Analog Function Generator

GFG-8200A Series

USER MANUAL

GW INSTEK PART NO. 82FG-82150M11

ISO-9001 CERTIFIED MANUFACTURER GW INSTEK

The information in this manual was correct at the time of printing. However, Good Will continues to improve products and reserves the rights to change specification, equipment, and maintenance procedures at any time without notice.

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Table of Contents

SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow when operating the GFG-8200A series and when keeping it in storage. Read the following before any operation to insure your safety and to keep the GFG-8200A Function generator in the best condition.

Safety Symbols

These safety symbols may appear in this manual or on GFG-8200A series function generators.

 WARNING	Warning: Identifies conditions or practices that could result in injury or loss of life.
 CAUTION	Caution: Identifies conditions or practices that could result in damage to the GFG-8200A series or to other properties.
	Attention Refer to the Manual
	Earth (ground) Terminal

Safety Guidelines

General Guideline

CAUTION

- Do not place any heavy object on GFG-8200A.
- Avoid severe impact or rough handling that could lead to damaging the function generator(s).
- Do not discharge static electricity to GFG-8200A series.
- Use only mating connectors, not bare wires, for the terminals.
- Do not block or obstruct cooling vent openings.
- Do not disassemble the GFG-8200A series unless you are qualified as service personnel.

(Note) EN 61010-1:2001 specifies the measurement categories and their requirements as follows. The GFG-8200A series falls under category II.

- Measurement category IV is for measurement performed at the source of low-voltage installation.
- Measurement category III is for measurement performed in the building installation.
- Measurement category II is for measurement performed on the circuits directly connected to the low voltage installation.

Power Supply

WARNING

- Input voltage: 115/230V AC +15%, 50/60Hz
- The power supply voltage should not fluctuate more than 15%.
- Connect the protective grounding conductor of the power cord to earth ground, to avoid electrical shock.

Fuse

WARNING

- Fuse type: T0.16A/250V or T0.315/115V
- Only service personnel are allowed to access internal fuse holders.
- Replace the fuse with the specified type and rating only, for continued fire protection.
- Disconnect the power cord before fuse replacement.
- Make sure the cause of the fuse blowout is fixed before fuse replacement.

Cleaning the GFG-8200A series

- Disconnect the power cord before cleaning.
- Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid into the instrument(s).
- Do not use chemicals or cleaners containing harsh materials such as benzene, toluene, xylene, and acetone.

Operation Environment

- Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below)
- Relative Humidity: < 80%
- Altitude: < 2000m
- Temperature: 0°C to 40°C

(Note) EN 61010-1:2001 specifies the pollution degrees and their requirements as follows. the GFG-8200A series falls under degree 2.
Pollution refers to "addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity".

- Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.
- Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.
- Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.

Storage Environment

- Location: Indoor
- Relative Humidity: < 80%
- Temperature: −10°C to 70°C

Power cord for the United Kingdom

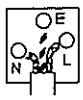
When using the GFG-8200A series in the United Kingdom, make sure the power cord meets the following safety instructions.

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 marking 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.

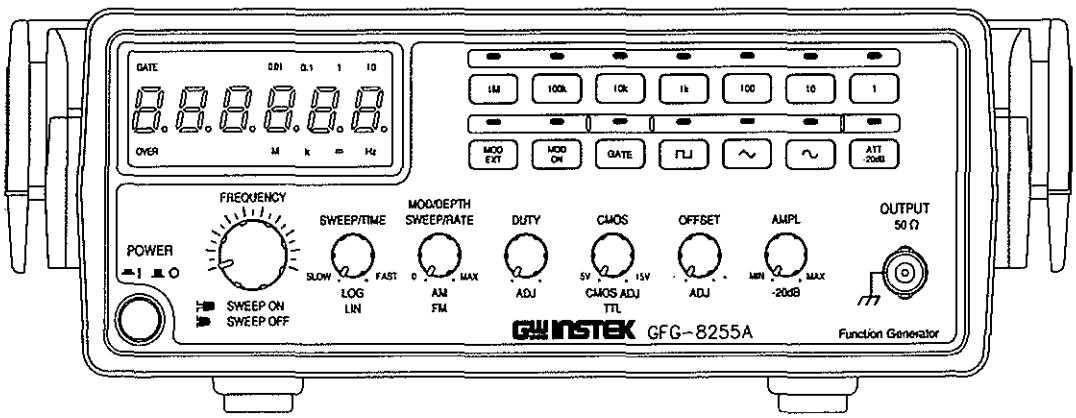
If in doubt, consult the instructions provided with the equipment or contact the supplier.

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 a live socket. Any re-wiring must be carried out in accordance with the information detailed on this label.

GETTING STARTED

This chapter describes the GFG-8200A series, including main features and front/rear/display introduction. Follow the Setup section to properly install and power up the GFG-8200A series.



Technical background

Traditional function generators

GFG-8200A series are traditional low distortion analog function generators ranging from 3 to 5 MHz. The GFG-8200A series are typically used for audio response testing, servo system evaluation and ultrasound applications. The GFG-8255A, 8219A and 8217A feature logarithmic and linear sweep. All the series feature TTL/CMOS and VCF (Voltage control frequency). Bar the 8215A, all feature a frequency counter.

Analog function generators use discrete components such as capacitors and resistors. Temperature changes can affect the discrete components, which in turn can affect output frequency and stability. As temperature can affect the output, it is recommended that the GFG has warmed up for a short period of time.

Lineup/Features

Series lineup

	GFG-8215A	GFG-8216A	GFG-8217A	GFG-8219A	GFG-8250A	GFG-8255A
AM/FM				√		√
SWEEP			√	√		√
COUNTER		√	√	√	√	√
GCV OUT				√		√
TTL/CMOS	√	√	√	√	√	√
VCF	√	√	√	√	√	√
DUTY CYCLE	√	√	√	√	√	√

Main features

Performance

- Low distortion
- Easy operation
- Portable
- Frequency Counter

Features

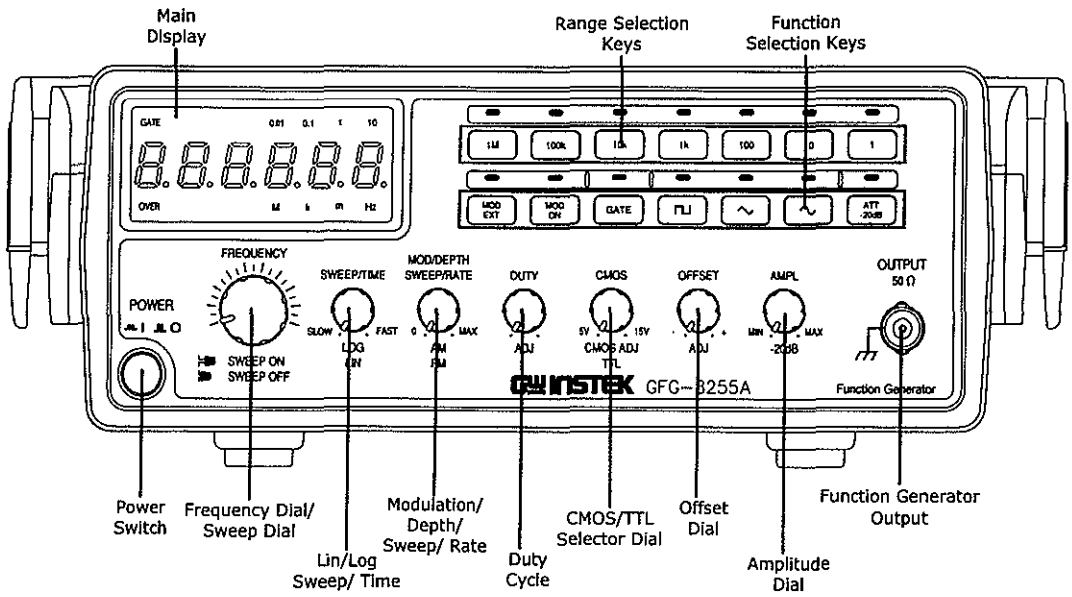
- Frequency range: 3 & 5MHz
- Various output waveforms: Sine, Square, and Triangle
- TTL/CMOS output
- Voltage controlled frequency
- GCV (Generator controlled voltage) 8219A,8255A
- Frequency Counter operates at up to 150MHz (45mVrms) excluding 8215A
- AM/FM with internal and external (8219A, 8255A)
- Sweep mode with LINE and LOG) (8219A, 8255A, 8217A)
-

Input/Output Terminals

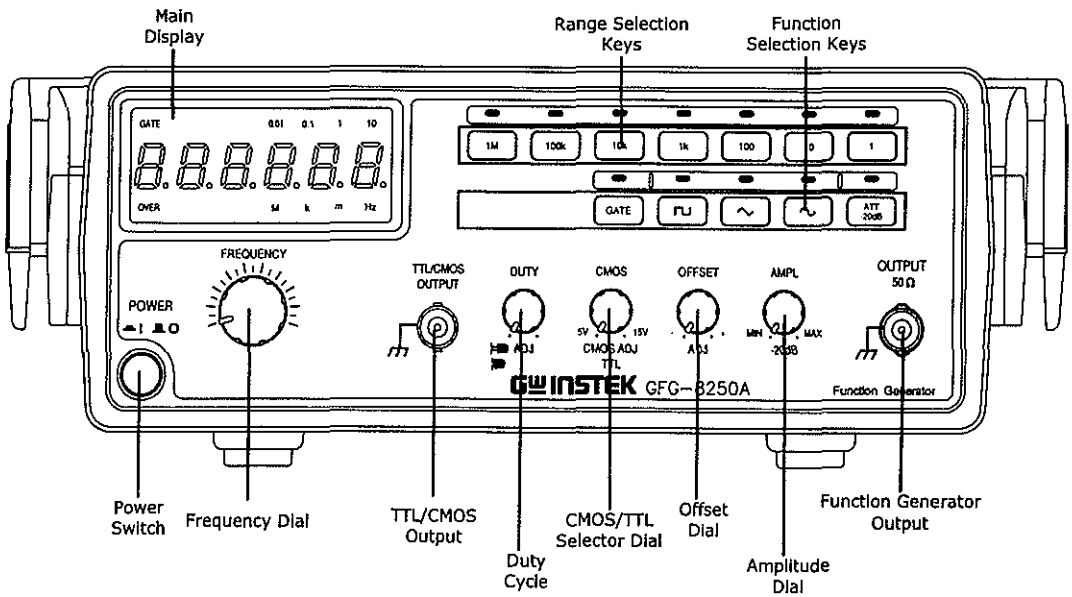
- Frequency output
- TTL/CMOS output
- Counter input
- External modulation input

Front Panel

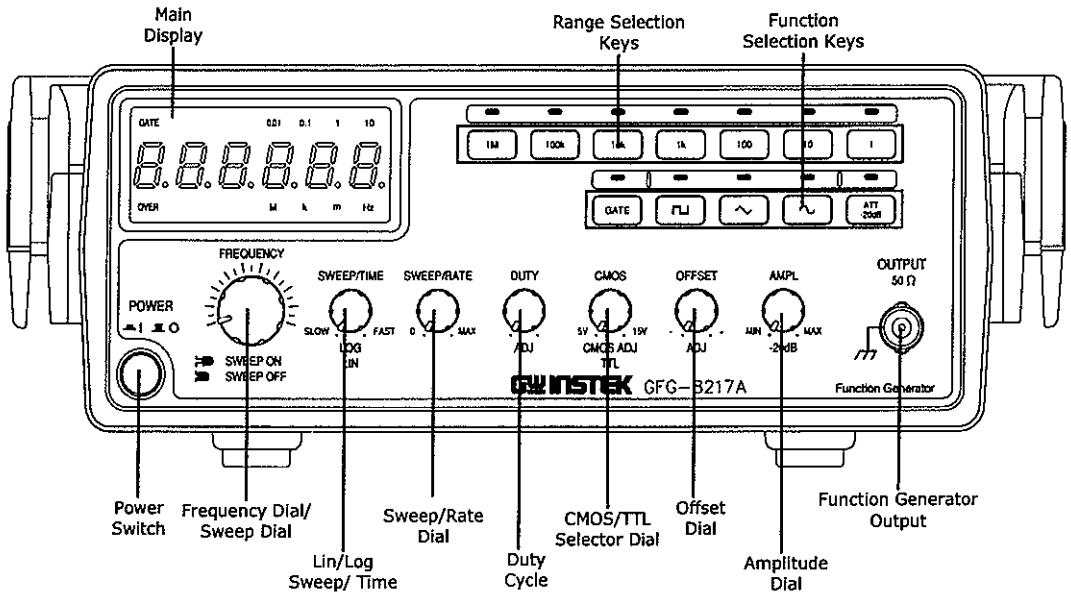
GFG-8255A/8219A Front Panel



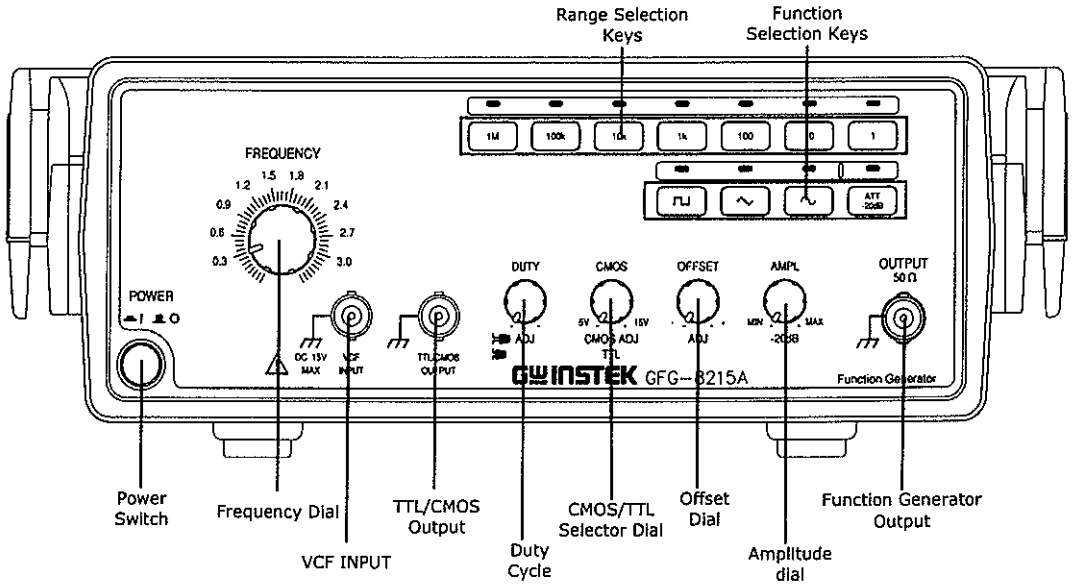
GFG-8250A/8216A Front Panel



GFG-8217A Front Panel



GFG-8215A Front Panel



Not all the range have the same functions/features. Refer to the front panel diagram/specifications for model differences and variations.

Main display (excl 8215A)

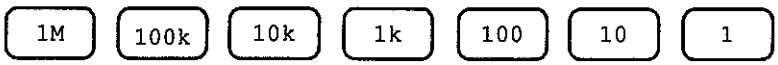

(6 segment)

Shows the waveform frequency, counter frequency, and duty cycle.

OVER	Indicates when an input has exceed the frequency specifications (over 150MHz) when using the counter function.
GATE	In counter mode, indicates gate time selection.
M k m Hz	Indicates the output frequency unit: MHz, kHz, or Hz.
0.01 0.1 1 10	Indicates the Gate Time in seconds.

Range Selection Keys

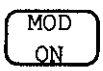
Selects the frequency range from Megahertz to Hertz. When a key has been pressed a led will light above the pressed key to indicate selection.



Function Selection Keys

The function selection keys select different waveforms, enable modulation, gate time and attenuation. When a key has been pressed a led will light above the pressed key to indicate selection.

External modulation signal input key. (DC- 20kHz) Pressing the MOD EXT key will cycle from external and internal modulation.



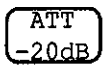
Turns AM/FM Modulation on/off

When in Frequency Counter mode, pressing the gate key will cycle through 4 different gate times: 0.01m 0.1, 1, & 10 second gate times

Square wave selector key.

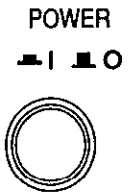
Triangle wave selector key.

Sine wave selector key.



Pressing the ATT -20dB key will attenuate the signal by -20dB.

Power Button



Turns off the FG.

In: on

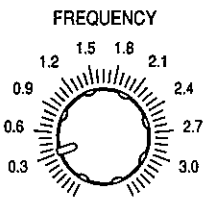
Out: off

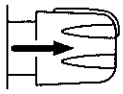
Frequency Dial/Sweep Dial

The Frequency dial/Sweep dial is used to control the frequency of the FG or the Sweep range.

Push/pull the dial to select the output function type.

Pushed: Frequency adjustment dial. Sweep mode off.

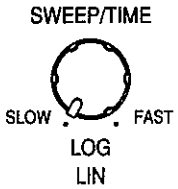




Pulled: Sweep mode is selected. Turning adjusts the sweep frequency.

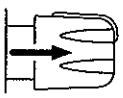
Sweep Time/Rate Dial

Adjusts the sweep time. Counterclockwise: slow sweep, clockwise fast sweep.



Push/pull the dial to select the output function type.

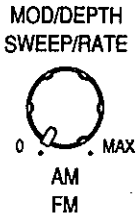
Pushed: Lin (linear) sweep type.



Pulled: Log (Logarithmic) sweep type.

Mod/Depth Sweep/Rate Dial

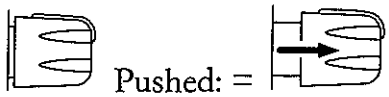
Depending on the current mode, controls either sweep rate or AM/FM modulation.



Sweep mode

Clockwise increases the sweep rate and anticlockwise decreases the sweep rate.

Pushed or pulled, the functions are identical in Sweep mode

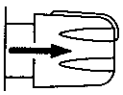


Mod mode

Push/pull the dial to select the output function type.

Counterclockwise decreases the modulation depth and clockwise increases.


Pushed: FM

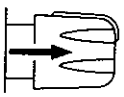

Pulled: AM

Duty Dial

Adjusts the Duty cycle.

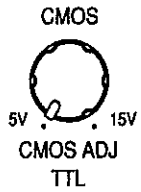
Push/pull the dial to select the output function type.


Pushed: 50% duty cycle.


Pulled: Adjustable duty cycle.
Counterclockwise: decreases the duty cycle (to 30%).

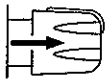
Clockwise: increases the duty cycle (to 70%).

CMOS /TTL control

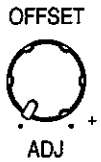


This knob becomes effective when the TTL/CMOS output is connected (page28).

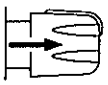
 Selects TTL as output.

 When pulled out, selects CMOS as output. Sets the CMOS output level. Turn counterclockwise (decrease) or clockwise (increase).

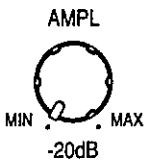
Offset control



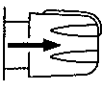
 Pushed, no offset.

 When pulled out, enables offset adjustment. Counterclockwise: negative offset, clockwise: positive offset.

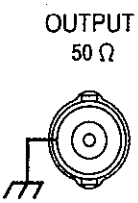
Amplitude/ Attenuation control



 Pushed, sets the sine/square/triangle waveform amplitude. Counterclockwise (decrease) or clockwise (increase).

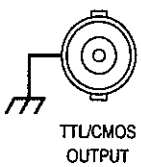
 When pulled out, attenuates the sine/square/triangle waveform amplitude by up to −20dB. Turn counterclockwise (decrease) or clockwise (increase).

Output

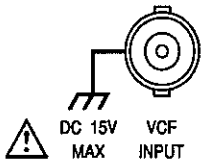


50Ω BNC output.

TTL/CMOS out

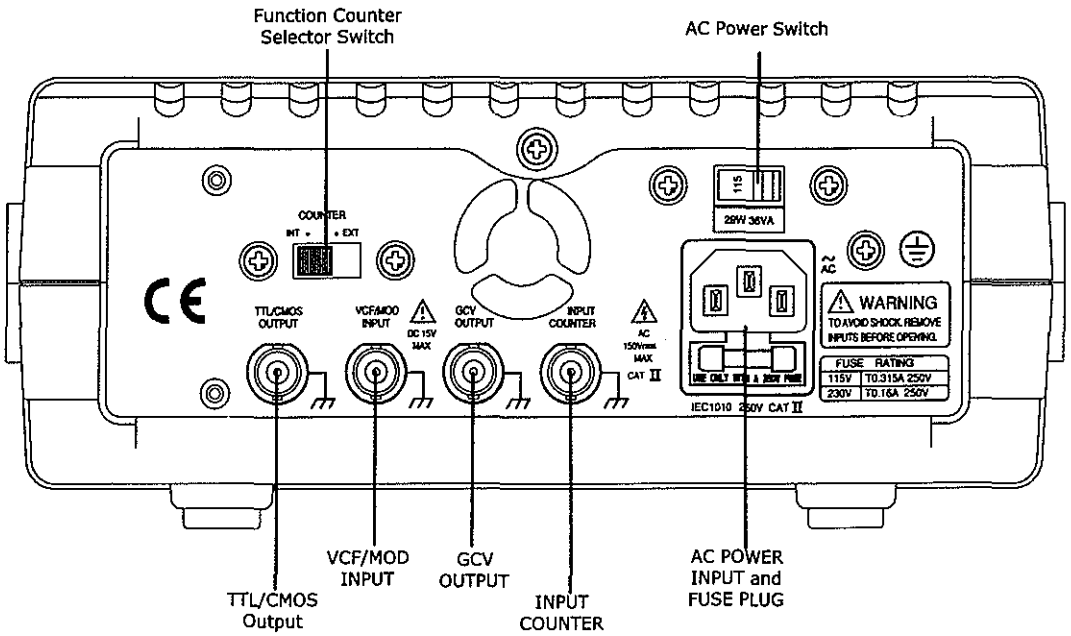


A 3V-pp(TTL) or 4-14.5V-pp (CMOS) adjustable output.

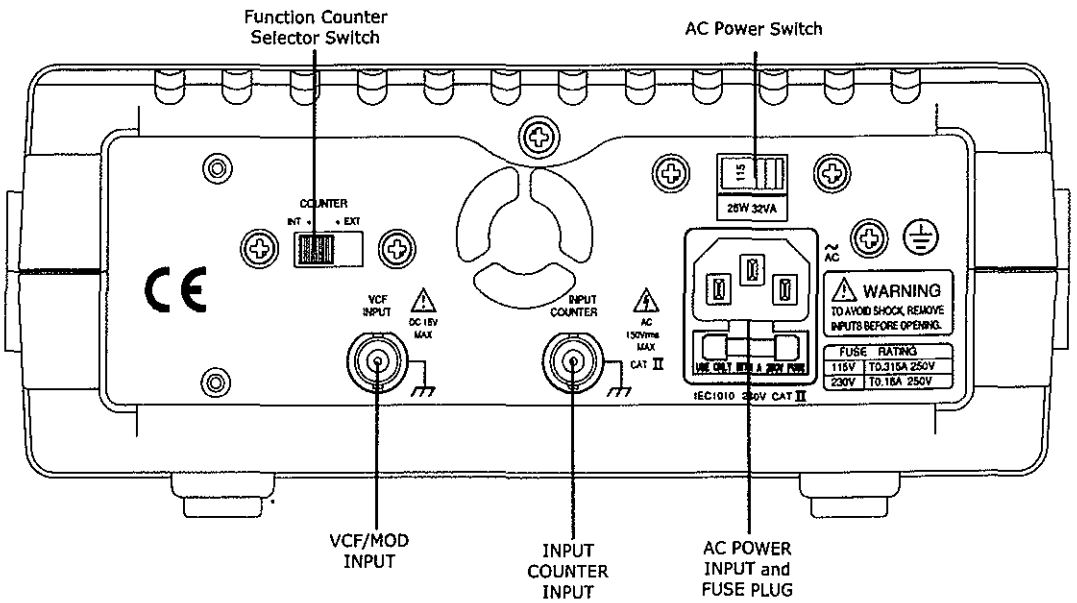
VCF input		BNC terminal, 0-10V with 10kΩ impedance.

Rear Panel

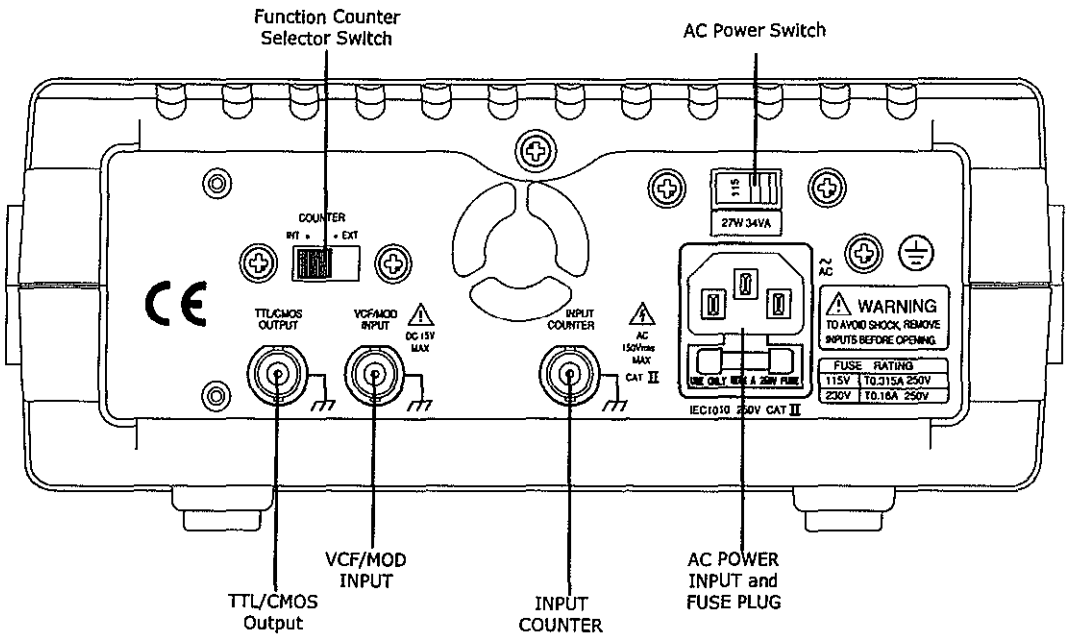
GFG-8255A/8219A Rear Panel



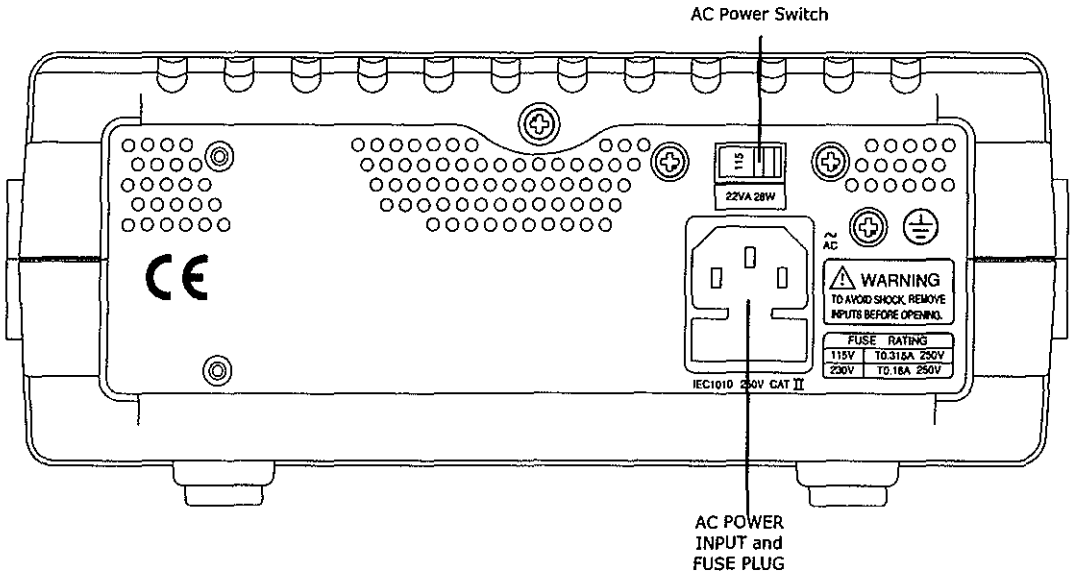
GFG-8250A/8216A Rear Panel



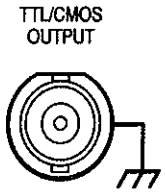
GFG-8217A Rear Panel



GFG-8215A Rear Panel



TTL/CMOS Output

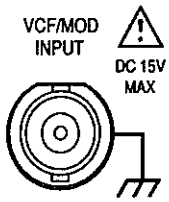


BNC type terminal connection.

TTL: 3V-pp

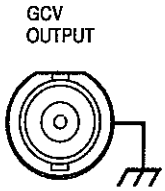
CMOS: 4V-14.5V-pp

VCF/MOD INPUT



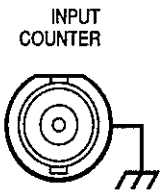
Voltage Control Frequency and external Modulation input terminal. Accepts a modulation signal from an external device. BNC male connector, 10Vp-p maximum. Must be activated to enable external modulation. For modulation details, see page 31. For VCF details see page 45.

GCV Output



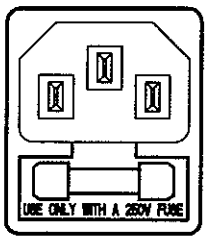
Generator Controlled Voltage (GCV) sets an output voltage of 0-2V.

Input Counter



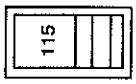
The function counter input can accept signals from 5Hz to 150MHz @ 1MΩ, with an accuracy of 20ppm.

AC Power Input and Fuse Plug



AC Power input accepts power 115V or 230V ±15% depending on the fuse and the AC power selected.

AC Power Switch



Selects 115V or 230V for power source.

AC 100/110/120V → select 115V.

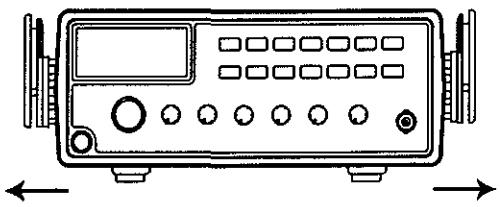
AC 220/230/240V → select 230V.

⚠ Improper selection might lead to internal fuse blowout.

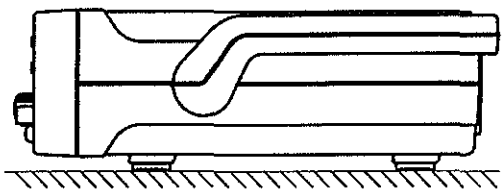
Function Counter Selector Switch		Selects internal or external counter function. To view an external signal's frequency, the Function Counter must be in the EXT position.

Set Up

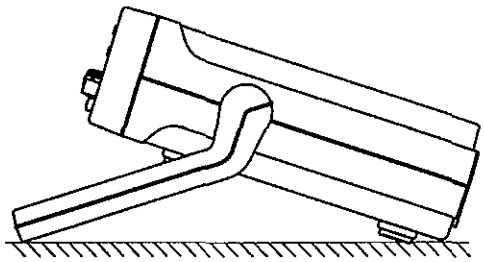
Tilt stand



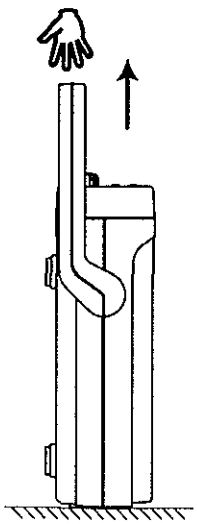
Pull out the handle sideways and rotate it.



Place the FG horizontally,



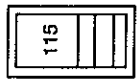
Or tilt the stand.



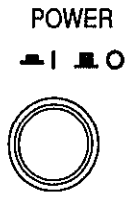
Place the handle vertically to hand carry.

Power up

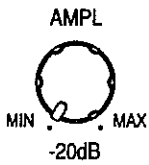
1. Select the AC voltage on the rear panel accordingly.
   AC 100/110/120V→select 115V.
   AC 220/230/240V→select 230V.



2. Connect the power cord.
3. Push and turn on the main power switch on the front panel.



4. Ensure all the rotary switches are pushed in.
5. Rotate the AMPL knob till it is at the top-most position.



6. Rotate the FREQ knob to its full extent anti-clockwise.

OPERATION

Waveform Generation

Waveform

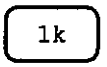
1. Press square, triangle or sine waveform button

Sine waveform.

Square waveform.

Triangle waveform.

Range

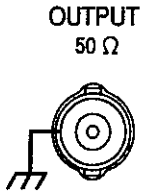


2. Select the range. 1M-1 Hz.

Frequency

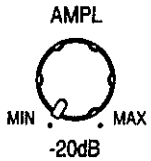
3. Rotate the frequency knob to the desired frequency. The frequency will be displayed on the LED display.

Output



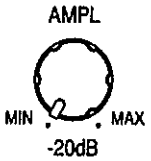
4. Connect the FG to an input (oscilloscope).

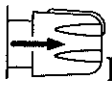
Amplitude

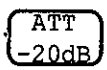


5. Adjust the amplitude to the desired amplitude.

Attenuation

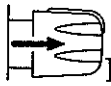


6.  Pull the AMPL knob out and adjust the attenuation if desired up to -20dB.



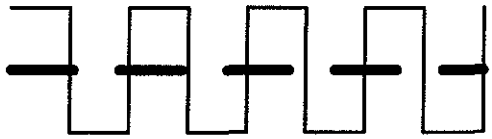
7. Furthermore the attenuation can be increased by pressing the ATT -20dB button.

Duty cycle

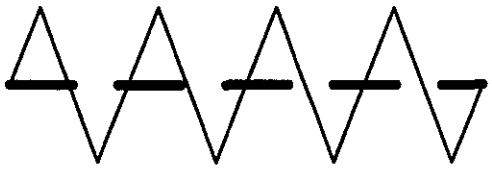
8.  Pull the Duty Cycle knob and rotate to adjust the duty cycle.

Waveform types

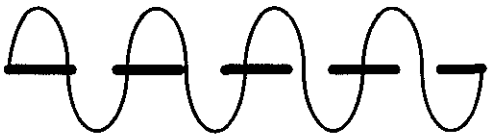
Square Wave
50% Duty
cycle



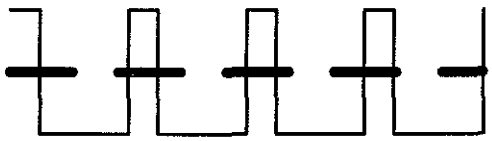
Triangle Wave
50% Duty
cycle



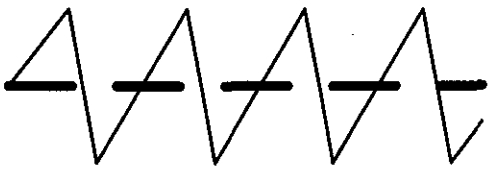
Sine Wave
50% Duty
cycle



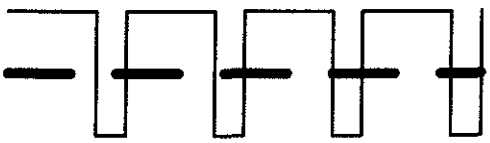
Pulse Wave
30% Duty
cycle



Ramp Wave
30% Duty
cycle



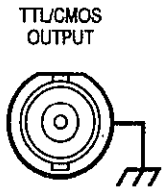
Gated Pulse
70% Duty
cycle



TTL/CMOS Output

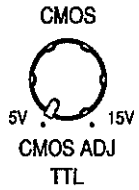
Background

The GFG-8200A FG series are able to output TTL & CMOS Output.



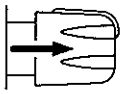
1. Connect the FG to an appropriate device using the CMOS/TTL output terminal

2. Setup the FG to output a waveform. See page26.



3. Push/pull the TTL/CMOS knob to select the output type.

 Pushed: TTL is selected as output.

 Pulled: CMOS is selected as output.

The waveform is output is as follows:

TTL: ≥3Vp-p (fixed)

CMOS: 4V±1Vp-p ~ 14.5±0.5Vp-p

Sweep

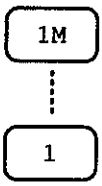
Background

The FG can add sweep to the waveform output, a convenient tool for measuring the frequency response of a DUT.

Waveform

1. Choose the waveform type.

Range



2. Set the range

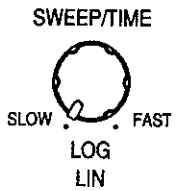
Frequency

3. Use the frequency knob to set the frequency. For best results set the frequency knob to its most clock-wise position, this will set the upper frequency limit.

Sweep

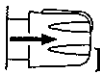
4.  Pull the Frequency knob to enable Sweep mode.

Sweep Type



5. Select the sweep type.

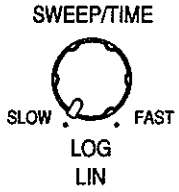
Logarithmic Sweep:

 Pull the SWEEP TIME knob.

Linear Sweep:

 Push the SWEEP TIME knob.

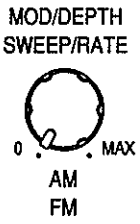
Sweep Time



6. Rotate the SWEEP TIME knob, clockwise (fast) or counterclockwise (slow).

Range 0.5 ~ 30 seconds adjustable.

Sweep Rate



The Sweep Rate knob sets the frequency width. The current output frequency becomes the start frequency.

7. Rotate the SWEEP/RATE knob to set the rate.

Range 1 ~ 100 frequency ratio

Note: In order to get the maximum rate (frequency ratio), set the sweep time to a sufficient length (not too short).

The sweep rate can only be set when in Sweep mode (Frequency dial pulled out)

AM/FM Modulation

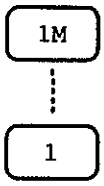
Background

Amplitude modulation and Frequency modulation can be simulated using the modulation function.
AM/FM Modulation only applies only to GFG-8255A and GFG-8219A.

Waveform

1. Choose the waveform type.

Range



2. Set the range

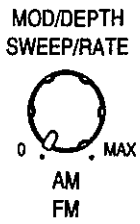
Frequency

3. Use the frequency knob to set the frequency. This will set the upper frequency limit.

Modulate

4. Press the MOD ON button to enable modulation.

Modulation Type



5. Select the modulation type.

AM:


Pull the MOD/DEPTH knob.

FM:


Push the MOD/DEPTH knob.

Depth

6. Turn the MOD/DEPTH SWEEP/RATE knob to set the depth:

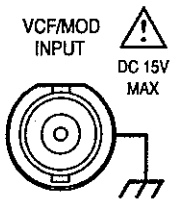
Counterclockwise, shallow.

Clockwise, deep.

The selected frequency is the centered frequency.

Using external modulating signals

The GFG-8255A and GFG-8219A uses an internal 400Hz sine wave as the default modulating signal. An external signal can be used.



1. Connect the modulating signal to the rear panel terminal.

2. Press the MOD EXT button.

Frequency Range

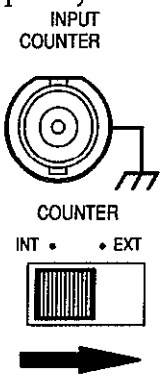
DC~1kHz.

COUNTER INPUT

Background

All the GFG-8200A series bar the GFG-8215A feature a frequency counter.

Input



1. Connect the input signal to the Counter input on the rear panel.
2. Select Ext on the Counter switch on the rear panel.

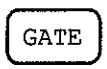
The Frequency will be displayed on the LED display.

Setup

Range	0 ~ 150MHz
Resolution	100nHz for 1Hz input, 0.1Hz for 100MHz input

Set the Gate time

Gate time sets the display update rate and counter resolution. These two parameters are trade-offs.
Short gate time = faster update, coarse resolution. (5 digits, 0.01s)
Long gate time = slower update, fine resolution. (6 digits, 0.1s and over)



3. To change the gate time, press the GATE button.

0.01 0.1 1 10

The GATE button will cycle the gate time:

0.01, 0.1s, 1s, 10s

The Gate time can only be changed when using the frequency counter function.

Over sign

The Over sign is tripped if the input frequency is over the specifications or exceeds the range.

OVER

The over sign will light up under the following conditions:

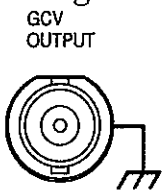
- Input frequency: ≥150MHz
- Gate Time: 10s

GCV Output

Background

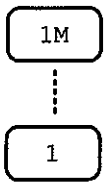
The GFG-8255A & GFG-8219A feature GCV output. GCV (generator controlled voltage) output is used to control generators.

Input



1. Connect the GCV output to an appropriate device.

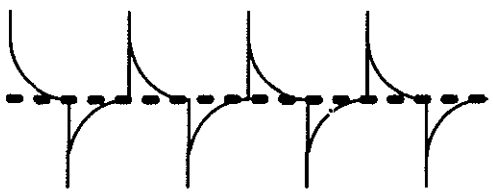
Range



2. Select the right frequency range.

Frequency

3. Use the frequency dial to adjust the frequency of the GCV output.

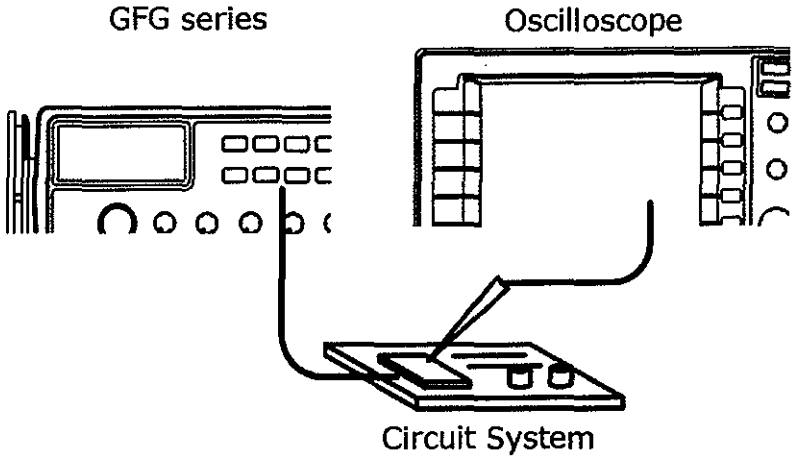


APPLICATION EXAMPLES

Trouble-Shooting Signal Source

Description

The GFG output can be used as the signal source to test a failed part in a circuit system. Isolate the problematic part from the rest, feed the GFG output as a stimulus, and observe the outcome using an oscilloscope.

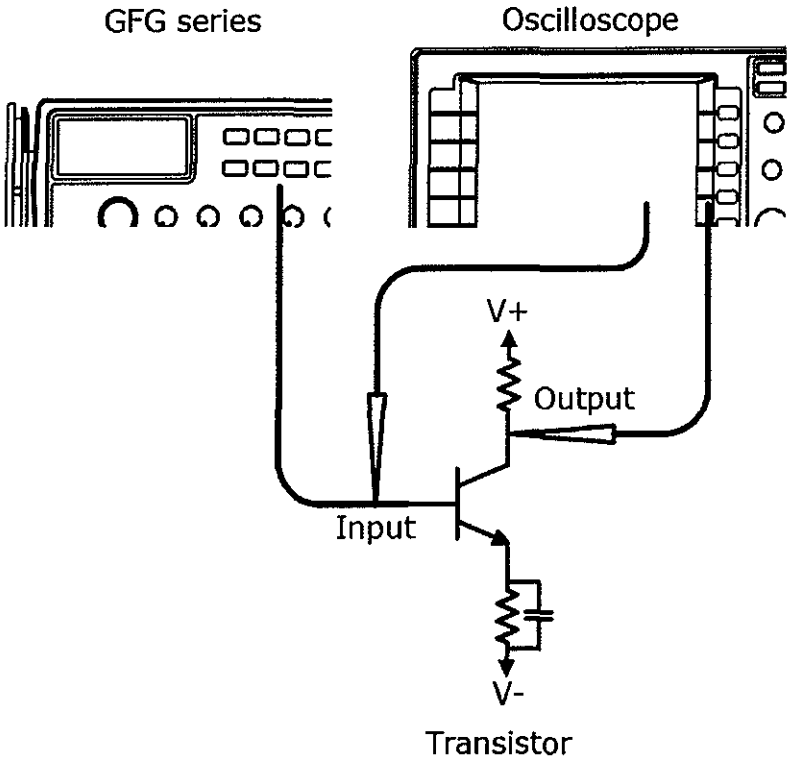


Transistor DC Bias Characteristics Test

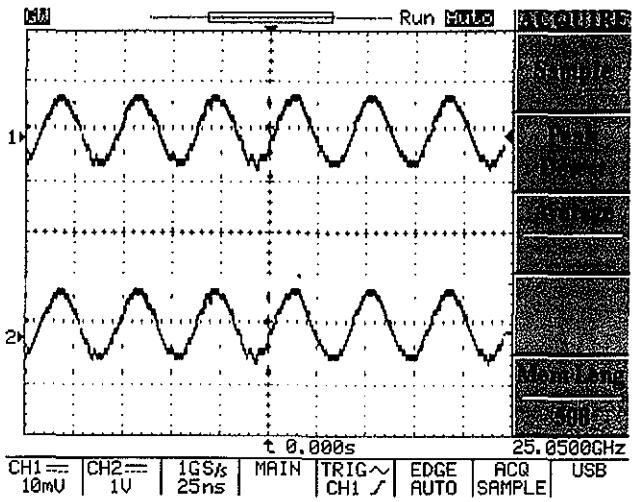
Description

Use the GFG-8200A series as the signal source for a transistor. Compare the transistor input/output waveform using the oscilloscope. Adjust the DC voltage source to find out the maximum output without distorting the waveform.

Block diagram



Oscilloscope display

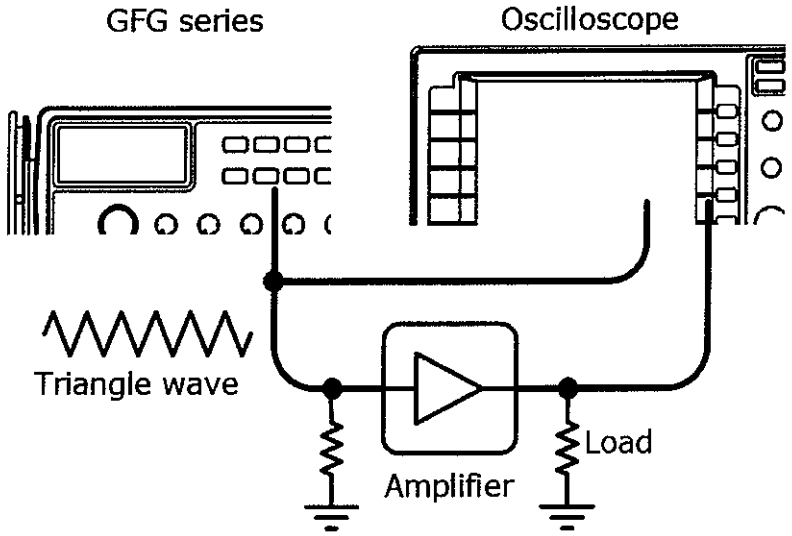


Amplifier Over-Load Characteristic Test

Description

Use the triangle wave output from the GFG-8200A series to check the amplifier output distortion caused by overload. The common sine wave is not the ideal source in this case. Observe the linearity of the triangle waveform using an oscilloscope.

Block diagram

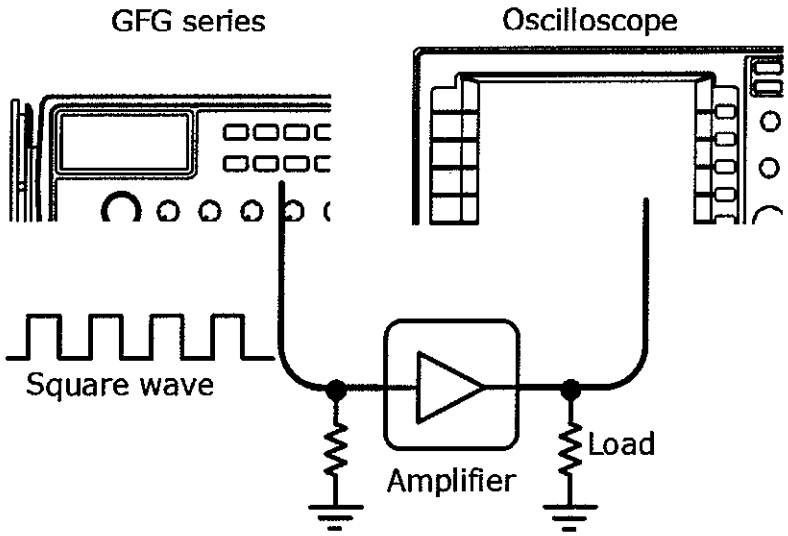


Amplifier Transient Characteristics Test

Description

Use the square wave output from the GFG-8200A series to check the transient frequency response of an amplifier. The common sine wave is not the ideal source in this case. Observe the waveform using an oscilloscope.

Block diagram



Test step

1. Apply a triangle waveform to the amplifier first. Adjust the waveform amplitude to make sure there is no clipping.
2. Switch to square waveform and adjust its frequency to the middle of the amplifier pass band, such as 20Hz, 1kHz, and 10kHz.
3. Observe the shape of the amplifier output. The following table shows the possible output distortions and their explanations.

Transient characteristic list

	• Amplitude reduction at low frequency • No phase shift
	• Low frequency boosted (accentuated fundamental)
	• High frequency loss • No phase shift
	• Low frequency phase shift • Trace thickened by hum-voltage
	• High frequency loss • Phase shift
	• Low frequency loss • Phase shift
	• Low frequency loss • Low frequency phase shift
	• High frequency loss • Low frequency phase shift
	• Damped oscillation

Note

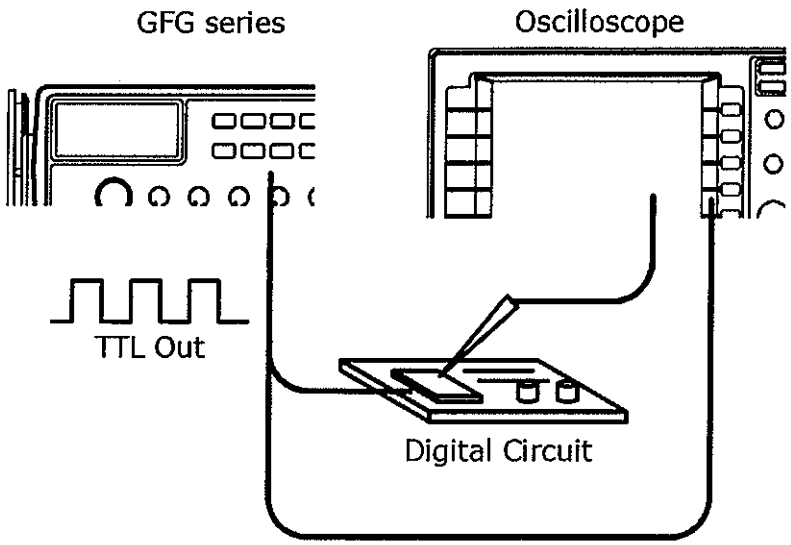
This application is not suitable for narrow band amplifier testing.

Logic Circuit Test

Description

Use the TTL/CMOS output from the GFG-8200A series to test digital circuits. Observe the timing relation of input/output waveform using an oscilloscope.

Block diagram

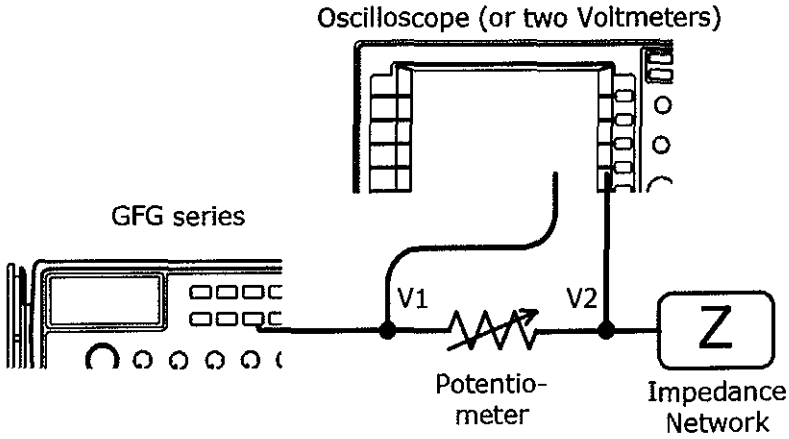


Impedance Matching Network Test

Description

Use the GFG-8200A series for impedance matching network: testing its frequency characteristic and matching the impedance.

Block diagram



Test step

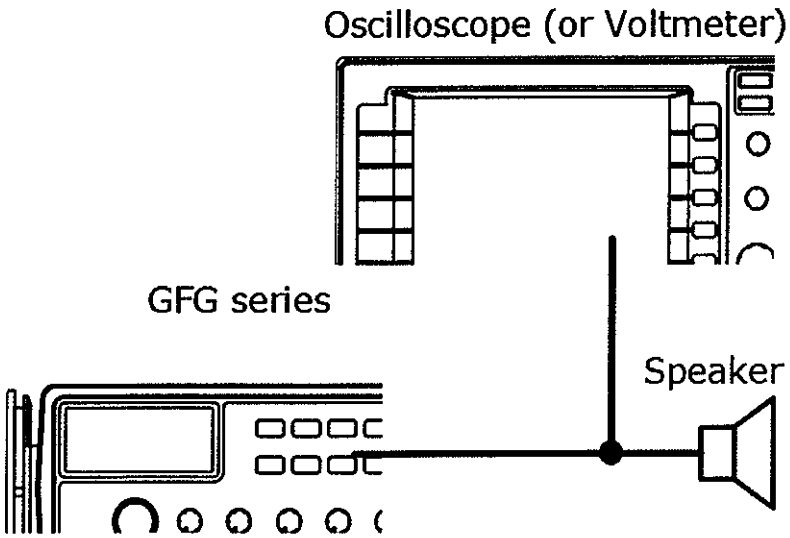
Adjust the potentiometer until V2 becomes the half of V1 (V2=0.5V1). Then the impedance Z of the network becomes identical to the potentiometer.

Speaker Driver Test

Description

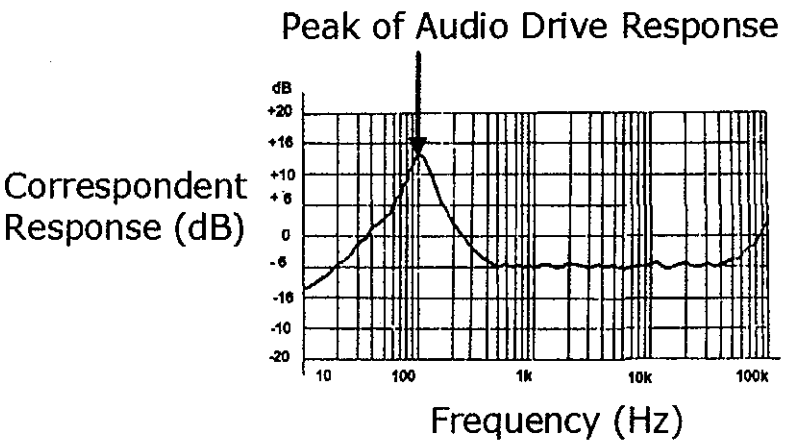
Use the GFG-8200A series for testing the frequency characteristics of audio speakers. Record the voltage reading versus the input signal frequency.

Block diagram

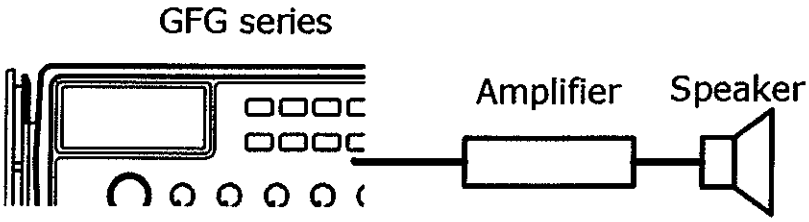


Graph

The peak voltage occurs on the resonant frequency of the speaker.



Sweep for Speaker Test

Description	Use the sweep feature in the GFG-8200A series for testing the frequency response of an audio speaker.
Test description	1. Set GFG output to sine wave, 20Hz. 2. Activate sweep and set LIN/LOG, sweep time, and sweep rate. 3. Change the frequency if other bands need to be tested.
Block diagram	

FAQ

- I pressed the Power key on the front panel but nothing happens.
- I can't get the frequency counter to work.
- The device accuracy does not match the specification.

I pressed the Power key on the front panel but nothing happens.

Make sure the AC source voltage setting on the rear panel is correct (page24). Otherwise the internal fuse might be blown out. Contact the service personnel.

I can't get the frequency counter to work.

Make sure the INT/EXT switch on the rear panel is set for EXT (external). Make sure the input signal is within the specifications for the frequency counter.

The device accuracy does not match the specification.

Make sure the device is powered On for at least 30 minutes, within +20°C~+30°C. This is necessary to stabilize the unit to match the specification.

If there is still a problem, please contact your local dealer or GWInstek at www.gwinstek.com.tw / marketing@goodwill.com.tw.

APPENDIX

Specification

		GFG-8215A/8216A GFG-8217A/8219A	GFG-8250A/8255A
Main	Frequency Range	0.3Hz~3MHz 7 Ranges	0.5Hz~5MHz 7 Ranges
	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	80%:20%:80% to 1MHz Continued variable	80%:20%:80% to 1MHz Continued variable
	Display	6 digits LED display *GFG-8215A does not have display.	6 digits LED display
	Range Accuracy	±5%+1Hz(at 3.0 position) *only for GFG-8215A	----------

		GFG-8215A/8216A GFG-8217A/8219A	GFG-8250A/8255A
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
Triangle Wave	Linear	≧98%,0.3Hz～100kHz≧95%, 100kHz～3MHz	≧98%,0.5Hz～100kHz≧95%, 100kHz～5MHz
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)
CMOS Output	Level	4Vpp±1Vpp～14.5Vpp ±0.5Vpp adjustable	4Vpp±1Vpp～14.5Vpp ±0.5Vpp adjustable
	Rise or Fall Time	≦120ns	≦120ns
TTL Output	Level	≧3Vpp	≧3Vpp
	Fan Out	20 TTL load	20 TTL load
	Rise or Fall Time	≦25ns	≦25ns
VCF	Input voltage	0V～10V±1V(100:1)	0V～10V±1V(100:1)
	Input Impedance	10kΩ±10%	10kΩ±10%
GCV *8219A *8255A	Output voltage	To set the voltage between 0V～2V as per different frequency.	To set the voltage between 0V～2V as per different frequency.

		GFG-8215A/8216A GFG-8217A/8219A	GFG-8250A/8255A
Sweep Operation *8217A *8219A *8255A	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
Amplitude Modulation *8219A *8255A	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
Frequency Modulation *8219A *8255A	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
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±1count	Time base accuracy±1count
	Time base	±20ppm(23℃±5℃) after 30 minutes warm up	±20ppm(23℃±5℃) after 30 minutes warm up
	Resolution	The maximum	The maximum

		GFG-8215A/8216A GFG-8217A/8219A	GFG-8250A/8255A
		resolution is 10nHz for 1Hz and 0.1Hz for 100MHz.	resolution is 10nHz for 1Hz and 0.1Hz for 100MHz.
	Input Impedance	1MΩ/150pF	1MΩ/150pf
	Sensitivity	≦35mVrms (5Hz~100MHz) ≦45mVrms (100MHz~150MHz) *GFG-8215A does not have Frequency Counter function.	≦35mVrms (5Hz~100MHz) ≦45mVrms (100MHz~150MHz)
General	Power Source	AC115V, 230V±15%,50/60Hz	AC115V, 230V±15% ,50/60Hz
	Operation Environment	Indoor use, altitude up to 2000m. Ambient Temperature 0℃ to 40℃. Relative Humidity 80%(Maximum). Installation category II Pollution Degree 2	
	Storage temperature & Humidity	-10℃ to 70℃. 70% (Maximum).	
	Accessories	GTL-101×2 *GTL-101×1 for GFG-8215A Instruction manual×1	GTL-101×2 Instruction manual×1
	Dimension	251(W)×91(H)×291(D	251(W)×91(H)×291(D)

		GFG-8215A/8216A GFG-8217A/8219A	GFG-8250A/8255A
		1 m/m	m/m
	Weight	Approx. 2.0kgs-GFG-8215A 2.1kgs-GFG-8216A 2.15kgs-GFG-8217A 2.2kgs-GFG-8219A	Approx. 2.3kgs-GFG-8250A 2.4kgs-GFG-8255A

EC Declaration of Conformity

We

GOOD WILL INSTRUMENT CO., LTD.

No. 7-1, Jhongsing Rd, Tucheng City,Taipei County 236, Taiwan

GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.

No. 69, Lushan Road, Suzhou New District Jiangsu, China

declares that the below mentioned product

GFG-8215A, GFG-8216A, GFG-8217A,
GFG-8219A, GFG-8250A, 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 (2004/108/EC) and Low Voltage Equipment Directive (73/23/EEC & 93/68/EEC). For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Equipment Directive, the following standards were applied:

◎ EMC

EN 61326-1 : EN 61326-2-1:	Electrical equipment for measurement, control and laboratory use — EMC requirements (2006)
Conducted and Radiated Emissions CISPR11: 2003+A1: 2004+A2: 2006	Electrostatic Discharge IEC 61000-4-2: 2001
Current Harmonic EN 61000-3-2: 2006	Radiated Immunity IEC 61000-4-3: 2006+A1: 2007
Voltage Fluctuation EN 61000-3-3: 1995+A1: 2001+A2 : 2005	Electrical Fast Transients IEC 61000-4-4: 2004+Corr.1 : 2006+Corr.2 : 2007
----------	Surge Immunity IEC 61000-4-5: 2005
----------	Conducted Susceptibility IEC 61000-4-6: 2003+A1: 2004+A2: 2006
----------	Power Frequency Magnetic Field IEC 61000-4-8: 2001
----------	Voltage Dips/ Interrupts IEC 61000-4-11: 2004

◎ Safety

Low Voltage Equipment Directive 73/23/EEC & amended by 93/68/EEC
Safety Requirements IEC/EN 61010-1: 2001

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