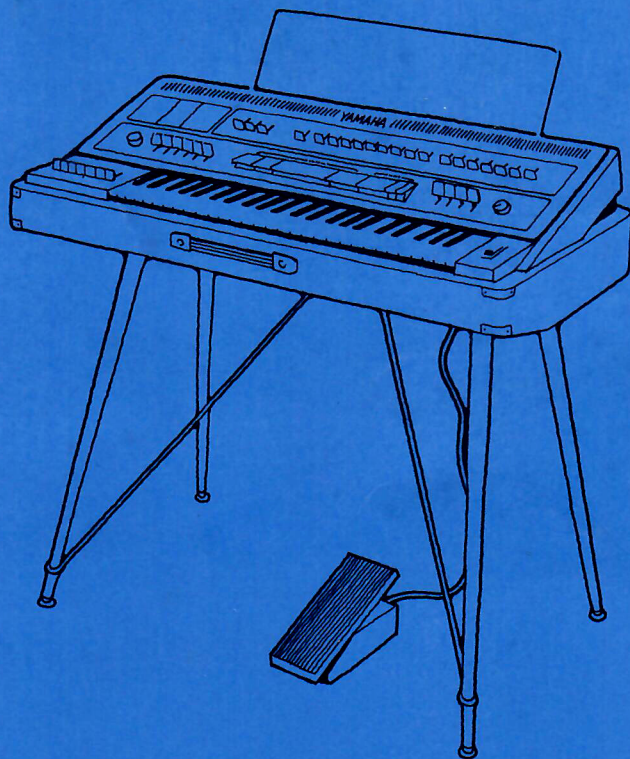


CS-50

GUIDE TO YOUR YAMAHA SYNTHESIZER

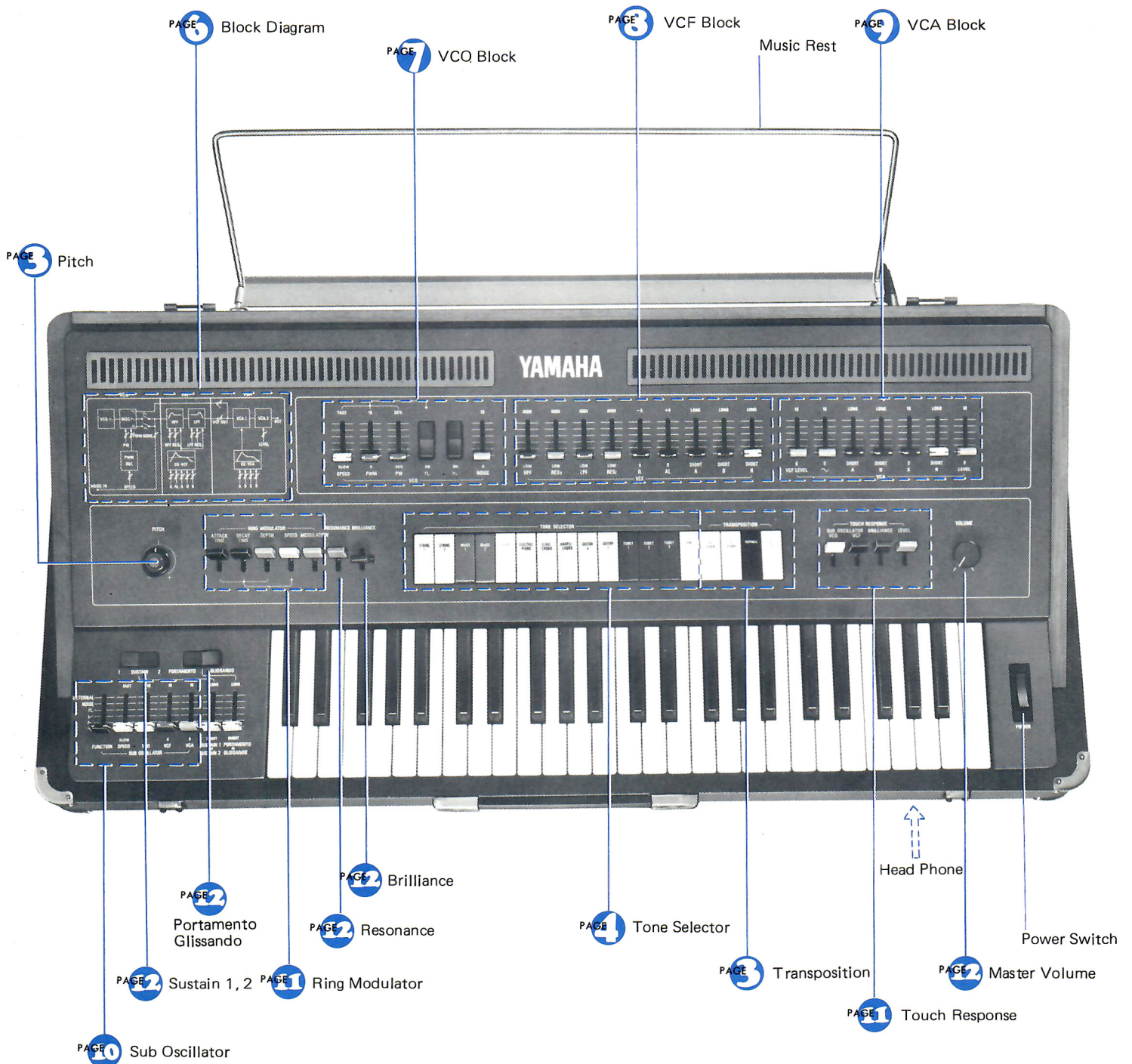


Welcome to the YAMAHA world of music!
We, YAMAHA, wish to thank you for selecting the Synthesizer CS-50.
We feel sure that you will realize many happy years of playing enjoyment with this instrument.
Please read this manual carefully to be sure you are familiar with each of the Synthesizer's features and their expressive possibilities. In that way you and your Synthesizer can become lifelong partners in musical creativity.

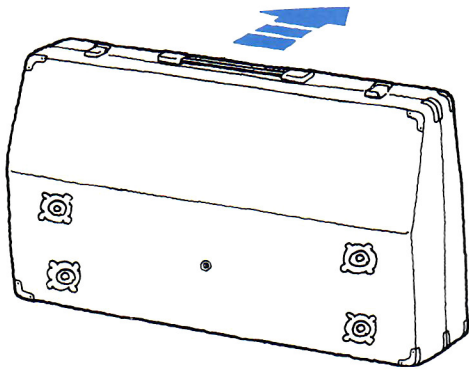
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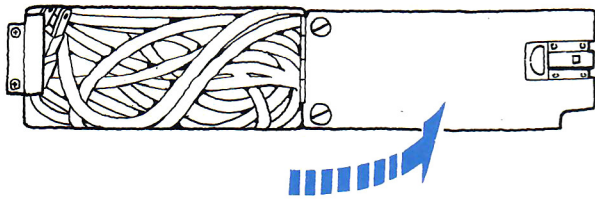
This is Your Synthesizer CS-50



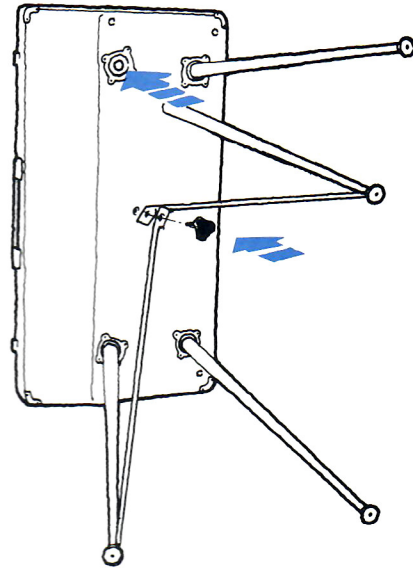
Assembly



Remove the CS-50 cover by unlatching the front, tilting it open, and lifting it from the rear hinges.



Open the storage panel on the bottom of the CS-50 and lift out the AC line cord. Close the panel, making certain the AC cord is routed through the cutaway corner so as to avoid "pinching".



Remove the four legs from the cover, and screw them into the bottom of the CS-50.

Connections

The CS-50 can be connected to almost any amplifier/speaker system. It also works well with a PA system, and it can even be connected to an electronic organ, such as the Yamaha Electone. You may want to use a standard hi-fi system for home practice, although a top quality system is needed for good results. The CS-50 should be connected to the "Low Sensitivity" input of a guitar amplifier, the "Line" input of a PA system or mixer, external input of an Electone organ, or the "auxiliary" input of a hi-fi.

Use the connecting cable; plug one end into the OUTPUT jack on the rear of the synthesizer and the other end into the input jack of our amplifier.

Once connections are made, experiment with the level switch to find the setting which best matches the connected unit's input sensitivity. The nominal output voltage and impedance of the CS-50 are as follows:

HIGH/LOW switch to high position—0.8V rms, 600 ohms

HIGH/LOW switch to low position—80mV rms, 600 ohms

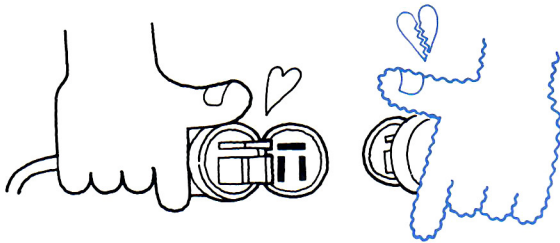
To use the foot pedal, just plug it into the rear-panel jack labeled **FOOT CONTROLLER**. Holding the key down, rock the foot pedal back and forth. The sound gets louder and softer as the pedal position moves. . . just like the expression pedal of Electone organ.

By setting the **FUNCTION** lever on the control panel to the **EXTERNAL** position, and by connecting other **AUDIO** signal sources (tape recorder, turntable, rhythm box, etc.) to the **EXT.IN** jack on the rear panel, it is possible to alter the sound source signals with the **SUB OSCILLATOR** section.

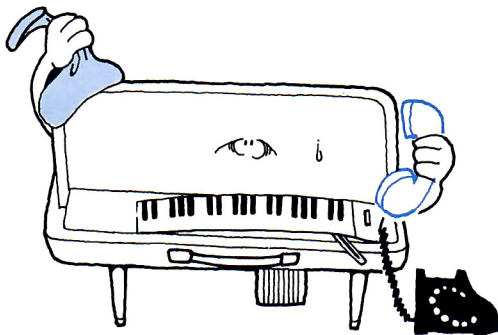
Read the following before playing

In general, treat your Synthesizer with the same care you would any fine musical instrument. The following points are suggested for optimum enjoyment.

1. Use only proper line voltage. Consult your Yamaha serviceman for changes.

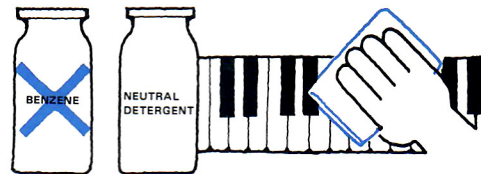


2. Never touch the inside parts.

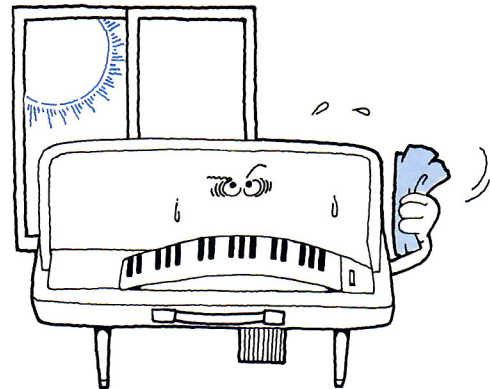


3. Always shut off the power after playing.

4. Clean keys, etc. with a damp cloth only. Never use chemical solvents such as benzene which may damage the finish.



5. Keep the Synthesizer in a position away from direct sunlight, excess humidity and heat to protect the cabinet finish and joints.



6. Before carrying out pitch adjustment, be sure to stabilize electrical circuit of your Synthesizer more than 30 minutes after power switch is turned on.

Special Instructions for British-Standard Model

As the colours of the wires in the mains lead of the apparatus may not correspond with the coloured markings identifying the terminals in your plug proceed as follows.

The wire which is coloured **GREEN-and-YELLOW** must be connected to the terminal in the plug which is marked by the letter E or by the safety earth symbol \perp or coloured **GREEN** or **GREEN-and-YELLOW**.

The wire which is coloured **BLUE** must be connected to the terminal which is marked with the letter N or coloured **BLACK**.

The wire which is coloured **BROWN** must be connected to the terminal which is marked with the letter L or coloured **RED**.

IMPORTANT

THE WIRES IN THE MAINS LEAD ARE COLOURED IN ACCORDANCE WITH THE FOLLOWING CODE.

GREEN-AND-YELLOW: EARTH
BLUE: NEUTRAL
BROWN: LIVE

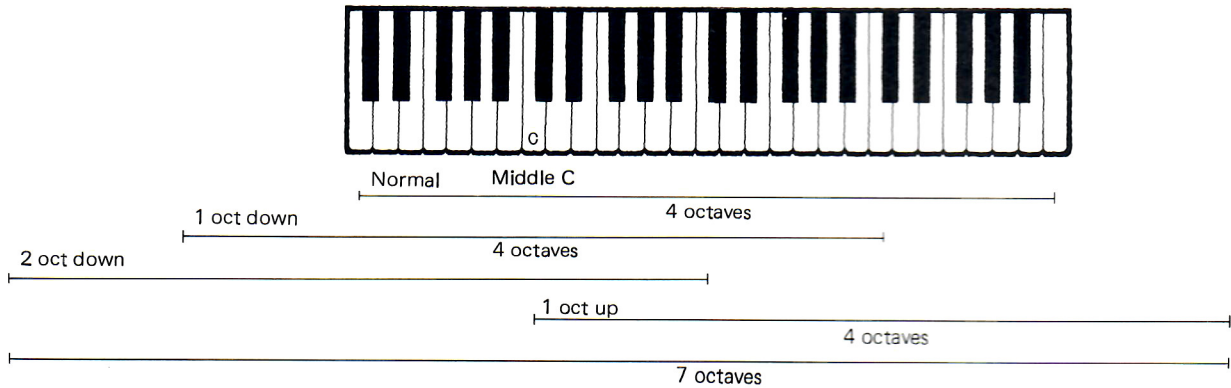
WARNING:

THIS APPARATUS MUST BE EARTHED.

Keyboard

Your YAMAHA synthesizer's keyboard has 49 keys ranging from c to c4 (4 octaves).

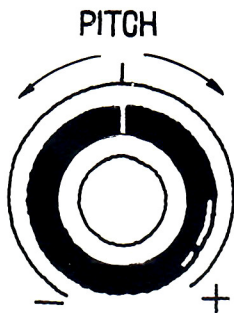
Note: Your YAMAHA synthesizer is designed to sound four tone sources at the same time.



TRANSPOSITION

Normal range is 49 keys/4 octaves, but by employing the **TRANSPOSITION** switch, it is possible to extend the range by one octave on the higher side and two octaves on the lower side, for a total of seven octaves. (from C₁ to c₅)

- Notes
1. When no **TRANSPOSITION** switch is depressed, you hear the keyboard as if the **NORMAL TRANSPOSITION** switch was depressed.
 2. When you depress two or more **TRANSPOSITION** switches at the same time, you will hear only the one furthest to the right on the tablet.



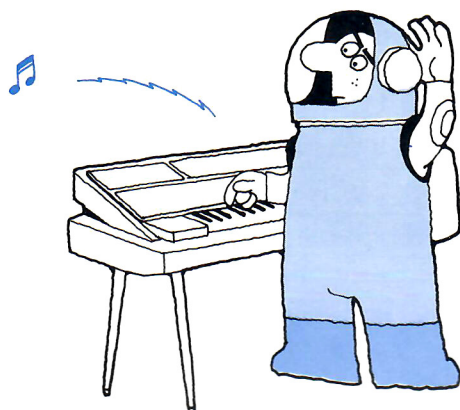
PITCH Knob

used when playing in ensemble with other instruments to match the pitch of the other instruments. Normal position is in the center; turning to the right will raise the pitch while turning to the left will lower the pitch (Inside knob controls the pitch delicately).

Note: Tuning is to be carried out after about 30 minutes have past following switch-on of power.

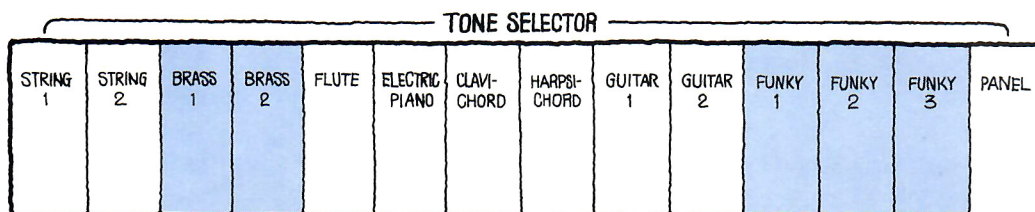
The Synthesizer Sounded

1. Set up your Synthesizer referring to the illustration of the assembly and connection.
2. Set all the levers, switches and volumes to the normal position (Refer to the illustration shown on page 1.)
3. Turn the power switches on of the amplifier/speaker system and CS-50, and raise the volume of the amplifier/speaker system to some position.
4. Push a preferable **TONE SELECTOR** switch and play. Then adjust the volume for proper sound level.



Tone Selector

There built in 13 kind of sounds, which are very much like those of popular musical instruments.



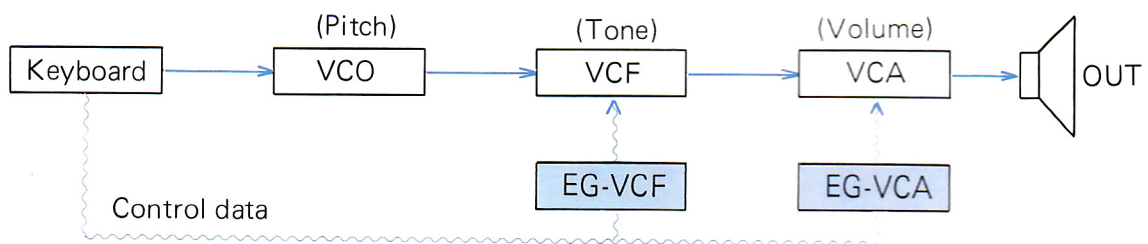
- Notes
1. If you do inadvertently press down two or more **TONE SELECTOR** switches at the same time, the sound you hear is determined only by the SWITCH closest to the right of the synthesizer.
 2. When no SWITCH'S depressed, the sound of **STRING 1** to the left end of the **TONE SELECTOR** will be heard.

What is a Synthesizer?

The sounds we hear from trumpets, violins and other natural musical instruments change subtly in pitch, tone and volume as they pass through the stages of attack, sustain and decay. The time required for these changes to take place differs according to the musical instrument, and constitutes a major factor in creating the character of the instrument's sound.

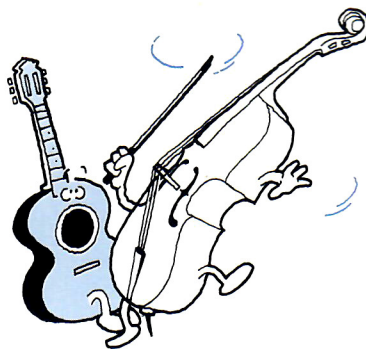
By controlling the oscillator which produces the sound, the filters which determine the tone color and the amplifier, the synthesizer changes the pitch, tone and volume into time sequences, and in this way can create sounds which are close to those of natural musical instruments as well as completely original sounds. The Envelope Generator (EG) enables to create the effect of natural sound such as trumpets, violins and so on.

The various components of the sound, through its attack, sustain and decay can be changed by EG each time a key is pressed. The concise Block Diagram of the Synthesizer is as follows;



The CS-50 brings together the numerous factors forming a sound into the **VCO**, **VCF**, **VCA** and **SUB OSCILLATOR** and other functions, where they are controlled.

Using the CS-50 Properly

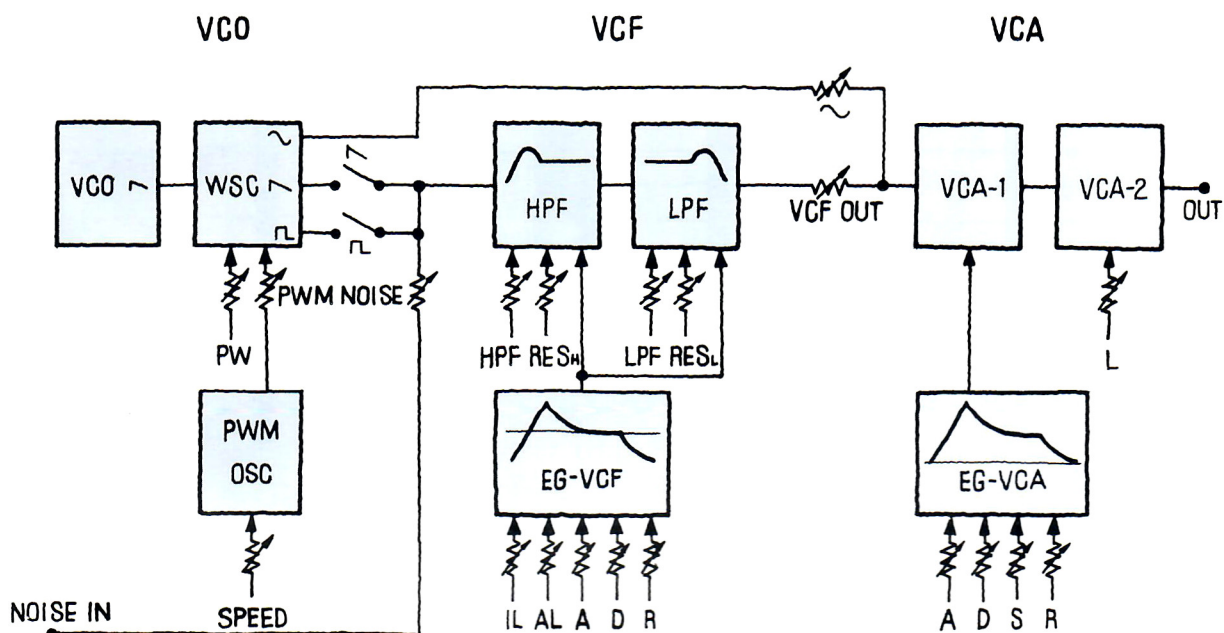


The CS-50 has 13 preset tones built in, adding further expressive possibilities to the synthesizer, whose original function is to create original sounds.

In order for you to fully express your feelings and create your own sounds, it will be necessary for you to have a basic understanding of the CS-50's system.

You will be able to make full use of the CS-50 after studying the system drawing on the left corner of the panel.

Operating Procedures



- 1) Select either a preset tone or a tone created by yourself on the panel.
If you select a tone created by yourself ...
- 2) Choose the basic tone source waveform (**VCO** Block)
- 3) Select the basic harmonic combination. For this step, set the High Pass Filter (passes high tone only) and Low Pass Filter (passes low tones only). (**VCF** Block)
- 4) Next add the temporal change to this harmonic combination. (**VCF** Block; **EG-VCF**)
- 5) Set the levels for the sine wave and other tones.
- 6) Add the temporal volume changes from the instant that the tone begins to sound to the final moment before it dies away. (**VCA** Block; **EG-VCA**)
- 7) Control the level of **A.D.S.R.** and advance the volume of **VCA** to a comfortable listening level. (**VCA** Block)

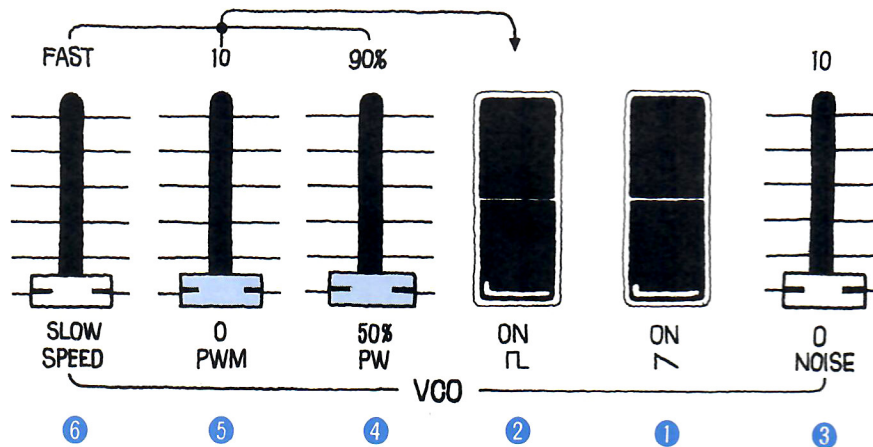
In this way the characteristics of the tone can be freely set.

It will be possible to create the original sounds by operating the **TOUCH RESPONSE**, **OSCILLATOR**, and **RING MODULATOR**.

The CS-50 thus has great appeal to performers as a revolutionary system which has broken through boundaries which previously limited electronic music.

Note: This CS-50 provides you infinite variety of sound and you can create splendid sound and effects with it. Recommend you will record those sound and effect on the card.




VCO (Pitch)



VCO Block

This is the most important tone source and may be said to be the heart to the synthesizer.

Wave Form

- ①  (saw tooth) wave; This wave is used when creating waves with many harmonic spectrum, such as those of string-like sounds.
- ②  (square) wave; This wave is like the wave of a clarinet tone.
- ③  (sine) wave; This wave is used when creating round, clear tones like those of a Flute.
(This lever is in VCA Block)

③ NOISE lever

using noise signals as the tone source, the noise lever is used to produce natural sounds such as those of the wind or waves.

④ PW (Pulse Width) lever

adjusts harmonic spectrum by changing the pulse width of the tone source (The ratio of Pulse Width is variable from 50% to 90%.) and applies subtle changes to the tone color. This lever changes the tone color from a "Pinched" sound to a "Clarinet-like" sound.

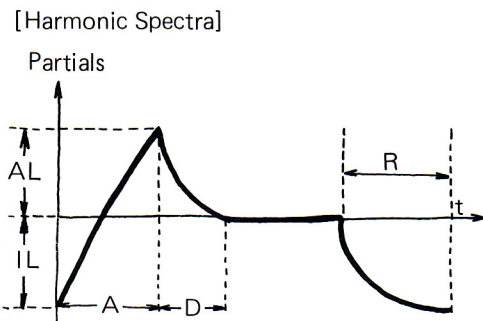
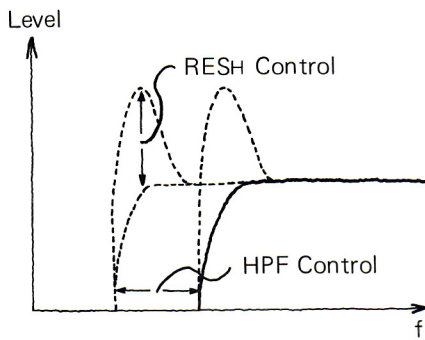
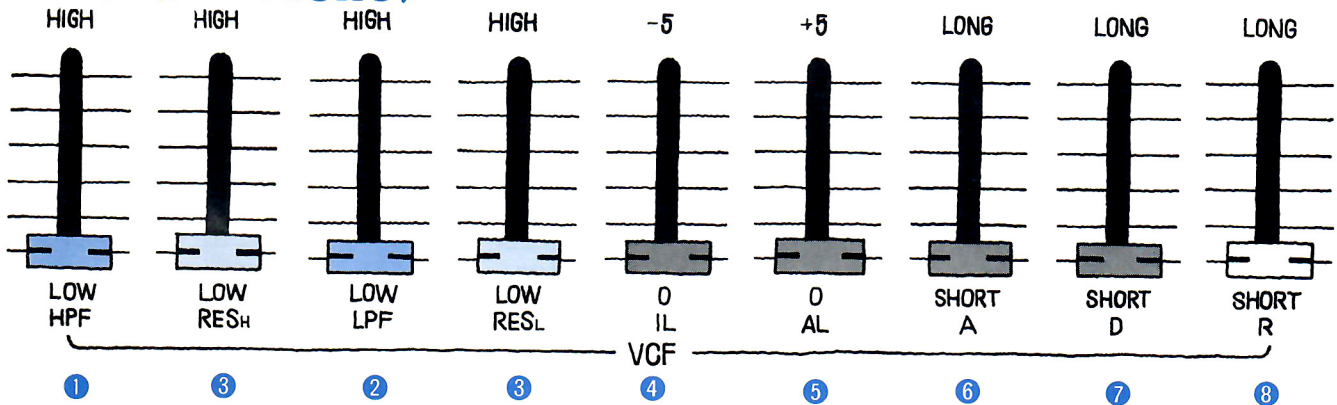
⑤ PWM (Pulse Width Modulation) lever

applies variations to tone source waves and produces special effects as if two sounds are evoked at the same time.

⑥ SPEED lever

controls the speed of **PWM** effects.

VCF (Tone)



VCF Block

refines the tone and alters harmonics.

1 HPF (High Pass Filter) lever

When this lever is raised to "High" side, the low frequency components are cut off and the tone color is bright and clear.

2 LPF (Low Pass Filter) lever

As opposed to the **HPF** lever, this lever cuts off the high frequency components. As the lever is raised to "Low" side, the tone color is given a darker feeling.

Note: Depending on the position of the **HPF** and **LPF** levers a tone may not be heard, so attention should be paid to their position.

3 RESH (RESL) (Resonance) lever

Higher **RESONANCE** setting increase the height of a resonant peak at the cut off frequency.

4 IL (Initial level) lever

determines the initial harmonic spectrum as to how many multiples are contained in it. The more raise the lever, the fewer the multiples are contained.

5 AL (Attack level) lever

determines the most rich harmonic spectrum. The more raise the lever, the more multiples are contained.

6 A (Attack time) lever

controls the time from the instant the key is pressed until the harmonics reaches its maximum height.

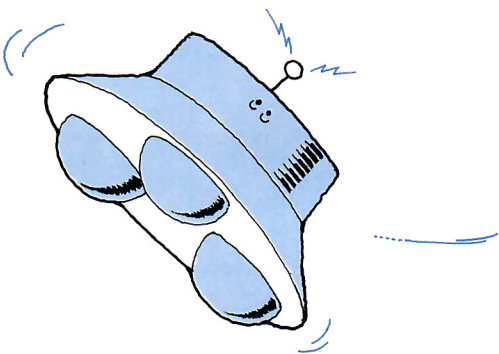
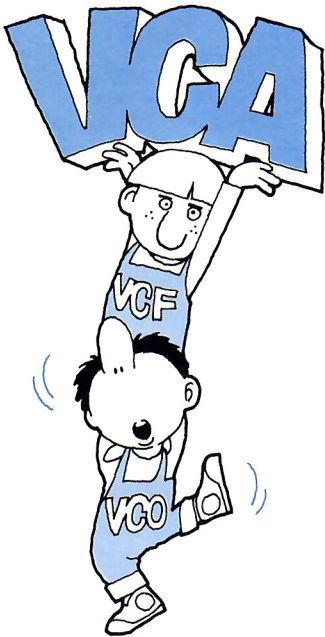
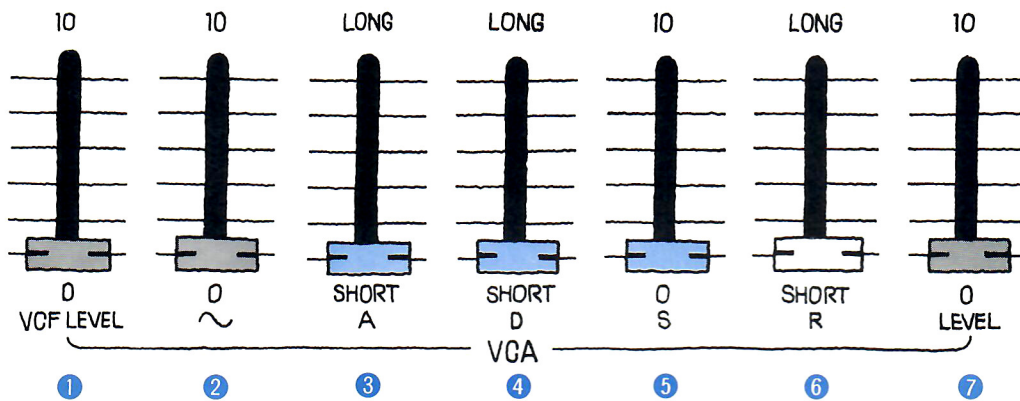
7 D (Decay time) lever

controls the time from the instant the harmonics reaches its maximum height until it sustains.

8 R (Release time) lever

controls the time from the instant the key is released until the tone disappears.

VCA (Volume)



VCA Block

The volume (amplitude) of the signal which passed through the VCF and sine wave are controlled either manually using the **VCF LEVEL** (or ~ Lever) or automatically by the envelope from the Envelope Generator.

① VCF LEVEL lever

This lever controls the amplitude of the signal which passed through the VCF section (except sine wave and the preset tone signal).

② ~ lever

controls the volume (amplitude) of sine wave signal, from Wave Shaper Converter directly.
(see the Block Diagram in Page 6)

③ A (attack time) lever

controls the length of time from when the key is pressed to the instant the signal reaches its maximum height.

④ D (Decay time) lever

controls the length of time from the time the signal reaches its maximum height until the instant it returns to the pitch of the depressed key.

⑤ S (Sustain Level) lever

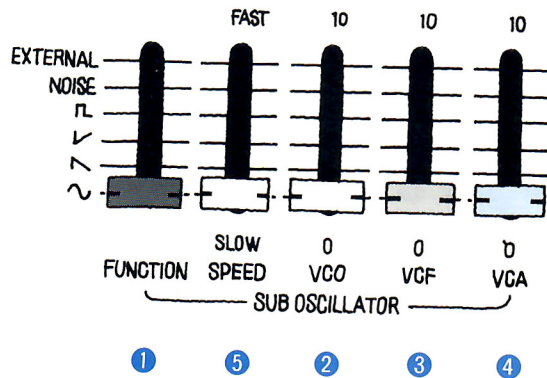
controls the signal level during the time the key is pressed.

⑥ R (Release time) lever

controls the length of time from the instant the key is released to the time the signal disappears.

⑦ LEVEL lever

controls the amplitude of the signal which passed through **VCA** Block.



SUB OSCILLATOR

This is a modulation signal the function of the suboscillator is to create variations, in addition to the waves of each block (VCO, VCF, VCA)

1 FUNCTION

This lever selects the modulation wave shape to which variations are to be given. There are six types.

- ~ : Sine wave. A smooth "wavelike" variation.
- ∇ : Saw tooth wave. A fast-rising variation.
- ∨ : Saw tooth wave. A slow-rising variation.
- ⌊ : Square wave. An angular variation.

NOISE: Introduces variation by means of a noise signal (a signal which ranges from a low to an extremely high vibration, with absolute irregularity and proportion).

EXTERNAL: Other audio sources (turntables, tape recorders, rhythm box, etc.) can be connected to the **EXTERNAL IN** on the rear panel, and variations applied with the signals.

2 VCO

commonly called vibrato. As the lever is pushed upward, the vibrato becomes deeper.

3 VCF

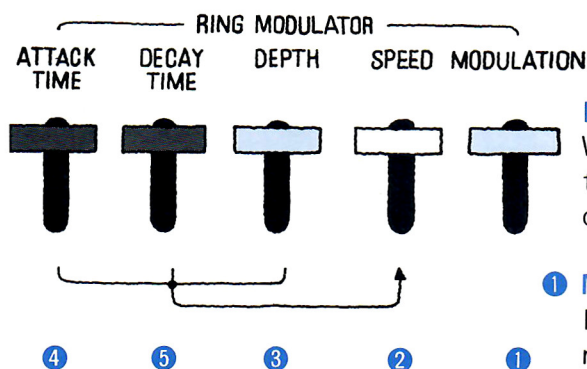
commonly called wah-wah. As the lever is pushed upward, the wah-wah becomes deeper.

4 VCA

changes the vibration width of the wave, commonly called electronic tremolo.

5 SPEED

This lever controls the speed of the four modulation signal waves mentioned above, except for **NOISE** and **EXTERNAL**.



RING MODULATOR

When two oscillations are fed in, this modulator can use them to create a third frequency based on their sums or differences.

1 MODULATION lever

Forwarding this lever will gradually change the ring variation.

NOTE: There will be no ring modulator effect unless this modulation lever is forwarded.

2 SPEED lever

This lever controls the speed of the Ring modulation.

3 DEPTH lever (Speed Control)

This lever controls the speed of repetition of the amplitude modulated sound.

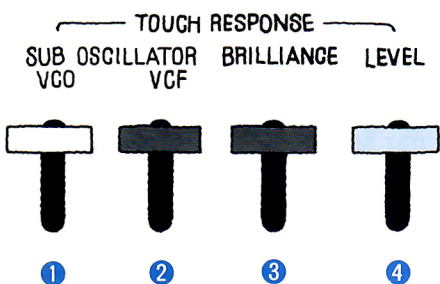
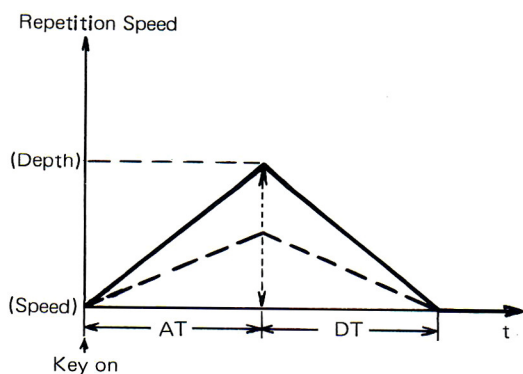
4 ATTACK TIME lever

controls the time getting to the maximum repetition speed.

5 DECAY TIME lever

controls the time from the maximum repetition speed to initial speed.

NOTE: **ATTACK TIME** and **DECAY TIME** are effected only when the **DEPTH** lever is raised.



TOUCH RESPONSE

By deeply pressing the keys, the following effects can be obtained.

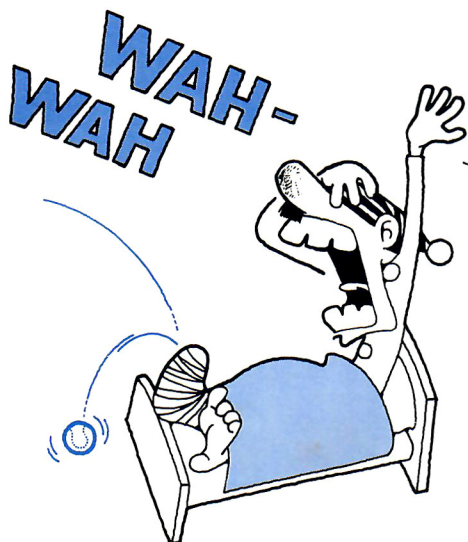
1 **VCO lever;** This lever controls the depth of the vibrato effect.

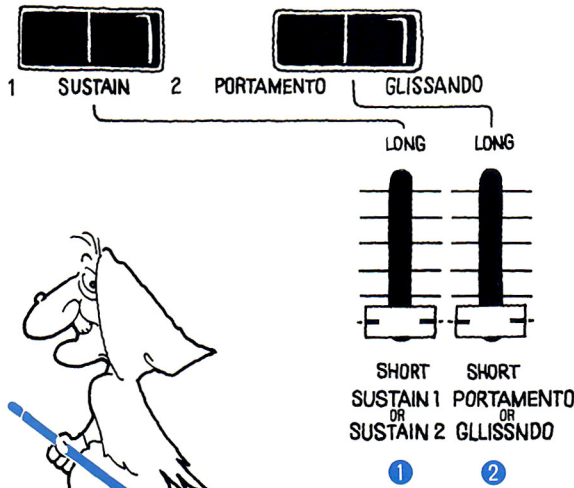
2 **VCF lever;** This lever controls the depth of the wah-wah effect.

NOTE: These levers are applied to both "VCO" and "VCF" levers in **SUB OSCILLATOR BLOCK**. When these levers (in **SUB OSCILLATOR**) are turned off, you can't hear the vibrato and Wah-Wah effects.

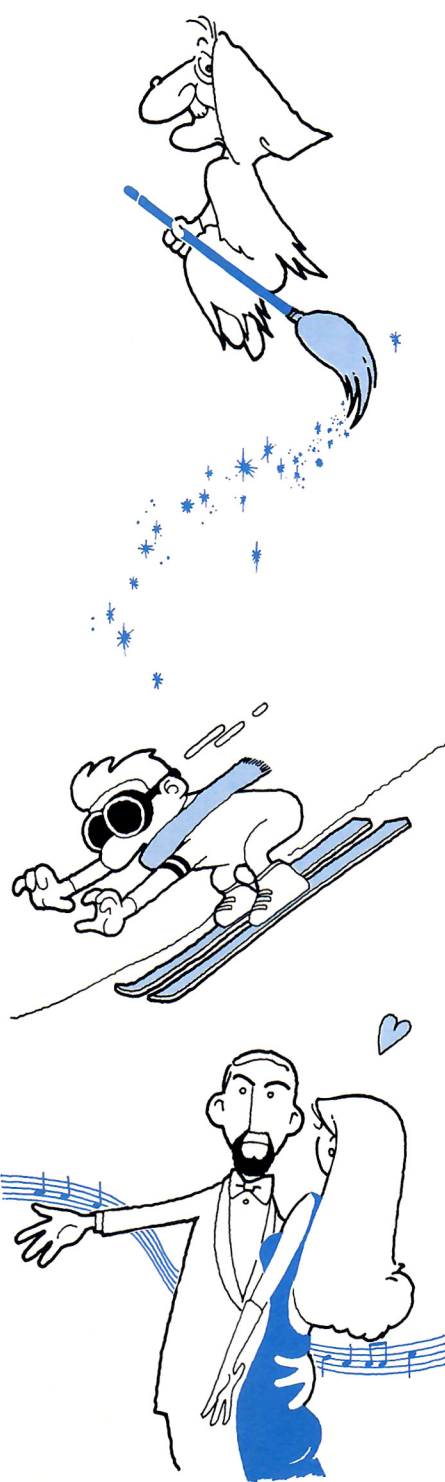
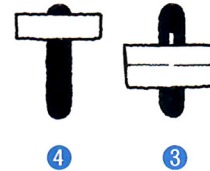
3 **BRILLIANCE lever;** The degree of harmonics is determined by deeply pressing the key.

4 **LEVEL lever;** This lever controls the Volume by deeply pressing the key.





RESONANCE BRILLIANCE



SUSTAIN

The sustain controls the length of the signal after the key is released. The switches give a selection of the type of sustain desired.

1 SUSTAIN 1

When the keys are released, the sustain effect is obtained for all notes.

2 SUSTAIN 2

When two or more keys are released the sustain effect will be on the last key released.

2 PORTAMENTO and GLISSANDO

The **PORTAMENTO** controls the interval of the non-step pitch travel from the moment one key is pressed until the following one.

The **GLISSANDO** controls the interval of the step pitch travel from the moment on key is pressed until the following one. On the **SHORT** side the effect is almost identical to **PORTAMENTO**.

NOTE: The **PORTAMENTO** and **GLISSANDO** effect up to four notes at a time.

3 BRILLIANCE

This effect imparts a brilliant or soft feeling to the whole tones. Normal position is in the center.

4 RESONANCE

RESONANCE serves to stress the specified harmonics and creat a most unique sound.

MASTER VOLUME

controls overall volume.

Explanation of Synthesizer

VCO: Voltage Controlled Oscillator

The oscillation frequency is controlled by direct current voltage, in ratio to the voltage. That is, this is the synthesizer sound source which controls the intervals with the voltage.

VCF: Voltage Controlled Filter

This is a filter which changes the tone in proportion to the voltage. That is the tone of the synthesizer is controlled by the voltage.

VCA: Voltage Controlled Amplifier

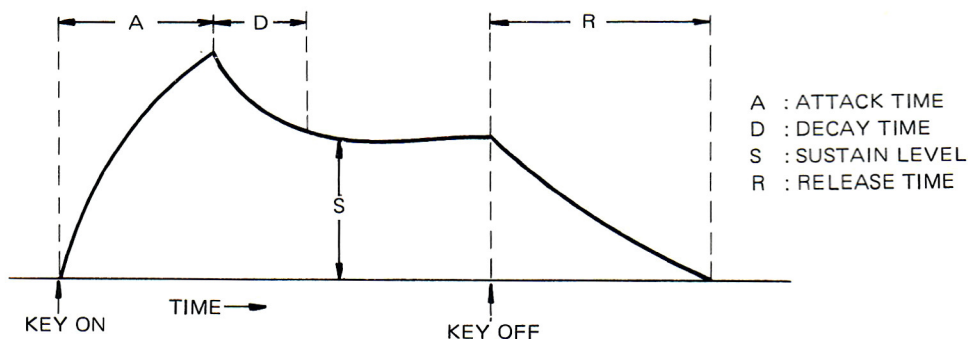
An amplifier which changes the amplitude in proportion to the voltage. Minute volume changes of each tone are controlled by changes in voltage.

Envelope

The first notes the changes in sound volume through decay and time, and the changes in the frequency components can be controlled.

A.D.S.R. (Attack, Decay, Sustain, Release)

The conventional A.D.S.R. circuit changes the envelope in the following way, feeding the envelope to the VCF and VCO to change tone color and volume. In the Yamaha system, however, this part is already reduced, making use of EG-VCF and EG-VCA circuits.



Attack Time (A)

From the instant time the key is pressed and the first note sounds to the time the maximum level is reached.

Decay Time (D)

The decay time from the maximum level of the Attack when the key is pressed until the sustaining level.

Sustain Level (S)

The sound volume which is sustained during the time the key is pressed.

Release time (R)

The sustaining time from the time the key is released until the sound is completely gone.

Filter

The frequency components (how the harmonics are included) are controlled and the tone changed. The synthesizer filter is the VCF

Cut off Frequency

This determines the point where the frequency component should be cut with the filter. By changing the cut-off frequency, the amount of harmonics can also be changed, thus changing the tone.

Resonance

The frequency just before the cut-off frequency is emphasized with the resonance.

Transposition

The total pitch can be raised or lowered in octaves.

Portament

The interval shifts continuously from the key previously pressed to the next key. The time required for the shifting can also be regulated.

Specifications

KEYBOARD

49 Keys

TONE SELECTORS

String 1	Harpichord
String 2	Guitar 1
Brass 1	Guitar 2
Brass 2	Funky 1
Flute	Funky 2
Electric Piano	Funky 3
Clavichord	(Panel)

TONE CONTROLS

VCO Section

\wedge (saw tooth wave)
 \square (pulse wave)
 PW (Pulse Width)
 PWM (Pulse Width Modulation)
 SPEED
 NOISE

VCF Section

HPF (High Pass Filter)
 LPF (Low Pass Filter)
 RES_H (Resonance, High)
 RES_L (Resonance, Low)
 IL (Initial Level)
 AL (Attack Level)
 A (Attack time)
 D (Decay time)
 R (Release time)

VCA Section

VCF Level
 \sim (sine wave)
 A (Attack time)
 D (Decay time)
 S (Sustain level)
 R (Release time)
 LEVEL

EFFECT CONTROLS

Ring Modulator
 Modulation
 Speed
 Attack Time
 Decay Time
 Depth

Touch Response

VCO
 VCF
 Brilliance
 Level

Sub Oscillator

Function (\wedge , \surd , \square , NOISE, EXTERNAL)
 Speed
 VCO
 VCF
 VCA

Sustain 1

Sustain 2
 Portamento
 Glissando
 Resonance
 Brilliance
 Pitch
 Transposition
 Normal
 1 oct up
 1 oct down
 2 oct down

OTHER FITTINGS

Head Phone Jack
 EXT. IN
 LEVEL CONTROL
 OUT PUT Jack
 (FOOT CONTROLER)

CIRCUITRY

Power Consumption : 50W
 Power Source : 50/60 Hz, AC

DIMENTIONS

Width : 98 cm (38-1/2")
 Depth : 49 cm (19")
 Height : 106 cm (41-1/2")

WEIGHT : 35 kg (77 lbs)

FINISH : Black leatherette

Specifications subject to change without notice.

SINCE 1887  **YAMAHA**
NIPPON GAKKI CO., LTD. HAMAMATSU, JAPAN