

FUNCTION GENERATOR
GFG-8216A/8219A/8255A

ISO-TECH GFG 8216A RS Stock No. 376-0200

ISO-TECH GFG 8219A RS Stock No. 398-5364

ISO-TECH GFG 8255A RS Stock No. 376-0216

82RS-82550ME

EC Declaration of Conformity

GFG-8216A, GFG-8219A, GFG-8255A

are herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Law of Member States relating to Electromagnetic Compatibility (89/366/EEC, 92/31/EEC, 93/68/EEC) and Low Voltage Equipment Directive (73/23/EEC).

For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Equipment Directive, the following standards were applied:

Conducted and Radiated Emissions EN 55011 Group I class A: 1991	Electrostatic Discharge EN 61000-4-2: 1994
Current Harmonic EN 61000-3-2: 1995	Radiated Immunity ENV 50140: 1993
Voltage Fluctuation EN 61000-3-3: 1995	Electrical Fast Transients EN 61000-4-4: 1995
	Surge Immunity EN 61000-4-5: 1995
	Conducted Susceptibility EN 61000-4-6: 1996
	Power Frequency Magnetic field EN 61000-4-8: 1993
	Voltage Dips/ Interrupts EN 61000-4-11: 1994

Safety Requirements
EN 61010-1: 1990+A1: 1992+A2: 1995; IEC 61010-1: 1990+A1: 1992+A2: 1995

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1.SAFETY TERMS AND SYMBOLS

Please take a moment to review these safety terms and symbols which may appear in this manual or on Equipment to prevent damage to the Function Generators or injury to the user.



WARNING. Warning statements identify condition or practices that could result in injury or loss of life.



CAUTION. Caution statements identify conditions or practices that could result in damage to this product or other property.



DANGER High Voltage



ATTENTION refer to Manual



Protective Conductor Terminal



(ground) Earth Terminal



Frame or Chassis Terminal

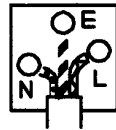
FOR UNITED KINGDOM ONLY

NOTE: This lead/appliance must only be wired by competent persons

WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are coloured in accordance with the following code:

Green/ Yellow: Earth
Blue: Neutral
Brown: Live(Phase)



As the colours of the wires in main leads may not correspond with the colours identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with the letter E or by the earth symbol

 or coloured Green or Green & Yellow.

The wire which is coloured Blue must be connected to the

terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

If in doubt, consult the instructions provided with the equipment or contact the supplier.

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, cable of 0.75mm² should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any moulded mains connector that requires removal/replacement must be destroyed by removal of any fuse & fuse carrier and disposed of immediately, as a plug with bared wires is hazardous if engaged in live socket. Any re-wiring must be carried out in accordance with the information detailed on this label.

2. INTRODUCTION

The Function Generator series are stable low distortion instruments which generate signals in the frequency range up to 5MHz (GFG8255A). Typical applications include a wide range of audio response testing applications, vibration testing, servo system evaluation, ultra sound applications, and etc.

These instruments include the following features: logarithmic and linear sweep capabilities, together with a built in frequency counter. The sweep capability simplifies the task of finding resonant points of speakers, filter networks and other networks/structures. An oscilloscope may be connected to this instrument for the response to be displayed. The counter can be switched to measure and display the frequency of an external signal up to 150MHz.

● ADDITIONAL FEATURES

1. Low distortion waveforms (sine, triangular and square) and ramp signal.
2. Signal output in seven decade stages, 0.5Hz to 5MHz for GFG-8255A, 0.3Hz to 3MHz for GFG-8216A and GFG-8219A.
3. Adjustable sweep time and sweep width in both linear and logarithmic modes.
4. Duty cycle control with signal inversion capability.
5. External Voltage controlled Frequency (VCF).
6. AM or FM modulation modes with internal or external modulation control.

7. A second output for TTL or adjustable CMOS pulses.

8. 50 ohm main signal output with DC offset adjustment and 20dB attenuation capability.

9. Supplied with two BNC test leads and AC power cord set.

● FEATURES COMPARISON TABLE FOR MODELS:

MODEL	GFG-8216A	GFG-8219A	GFG-8255A
FEATURE			
AM/FM	—	✓	✓
SWEEP	—	✓	✓
COUNTER	✓	✓	✓
GCV Output	—	✓	✓
TTL/CMOS	✓	✓	✓
VCF	✓	✓	✓
Duty Cycle Control	✓	✓	✓

3. SPECIFICATION

	GFG-8216A/8219A	GFG-8255A
1.Main		
Frequency Range	0.3Hz~3MHz(7 Range)	0.5Hz~5MHz(7 Range)
Amplitude	> 10Vpp(into 50Ω load)	>10Vpp(into 50Ω load)
Impedance	50Ω ± 10%	50Ω ± 10%
Attenuator	-20dB ± 1dB × 2	-20dB ± 1dB × 2
DC Offset	< -5V ~ > 5V (into 50Ω load)	< -5V ~ > 5V (into 50Ω load)
Duty Control	30%:20%:80% to 1MHz Continued variable	80%:20%:80% to 1MHz Continued variable
Display	6 digits LED display	6 digits LED display
2.Sine Wave		
Distortion	≤ 1%, 0.3Hz~200kHz	≤ 1%, 0.5Hz~100kHz
Flatness	< 0.3dB, 0.3Hz~300kHz < 0.5dB, 300kHz~3MHz	≤ 0.3dB, below 500kHz ≤ 1dB, below 5MHz
3.Triangle Wave		
Linear	≥ 98%, 0.3Hz~100kHz ≥ 95%, 100kHz~3MHz	≥ 98%, 0.5Hz~100kHz ≥ 95%, 100kHz~5MHz
4.Square Wave		
Symmetry	± 2%, 0.3Hz~100kHz	± 2%, 1Hz~100kHz
Rise or Fall Time	≤ 100ns at maximum output. (into 50Ω load)	≤ 50ns at maximum output (into 50Ω load)

	GFG-8216A/8219A	GFG-8255A
5.CMOS Output		
Level	4Vpp ± 1Vpp ~ 14.5Vpp ± 0.5Vpp adjustable	4Vpp ± 1Vpp ~ 14.5Vpp ± 0.5Vpp adjustable
Rise or Fall Time	≤ 120ns	≤ 120ns
6.TTL Output		
Level	≥ 3Vpp	≥ 3Vpp
Fan Out	20 TTL load	20 TTL load
Rise or Fall Time	≤ 25ns	≤ 25ns
7.VCF		
Input voltage	0V ~ 10V ± 1V(100:1)	0V ~ 10V ± 1V(100:1)
Input Impedance	10kΩ ± 10%	10kΩ ± 10%
8.GCV(for GFG-8219A/8255A only)		
Output voltage	To set the voltage between 0V ~ 2V as per different frequency.	To set the voltage between 0V ~ 2V as per different frequency.
9.Sweep Operation(for GFG-8219A/8255A only)		
Sweep/Manual	Switch selector	Switch selector
Sweep/Rate	100:1 ratio max. and adjustable	100:1 ratio max. and adjustable
Sweep/Time	0.5Sec ~ 30Sec adjustable	0.5Sec ~ 30Sec adjustable
Sweep/Mode	Lin./Log. switch selector	Lin./Log. switch selector
10.Amplitude Modulation(for GFG-8219A/8255A only)		
Depth	0 ~ 100%	0 ~ 100%
MOD.Freq.	400Hz(INT), DC ~ 1MHz(EXT)	400Hz(INT), DC ~ 1MHz(EXT)
Carrier BW	100Hz ~ 3MHz(-3dB)	100Hz ~ 5MHz(-3dB)
EXT Sensitivity	≤ 10Vpp for 100% modulation	≤ 10Vpp for 100% modulation

	GFG-8216A/8219A	GFG-8255A
11.Frequency Modulation(for GFG-8219A/8255A only)		
Deviation	0~±5%	0~±5%
MOD.Freq.	400Hz(INT),DC~20kHz(EXT)	400Hz(INT),DC~20kHz(EXT)
EXT Sensitivity	≤10Vpp for 10% modulation	≤10Vpp for 10% modulation
12.Frequency Counter		
Int./Ext.	Switch selector	Switch selector
Range	0.3Hz~3MHz (5Hz~150MHz EXT)	0.5Hz~5MHz (5Hz~150MHz EXT)
Accuracy	Time base accuracy ±1 count	Time base accuracy ±1 count
Time base	±10ppm(23°C ±5°C) after 30 minutes warm up ±20ppm (0~50°C)	±10ppm(23°C ±5°C) after 30 minutes warm up ±20ppm (0~50°C)
Resolution	The maximum resolution is 100nHz for 1Hz and 1Hz for 100MHz	The maximum resolution is 100nHz for 1Hz and 1Hz for 100MHz
Input Impedance	1MΩ/150pF	1MΩ/150pF
Sensitivity	≤35mVrms(5Hz~100MHz) ≤45mVrms(100MHz~150MHz)	≤35mVrms(5Hz~100MHz) ≤45mVrms(100MHz~150MHz)
13.General		
Power Source	AC115V, 230V ±15%.50/60Hz	AC115V, 230V ±15%.50/60Hz
Operation Environment	Indoor use, altitude up to 2000m. Ambient Temperature 0°C to 40°C. Relative Humidity 80%(Maximum). Installation category II Pollution Degree 2	
Storage temperature & Humidity	-10°C to 70°C. 70% (Maximum).	

	GFG-8216A/8219A	GFG-8255A
Accessories	GTL-101×2 Instruction manual×1	GTL-101×2 Instruction manual×1
Dimension	251(W)×91(H)×291(D) m/m	251(W)×91(H)×291(D) m/m
Weight	Approx. 2.1kgs – GFG-8216A 2.2kgs ----- GFG-8219A	Approx. 2.4kgs



WARNING : To avoid electrical shock, the power cord protective grounding conductor must be connected to ground.



CAUTION : To avoid damaging the instrument, do not use it in a place where ambient temperature exceeds 40°C.



CAUTION : To avoid damaging the instrument, do not input more than DC15V to V.C.F.(V.C.G.).

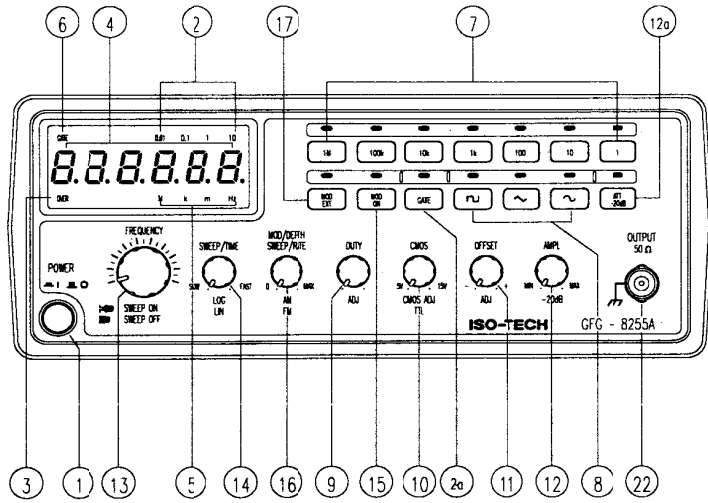


CAUTION : To avoid damaging the instrument, do not input more than AC30V to Frequency Counter.

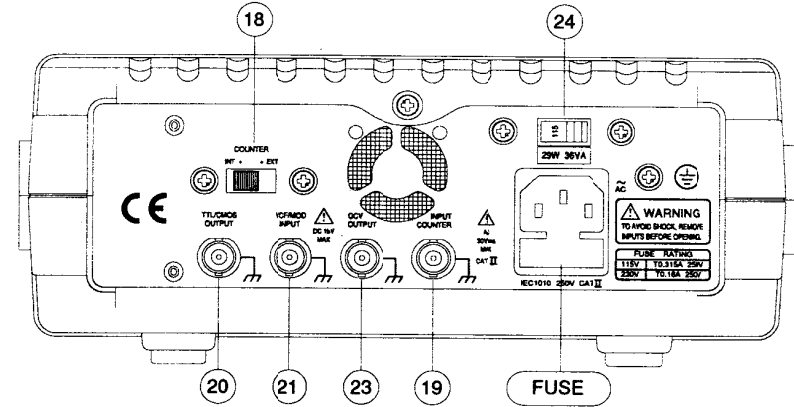


CAUTION : To avoid damaging the instrument, do not input more than AC10Vpp when proceed EXT modulation operation (for GFG-8219A,GFG-8255A).

● Fig.4.1 FRONT PANEL



● Fig.4-2 REAR PANEL



4. FUNCTION DESCRIPTION

1. **Power Switch** This button is used to switch the instrument on/off once the AC power has been connected.
2. **Gate Time Indicator** Once the instrument is switched on, the Gate time indicator will start to flash (with a gate time of 0.01 second).
- 2a. **Gate Time Selector** Press this key to change gate time when using external counter mode. The cycle order is according to 0.01s, 0.1s, 1s, 10s .
3. **Over Indicator** In the external counter mode, the indicator is illuminated when the output frequency is greater than the range selected.
4. **Counter Display** Shows the external frequency in a 6 x 0.3" green display, and shows the internal frequency in a 5 x 0.3 green display.
5. **Frequency Indicator** Indicates the value of the current frequency value.
6. **Gate Time Indicator** Indicates the current Gate time (external. counter mode use only).
7. **Frequency Range Selector** Selects the required frequency range as shown in Table 1 .and Table 2.

Table 1(for GFG-8216A/8219A)

Push button	1	10	100	1k	10k	100k	1M
Frequency Range	0.3Hz	3Hz	30Hz	300Hz	3kHz	30kHz	300kHz
	3Hz	30Hz	300Hz	3kHz	30kHz	300kHz	3MHz

Table 2(for GFG-8255A)

Push button	1	10	100	1k	10k	100k	1M
Frequency Range	0.5Hz	5Hz	50Hz	500Hz	5kHz	50kHz	500kHz
	5Hz	50Hz	500Hz	5kHz	50kHz	500kHz	5MHz

8. **Function Selector** Press one of the three push buttons to select the desired output waveform.
9. **Duty Function** Pull out and rotate the knob to adjust the duty cycle of the waveform.
10. **TTL/CMOS Selector** The BNC terminal of ⑳ outputs a TTL compatible waveform. Pull out and rotate the knob to adjust the CMOS compatible output from 5-15Vpp.
11. **DC Offset Control** Pull out the knob to select any DC level of the waveform between $\pm 10V$, turn clockwise to set a positive DC level waveform and anticlockwise for a negative DC level waveform.
12. **Output Amplitude Control with Attenuation Operation** Turn clockwise for MAX. outputs and anticlockwise for a -20dB output. Pull the knob out for an additional 20dB output attenuation.

- 12a. 20dB Attenuation Press to adjust the output by -20dB.
13. MANU/SWEEP Selector and Frequency Adjustment (Sweep On/Off) Press and turn knob clockwise for MAX frequency and anticlockwise for MIN frequency. (Keep the pointer within the scale range on the panel.) Pull out the knob to start the auto sweep operation; the upper frequency limit is determined by the knob position.
14. Sweep Time Control and LIN/LOG Selector 8219A/8255A only (1) Rotate the knob clockwise to adjust sweep time for MAX, or anticlockwise for MIN. (2) Select Linear sweep mode by pushing in the knob. To select LOG sweep mode, pull out the knob.
15. Control MOD ON/OFF Selector 8219A/8255A only Press to modulate the output by an internal 400Hz Sine wave or an external signal via VCF/MOD in connector (21).
16. Sweep Width & Modulation Carrier & AM/FM Selector & FM Selector 8219A/8255A only (1) Sweep width can be controlled from 0 to 1000 times. (2) To adjust modulation ratio turn the knob clockwise for MAX, or anticlockwise for MIN. (3) Press the knob for AM function or pull it out for FM function.
17. INT/EXT MOD Selector 8219A/8255A only Press the button once, the indicator will light to indicate that EXT MOD has been selected. Press the key again, the indicator will go off, INT MOD has been selected.
18. INT/EXT Counter Selector Selects internal counter mode or selects external counter mode (for an independent counter with an input signal from BNC (19)).
19. EXT Counter Input Terminal Accepts external signals for measurement.

20. TTL/CMOS Output Terminal TTL/CMOS compatible signal output
21. VCF/MOD Input Terminal Used to connect the input voltage required to perform the "voltage control frequency" operation or the EXT modulation operation.
22. Main Output Terminal Main signal output.
23. GCV Output This is a DC voltage output and its voltage level will follow the change in Frequency.
24. Power Switch 115V and 230V selectable.

- **Remark:** The functions of item 14, 15, 16, 17 and 23 can not be applied to GFG-8216A.

5. USAGE DESCRIPTION

The function generators can provide versatile waveforms of high efficiency and convenient operation. Familiarize yourselves with the functions thoroughly through the use of this Operation Manual.

One of the best ways to observe the waveforms is by connecting an Oscilloscope and watching the effect on the waveform as you follow the steps below:

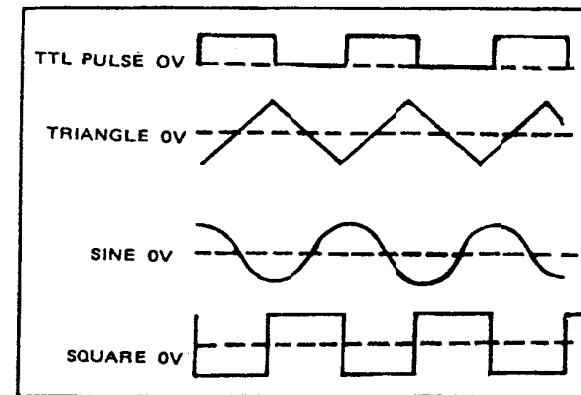
5-1. First-step check:

- (1) Ensure that the AC voltage selector switch is set correctly as indicated on the rear panel. Connect the instrument to the mains supply using the power cord supplied.
- (2) Press PWR switch ① and ensure all the rotary controls are pushed in, then rotate AMPL ⑫ knob to increase the output signal.
- (3) Rotate the FREQ ⑬ control fully anticlockwise.


5-2. Triangle, square and sine wave

- (1) First select the required Function ⑧, then select Range ⑦, and finally rotate FREQ ⑬, to set the required frequency (read out from display window).
- (2) Connect Output ⑫, to an oscilloscope and observe the output signal.
- (3) Rotate AMPL ⑫ to control the waveform amplitude.
- (4) If attenuation to the output signal is required, pull out AMPL ⑫ knob to obtain 20dB attenuation or press (12a) knob for additional 20dB attenuation..
- (5) The phase-relation of Output Waveform is shown in Figure 1 below:


● Figure 1.



5-3.Pulse wave generation

- (1) First press the key () of Function ⑧ ; then select Range ⑦ , and rotate **FREQ** ⑬ , to set required frequency range.
- (2) Connect output-terminal ②② to the oscilloscope to observe the output signal.
- (3) Pull out and rotate Duty ⑨ knob to adjust the width of the pulse waveform.
- (4) Adjust **AMPL** ⑫ knob to set the pulse amplitude.
- (5) Pull out **AMPL** ⑫ knob to apply a 20dB attenuation to the output.

5-4.Ramp wave generation

- (1) First press the key () of Function ⑧ , then select Range ⑦ , rotate **FREQ** ⑬ switch to set required frequency range.
- (2).Connect output-terminal ②② to the oscilloscope to observe the output signal.
- (3) Pull out and rotate **DUTY** ⑨ knob to adjust the slope of the ramp waveform.
- (4).Adjust **AMPL** ⑫ knob to control output amplitude of the ramp waveform.
- (5).Pull out **AMPL** ⑫ knob to apply a 20dB attenuation to the output.

5-5.TTL/CMOS signal output

- (1) First select Range ⑦ , then rotate **FREQ** ⑬ to set required frequency range.
- (2) Connect BNC connector of TTL/CMOS ②⑩ to an oscilloscope to observe the output signal.
- (3) At this moment, the output is a square wave fixed to TTL level; suitable for general TTL integrated circuit.
- (4) If square waveform of CMOS level is required, pull out CMOS ⑩ knob

to adjust voltage level.

5-6.Variation of external voltage-controlled frequency

This mode of operation allows the user to adjust the frequency of the function generator with an external DC control Voltage.

- (1) First select Function ⑧ , then select Range ⑦ , and finally rotate **FREQ** ⑬ to set required frequency range.
- (2) Connect an external control voltage ($0 \pm 10V$) to the VCF ②① connector via a suitable lead, this will generate a signal from the Output ②②.
- (3) Other adjustments, such as **AMPL** ⑫ can change the amplitude of the signal, or get attenuation; adjust Offset ⑪ for DC level, rotate Duty ⑨ switch to change output signal of pulse or ramp waveform etc..

5-7.Auto Sweep

- (1) First select the required waveform by pressing Function ⑧ button, then select required frequency range by pressing range ⑦ push button.
- (2) Connect output terminal ②② to an oscilloscope to observe the output signal.
- (3) Rotate frequency ⑬ to set the upper frequency limit.
- * (4) Pull out frequency ⑬ to perform auto-sweep operation.
- * (5) Rotate **SWEEP/TIME** ⑭ and **SWEEP/RATE** ⑯ to adjust sweep time and rate.
- (6) Pull out (press) **LIN/LOG** ⑭ to obtain LOG (LIN) sweep mode.

*only available on the 8219A/8255A

Note: The sweep width can only be adjusted during the sweep cycle and it can not be stopped.

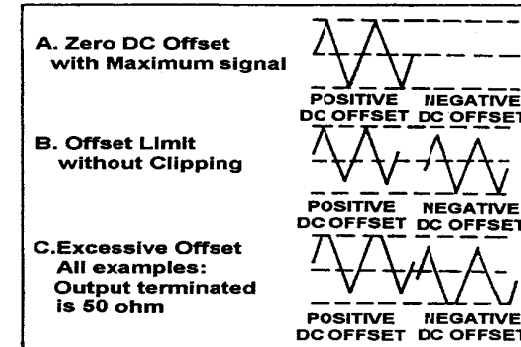
5-8. AM/FM operation (8219A/8255A only)

- (1) Select function ⑧ first; then select Range ⑦, and rotate FREQ ⑬ to set the required frequency range.
- (2) Connect output terminal ⑫ to an oscilloscope to observe the output signal.
- (3) Press MOD ⑮ and pull out MOD ⑯ to obtain FM/AM modulation mode.
- (4) Adjust MOD ⑯ to achieve required modulation ratio.

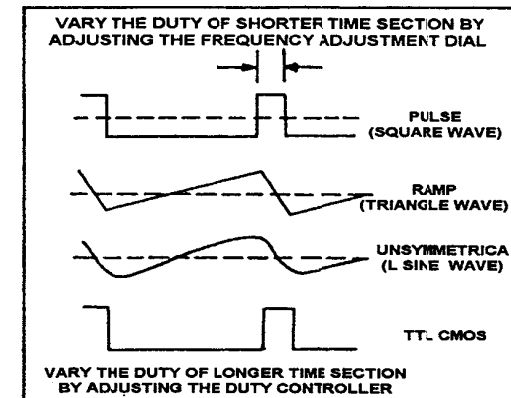
5-9. Precautionary notes

- (1) Adjusting the DC OFFSET will provide a change in voltage of $\pm 10V$ (no load) or $\pm 5V$ (50Ω load). However, signal added to DC level, is still limited to $\pm 20V$ (no load) or $\pm 10V$ (50Ω load). In case of over-voltage, clipping will appear as shown in Figure 2:
- (2) The output connector marked 50Ω has a signal source impedance of 50Ω . The output voltage and terminal impedance will be limited irrespective of what impedance is connected to the output. When using a high frequency or square wave output, oscillation can be avoided by using a 50Ω termination and by keeping the cables as short as possible.
- (3) With the Duty knob in the left-hand position the ratio of positive state to negative state will be 80:20. A Square wave can be expanded to a Pulse wave, Triangle wave to Ramp wave and a Sine wave to an asymmetrical Sine wave. As shown in Figure 3.

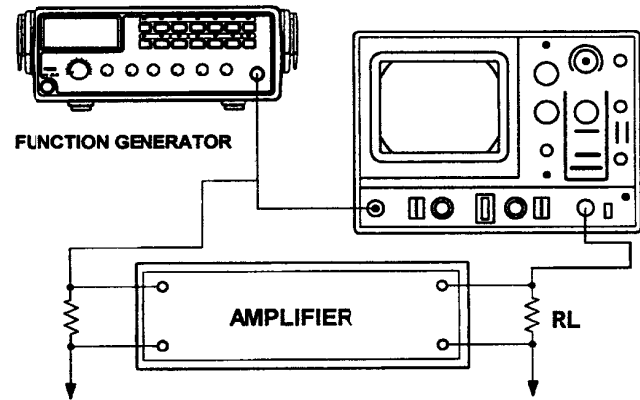
● Figure 2.



● Figure 3.



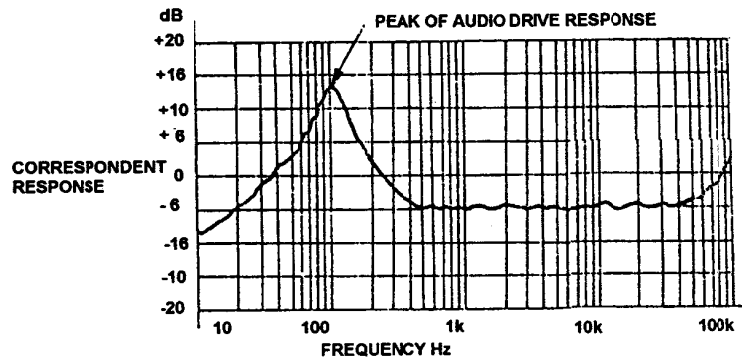
● FIGURE 4



● FIGURE 5

<p>Frequency distortion (amplitude reduction of low frequency). No phase shift</p>	<p>Low frequency boost (accentuated fundamental)</p>	<p>high frequency loss No phase shift</p>	<p>Low frequency phase shift (trace thickened by hum-voltage)</p>	<p>High frequency loss and phase shift</p>
<p>Low frequency phase shift</p>	<p>Low frequency loss and low frequency phase shift</p>	<p>High frequency loss and low frequency phase shift</p>	<p>Damped oscillation</p>	<p>Standard square wave</p>

● FIGURE 6



6. MAINTENANCE

The following instructions are for use by qualified person only, to avoid electrical shock, do not perform any service other than contained in the operation instructions unless you are qualified to do so.

6-1. Fuse Rating and type

If the fuse blows, the FUNCTION GENERATOR will not operate. Try to determine and correct the cause of the blown fuse, then replace the fuse with correct rating and type shown as below:

MODEL	FUSE Rating and Type		Rating Input	
	115V	230V	Watts	VA
GFG-8216A			25	32
GFG-8219A	T0.315A 250V	T0.16A 250V	29	36
GFG-8255A			29	36

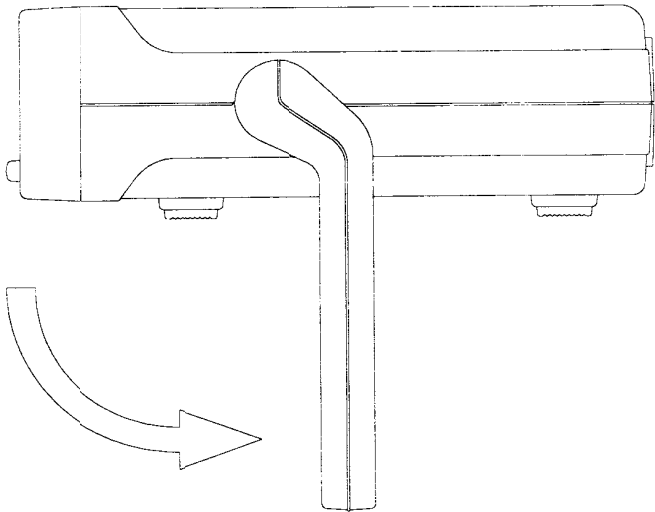


WARNING: For continued fire protection, replace only with 250V fuse of the specified type and rating, and disconnect the power cord before fuse replacement.

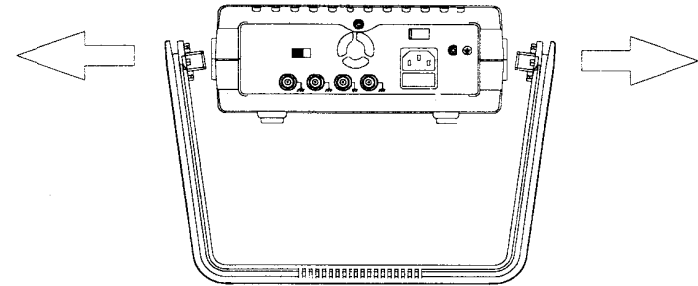
6-2. Fuse Replacement Procedure

For calibration or maintenance of the Function Generators, or if you need to replace the fuse, the upper cover must be removed according to the following steps:

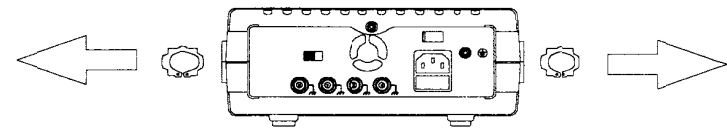
- 1) First turn the handle downwards by 90 degrees as shown below:



- 2) Pull the handle away from the Function Generator. Please rotate the handle left and right slightly to make it easier to disconnect.

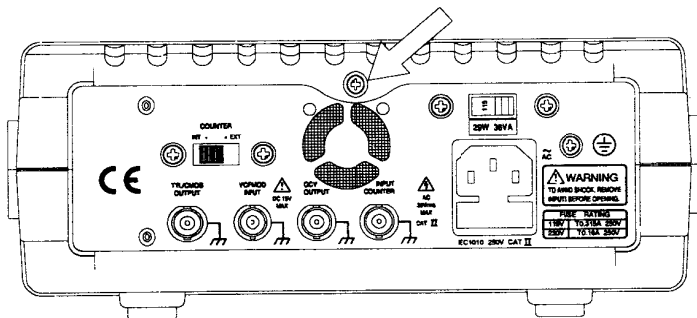


- 3) There are two washers located inside of two handle fixing holes either side of the case. Please use a screwdriver to remove these washers.



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- 4) Please use a screwdriver to remove the screw located on the upper side of the rear panel, then slide the top cover away from the backside.



Note: If you want to install the upper cover, please reverse the above steps.

6-3. Cleaning

To keep the instrument clean, wipe the case with a damp cloth and detergent. Do not use abrasives or solvents.

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