



User Manual

RSFG-1013

Stock number: 2889873

EN



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SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow when operating RSFG-1013 and when keeping it in storage. Read the following before any operation to insure your safety and to keep the best condition for RSFG-1013.

Safety Symbols

These safety symbols may appear in this manual or on RSFG-1013.



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 RSFG-1013 or to other properties.



Attention Refer to the Manual



Earth (ground) Terminal

Safety Guidelines

General Guideline



CAUTION

- Do not place any heavy object on RSFG-1013.
- Avoid severe impacts or handling that leads to damage.
- Do not discharge static electricity to RSFG-1013.
- Use only mating connectors, for the terminals.
- Do not block or obstruct cooling vent opening.
- Do not perform measurements at power source and building installation site (Note below).
- Do not disassemble RSFG-1013 unless you are qualified as service personnel.

(Note) EN 61010-1:2001 specifies the measurement categories and their requirements as follows. RSFG-1013 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: 110/220/240V AC $\pm 10\%$, 50/60Hz (fixed voltage rating, factory installed)
- The power supply voltage should not fluctuate more than 10%.
- Connect the protective grounding conductor of the power cord to earth ground, to avoid electrical shock.

Fuse



WARNING

- Fuse type: T0.16A/ 250V (for 220V/240V $\pm 10\%$ rating), T0.315A/ 250V (for 110V $\pm 10\%$ rating)
- Replace the fuse with the specified type and rating only, for continued fire protection. For fuse replacement details, see page47.
- Disconnect the power cord before fuse replacement.
- Make sure the cause of the fuse blowout is fixed before fuse replacement.

Cleaning RSFG-1013	• 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 RSFG-1013. • 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. RSFG-1013 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: < 70% • Temperature: -10°C to 70°C

Power cord for the United Kingdom

When using RSFG-1013 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.

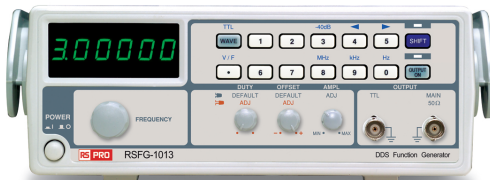
If in doubt, consult the instructions provided with the equipment or contact the supplier.

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

GETTING STARTED

This chapter describes RSFG-1013 in a nutshell, including main features and front/rear/display introduction. Follow the Set Up section to properly install and power up RSFG-1013.



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Technical background

Traditional
function
generators

RSFG-1013 uses the latest Direct Digital Synthesis (DDS) technology to generate stable, high resolution output frequency. The DDS technology solves several problems encountered in traditional function generators, as follows.

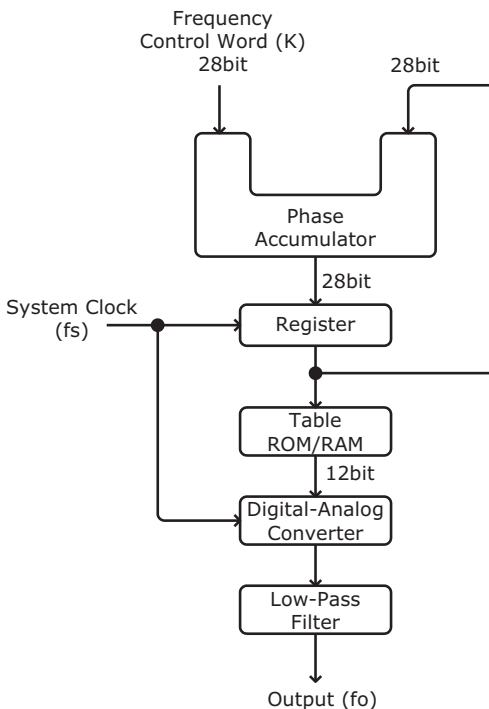
Constant current circuit methodology

This analog function generating method uses a constant current source circuit built with discrete components such as capacitors and resistors. Temperature change inside the generator greatly affects the components characteristics which lead to output frequency change. The results are poor accuracy and stability.

DDS
methodology

In DDS, the waveform data is contained in and generated from a memory. A clock controls the counter which points to the data address. The memory output is converted into analog signal by a digital to analog converter (DAC) followed by a low pass filter. The resolution is expressed as $f_s/2^k$ where f_s is the frequency and k is the control word, which contains more than 28bits. Because the frequency generation is referred to clock signal, this achieves much higher frequency stability and resolution than the traditional function generators.

Block diagram DDS synthesizer consists of Phase accumulator (counter), lookout table data (ROM), Digital-to-analog converter (DAC), and Low-pass filter (LPF).



The phase accumulator adds the frequency control word K at every clock cycle f_s . The accumulator output points to a location in the Table ROM/RAM. The DAC converts the digital data into an analog waveform. The LPF filters out the clock frequency to provide a pure waveform.

Lineup/Features

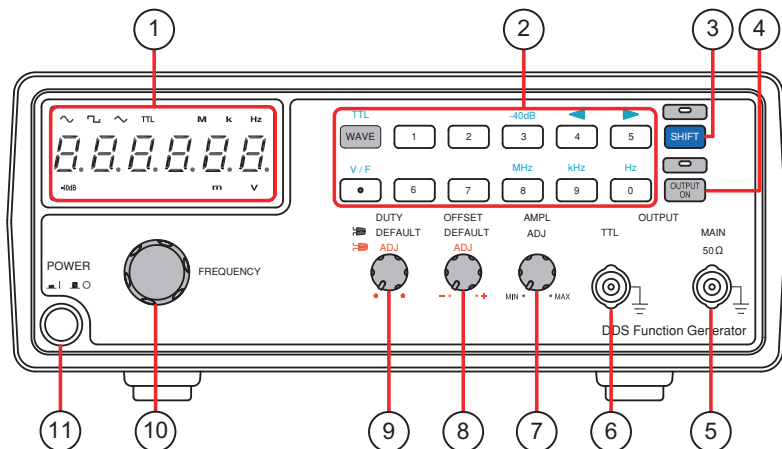
Series lineup

Features Lineup	Frequency	Offset	TTL output	-40dB attn.	Voltage display
RSFG-1013	3MHz	●	●	●	●

Main features

Performance	• High resolution using DDS technology • High frequency accuracy: $\pm 20\text{ppm}$ • Low distortion: $-55\text{dBc @ } \leq 200\text{kHz}$ • High resolution 100mHz
Features	• Digital user interface with 6-digit LED display • Various output waveforms: Sine, Square, and Triangle • TTL output • Amplitude control • -40dB attenuation • Duty control • Variable DC offset control • Output On/Off control • Voltage display • Output overload protection
Interface	• Frequency output • TTL output

Front Panel



1. 7 segment
LED



Shows frequency and
voltage.

TTL indicator **TTL**

Indicates that the TTL output
is enabled. For details, see
page29.

Waveform
indicator



Indicates the waveform
shape: Sine, Square, and
Triangle.

Frequency
indicator

M k Hz

Indicates the output
frequency: MHz, kHz, or Hz.

Voltage
indicator

m V

Indicates Voltage unit: mV, or
V. For voltage measurement
detail, see page26.

-40dB
indicator

-40dB

Indicates -40dB attenuation
is activated. For details, see
page26.

- | | | |
|---------------------------------------|--|--|
| 2. Waveform key |  | Selects the waveform: sine, square, and triangle. For details, see page23. |
| TTL activation |  →  | Activates TTL output. For details, see page29. |
| Numerical keys |  ~  | Specifies frequency. |
| Frequency unit selection |  → 

 ,  | Specifies the frequency unit: MHz, kHz, or Hz. |
| Cursor selection |  →  or  | Moves the cursor (frequency editing point) left or right. For details, see page24. |
| -40dB attenuation |  →  | Attenuates amplitude by -40dB. For details, see page26. |
| Frequency / Voltage display selection |  | Switches the display between frequency and voltage. For details, see page26. |
-
- | | | |
|--------------|--|--|
| 3. Shift key | 
 | Selects the 2 nd function associated to the entry keys. The LED lights when Shift is activated. |
|--------------|--|--|
-
- | | | |
|----------------------|--|--|
| 4. Output On/Off key | 
 | Turns the output On/Off. The LED lights when the output is On. |
|----------------------|--|--|

5. Main output

OUTPUT
50Ω



Outputs sine, square, and triangle waveform. BNC, 50Ω output impedance. For details, see page23.
6. TTL output

TTL
OUTPUT

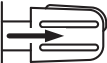


Outputs TTL output waveform, BNC terminal. For TTL mode details, see page29.
7. Amplitude control

AMPL



MIN • • MAX
-40dB

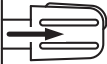


When pulled out, attenuates the sine / square / triangle waveform amplitude by -40dB. For details, see page26.
8. DC offset control

OFFSET



- • • +
ADJ

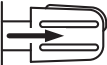


When pulled out, sets the DC offset level for sine/square/triangle waveform. Turn left (decrease) or right (increase). The range is -5V ~ +5V, in 50Ω load. For details, see page28.
9. Duty cycle control

DUTY

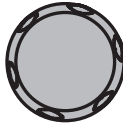


• •
ADJ



When pulled out, sets the square or TTL wave duty cycle. Turn left (decrease) or right (increase). The range is 25% ~ 75%. For details, see page27 (square wave) or page33 (TTL).

10. Frequency editing knob



Increases (right turn) or decreases (left turn) the frequency.

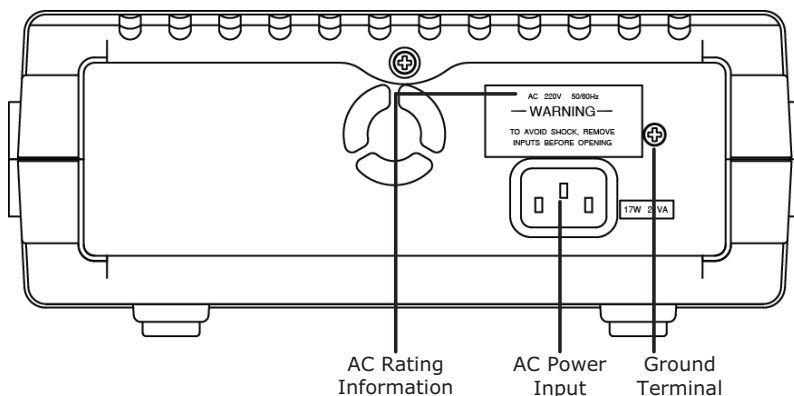
11. Power switch



Turns the main power On/Off. For power up sequence, see page19.



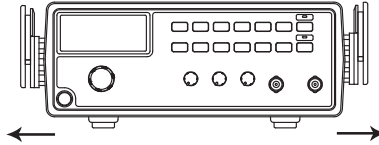
Rear Panel



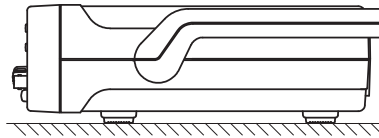
AC Rating Information	RSFG-1013 has fixed AC line voltage: 110, 220, or 240V (factory installed setting). The label shows the applicable rating.
AC Power Input	Accepts the AC power cord. 110, 220, or 240V, $\pm 10\%$, 50/60Hz.
Ground Terminal	The safety ground terminal. Use this terminal for common ground connection.

Set Up

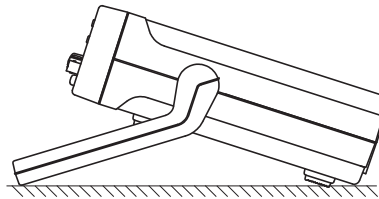
Tilt stand



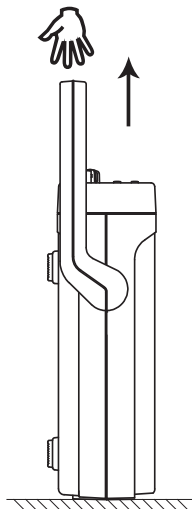
Pull out the handle sideways and rotate it.



Place SFG horizontally,



Or tilt stand.

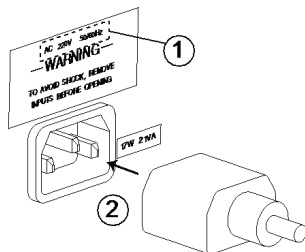


Place the handle vertically for hand carry.

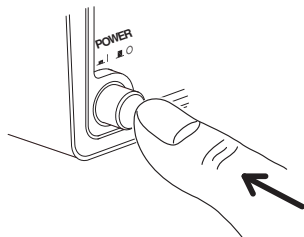
Power up



1. Check the voltage level displayed on the label(1) and make sure it is identical to the AC line. Then connect the power cord(2).



2. Push and turn On the main power switch on the front panel.



3. The display shows the default setup:
Sine wave, 1kHz

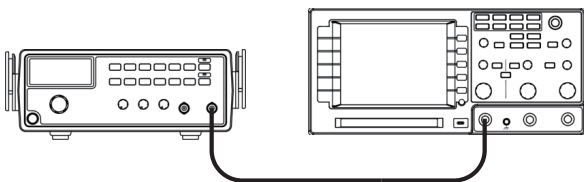
~

k Hz

1.0000

Functionality check

1. Connect SFG main output to measurement device such as oscilloscope.

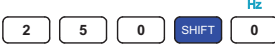
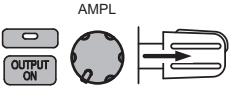
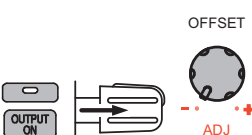
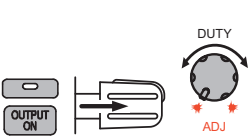


2. Press the output key.
The output is activated and the LED turns On.



3. Observe the output waveform: 1kHz, sine wave.

Operation Shortcuts

Sine wave 250Hz, -40dB amplitude OUTPUT 50 Ω 	1. Press Wave key and select Sine  2. Press 2 + 5 + 0 + Shift + 0(Hz) key  3. Press Output key, then pull Amplitude knob  4. Press Output key, then press Shift + 3 (-40dB) key 
Triangle wave 8kHz, +2V Offset OUTPUT 50 Ω 	1. Press Wave key and select Triangle  2. Press 8 + Shift + 9(kHz) key  3. Press Output key, then pull Offset knob and Rotate 
Square Wave 1MHz, 45% duty OUTPUT 50 Ω 	1. Press Wave key and select Square  2. Press 1 + Shift + 8(MHz) key  3. Press Output key, then pull Duty knob and rotate 
TTL Output 10kHz	1. Press Output key  2. Press Shift + Wave (TTL) key 

TTL
OUTPUT



3. Press 1 + 0 + Shift +
9(kHz) key

1

0

SHIFT

kHz

9

SINE/SQUARE/TRIANGLE WAVE

Activate waveform	23
Sine / Square / Triangle	23
Set Frequency	24
Enter frequency.....	24
Edit frequency	24
Maximum frequency limit error.....	25
Minimum frequency limit error.....	25
Set Amplitude.....	26
Set Amplitude.....	26
View amplitude.....	26
Attenuate by -40dB	26
Set Duty Cycle (Square Waveform).....	27
Enter duty cycle	27
Set Offset	28
Activate offset	28
Adjust offset	28
Limitation.....	28

Activate waveform

Sine /
Square /
Triangle



1. Press the wave key repeatedly. The corresponding indicator appears on the display.



Sine waveform



Square waveform



Triangle waveform



2. Press the output key. The LED turns On.

OUTPUT
50 Ω



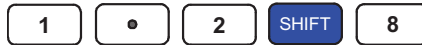
3. The waveform comes out from the main terminal.
10Vp-p (50 Ω load)
20Vp-p (no load)

Set Frequency

Enter frequency

Enter the waveform frequency using the numerical keys.

1.2MHz



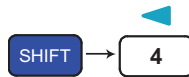
37kHz



45Hz



Edit frequency



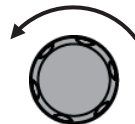
Left cursor key moves the active cursor left.

(Flashing) 100.0 → 100.0



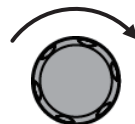
Right cursor key moves the active cursor right.

(Flashing) 100.0 → 100.0



Turn the Frequency knob left to decrease the frequency.

(Flashing) 100.0 → 99.0



Turn the frequency knob right to increase the frequency.

(Flashing) 100.0 → 10 1.0

Maximum
frequency
limit error

For full error message list, see page49.



Err - 1

Sine and square waveform frequency is limited to maximum 3MHz. When the input exceeds it, an error message (Err-1) appears and forces the frequency to 3MHz.



Err - 2

Triangle waveform frequency is limited to maximum 1MHz. When the input exceeds it, an error message (Err-2) appears and forces the frequency to 1MHz.

Minimum
frequency
limit error

For full error message list, see page49.

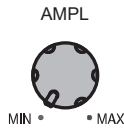
Err - 4

The minimum frequency is 0.1Hz. When the frequency input becomes less than 0.1Hz, an error message (Err-4) appears and forces the frequency to the previous value.

Set Amplitude

Amplitude setting does not apply to TTL output (page29).

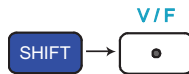
Set Amplitude



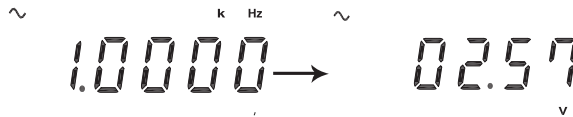
Turn the Amplitude knob right (increase) or left (decrease).

The range is 2mVpp ~ 10Vpp for 50Ω output impedance.

View amplitude



To view the voltage level (amplitude), press the Shift key and dot (V/F) key. The display shows the voltage level. Repeat this procedure to go back to the frequency level view.



Attenuate by -40dB

RSFG-1013 can attenuate the main output by -40dB, in different method.

RSFG-1013



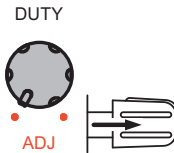
Press the Shift key, then 3 (-40dB). The main output is attenuated by -40dB, and the -40dB display indicator in the display turns On.



Set Duty Cycle (Square Waveform)

The duty cycle setting is not available in sine/triangle waveform.

Enter duty
cycle



Pull out the Duty knob. Turn right (left) to increase (decrease) the duty cycle. The default is set at 50%.

Range	25% ~ 75%
-------	-----------

Set Offset

Offset setting does not apply to TTL output (page29).

Activate offset

SFG can add or delete offset to the sine/square/triangle waveform, thus changing the waveform vertical position.



Pull the OFFSET knob to turn On Offset setting.

Adjust offset

OFFSET



Turn the knob right (higher position) or left (lower position).

Range

-5V ~ +5V for 50Ω output load

Limitation



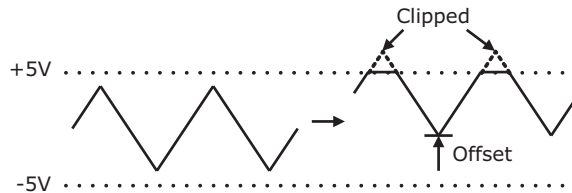
Note that the output amplitude, including the offset, is still limited to:

-5 ~ +5V (50Ω load)

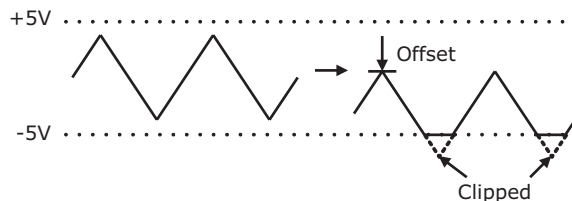
-10 ~ +10V (no load)

Therefore excessive offset leads to peak clip as below.

Positive peak clip (50Ω)



Negative peak clip (50Ω)

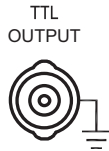
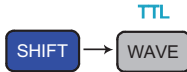


TTL OUTPUT

Activate TTL	30
Select TTL	30
Set Frequency	31
Enter frequency	31
Edit frequency.....	31
Maximum frequency limit error	32
Minimum frequency limit error	32
Set Duty Cycle	33
Enter duty cycle	33

Activate TTL

Select TTL



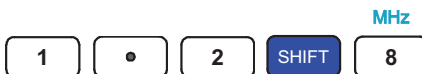
1. Press the Output key. The LED turns On. (TTL does not activate unless the output is already On)
2. Press the Shift key, then the Wave key. TTL indicator appears on the display.
3. The waveform comes out from the TTL output terminal. Level: $\geq 3V_{p-p}$

Set Frequency

Enter frequency

Enter the waveform frequency using the numerical keys.

1.2MHz



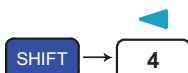
37kHz



45Hz

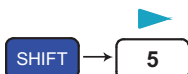


Edit frequency



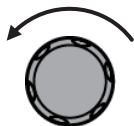
Left cursor key moves the active cursor left.

(Flashing) 100.0 → 100.0



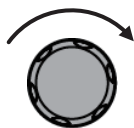
Right cursor key moves the active cursor right.

(Flashing) 100.0 → 100.0



Turn the Frequency knob left to decrease the frequency.

(Flashing) 100.0 → 99.0



Turn the frequency knob right to increase the frequency.

(Flashing) 100.0 → 10 1.0

Maximum
frequency
limit error

For full error message list, see page49.

TTL

Err - 1

TTL frequency is limited to maximum 3MHz. When the input exceeds it, an error message (Err-1) appears and forces the frequency to 3MHz.

Minimum
frequency
limit error

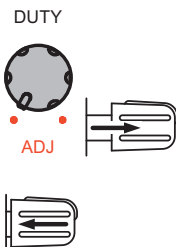
For full error message list, see page49.

Err - 4

The minimum frequency is 0.1Hz. When the frequency input becomes less than 0.1Hz, an error message (Err-4) appears and forces the frequency to the previous value.

Set Duty Cycle

Enter duty cycle



1. Pull out the Duty knob. Turn right (left) to increase (decrease) the duty cycle. The default is set at 50%.
2. Press the Duty knob. The edited duty cycle is stored.

Range

25% ~ 75%

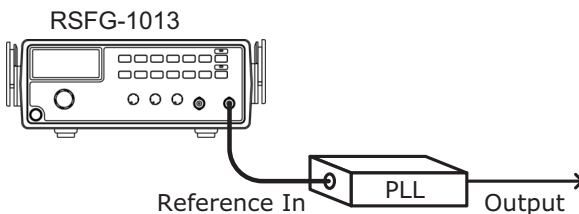
APPLICATION EXAMPLES

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Reference Signal for PLL System

Description The SFG output can be used as a cost-effective reference signal for Phase-Locked-Loop system. Directly connect SFG output to PLL input.

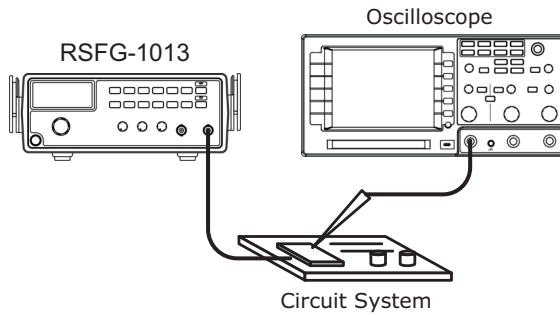
Block diagram



Trouble-Shooting Signal Source

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

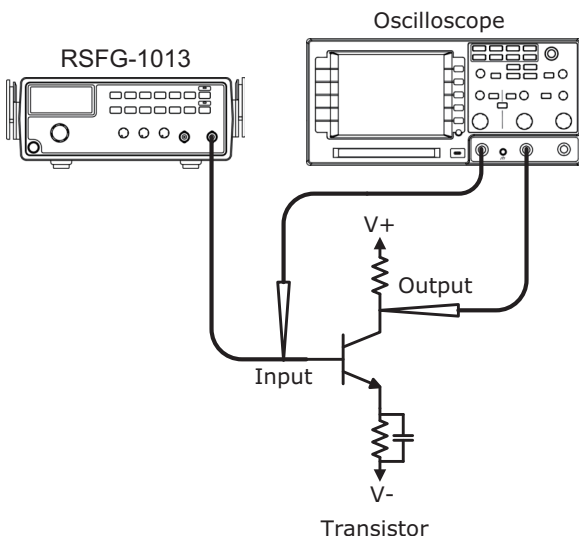
Block diagram



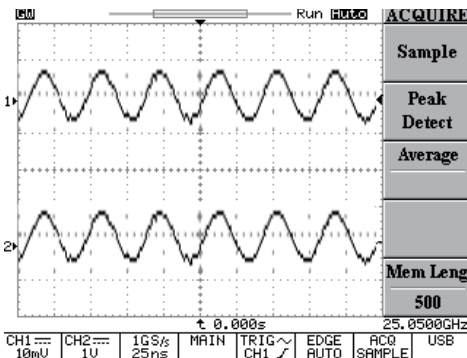
Transistor DC Bias Characteristics Test

Description Use RSFG-1013 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



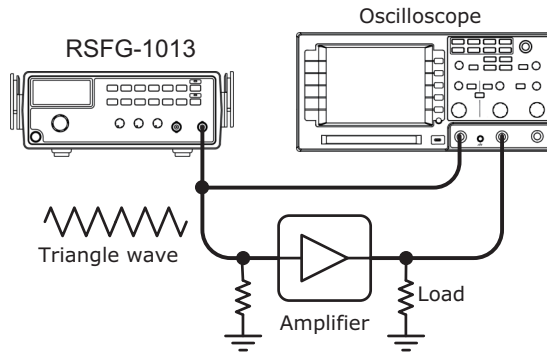
Oscilloscope display



Amplifier Over-Load Characteristic Test

Description Use the triangle wave output from RSFG-1013 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.

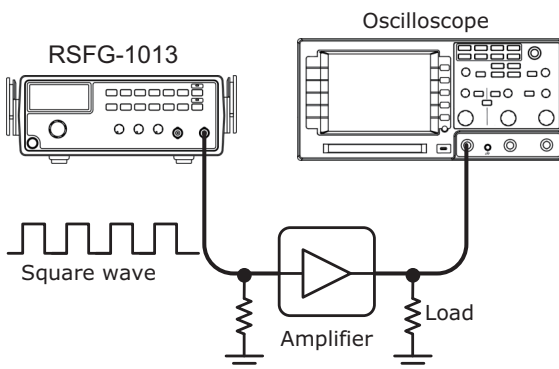
Block diagram



Amplifier Transient Characteristics Test

Description Use the square wave output from RSFG-1013 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



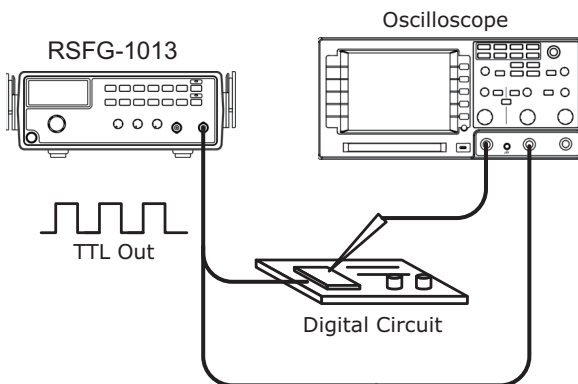
Note

For narrow band amplifier testing, square wave may not be suitable.

Logic Circuit Test

Description Use the TTL output from RSFG-1013 to test digital circuits. Observe the timing relation of input/output waveform using an oscilloscope.

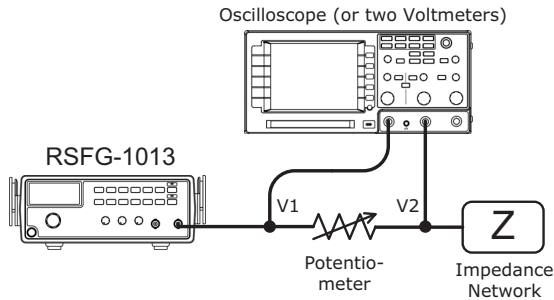
Block diagram



Impedance Matching Network Test

Description Use RSFG-1013 for impedance matching network: testing its frequency characteristic and matching the impedance.

Block diagram

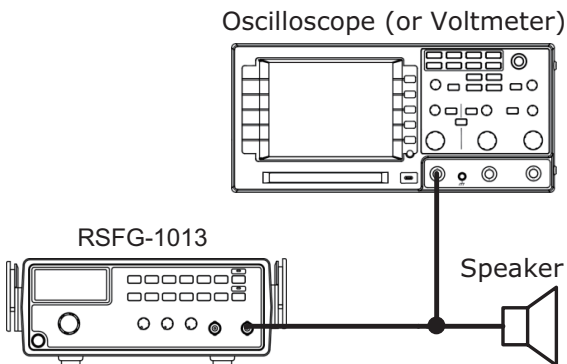


Test step Adjust the potentiometer until V2 becomes the half of V1 ($V2=0.5V1$). Then the impedance Z of the network becomes identical to the potentiometer.

Speaker Driver Test

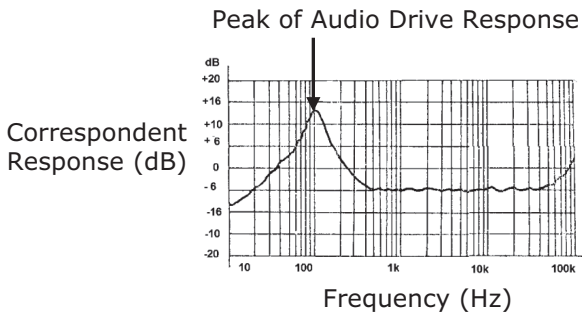
Description Use RSFG-1013 for testing the frequency characteristics of audio speakers. Record the volt reading versus the input signal frequency.

Block diagram



Graph

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



F_{FAQ}

- I pressed the Power switch on the front panel but nothing happens.
 - How can I get out of TTL/-40dB mode?
 - The device accuracy does not match the specification.
 - What are these error messages?
-

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

Make sure the AC source voltage is set at the rating $\pm 10\%$, 50/60Hz. For power up sequence, see page19. Otherwise the internal fuse might be blown out. For fuse replacement procedure, see page47.

TTL does not activate (pressed Shift + Wave key)

You need to turn On the output first. Press the Output key, then press Shift + Wave. For details, see page29.

How can I get out of TTL/-40dB mode?

For TTL: press the Shift key, then the wave key. For details, see page29.
For -40dB mode, press the Shift key, then 3. For details, see page26.

The device accuracy does not match the specification.

Make sure the device is powered On for at least 30 minutes, within $+18^{\circ}\text{C} \sim +28^{\circ}\text{C}$. This is necessary to stabilize the unit to match the specification.

What are these error messages?

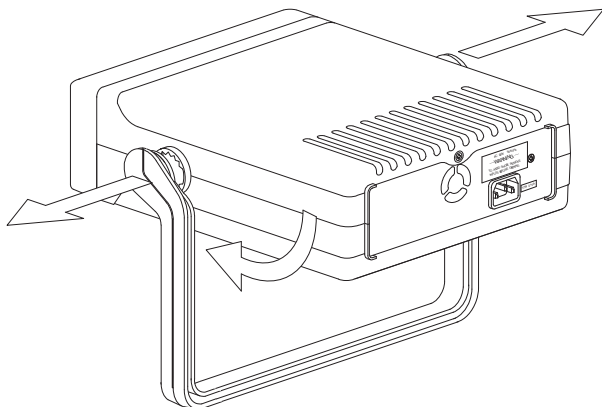
Several messages appear when trying to set the frequency in irregular ways. Page49 summarizes the messages.

APPENDIX

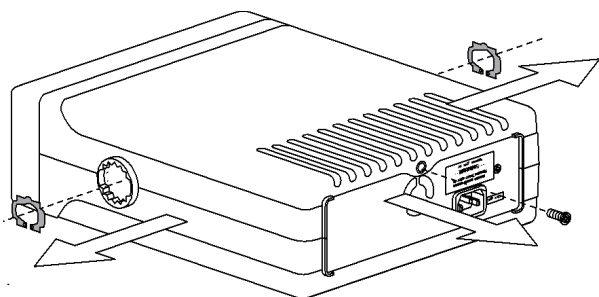
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Fuse Replacement

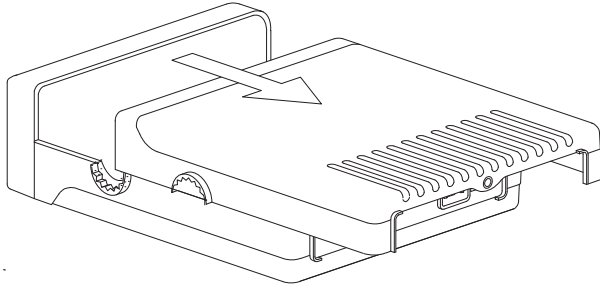
1. Take off the Handle In order to detach the handle from the unit, turn the handle down 90 degrees, then pull it off sideways.



2. Take off the Cover Take off the two metal holdings from the handle joint. Then take the top screw off from the rear panel.

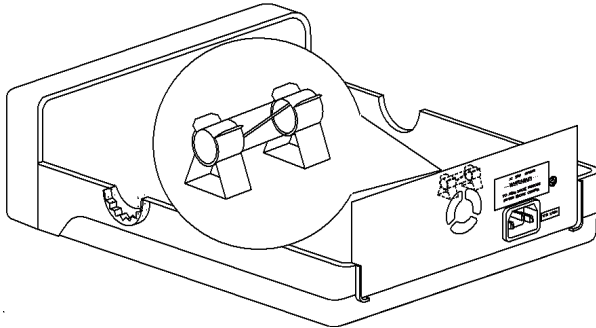


Slide the upper case to the rear side and take off the top cover.



3. Replace the Fuse

Replace the blown fuse located on the rear printed circuit board.



Fuse rating	AC 110V	T0.315A/250V
	AC 220/240V	T0.16A/250V

Error Messages

Frequency
error

Err-1

Err-1 Sine, square, and TTL wave frequency over range. This message appears when entering sine / square / TTL waveform frequency larger than 3MHz. The frequency is automatically forced to 3MHz.

Err-2 Triangle wave Frequency over range. This message appears when entering triangle waveform frequency larger than 1MHz. The frequency is automatically forced to 1MHz.

Err-4 Frequency over resolution. This message appears when trying to enter frequency less than 0.1Hz. The frequency is automatically forced to the previous value.

Specification

RSFG-1013 must be powered for at least 30 minutes within the ambient temperature 18°C~28°C to meet this spec.

Main	Output Function	Sine, Square, Triangle
	Amplitude Range	10Vpp (50Ω load)
	Amplitude Accuracy	±20% at maximum position
	Impedance	50Ω ± 10%
	Attenuator	-40dB ± 1dB x1
	DC Offset	< -5V ~ >+5V (50Ω load)
	Duty Range	25% ~ 75%, ≤1MHz (Square Wave)
	Display	6 digits LED display
Frequency	Sine/Square Waveform Range	0.1Hz ~ 3MHz
	Triangle Waveform Range	0.1Hz ~ 1MHz
	Resolution	0.1Hz maximum
	Stability	±20ppm
	Accuracy	±20ppm
	Aging	±5ppm/year
Sine Wave	Harmonic Distortion	≥-55dBc, 0.1Hz ~ 200kHz ≥-40dBc, 0.2MHz ~ 2MHz ≥-35dBc, 2MHz ~ 3MHz (At maximum position without any attenuation to 1/10 of any combination setting, TTL Off)
	Flatness	< ± 0.3dB, 0.1Hz ~ 1MHz < ± 0.5dB, 1MHz ~ 2MHz < ± 1dB, 2MHz ~ 3MHz (At the max amplitude relating to 1kHz)
Triangle Wave	Linearity	≥ 98%, 0.1Hz ~ 100kHz ≥ 95%, 100kHz ~ 1MHz
Square Wave	Symmetry	±5% of period + 4ns, 0.1Hz ~ 100kHz
	Rise/Fall Time	≤ 100ns at maximum output, 50Ω load
TTL Output	Level	≥ 3Vpp
	Fan Out	20 TTL Load
	Rise/Fall Time	≤ 25ns

General	Power Source	AC110/220/240V $\pm 10\%$, 50/60Hz (Line voltage setting is factory installed)
	Operation Environment	Indoor Use, Altitude Up to 2000m Ambient Temperature 0 ~ 40°C Relative Humidity $\leq 80\%$, 0 ~ 40°C Install Category II / Pollution Degree 2
	Storage Environment	Temperature -10 ~ 70°C Humidity $\leq 70\%$
	Accessories	Instruction Manual x 1 GTL-101 x 1
	Dimension	251 (W) x 91 (H) x 291 (D)
	Weight	Approx. 2.1kg

Declaration of Conformity

We

declare that the CE marking mentioned product satisfies all the technical relations application to the product within the scope of council:

Directive: EMC; LVD; WEEE; RoHS

The product is in conformity with the following standards or other normative documents:

⊙ EMC	
EN 61326-1 :	Electrical equipment for measurement, control and laboratory use — EMC requirements
Conducted & Radiated Emission EN 55011 / EN 55032	Electrical Fast Transients EN 61000-4-4
Current Harmonics EN 61000-3-2 / EN 61000-3-12	Surge Immunity EN 61000-4-5
Voltage Fluctuations EN 61000-3-3 / EN 61000-3-11	Conducted Susceptibility EN 61000-4-6
Electrostatic Discharge EN 61000-4-2	Power Frequency Magnetic Field EN 61000-4-8
Radiated Immunity EN 61000-4-3	Voltage Dip/ Interruption EN 61000-4-11 / EN 61000-4-34
⊙ Safety	
EN 61010-1 :	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements