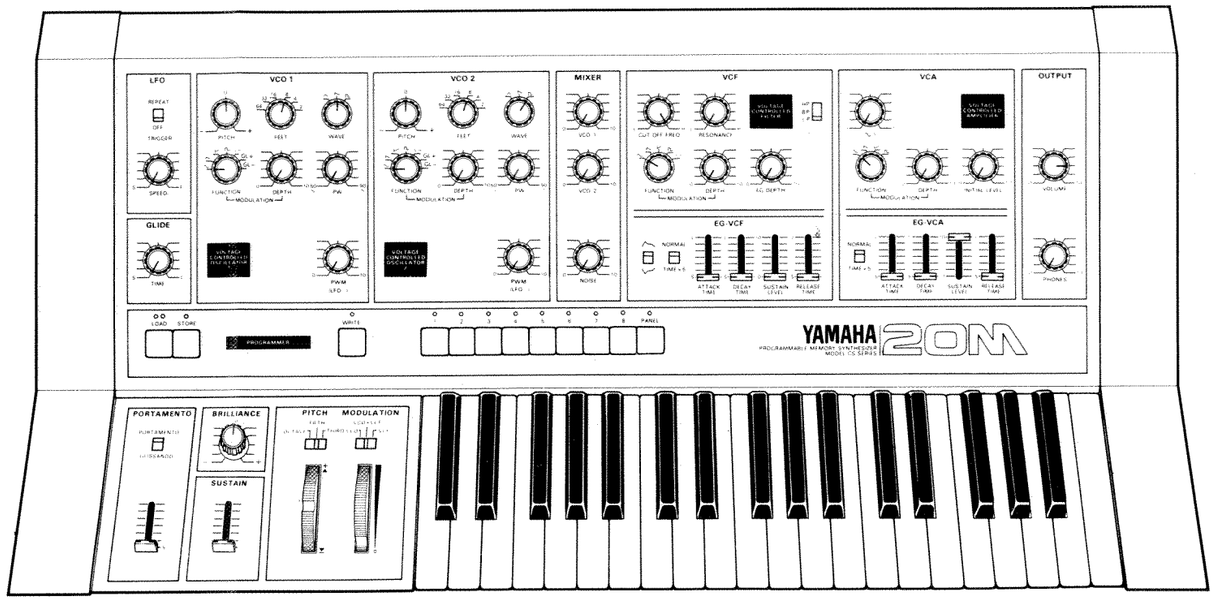
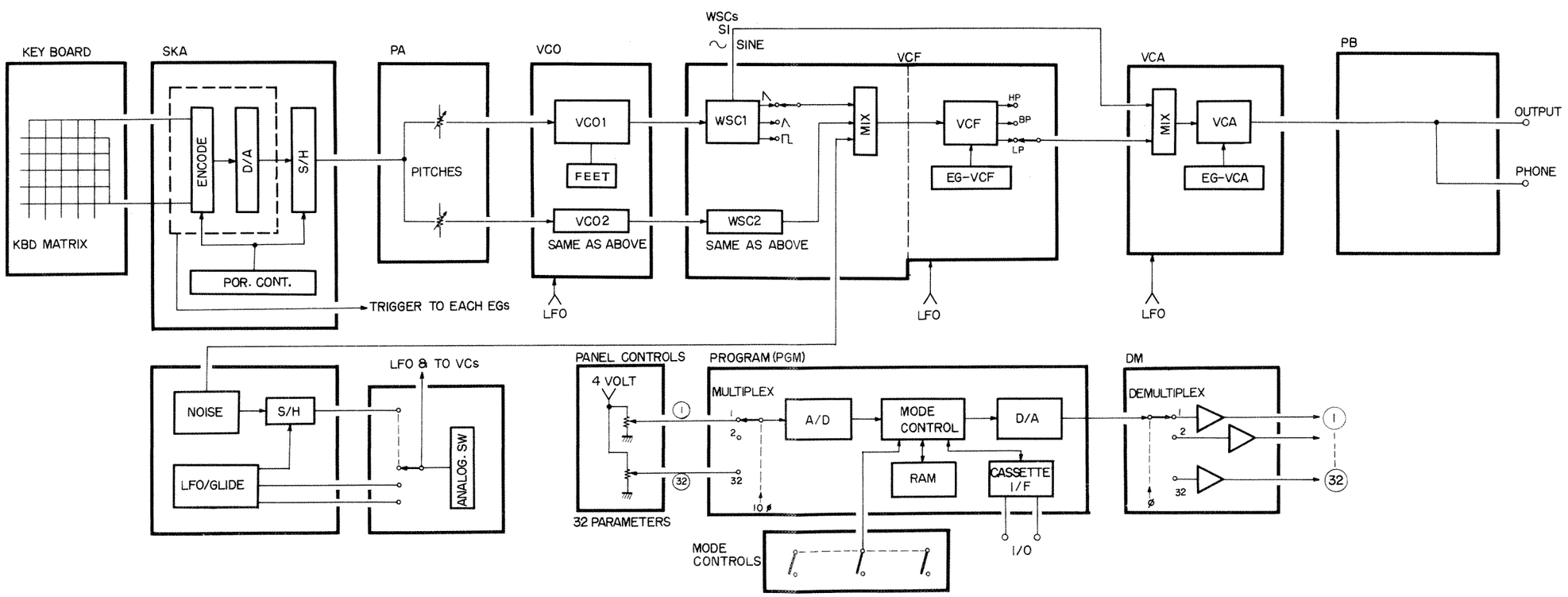
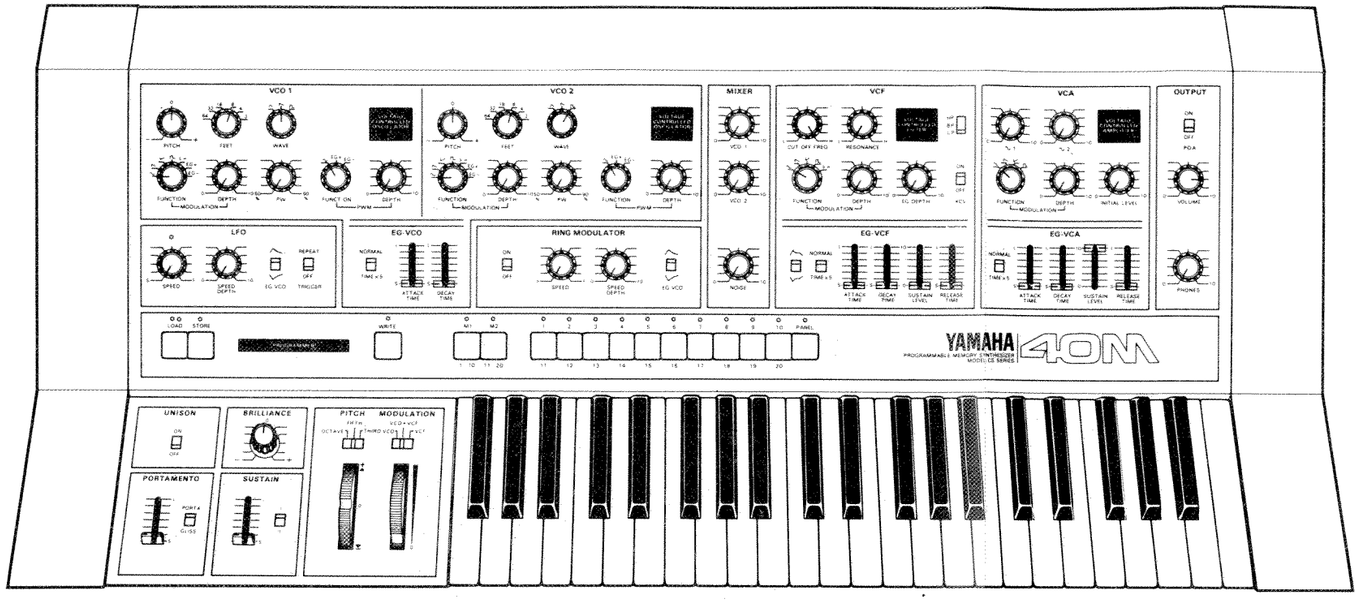
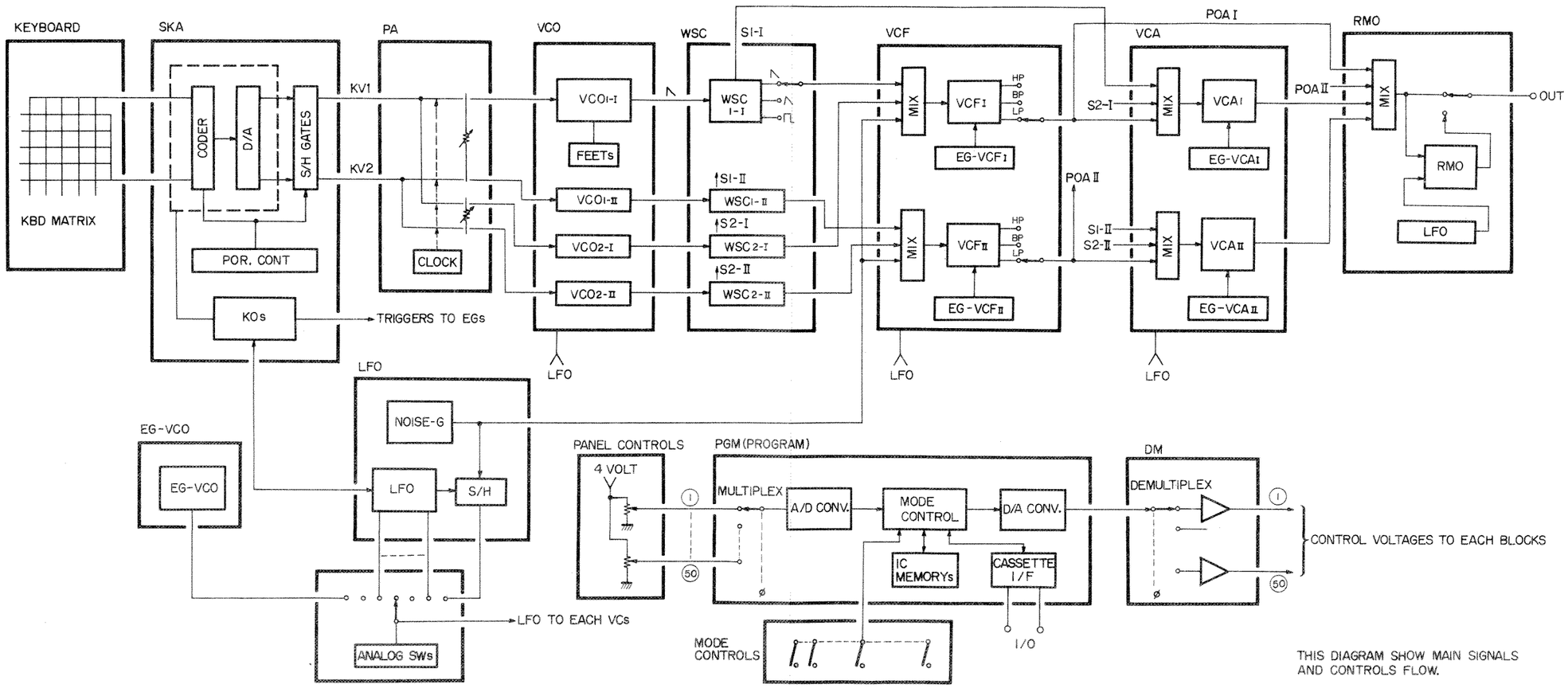
BLOCK DIAGRAM

CS-20M





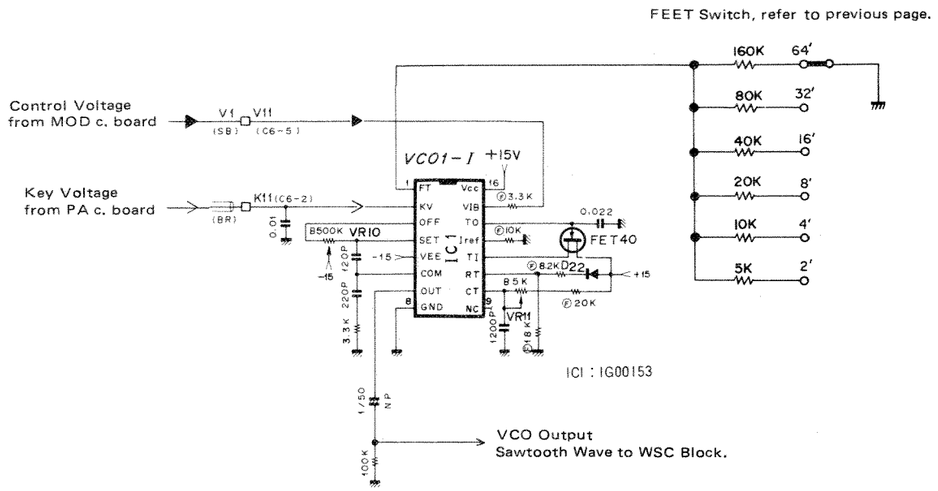




THIS DIAGRAM SHOW MAIN SIGNALS AND CONTROLS FLOW.

3. VCO CIRCUIT

This circuit is exactly the same as conventional VCO circuits except for the fact that changeover of FEET is electrically perfomed using the FET gates and analog switch, For the VCO, an exclusive-use IC, IG00153 is employed.

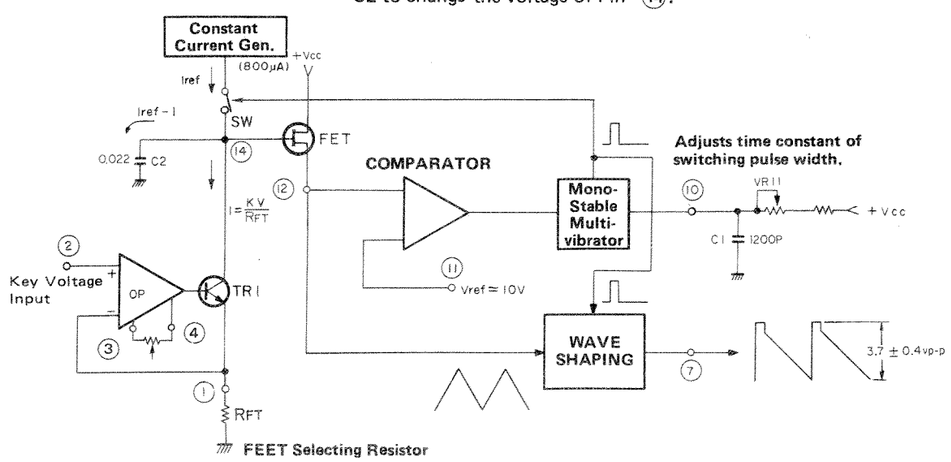


■ **Function**

1. Generates sawtooth waves of frequencies proportional to the KV voltage (0 ~ 4V) fed into Pin ②.
2. By using the control voltage that is fed into Pin ⑮, performs modulation such as VIBRATO.
3. Can change over FEET, using the resistor connected to Pin ①.
4. Feeds out sawtooth waves from Pin ⑦.

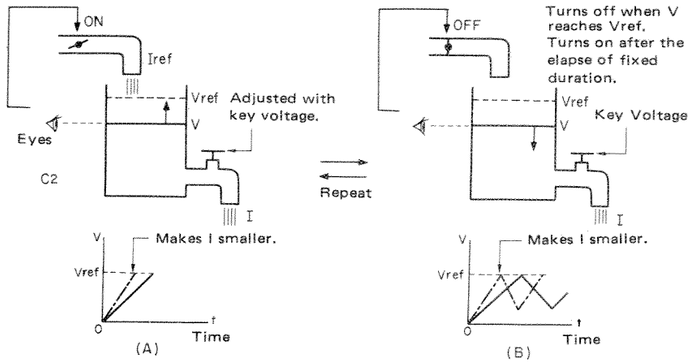
■ **Outline of Operation**

The internal circuit of IG00153 is composed as shown in the following diagram. Major actions are performed by charging or discharging the capacitor C2 to change the voltage of Pin ⑭.



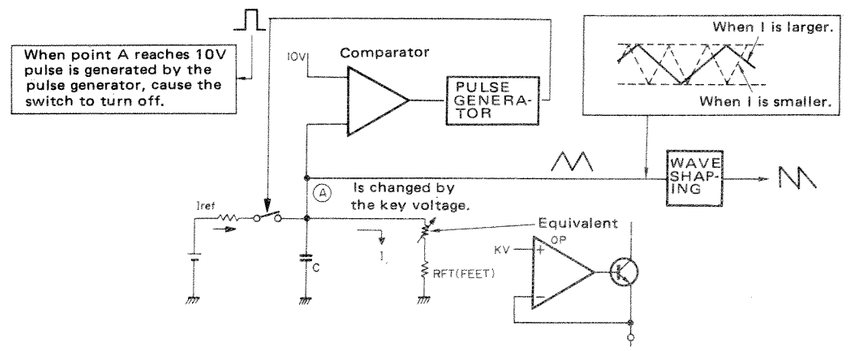
In order to discuss the operation of this circuit, a model in which the capacitor is likened to a water tank and the current to water flow is shown below.

Condition: Water of an amount of I_{ref} is poured into the water tank from a water faucet that is equipped with a valve which can stop or permit entry of water into the tank. Meanwhile, from the water tank, water in the amount of I is poured out from a water faucet that can be controlled with the key voltage. (I_{ref}>I)



Iref and C2

Now, take a look at Drawing (A). As water is poured in, the water level V will get increasingly higher. In other words, the condition will be that shown in the graph of Drawing (A). When the water level reaches V_{ref}, the water faucet on the I_{ref} side is closed.
This causes water to keep pouring out in the amount if I. That is, as shown in Drawing B, the curve of the graph will drop. After it keeps dropping for a fixed time, the water faucet on the I_{ref} side will open again, and the process described above will be repeated. Here, we can change the speed at which the water level V changes, by adjusting the water amount I that is poured out from the water tank. In other words, the oscillating frequency will change.
The figure shows the composition of the hardware. The figure shows a model in which, the water tank has been changed into capacitor C, the water faucet of the I_{ref} side into a switch, and the water faucet of I into a (R_{FT} + variable resistor). The comparator and the fixed-time generator circuit forms a section that controls the output voltage V. I is changed by varying the variable resistor, which, in turn, will cause the osicllating frequency to change.



Operating Principle of IG00153

Although the process may seem somewhat complex, it can be summarized as follows: while the switch is "ON", C2 will be kept being charged with the charge of I_{ref} −I, and when the voltage reaches 10V, the switch will be turned off for a fixed duration. During this time, the charge of −I will be discharged, causing the voltage of the capacitor to drop. After discharge continues for a fixed duration, the switch will turn on again, causing charging to start again. By repeating this, a certain waveform is generated.

WAVE SHAPE CONVERTER: MOD BOARD

The major function of the waveform converting circuit is to change the input sawtooth waveforms into triangular waves, square waves and the sine waves. The circuit employs the IG00158. Waveform selection is performed by the FET and analog switch. PW and PWM are provided as mechanisms to control the square waves. The section that was taken care of by controls in the past has been replaced with electronic controls, a comparator, analog switch, etc.

The function of the IG00158 is identical to that of conventional synthesizers.

The WSC and peripheral circuits are shown in the right hand side.

The VCA composed by IG00151 functions as an electronic potentiometer, while the OP amp of the next stage functions to apply DC voltage, here, a control voltage up to the maximum of 10 volt will be applied to the variable resistor that indicates DEPTH and PW equalized manner, at the DEMULTIPLEXER section of the PROGRAMMER block.

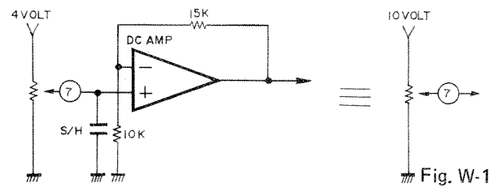
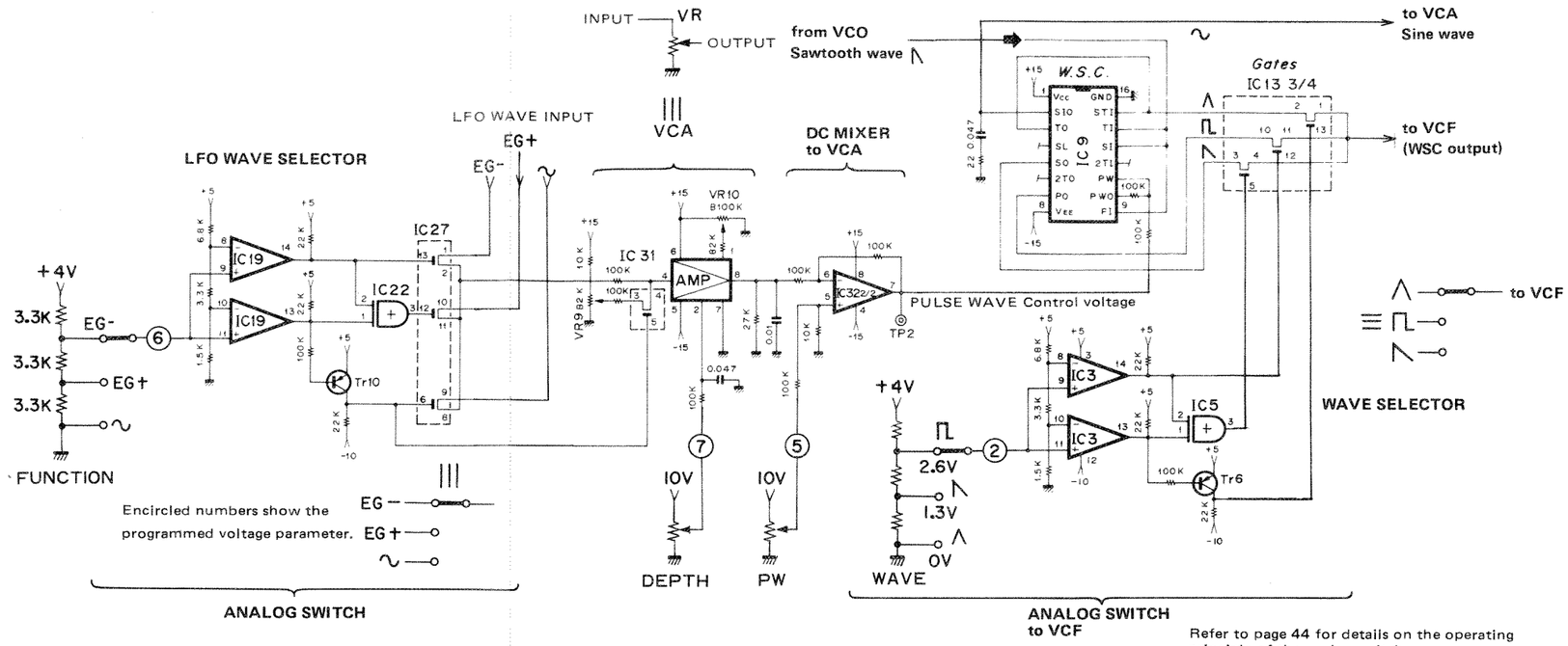


Fig. W-1



Refer to page 44 for details on the operating principle of the analog switch.

Operating Principle Of IG00158

The inner circuit of IG00158 is composed as shown below.

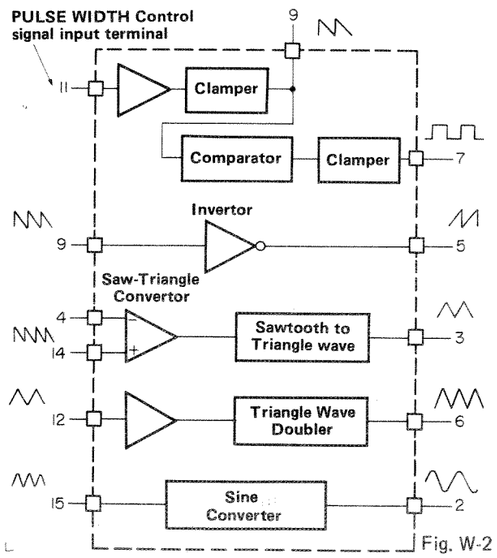


Fig. W-2

WAVEFORM SHAPING CIRCUITS

Outlines Of Sine Conversion

The sine conversion circuit, which functions to feed out a sine waves when triangular waves are fed in, is a reversed amplified to which feedback elements consisting of diodes and resistors are connected.

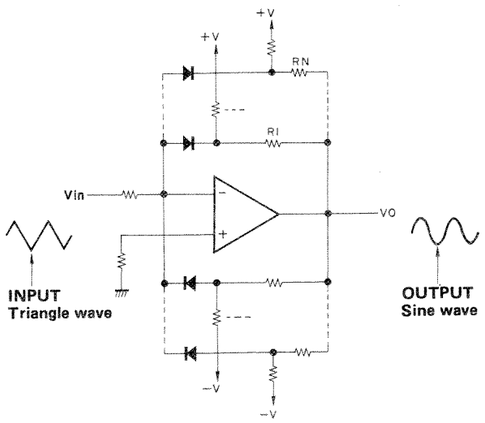


Fig. W-3

Polygonal lines

Now, take a look at the figure shown below. This is a circuit formed by adding a diode D and resistor R_A to an ordinary inversion amplifier circuit.

As may be seen from Figs. (A) and (B). this circuit has such a characteristic that the output will rapidly rise up to a certain point ($V_O \sim V_{th}$) but will bend from there, forming output characteristics such as R_2/R_1. This is due to the diode's switching characteristics. The circuit up to $V_O = V_{th}$ will be as shown in Fig. (A), while from the point $V_O > V_{th}$, the circuit will become an ordinary inversion amplifier circuit as shown in Fig. (B).

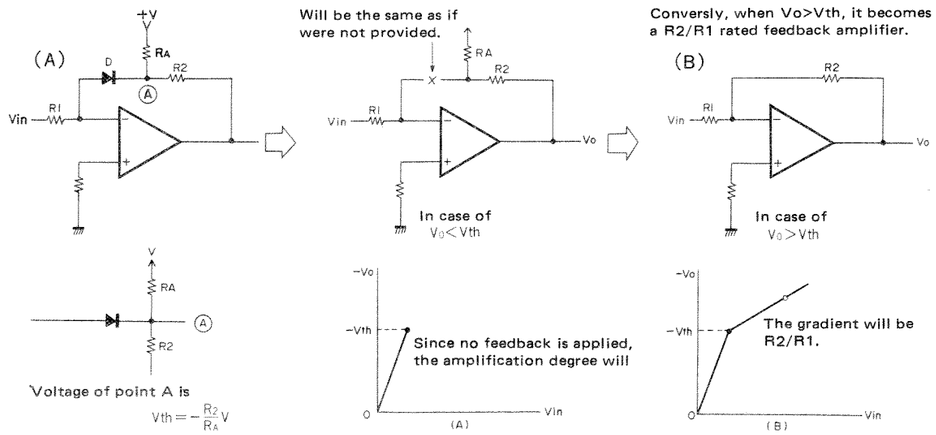


Fig. W-4