

**KENWOOD**

FUNCTION GENERATOR

**FG-273**

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**INSTRUCTION MANUAL**

KENWOOD CORPORATION

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A product of  
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## INTRODUCTION

The MODEL FG-273 Sweep/ Function Generator provides of a function generator, pulse generator, Sweep oscillator, and frequency counter.

## FEATURES

1. Wide-band design : seven ranges cover full oscillation frequency from 0.02 Hz to 2 MHz
2. Selectable output of sine waves, square waves, and triangular waves through one-touch operation.
3. TTL/CMOS square wave output connector facilitates using TTL-level and CMOS-level output square waves as the signal source for experiment of a digital circuit.
4. The symmetry Function varies symmetry of saw-tooth waves and pulse waves.  
It can invert the wave polarity.
5. Equipped with a 6-segment LED oscillation frequency display and a counter covering the range from 5 Hz to 10 MHz.
6. Applying voltage from 0 to +10 V to the VCF IN connector implements external sweep as well as output frequency control.
7. The log sweep and linear sweep function provides sweep frequency control up to max. 1000 : 1. Sweep frequency is variable from 0.5 Hz (2 seconds) to 50 Hz (20 milliseconds).  
Sweep control is implemented by applying sweep signal to the VCF connector from an external device.
8. DC voltage (0 to  $\pm 10$  V) can be overlaid upon output waveform.
9. Combined use of the -20 dB and -40 dB ATTENUATOR pushbuttons and the continuous attenuator provides maximum attenuation over 60 dB.
10. A small and light-weight case with convenient carrying handle, which also serves as a tilting stand.

## PRECAUTIONS

1. Do not use the FG-273 Function Generator under the following conditions :
  - Places exposed to the direct sun light
  - Very hot and humid rooms
  - Rooms with excessive mechanical vibrations
  - Near devices which irradiate strong magnetic forces or pulse voltage
2. The FG-273 operates immediately after turning on power.  
  
For accurate measurement, however, wait until it warms up sufficiently after pressing the POWER switch.
3. Do not repeat switching on and off the Generator.
4. Follow the instructions in section "MAINTENANCE", if the supply voltage is to be changed.

## SPECIFICATIONS

### < FREQUENCY CHARACTERISTICS >

#### GENERAL

- Output Waveform . . . . Sine wave, square wave, triangl wave, pulse wave, TTL / CMOS-level square wave, & ramp wave
- Oscillation Frequency Range . . 0.02 Hz to 2 MHz  
7 ranges (1/10/100/1k/10k/100k/1M)
- Frequency Accuracy (1) . . Max.  $\pm 1/4$  digits (Digital display to output frequency)
- Frequency Accuracy (2) . .  $\pm 5\%$  of full scale (0.2H to 2MHz) (Frequency dial to output frequency)
- External Frequency Control (VCF)  
Input Voltage . . . . . 0 to +10 ; frequency increases with positive voltage, max.  $\pm 20$  V (DC + AC peak)
- Frequency Variable Range . . . 1000 : 1 or more
- Symmetry Variable Range . . . . 1 : 1 to 40 : 1 or more

- DC Offset . . . . .  $\pm 10$  V (open circuit)  
 $\pm 5$  V (into  $50 \Omega$ )  
continuous variable

- Polarity . . . . . Inverted or non-inverted

#### SINE WAVE

- Distortion . . . . . 1% or less (10 Hz to 100 kHz)
- Output Frequency Response . . . Within  $\pm 1.0$  dB up to 100 kHz (into  $50 \Omega$  , at max. output)
- Output . . . . . Variable

#### SQUARE WAVE

- Symmetry . . . . .  $\pm 3\%$  or less (at 100 Hz)
- Rise/Fall Time . . . . . 100 ns or less (at max. output level)
- Output . . . . . Variable

#### TRIANGL WAVE

- Linearity . . . . . 1% or less (at 100 Hz)
- Output . . . . . Variable

## TTL OUTPUT

Rise/Fall Time . . . . . 25 ns or less

Output . . . . . TTL level

## CMOS OUTPUT

Rise/Fall Time . . . . . 60 ns or less

Output . . . . . Continuous variable from +5  
V to +15 V (High)

## < SWEEP CHARACTERISTICS >

Internal Sweep . . . . . Linear or logarithmic

Sweep Frequency . . . . . 0.5 Hz (2 sec) to 50 Hz (20  
m sec), continuous variable

Sweep width . . . . . 1 : 1 to 1000 : 1, peak-peak  
variable and continuous  
variable

External sweep . . . . . By means of VCF input

## < FREQUENCY COUNTER CHARACTERISTICS >

Frequency Range . . . . . 5 Hz to 10 MHz (10 sec, 1 sec,  
0.1 sec, & 0.01 sec)

Accuracy . . . . . Reference clock accuracy  $\pm 1$  count

Stability . . . . .  $\pm 2 \times 10^{-5}$  or less (0 to 40°C)

Input Sensitivity . . . . . 30 mV r.m.s. (5 Hz to 10 MHz)

Max. Input Voltage . . . . . 150V r.m.s (at 1kHz)

Input Impedance . . . . . 0 dB : Approx, 500k $\Omega$   
-20 dB : Approx, 1M $\Omega$

## < OUTPUT CHARACTERISTICS >

Output Voltage . . . . . 20 Vpp or more (open circuit)  
10 Vpp or more (into 50 $\Omega$ )

Attenuator . . . . . -20 dB/-40 dB step, or continuous  
variable

Impedance . . . . . 50 $\Omega \pm 10\%$

**< POWER SUPPLY >**

Input Voltage . . . . . 100/120/220/240 VAC  $\pm$  10%  
(Max. 250V AC)

Frequency . . . . . 50/60 Hz

Power Consumption . . Approx. 20 VA

**< ENVIRONMENTAL CONDITIONS >**

Storage Temperature . . -20 to 60 °C, 70% or less.

Operating Temperature . 0 to 40 °C, 80% or less

With Specifications . . 23  $\pm$  5 °C, 70% or less

**< SIZE & WEIGHT >**

Dimensions (WHD) . . 240  $\times$  64  $\times$  190 mm

Weight . . . . . 1.8 kg

**< ACCESSORIES >**

Instruction Manual . . 1

AC cable . . . . . 1

Fuse (0.3AT) . . . . . 1

(0.2A) . . . . . 1

# OPERATOR'S CONTROLS AND INSTRUCTIONS

FRONT PANEL

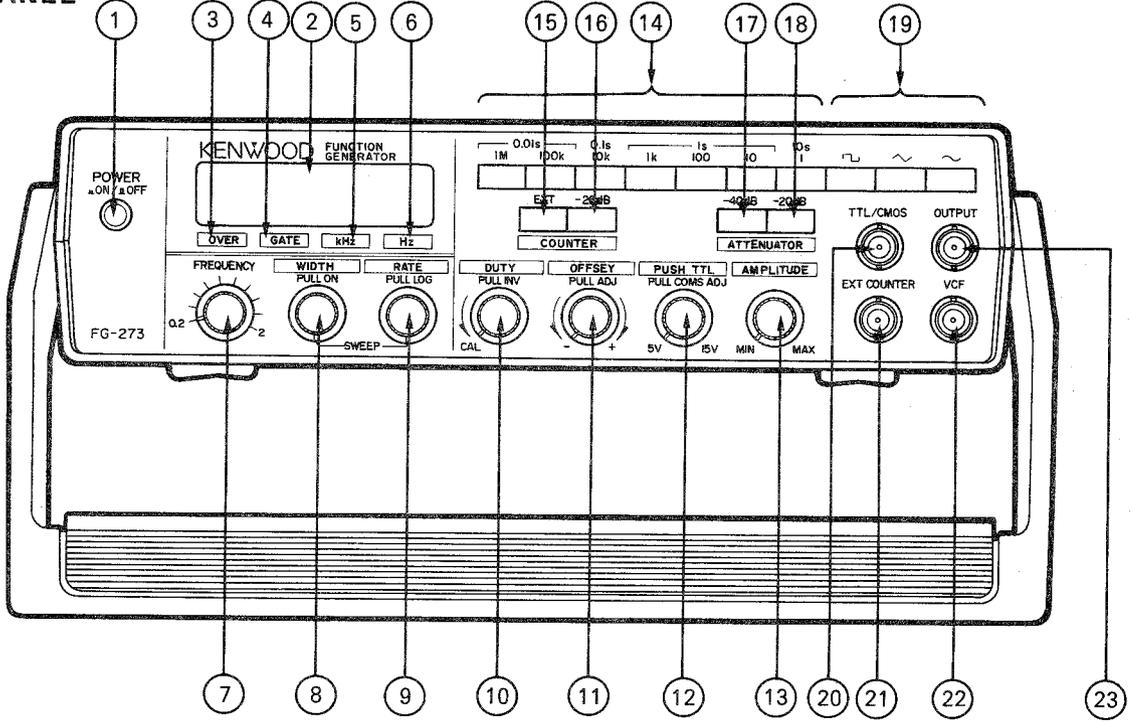


Fig. 1

① **POWER Pushbutton**

Pressing this pushbutton turns on power. Counter display lights up to indicate power is on.

② **Counter Display**

Digitally displays internal oscillation frequency or frequency of external input signal.

③ **OVER LED**

Lights up when reading on the counter display overflows.

④ **GATE LED**

Flashes when the gate is operating.

⑤,⑥ **Hz/kHz LED**

Indicate the unit of frequency, Hz or kHz, as well as the decimal point when 10 s, 1 s, 0.1 s, or 0.01 s is selected with the gate time selector switch assembly⑭.

⑦ **FREQUENCY Control**

Variable potentiometer varies frequency within the range selected with the Frequency RANGE selector switch assembly⑭. The dial is scaled from 0.2 to 2.0.

⑧ **SWEEP WIDTH / PULL ON Control**

Pulling the knob selects internal sweep. Rotating it controls sweep width.

Pushing the knob selects external sweep, which is implemented when external sweep voltage is applied to the VCF input connector.

⑨ **SWEEP RATE / PULL LOG Control**

Controls sweep rate (sweep frequency) of the internal sweep oscillator.

Pulling the knob selects logarithmic sweep.

⑩ **DUTY/PULL INV (Symmetry Adjustment/Polarity Selector) Knob**

Controls symmetry of output signal.

Clockwise rotation varies the duty ratio from 1:1 to 40:1.

This adjustment makes pulse wave of square wave, ramp wave or saw-tooth wave of triangle wave, and asymmetric sine wave of sine wave.

Pulling this knob inverts the phase polarity.

Note : Note that controlling this knob changes frequency.

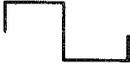
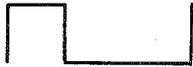
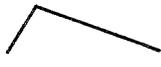
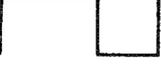
Waveform \ Knob Position	Polarity		Polarity	
	Normal	Inverted	Normal	Inverted
	Counterclockwise Rotation	Counterclockwise Rotation	Clockwise Rotation	Clockwise Rotation
Square Wave				
Triangl Wave				
Sine Wave				
TTL Wave				

Fig. 2 Effect of INVERT Pushbutton with respect to DUTY Control Knob Setting

⑪ **OFFSET/PULL ADJ Control**

Pulling this knob admixes DC voltage with output signal.

Clockwise rotation admixes positive voltage.

Counterclockwise rotation admixes negative voltage.

Fig.3 illustrates several types of waveform with the OFFSET knob pulled and 50-ohm load connected.

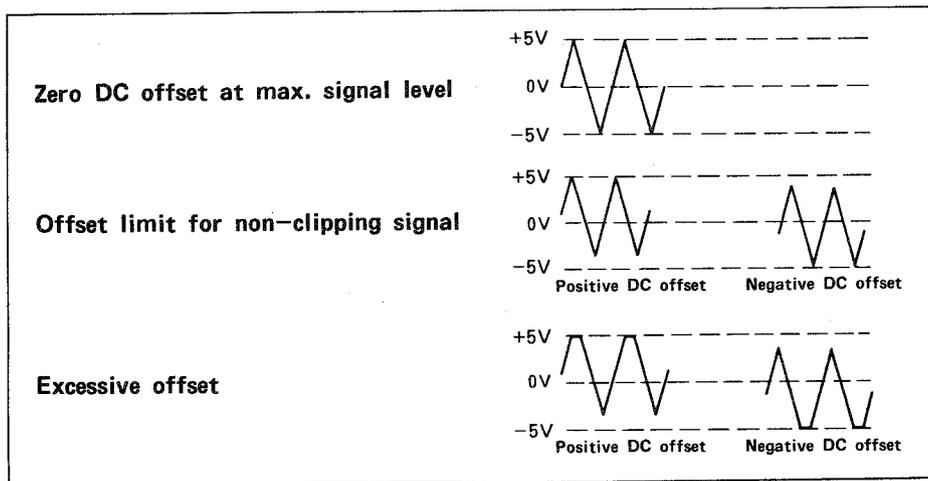


Fig.3 Application Example of DC Offset

⑫ **PUSH TTL Knob (CMOS Level Control Knob)**  
 Pulling the control varies the level of CMOS square waves from 5Vpp to 15 Vpp continuously. Rotating the knob, if it is depressed, causes no variation in the level of TTL square waves.

⑬ **AMPLITUDE Control**  
 Rotating this control varies amplitude of output waveform.

⑭ **Frequency Range/Gate Time Selector Switch Assembly**  
 Selects the following seven ranges of oscillation frequency or four ranges of gate time :

X 1 :	10s	0.2 Hz	to	2 Hz
X 10 :	} 1s	2 Hz	to	20 Hz
X 100 :		20 Hz	to	200 Hz
X 1k :		0.2 kHz	to	2 kHz
X 10k :	0.1s	2 kHz	to	20 kHz
X 100k :	} 0.01s	20 kHz	to	200 kHz
X 1M :		0.2 MHz	to	2 MHz

⑮ **COUNTER EXT Selector Pushbutton**  
 Pressing the pushbutton (button engaged) selects external input frequency. Another press (button released) selects internal oscillation frequency.

⑯ **COUNTER -20 dB Pushbutton**  
 Pressing the pushbutton attenuates counter input signal by 20 dB.

⑰, ⑱ **ATTENUATOR Pushbuttons**  
 Pressing these pushbuttons attenuates output signal by 20 dB and 40 dB respectively.

⑲ **FUNCTION Selector Switch Assembly**  
 Selects output waveform out of sine wave ( $\sim$ ), triangle wave ( $\wedge$ ), and square wave ( $\square$ ).

⑳ **TTL/CMOS Output Jack**  
 Outputs TTL-level or CMOS square waves.

㉑ **EXT COUNTER Input Jack**  
 Input jack for measuring frequency of external signal.

㉒ **VCF Input Jack**  
 By applying voltage to this jack in the state where the WIDTH pushbutton ⑧ is depressed (button engaged), frequency of output signal can be varied. Application of voltage from 0 to 10V varies frequency up to max. 1000:1.

㉓ **OUTPUT Jack**  
 Outputs sine wave, triangle wave, or square wave selected with the FUNCTION selector switch assembly ⑲.

## REAR PANEL

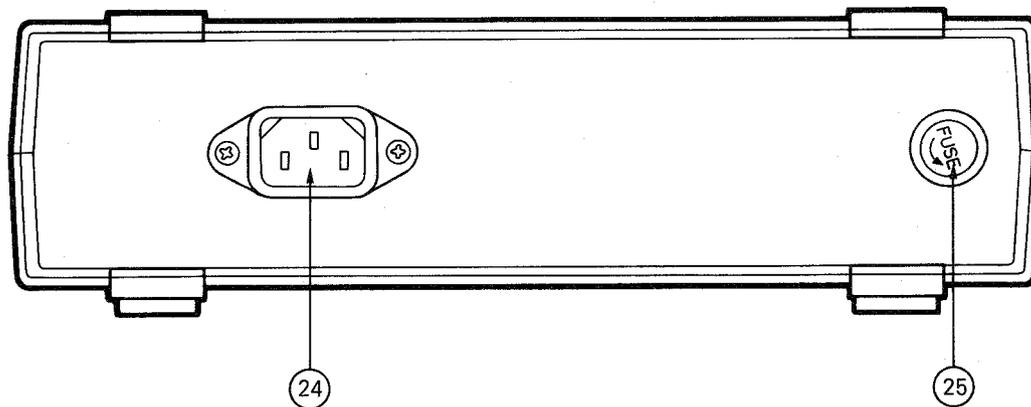


Fig. 4

- ②④ **Power Connector**  
Connector for supplying AC power.  
Use the dedicated power cord.
- ②⑤ **Fuse Holder**  
Fuse holder for AC power supply.

## MAINTENANCE

### 1. Fuse Replacement

If the fuse has blown out, find out and eliminate the cause.

Then, replace it with a new fuse. Use a 0.3 A slow-blow fuse for supply voltage of 100 to 120 V, or a 0.2 A fuse for supply voltage of 220 to 240 V. Fuse holder is provided on the rear panel of the unit.

### 2. Changing Supply Voltage.

**WARNING :** Prior to opening the case, be sure to disconnect the power cord from the socket.

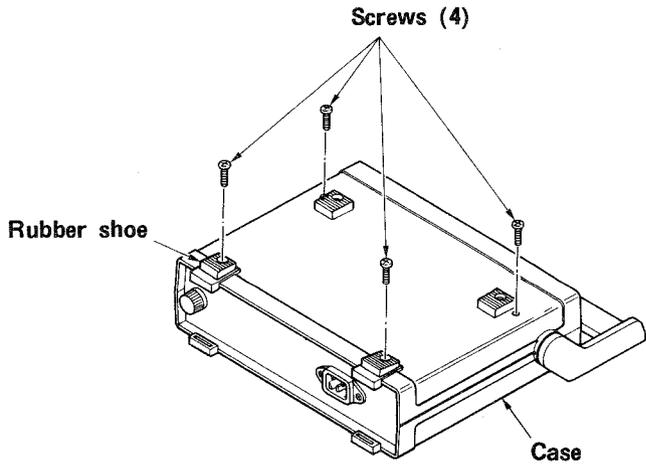
#### 2-1 How to Remove Case

To open the case, turn the unit upside down, and remove four screws from the case base plate. (See Fig. 5.) Then, lift the base plate to detach it.

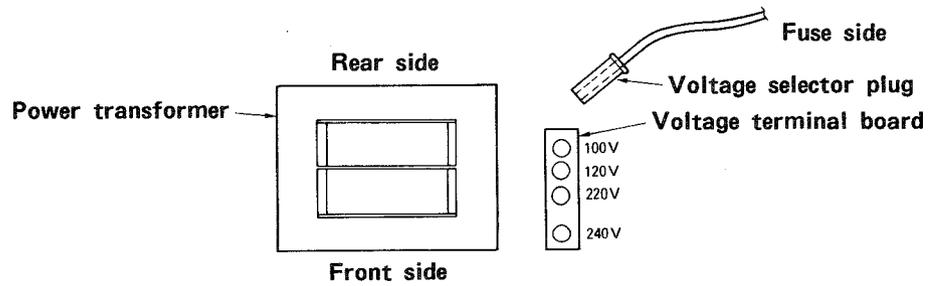
#### 2-2 How to Change Supply Voltage

The FG-273 is available for supply voltage of 100, 120, 220, and 240 VAC, 50/60 Hz.

To change the supply voltage, remove the case (in accordance with item 2-1 above), and reconnect the voltage selector plug on the printed circuit board in the unit to a desired voltage position on the voltage terminal board. (See Fig. 6.)



**Fig. 5 Disassembly and Assembly of Case**



**Fig. 6 Internal selection of Supply Voltage**