MODEL 455L

FUNCTION GENERATOR

OPERATION MANUAL

KIKUSUI ELECTRONICS CORP.

CONTENTS

1. Outline

Type Function Generator Model 455L is an ultra-low frequency oscillator which divides sine wave, triangular wave, ramp wave and square wave from 0.0005 Hz - 10 KHz into 7 ranges based on the decimal system and generates them.

Transistors have been adopted for all the circuits of Model 455L , resulting in compact design and light weight.

The frequency characteristics of the oscillation output voltage is essentially flat for the reason of its principle. Almost no transient is caused when wave form and range are changed over. It starts oscillating immediately with newly given wave form.

By means of the start switch located on the operation panel, sine wave, triangular wave and ramp wave can be oscillated from minus (-) electric potential and square wave, from plus (+) electric potential respectively optionally.

For this reason, this is a very convenient unit when measurement is made in ultra-low frecuency.

This unit can be used for measurement on low pass characteristics of feedback amplifiers, test of servo-mechanism of automatic controllers and serve as function generator for analog computer as well as signal source for oscillation driver. This unit can be applied to various kinds of measurements and tests in a very

range.

2. Specification

o Power .....V.....Hz Approx. 18 VA

o Dimensions 300(W) x 140(H) x 330(D)

(Largest part) 200(W) x 155(H) x 370(D)

o Weight Approx. 6 Kg

o Accessories

o Operation Manual 1 copy

o 941 B type terminal adaptor 1

o Oscillation frequency 0.0005 Hz - 10 KHz

Range x 0.001, x 0.01, x 0.1, x 1, x 10, x 100, x 1K

Dial scale Equally-divided scale 0.5 - 10

Accuracy 2% + (dial scale ±0.05)

Frequency Stability within ±0.5% with respect to ± 10% fluctuation of power voltage

o Output

Sine wave ∿ Triangular wave ∿ Ramp wave ⩘

Square wave ⊓

Max. output voltage (at load resistance 600Ω) more than 15 Vp-p

o Frequency characteristics

For 1 KHz (sine wave, triangular wave, square wave) less than ± 0.3dB

For 1 KHz (ramp wave) less than ± 1 dB

Distortion (sine wave) 20Hz-10KHz less than 1%

Output impedance 600Ω ± 20%

AMPLITUDE Stability	within ±0.5% with respect to ±10% fluctuation of power voltage	
Mutual deviation of voltage	At 1 kHz	less than 5%
Square wave output voltage (at 50Ω terminal output open)		more than 1 Vp-p
Rise time (at 50Ω termination)		less than 70nsec
Sag overshoot (at 50Ω termination)		less than 5%
Synchronous output		more than -10Vpeak
Pulse width		less than 5μsec
Start. stop		Possible

3. Operation Procedure.

3-1. Description for Panel (Refer to Fig. 3-1: P. 9)

(1) POWER

This is a push type power switch. When pushed and locked, power will be turned on and the neon lamp will be lighted, resulting in action.

(2) FUNCTION

This is a change-over knob for output wave form.

∿ (sine wave) ∧∨ (triangular wave) ◿ (ramp wave) and ⊓⊔ (square wave) can be taken out.

Whenever changed over, a stable newly changed-over wave form can be used. Almost no change takes place in output voltage due to wave form. As for the time correlated relations of respective output wave forms, sine wave, triangular

and ramp wave are in-phase and the square wave is delayed at 90° as compared with the former 3 waves.

(3) FREQ.CONT

This is a knob for continuous variation of frequency located at the central part of panel. When it is turned clockwise, the frequency will be increased

(4) FREQ.FINE

↘ CAL'D

This knob is used for fine adjustment of frequency. It has an approx. 10% variable range. When this knob is turned clockwise, frequency will be increased. The dial scale has been calibrated at position of CAL'D.

(5) RANGE

This is a change-over switch for frequency ranges. The value of frequency of output wave form can be calculated by multiplying 0.001 Hz..... 1 kHz by dial number.

Output voltage has no relations with frequency and is almost fixed. Simultaneously with change-over, a newly-set output can be utilized.

(6) OUTPUT

This is a variable knob for output and voltage of sine wave, triangular wave, ramp wave and square wave. When this knob is turned clockwise from 0, output voltage will be increased.

At 600Ω load, 15Vp-p or above can be taken out.

The output terminal is the UHF type receptacle located at the lower part of knob and the metal terminal is connected with the outer circumference of the receptacle electrically. It is GND for circuit.

GND terminal is floated from the case in DC.

(7) OUTPUT

This is a variable knob for output voltage only for square wave. When it is turned clockwise from 0, output is increased.

50Ω

This UHF type receptacle is the 50Ω square wave output terminal of output impedance, When output is open, voltage of 1 Vp-p or more can be taken out.

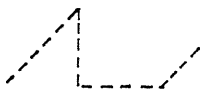
(8) START

This is a black push switch. When it is pushed and pilot lamp, lighted, it will start oscillating.

When pushed once again and the pilot lamp is put out, it will stop oscillating.

The start level and slope at starting of oscillation are as follows:

Sine wave	FROM (-) electric potential
Triangular wave	FROM (-) electric potential

Ramp wave FROM (-) ELECTRIC POTENTIAL 

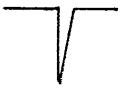
Square wave FROM (+) ELECTRIC VOLTAGE 

Square wave (50Ω) FROM (-) ELECTRIC VOLTAGE 

3-2. Description for Back of Panel (Refer to Fig. 3-2: P.9)

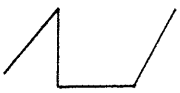
(9) Synchronous Output Terminal

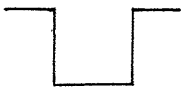
This is output terminal by UHF receptacle. An output voltage of - 10 V peak which has been synchronized with the positive max. rise point of ramp wave, fall point of square wave, and fall point of square wave (50Ω terminal) can be taken out.

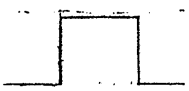
Synchronous pulse 

Sine wave 

Triangular wave 

Ramp wave 

Square wave 

Square wave (50Ω terminal) 

(10) GND TERMINAL

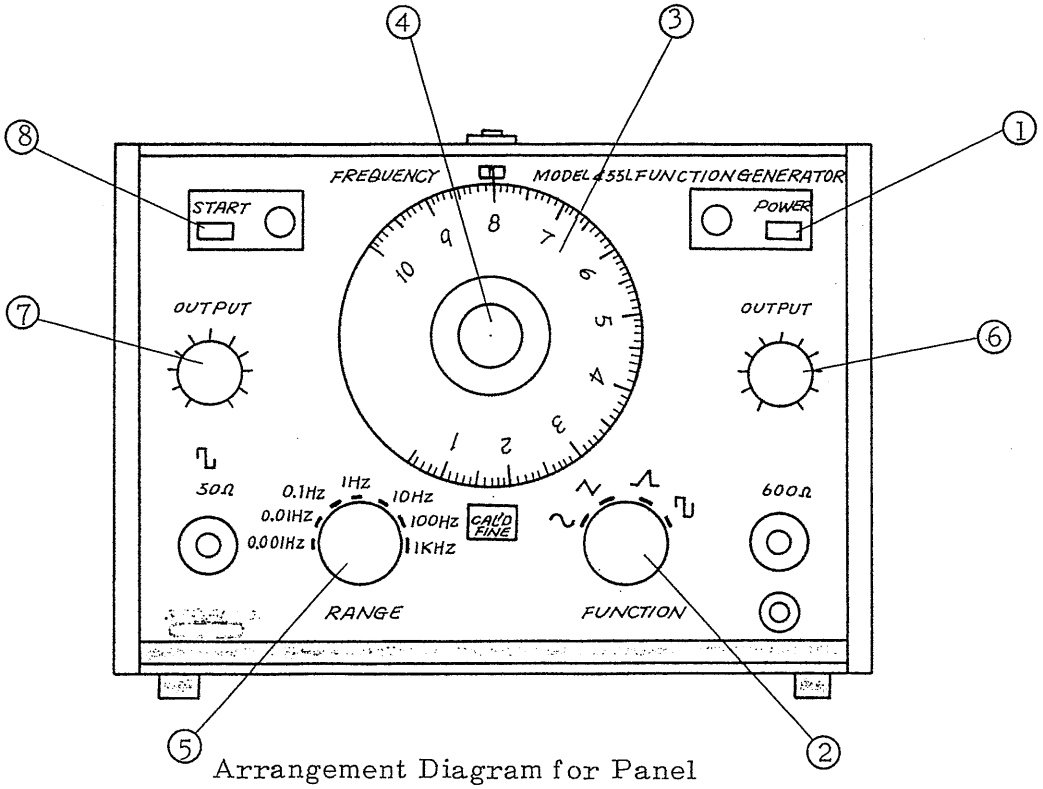
This terminal is connected with "GND" as in the case of the metal terminal located on the front panel.

(11)FUSE

This is a fuse holder for AC power.

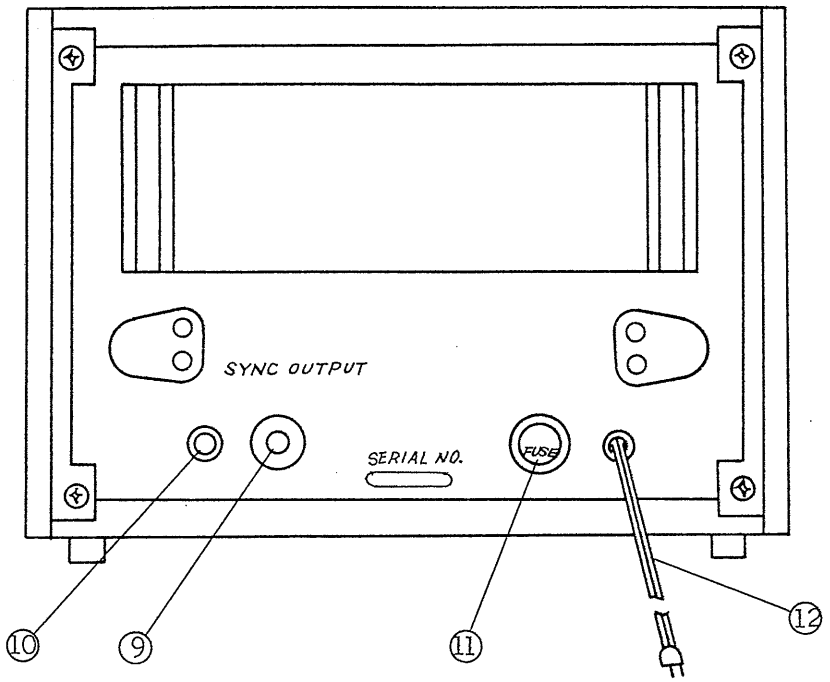
(12)POWER CORD

This is connected with AC ..... V 50/60 Hz



Arrangement Diagram for Panel Surface

Arrangement Diagram for Panel Back



Working Principle

Fig. 4-1 is a block diagram for working principle of the Function Generator Model 455L

Function Generator Block Diagram

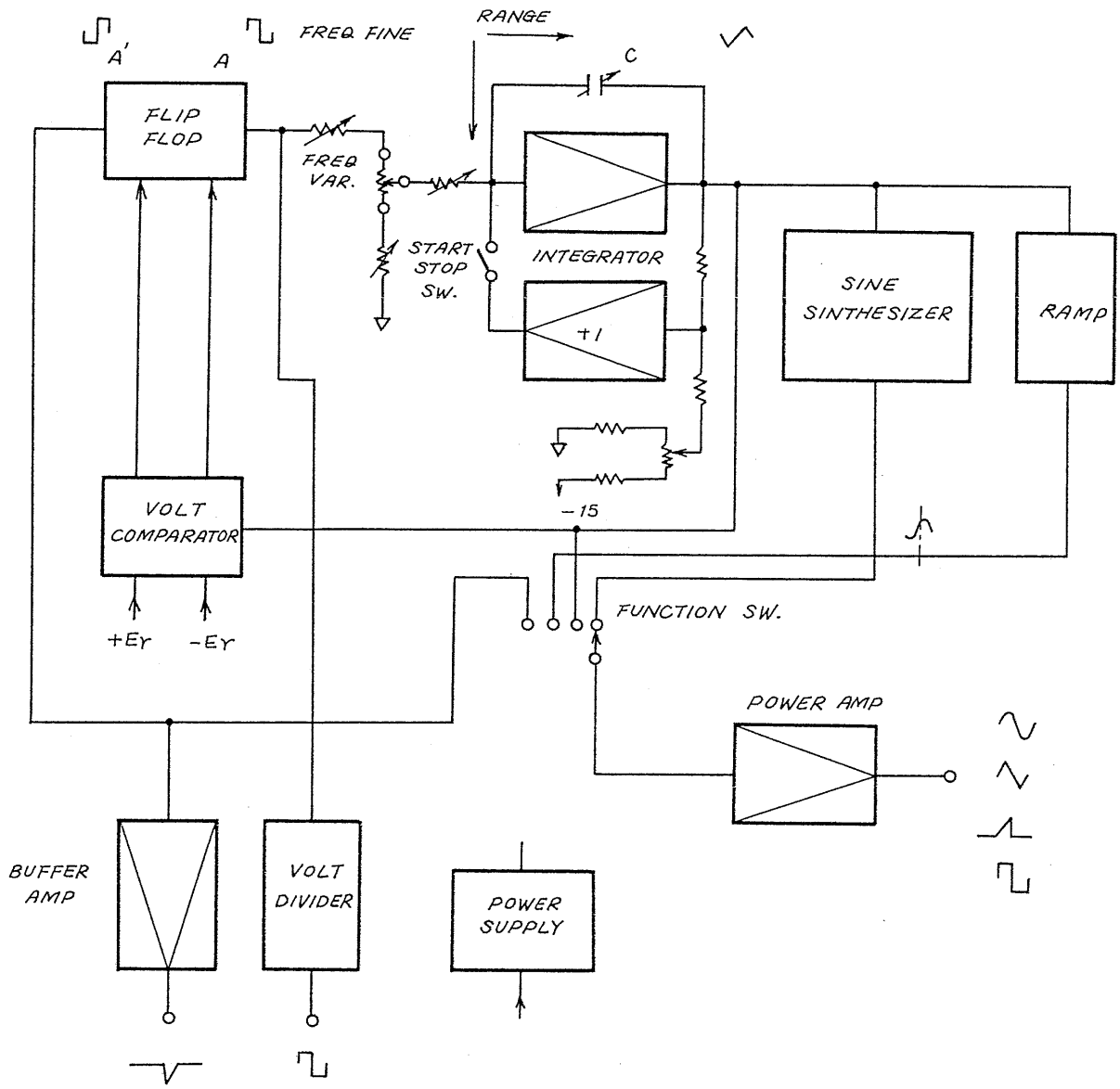


Fig 4 - 1

This oscillator is quite different in principle from the RC oscillator of Win Bridge and Sauture System. It is a kind of relaxation oscillator with a close circuit by flip flop, integrator and voltage comparing device. Its action is as follows.

In Fig. 4-1, the output A, of flip flop which is reversed to negative or positive is assumed to be negative.

The output is divided with the potentiometer for variation of frequency and added to the integrator.

The inegrator consists of a high gain d-c amplifier and negative feed back to input at capacitor C from output.

The integrated output increases gradually with a fixed inclination according to size of input voltage and integrating time constant for time because input voltage is negative.

The intergrated output voltage enters a voltage comparing device and compared with the preset reference voltage $+ E_r$ When it is equal, a trigger pulse is generated, resulting in reversal of flip flop.

Due to its reversal action, the output A of flip flop is turned to positive voltage and integrated in the same way. And, its output voltage drops.

When the dropping voltage reaches $- E_r$ the trigger pulse is generated by the comparing device and the flip flop will be reversed again to its original condition.

When the above-mentioned action is repeated, the oscillating condition will continue.

Accordingly, the range of oscillated frequency is changed over by capacitor C and resistor R and it can be varied by changing the volume of integrating voltage with potentiometer.

Then, the triangular wave is made to be sine with the sine wave synthesizer by tangential approximity employing diodse and its amplitude is adjusted together with the triangular wave of the integrator output and square wave made of flip flop.

Then, it is amplified at output amplifier and turned to be output voltage.

5. Maintenance

5-1. Inspection of Inside

Remove the 4 screws shown in Fig. 5-1 and remove the legs. Pull backwards the side plates at both sides, upper plate and bottom plate gently. Thus, the inspection can be made on the inside of the unit.

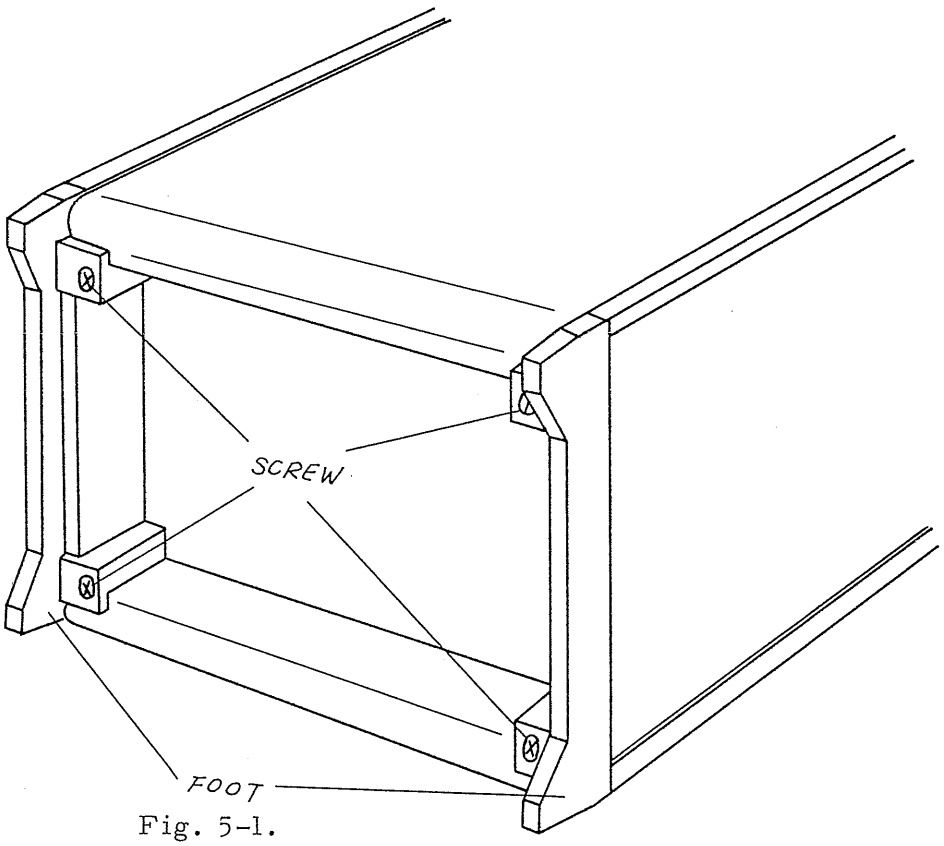


Fig. 5-1.

CAUTION

With the foot of the back plate removed, when the panel front is inclined with the handle, the upper plate is removed from the frame. Pay attention to this point well.

5-2. Arrangement

Figs. 5-2, 5-3 ~~and 5-10~~ show the arrangement of main parts.

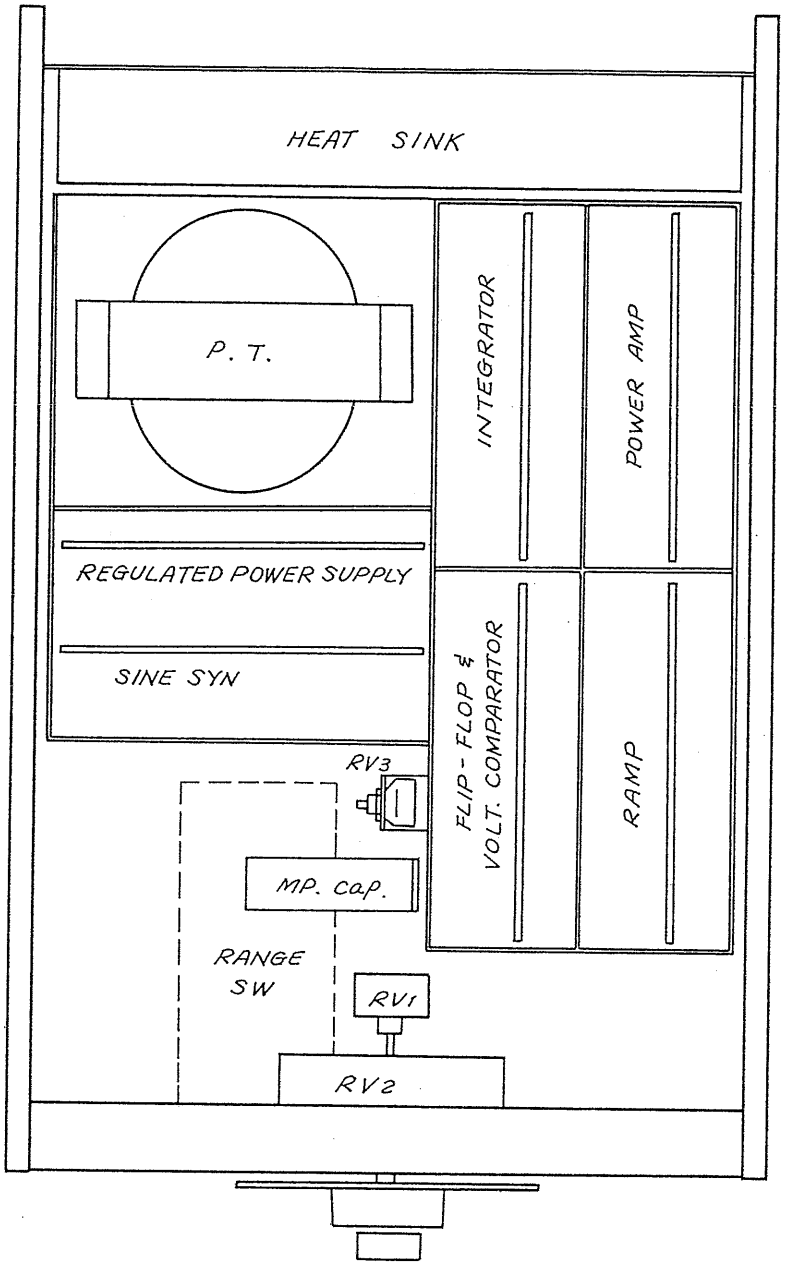


FIG. 5-2. Arrangement Plan for Parts

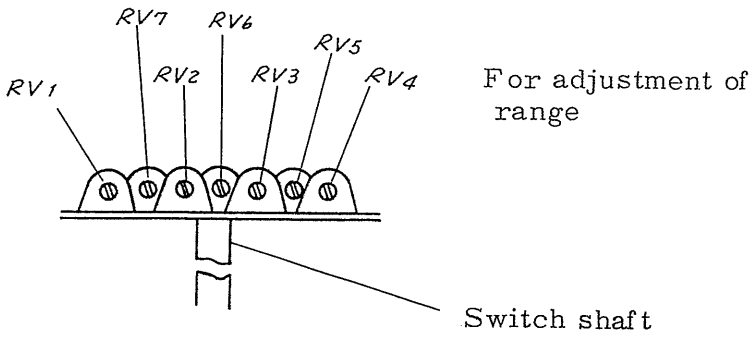


FIG.. 5-3 Arrangement Plan for Parts