

This section presents detailed information on all the synthesizer's sliders, levers, switches and rotary controls, except the Panel and Memory controls, which are treated separately in Section IV. We have included many diagrams to illustrate the effects of the controls, and to stimulate your own imagination. If you would like more information about synthesizers in general, refer to Section V.

Within this manual, or any manual, it would be impossible to completely describe the many sounds you can achieve with your synthesizer. However, we feel that if you understand the concept of the instrument, and generally are familiar with how it works, you will be able to use the CS-50 or CS-60 with creativity and skill.

The CS-50 and CS-60 allow you to learn that your playing style has as much to do with the "realism" of a sound as does the inherent sound of the synthesizer. If you play a good recording of a clarinet note, but turn on the speaker only during the middle of the note, it might sound like a purely electronic sound because the way the tone and volume change during the note are essential to defining the clarinet character. Musical realism often depends on the musical context as well, since other instruments can mask or bring out a given sound.

With synthesizers, the word "patch" commonly describes the control setup for any given sound. Historically, there used to be physical patch cords or pegs that had to be connected for each new sound. . . some synthesizers still use this system. However, the CS-50 and CS-60 are third-generation instruments, and many advances in design allow all patching to be done internally, and quickly, with no cords to handle. Still, out of tradition and for lack of a better term, we refer to each program (each sound) as a patch.

Explanatory Notes:

A. The synthesizer controls are color coded. Different color knobs suggest different types of functions, as follows:

- GREEN = general filter characteristics
- RED = filter resonance
- WHITE = pitch
- GRAY = volume
- YELLOW = sustain
- BLACK = other functions

B. In this section, we have indicated control knob colors in parentheses. (Button colors for the preset patches do not strictly follow the color coding scheme.)

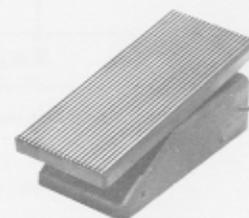
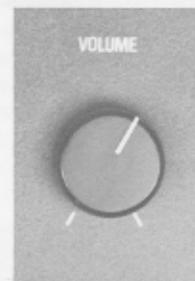
C. All slider controls and levers on the synthesizer move in a forward-to-backward direction relative to the player. However, some controls are arranged so that maximum effect occurs nearest the player (lever down), and others give maximum effect away from the player (lever up). Therefore, in the text of this manual, settings are sometimes suggested by the words "down" or "up," which avoids confusion with "max" and "min."

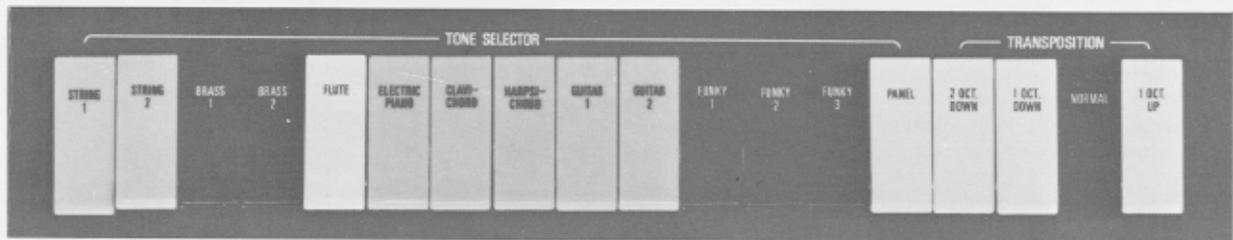
D. Interspersed among the discussions of the basic sound producing and sound modifying functions, there are a number of patch examples. These examples are intended to assist you in quickly learning how each control works, and to illustrate what the control does to the sound. You are encouraged to try our examples and to also play with other settings. Unless otherwise noted, set all controls at the "normal" or nominal settings, as shown by the photographs inside the covers. The CS-50 is inside the front cover and the CS-60 inside the rear cover.

Controls & Switches

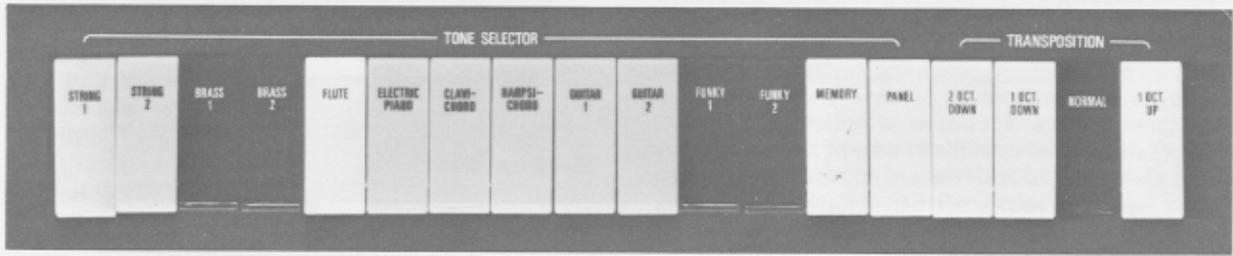
[1] **POWER SWITCH** — The power should be ON from 10 to 30 minutes before you play the synthesizer. While the unit is 100% solid state, a "warm up" period allows internal components to stabilize, as is common with most multiple-oscillator synthesizers. A red light in the switch is illuminated when power is ON.

[2] **VOLUME CONTROL** — This adjusts the volume (output level) for the entire synthesizer. There are also other controls on the unit which affect the VOLUME. If the sound is too quiet, check to be sure the EXPRESSION pedal is set for maximum level (parallel to the floor). Also, check the rear-panel HIGH/LOW switch; moving it from LOW to HIGH increases the level substantially (20dB). BRILLIANCE [5] can have a marked effect on the volume of some preset patches.





CS-50

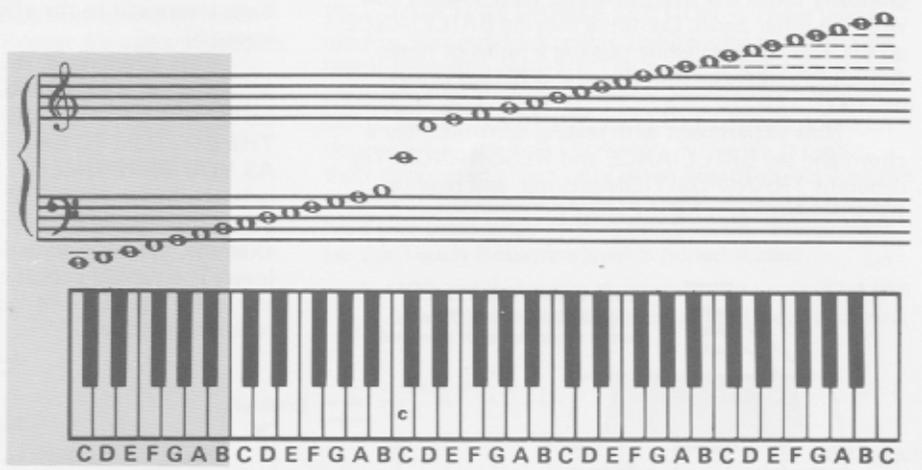


CS-60

[3] **TONE SELECTORS** – This set of 14 pushbutton selector switches are interlocked so that pushing one button disengages the previous selection. On the CS-50 there are 13 preset patches and the PANEL button selects the programmable panel for whatever patch you set up. The CS-60 has one less preset patch, substituting a memory-programmed patch selection for one preset button. The preset patches let you come very close to playing the sounds indicated on the TONE SELECTOR buttons. When there is more than one patch with the same name, they sound similar, but not identical. (Two sounds may not be selected simultaneously. If more than one button is pressed, only the button farthest to the right will have an effect.) For more information about the programmable PANEL and the CS-60 MEMORY, see Section III.

[4] **TRANSPPOSITION** – This set of 4 pushbutton selector switches are interlocked so that pushing one button disengages the previous selection. When the black NORMAL button is down, middle C on the keyboard produces a pitch corresponding to true middle C. When 1 OCT UP is pressed down, the whole keyboard shifts up an octave. 1 OCT DOWN shifts the keyboard down an octave, and 2 OCT DOWN shifts it down two octaves. Thus, instant transposition is as easy as pressing a button. (If two buttons are pressed at the same time, only the button on the right will have an effect. If no button is down, the synthesizer will play as though the NORMAL button were down). Fine tuning is accomplished with a separate PITCH control [13].

The score illustrates what you will hear at the various TRANSPPOSITION settings when the C shown on the keyboard is depressed. Select BRASS 1 and 1 OCT DOWN. As you play, press 2 OCT DOWN, NORMAL and then 1 OCT UP. Notice that you can convert a tuba into a trombone, etc.



"Normal" CS-60 Keyboard Range (Transposition at Normal), Middle "C" equals 8' pipe on organ. (CS-50 does not include shaded area of keyboard.)

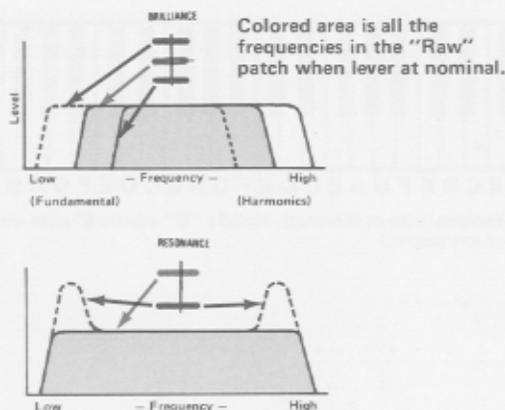


[5] **BRILLIANCE** — (Green) BRILLIANCE allows you to increase or decrease the amount of harmonics (overtones) for any sound, whether preset or patched. Setting the lever down creates a brighter sound. Setting the lever up produces a muted, more mellow sound. This level affects the entire keyboard. The nominal lever position for all patches is centered.

[6] **RESONANCE** — (Red) RESONANCE creates special tonal effects, such as "twang" and "wah." The exact effect of RESONANCE depends on the BRILLIANCE [5] setting.

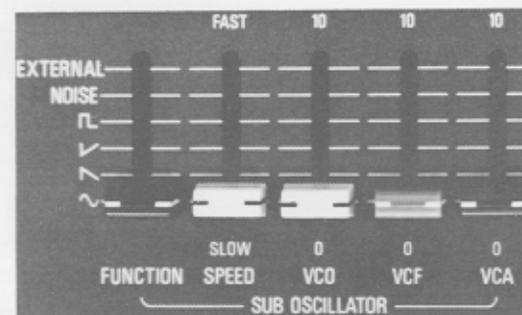
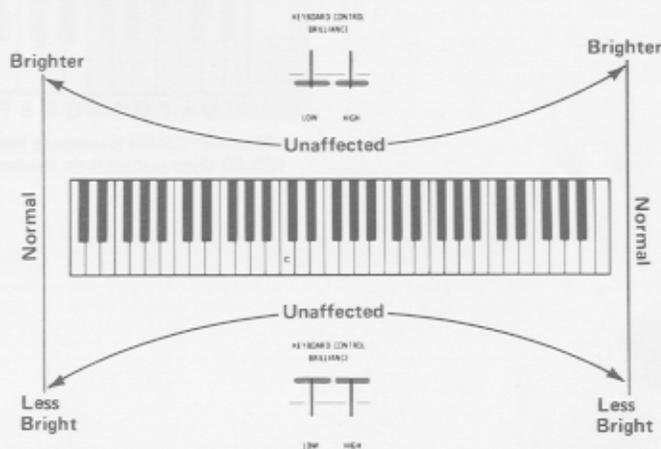
Set RESONANCE for maximum (up) and very gradually move the BRILLIANCE lever toward you with the other hand. Continue moving BRILLIANCE all the way forward while playing a series of notes. Repeat this exercise using several different preset patches.

Now experiment with several controls. Play a chord and set BRILLIANCE and RESONANCE. Try different TRANSPOSITION settings, and readjust RESONANCE and BRILLIANCE.

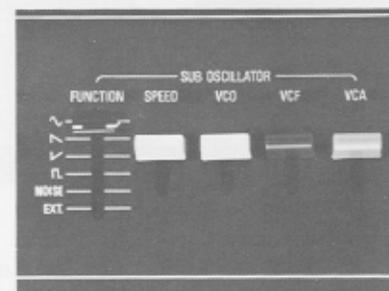


[7] **KEYBOARD CONTROL BRILLIANCE—LOW & HIGH — (CS-60 ONLY)** — (Green) BRILLIANCE LOW and BRILLIANCE HIGH allow you to balance the brightness across the keyboard range. There is no abrupt change where one lever's effect ends and the other lever's effect begins, although a transition occurs somewhere near the middle of the keyboard. In fact, the LOW and HIGH levers operate on a smooth curve (see illustration). BRILLIANCE LOW produces more effect gradually as notes further below the middle of the keyboard are played, and, conversely, BRILLIANCE HIGH produces more effect gradually as notes further above the middle of the keyboard are played. Both levers add to the effect of the overall BRILLIANCE lever [5].

Play Clavichord, string, Funky and Piano patches, adjusting the KEYBOARD CONTROL BRILLIANCE LOW lever. BE SURE TO PLAY A SCALE FROM THE BOTTOM TO THE TOP OF THE KEYBOARD AS YOU EXPERIMENT. Notice that this lever affects only the lower portion of the keyboard, with more effect toward the lowest notes. Repeat the musical example, this time adjusting the BRILLIANCE HIGH lever. The typical acoustic instrument is less brilliant in the lower registers and more brilliant in the higher registers, as shown.



CS-50



CS-60

[8] **SUB OSCILLATOR SECTION** — This section can be used to create effects such as vibrato, wah-wah, tremolo and others through modulation of the VCO, VCF and VCA.* The FUNCTION slider selects the type of modulation (the waveform) for variations in effect, and the SPEED lever determines the modulation rate. The VCO, VCF and VCA levers determine the amount of modulation, and may be used individually or in combinations. For the CS-50, with the lever down, there is no effect, and with it up, the depth of the effect is maximum. The CS-60 operates so effect is maximum with levers down. These controls may be used to modify the sound of any of the patches, whether preset or of your own selection, and their effects apply equally across the entire keyboard range.

A. **FUNCTION** (black) Use this switch to select:

- ~ a sine wave (for smooth, up and down modulation).
- ∇ a sawtooth wave with rapid beginning and slow decay (for a downward sweeping special effect sound).

*VCO, VCF and VCA refer to Voltage Controlled Oscillator, Filter and Amplifier. These change the pitch, harmonic structure and level, respectively, as discussed further in Sections III and V.

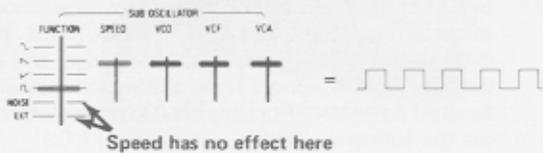
✓ an inverted sawtooth wave with slow beginning and rapid decay (for an upward sweeping effect).

▭ a square wave (for angular, alternating sound, like a trumpet trill or a rapidly picked pair of mandolin strings).

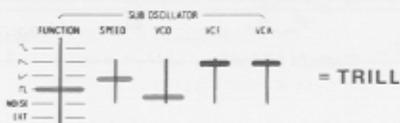
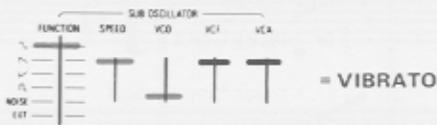
NOISE white noise (for breath or a raspy sound).

EXT whatever line-level (0dBm) signal is applied to the external input jack will affect the VCO, VCF and/or VCA sliders (C, D & E below); if nothing is connected to the external input, this position may be used as an "off" mode for the whole sub oscillator section.

B. **SPEED** (white) affects the speed (rate) of the sine, sawtooth and square waves, but has no effect on noise or the external input. Set the lever up for slowest speed and down for fastest speed.



C. **VCO** (white) varies the pitch of any notes you play by modulating the Voltage Controlled Oscillator with the FUNCTION-selected waveform. At slower speeds, the sound is that of a vibrato. Faster speeds produce a resonance that resembles ring modulation.



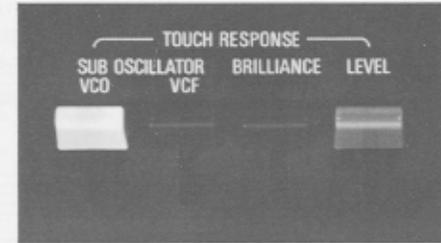
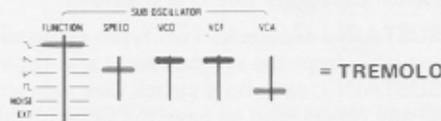
D. **VCF** (green) modulates the Voltage Controlled Filter, thereby varying the tonal character (over tones) of any notes that are played. At slower speeds, the sound is that of an automatic wah-wah (especially if RESONANCE [6] is used). Faster speeds yield unusual effects, particularly when a square or sawtooth wave is selected for the FUNCTION.



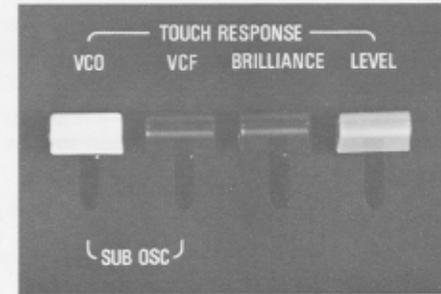
For more "wah" add Resonance [6].

E. **VCA** (gray) applies the modulation to the Voltage Controlled Amplifier, varying the volume of any notes that are played. At slower speeds, the sound is that of a tremolo. Faster speeds produce beating or pulsing effects.

NOTE: Initially, the best way to hear the effect of the Sub Oscillator is to choose a slow SPEED, pull the VCO lever down for maximum modulation, and then select each FUNCTION waveform. Repeat the same procedure for the VCF and VCA levers.



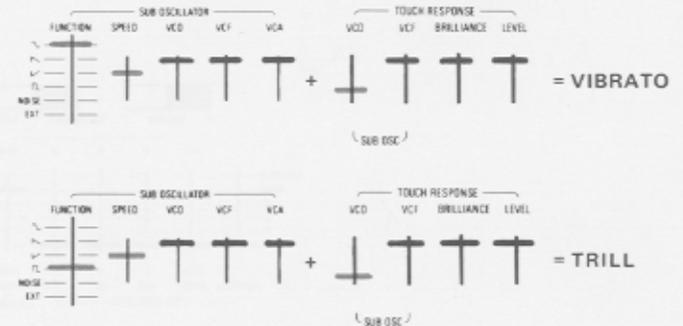
CS-50



CS-60

[9] **TOUCH RESPONSE SECTION** – These levers modify the sound according to how you play the keyboard (dynamic control). The two left-hand controls are related to the Sub Oscillator Section [8], as indicated. The BRILLIANCE and LEVEL levers are independent of the Sub Oscillator. All levers produce their designated effect only when you press hard on the keyboard; the amount of effect is determined by how hard you press a key after it hits bottom, and by how far the Touch Response lever is pulled down.

A. **VCO** (white) varies the pitch of the sound up and down for adding vibrato to a given note or chord.*



*The rate and waveform of the effect variation is set by the Sub Oscillator [8]. If its Function lever is set at EXT, there will be no Touch Response effect unless an external input signal is connected to the synthesizer.

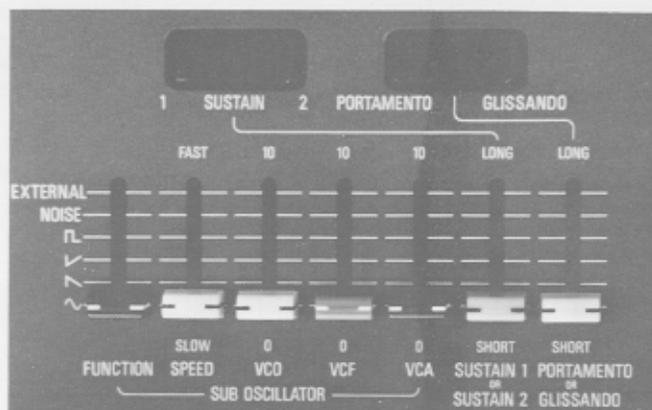
B. **VCF** (green) varies the audible overtones up and down for adding brightness to a given note or chord (a wah-wah if **RESONANCE** [6] is down).*



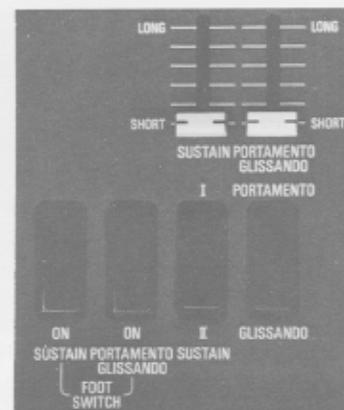
C. **BRILLIANCE** (green) raises the audible amount of overtones in a given note or chord in direct proportion to how hard you press the keyboard.

D. **LEVEL** (gray) increases the volume of a given note or chord in direct proportion to how hard you press the keyboard.

*The rate and waveform of the effect variation is set by the Sub Oscillator [8]. If its Function lever is set at **EXT**, there will be no Touch Response effect unless an external input signal is connected to the synthesizer.



CS-50



CS-60

[10] **SUSTAIN SECTION** — Several controls affect how long the note remains after you let go of a key. On the CS-60, the sustain can be activated by hand or with a foot switch; the CS-50 has hand actuation only.

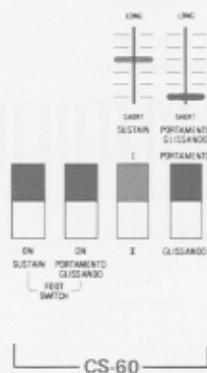
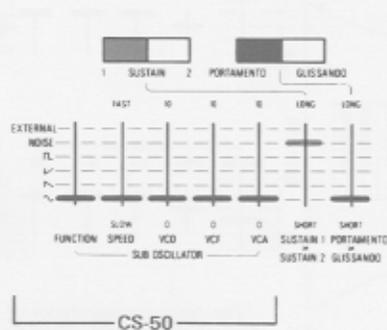
A. **SUSTAIN SLIDER** (yellow) Adjusts how long a note sustains, from **SHORT** (no sustain) to **LONG** (about 10 seconds). In the CS-50, raising this slider is the way you turn **ON** the sustain; the CS-60 works the same way, but also has foot switch capability (see C & D below).

B. **SUSTAIN I-II** (black) Two types of sustain are available from the synthesizer, I and II. With **SUSTAIN I**, each note struck dies independently of any others, and all have the same sustain time. In **SUSTAIN II** mode, the last note or chord played carries the sustain; if several keys are released simultaneously, they will all carry the sustain. The next chord or note played ends the previous sustain.

C. **FOOT SWITCH PEDAL (CS-60 ONLY)**

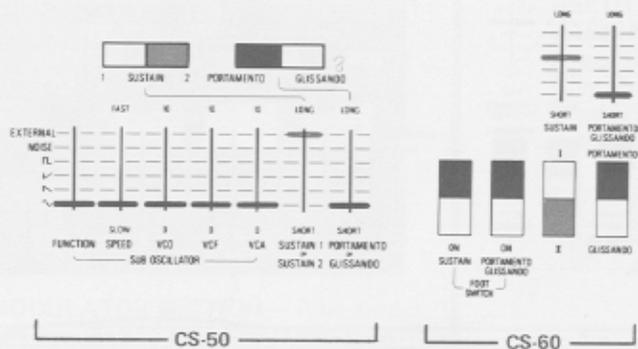
Stepping on this **FOOT SWITCH PEDAL** turns **ON** the sustain when the **SUSTAIN FOOT SWITCH PEDAL** assigner is also **ON**. The amount of sustain is set with the **SUSTAIN SLIDER**. However, releasing the pedal will immediately end any sustain, short or long. (This foot switch may also be used to control Portamento/Glissando effects; see the following section, paragraph 11 C.)

D. **SUSTAIN FOOT SWITCH ASSIGNER (CS-60 ONLY)** (black) When switched to **ON**, there is no sustain unless the **FOOT SWITCH PEDAL** is also held down. If you wish to activate the sustain with your hand, simply rock the switch back. This bypasses the **FOOT SWITCH PEDAL** and introduces that amount of sustain already set with the **SUSTAIN SLIDER**.



What you play

What you hear



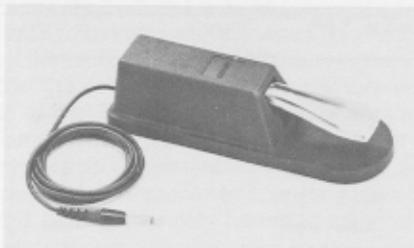
What you play

What you hear

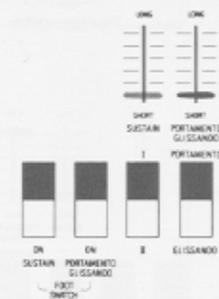


Sustain II Mode

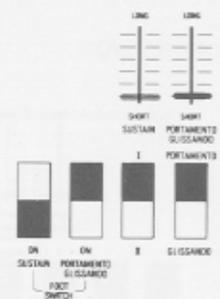
CS-60 ONLY



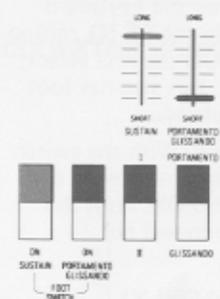
NOTE: With the FOOT SWITCH PEDAL unplugged, the ASSIGNER switch does not function, so sustain is always ON. If you prefer not to use a FOOT SWITCH PEDAL and you want to switch sustain ON and OFF, do it by moving the SUSTAIN SLIDER up and down, or insert an unwired standard phone plug in the rear-panel foot switch jack to activate the ASSIGNER switch.



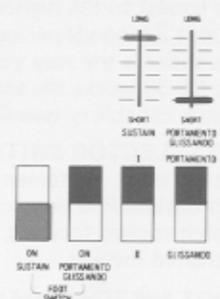
No sustain regardless of foot switch position.



No sustain regardless of foot switch position.



Long sustain regardless of foot switch position.



Long sustain when foot switch is down.

[11] PORTAMENTO/GLISSANDO SECTION —

Several controls affect the transition between successive notes or chords. Portamento is a smooth, continuous glide in pitch from the previously played note or chord to the next. Glissando is also a change in pitch from the previously played note or chord to the next, but is a stepped progression rather than a continuous slide. . . like playing a chromatic 1/2 step scale from one note or chord to the next. On the CS-60, the Portamento or Glissando effect can be activated by hand or with a foot switch; the CS-50 has hand actuation only.

A. PORTAMENTO/GLISSANDO SLIDER (white)

Adjusts how long it takes to move from one note to the next when Portamento or Glissando is ON. Set at SHORT (up) there is no audible effect; at LONG (down) the maximum effect is obtained. With the lever at maximum LONG effect, it takes about 10 seconds for the pitch to be changed from the lowest to the highest note on the keyboard (about 2 seconds per octave). In the CS-50, raising this slider is the way you turn ON the P/G effect; the CS-60 works the same way, but also has foot switch capability (see C & D below).

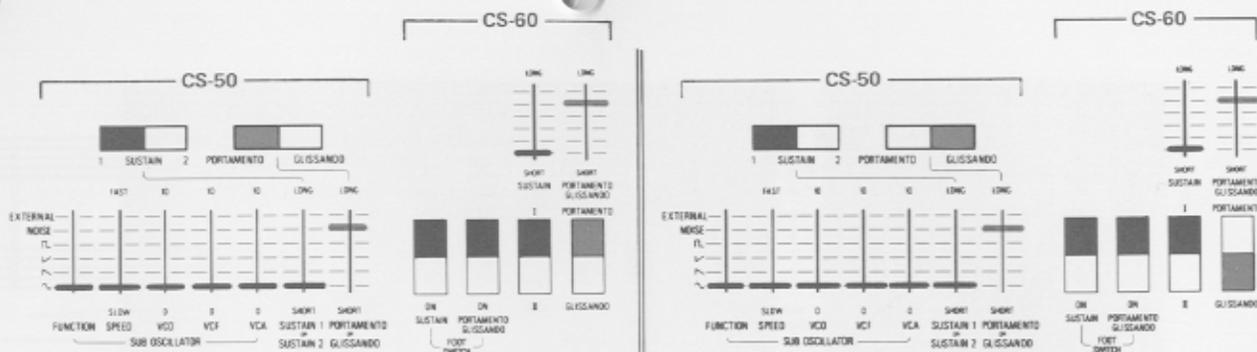
B. P/G SELECTOR SWITCH (black) With the switch rocked back, Portamento will be activated if the appropriate P/G controls are also ON. With the switch rocked forward, Glissando will be activated instead.

C. FOOT SWITCH PEDAL (CS-60 ONLY)

Stepping on the FOOT SWITCH PEDAL turns ON the P/G effect only when the P/G FOOT SWITCH ASSIGNER is also ON. The amount of effect is set with the P/G SLIDER. However, releasing the pedal will immediately end the gradual transition and cause the pitch to jump to the note BEING played. (This FOOT SWITCH PEDAL may also be used to control Sustain; see the previous section, paragraph 10 C.)

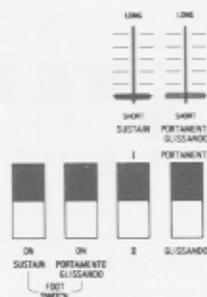
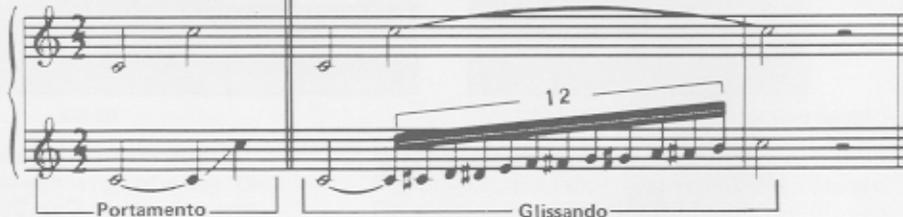
D. P/G FOOT SWITCH ASSIGNED (CS-60 ONLY)

(black) When switched to ON, the FOOT SWITCH PEDAL controls the Portamento or Glissando effect. If you wish to activate the P/G effect with your hand, turn off this switch; it then bypasses the FOOT SWITCH PEDAL and introduces the amount and type of effect you set with the P/G SLIDER and SELECTOR SWITCH.

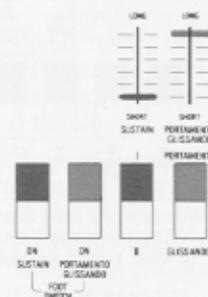


What you play

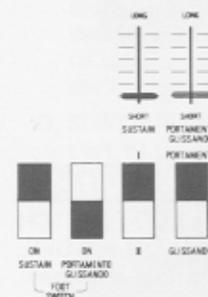
What you hear



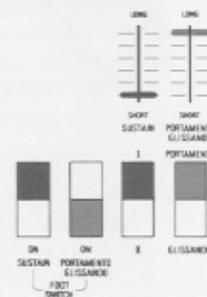
No portamento or glissando regardless of foot switch position



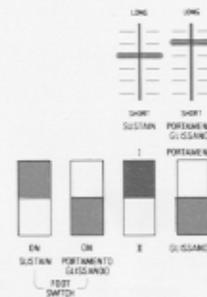
Long portamento regardless of foot switch position (or long glissando if P/G selector moved to "Glissando")



No portamento or glissando regardless of foot switch position

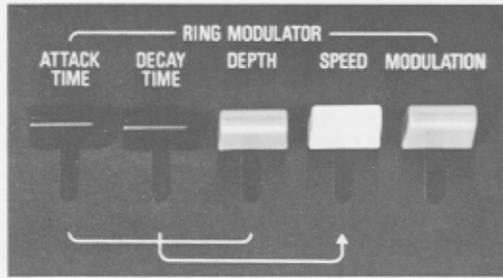


Long portamento (or glissando) when foot switch is down

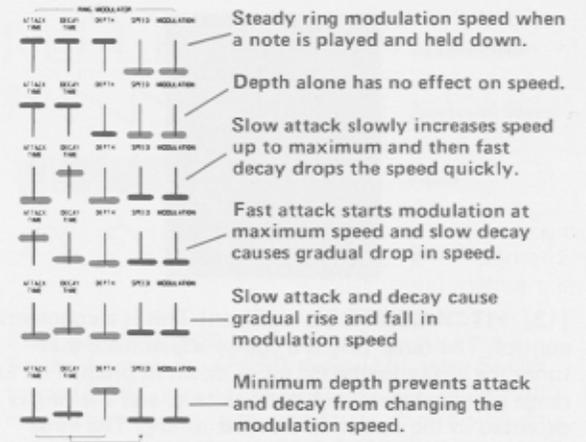


Moderate sustain on all notes, Glissando when foot switch is down

CS-60 NOTE: With the FOOT SWITCH PEDAL unplugged, the P/G ASSIGNER SWITCH does not function, so P/G is always ON. If you prefer not to use a FOOT SWITCH PEDAL and you want to switch P/G ON and OFF, do it by moving the P/G SLIDER up and down, or insert an unwired standard phone plug in the rear-panel foot switch jack to activate the ASSIGNER switch.



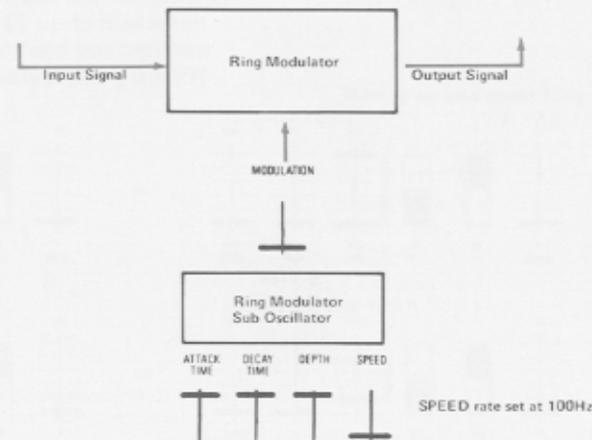
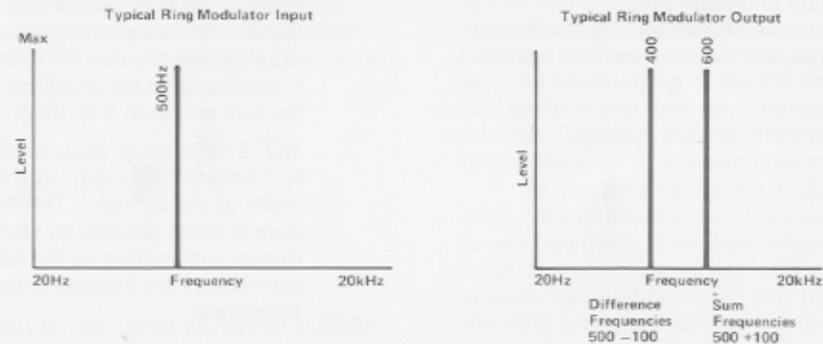
D. **DEPTH** (grey) Sets the amount of automatic speed change created by the ATTACK & DECAY levers. (Depth does not refer to the amount of Ring Modulation.) With this lever up (minimum depth), the ATTACK & DECAY TIME levers do nothing.



[12] **RING MODULATOR SECTION** – Ring modulation creates new frequencies, both higher and lower in pitch than the note played, but does not allow the actual note to be heard. This is accomplished by “beating” a sub oscillator against whatever input signal is fed to the Ring Modulator, thus producing sum and difference frequencies (the input frequency plus the sub oscillator frequency and the input frequency minus the sub oscillator frequency). The input signal is then cancelled in the output, leaving only the sum and difference of the input and sub oscillator frequencies.

A knowledge of how the Ring Modulator works is not necessary to understand how it sounds. When the Ring Modulator’s sub oscillator is set to a slow SPEED, the effect is pulsing that may resemble a tremolo. However, at faster speeds a strange gong-like ringing or non-musical dissonance will be heard. The MODULATION (amount of effect) is constant when a note is played, and so is the SPEED unless the adjacent ATTACK TIME, DECAY TIME and DEPTH levers are activated; these levers enable you to automatically speed up and slow down the Ring Modulator’s sub oscillator whenever you play a note, for a “swooping” or “pinging” effect.

HOW THE RING MODULATOR WORKS



- A. **MODULATION LEVER** (gray) Adjusts the depth of effect from no effect (up) to maximum effect (down).
- B. **SPEED LEVER** (white) Sets the modulation speed or rate. Slowest speed is obtained with the lever up, fastest with the lever down.
- C. **ATTACK & DECAY TIME LEVERS** (black) ATTACK sets the maximum SPEED obtained as the ring modulator moves from the basic SPEED setting. DECAY sets the length of time it takes for the rate to the set SPEED.

NOTE: So long as you hold down one or more keys, playing additional notes will not generate another Ring Modulator attack. However, if you let go of all keys first, then the Ring Modulator will again attack and decay on the next note or chord you play.

SPEED rate set at 100Hz



[13] **PITCH CONTROL** – (Black) This is a concentric control. The outer ring is a coarse adjustment that tunes the entire keyboard up or down in pitch. The full range of adjustment is about 1 octave, and the ring is detented in the center for normal tuning. The inner knob is a fine pitch adjustment with a range of about one semi-tone (slightly less on the CS-50). Nominal position for both knobs is centered.

NOTE: To obtain the most precise tuning to other instruments:

- a) Press the "FLUTE" Preset [3].
- b) Turn off or set at minimum all Sub Oscillator, Ring Modulator, and Touch Response effects.



[14] **RIBBON CONTROLLER (CS-60 ONLY)** – This is a velvet-covered strip that tunes the entire keyboard up or down in pitch. It makes no difference where you first touch the ribbon; you just move up or down from that reference point, either by sliding a finger along the ribbon, or by holding one finger in place and touching another finger elsewhere on the ribbon. Use this for expressive vibratos, string-bending effects, chord modulations, whistles or other unusual effects. When the CS-60 is in SUSTAIN I mode, the ribbon only changes the pitch while you are holding down a key. In SUSTAIN II mode, the ribbon will also change the pitch during the sustain (after you let go of the keys). Experiment to see what happens when you let go of the key and then the ribbon, and vice-versa.

NOTE: The range of upward pitch slide is approximately 1 octave if you start at the left of the ribbon and move to the far right. The range of downward pitch slide is much greater; by starting on the right of the ribbon and moving to the left, you can move the highest note on the keyboard down to a sub-audio frequency.