

FUNCTION GENERATOR-SERIES

⚠ WARNING

The instrument in line with the International Electrotechnical Commission (IEC) II class safety stands. The power cord protection earth line must be connected to ground.

WARRANTY

Our company warrants to the original purchaser that each product it manufactures will be free from defects in material and workmanship under normal use and service for a period of one year from date of purchase. Our company's warranty does not apply to fuses, test leads, power cable, **box or any product which**, in our company's opinion, has been misused, altered, or damaged by accident or abnormal conditions of operation or handling.

To obtain warranty service, contact your nearest Service Center or send the product, with a description of the difficulty, postage and insurance prepaid, to the nearest Service Center. Our company assumes no risk for the damage in transit. Our company will, at its option, repair or replace the defective product free of charge or refund your purchase price. However, if our company determines that the failure was caused by misuse, alterations, accident or abnormal condition of operation or handling, you will be billed for the repair and the repaired product will be returned to you transportation prepaid.

SHIPPING TO MANUFACTURER FOR REPAIR OR ADJUSTMENT

All shipment of our company's instruments should be made via United Parcel Service or "Best Way" prepaid. The instrument should be shipped in the original carton; or if it is not available, use any suitable container that is rigid and of adequate size. If a

substitute container is used, the instrument should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material.

**CLAIM FOR DAMAGE IN SHIPMENT
TO ORIGINAL PURCHASER**

The instrument should be thoroughly inspected immediately upon original delivery to purchaser. All material in the container should be checked against the enclosed packing list. The manufacturer will not be responsible for shortages against the packing sheet unless notified immediately.

If the instrument is damaged in any way, a claim should be filed with the carrier immediately. (To obtain a quotation to repair shipment damage, contact the nearest Service Center.) Final claim and negotiations with the carrier must be completed by the customer.

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Chapter 1 Safety & Chapter Instructions

In this manual, the “**WARNING**” is used to indicate the conditions and behavior harming the user; and the “**CAUTION**” is used to indicate the conditions and behavior harming the instrument or other equipment.

CAUTION

Please be sure to comply with the warning message of this manual containing in order to ensure safe operation, while ensuring that the function generator in a safe conditions.

WARNING

Read through the part of the “Safe Use of the Function Generator” before using the function generation.

Chapter briefly

This manual has been organized to assist you in getting started quickly. It is not necessary for you to read the entire manual before using the Function Generator effectively. However, we recommend that you do so in order to use your Function Generator to its full advantage.

Begin by scanning the Table of Contents to familiarize yourself with the organization of the manual. Then, read Section 2, “Learn Instrument”. Refer to the appropriate section of the manual as needed. The contents of each section are summarized below :

Chapter 1 Safety & Chapter Instructions

Introduces the security considerations of the use of the function generator, and the contents of various sections of this manual.

Chapter 2 Learn Instrument

You can learn the specifications and the function of the multi-function generator series product.

Chapter 3 Operation Function Generator

Describes in detail how to correctly use the function generator. The aim of the third chapter is how to combine the corresponding operation with the function.

Chapter 4 Application Examples

It provides the use in a number of common test of the instrument.

Chapter 5 Performance

Describes the performance of the function generator series.



Chapter 6 Maintenance




Describes the maintenance when using the instrument, replacement fuse and cleaning.

Safe Use of Function Generator

This instrument has been designed and tested strict according to GB4793 .1(equivalent IEC1010—1) safety requirements. This instruction manual contains warnings and safety rules which must be observed by the user to ensure safe operation of the instrument and retain it in safe condition.

Please take a moment to review these safety terms and symbols which may appear in this manual or on the instrument to prevent damage to the function generators.

○	Off power Power Switch Position		Protective Conductor Terminal
	On power Power Switch Position		(ground) Earth Terminal

	DANGER High Voltage		Frame Chassis Terminal
	Warning Information		

Before using the function generator, please carefully read the following safety information:

- To avoid working alone.
- When testing the equipment you must follow all security procedures.
- To ensure that the function generator in a good operating environment.
- Do not place any heavy object on Function Generator.
- Avoid severe impacts or handling that leads to damage.
- Do not discharge static electricity to Function Generator.
- Check whether the power cord and the part of the insulation of the testing line is damaged or whether there are exposed metal, check the power cord and the testing line are switch on or cut, and the damaged cable should be replaced.
- In order to meet your measurement needs, please select the appropriate function.
- Use only matching connectors for input/output terminals and power input jack.
- To avoid electrical shock and damaging the instrument, do not connect greater than the specified max. support voltage between the inside and outside conductor of the input/output terminals.
- To avoid electrical shock and damaging the instrument, do not connect current between the outside conductor of the input/output terminals, instrument shell, knob and protective earth line.

- To avoid electrical shock and damaging the instrument, do not connect non-equipotential equipment between the outside conductor of the input/output terminals, instrument shell, knob, protective earth line and the non-floating system.
- Do not block or obstruct cooling vent opening.
- Prohibited in the power input socket and the vents to measure.
- To avoid electrical shock injuries, prohibit disassemble the instrument in addition to professional maintenance personnel. Must to remove the power cord and signal cable before removal or disassembly the instrument.
- You should immediately cut off the power supply to stop working when the instrument occurs smoking, peculiar smell, abnormal sound, flashing, surface temperature too high, shell deformation, the internal device damaged or shelled, insulation parts damaged, liquid or foreign objects into the instrument.

CAUTION!

IEC1010—1(EN 61010-1: 2001) specifies the measurement categories and their requirements as follows:

Multi-function generator 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

- Rated input voltage: AC 110/220V, 50/60Hz
- The power supply voltage should not fluctuate more than 10% of rated value.
- Connect the protective grounding conductor of the power cord to earth ground, to avoid electrical shock.

Fuse

WARNING

- Fuse type:
 - Slow melting 0.5A / 250V (220V power supply) Ø5x20mm
 - Slow melting 1A / 250V (110V power supply) Ø5x20mm
- To avoid fire, replace the fuse with the specified type and rating only. For fuse replacement details, see page **xx**.
- Cut off power supply, and disconnect the power cord and the testing signal line before fuse replacement.
- Make sure the cause of the fuse blowout is fixed, and troubleshooting before fuse replacement.

Operation Environment

- Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution, ventilated.
- Relative Humidity: < 80% no condensation
- Altitude: <2000m
- Temperature: 0°C to 40°C
- Security level II Pollution degree 2

Pollution degree description

Caution! EN 61010-1: 2001 specifies the pollution degrees and their requirements as follows. Multi-Function 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: $\leq 80\%$ no condensation, indoor
- Temperature: -10°C to 70°C

Introduction

The second part explains the classification and their respective characteristics of the multi-function generator series, the instrument interface, and the preparation for use, so that you can know the basic functions and operation mode of the instrument.

Product Specifications / Features

The Function Generator series are stable low distortion instruments which generate signals in the frequency range up to 5MHz. 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, 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. FM/AM modulation function can be used as the excitation signals of debugging measured of a general carrier wave circuit, IF circuit. The instrument also has a built-in frequency counter, the frequency meter can be used to measure the frequency of the external signal which measuring frequency can up to 50MHz. It has the power output function. You can use the Function Generator which has power output function in a low-impedance load testing. The Function Generator which has power output function can generate 20Vp-p, frequency up to 200kHz power signal. The power signal can drive 5W load, and it can be easily used to test of loop, speakers, and etc..

BASIC FEATURES:

- Low distortion waveforms (sine, triangular and square) and ramp signal.
- Signal output in seven decade stages, 0.5Hz to 5MHz. The output can be able to fine-tune.
- Output amplitude 20Vp-p (no load), Output attenuation from 0 to -60dB.
- Independent $\pm 10V$ (no load) DC Offset adjustment, independent duty adjustment.
- Adjustable 3~15V synchronous CMOS (compatible TTL) level independent output.
- External Voltage controlled Frequency (VCF)(power type and multi-function type only).
- The frequency of an external signal up to 50MHz measurement (power type and multi-function type only)
- Adjustable sweep time and sweep width both in linear and logarithmic (multi-function type only).
- AM or FM modulation modes with internal or external modulation control (multi-function type only).
- 5W power output (power type only).
- Large VFD display, six frequencies display, and a variety of function instructions from soup to nuts.
- Multi-protection function, the output port overpressure, over-current, power amplifier overload protection function, and a sound and light alarm instructions.
- 220V/110V power conversion, external fuse easily replaced.
- Simple man-machine operation, sturdy and durable apply to laboratories, schools, factories.

Function Generator series all models feature comparison table

MODEL FEATURE	Standard type	Power type	Multi-function type
Function waveform output	√	√	√
CMOS	√	√	√
DC Offset Control	√	√	√
Duty Cycle Control	√	√	√
VCF	—	√	√
EXT. Freq. Measurement function	—	√	√
SWEEP	—	—	√
AM/FM	—	—	√
Power Output	—	√	—

Front Panel & Rear Panel

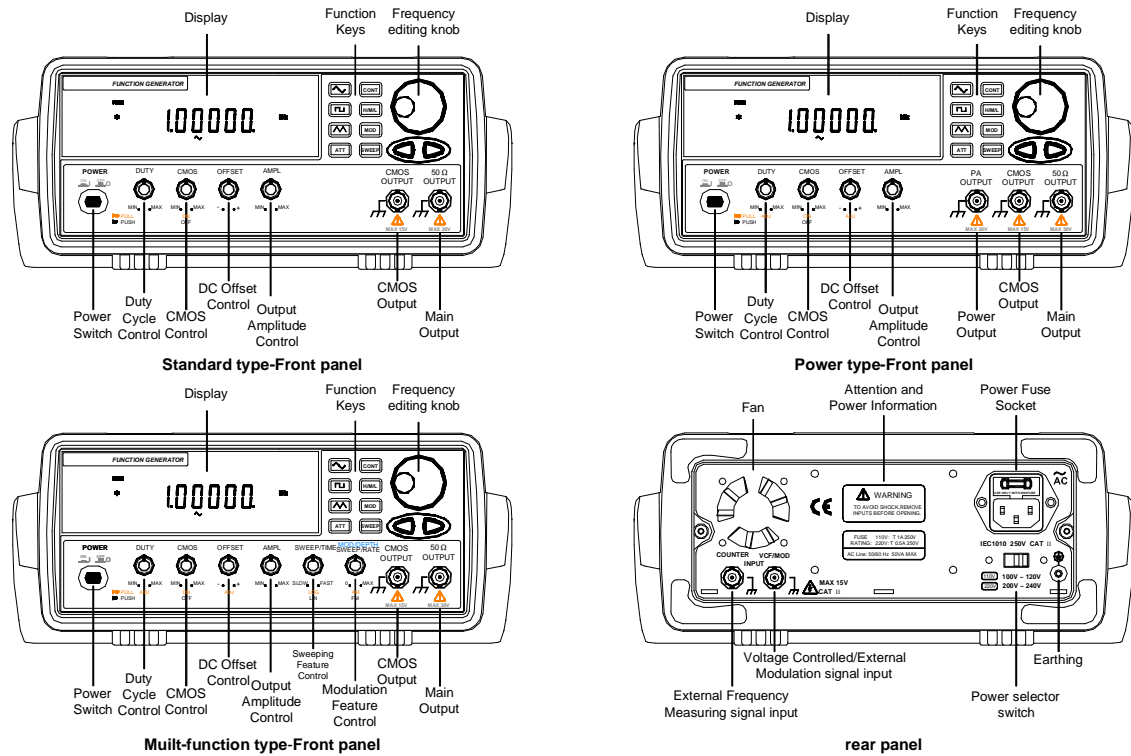


Figure 2-1 the front and rear panel diagram of the Function Generator series

Display (Figure 2-2)

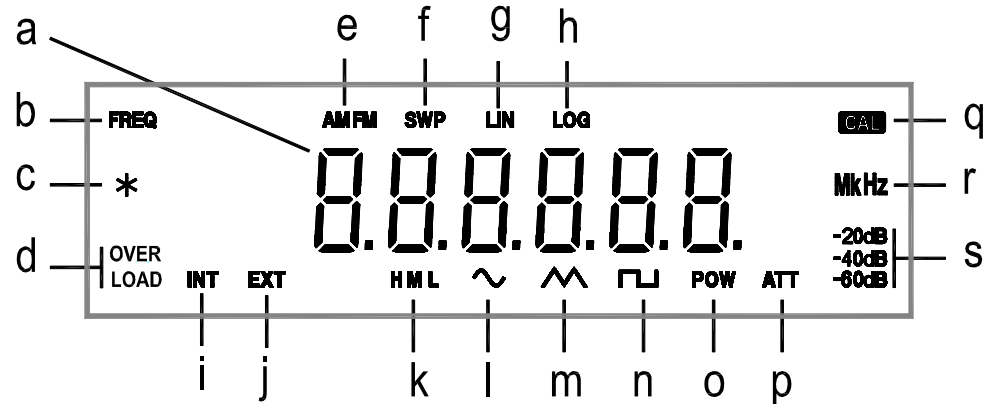





Figure 2-2

- a. 6 digit 8 segment “8” font 8 : Shows frequency and functional status.
- b. Frequency indication FREQ : Shows the meaning of the information displayed on the main display. It will remain displayed.
- c. Sampling gate time indicator * : It shows whether the data displayed on the main display has been refreshed. This symbol flashes every time, then the data displayed on the main display is refreshed once.
- d. Over indicator OVER LOAD : Shows that main output or power output terminal occurs overload fault, at the same time, the instrument has automatic protection.
- e. Modulation indicator AM FM : Shows modulation mode, AM shows amplitude modulation mode, FM shows


frequency modulation mode. If FM and AM is not displayed, this status shows current output is non-modulated output mode.


- f. **Sweep indicator** SWP : Shows Function Generator is currently in frequency sweep state.
- g. **LIN indicator** LIN : Shows in the frequency sweep mode, the output signal frequency to time in accordance with the linear increase relationship to transform.
- h. **LOG indicator** LOG : Shows in the frequency sweep mode, the output signal frequency to time in accordance with the logarithmic increase relationship to transform.
- i. **Inside indicator** INT : Shows the mode using internal source, such as internal modulation.
- j. **Outside indicator** EXT : Shows the mode using external input source, such as external modulation, external frequency measurement.
- k. **Frequency-band indicator** H M L : Shows frequency measuring range in the external frequency measurement function. It is divided into H (high), M (mid) and L (low), 3 frequency band.
- l. **Sine wave indicator**  : Shows that the output signal waveform is sine wave.
- m. **Triangle wave indicator**  : Shows that the output signal waveform is triangle wave.
- n. **Square wave indicator**  : Shows that the output signal waveform is rectangle wave.
- o. **Power output indicator** POW : Shows that the current power output terminal is effective.
- p. **Output attenuation indicator** ATT : Shows that the output attenuator of the main signal channel is used, signal amplitude of the main output will be attenuated.
- q. **Calibration indicator** CAL : Shows whether the instrument is in calibration condition.
- r. **Frequency unit** MkHz : Frequency unit when frequency value is displayed on the main display.
- s. **Attenuation indicator** -20dB -40 dB -60 dB : Shows attenuation size of the output attenuator, it is divided

into -20dB, -40dB and -60dB, 3 range.

Button & the editing knob (Figure 2-3)

By manipulating the rubber buttons on the front panel, you can choose the function and the output signal feature of Function Generator. Adjust the knob to change the output frequency within a same frequency band.

A. Sine wave selector 【】 : Press the button, the output waveform can be switched to sine wave.

B. Square wave selector 【】 : Press the button, the output waveform can be switched to rectangle wave.

C. Triangle wave selector 【】 : Press the button, the output waveform can be switched to triangle wave.

D. Signal output attenuation selector 【ATT】 : Press the button take turns to change the size of the main signal output attenuation: -20dB, -40dB, -60dB or no attenuation.

E. INT./EXT. Counter selector 【CONT】 : Press the button to open or close measuring the external input signal frequency function. On the function, the display will show the measuring information of the external frequency.

F. EXT. frequency measurement range selector 【H/M/L】 : On the external frequency measurement function, press the button to select the measuring range of frequency. It is divided into H(High), M(Mid), L(Low) 3 frequency range.

G. Modulation function selector 【MOD】 : Press the button to select the modulation mode that the instrument internally generated modulation signal, the modulation mode of the external input modulation signal, and non-modulation equal

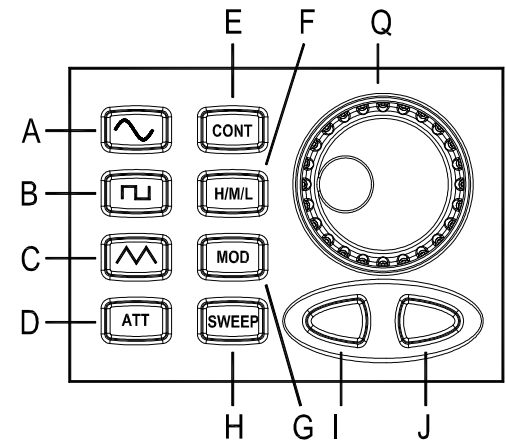


Figure 2-3

amplitude output mode.

H. Sweep function selector 【SWEEP】 : Press the button to turn on or off the frequency sweep function.

I. Decreasing frequency range selector 【◀】 : Each time the button press, the frequency range of generating signal will be reduced a 10 times frequency range.

J. Increasing frequency range selector 【▶】 : Each time the button press, the frequency range of generating signal will be increased a 10 times frequency range.

Q. Frequency editing knob 【FREQ】 : Adjustment the knob can fine-tune the output frequency within each frequency range. The knob can be adjusted continuously about 10 laps.

Switches & Knobs (refer to Figure 2-1)

1. Power switch 【POWER】 : Press the switch turns on the power, and then press the switch turns off the power.

2. Duty cycle control【DUTY】: It is the adjustment knob with a push-pull switch. Pull out and rotate the knob/switch to adjust the duty cycle of the output square wave or triangular. Rotating the knob clockwise to increase, and anticlockwise to decrease. When press the knob/switch, duty cycle has been preset to 50%.

3. CMOS control【CMOS】: It is a adjusting knob with a push-pull switch. Pull out the knob/switch to output the CMOS signal from **【CMOS OUT】** terminal, and rotate the knob to adjust the output CMOS high range.

4. DC offset control 【OFFSET】 : It is a adjusting knob with a push-pull switch. Pull out and rotate the knob/switch to adjust the DC offset of the output signal. Clockwise rotation the button to provide positive polarity offset, anti-clockwise rotation it available negative offset, and adjusting range no-load is $\pm 10V$. Press the knob/switch that the DC offset is preset to 0.

5. Amplitude control 【AMPL】 : Clockwise rotation the button to increase the amplitude of the output signal, contrarily to decrease. By adjusting the button you can obtain the signal amplitude about $2V_{p-p} \sim 20V_{p-p}$ on no-load. The knob

does not function with a switch.

6. Sweeping Feature control 【SWEEP/TIME】 : It is a adjusting knob with a push-pull switch. It can be used to adjust the sweep time and sweep mode. In the sweeping mode, pull out the knob/switch to enter logarithm sweep mode, press the knob/switch to enter linear sweep mode. Rotating the knob/switch can adjust the frequency sweeping one-way time between 0.5 seconds and 30 seconds. Rotating the knob clockwise to decrease the sweep time and to increase the sweep speed. The other hand the sweep time will increase, and the sweep speed will decrease.

7. Modulation Feature control 【SWEEP/RATE, MOD/DEPTH】 : It is a adjusting knob with a push-pull switch. In the modulation, you can use it to select the modulation mode and adjust the modulation depth. Pull out the knob/switch to enter the AM mode, and press the knob/switch to enter the FM mode. Rotating the knob/switch to adjust the modulation ratio of the modulation signal. Adjustment range: AM amplitude modulation factor: 0%~100%, FM frequency offset: 0%~10%. In the sweeping mode, if you adjust the knob, the sweep width ratio(the ratio of the maximum of the signal frequency change to the minimum) can be adjusted from 1 to about 100, rotating the knob clockwise to increase the sweep width, contrarily to decrease the sweep width.

Signal input / output terminals

1. Power Output Terminal 【PA OUTPUT】 : The BNC-type socket on the front panel can be used to output signal that the maximum power is 5W below the 200kHz.

2. CMOS output Terminal 【CMOS OUT】 : The BNC-type socket on the front panel can provide a CMOS-level signal synchronized with the signal of the main channel.

3. Main Output Terminal【OUT】: The terminal is the output terminal of the main channel signal. It used the BNC-type socket, and its rated output impedance is 50Ω.

4. VCF/MOD Input Terminal 【VCF/MOD INPUT】 : It is the external voltage input terminal of the external voltage-controlled frequency (VCF). In the external signal modulation mode, the external modulation signal is inputted from the socket on the rear panel.

5. EXT. Counter Input Terminal【COUNTER INPUT】: When the instrument is in the external frequency measuring function, the unknown frequency signal that need to measure is inputted from the terminal on the rear panel, and the measurement result will be displayed on the main display.

⚠ WARNING!

- **The outer conductor of the input/output terminals is connected with the shell, the adjusting knob shaft and the protection earth line in the internal of the instrument. In order to prevent personal injury caused by electrical shock, the instrument must be grounded according to demand.**

CAUTION!

- **Do not connect non-equal-potential equipment between the outer conductor of the input/output terminal, the shell, the knob and the protection earth line or non-floating systems, in order to prevent damage of the instrument and the equipment tested.**
- **Do not connect greater than the maximum withstand voltage of the instrument requirements between the inner and outer conductor of input/output terminal. To avoid output short circuit or driving a relatively heavy load.**

Other Devices Description

The rear panel contains:

- **Power Insurance socket:** Connect the AC power line, for the instrument providing power, there is a built-in movable

fuse holder.

- **Power Switch:** 110V and 220V selectable.
- **Ground terminal:** Safety grounding terminal. The port connects with the shell and the outer conductor of the terminal for the public ground.
- **Attention proceeding & power information signs:** It designates the warning when the instrument need to maintain, the rated voltage of the instrument, power and the corresponding fuse type.
- **Cooling Fan:** It is the exhaust outlet for cooling the instrument.

Note: for instructions

- The operation corresponding to the functions that some types instruments do not contain is invalid. When pressing the button corresponding to these functions, “**NO OP**” will be displayed on the VFD, it can prompt the user that the instrument does not have the function, and you can not operate. The specific functions of different models containing refer to the aforementioned “**Function Generator series all models feature comparison table**” in this section.
- For the standard type Function Generator, the duty cycle control knob **【DUTY】** and the DC offset control knob **【OFFSET】** can only rotate adjusting, they do not have push-pull switch.
- The standard type Function Generator does not have cooling fans and vents.

The handle bracket of the instrument has four orientation angles for different occasions using. When you need to adjust the orientation of the bracket, just gently pull out the bracket along the axial direction towards the outside, and turn it to appropriate anchor point. As shown in Figure 2-6:

- Bracket position 1 — The instrument has been flat.
- Bracket position 2 — The instrument has been supported a fixed angle in order to use.
- Bracket position 3 — Lift up the instrument.
- Bracket position 4 — It is the demolition location of the bracket of the instrument.

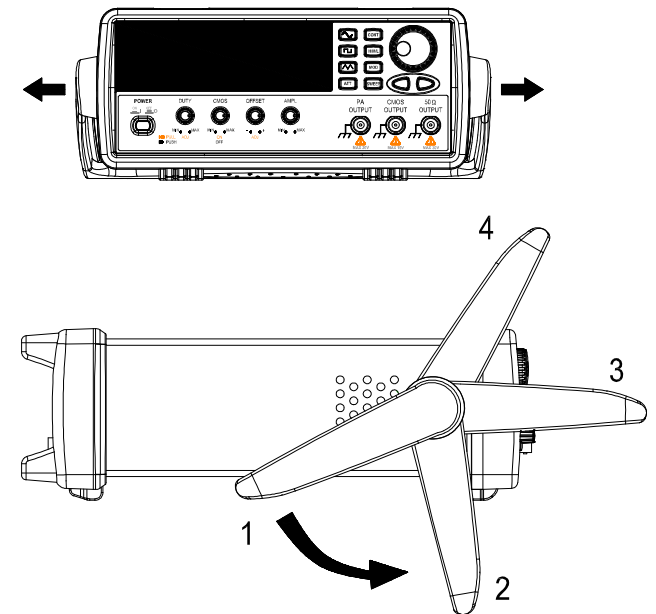


Figure 2-6

Power



To avoid electrical shock injuries, please use the safety power cable that match up to the power, and power supply must be connected to the power outlet that has a good grounding protective.

CAUTION!

Power supply voltage and frequency must be accord with the requirements of the labeling on the rear panel.

Function Generator series is available in single-phase AC power supply regions of 220V or 110V ($\pm 10\%$), 50Hz or 60Hz. Before using for the first time or after the place to use has been changed, you need to check whether the power supply voltage selector switch on the rear panel accord with the local power supply voltage, by adjusting the power supply voltage the voltage will suit the local power supply voltage range. To check whether the power cable plug match up to the form of the user's power outlet, and ensure that the power outlet has the correct connections, then you can connect the power to boot-strap.

Operational Readiness

Open the packaging to examine the Function Generator

Carefully take out Function Generator from the box, and check whether it is damaged or it is missing parts. If the Function Generator you purchased is damaged or it is missing some standard parts, accessories, please as soon as possible to contact the manufacturer or the dealer, and be properly save the packing boxes and the packing materials so that you can return the Function Generator you purchased.

Start Function Generator

Ensure that the voltage of the main supply is compatible with this instrument. The label on the rear panel states the required AC voltage. Connect the instrument to the main supply using the power cord supplied. Press power switch **【POWER】** (located in the lower left of the front panel). If you have already shut down the power switch of the Function Generator, intervals should be more than 5 seconds to re-open the Function Generator, otherwise it will not work correctly because the reset errors which may occur.

When you turn on the Function Generator, all marks will be displayed about 1 second, at the same time, the buzzer sound.

If the instrument is normal, It will enter the normal working condition.




Introduction

This chapter describes how to operate the Function Generator.

The basic function signal output

It will boot into the signal output function after turning on the Function Generator, that is, point-frequency-equal-amplitude output mode. Temporality, the main display shows the current frequency generated.

Set Wave

- (1) Press one of the three buttons【】，【】，【】to select the desired output waveform.
- (2) At the moment, the main output terminal **【OUT】** and the power output terminal **【PA OUTPUT】** will output the selected waveform (the power output terminal will be closed in frequency range 7).
- (3) The phase-relation of output waveform shown in Figure 3-1.

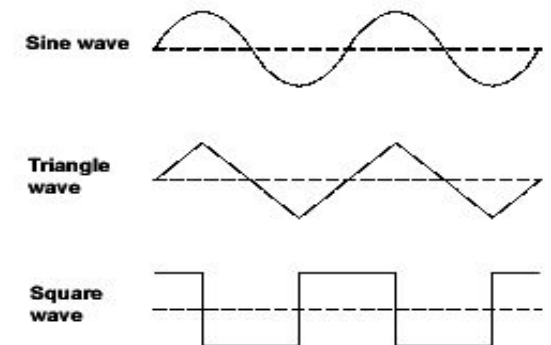


Figure 3-1

Set Frequency

Press **【◀】** or **【▶】** to select the required frequency range, and then rotate the **【FREQ】** to fine-tune the frequency. You can observe the frequency of the current output signal that the main display shows until the signal frequency can be required.

Set Amplitude & Output attenuation

Rotate **【AMPL】** to control waveform amplitude of the main signal and the power signal. The adjustment range of the signal amplitude no load is from 2Vp-p to 20Vp-p.

If attenuation output signal is required, press **【ATT】**, “ATT” mark is displayed at the lower right part of the VFD. At the same time, the corresponding attenuation indicator “-20dB”, “-40dB”, “-60dB” will be displayed on the VFD. Repeat pressing **【ATT】**, you can obtain three attenuation. The adjustment method of the attenuation in accordance with the way shown in Figure 3-2:

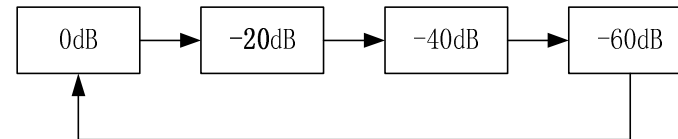


Figure 3-2

Set Duty Cycle

Pull out **【DUTY】** knob to adjust the symmetry of sine waveform, the slope of triangle waveform (so that it can switch to saw-tooth waveform or ramp waveform), the width of pulse waveform. Press **【DUTY】**, the duty cycle will be pre-set to 50%. Standard function generator has not pre-set switch, you can adjust the knob to the midpoint.

Set DC Offset

The Function Generator can change the DC voltage offsets of the wave by adding DC offset to the signal of the main output and the power output.

Pull out the **【OFFSET】** knob/switch to open the offset setting, clockwise rotation the knob to provide positive polarity offset, anti-clockwise rotation the knob to provide negative offset. In the case of no-load small-signal the adjusting range of the DC offsets is from -10V to +10V. But due to the limitations of the maximum output voltage of the instrument, when output the more signal and adjust the DC offset, the signal peak superimposed has been exceeded the maximum output voltage range of the instrument, temporality, the output waveform will appear cut the top distortion, which is a normal phenomenon, so you should decrease the output amplitude or the size of DC offsets. You had best set the peak value voltage containing DC offset within $\pm 10V$, that can ensure that the cut the top distortion does not occur.

CMOS signal output

The Function Generator can provide a CMOS square wave signal synchronized with the main signal, and the low level of the CMOS signal is 0V or so and the high level can be adjusted. The output can also drive TTL logic gate circuit.

Set CMOS

Pull out **【CMOS】** knob to turn on the output of CMOS level. At this moment, CMOS level will output from **【CMOS OUT】** terminal. Frequency and duty cycle of CMOS level and output of the main function are fully synchronized.

Set Frequency

In accord with the method of setting output frequency of the main signal. Press **【◀】** or **【▶】** to set required frequency range, rotate **【FREQ】** to turn frequency, you can observe the frequency of the main display shows until the signal frequency can be required.

Set Duty Cycle

In accord with the method of setting output duty cycle of the main signal. Through adjust **【DUTY】** knob to adjust.

Variation of external voltage-controlled frequency (VCF)

This function can be applied to power and multi-function Function Generator. This mode of operation allows the user to adjust the frequency of the function generator with an external DC control Voltage.

- (1) In a state of the basic signal output, according to the need of using to set signal waveform, amplitude, duty cycle and DC offset, and etc. The setting frequency is the output signal frequency when the external control voltage is 0V.
- (2) Connect external control voltage (0 ~10V) to the **【VCF/MOD INPUT】**connector via a suitable lead. At the tiptop of the frequency range, the maximum frequency change ration is 100:1. The output of all signals are synchronized with the controlled signals.

CAUTION!

It is not tolerable that there has voltage difference between the outer conductor (reference terminal) of the external voltage-controlled signal input terminal and the earth. The amplitude of the input signal should not exceed 15V. If there is the ground voltage difference or the input voltage is too high, it may cause damaging the instrument or other equipment of user.

External Frequency Measurement

The part of the internal frequency measuring of the Function Generator can be used to show the frequency of its own signal, it can also be used independently. By selecting an external frequency measurement function you can realize the measuring of the

external input signal. The power-type and the multi-function Function Generator have the function. First, the external signal is inputted from the **【COUNTER INPUT】** terminal on the rear panel, and set the instrument on the external frequency measurement function and select the appropriate frequency range, then you can measure the frequency of the input signal.

Set frequency measurement channels

When the instrument at the internal frequency displayed state, press **【CONT】** button to enter the external frequency measuring mode, temporality, “**EXT**” mark will be displayed on the VFD, and output of the Function Generator will remain.

Set the external frequency measurement range

In the external frequency measurement mode, press **【H/M/L】** button can in turn change the range of the frequency measurement, the “**H**”, “**M**” or “**L**” mark of the current range corresponding will be displayed on the VFD. When turn into the external frequency measurement mode, the instrument default to “**H**” range. If you want to adjust the measuring range, please according to Figure 3-3:

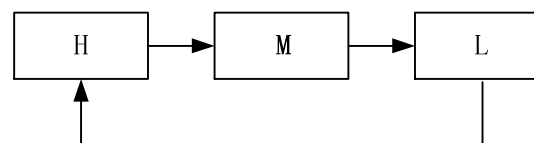


Figure 3-3

thereinto: **H:** the high frequency measuring, for 1Mhz ~ 50MHz signal measuring, 6 digits display

M: the intermediate frequency measuring, for 10Hz ~ 1MHz signal measuring, 6 digits display

L: the low-frequency measuring, for 0.1Hz ~ 10Hz signal measuring, 5 digits display(under 1Hz); 6 digits display (above 1Hz).

CAUTION!

- It is not tolerable that there has voltage difference between the outer conductor (reference terminal) of the external voltage-controlled signal input terminal and the earth. The amplitude of the input signal should not exceed 15V. If there is the ground voltage difference or the input voltage is too high, it may cause damaging the instrument or other equipment of user.
- For the external signal which yawp is bigger or contains many zero-crossing, the result of frequency measuring may show inaccurate.

Frequency Sweep

This function can only be applied to multi-function Function Generator. The function can be to change that the signal frequency relative to time in accordance with linear or logarithmic relationship. By adjusting the **【FREQ】** knob, you can change the starting frequency of frequency sweep.

Set Frequency Sweep Mode

Press **【SWEEP】** button, then make the instrument enter/exit sweep mode. Then “SWP” mark is displayed on the VFD.

Press **【SWEEP/TIME】** to obtain LIN sweep mode, at the same time, “LIN” mark is displayed on the VFD. Pull out **【SWEEP/TIME】** to obtain LOG sweep mode, “LOG” mark is displayed on the VFD. No matter which kind of sweep mode, the trends of the frequency change are from low to high.

Set Frequency Sweep Time

Rotate **【SWEEP/TIME】** to adjust sweep time. Rotating the knob clockwise to decrease the sweep time, sweep speed will be increased. Contrary to increase the sweep time, sweep speed will be decreased.

Set Frequency Sweep Width

Rotate **【SWEEP/RATE, MOD/DEPTH】** to adjust sweep rate. Namely in the sweeping process, in the ratio of the termination frequency (the maximum value) to the starting frequency (the lowest value). Sweep width can be continuously adjustable from 1 to 100 times. Rotating the knob clockwise to increase the sweep width, contrary to decrease the sweep width.

Description:

- Due to the limit of the frequency range of the instrument itself, the maximum variation is about 100 for each frequency range, however, a higher initial frequency will cause that sweep width is limited, and appear the change of sweep time and frequency relation.
- For the mode required an external signal to change the frequency feature, you can reference to “**Variation of external voltage-controlled frequency (VCF)**” section.

Modulation

This function can only be applied to multi-function Function Generator. Enable the function, you can gain amplitude modulation signal or frequency modulation signal that show frequency as the carrier frequency. The function includes the internal modulation mode that 400Hz signal as a modulated signal and the external modulation mode that modulation signal is input from external.

Set modulation signal input mode

Press **【MOD】** button, then make the instrument open/close modulation mode. In the ordinary output mode, press **【MOD】** button into the modulation mode that built-in 400Hz signal as a modulation signal, at the same time, “**AM**” or “**FM**” mark will be displayed on the VFD. Press **【MOD】** button again into the modulation mode that an external signal as a modulation signal, at the same time, “**AM**” or “**FM**”, and “**EXT**” mark will be displayed on the VFD. The third press **【MOD】** button to exit the modulation function, as shown in Figure 3-4:

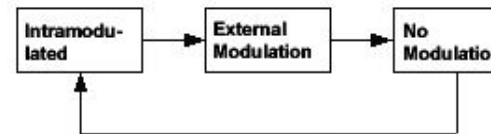


Figure 3-4

Set modulation mode

Press **【SWEEP/RATE, MOD/DEPTH】** to obtain AM modulation mode, at the same time, “**AM**” mark is displayed on the VFD. Pull out **【SWEEP/RATE, MOD/DEPTH】** to obtain FM modulation mode, “**FM**” mark is displayed on the VFD.

Set modulation ratio

Rotate **【SWEEP/RATE, MOD/DEPTH】** to achieve required modulation ratio. Rotating the knob clockwise to increase the modulation ratio, and anticlockwise to reduce the modulation ratio until 0. Adjustment range: AM amplitude coefficient: 0%~100%, FM frequency offset: 0% ~10%.

Power signal output

This function can only be applied to power type Function Generator. Power signal from **【PA OUTPUT】** terminal of on the front panel output can be used to drive low-impedance load. Power signal in accord with the voltage, phase, waveform of the main output signal, and has a power output bandwidth of 200kHz. In frequency range 7, power output will automatically shut down, at the same time, “**POW**” mark will be disappeared form the VFD.

Power signal feature

Power signal is the signal that the main signal is enlarged by the internal power amplifier, in the normal, the output is constant

voltage output (the output voltage is constant, largely unaffected by load impedance change). Power signal in accord with the voltage, phase, waveform of the main output signal. But it is compared with the main output channel, there is a lower output resistance in order to drive low-impedance load. The power output bandwidth of 200kHz can generate approximately 5W power into 8Ωload, and the maximum peak output current is about 1.3A. In frequency range 7, power output will automatically shut down, at the same time. “**POW**” mark will be disappeared from the VFD.

Output Protection

The device internal protection circuit will be started when the main signal output port or power output port occurred overload, short circuit, overcurrent, overvoltage, at the same time, “**OVER LOAD**” mark flashes on the VFD, and go with intermittent alarm sounds. Temporality, you should promptly disconnect the output circuit, and protection circuit will automatically reset. You can not connect the circuit before a failure be excluded.

CAUTION!

Although there has the output protection circuit in the device within the instrument, that does not mean that it can withstand the fault more than the standard requirement. So you must be carefully examined whether the signal settle for the safe working conditions of the instrument provided before connecting the signal, in order to avoid equipment , circuit damage or personal injury!

Trouble-shooting using signal-tracing method.

This method is similar to signal replacing way. The signal of model will be fixedly sent to input terminal. Observing its signal wave on the oscilloscope from front stage to rear stage orderly until appear a signal with normal input but with abnormal output.

Use as bias source and signal source circuit.

Utilize the Figure 4-1 of connecting type, which can provide exchange signals for transistor amplifier circuits, can also provide a superimposed DC bias signal, using the oscilloscope to compare their input and output signal waveforms. Adjust the output amplitude and the size of DC offsets, the output waveform for the circuit will have the maximum output voltage and dose not distortion. Usually, in order to protect the circuit and to facilitate adjustment, suggested that the function generator output attenuator set at -20dB or so.

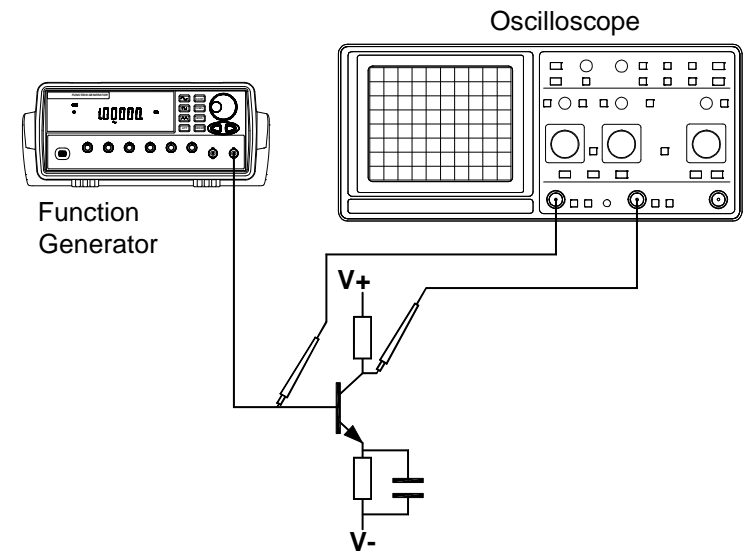


Figure 4-1

Amplifier over-load characteristics

For the low-frequency amplifier overload characteristics of testing, sine wave excitation signal is no very good. The use of triangular wave as the excitation signal can be very easy to use oscilloscope to observe the linear range of the waveform, and measured the maximum amplifier output amplitude without distortion.

Using the Square wave test the characteristics of amplifier circuit

It can't actually explain the transient response of amplifier by using sine wave for the frequency response curve observation, but using the high order poly-wave, square wave, instead to display its waveform from the oscilloscope can show up many characteristics of amplifier.

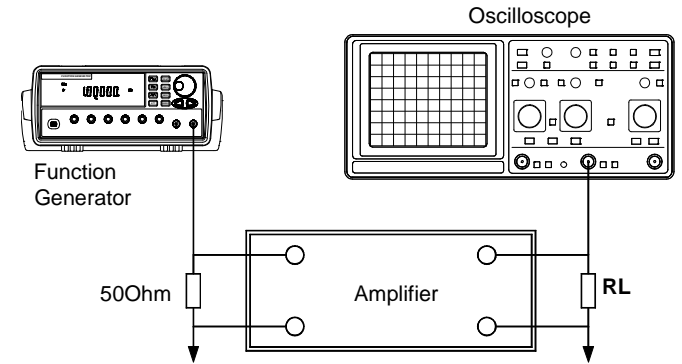


Figure4-2

Using the circuit of figure 4-2, the 50Ω connector trim the oscillation effect of Square wave.

- Using the circuit of figure 4-2, for an amplifier of the high input impedance need to fake its input in parallel 50Ω load, the load as a function generator is used to prevent the impact of the input rectangular-wave oscillation.
- Use the output of triangle wave, adjust the amplitude until there are no clipping happened in the applied frequency.
- Select square wave, adjust frequency, choose to watch the waveform of middle of amplifier pass band, like 20Hz, 1kHz, 10kHz and etc.
- Observed through the oscilloscope amplifier output waveform, must get something with frequency figure 4-3 shows some possible conditions.
- **Caution:** The composed poly-wave frequency of square wave is quite large, so it's not suitable for the narrow band

amplifier testing.

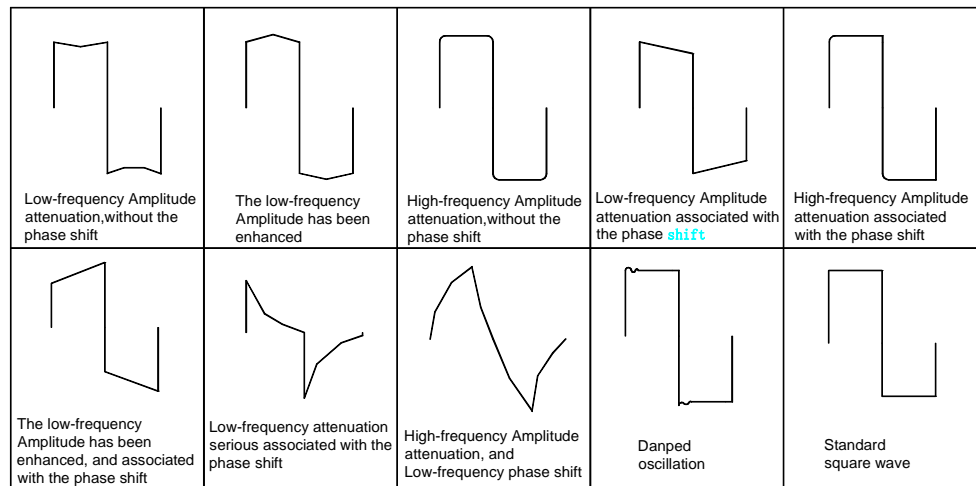


Figure4-3

Test of logic circuit

This equipment is suitable for logic circuit testing. Using Square or Pulse wave can analyze or watch the frequency waveform of a designed testing circuit. Also the DC Offset effect, drive the plug-in model board or logic circuit trouble-shooting and etc. Used as signal tracing and signal replacing operation:

- Connect the lines as figure 4-4.
- According to the operation guide in this manual, set the required frequency and duty cycle.
- Pull up the switch of **CMOS**, **【CMOS OUT】** output terminal is start output signal at this time. Adjust **CMOS** level by rotating the switch to set the proper level.
- Use dual-trace scope to show the input-output timing relation judged by the two waves shown in figure 4-4.

Testing of speaking and impedance network

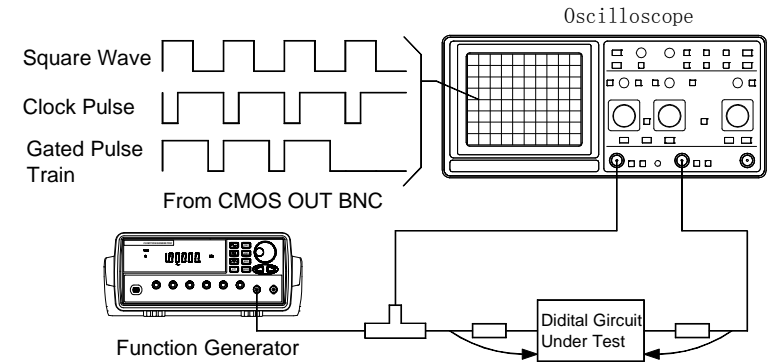


Figure4-4

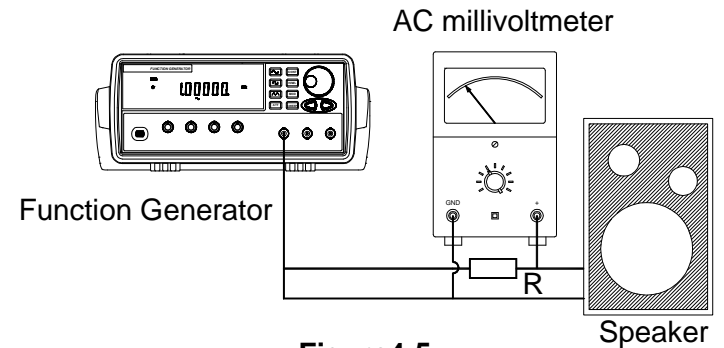


Figure4-5

The power-type or multi-mode function generator can be used to test the frequency characteristics of speaker or any impedance network. It also can get the resonant frequency of network.

- The circuit testing speaker as shown in figure 4-5, the main output signals can be used for the low-power speaker, for testing larger power speaker can be used the independently power output signals. The size of external series resistance R according to the speaker impedance. Adjust the output amplitude knob **【AMPL】**, so that the power of the speaker bore is less than one-tenth of the rated.
- Tuning function generator output frequency, and record the interrelationship of the AC value and the output freq. at this time.
- When testing speaker, if there is a peak volt value, when in low freq., this must be the resonant freq. of this speaker, see figure 4-6.

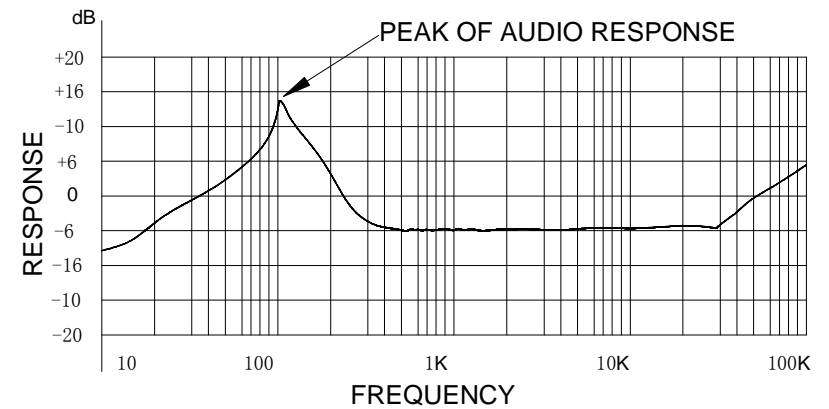


Figure 4-6

In testing other impedance network, if the performance of the network circuits is not known, you can use multi-function generator freq. sweep function to do a wide range of freq. response characteristics scanning for the circuit. Identify the freq. of concern, the turned into normal mode and then do detailed testing. Use of the following ways to measure the unknown impedance at a fixed freq. corresponding to the equivalent impedance:

- Series connect a R1 to the network under test as in figure 4-7.
- Get voltage read out in E1, E2, adjust R1 until E2 is equal to one half of E1.
- Under this freq., the impedance network is the same as the R1.

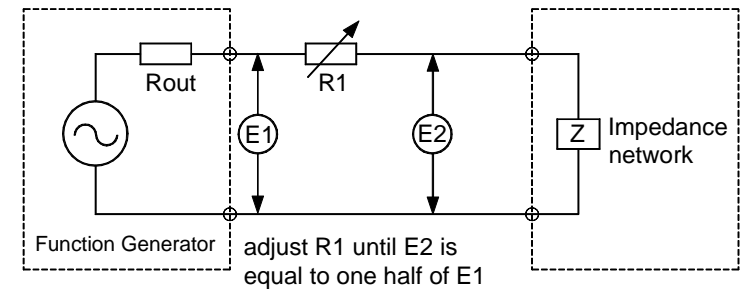


Figure4-7

Chapter 5 Performance

This chapter describes the performance of the multi-function digital signal generator series product. Its application conditions are:

- Within one year after calibration
- Operation Environment: 18°C~28°C (64.4°F ~ 82.4°F)
- Warm-up time 1 hour
- Relative humidity 70% or less (no condensation)
- Rated power voltage, freq. emergency supply

Main		
Frequency Range	Divided into seven bands: 0.5Hz~5Hz, 5Hz~50Hz, 50Hz~500Hz, 500Hz~5kHz, 5kHz~50kHz, 50kHz~500kHz, 500kHz~5MHz	
Band coverage	Width on 5% of the upper and lower limits	
The main channel output amplitude	1Vp-p ~ 10Vp-p (into 50Ω load)	2Vp-p ~ 20Vp-p (no load)
The main channel output impedance	50Ω±10%	
The main channel output attenuator	0dB, -20dB, -40dB, -60dB	
DC Offset	-5V ~ +5V (into 50Ω load)	-10V ~ +10V (no load)

The max. output amplitude	-5V ~ +5V (into 50Ω load)	-10V ~ +10V (no load)
Duty Control	(20% ~ 80%) ±5% Continued variable	
Display & Backlight	Blue-green VFD vacuum fluorescent display, six digital and a number of symbols segment display	
Sine Wave		
Distortion	≤ 1.5% (1KHz)	
Flatness	≤ ±0.3dB, below 500kHz	≤ ±1dB, below 5MHz
Triangle Wave		
Linear	≥ 98% (0.1Hz~100KHz)	≥ 95% (>100KHz)
Square Wave		
Symmetry	±2%, 1Hz~100kHz	
Rise or Fall Time	≤ 50ns (10%~90% of the signal peak-peak value)	
CMOS Output		
Output Amplitude	3.0Vp-p ~ 15Vp-p	
Rise or Fall Time	≤ 120ns	
Max. Output Current	±10mA	
VCF Input*		
Input Voltage	0~10V±1V (100:1)	

Input Impedance	20k Ω ±10%			
Sweep Operation*				
Sweep/Rate	1:1 ~ 100:1 adjustable			
Sweep/Time	0.5Sec ~ 30Sec adjustable			
Sweep/Mode	Lin./Log.			
Amplitude Modulation*				
Depth	0 ~ 100%			
MOD. Freq.	INT	400Hz ± 50Hz		
	EXT	10 Hz ~ 1MHz		
Carrier BW	100Hz ~ 5MHz (-3dB)			
EXT. Sensitivity	≤10Vp-p for 100% modulation (adjust the internal modulation to the greatest)			
Frequency Modulation*				
Deviation	0 ~ ±5%			
MOD. Freq.	INT	400Hz ± 50Hz		
	EXT	DC~20kHz		
EXT Sensitivity	≤10Vp-p for ±5% modulation			
Frequency Counter				
INT./EXT.	Internal measurement		External measurement*	
Range	0.5Hz ~ 5MHz		L	0.1Hz ~ 10Hz
			M	10Hz ~ 1MHz

		H	1MHz ~ 50MHz
Accuracy	± (0.05%+5digits)		
Time base	±20ppm(23±5°C) after 30 minutes warm up		
Resolution	6 digits display The max. resolution is 10uHz for 1Hz and 100Hz for 50MHz		
Input Impedance			1MΩ/150pF
Sensitivity			≥100mVrms (1Hz ~ 50MHz)
Max. Input Voltage			30Vp
Power Output*			
Output Voltage	2Vp-p ~ 20Vp-p(no load)		
The Bandwidth of Rated freq.	0.5Hz ~ 200kHz		
Output Power/Type	Constant voltage output, ≥5W (into 8Ω purely resistive load)		
Max. Output Current	Approx. 1.3Ap		
Protection Features	Overcurrent, Overvoltage, Overload		
General			
Power Source	AC 110V/220V ±10%, 50/60Hz		

Power	Standard / Multi-function type	Power type
		30VA
Operation Environment	Indoor use, altitude up to 2000m. Ambient Temperature 0 °C to 40°C. Relative Humidity 80%(Max.)(no condensation) Installation category II Pollution Degree 2	
Storage temperature & Humidity	-10°C to 70°C 80% (Max.)(no condensation)(Indoor use)	
Dimension	325 x 260 x 110(mm)	
Weigh	Standard type 、 Multi-function type : Approx. 3.5kg / Power type : Approx. 4.0kg	

*: It is said that only a part of the instrument has the feature.

Introduction

The information of the chapter 6 provided is very useful to the user to do some basic maintenance for the function generator. Following the method on the instructions described to do maintenance for the function generator. The service personnel responsible for the maintenance should refer to the manual to do a comprehensive maintenance and to repair for the function generator.

Fuse Replacement Procedure

⚠ WARNING

Replacement fuse may cause dangerous voltage exposed, so must remove the power cord, input and output signal lines before replacement fuse.

⚠ CAUTION

When the function generator for maintenance, can only be replaced the fuse with correct rating and type.

When the instrument has been damaged or the power supply voltage is set incorrectly, the power fuse may be burned. Try to determine and correct the cause of the blown fuse, then replace the fuse according to the following steps:

- First turn off the function generator power, remove the power cord, input and output signal lines.
- The instrument as shown in Figure 6-1 flip 180 degrees, so that the bottom upward, the latter back towards us.
- Use the tool cut in the power fuse groove and fiddle outward until the fuse holder can be removed by hand.

- Take out the fuse from the fuse holder, then replace it with the same type. There is a spare fuse in the reserve warehouses of the fuse holder before the instrument leave from the factory. Need to access, you can use the tool to take it out.
- Cut the fuse holder after replacement the fuse in the power fuse socket in accordance with out direction.

The fuse specification:

The power supply working condition 220V±10%: slow melting 0.5A / 250V Ø5×20mm

The power supply working condition 110V±10%: slow melting 1A / 250V Ø5×20mm

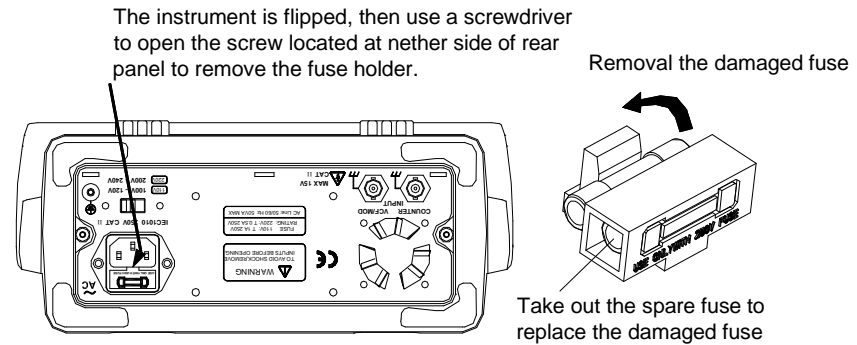


Figure6-1

Cleaning

⚠ WARNING

In order to avoid electrical shock injury or damage to the function generator to prohibit the flow of water or other liquid instrument shell.

 WARNING

In order to avoid electrical shock injury and facilitate cleaning, cleaning function generator should turn off the power, remove the power and signal cable.

 CAUTION

In order to avoid electrical shock injury or damage to the function generator, the cleaning instrument should be completely dry so only after the power boot.

In order to prevent damage to the function generator, do not use solvents to clean the function generator. If you need to clean the function generator, when the instrument cutting off the power cooled to room temperature, you can use the cloth with water or neutral water-soluble detergent to wipe the function generator. Do not use on metal, plastic, rubber, plexiglass and other materials with corrosive or abrasive cleaning agents to wipe the function generator. Should be avoided detergent residues, contaminated terminal or into the instrument in a clean. The cleaning instrument should be completely dry so only after the power boot.

Ease to use, standard attachment were be provided when instrument come out from the factory.

- RF coaxial test clip leads one
- Three-core power cable one
- Products Instructions one
- Spare fuse T0.5A/250V one