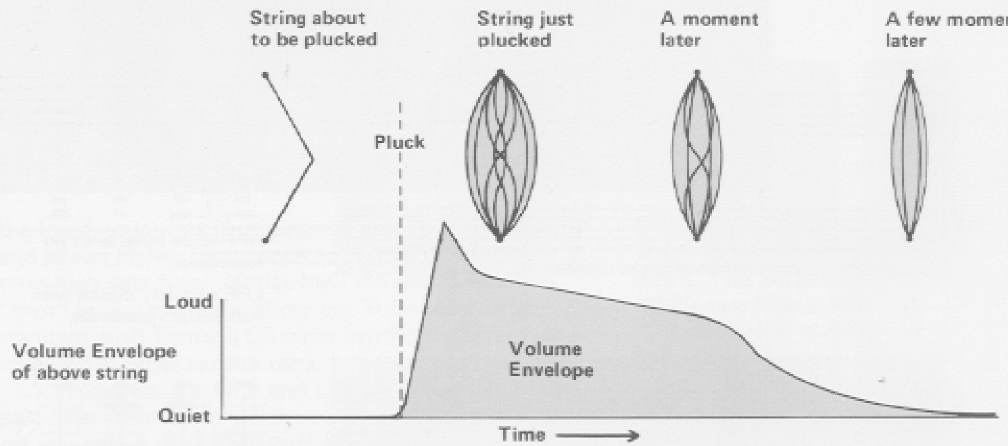
[32] **ATTACK** – (Black) ATTACK TIME defines how fast the VCA turns on to a maximum volume when you **first play** a key.

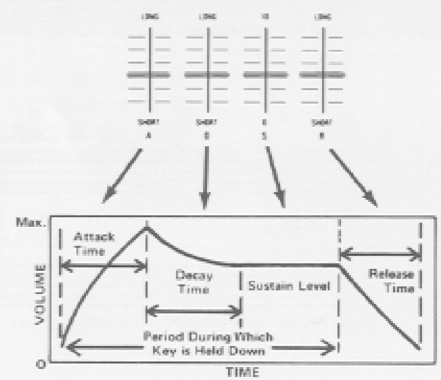
[33] **DECAY** – (Black) DECAY TIME defines how long it takes for the VCA to lower the volume as you continue to **hold down** the key.

[34] **SUSTAIN** – (Black) SUSTAIN LEVEL defines how loud the note remains while you continue **holding down** the key.

[35] **RELEASE** – (Yellow) RELEASE TIME defines how quickly the note dies out after you **let go of** the key.



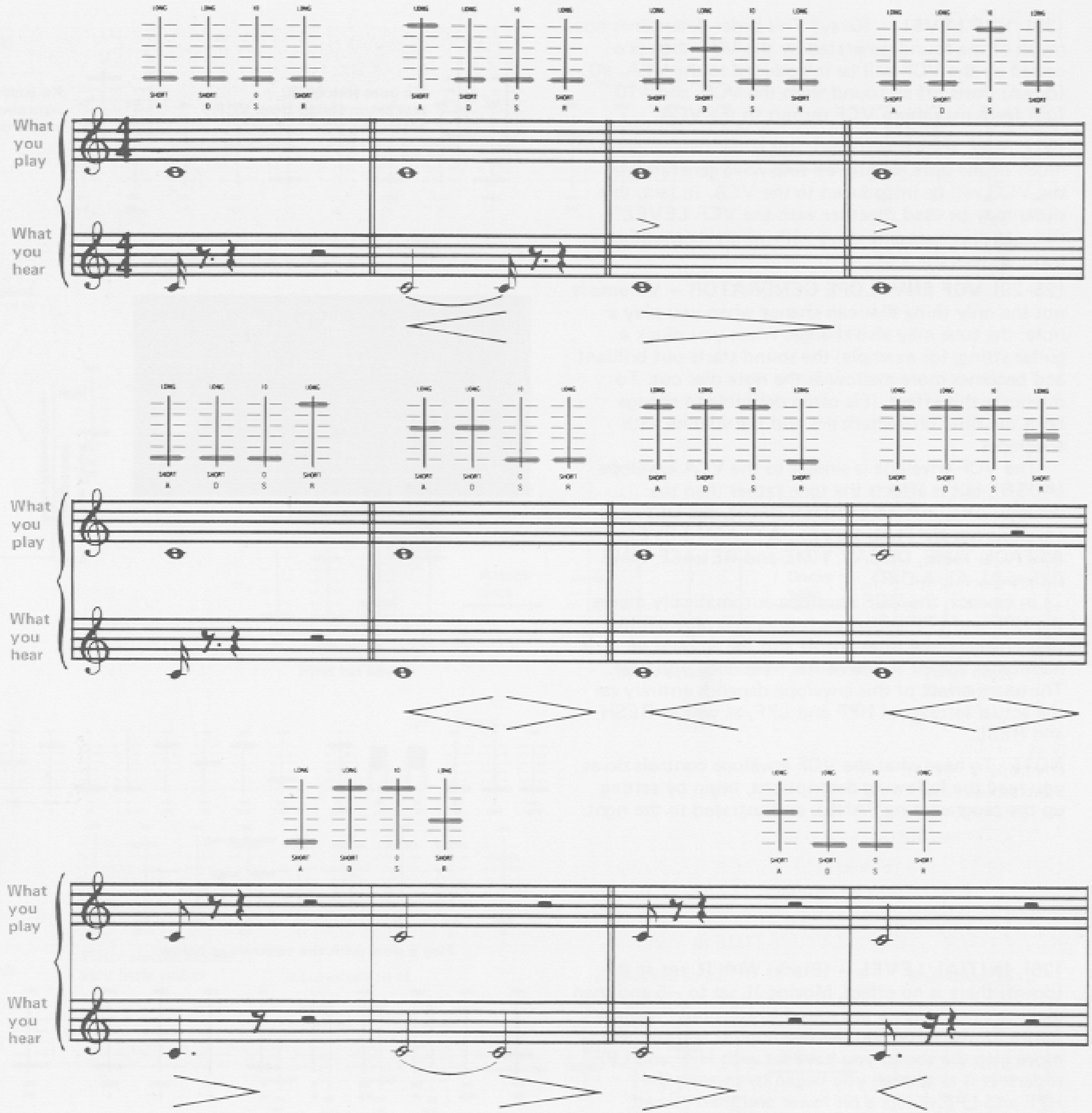



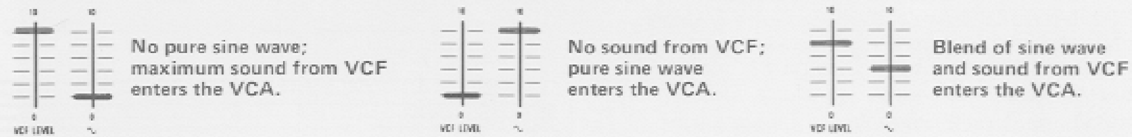
### More About VCA Envelopes

It may be easier for some players to understand the envelope in musical terms rather than with graphs or charts. The illustration to the right demonstrates how different settings of the VCA's A, D, S & R levers affect the sound. Play these examples and listen to the effect of each lever. The examples are not intended to sound like any particular instruments.

NOTE: Upper line represents the notes played. Lower line represents what you hear.



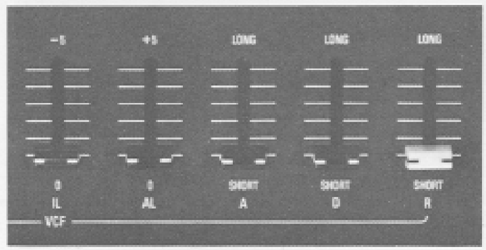
[30] **VCF LEVEL** – (Gray) This slider determines how much of the sound generated by the VCO then processed by the VCF will be introduced to the VCA. #0 (down) shuts off all sound from the VCF, and #10 (up) feeds maximum VCF output to the VCA.

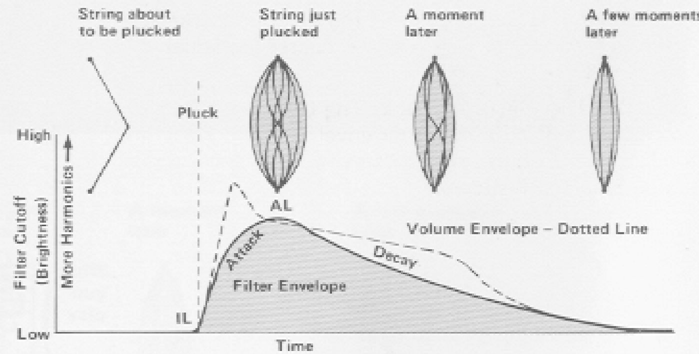



[31] **SINE WAVE** – (Gray) This slider determines how much of the pure, unfiltered sine wave generated by the VCO will be introduced to the VCA. In fact, this slider may be used together with the VCF LEVEL slider to mix pure sine wave with whatever sound is coming from the VCF.

[25-29] **VCF ENVELOPE GENERATOR** – Volume is not the only thing that can change when you play a note; the tone may also change. When you pluck a guitar string, for example, the sound starts out brilliant and becomes more mellow as the note dies out. To duplicate this effect, it is often desirable to change both the filter characteristics and the volume with envelopes.

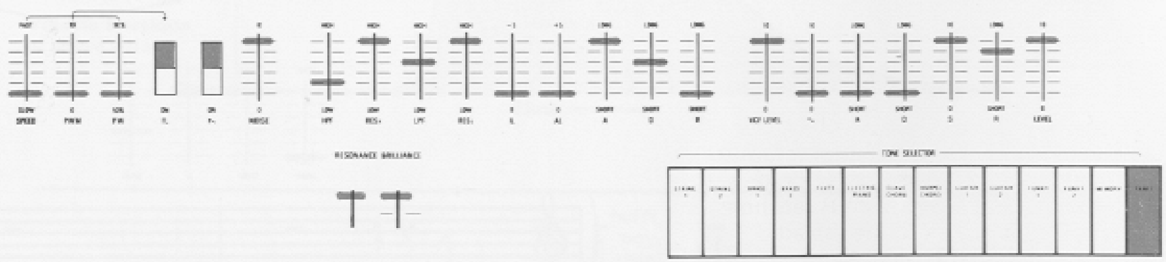
The VCF envelope is similar to the VCA envelope (ADSR), but it affects the tone rather than the volume. Also, instead of ADSR sliders, the VCF envelope has **I**NITIAL **L**EVEL, **A**TTACK **L**EVEL, **A**TTACK TIME, **D**ECAY TIME and **R**ELASE TIME sliders (IL-AL-A-D-R).




In essence, the VCF envelope automatically moves the HPF and LPF sliders each time you play a note, thus changing the filter cutoff and the amount of harmonics and/or fundamental frequency you hear. The exact effect of this envelope depends entirely on the actual settings of HPF and LPF, as well as RESH and RESL.

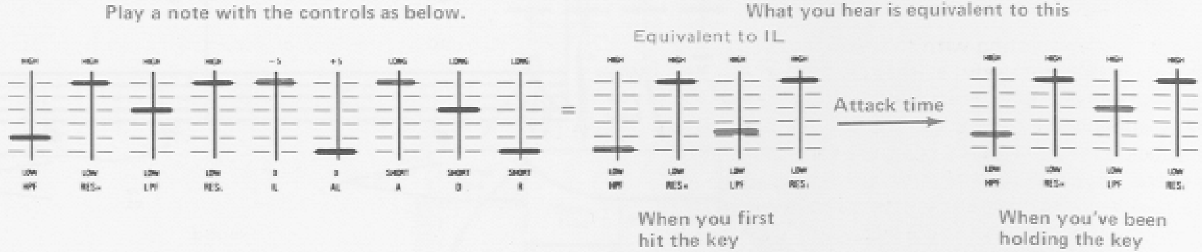
NOTE: To hear what the VCF envelope controls do as you read the following descriptions, begin by setting up the programming PANEL as illustrated to the right.



[25] **INITIAL LEVEL** – (Black) With **IL** set at #0 (down) there is no effect. Moving IL up to –5 and then playing a note causes the sound to start out "mellow" (more fundamental and less harmonics) and to then move into the sound you have set with HPF and LPF sliders. It is as though you began by moving the HPF and LPF sliders a bit lower and then moved them up together as you play the note until they reach the "steady" setting.

Play a note with the controls as below.

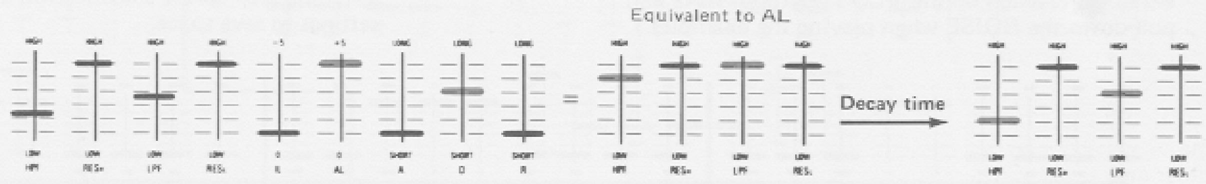
What you hear is equivalent to this



[26] **ATTACK LEVEL** – (Black) With **AL** set at #0 (down) there is no effect. Moving AL up to +5 and then playing a note causes the sound to get "thinner" (less fundamental and more harmonics) and to then move back to the sound you have set with the HPF and LPF sliders. It is as though you moved the HPF and LPF sliders up past the "steady" setting and then brought them down together.

[27] **ATTACK TIME** – (Black) The **A** slider adjusts how long it takes for the filter envelope to move from the "fattest" sound to the "thinnest" sound (these points being set by the IL and/or AL sliders). SHORT (slider down) causes a rapid move that sounds like a "blip," whereas LONG (slider up) causes a gradual change in tone.

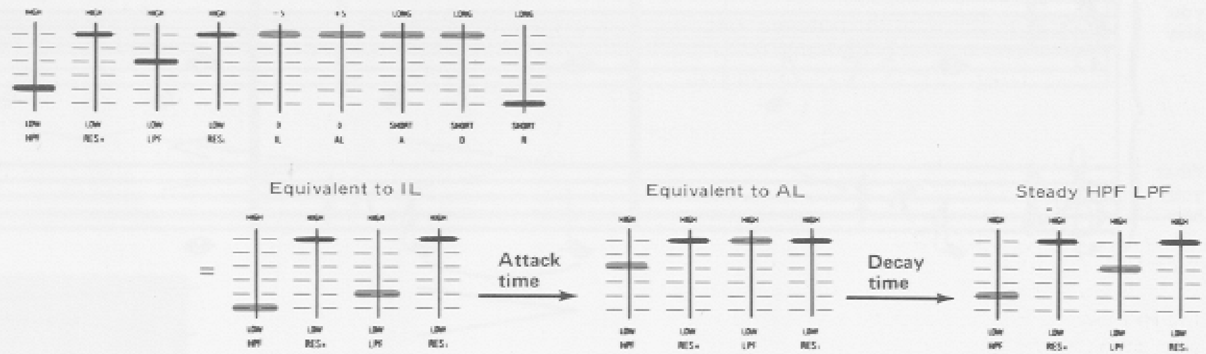
[28] **DECAY TIME** – (Black) The **D** slider adjusts how long it takes for the filter envelope to move from the "thinnest" sound to the "steady" sound set with the HPF and LPF sliders.




**Like starting with HPF & LPF higher and then moving down**

**First hit key**

**Holding key down**



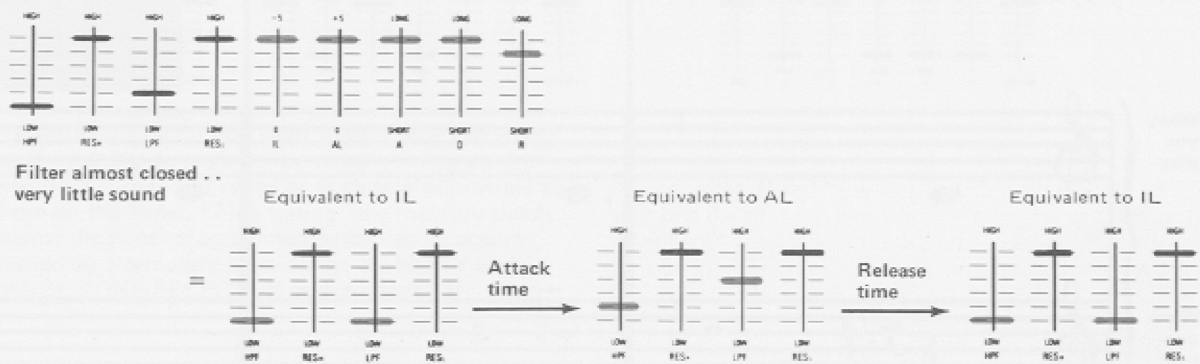

**First hit key**

**After attack**

**After decay (holding key)**

[29] **RELEASE TIME** – (Yellow) The **R** slider adjusts how long it takes for the filter to return to the **IL** setting after you let go of the key or keys. If the **IL** slider is set at #0 (down), then **R** sets how long it takes for the filter to return to the "steady" setting after you release the key. If **IL** and **AL** are both at #0, then **R** has no effect.

By experimenting with the VCF envelope, you will find that many useful effects can be achieved, including whistle and rushing wind. Brass sounds are greatly enhanced by the use of IL and AL with moderate attack and decay times. To get a very sharp "blip" for extremely percussive sounds, set AL up to +5 and set attack and decay at the shortest time (down). You will also find that the VCF envelope and VCA envelope can be manipulated together to get still more variations in effect.




**Filter almost closed . . very little sound**

**No sound**

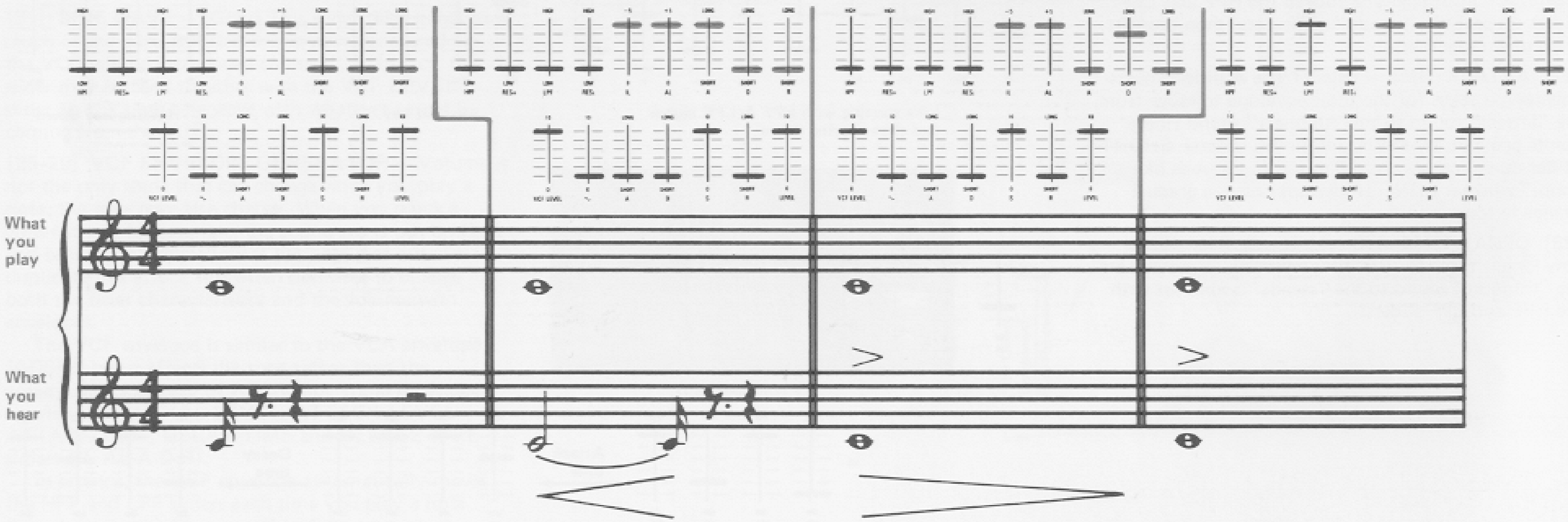
**A lot of sound**

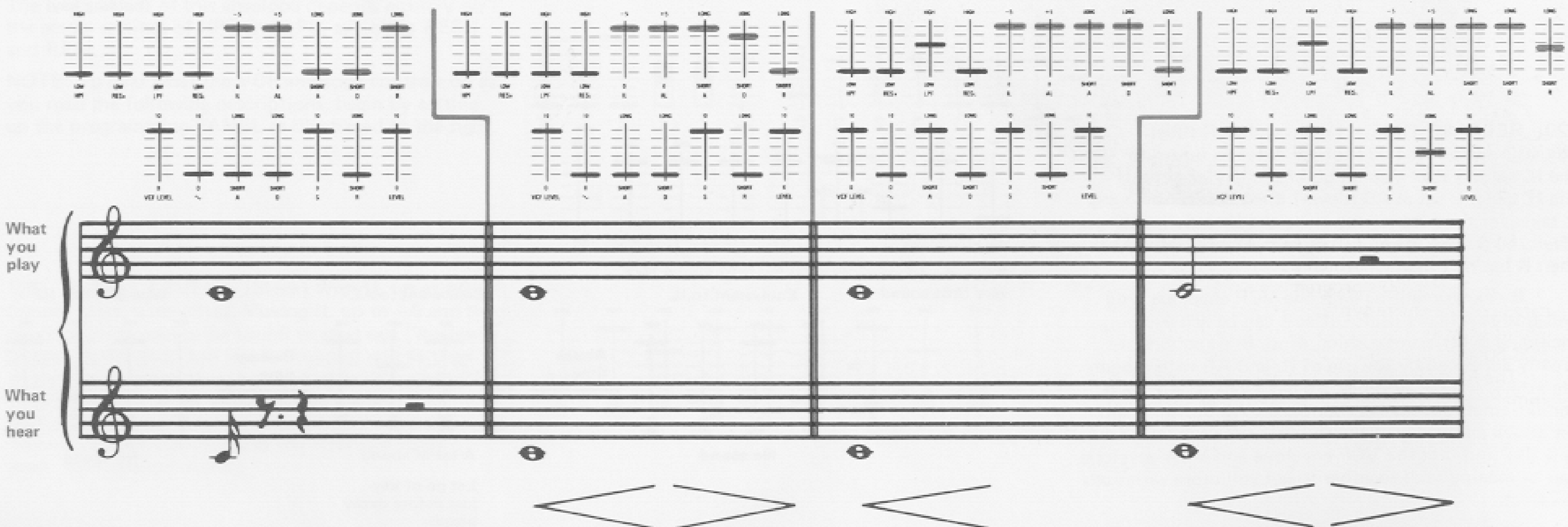
**Let go of key just before decay begins**

**No sound**

The musical examples provide an alternative to the preceding charts for understanding the VCF envelope. (Switch on the VCO's sawtooth wave and pull down the NOISE when playing the examples.)

NOTE: In these illustrations, hairpins represent changes in filter response, not level. The VCA envelope settings are shown below the VCF settings to save space.

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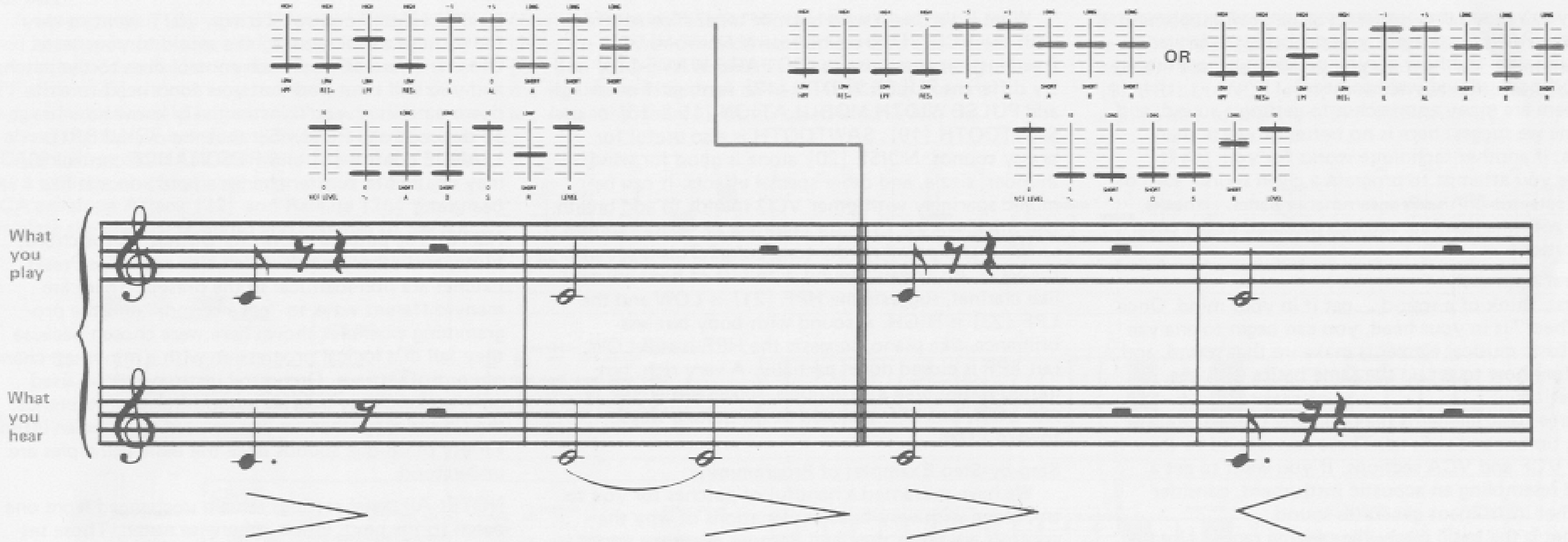
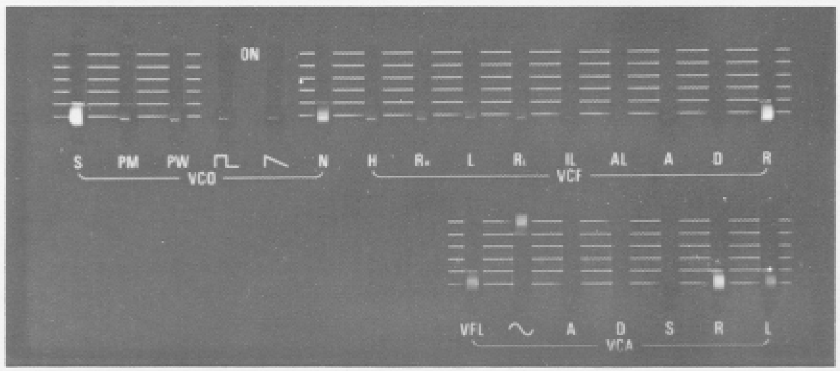



[37] **MEMORY (CS-60 ONLY)** – The memory is beneath a hinged cover which bears a simplified block diagram of the CS-60's programming functions. (Block diagrams of the entire synthesizer and simplified block diagrams showing only the programmable panels of both the CS-50 and CS-60 are discussed in Section V).

The Memory is a miniaturized version of programmable panel, minus the detailed labeling. Once you develop a patch you want to save, you can transfer the settings to memory by visually lining up the memory's sliders and switches as closely as possible to those on the Panel. "Fine tuning" the memory patch against the panel-programmed patch can be accomplished by alternately pressing the MEMORY and PANEL TONE SELECTOR pushbuttons [3].

If you've read the previous section and experimented with the PANEL controls, you probably understand what they do, but how do you go about programming a specific sound you want to hear?

There are many approaches to getting a sound, and the one we suggest here is no better or worse than others; if another technique works for you, use it. Before you attempt to program a given sound, turn off all effects not on the Programmable panel. . .that is, begin with the nominal settings pictured in the cover illustrations.

### General Approach

First, think of a sound. . .get it in your mind. Once you "hear" it in your head, you can begin to analyze what basic musical elements make up that sound, and therefore how to set up the same basics with the synthesizer.

Three basic elements make up any musical sound, pitch, timbre and volume. These correspond to the VCO, VCF and VCA sections. If you want to get a sound resembling an acoustic instrument, consider how that instrument generates sound.

What is the basic pitch, the playing range? Use the TRANSPOSITION pushbuttons [4] to set the keyboard to an appropriate pitch range.

What is the basic waveform or tone? You set this with the VCO. If the sound resembles woodwinds (reed instruments), use the SQUARE WAVE [18] and try different PULSE WIDTH [17] settings. For strings, add PULSE WIDTH MODULATION [15 & 16] or use SAWTOOTH [19]. SAWTOOTH is also useful for brassy sounds. NOISE [20] alone is good for wind, thunder, sizzle, and other special effects. It can be mixed sparingly with other VCO sounds to add breath. Use SINE WAVE [31] for colorless or "pure" sounds.

What is the timbre, the tone color? This is set with the VCF. An "open" sound with lots of harmonics, like clarinet, suggests the HPF [21] is LOW and the LPF [23] is HIGH. A sound with body but less brilliance, like piano, suggests the HPF is still LOW, but LPF is closed down partially. A very rich, but muted sound, like a string bass, suggests the HPF is still LOW, but LPF is closed down quite a ways toward LOW.

### Step-by-Step Examples of Programming

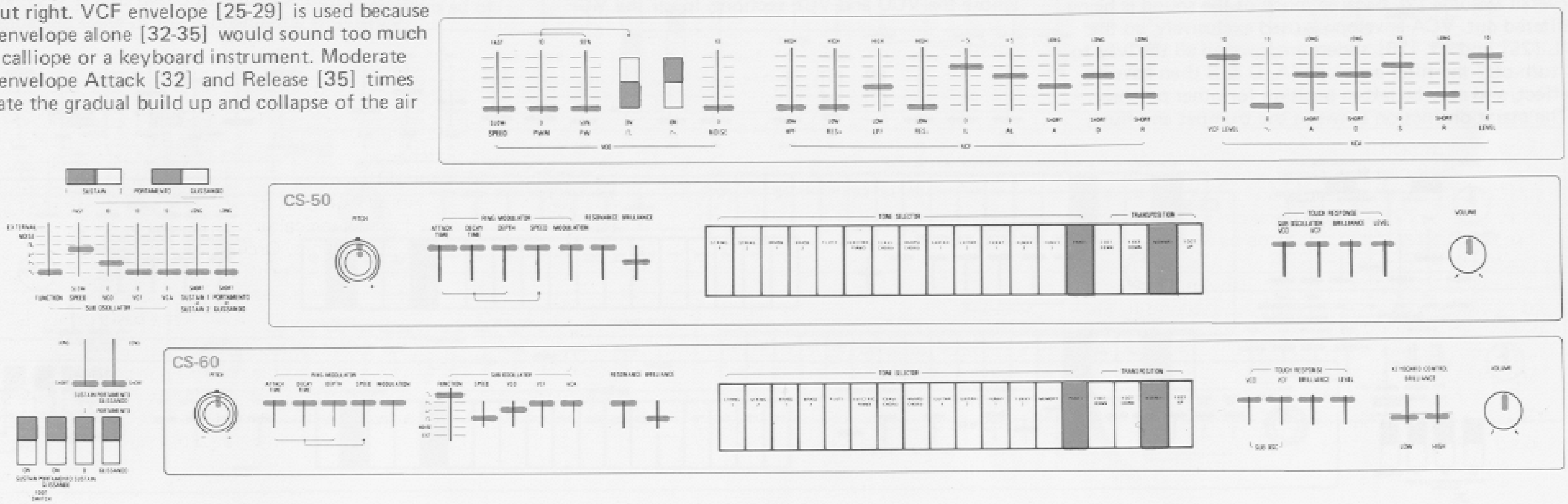
We have presented a handful of patches for you to try, along with very brief explanations of why the controls are set as they are. Because everyone conceives of and plays sounds differently, and because normal component tolerances make it impossible to give "absolute" control settings, you'll want to vary the settings to "fine tune" the sound to your taste. Become aware of what each control does to the patch, and you will soon find that you don't need to write down patches. . .you'll instinctively know how to set all the controls. Remember that the overall BRILLIANCE control [5] and RESONANCE control [6] may be used to further change a patch once it has been set.

NOTE: The patches shown for Strings, Harpsichord, Flute, and other sounds which also appear as Preset Patches are non-identical to the presets. There are many different ways to "get a sound," and the programming examples shown here were chosen because they fall in a logical progression with a minimum change of control settings. Orchestral instruments are used only because they provide a good frame of reference; the CS-series synthesizer can be used to make an infinite variety of unique sounds once the basic principles are understood.

NOTE: All panel settings remain unchanged from one patch to the next, unless otherwise noted. Those settings which do change from the previous patch are marked in color on the patch diagrams.

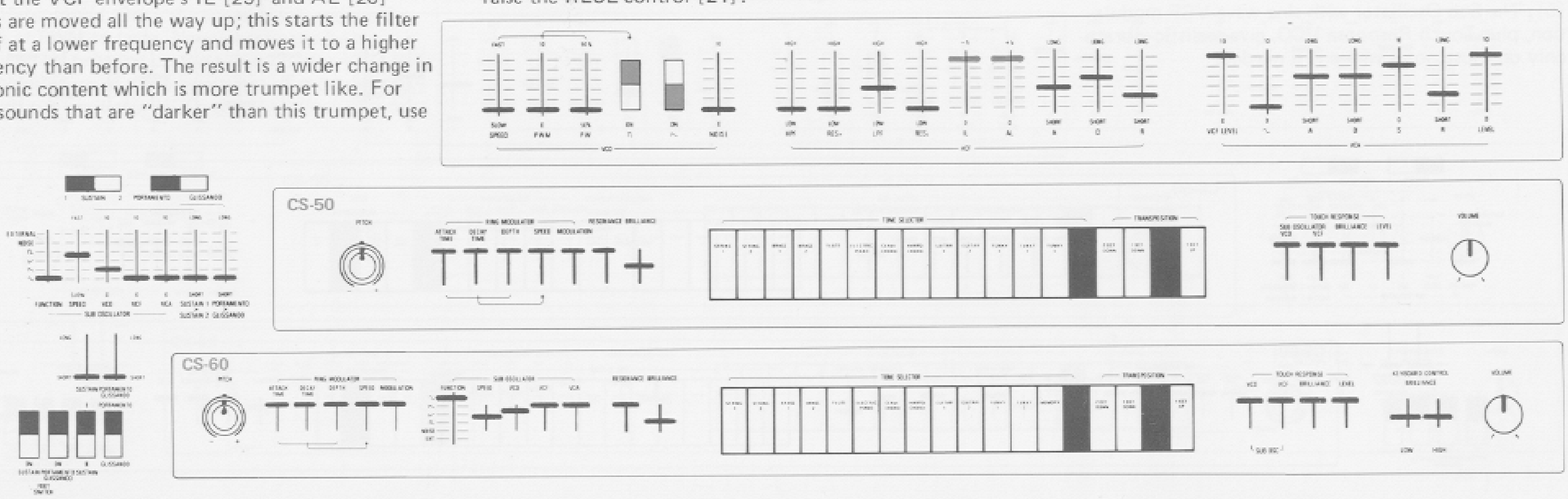
## Clarinet

A square wave [18] with 50% pulse width [17] is used because it simulates a single reed instrument by generating odd-order harmonics (3rd, 5th, etc.). The LPF slider [23] should be set so the sound is clarinet-like; wide open would be too bright, and mid way up is about right. VCF envelope [25-29] is used because VCA envelope alone [32-35] would sound too much like a calliope or a keyboard instrument. Moderate VCA envelope Attack [32] and Release [35] times simulate the gradual build up and collapse of the air column in a true clarinet. Vibrato is provided by modulating the VCO with a sine wave in the Sub Oscillator [8]. The VCO lever should first be fully engaged so the maximum effect can be heard while the speed is set. After the desired vibrato speed is achieved, the VCO modulation should be reduced for a more realistic effect (excess vibrato often leads to a synthetic sound). You may wish to engage the Touch Response [9] BRILLIANCE lever, in which case it is probably a good idea to lower the LPF slider slightly.




## Trumpet

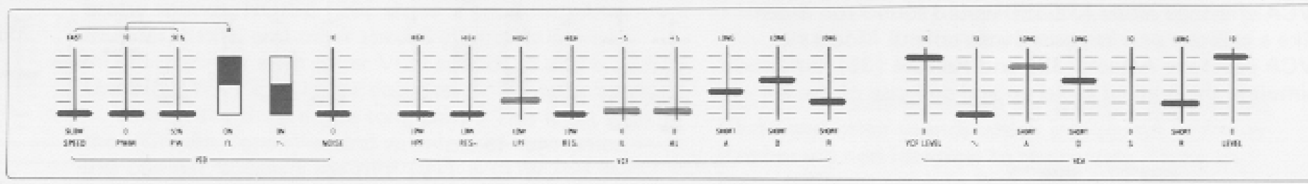
Change from square wave to sawtooth wave [19] to include even-order harmonics for a richer sound. The rest of the patch is almost identical to the clarinet, except the VCF envelope's IL [25] and AL [26] sliders are moved all the way up; this starts the filter cutoff at a lower frequency and moves it to a higher frequency than before. The result is a wider change in harmonic content which is more trumpet like. For brass sounds that are "darker" than this trumpet, use slightly longer VCF and VCA attack (27 & 32] and release times [29 & 35], and lower the LPF slider [23] somewhat. For more of a coronet or "wah" sound, raise the RESL control [24].

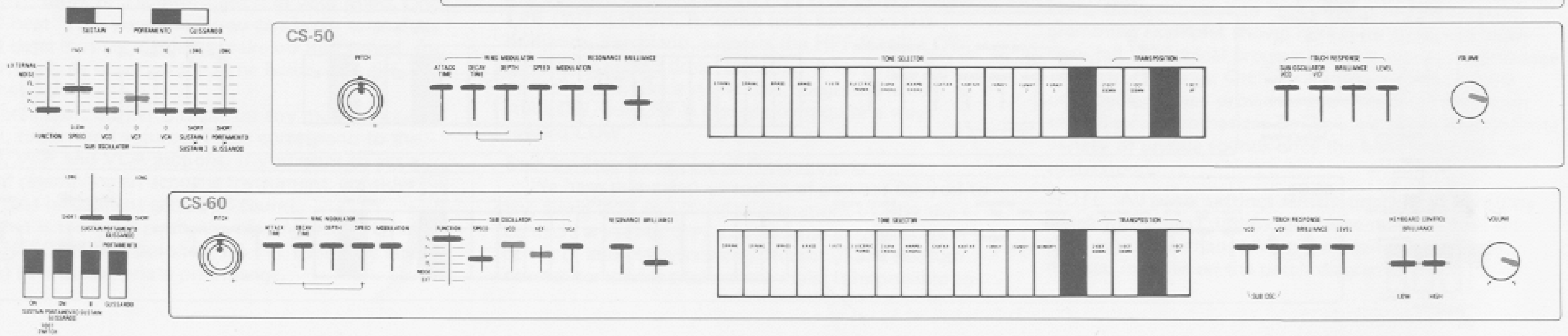


## Flute

The sawtooth is still an appropriate waveform, but fewer harmonics are desired, so the LPF slider [23] should be lowered. As harmonics are cut out by lowering the LPF filter cutoff, the waveform actually begins to resemble a sine wave. It is necessary to turn up the overall Volume [2] because much of the sound is being filtered out. VCA envelope is used exclusively, so the IL [25] and AL [26] sliders are lowered all the way to "turn off" the filter envelope (A, D & R then have no effect, and may be left in position for other patches). The major distinction between the trumpet and flute, other than filter cutoff frequency, is the change in Sub Oscillator modulation [8]; VCO modulation should be greatly reduced or turned off altogether, and instead replaced by VCF modulation.

Another way to program a flute is to completely ignore the VCO and VCF sections, lower the VCF slider [30] and use sine wave [31] instead. VCA envelope then defines the note exclusively. However, no instrument is quite as perfect as the sine wave, and this patch tends to sound artificial. The quasi-sine wave generated with a heavily filtered sawtooth wave tends to be more realistic.

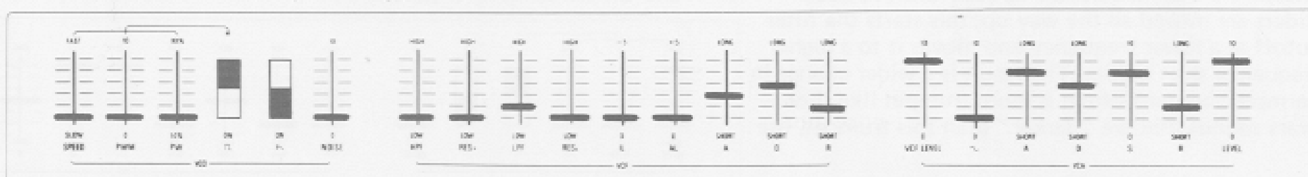


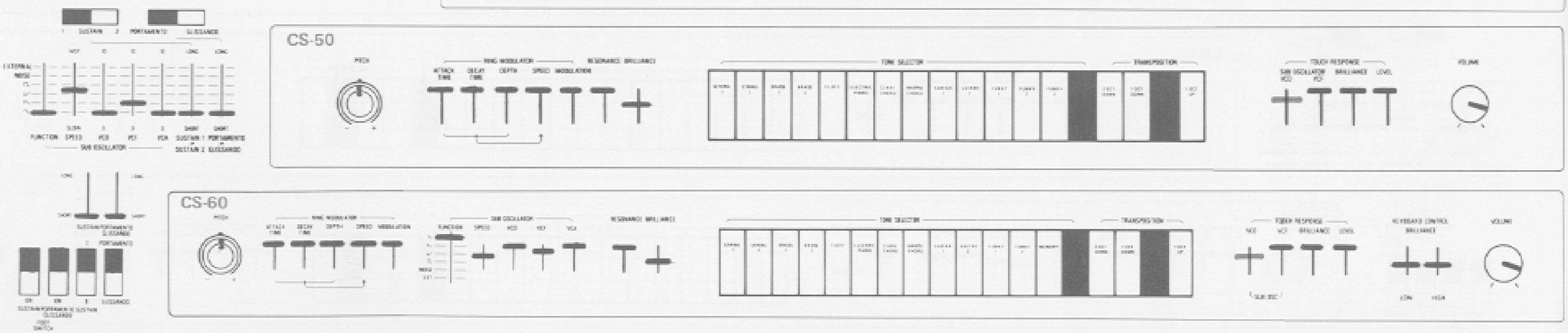



## Solo Violin

This patch is almost identical to the flute patch, with the addition of VCO modulation. Overall tone may be changed somewhat with the Brilliance lever [5]. The Sub Oscillator with sine wave VCF modulation, plus Touch Response VCO, give realistic vibrato only on those notes where it is needed.

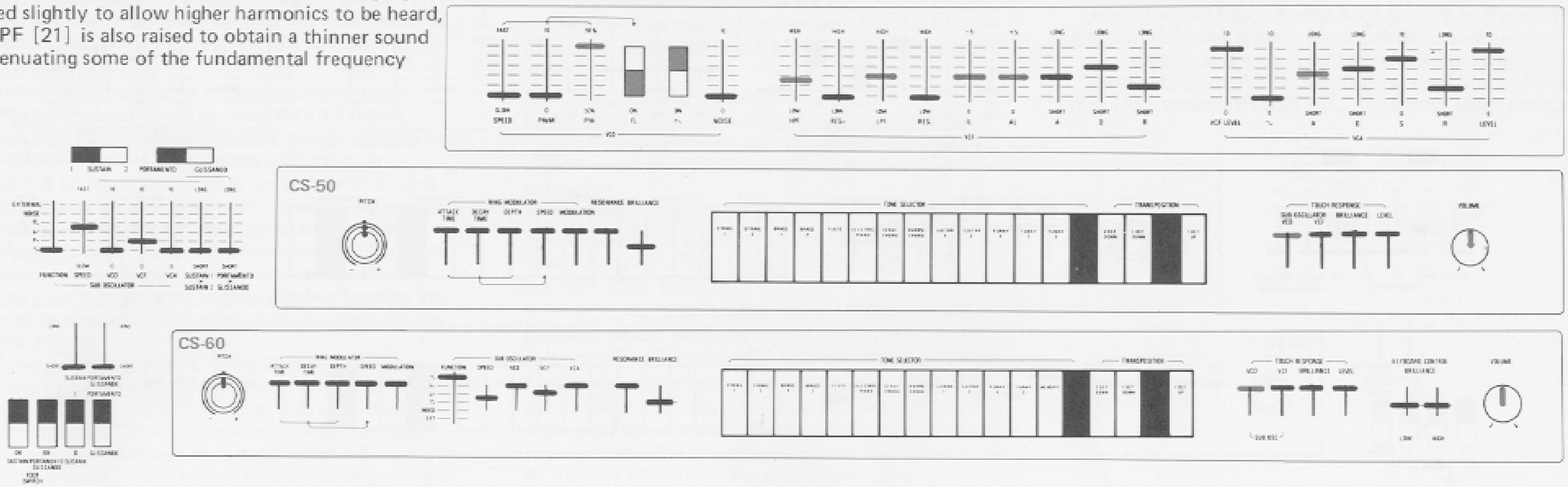
NOTE: Consider the foregoing patches and what changes occurred in the sound as relatively few changes were made on the programming panel. Observe that a different waveform or IL-AL setting account for the most dramatic changes.





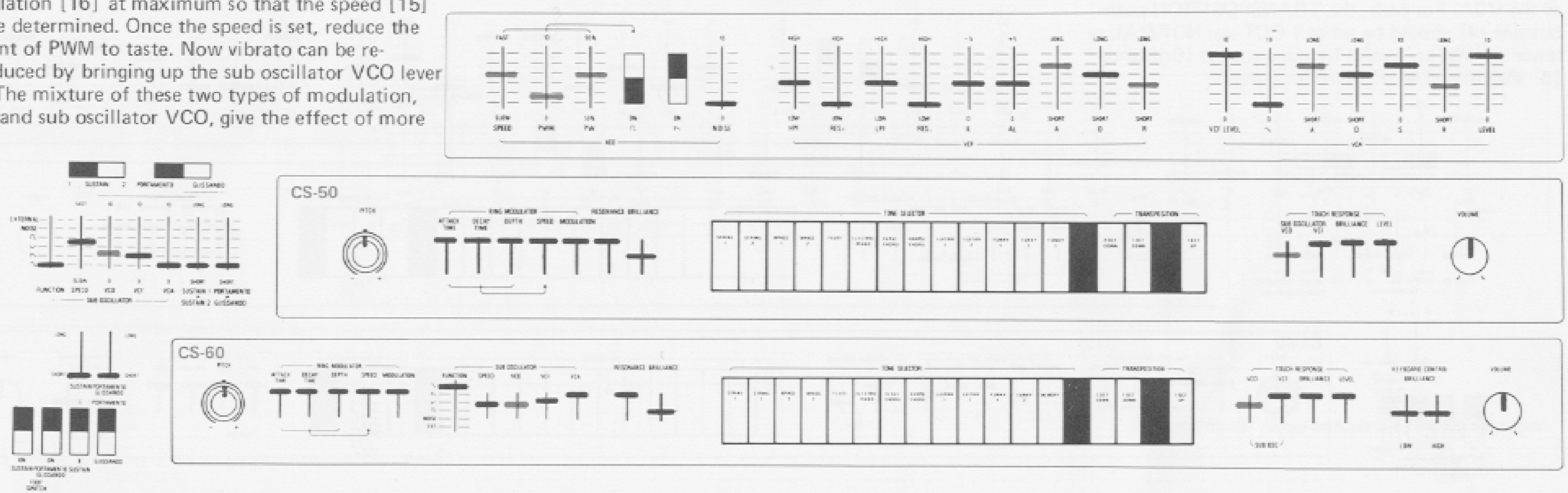
## Oboe

Turn off the sawtooth wave and switch to the square wave [18]. Use 90% pulse width [17] which eliminates specific harmonics, as would be the case with a double-reed instrument. The LPF slider [23] is raised slightly to allow higher harmonics to be heard, and HPF [21] is also raised to obtain a thinner sound by attenuating some of the fundamental frequency (this creates a narrow bandpass). IL and AL [25 & 26] are raised to introduce some filter envelope which simulates tonal changes that occur due to changing embouchure. Some low pass resonance [24] may be added if desired, but AL [26] should then be lowered to avoid a "wah" sound.



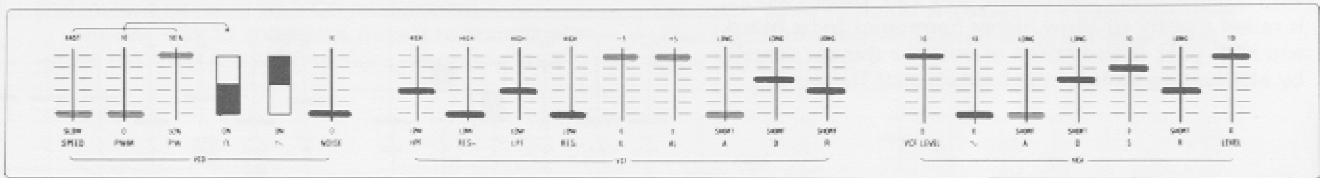

## Multiple Strings

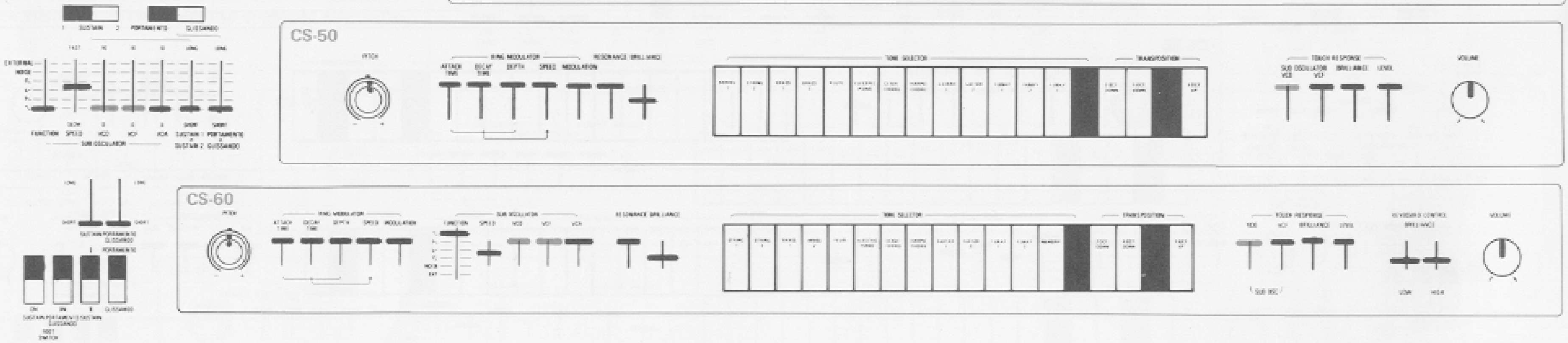
Temporarily turn off the Sub Oscillator VCF modulation [8] and Touch Response VCO so that the rate of pulse width modulation can be easily heard. Reduce the pulse width [17] to about 70%, and set pulse width modulation [16] at maximum so that the speed [15] can be determined. Once the speed is set, reduce the amount of PWM to taste. Now vibrato can be reintroduced by bringing up the sub oscillator VCO lever [8]. The mixture of these two types of modulation, PWM and sub oscillator VCO, give the effect of more than one instrument playing. The VCF and VCA attack times [27 & 32] and release times [29 & 35] are lengthened to simulate the bowing of strings as opposed to the quicker initiation of sound in an oboe.



## Clavichord

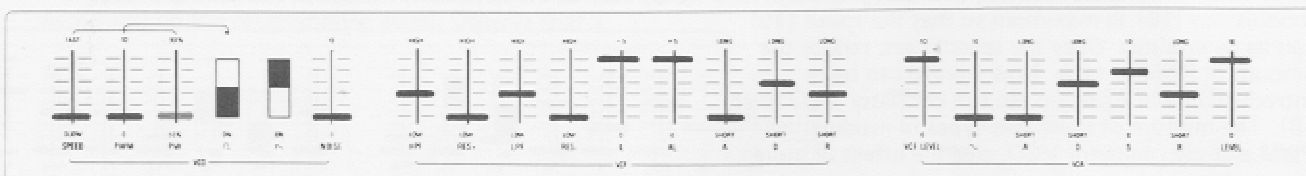
Lower the PWM slider [16] all the way, and raise the pulse width to 90% [17]. Remove all Sub Oscillator [8] modulation. VCF and VCA envelope Attack times [27 & 32] are both set at minimum for a plucked sound. While either VCF or VCA attack could be used alone, together they provide a more natural sound, simulating the change in harmonics that occurs as a string is plucked and then settles down (VCA envelope alone sounds more synthetic). Low Pass Resonance [24] may be added, but the AL should then be lowered somewhat to avoid a "wah" sound.

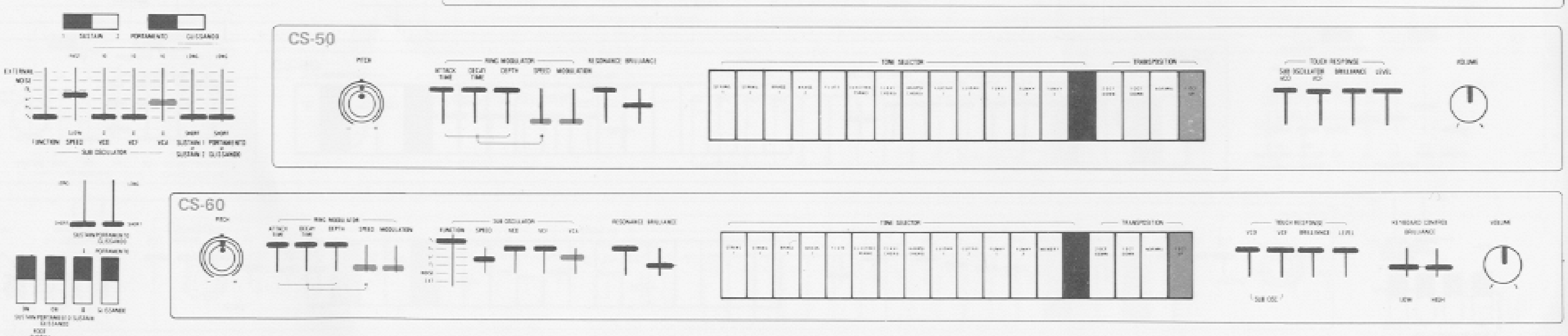





## Bells & Gongs

Move the pulse width [17] back to 50%, and fully engage the Ring Modulator [12] Speed and Modulation controls. If desired, add Sub Oscillator [8] modulation of the VCA. For bells, the TRANSPOSITION push-buttons [4] should be set at 1 OCT up; NORMAL or lower settings are useful for gong sounds (Brilliance [5] should also be adjusted for gongs).





## USING THE PROGRAMMABLE PANEL TO DUPLICATE THE PRESET PATCHES

As stated elsewhere in this manual, the preset patches were all derived from settings of the programmable panel. Normally, there would be no need to duplicate the presets by programming the panel. However setting up the panel to emulate the presets can serve as a good point of departure for developing your own patches.

The following diagrams of programmable panel settings correspond to the synthesizer's 13 preset patches (the CS-60 has a MEMORY button instead of the FUNKY 3 preset, but you can still program FUNKY 3 on it). Some settings are very critical, and a slight change of adjustment can make the difference between a poor match or a perfect match with the equivalent preset's sound. The fine tuning of controls necessary to match the preset is very relevant to making your own entirely unique patches because you experience how to subtly manipulate the controls for specific effects.

A few patches are more difficult to fine-tune than the others, due to a combination of a critical pulse width adjustment, HPF and LPF settings that yield a band-pass filter, and VCF envelope. The "tricky" patches are: Clavichord, Guitar 1 & 2, and Funky 1 & 3; it is probably a good idea to return to these after you have worked through the other patches.

1. Tune the patches using the middle of the keyboard (Transposition set at NORMAL [4]). This allows you to hear the fullest spectrum of overtones for more accurate adjustments.

2. If the setting involves adjustment of Pulse Width [17], first adjust that control for the closest sound match.

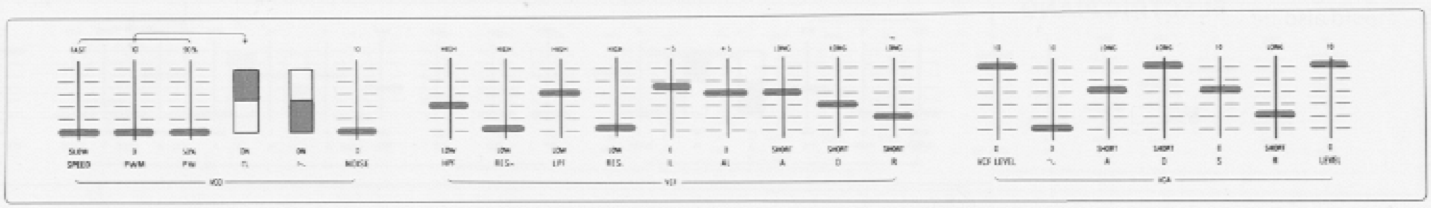
3. Adjust the filter settings [21-25]: LPF, HPF, RESL and RESH. Press the keys lightly so that any Touch Response effects do not commence. (NOTE: If VCF envelope [25-29] is in use, also see Step 4 below.)

4. If VCF envelope (IL and/or AL) is in use, hold down a key until the filter settles to a steady, unchanging cutoff. Then adjust the filter LPF [23] and HPF [21] controls.

5. If VCF AL [26] is used, adjust it to produce the brightest sound obtained in that patch; then readjust the LPF [23] and HPF [21] sliders as required.

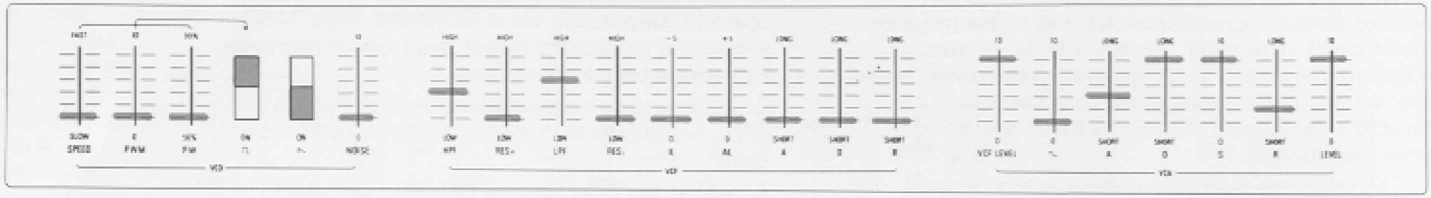
6. If the program and panel patches are the same, then they should react identically to exaggerated settings of the overall Brilliance [5] and Resonance [6] controls. One at a time, set these two controls all the way up, and all the way down, comparing the preset and programmed patches. If differences in sound are observed at extreme settings, adjust the corresponding controls on the Panel to re-match the preset and programmed sounds: RESH and/or RESL at extreme Resonance settings; HPF and/or LPF at extreme Brilliance settings.

**STRING 1**

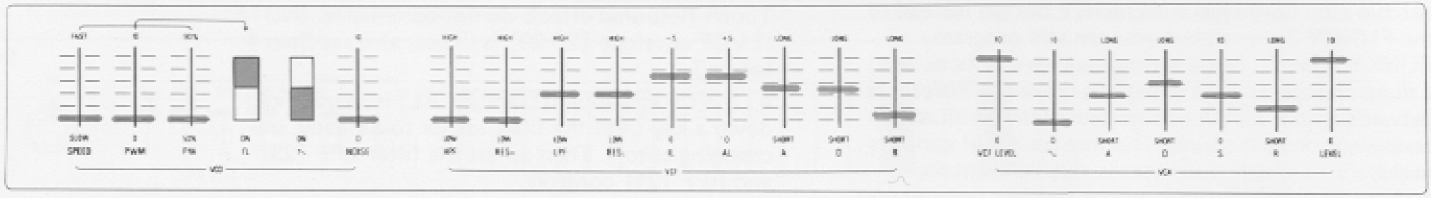


*See additional panel setups on following pages.*

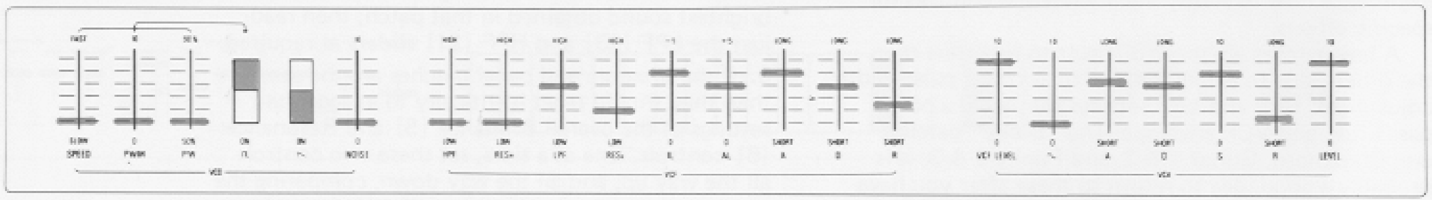
STRING 2



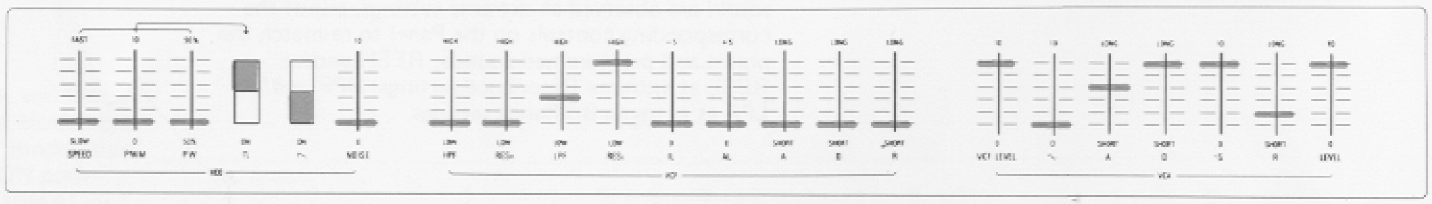
BRASS 1



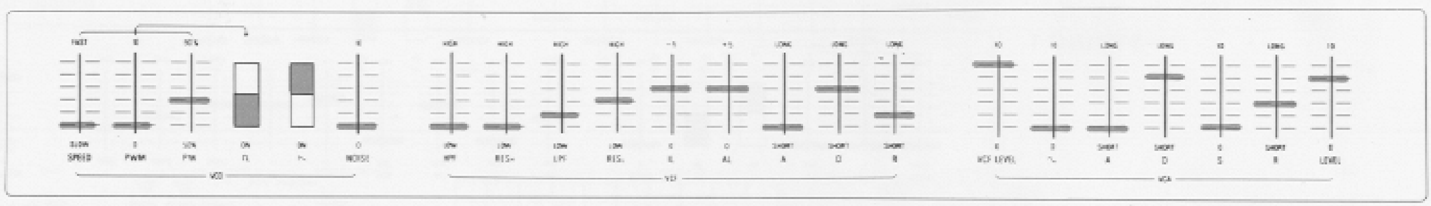
BRASS 2



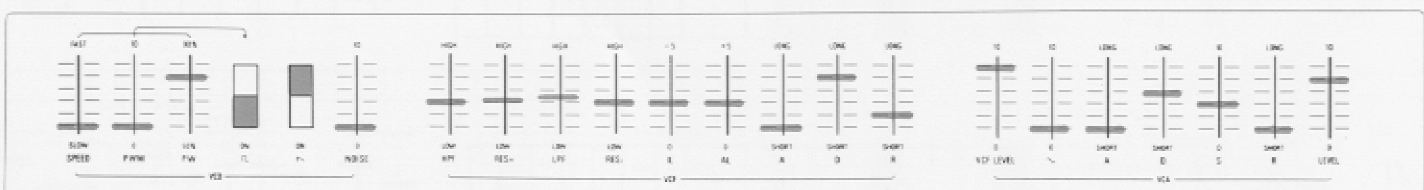
FLUTE



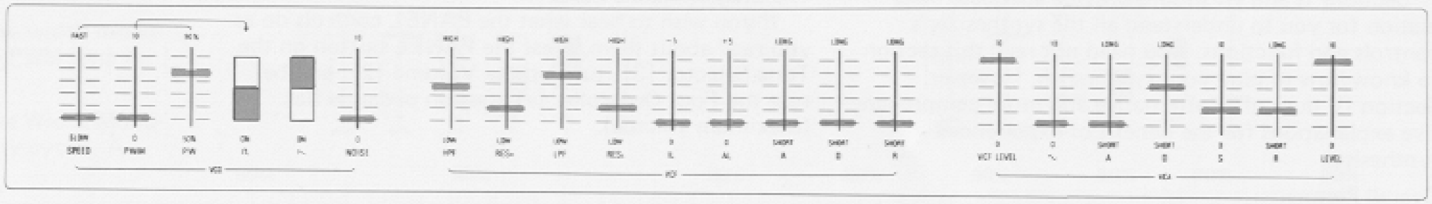
ELECTRIC PIANO



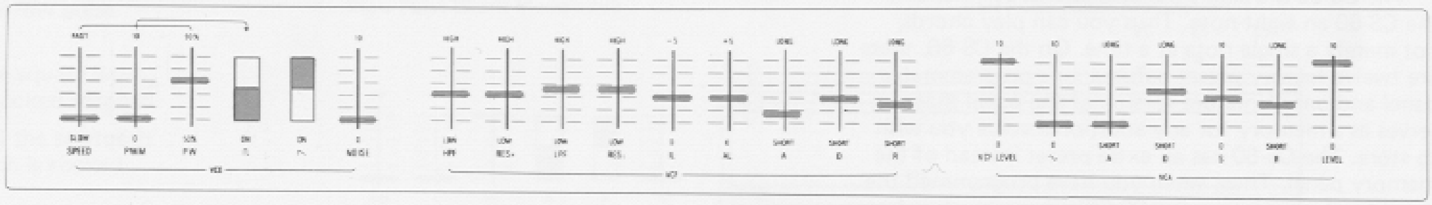
CLAVICHORD



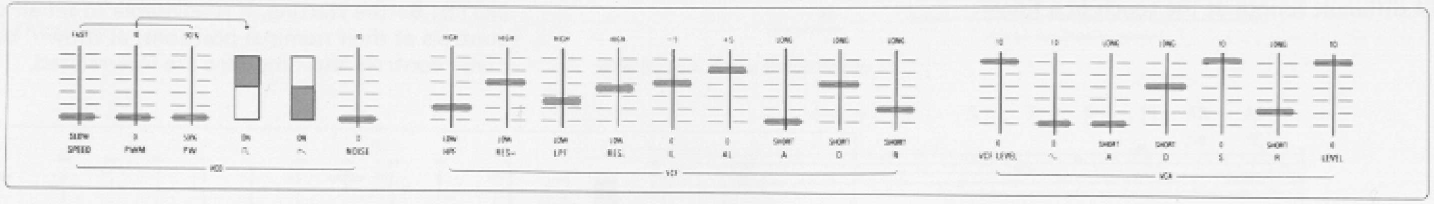
HARPSICHORD



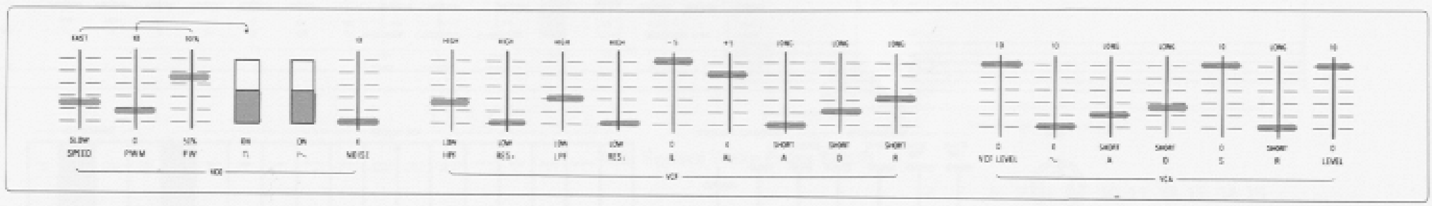
GUITAR 1



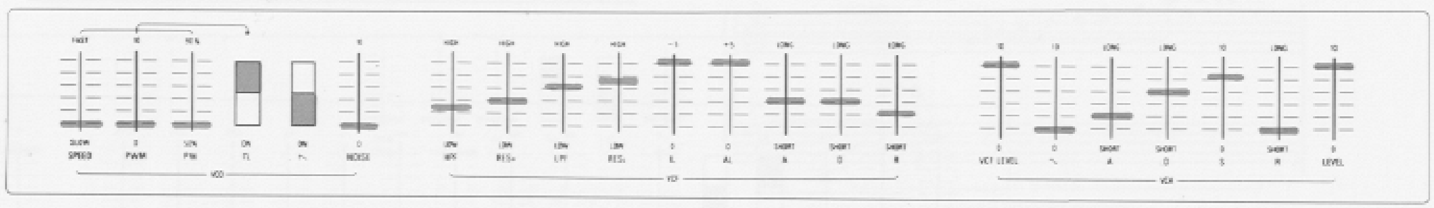
GUITAR 2



FUNKY 1



FUNKY 2



FUNKY 3

**Appears on CS-50 only, but may also be programmed on CS-60.**