

1. INTRODUCTION

1-1. FEATURES

The Model FG-8002 is an advanced Function Generator which provides functions of function generator, pulse generator and sweep oscillator including following versatile features.

- (1) WIDE BAND WIDTH covers full oscillation frequency range from 0.02Hz to 2MHz.
- (2) VERSATILE WAVEFORMS are selectable in sine wave, square wave, triangle wave and pulse wave etc.
- (3) TTL-LEVEL SQUARE WAVE output is available for signal source for Digital circuit experiments.
- (4) By SYMMETRY FUNCTION, the symmetry of saw-tooth wave and pulse wave can be controlled.
- (5) Frequency of output signal can be controlled by applying voltage from 0 to +10V to VCF IN connector.
- (6) The linear sweep function provides SWEEP FUNCTION CONTROL from 1 : 1 to 100 : 1.
- (7) DC VOLTAGE from 0 to +10V can be OVERLAID upon output waveform.
- (8) Maximum ATTENUATION is over 40dB.

1-2. SPECIFICATIONS

- (1) Frequency Range : 0.02Hz to 2MHz
- (2) Output Waveform : Sine wave, Square wave
Triangle wave, Pulse wave.
TTL-level square wave, Ramp wave
Screwed sine wave.

- (3) Accuracy of
 Dial Scale to : $\pm 5\%$ (Range : 1, 10, 100, 1K, 10K, 100K)
 Output frequency : $\pm 8\%$ (Range : 1M)
- (4) VCF input voltage : 0 to 10V (DC or AC peak)
- (5) Frequency Variable : 100 : 1 or more.
 Range
- (6) Symmetry Variable : 10 : 1 to 1 : 10 or more.
 Range
- (7) DC Offset : $\pm 10V$ (Open circuit)
 $\pm 5V$ (Into 50Ω)
- (8) Sine Wave
 ① Distortion : $\pm 1\%$ or less (10Hz to 100KHz)
 ② Flatness : $\pm 0.35V$ (Reference level : +10V)
- (9) Square Wave
 ① Symmetry : $\pm 3\%$ or less (at Max, 1KHz)
 ② Rise/Fall Time : 100nS or less (at Max, output level)
- (10) Triangle Wave
 ① Linearity : $\pm 1\%$ or less (10Hz to 100KHz)
 $\pm 5\%$ or less (100KHz to 2MHz)
- (11) TTL Output
 ① Rise/Fall Time : 25nS or less
 ② Output : TTL level
- (12) Sweep
 ① Sweep Width : 1 : 1 to 100 : 1
 ② Sweep Ratio : 20nS to 2S (0.5Hz to 50Hz)
 ③ Internal Sweep : Linear
 External Sweep : Controlled by VCF input
- (13) Output
 ① Maximum Output Voltage : 20Vp-p (Open circuit)
 10Vp-p (Into 50Ω)
 ② Attenuator : -20dB Step
 ③ Impedance : $50\Omega \pm 10\%$

(14) Power

- ① Performance power requirement : 110/220V AC \pm 10 %
50/60Hz
- ② Power Consumption : Approx, 20W

(15) Environmental Conditions

- ① Storage temperature : -20°C to $+60^{\circ}\text{C}$
- ② Operating temperature : 0°C to $+35^{\circ}\text{C}$
- ③ Operating Humidity : 35% to 85%
- ④ Rated Range of use temperature : $+23^{\circ}\text{C}$ ($\pm 5^{\circ}\text{C}$)
- ⑤ Frequency stability : $\pm 0.5\%$ (18°C to 28°C)
 $\pm 10\%$ (0°C to 18°C , 28°C to 35°C)

1-3. ACCESSORIES

The following accessories are included in the package of this instrument.

- (1) FUSE : 2
- (2) BNC to CLIP Cable : 1
- (3) Instruction Manual : 1

1-4. PRECAUTIONS

Following precautions are needed,
for safe use and longer life of the instrument.

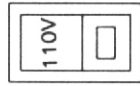
1-4-1. INPUT VOLTAGE & FUSE

- (1) Before connecting POWER to the instrument, make sure that the line voltage selector is set to the correct voltage level for the AC voltage being applied, and correct fuse is installed.

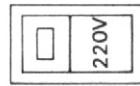
Input line Voltage	Voltage Selector
99V~121V AC (50/60Hz)	110V
208V~242V AC (50/60Hz)	220V

(2) Voltage level can be selected by turning the voltage selector on the rear panel of the instrument.

(Example)



<110V Setting>



<220V Setting>

(3) Use only specified fuse.

Fuse specifications for input voltage are as following

Voltage	Fuse Spec.	Size
110V	0.5A, 250V	5.2 ϕ \times 20
220V	0.25A, 250V	5.2 ϕ \times 20

1-4-4. INSTALLATION & HANDLING

- (1) Avoid installing the instrument in an extremely hot or cold place.
(For example, long exposure to direct sunlight, near a heater or in a closed car in midsummer)
- (2) Do not move the instrument rapidly from a hot place to a cold place or vice versa.
Condensation may form inside of the instrument.
When moving, Warming time is needed before operation.
- (3) Keep the instrument away from damp air, water and dust.
Unexpected trouble may be caused when the instrument is placed in a damp or dusty place.
- (4) Do not place a liquid-filled containers such as a vase on the instrument.
(Accidental intrusion of liquid may also cause troubles)
- (5) Do not place the instrument in a place where vibration is strong.

- (6) Do not put a heavy object on the instrument.
- (7) Do not place the instrument near a magnet or in strong magnetic field.
- (8) Do not leave a hot soldering iron near the cabinet of the instrument.
- (9) Do not try to turn the instrument upside down, otherwise knobs may be broken.
- (10) Do not apply excessive voltage higher than maximum input voltage to input connector.
(Refer 1-2. SPECIFICATIONS)

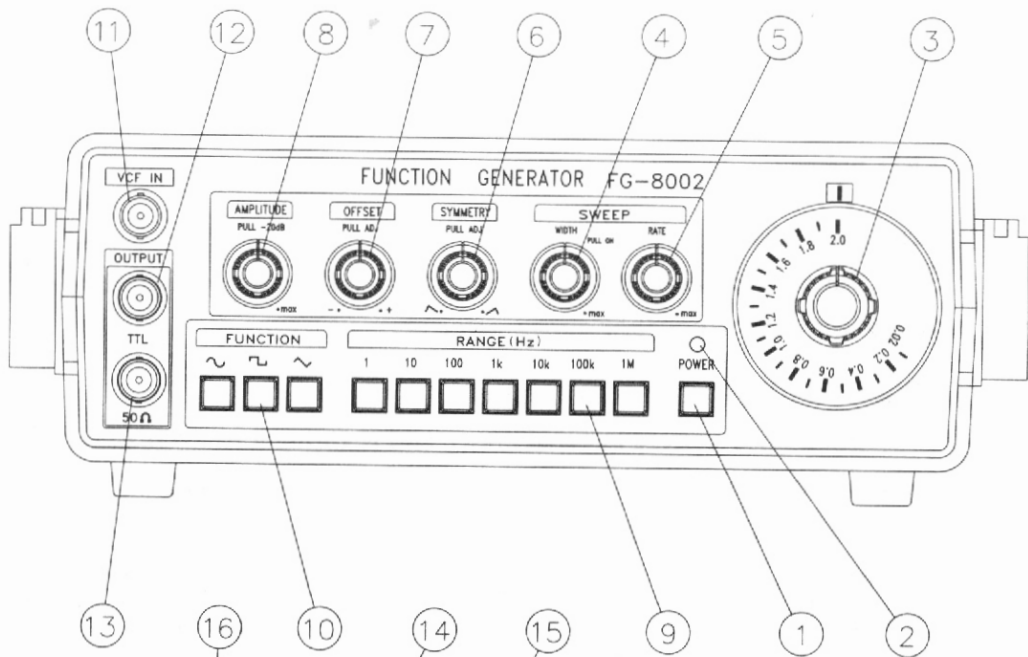


Fig 2-1. FRONT PANEL

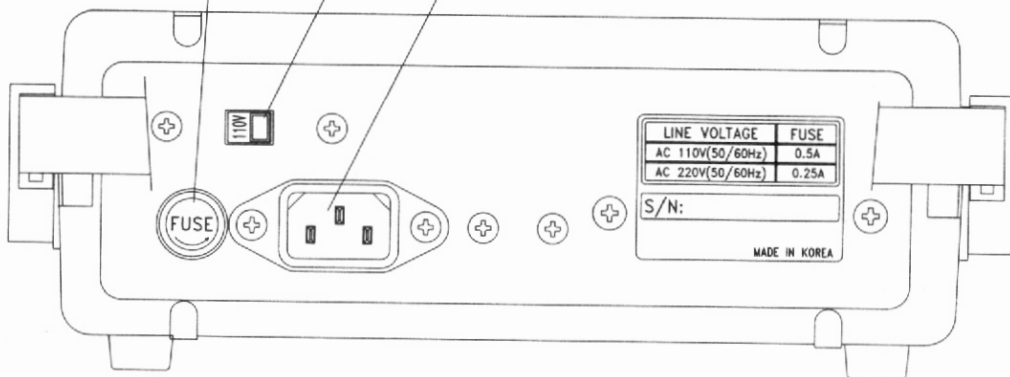


Fig 2-2. REAR PANEL

2. OPERATION INSTRUCTIONS

2-1. FRONT PANEL

① POWER Switch

Pressing this push switch turns on power.

② POWER Lamp

LED lights up when power is on.

③ Frequency Dial

This Variable potentiometer varies output frequency within the selected range with the frequency range selector.

④ SWEEP WIDTH/PULL ON Control

Pulling the knob selects internal sweep and Rotating it controls sweep width. Rotate it counterclockwise to get a minimum sweep width (1 : 1) and rotate it clockwise to get a maximum sweep width (100 : 1). To get a maximum sweep width, set the frequency dial to minimum scale (below 0.2 scale). Pushing the knob selects external sweep, which is implemented when external sweep voltage is applied to the VCF input connector.

⑤ SWEEP RATE Control

This controls sweep rate (sweep frequency) of internal sweep oscillator.

⑥ SYMMETRY Control

This controls symmetry (duty cycle) of output signal waveform within range of 10 : 1 to 1 : 10.

Fig 2-3. shows waveforms varied by symmetry control.

Knob position Waveform	PUSH	PULL		
		Center	Counter-clockwise	Clockwise
Square Wave				
Triangle Wave				
Sine Wave				
TTL Wave				

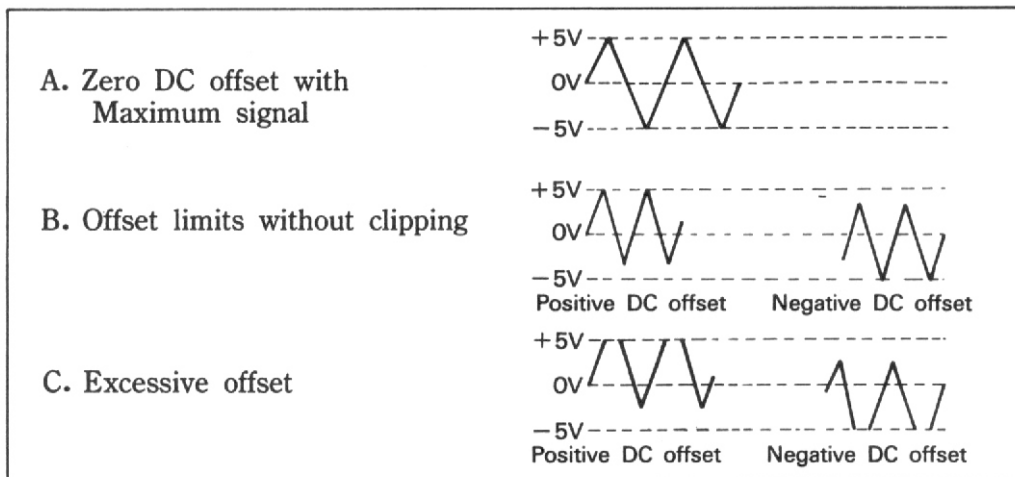
Fig 2-3. Symmetry control.

⑦ DC OFFSET Control

The DC offset control can provide up to $\pm 10V$ open circuit, or $\pm 5V$ into 50Ω .

Clockwise rotation admixes positive voltage and counter clockwise rotation admixes negative voltage.

Fig 2-4. shows the various operating conditions encountered when using DC offset.



All examples : Output terminated in 50Ω

Fig 2-4. DC offset control

⑧ AMPLITUDE/PULL –20dB Control

Amplitude of output signal can be controlled by this knob.

Maximum attenuation is more than 20dB when the knob is rotated fully counterclockwise.

Pulling this knob make attenuation of 20dB, so the output signal can be attenuated by 40dB when this is pulled and rotated fully counterclockwise.

⑨ FREQUENCY RANGE Selector

Select one of the following seven ranges of oscillation frequency as desired.

Frequency Ranges	Desired Output Frequency
1	0.02Hz~ 2Hz
10	2Hz~ 20Hz
100	20Hz~200Hz
1K	200Hz~ 2KHz
10K	2KHz~20KHz
100K	20 KHz~200KHz
1M	200KHz~ 2MHz

⑩ FUNCTION Selector

Push one of three knobs to get a desired waveform out of sine wave, triangle wave and square wave.

⑪ VCF IN Connector

Frequency of output signal can be varied by applying voltage to this connector.

Application of voltage from 0 to +10V provides frequency variation up to 100 : 1.

To maximum variation, set the frequency dial to minimum scale. (below 0.2 scale)

⑫ TTL–OUTPUT Connector

TTL–level square waves output from here.

⑬ OUTPUT Connector

This is the main output connector for sine wave, triangle wave and square wave selected with the FUNCTION Selector.

2-2. REAR PANEL

⑭ Voltage Selector

Select rated voltage 110V or 220V according to the power line voltage to be applied to the instrument.

⑮ Power Cord

Connect to a power connector for supplying AC power.

⑯ FUSE Holder

Fuse holder for AC power supply.

Use a specified fuse for safety of the instrument.

3. MAINTANANCE GUIDE

3-1. CLEANING

When the outside of the case is stained, remove the stain by wiping it lightly with cloth moistened with neutral washing agent and the wipe the surface with a dry cloth, Never use strong volatile agent such as benzine or thinner.

3-2. CALIBRATION

To maintain instrument accuracy, perform the calibration of FG-8002 at least every 1000 hours of operation, or every six months if used infrequently. Calibration should be done by a qualified personnel.

3-3. TROUBLE CHECK

If trouble occurs in use, check the following items first.

- ① Voltage selector and power line voltage applied.
- ② Fuse specifications
- ③ Position of the Knobs
- ④ Cables connected to the instrument
- ⑤ Operation mistake.

If the problem persists after checking all above,
Ask a service station or agent for service.