CS-80
POLYPHONIC
SYNTHESIZER

INSTRUCTION MANUAL

YAMAHA

This instruction manual is probably different from any synthesizer manual you have previously read. The controls and functions are explained in terms that should be comprehensible to non-technical and technically oriented players alike. The CS-80 is a unique step forward in synthesizer technology, an advanced and very playable instrument. This instruction manual complements the CS-80, and will also serve as a valuable reference book for understanding many other synthesizers.

All CS-80 controls referenced in the manual are followed by a number in brackets, like this: the VOLUME control [2]. The numbers refer to the callouts on the photograph inside the front cover. Consult the INDEX on page 1 to find other pages where the same control is discussed.

Those who are already experienced with synthesizers may wish to review the control functions as outlined in Section IV. A more detailed and less technical explanation is provided in Sections II and III.

When portions of the control panels are shown in examples, all controls not shown in the example should be set at the nominal positions indicated by the inside cover photo (unless otherwise suggested by the accompanying text).

Try the example settings shown, and experiment as you read the text. Feel free to use your own music, and adjust your playing style to suit the nature of the patch you have selected.

[1]	AC POWER switch	[12]	TOUCH RESPONSE	[24]	Sawtooth wave ON/OFF	[36]	Sine Wave
[2]	Main VOLUME	[13]	SUSTAIN	[25]	White NOISE	[37]	A (Attack Time)
[3]	TONE SELECTORS	[14]	PORTAMENTO/GLISSANDO	[26]	HPF filter cutoff	[38]	D (Decay Time)
[4]	MIX I-II	[15]	TREMOLO/CHORUS	[27]	RES_H filter "Q"	[39]	S (Sustain Level)
[5]	FEET I-II	[16]	RING MODULATOR	[28]	LPF filter cutoff	[40]	R (Release Time)
[6]	DETUNE CH II	[17]	FOOT PEDAL SELECTOR	[29]	RES_L filter "Q"	[41]	VCA LEVEL
[7]	Overall BRILLIANCE	[18]	PITCH (tuning)	[30]	IL (Initial Level)	[42]	INITIAL-TOUCH BRILLIANCE
[8]	Overall RESONANCE	[19]	Ribbon (glide) controller	[31]	AL (Attack Level)	[43]	INITIAL-TOUCH LEVEL
[9]	KEYBOARD CONTROL— BRILLIANCE LOW & HIGH	[20]	Pulse Width Modulation SPEED	[32]	A (Attack Time)	[44]	AFTER-TOUCH BRILLIANCE
[10]	KEYBOARD CONTROL— LEVEL LOW & HIGH	[21]	PWM depth	[33]	D (Decay Time)	[45]	AFTER-TOUCH LEVEL
[11]	SUB OSCILLATOR	[22]	PW duty cycle	[34]	R (Release Time)	[46]	MEMORY PANEL (beneath Block Diagram)
		[23]	Square wave ON/OFF	[35]	VCF LEVEL		

1. Physically assemble the legs (see instructions on page 2) or set the CS-80 atop a sturdy surface, allowing space for air to circulate through the top and bottom cooling vent panels.

2. Plug in the FOOT SWITCH and FOOT PEDAL (CONTROLLER) at the rear panel; **be sure to insert the plugs in the proper jacks.**

3. Using guitar cord(s), connect the CS-80 Rear-Panel Output Jack(s) to a professional, wide-range speaker/ amplifier unit. LEFT and RIGHT may be used for 2-channel systems, or GENERAL (mono) for single-channel systems, such as guitar amps. (Hi-Fi music systems are **not** recommended for this application.)

    Alternately, connect a pair of stereo headphones to the PHONE JACK below the right side of the keyboard.

4. Open the storage panel below the synthesizer, remove the power cord, and plug it in to a suitable AC power main.

5. Set the rear-panel HIGH/LOW switch to LOW, turn on the CS-80 power, and set all controls at nominal. If the volume is too low, even with the VOLUME control all the way up and the FOOT PEDAL flat (maximum level), then switch HIGH/LOW to HIGH.

6. Try various preset patches by touching different TONE SELECTOR buttons [3] and moving the MIX I—II lever [4] up or down to point at the row corresponding to the selected preset. Adjust BRIL-LIANCE [7] as you do this. See pages 24 through 30 for additional panel-programmed patches.

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1. Always allow space below and above the synthesizer for air to circulate through the vent panels. This is essential for proper cooling of the circuitry. **If the vents are blocked, tuning instability and component failure may occur.**

2. Always plug the FOOT SWITCH and FOOT PEDAL (CONTROLLER) into the proper jacks. **THE SYNTHESIZER WILL NOT WORK AND MAY REQUIRE REPAIR.**

3. Avoid exposing the synthesizer to direct sunlight or very high humidity environments.

4. Clean the keys and plastic parts with Yamaha Key Cleaner creme polish, or with a moistened soft cloth. Never use abrasives, cleansers, waxes or solvents, which may dull the keys or chemically attack the finish.

5. **Leave internal adjustments to qualified Yamaha service personnel. If you open up the unit and reset any trimmers, the unit may require a complete re-voicing by Yamaha.**

6. The **EXT IN** jack is designed for audio, line-level signals. Never connect it to an AC power line, or to a speaker-level output. Also, **do not connect any CS-80 output to the EXT IN** jack, as this may cause feedback and possible damage to your equipment.

7. The CS-80 weighs approximately 100kg (220 lbs.). When setting it up or transporting it, at least two people should do the lifting.

8. While the CS-80 is constructed with an integral case of sturdy plywood and metal-reinforced corners, we recommend the use of an additional travel case for cartage, preferably built to ATA-300 specifications. (See page 48.)

The CS-80 is easy to play. While it is a high-technology musical instrument, you don't have to know about electronics to understand how to use the CS-80. We do recommend, however, that you read this manual thoroughly, and periodically refer back to it as you learn the instrument. If you're in a hurry, check the Quick Setup Instructions on this page.

The Yamaha CS-80 is a unique 8-note polyphonic synthesizer, one which places the entire realm of musical expression at your fingertips. The CS-80 is a true musical instrument, not merely a "special effects" tool. The sounds are infinitely variable, and, because the keyboard is both velocity and pressure sensitive, you have true dynamic control over your music.

The CS-80 will give you an incredible variety of electronic sounds, but it goes further than that. Having a CS-80 is like having a symphony orchestra to choose from. Largely due to touch sensitivity (keyboard dynamics), Yamaha has overcome a traditional challenge for synthesizers, namely, the difficulty in creating the sound of an acoustic instrument. For example, if you've ever tried to create a "violin" on the keyboard of most synthesizers, you probably found the result too "electronic." While you may have achieved a good basic violin sound, when you played it, there was something missing . . . but what?

Ask a great violinist to play the note "G" 8 consecutive times (not an open string). Request that he make them **absolutely** identical in pitch, timbre, volume and every other possible variable. You'll discover that he **cannot do it** . . . fortunately. Much of the charm of a musical performance is that it is not "textbook perfect," and this is why your well-programmed synthesized violin did not sound "right" to you. However, your CS-80 is another story.

Touch response makes all the difference. You can set up a "violin" so that the way you press a key changes the vibrato, timbre, pitch, volume, brilliance . . . the whole essence of the sound. With this kind of expressive capability you too may not exactly duplicate 8 consecutive notes. However, the sound you do achieve will be much more realistic and musical than has ever before been practical with an electronic musical instrument.

The CS-80 is the first of a whole new generation of **performer-oriented** electronic musical instruments. Only Yamaha, the world's leading manufacturer of fine musical instruments and high-quality sound equipment, could have built it.

INDEX TO CONTROLS AND CONNECTIONS

TABLE OF CONTENTS

LEG ASSEMBLY

1. Unzip and open the carrying case. If you wish to move the CS-80 before you set it up, you need not carry it. Remove the casters from the case and insert them in the four holes at the corners of the CS-80 rear panel.

2. Hold the left leg assembly so the two thumbscrews on its mounting flange line up with the threaded sockets under the CS-80, as shown. Tighten the screws sufficiently to hold the leg in place, but do not tighten securely. Swing the upper leg brace so it is parallel with the bottom of the synthesizer, and leave the lower leg brace pivoted out of the way.

3. Remove the thumbscrew from the end of the upper leg brace on the right leg assembly, and set the screw aside temporarily: BE SURE TO SAVE THE THUMBSCREW. First slide the right upper leg brace into the end of the left upper leg brace. Then align the two mounting flange thumbscrews over their sockets and tighten the screws partially.

4. Swing the right lower leg brace over the point where the two upper leg braces join, aligning the holes as shown.

5. Swing the left lower leg brace over the junction of the other leg braces, also keeping the holes aligned.

6. Insert the thumbscrew through the two lower braces and tighten it firmly into the upper braces.

7. Tighten the four thumb screws that firmly secure the left and right leg flanges.
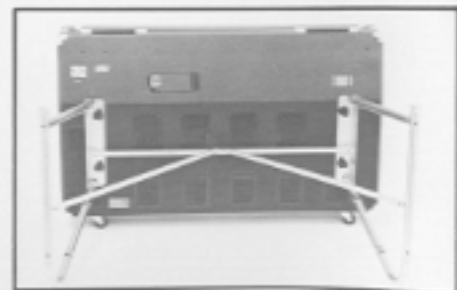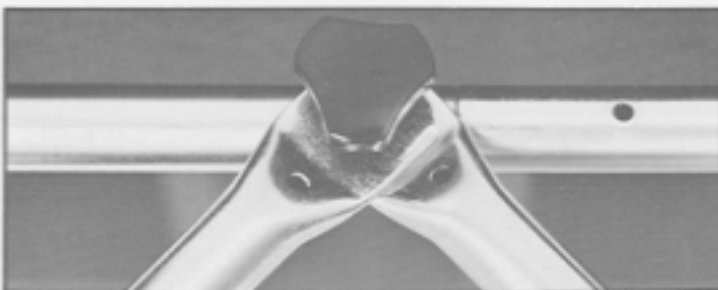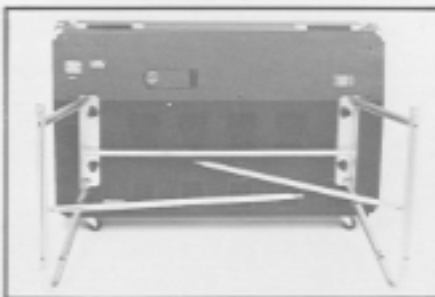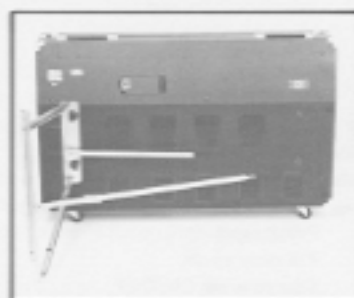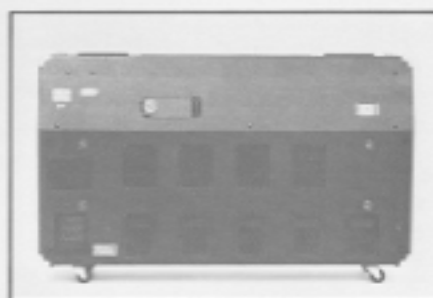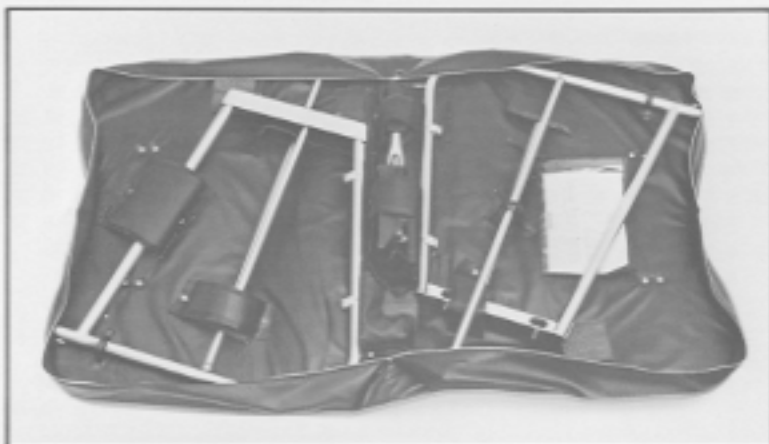
8. Flip up the latch on the power cord storage compartment, and remove the power cord.

9. Close the compartment cover, routing the cord through the notched corner so the cover does not pinch the cord.

10. With one person lifting each end, lift the unit up and stand it on its legs. The leveling screws on the front of each leg may be adjusted to steady the synthesizer, if necessary.*

11. Remove the Foot Switch and Foot Pedal Controller from the carrying case and place them below the synthesizer. To keep the cables out of your way, slip them into the clips on the right leg. (As stated in "Connections," be sure you plug the two cables into the correct jacks; the Pedal's three-circuit phone plug goes to the FOOT CONTROLLER jack.)

12. To keep the AC cord out of your way, slip it into the clips on the left leg. (Separating the power cord from audio cables is always a good idea since it avoids hum.)

13. Remove the casters, unlatch the cover, open the cover and lift it off as the half-round hinges disengage. If you wish, remove the music stand from the cover and insert it in the two slotted fittings atop the synthesizer (on the vent panel).

* CAUTION: The CS-80 weighs 100kg (220 lbs.). For safety, please have someone help you lift it.
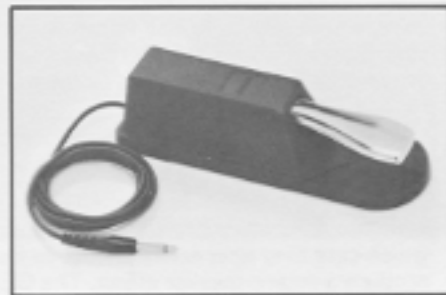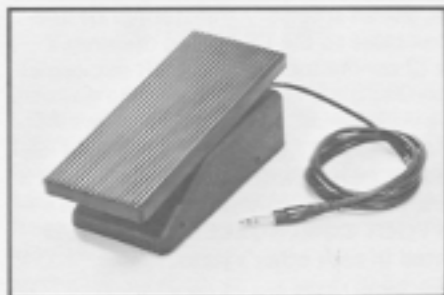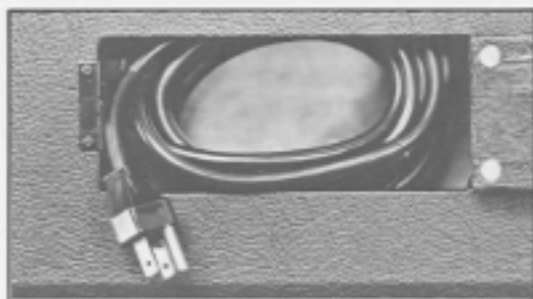
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NOTE: See Section VI for information on direct boxes, balanced lines, etc.

AC Power & Grounding

Plug the power cord into 50 or 60Hz AC outlet.*

When using the CS-80 with a standard guitar amplifier, it's a good idea to plug the AC cables of both the CS-80 and the guitar amplifier into the same AC outlet box or the same AC plug strip. If you use a plug strip, use the grounded type. **Do not defeat the ground connection (third pin on the AC plug) on either the CS-80 or the guitar amplifier.** By connecting the AC cables of both units to the same AC outlet and then connecting the CS-80's output to the guitar amp's input with a shielded cable ("output connections"), you insure that the chassis of both devices will be at the same ground potential, avoiding any possible shock hazard.

(Not applicable for the model with the 2P-plug.)

Output Jacks

The LEFT and RIGHT outputs are identical except when the TREMOLO or CHORUS effect is used, in which case they alternately change in level and phase to produce a rotary speaker effect. The GENERAL output is mono mix of LEFT and RIGHT.

Each jack is a low impedance, standard tip/sleeve phone jack. LOW line level is nominal −20dB (77.5 millivolts), and HIGH line level is 0dB (0.775V).

The CS-80 outputs are unbalanced and will drive low-impedance (600-ohm) or high impedance inputs, either balanced or unbalanced; this includes mixers, guitar amps, tape recorders, and many other audio devices. If you are not sure about the sensitivity of your equipment, start with the HIGH/LOW switch at LOW to avoid excessive levels. Use any high quality phone-to-phone plug patch cable (guitar cord) to connect the CS-80 to a standard guitar amplifier, a high impedance mixer such as Yamaha's PM-170 or directly to an amplifier/speaker system combination such as the Yamaha A4115H.**

To minimize hum pickup in very long sound system cables, use an accessory transformer or line-level direct box close to the CS-80 and then run a balanced line (2-conductor shielded XLR mic cable) to the mixer.

Foot Jacks

Plug the FOOT CONTROLLER PEDAL into the FOOT CONTROLLER jack. The controller plug is a 3-circuit phone plug (tip/ring/sleeve). **The FOOT SWITCH and FOOT CONTROLLER plugs should never be inserted in each other's jacks.**

External Input Jack

The External Input jack is for special Sub Oscillator effects. It allows for modulation of the filter, oscillator or amplifier by line-level sources, such as oscillators, rhythm boxes, other electronic instruments, etc. The input is high impedance, so it will not overload the external device. Sensitivity is adjustable with the EXTERNAL LEVEL control, but even at maximum sensitivity the input will not provide a discernable effect with mic-level or guitar pickup level signals.

Accessory Devices

You can use a variety of accessory devices between the CS-80 output and the sound system input: reverbs, echo boxes, phase shifters, and so forth. Remember that the CS-80 has built-in circuitry to produce wah-wah, tremolo, vibrato and certain phasing effects (SUB OSCILLATOR [11] and TREMOLO/CHORUS [15].

The Speaker/Amplifier System

The sound of the CS-80 will depend to a large degree on the amplifier and speaker system; the wider the response, the better. We recommend use of the self-powered Yamaha A4115H speaker system, due to its wide, flat frequency response. However, the CS-80 may be used with almost any wide-range professional

Yamaha A4115H Speaker/Amplifier

speaker/amplifier system (or tape recorder).

If you use several keyboards, you may also wish to use a keyboard mixer. In any case, it's a good idea to choose these items carefully. We recommend the Yamaha PM-170, a six-input stereo output mixer with

Yamaha PM-170 mixer

VU meters and BASS and TREBLE equalization on every input. This mixer can then feed any amplifier/speaker system. Alternately, use a self-powered mixer such as the Yamaha EM-150. The keyboard outputs,

Yamaha EM-150 self-powered mixer

including the CS-80 outputs, can be fed to the mixer input, and the outputs can be connected directly to a pair of speakers such as Yamaha S4115H's.

*As is the case with any electric or electronic instrument, the AC power receptacle should be checked for correct voltage and polarity. For operation with power mains that do not meet these specifications, contact the Yamaha authorized dealer.

**Set the INPUT LEVEL switch on the PM-170 or the A4115H to the "0dBm" position (for nominal 0dB sensitivity).

A4115H control panel   A4115H control panel

To optional monaural
amp/speaker system

A4115H control panel   A4115H control panel

A4115H control panel

PHONE

A4115H control panel

To optional monaural amp/speaker system

A4115H control panel

More About the A4115H

The Yamaha A4115H is a two-way speaker system with a built-in 100 watt power amp. It produces natural, accurate sound and smooth, wide dispersion. The A4115H can be driven directly from the CS-80's outputs, or from the output of a PM-170 or similar mixer. In the studio, the sound can be taken direct from the CS-80, or excellent results can be obtained by placing a microphone near the A4115H. On the stage, the A4115H's high sensitivity and high power output generate high volume levels free of audible distortion.

If you are using two A4115H's, connect a cable from the Left and Right outputs on the CS-80 to one input on each A4115H. Set the CS-80 output HIGH/LOW switch at HIGH, set the A4115H's INPUT LEVEL switch to the "0dBm" position, and set its INPUT VOLUME as required. The speaker's HF LEVEL control sets the volume level of the high frequency horn in relation to the low frequency woofer.

NOTE: If you wish to use three A-4115H's, one may be fed by the General output. To feed more than one A-4115H from one CS-80 output, "chain" the A4115H's together; connect a phone-to-phone cable from the unused input jack of the A4115H being fed by the CS-80 to an input jack on the next A4115H, and so forth.

A4115H control panel   **A4115H control panel**

A4115H control panel

A4115H control panel
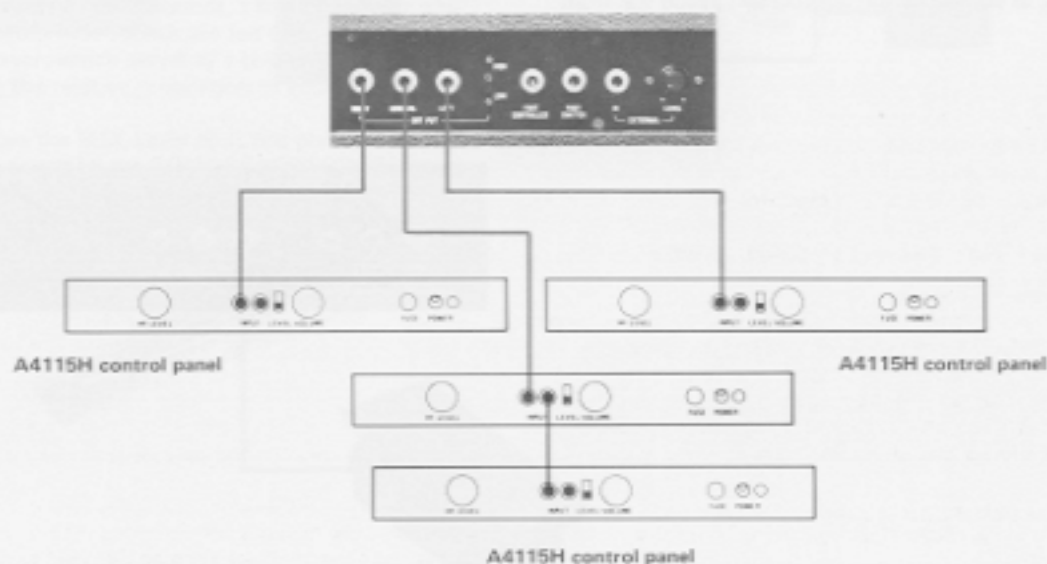
Headphones

A stereo headphone jack is provided under the keyboard on the right side. Use any 8-ohm or higher impedance stereo phones. As a rule, however, synthesizers sound best when monitored with speakers rather than phones.

PHONE

Getting Sound

When all connections are made, turn ON the CS-80 and set all controls at nominal except its main VOLUME control [1], which you set minimum. Then bring up the sound system volume to a moderate setting and adjust the CS-80 volume while playing a chord. Remember, as with most multiple-oscillator synthesizers, the CS-80 requires about 10 to 30 minutes to warm up for full stability.

6

This section presents detailed information on all the CS-80's sliders, levers, switches and rotary controls, except the Panel and Memory controls, which are treated separately in Section III. 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 CS-80. 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-80 with creativity and skill.

The CS-80 allows 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-80 is a third-generation instrument, 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 CS-80 controls are color coded. Different color knobs suggest different types of functions, as follows:

GREEN = general filter characteristics
RED = filter resonance
WHITE = pitch
GREY = 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.)
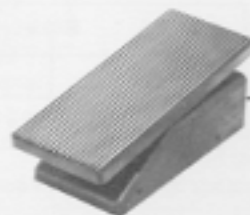
C. All slider controls and levers on the CS-80 move in a forward-to-backward direction relative to the player. However, some controls are arranged so that maximum effect occurs nearest the player (lever down), and others give maximum effect away from the player (lever up). Therefore, in the text of this manual, settings are sometimes suggested by the words "down" or "up," which avoids confusion with "max" and "min."
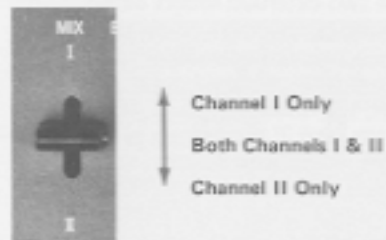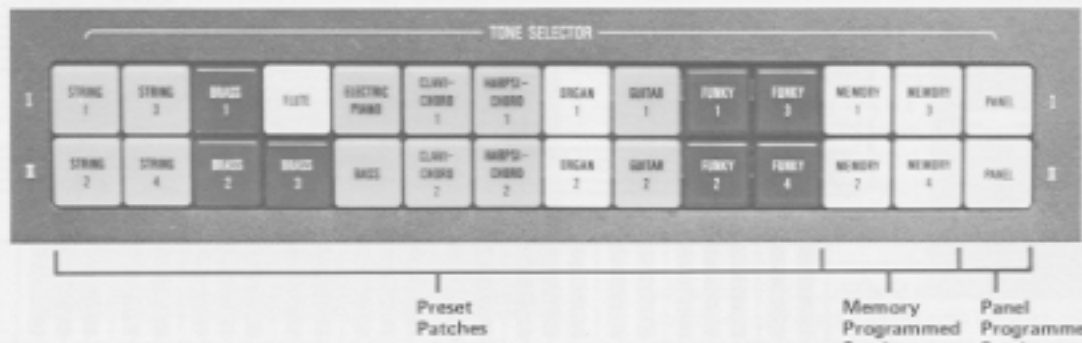
D. Interspersed among the discussions of the basic sound producing and sound modifying functions, there are a number of patch examples. These examples are intended to assist you in quickly learning how each control works, and to illustrate what the control does to the sound. You are encouraged to try 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 photograph inside the front cover.

Controls & Switches

[1]   POWER SWITCH—The power should be ON from 10 to 30 minutes before you play the synthesizer. While the CS-80 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 CS-80 which affect the VOLUME. If the sound is too quiet, check to be sure the FOOT CONTROLLER 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 [7] can have a marked effect on the volume of some preset patches.

Preset Patches   Memory Programmed Patches   Panel Programmed Patches

Channel I Only

Both Channels I & II

Channel II Only

NOTE: If you press two buttons in one row, only the left-most button will be engaged.

[3]   TONE SELECTORS — There are two rows (ranks) of selectors, each offering 11 preset patches, two memory-programmed patches and one panel-programmed patch. 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. You may select one patch from each row at the same time by lightly pressing the desired buttons. (Two sounds in the same row may not be selected simultaneously.) The MIX control [4] then sets the relative amount of sound from each row. For more information about the programmable PANELS and MEMORY, see Section III.

[4]   MIX I-II — The CS-80 will simultaneously produce two independent sounds, I & II, whenever you play a note. These sounds are fed to the MIX I-II control lever, which serves as a balance control, adjusting the relative proportion of sound I and sound II.

Move the MIX Lever to I, and play each preset patch by touching the TONE SELECTOR [3] buttons in row I. Now move MIX to II and try all the presets in row II. Thus far, you have heard only one patch at a time. However, any two patches, one from row I and one from row II, may be mixed by setting MIX at or near center.
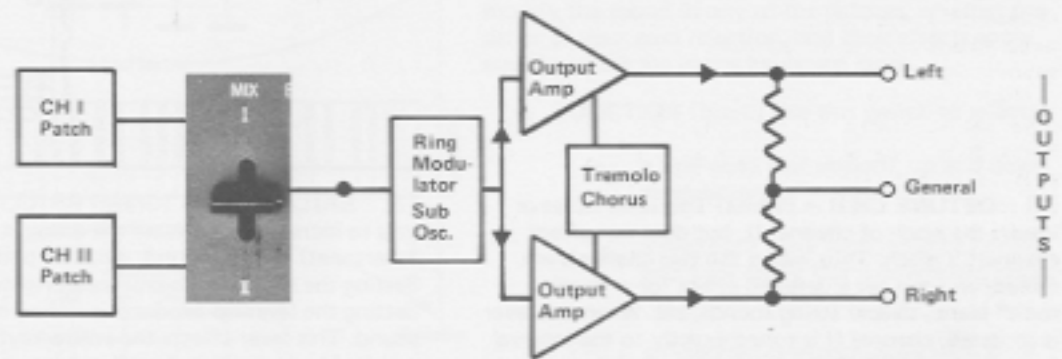
[5] **I-FEET-II** — These two detented sliders determine the pitch of the sound generated by channels I and II when a given note is played (a movable "do"). The term "Feet" is derived from standard organ stops, so the higher the number, the lower the pitch; 16' represents the lowest pitch, and 2' the highest pitch. The sliders do not operate in between detents. Instead, fine tuning is accomplished with a separate PITCH control [18].

The score illustrates what you will hear at the various footages when the C shown on the keyboard is depressed. If 8' is considered normal pitch, then 16' is one octave below, 5-1/3' is a perfect fifth up, 4' is one octave up, 2-2/3' is one octave plus a perfect fifth up, and 2' is two octaves up.

Select BRASS 1 & 2, and set FEET I at 16 and FEET II at 5-1/3. As you play, move the MIX LEVER from I to the center and down to II, listening closely. Then reset MIX in the center and move FEET I and II to various settings while playing a note. Notice that you can convert a tuba into a trombone, etc.


CDEFGABCDEFGABCDEFGABCDEFGABCDEFGABC
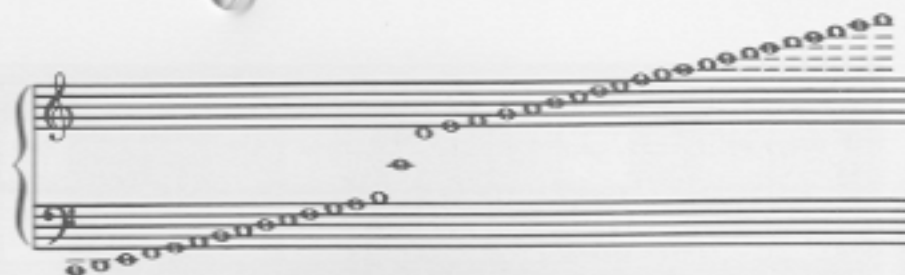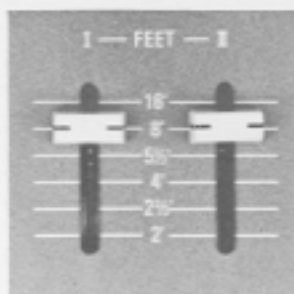
"Normal" CS-80 keyboard range (Feet Selector at 8'). Middle "C" equals 8' pipe on organ.
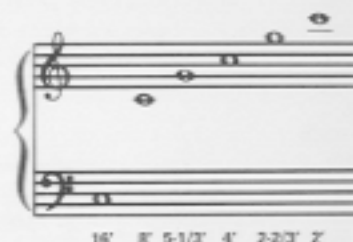
Music shows what note you hear when playing Middle "C" at different footage settings.

16'   8' 5-1/3'   4'   2-2/3' 2'

[6] **DETUNE CH II** — (White) This lever raises or lowers the pitch of channel II, but does not affect channel I's pitch. Thus, when the two channels are mixed, you can get a detuned effect for a "honky-tonk" piano, deeper string sounds, etc. When the lever is centered, channel II is tuned exactly to the interval set with the FEET II slider.
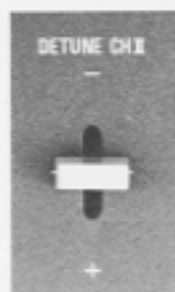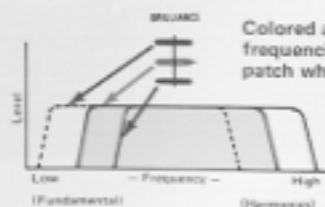
[7] **BRILLIANCE** — (Green) BRILLIANCE allows you to increase or decrease the amount of harmonics (overtones) for any sound, whether preset or patched. Setting the lever down creates a brighter sound. Setting the lever up produces a richer, more mellow sound. This lever affects the entire keyboard. The nominal lever position for all patches is centered.

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

Set RESONANCE for maximum (down) 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 moving one FEET selector to 16' and leave the other at 8' . . . or move it to 5-1/3' . . . whatever sounds good to you. Readjust RESONANCE and BRILLIANCE.


Colored area is all the frequencies in the "Raw" patch when lever at nominal.
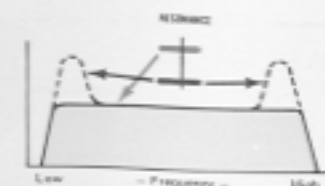
[9] KEYBOARD CONTROL BRILLIANCE—

LOW & HIGH — (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 [7].
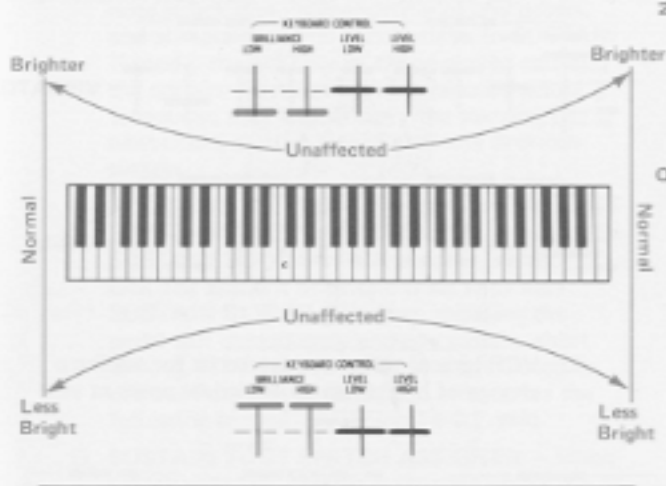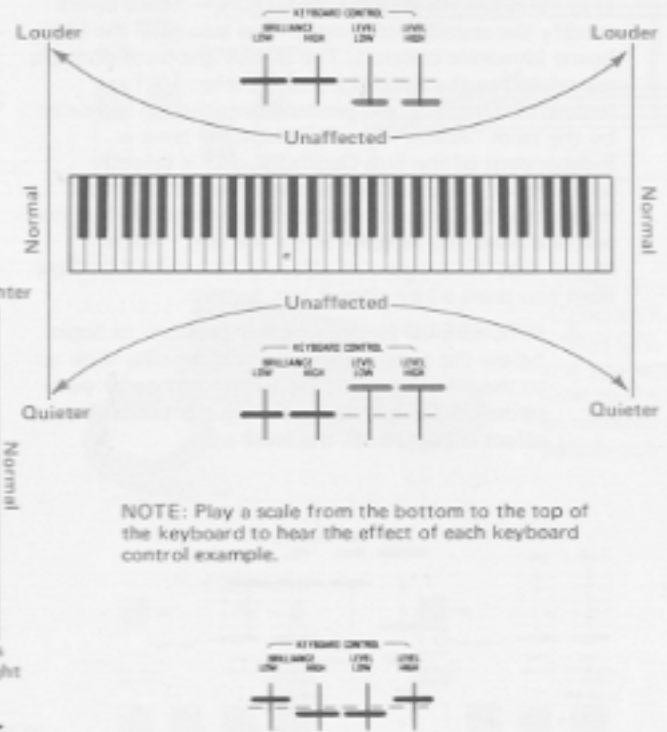

[10] KEYBOARD CONTROL LEVEL—

LOW & HIGH — (Grey) These levers operate in a manner similar to the adjacent BRILLIANCE LOW and HIGH controls. However, rather than adjusting the brightness for the lower and upper portions of the keyboard, these levers balance the volume level across the keyboard range. Moving a lever down increases

the volume and moving a lever up reduces the volume in the corresponding portion of the keyboard.

Play clavichord, string, organ, funky and piano patches, adjusting the KEYBOARD CONTROL BRILLIANCE LOW lever. 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.

Repeat the example twice more, only this time adjust LEVEL LOW and then LEVEL HIGH. When you have achieved a satisfying balance of brightness and volume across the keyboard, vary the overall tonality with the main BRILLIANCE control, and the overall level with the main VOLUME control. The typical acoustic instrument is louder and less brilliant in lower registers, while quieter and more brilliant in upper registers, as shown.

NOTE: Play a scale from the bottom to the top of the keyboard to hear the effect of each keyboard control example.

Typical setting to simulate the frequency response of an acoustic instrument.
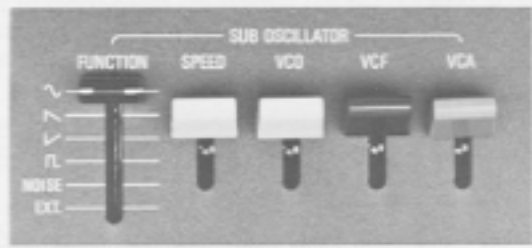
[11] SUB OSCILLATOR SECTION — This section
can be used to create effects such as vibrato, wah-wah, tremolo and others through modulation of the VCO, VCF and VCA.* The FUNCTION slider selects the type of modulation (the waveform) for variations in effect, and the SPEED lever determines the modulation rate. The VCO, VCF and VCA levers determine the **amount** of modulation, and may be used individually or in combinations; with the lever up, there is no effect, and with it down, the depth of the effect is maximum. 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).

⌄ 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 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.

*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.

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.

Speed has no effect here
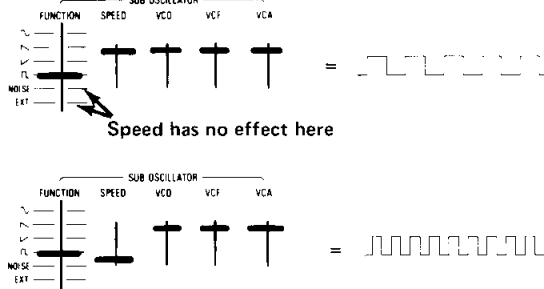
C. **VCO** (white) varies the pitch of any notes you play by modulating the Voltage Controlled Oscillator with the FUNCTION-selected wave-form. At slower speeds, the sound is that of a vibrato. Faster speeds produce a sound that resembles ring modulation.


= VIBRATO

= TRILL
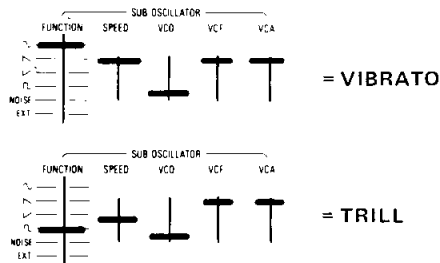
D. **VCF** (green) modulates the Voltage Controlled Filter, thereby varying the tonal character (overtones) of any notes that are played. At slower speeds, the sound is that of an automatic wah-wah. Faster speeds, particularly when a square or sawtooth wave is selected for the FUNCTION, yield unusual effects.

= WAH WAH
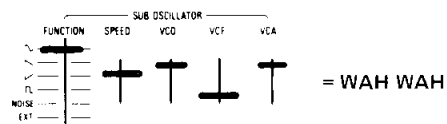
For more "wah" add Resonance [8].

E. **VCA** (grey) 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.

= TREMOLO
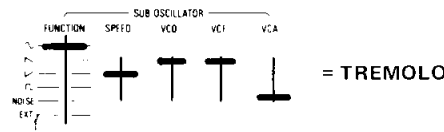
[12] **TOUCH RESPONSE SECTION** — These levers modify the sound according to how you play the keyboard (dynamic control). The three right-hand controls are related to the Sub Oscillator Section [10], as indicated. They also are pressure sensitive, as indicated by the term "After." The PITCHBEND lever is independent of the Sub Oscillator, and is velocity sensitive, as indicated by the term "Initial." "Initial" means that the amount of effect is determined by how fast and hard you initially strike the key. "After" means that the amount of effect is determined by how hard you press a key after it hits bottom.

A. **PITCHBEND** (white) causes the pitch to begin below the note you play and to quickly slide up to the proper pitch. **The faster and harder you strike the keys, the more the pitch bends. No effect is heard with the lever up.**
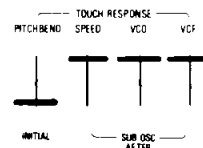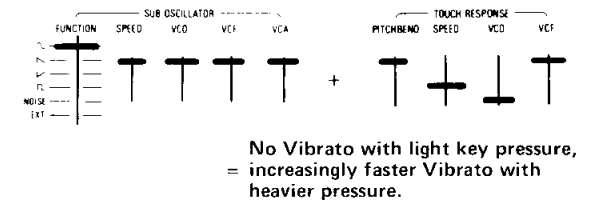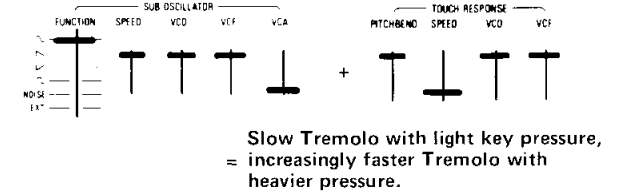


Little or no pitch-bend is heard. **Pitchbend occurs.**

B. **SPEED** (white) increases the speed of any VCO, VCF or VCA FUNCTION selected with the Sub Oscillator.

NOTE: SPEED also interacts with the adjacent VCO and VCF levers. SPEED has no effect if the Sub Oscillator Function is set at EXT or NOISE, since they have no set speed per se.

Slow Tremolo with light key pressure, = increasingly faster Tremolo with heavier pressure.

**No Vibrato with light key pressure, = increasingly faster Vibrato with heavier pressure.**

C. **VCO** (white) varies the pitch of the sound for a trill or vibrato on individual notes as you play.


= VIBRATO

= TRILL
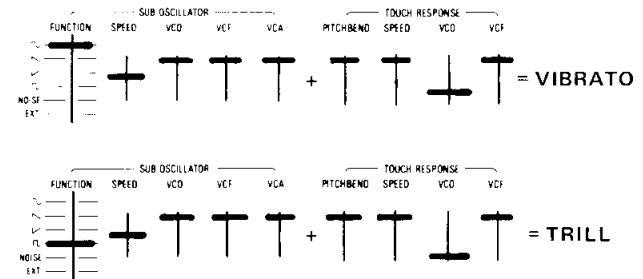
D. **VCF** (green) varies the overtones for adding a change of brightness to individual notes as you play.


= WAH WAH
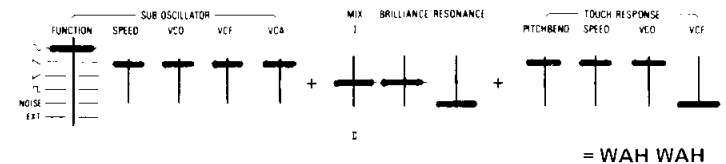
[13] SUSTAIN SECTION — Together, four controls affect how long the note remains after you let go of a key. The sustain can be activated by hand or with a foot switch.
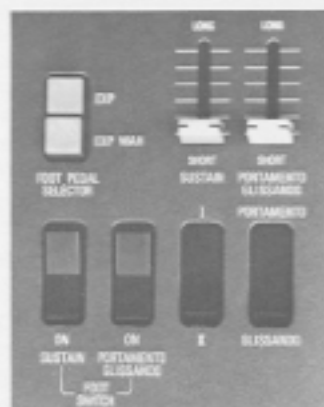

A. **SUSTAIN SLIDER** (yellow) Adjusts how long a note sustains, from SHORT (no sustain) to LONG (about 10 seconds).

B. **SUSTAIN I-II** (black) Two types of sustain are available with the CS-80, I and II (no relationship to channels I & 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 any previous sustain.

C. **FOOT SWITCH PEDAL** Stepping on this FOOT SWITCH PEDAL turns ON the sustain when the SUSTAIN FOOT SWITCH 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 14 C.)

D. **SUSTAIN FOOT SWITCH ASSIGNER** — 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 ASSIGNER SWITCH back. This bypasses the FOOT SWITCH PEDAL and introduces that amount of sustain already set with the SUSTAIN SLIDER.

Sustain I Mode

Sustain II Mode
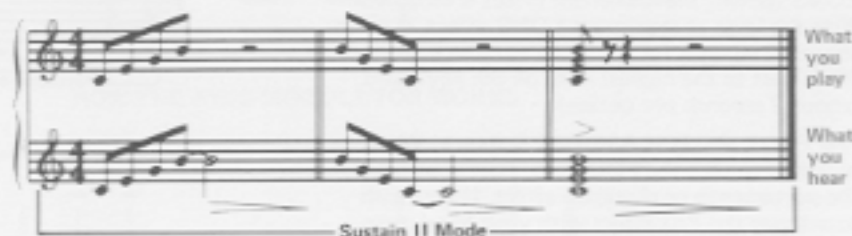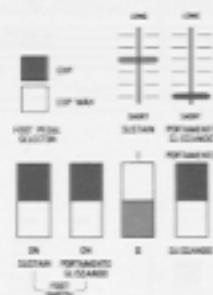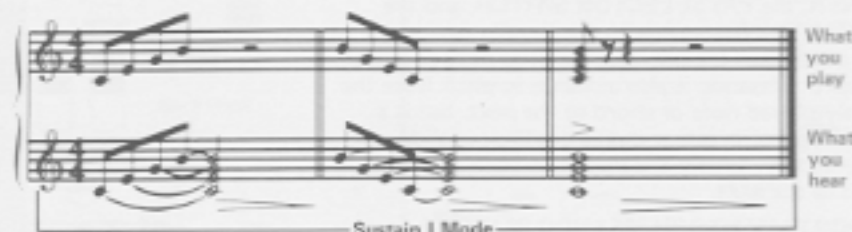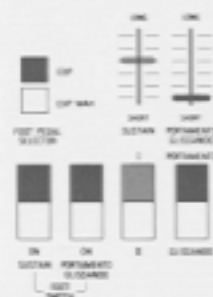
NOTE: With the FOOT SWITCH unplugged, the ASSIGNER switch does not function, so sustain is always ON. If you prefer not to use a FOOT SWITCH and you want to switch sustain ON and OFF, do it by moving the SUSTAIN SLIDER up and down, or insert an unwired standard phone plug in the rear-panel foot switch jack to activate the ASSIGNER switch.
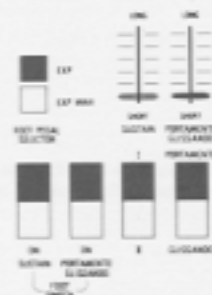
No sustain regardless of foot switch position.
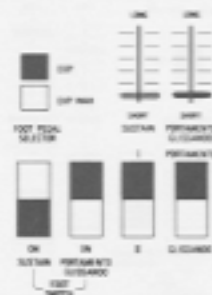
No sustain regardless of foot switch position.
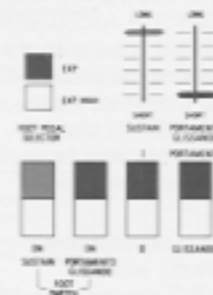
Long sustain regardless of foot switch position.
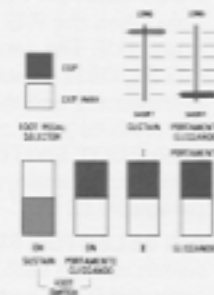
Long sustain when foot switch is down.

[14] PORTAMENTO/GLISSANDO SECTION —
Together, four controls affect the transition between successive notes or chords: the PORTAMENTO/ GLISSANDO (P/G) slider, the P/G FOOT SWITCH ASSIGNER, the P/G SELECTOR SWITCH, and the FOOT SWITCH. *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.

   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 change from the lowest to the highest note on the keyboard (about 2 seconds per octave).

   B. **P/G FOOT SWITCH ASSIGNER** (black) When switched to ON, the FOOT SWITCH 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 and introduces the amount and type of effect you set with the P/G SLIDER and SELECTOR SWITCH.

NOTE: With the FOOT SWITCH unplugged, the ASSIGNER switch does not function, so P/G is always ON. If you prefer not to use a FOOT SWITCH 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.

   C. **FOOT SWITCH PEDAL** 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 13 C.)

   D. **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.

What you play

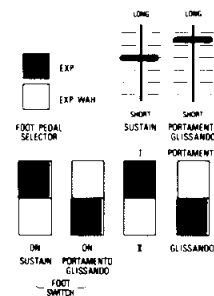What you hear

Portamento — Glissando
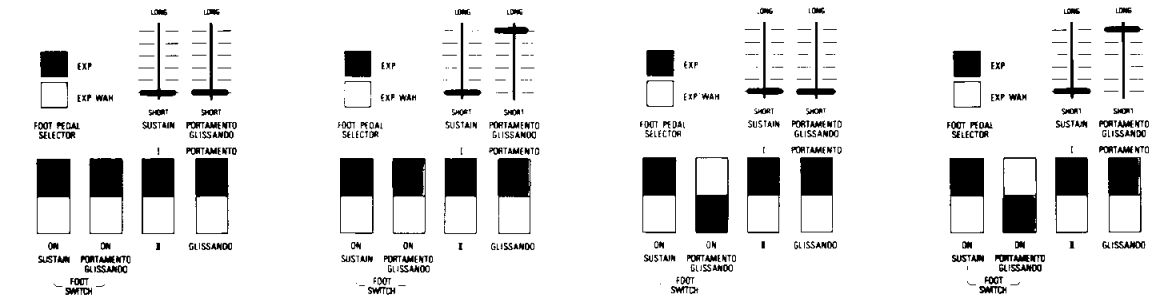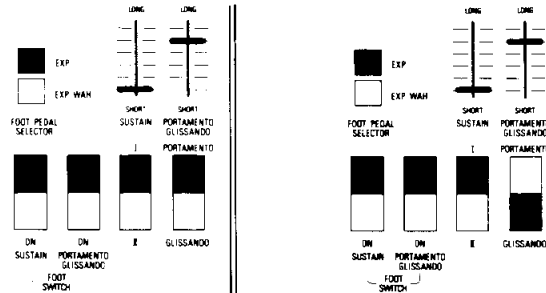
No portamento or glissando regardless of foot switch position

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
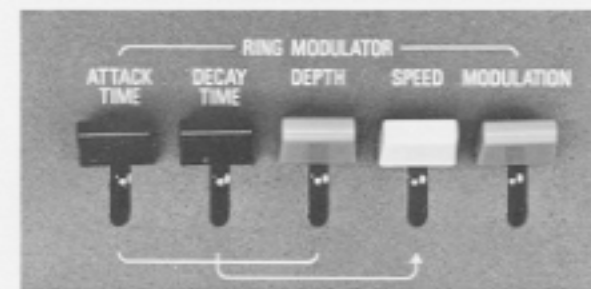
Long portamento (or glissando) when foot switch is down

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

[15] TREMOLO/CHORUS SECTION — Five controls activate and modify a phasing-type TREMOLO on the CS-80 output. CHORUS is actually a form of tremolo, but a very slow one. When either effect is activated, three things happen: (1) the volume level alternately varies up and down in the LEFT and RIGHT outputs, (2) the phase of the signal in the LEFT and RIGHT outputs changes to create a "rotary" speaker effect, and (3) overall CS-80 output volume decreases slightly. These effects may also be heard in the mono (GENERAL) output.
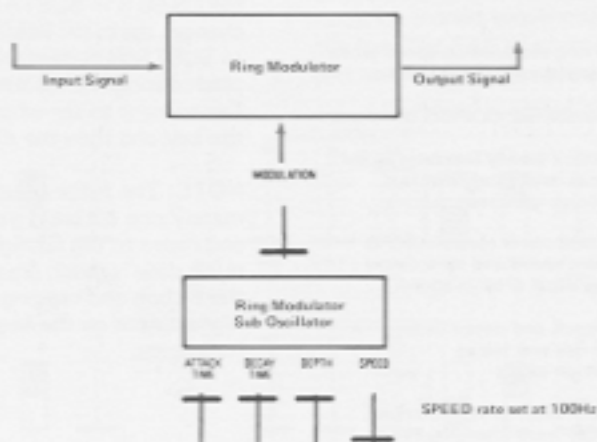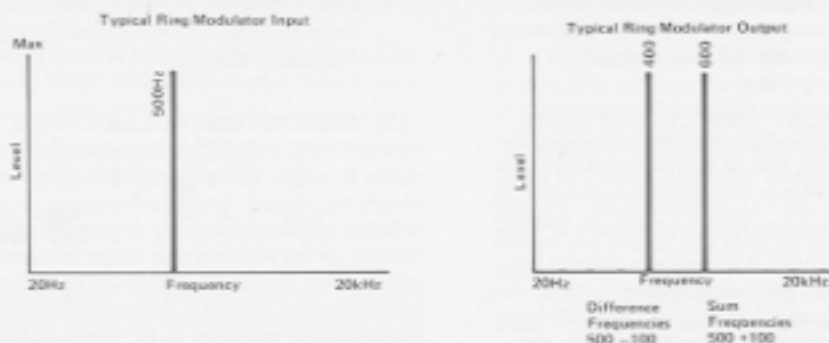
A. **ON/OFF** (black) This rocker switch activates the TREMOLO or CHORUS, as set by the adjacent rocker switches. If neither chorus nor tremolo is desired, this switch should be OFF.

B. **CHORUS** (black) This rocker switch presets the tremolo/chorus circuit for a very slow effect range (see D & E below).

C. **TREMOLO** (black) This rocker switch presets the tremolo/chorus circuit for a moderate to fast effect range (see D & E below).

D. **SPEED** (black) This control adjusts the speed of the modulation for the chorus or tremolo (the speed variation is greater with tremolo). Maximum speed is at full clockwise rotation.

E. **DEPTH** (black) This control adjusts the depth of modulation, the amount of effect. Maximum effect is at full clockwise rotation.
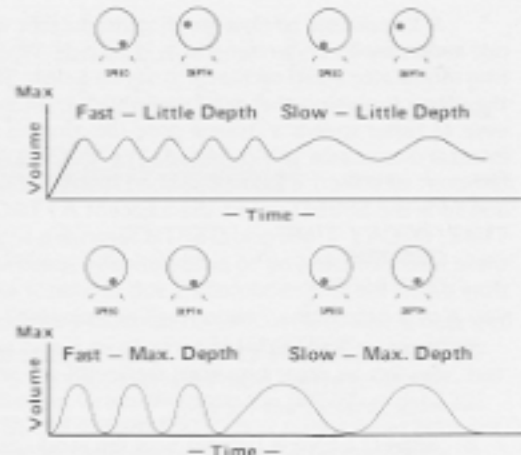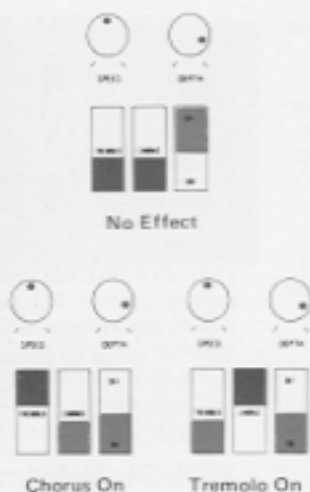
[16] RING MODULATOR SECTION — Ring modulation creates new frequencies, both higher and lower in pitch than the note played, but does not allow the actual note to be heard. This is accomplished by "beating" a sub oscillator against whatever input signal is fed to the ring modulator, thus producing sum 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.

No Effect

Chorus On   Tremolo On

Max
Volume
Fast — Little Depth   Slow — Little Depth
— Time —

Max
Volume
Fast — Max. Depth   Slow — Max. Depth
— Time —

HOW THE RING MODULATOR WORKS

Typical Ring Modulator Input

Typical Ring Modulator Output

Difference
Frequencies
500 −100

Sum
Frequencies
500 +100

Input Signal   Ring Modulator   Output Signal

MODULATION

Ring Modulator
Sub Oscillator

ATTACK TIME   DECAY TIME   DEPTH   SPEED

SPEED rate set at 100Hz

RING MODULATOR
ATTACK TIME   DECAY TIME   DEPTH   SPEED   MODULATION
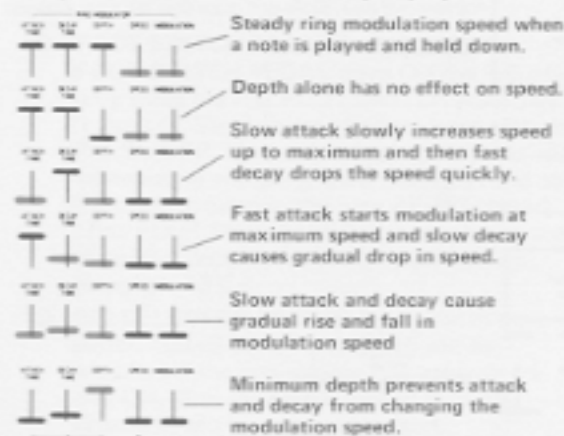
A knowledge of how the ring modulator works is not necessary to understand how it sounds. When the ring modulator's sub oscillator is set to a slow SPEED, the effect is pulsing that may resemble a tremolo. However, at faster speeds a strange gong-like ringing or non-musical dissonance will be heard. 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.

A. **MODULATION LEVER** (grey) 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. **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.

D. **ATTACK & DECAY TIME LEVERS** (black) ATTACK sets the maximum SPEED obtained as the ring modulator moves up from the basic SPEED setting. DECAY sets the length of time it takes for the rate to return to the set SPEED.

NOTE: So long as you hold down one or more keys, playing additional notes will not generate another ring modulation 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.

Steady ring modulation speed when a note is played and held down.

Depth alone has no effect on speed.

Slow attack slowly increases speed up to maximum and then fast decay drops the speed quickly.

Fast attack starts modulation at maximum speed and slow decay causes gradual drop in speed.

Slow attack and decay cause gradual rise and fall in modulation speed

Minimum depth prevents attack and decay from changing the modulation speed.

[17] **FOOT PEDAL SELECTOR BUTTONS** — (Grey) The FOOT PEDAL (Foot Controller) may be preset to perform two functions. When the **EXP** button is down, the FOOT PEDAL serves as an **expression** pedal; tilting the pedal forward lowers the volume. When the **EXP. WAH** button is down, and you rock the FOOT PEDAL, it simultaneously varies the volume (expression) and creates a **Wah-Wah**.

[18] **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 one 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; nominal position is centered.

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

a) Set the MIX lever [4] to "I".
b) Press the "ORGAN 1" Preset [3].
c) Turn off or set at minimum all Sub-Oscillator, Tremolo/Chorus, Ring Modulator, and Touch Response effects.

[19] **RIBBON CONTROLLER** — 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-80 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 one 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.

Expression Pedal

Expression & Wah-wah Pedal

Don't press both buttons

PITCH