

# COMPU SYNTH CMU-810

OPERATION MANUAL

Roland 

- **The CMU-810 is a monophonic synthesizer designed as a sound source unit for the CMU-800. As well as the Synthesizer Section that allows wide variety of synthesis, the unique VCA+Mixer function is provided for dynamics and accent controls, etc.**

## **Notice**

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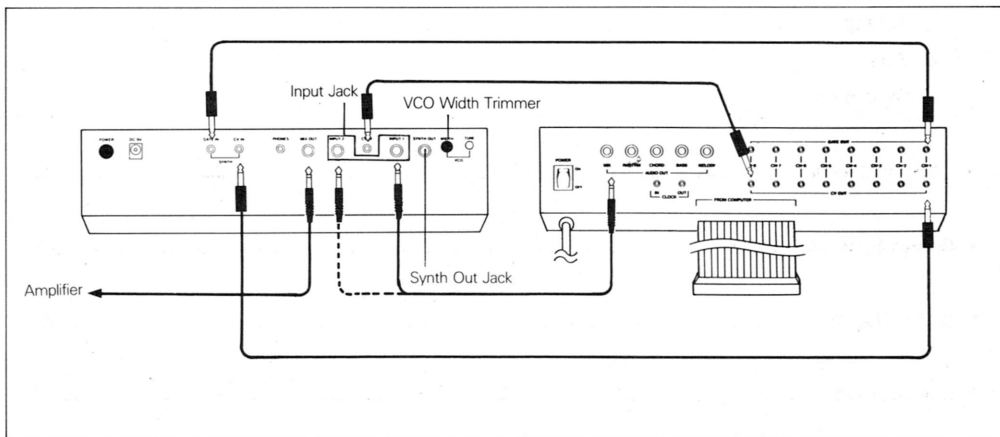
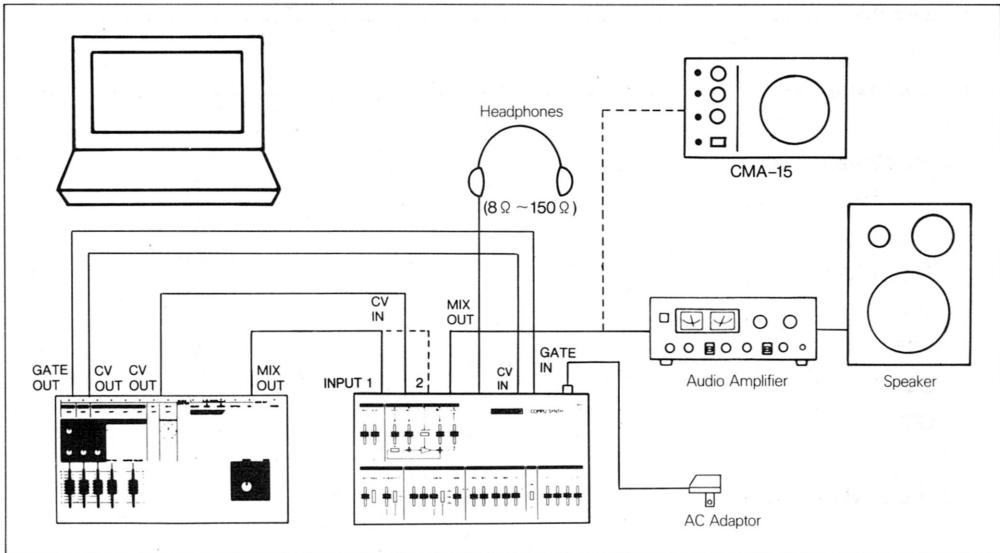
## **Important**

- ① Use only the supplied Roland DG ACP series (ACP-120, 220 or 240) for AC operation.
- ② Do not turn the unit on before connecting an AC Adaptor.
- ③ Do not place heavy objects on the unit or the power cable.
- ④ Be sure that the voltage of the power supply does not vary  $\pm 10\%$  of the rated voltage.
- ⑤ Avoid placing the unit in extreme heat or humidity, or where it may be affected by dust.
- ⑥ Do not give strong shock to the unit.
- ⑦ Clean the unit with soft cloth, and use only a mild detergent. Never use solvents such as paint thinner.
- ⑧ If the unit does not work properly, immediately turn it off. Then carefully repeat the procedure observing the instructions of this manual.

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## • Connections



### • Input Jacks 1, 2

The signal sent from the Input Jack 1 will pass through the VCA before being fed to the Mixer. The signal from the Input Jack 2, however, is fed to the Mixer directly.

### • Synth Out Jack

Through this jack, synthesizer sound is output.

\* The output level is not affected by the Synthesizer Level Knob on the front panel.

This is useful for setting up an effect unit, etc.

### • VCO Width Trimmer

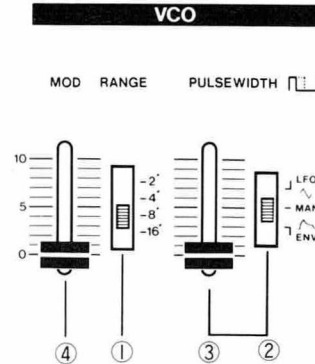
This is to be used to calibrate the VCO's Frequency. Normally, it is perfectly adjusted (1 oct/1V), so do not move it unless readjustment is necessary.

## ● Panel Description

### I Synthesizer Section

#### VCO (Voltage Controlled Oscillator)

The VCO is the Voltage Controlled Oscillator that controls the pitch, and creates waveforms which are the sound source of the synthesizer.



#### ① RANGE Selector Knob

This is to change the pitch of the VCO in exact one octave steps from 2' to 16' (2', 4', 8', 16'). To match the CMU-810's pitch to the CMU-800's, set this switch to 8'.

#### ② PWM Mode Selector Switch

When this switch is set to MAN, the pulse width can be controlled with the PWM Slider ③. When it is set to LFO or ENV, the intensity of the modulation is controlled with the same slider ③, i.e. the pulse width is controlled by the corresponding signal from the LFO or the Envelope Generator.

#### ③ Pulse Width Modulation Knob

#### ④ Modulation Depth Knob

When the LFO's signal is controlling the pitch of the VCO, this knob adjust the amount of signal depth of the modulation.

#### <Pulse Width>

When the top and bottom portions of the square wave are unequal, the result is what is called a pulse wave. The harmonic content of the pulse wave will depend greatly on the width of the pulses. It is possible to modulate, or change the pulse width by means of the LFO or the Envelope Generator.

#### <Waveforms>

There are 2 types of waveforms from the VCO (  $\square$  and  $\nearrow$  ) which are sent to the SOURCE MIXER and mixed at any proportion you like.

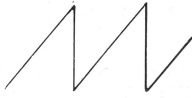
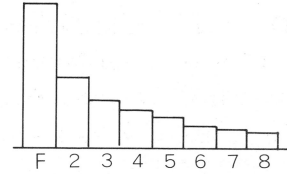
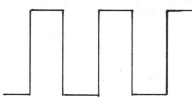
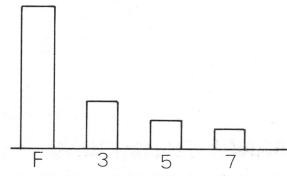
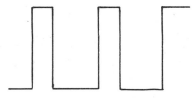
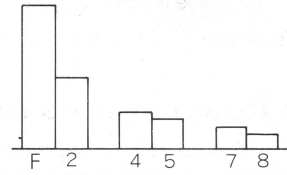
#### <Other Sound Sources>

##### ● Sub Oscillator

This is the VCO's subordinate Oscillator which generates the output signal one octave or two lower than the VCO's. The output waveform of this Oscillator is Square Wave and Pulse Wave.

##### ● Noise

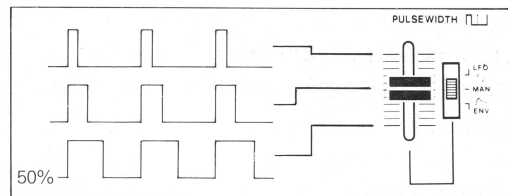
## Waveform

Waveform	Description	Harmonic Content
 <p><b>Saw Tooth</b></p>	The sawtooth wave contains a fundamental sine wave and its integral harmonic sine waves at a fixed ratio. The level of each harmonic is as shown on the right. When fundamental content is 1, the content of $n$ th harmonic is $1/n$ .	
 <p><b>Square</b></p>	The square wave contains a fundamental sine wave and its odd numbered harmonics at a fixed ratio. The level of each harmonic is the same as sawtooth wave: the content of $n$ th harmonic is $1/n$ ; except that there are no even numbered harmonics.	
 <p><b>Pulse</b></p>	With pulse wave, the harmonic content greatly varies depending on the pulse width. It is characterized by a lack of the $n$ th harmonic series when the pulse width is $1/n$ . The example on the left lacks 3rd, 6th, and 9th harmonics because the pulse width is $1/3$ (33%).	

## Pulse Width

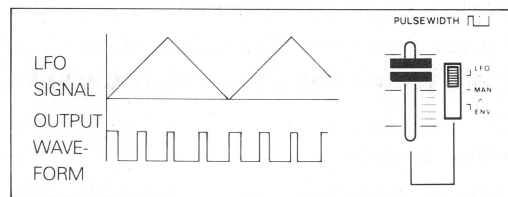
### ► Manual PWM

PWM Mode Selector Switch ② → MAN  
 Pulse Width Modulation Knob ③ → Determines the Pulse width.



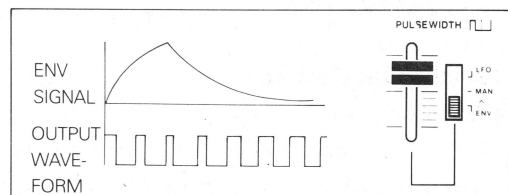
### ► Pulse Width Modulation by LFO

PWM Mode Selector Switch ② → LFO  
 Pulse Width modulation Knob ③ → Adjusts the intensity of modulation.







### ► Pulse Width Modulation by ENV

PWM Mode Selector Switch ② → ENV  
 Pulse Width Modulation Knob ③ → Adjusts the intensity of modulation.



## Source Mixer

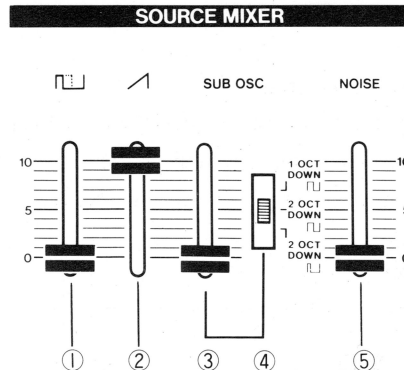
The SOURCE MIXER mixes the VCO (  or  ), SUB Oscillator, and Noise in various proportions, before sending them to the VCF.

- ①  **Level Knob**
- ②  **Level Knob**
- ③ **SUB Oscillator Level Knob**

### ④ SUB Oscillator Waveform Selector Switch

This selects the pitch range and the waveform of the SUB Oscillator.

### ⑤ Noise level Knob



## VCF (Voltage Controlled Filter)

The VCF is used to alter the tone color of the Source Mixer output by cutting or boosting harmonics in that sound. The VCF is a Low Pass filter which passes low frequencies and blocks high frequencies, and the Cutoff Point is controlled by voltage.

### ⑥ Cutoff Frequency Knob

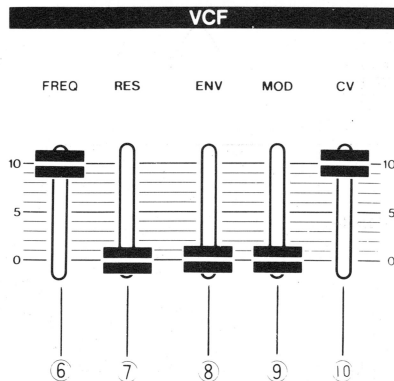
This knob determines the Cutoff Point of the VCF. In its highest position, the sound will pass unchanged. As you lower the knob, the frequencies in the higher pitch range will be cut, thereby the sound fades out in its lowest position.

### ⑦ Resonance Knob

This knob is to emphasize the frequency at the point set with the Cutoff Frequency ⑥. As you raise the knob, certain harmonics are boosted and sound will be more unusual, more electronic in nature. If setting the Resonance Knob to a high position and move the Cutoff Frequency knob, you can obtain a type of sound that is impossible to be produced by any other musical instrument. At its highest level, self-oscillation will begin (at the Cutoff Point).

### ⑧ ENV Depth Knob

When Cutoff Point of the VCF is controlled by the output signal from the Envelope Generator, this knob adjusts the depth of the modulation. You can change the Cutoff Point of the VCF in each note with the ADSR curve previously set. So the tone color of each note can be changed quite drastically.



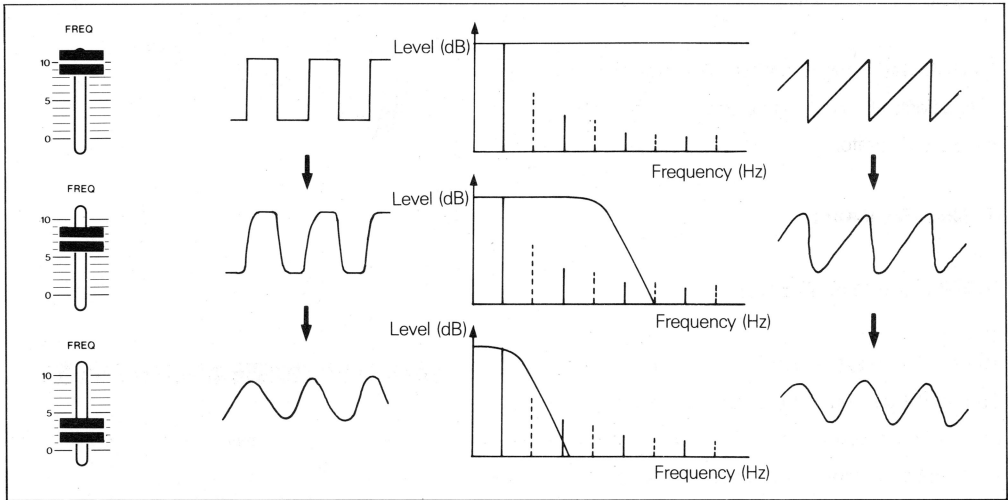
### ⑨ Modulation Depth Knob

When the Cutoff Point of the VCF is controlled by the output signal from the LFO, this knob is used to adjust the intensity of the modulation.

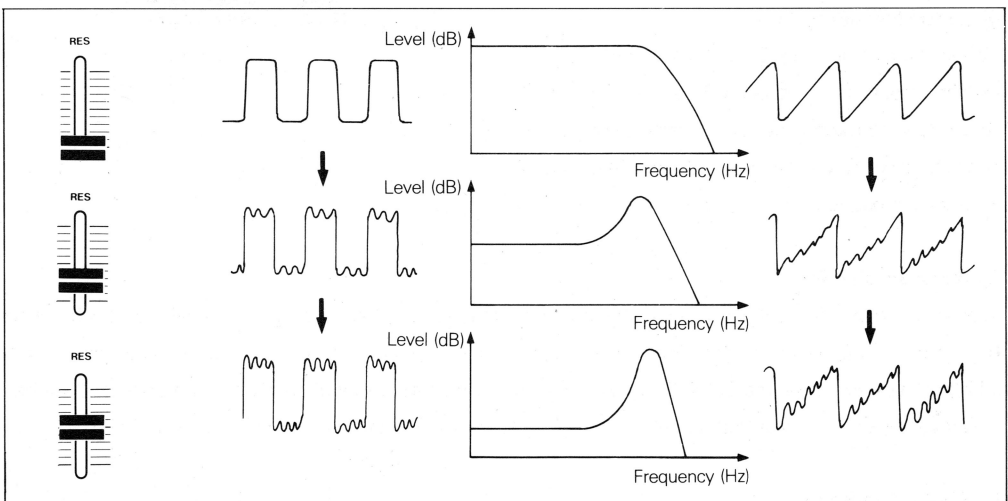
### ⑩ CV Follow Knob

When the Cutoff Point of the VCF is controlled by the CV (Control Voltage), this knob adjusts the intensity of the modulation. It prevents any inconsistency in the harmonic content caused by pitch alteration. Consequently this knob is usually set to the maximum, but can be set to your taste.

### Cutoff Frequency



### Resonance





## VCA (Voltage Controlled Amplifier)

This is to control the volume (amplitude) of the sound, and is normally controlled by the output voltage from the Envelope Generator.

### ① Control Signal Selector Switch

This switch enables you to select whether to control the VCA by the signal from the Envelope Generator or by the Gate signal.

## ENV (Envelope Generator)

This generates the Control Voltage applied to the VCF and the VCA, thereby controlling the volume and the tone color of each note. This output voltage is generated whenever the Gate is on.

### ② A (Attack time) Knob

This sets the time required for the voltage to reach its maximum from the moment the Gate is fed.

### ③ D (Decay time) Knob

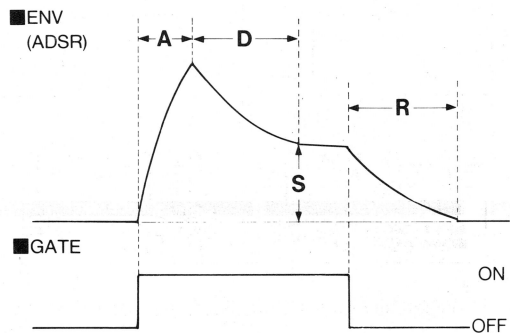
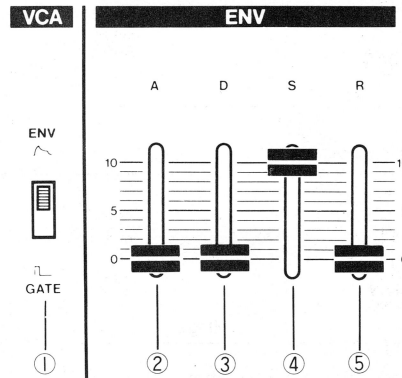
This determines the time required for the voltage to drop from the maximum to the sustain level. When the sustain level is high, the envelope curve does not change by adjusting the Decay Time.

### ④ S (Sustain level) Knob

This knob determines the Sustain level to which the voltage falls at the end of the Decay Time. As long as the Gate is on, the Sustain level remains at its set level.

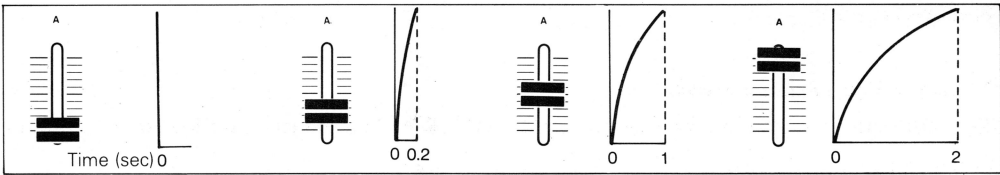
### ⑤ R (Release time) Knob

This sets the time needed for the voltage to reach zero from the moment the Gate is off.

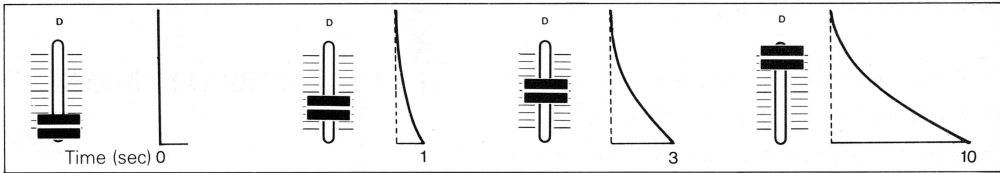


• **The variation of each knob.**

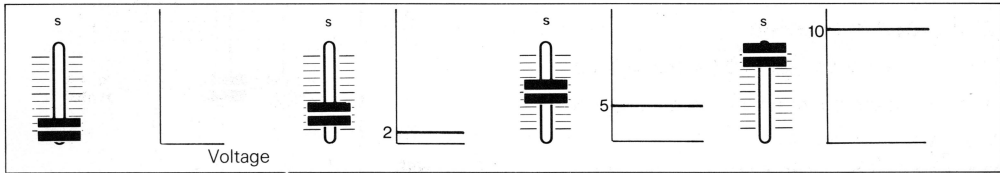
Attack Time



Decay Time and Release Time

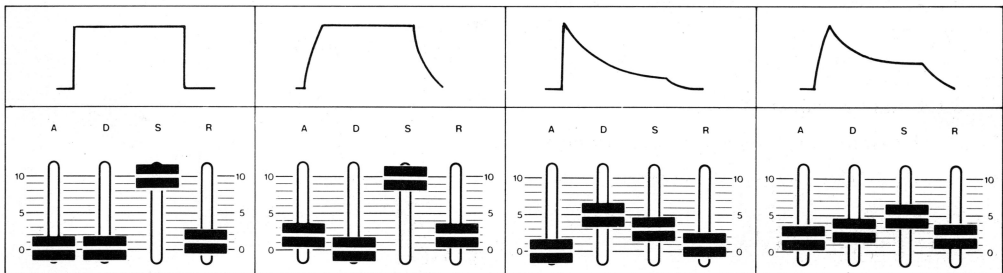


Sustain Level



\* In the figure shown above, the positions of the knobs are not meant to be exactly correct, so the knob position does not necessarily correspond with the time and the voltage.

• **Setting of ADSR and Envelope Curve.**



\*\* When all of the ADSR sliders are set at "0", the waveform will be an extremely short Pulse wave, and only a short "click" is heard. Please be careful.

## LFO (Low Frequency Oscillator)

The control signal generated in LFO controls the VCO and VCF, making vibrato and growl effects by its Sine wave. The pulse width modulation of VCO is done by Triangle wave.

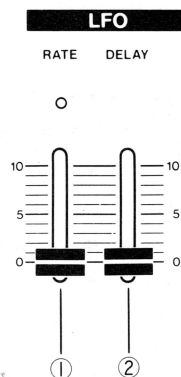
### ① Rate Knob

This sets the rate of the LFO modulation.

### ② Delay Time Knob

This determines the time required for the LFO to start its modulation.

\*This knob does not affect the pulse width modulation.



## II. VCA+Mixer Section

### VCA+MIXER

In this section it is possible to mix the internal synthesizer sound and two more external voices. Moreover, dynamics are available according to the data from the CMU-800.

\* This VCA is to be used quite differently from the usual VCA. That is, this is used exclusively for dynamics.

#### ① Synthesizer Level Knob

\* The output level of the Synth Out on the rear panel cannot be changed with this knob.

#### ② Input 1 Level

\* The input signal can be sent from here to VCA, then takes on dynamics.

#### ③ Input 2 Level

\* Signal of Input 2 does not go to the VCA, therefore dynamics are not obtained.

\* The phase of the signal sent into the Input 1 will be inverted at the VCA, so feeding the same signal to the Input 1 and 2 will offset each other. Therefore no sound is output.

#### ④ Output Level

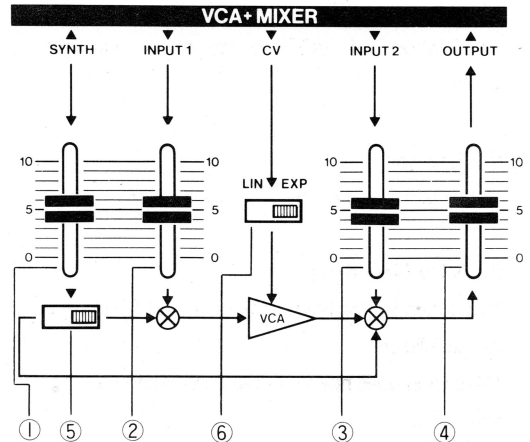
This is to set the output level of the mixed signal.

#### ⑤ Bypass

This switch selects whether to send the synthesizer signal to the VCO or not. That is, if you wish to obtain dynamics, set the switch on (to the right position).

#### ⑥ LIN/EXP Selector

This is to select how the external CV works on the VCA, linearly or exponentially.

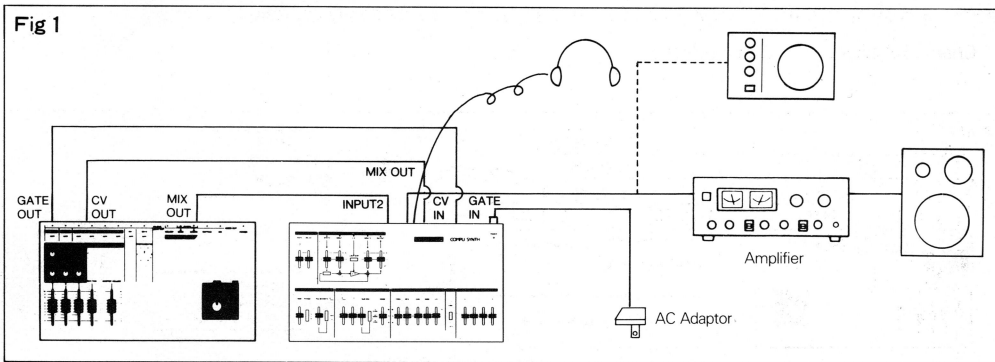


# Operation

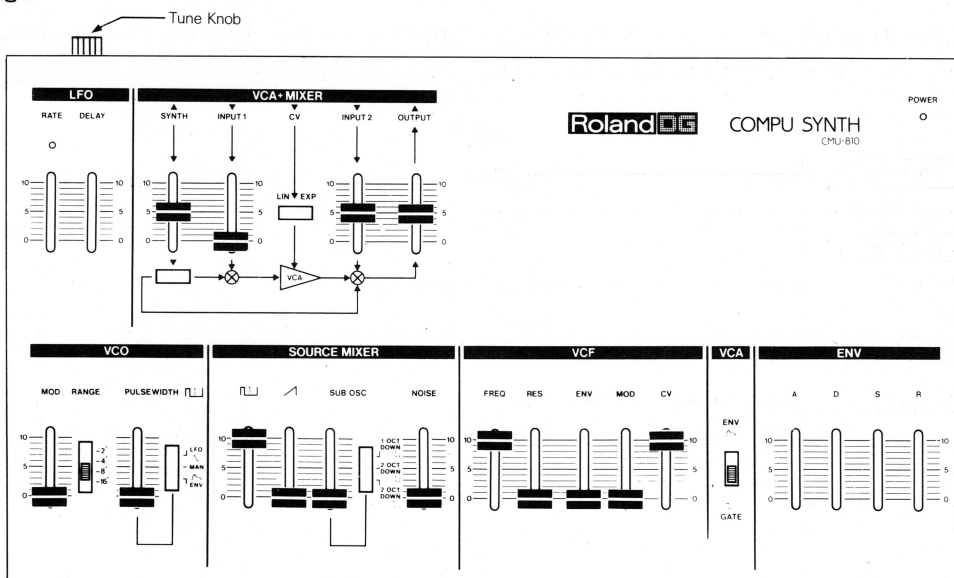
## a. Tuning

- ① Set up the units as shown in Fig 1.
- ② Set the Controls of the CMU-810 as Fig 2.
- ③ Execute Tune Command by pressing **T** key on the keyboard.
- ④ Adjust the Tune Knob on the rear panel of the CMU-810.

\* If using a synthesizer other than CMU-810, set the Range to 16' before tuning.



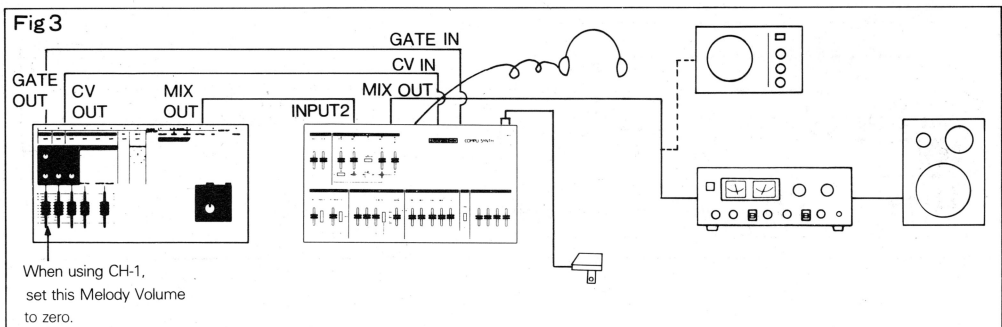
**Fig 2**



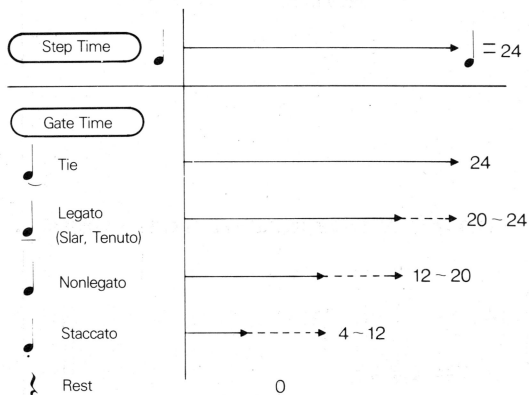
## b. Play

### Operation

- ① Set up the units as shown in Fig 3, then turn the corresponding volume of the CMU-800 to zero.
  - \* If using the CH-1, the Melody Volume and if CH-2 the Bass Volume should be turned to zero.
- ② Execute Play Command by pressing **P** key on the keyboard.
- ③ Changing each control in the Synthesizer Section, make the sound you like.
- ④ Adjust the levels of the synthesizer sound and CMU-800's internal voices at the VCA+Mixer Section.
  - \* You can use any channel you like, but it may be a good idea to use channels 7 and/or 8 which do not contain any sound source, or channel 1 and/or 2 whose volumes can be independently controlled.
  - \* Channel 8 allows Portament effect.



- \* Unlike the built-in sound source of the CMU-800, the CMU-810 allows organ-like sound as well as piano like sound. That is, by changing the Gate Time data, subtle nuance can be expressed.



- \* Refer to P36 in the CMU-800's owner's manual.

### c. Dynamics & Accents (How to use the VCA+Mixer Section)

Depending on the Control Voltage fed through CV In Jack on the rear panel, the VCA Gain changes, therefore dynamics or accents are available. The Mixer accepts the output signal from the Synthesizer Section and the external signal (such as CMU-800's built voices), then mix them, and finally sends to the amplifier.

You can choose whether to send the internal synthesizer signal to the VCA or not (to add dynamics or not) by the position of the Bypass Switch. Regarding external signal, that depends on the Jack used. If you use Input 1, the signal is sent to the VCA.

#### How to enter the Dynamics or Accent data.

- Choose any channel you like. (Usually CH-7 or 8 which has no sound source is to be chosen.)
- Refer to Examples shown on P46 in the CMU-800's operation manual.
- Relevant data for dynamics and accents are CV and ST. The GT value does not have to be changed.
- Possible CV Range

	CV data	Voltage
LIN	10~60	0.83~5
EXP	10~55	0.83~4.58

- To put an accent, make an envelope curve by finely setting CV values.  
(Setting the CV of the relevant step may be sufficient.)

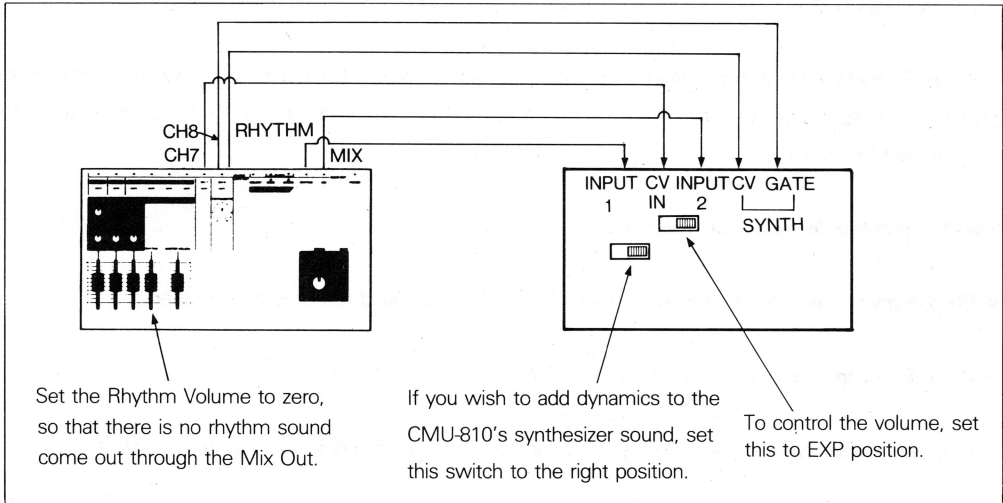
#### Operation

- ① Set up the units as shown on P3 or 15.
- ② Execute Play Command by pressing P key.
- ③ Adjust each level of the synthesizer; Input 1 and 2, and Output in the VCA+Mixer Section.

\* Around the ceiling level of the CV, the Gain of the VCA goes up, therefore distortion may occur if the input signal to the VCA is high. Please be deft about level setting.

### Set-up Example

- To put dynamics to the CMU-810's synthesizer voice, and the rhythm sounds of the CMU-800, then mix them with the CMU-800's unprocessed voices.



	With Dynamics	Without Dynamics
Synthesizer		
External Signal (e.g. CMU-800's sound)	Connect to the INPUT 1	Connect to the INPUT 2

### ★ When no external CV is used

The VCA+Mixer works like an ordinary Mixer and the Gain of the VCA (the level of the signal passed through the VCA) will be the same as when 2.5 V (=CV data 30) is input to the external CV In Jack.

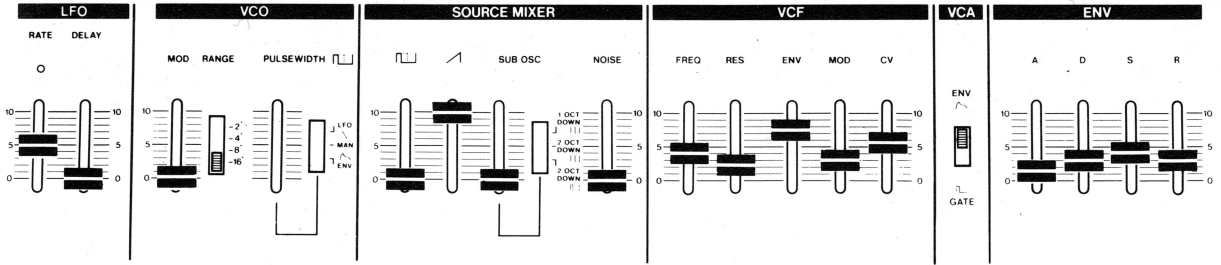


## Sample Sounds

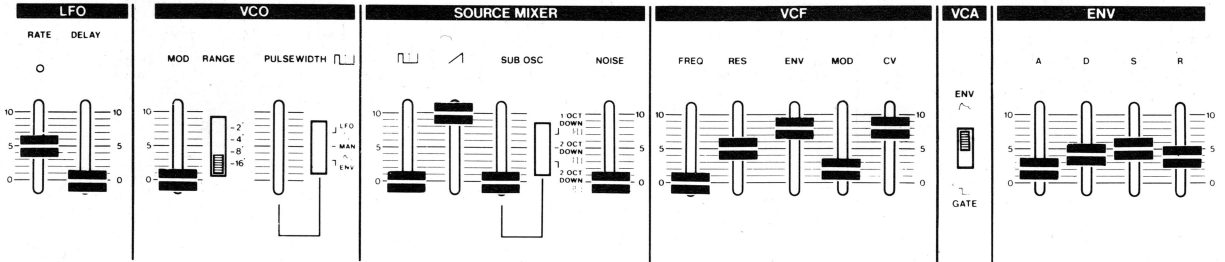
The position of each knob in the diagram is not meant to be exact, and the sound can differ drastically with any slight change of the knob positions. It also varies depending on the type of the speaker and the amplifier connected to the CMU-810. Please adjust the settings while actually playing.

\* The "missing" knobs in the diagrams are irrelevant to the sound, and can be set to any position.

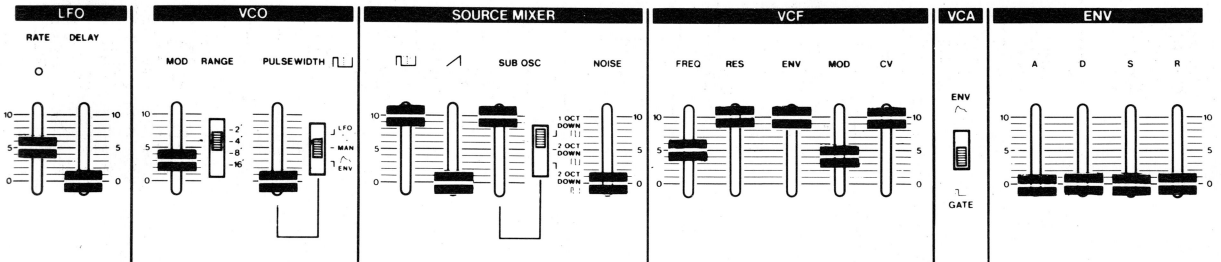
### (1) Trumpet



### (2) Synth Brass

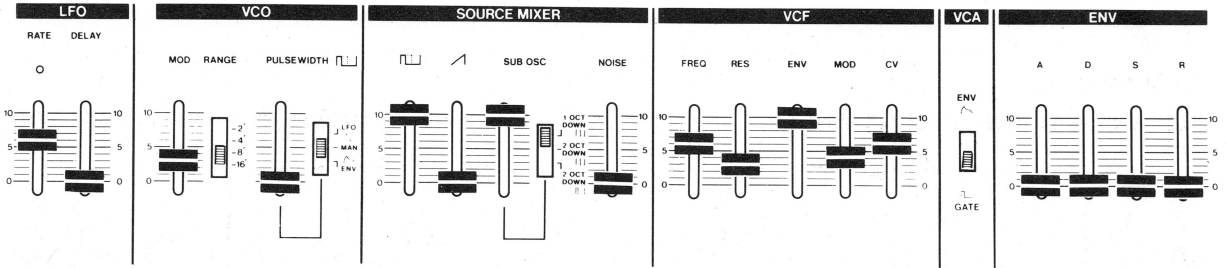


### (3) Jazz Organ I

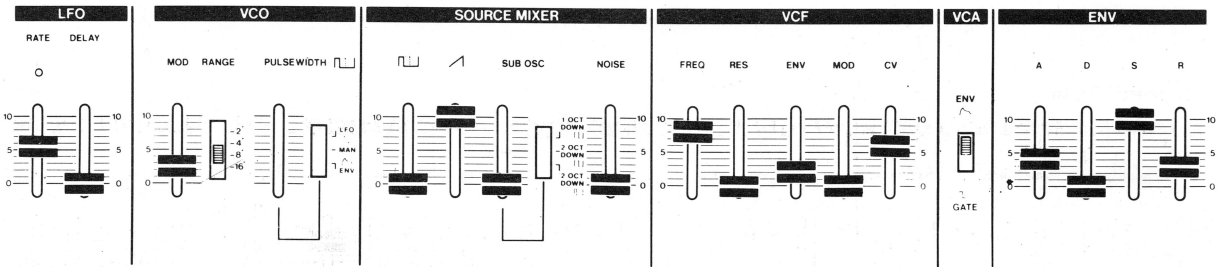


The self-oscillation of the VCF is the sound source as well as VCO. Set the Frequency where the VCF sound differs from the VCO's by a fifth.

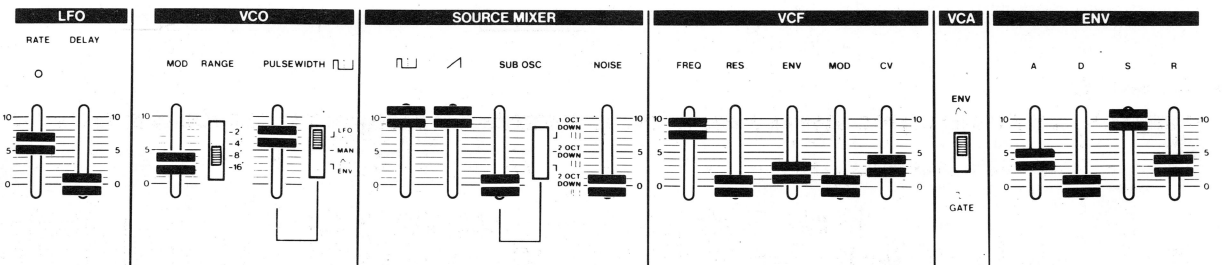
#### (4) Jazz organ II



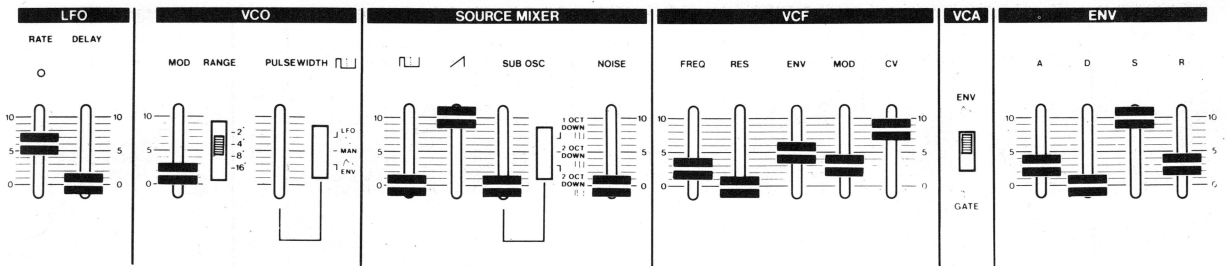
#### (5) Violin



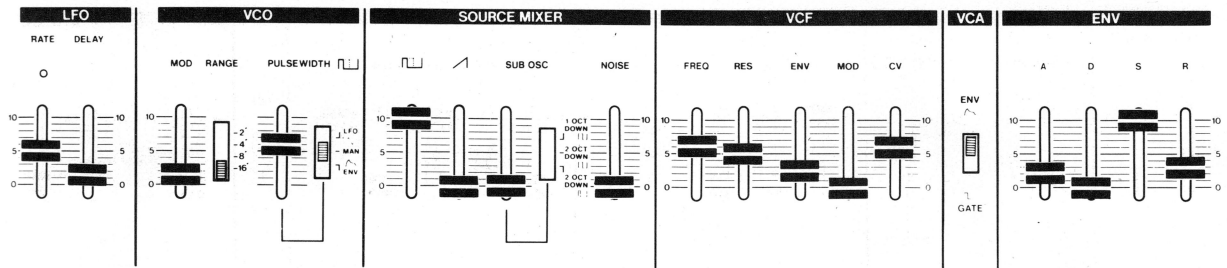
#### (6) Strings



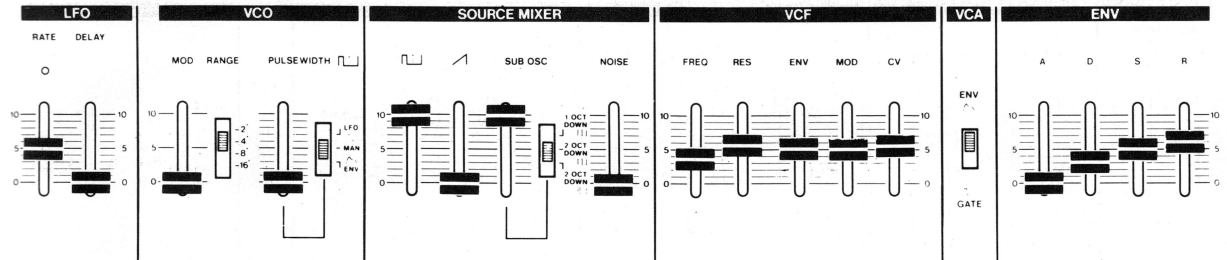
(7) Flute



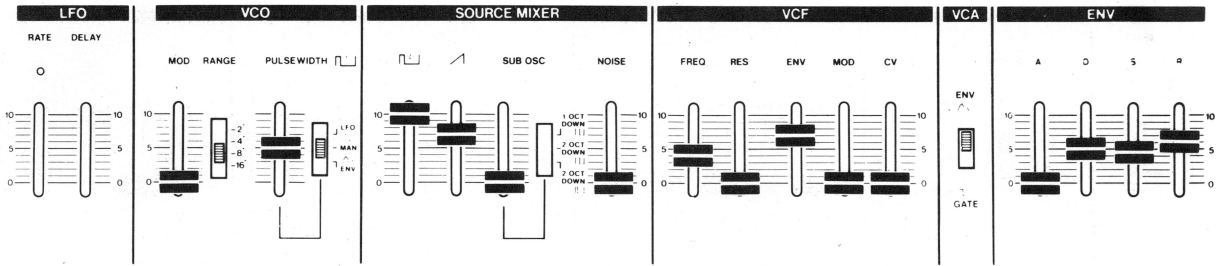
(8) Oboe



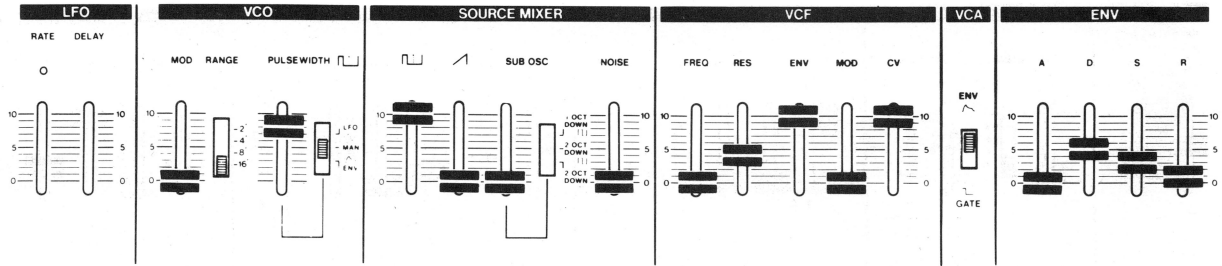
(9) Vibraphone



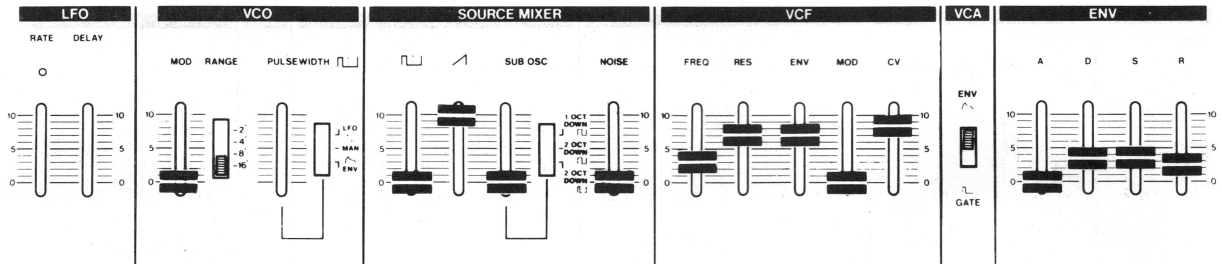
**(10) Electric Piano**



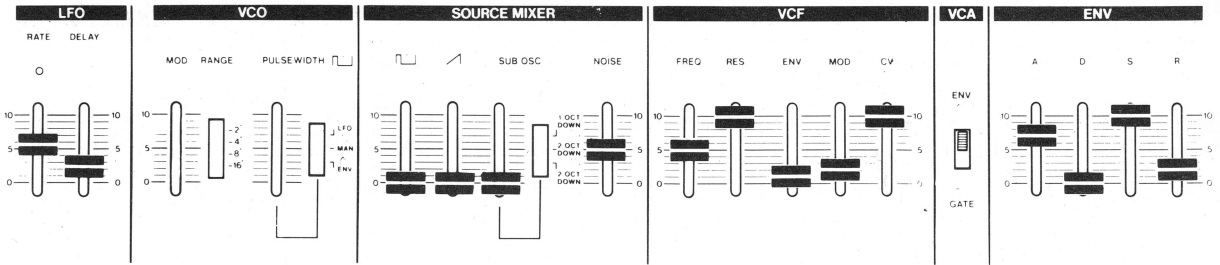
**(11) Funky Clavi**



**(12) Synth Bass**

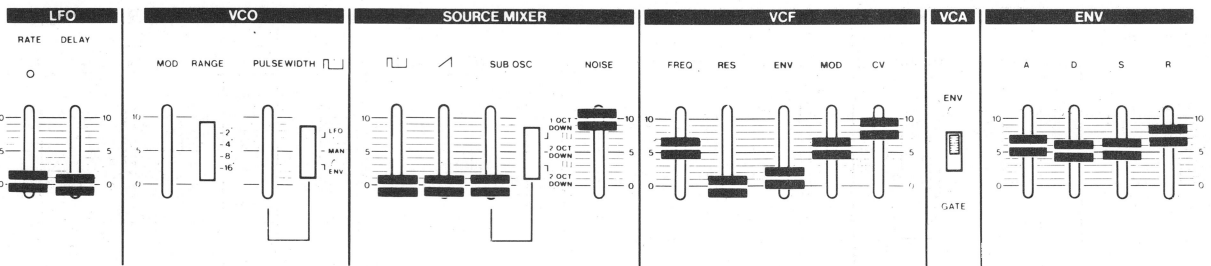


### (13) Whistle

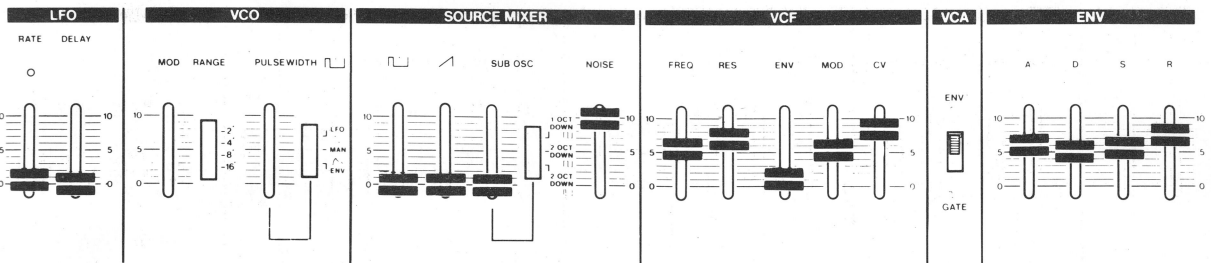


The self-oscillation of the VCF is the sound source.  
Adjust the Frequency for tuning.

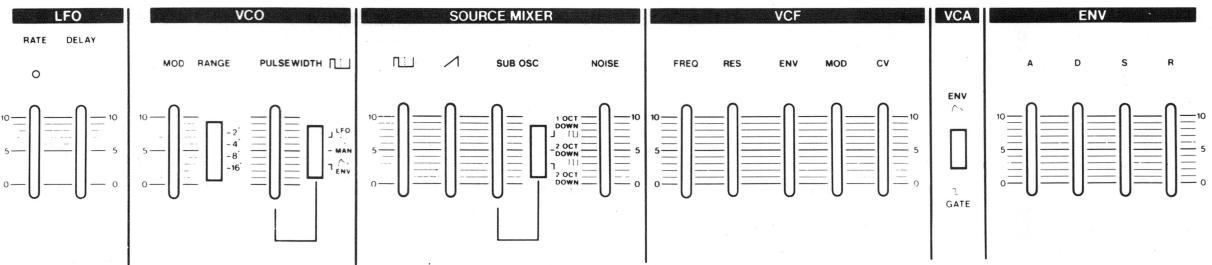
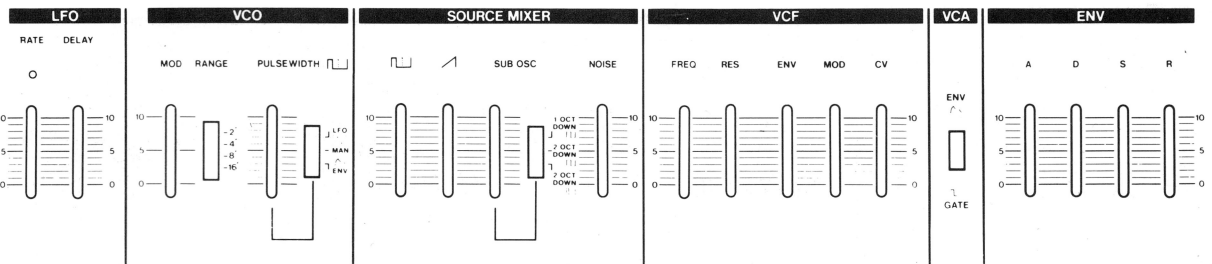
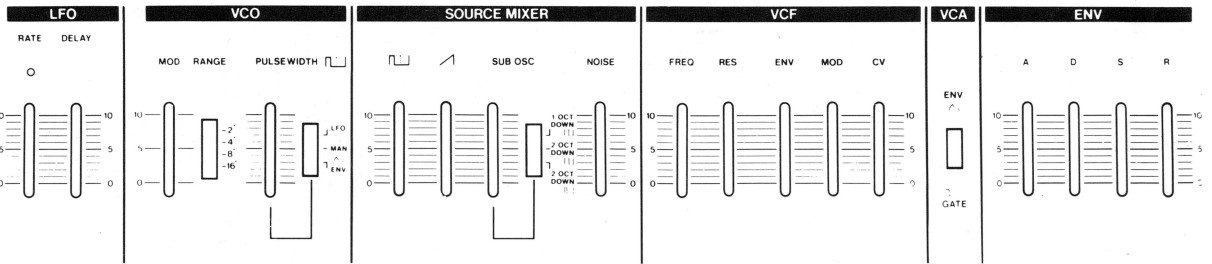
### (14) Surf



### (15) Wind

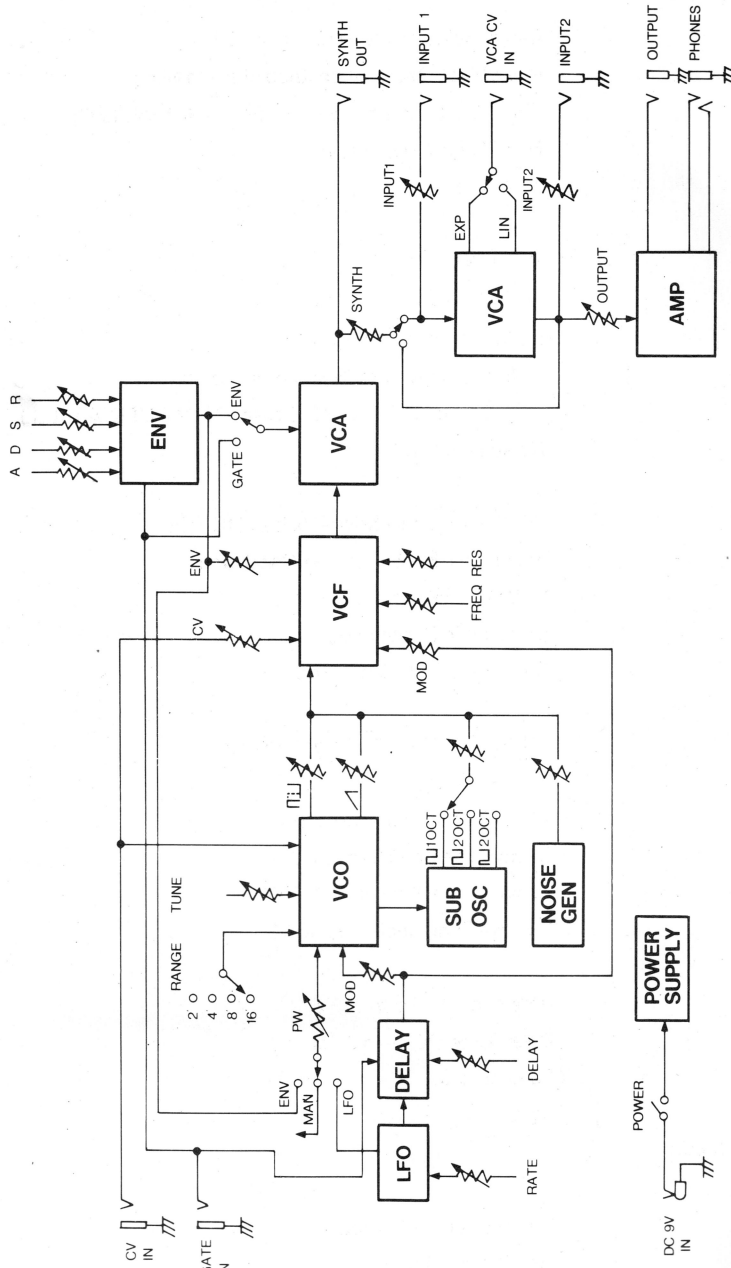


# Sound Synthesis Memo










# Block Diagram

CMU-810 BLOCK DIAGRAM



## Specifications

### ■ Synthesizer Section

<b>VCO</b>	Range Selector knob (16', 8', 4', 2') Pulse Width Modulation Knob (50% to Min.) PWM Mode Selector Switch (ENV/MANUAL/LFO) Modulation Depth Knob Tune Knob
<b>Source Mixer</b>	 Level Knob  Level Knob SUBOSC. Level Knob SUBOSC. Waveform Selector Switch (1 OCT Down  /2 OCT Down  /2 OCT Down  ) Noise Level Knob
<b>VCF</b>	Cutoff Frequency Knob (10Hz to 20kHz) Resonance Knob (0 to Self-Oscillation) ENV Depth Knob Modulation Depth Knob CV Follow Knob (0 to 100%)
<b>VCA</b>	ENV  /GATE  Selector Switch
<b>ENV</b>	Attack Time Knob (1.5ms to 2s) Decay Time Knob (2ms to 10s) Sustain Level Knob (0 to 100%) Release Time Knob (2ms to 10s)
<b>LFO</b>	Rate Knob (0.1Hz to 20Hz) Delay Time (20ms to 0.7s) Rate Indicator

### ■ VCA + Mixer Section

<b>VCA + MIXER</b>	Synthesizer Level Knob Input 1 Level Knob Input 2 Level Knob Output Level Knob Bypass Switch Control Mode Selector Switch (LIN/EXP)
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**Connection Jacks**  
Synth/CV In Jack (1 oct/V, 0 to 7V)  
Synth/GATE In Jack  
(+ 2.5V or more → ON, 0 to 12V)  
VCA/CV In Jack  
(LIN: 0.83V to 5V, EXP: 0.83V to 4.58V)  
Input 1 Jack  
Input 2 Jack  
Synth Out Jack (Max. - 6dBm)  
Mix Out Jack (Max. - 10dBm)  
Headphones Jack (Stereo/8Ω to 150Ω)  
DC Input Jack (9V to 12V)

**Power** DC 9V

**Power Consumption** Max. 130mA (DC 9V)

**Dimensions** 333 (W) × 108 (H) × 193 (D)mm/ 13<sup>1</sup>/<sub>8</sub> (W) × 4<sup>1</sup>/<sub>4</sub> (H) × 7<sup>5</sup>/<sub>8</sub> (D) in.

**Weight** 2kg/4lb. 7 oz

**Accessory**  
Mini to Mini Plug × 3  
Standard to Standard Plug × 2  
AC Adaptor (ACP-120, 220 or 240) × 1

**Specifications are subject to change without notice.**

**Roland**   
ROLAND DG CORPORATION