

**INSTRUCTION MANUAL**  
*For the*  
**Conducted Comb Generators**  
**CGC Series**  
**Models CGC-255E / CGC-510E**  
50 or 250 kHz step / 100 or 500 kHz step



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## Introduction

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This manual provides on how maintain and use the CGC series Conducted Comb Generator.

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## Product specifications

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<b>Models covered:</b>	CGC-255E / CGC-510 E
<b>Frequency step size:</b>	50 & 250 kHz step / 100 & 500 kHz
<b>Output Variation*:</b>	< $\pm 1$ dB
<b>Usable Frequency:</b>	50 kHz – 115 MHz (CGC-255E) 100 kHz – 115 MHz (CGC-510E)
<b>Internal Battery Type:</b>	6 V Rechargeable NimH
<b>Battery charger adapter specifications:</b>	
- Input:	115 / 230 VAC, 60 / 50 Hz
- Output:	6 VDC @ 500 mA (unregulated)
- Plug type:	2.5 ID x 5.5 OD mm (center pin positive)
<b>Output connector type:</b>	3 pole North American plug (NEMA 5-15)
<b>Operating temperature Range:</b>	5°C to 40°C
<b>Weight:</b>	2 lb. (max.)
<b>Circular base dimensions (W x H) :</b>	5 x 2.2 x 2.2 inches / 13.2 x 5.9 x 5.9 cm
<b>Weight (lb / kg):</b>	1 lb / 0.5 kg

\*Output variation with Comb Generator connected directly to EMI receiver or spectrum analyzer.

### Other Comb Generator models available from Com-Power

- CGO-520           Comb Generator, 20 MHz step
- CGO-5100B       Comb Generator, 100 MHz step
- CGO-51000       Comb Generator, 1 GHz step
- CGO-501           Comb Generator, 1 MHz step
- CGO-505           Comb Generator, 5 MHz step
- CGO-515           Comb Generator, 1 or 5 MHz step

## Important precautions and Maintenance

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### Precautions

The Conducted Comb Generator is an conducted signal source designed to produces signals over wide frequency range to verify conducted emissions test setup that utilize Line Impedance Stabilization Networks. It was designed for use in EMI test laboratory.



**Denotes: Read and understand user manual carefully before operating the equipment.**

### Maintenance

There are no user serviceable parts inside the unit. User modifications to the Comb Generator will void warranty. The Comb Generator uses re-chargeable NimH batteries. Call the factory if the battery needs replacement. Send Comb Generator to authorized Com-Power service center if needs repair. Please visit our website at [www.com-power.com](http://www.com-power.com) to request a return merchandise authorization number (RMA) before you send the unit in for service.

### Battery care and instructions

#### To avoid any risk of explosion

- Replace batteries with the size and type specified in this manual.
- Do not dispose of batteries in a fire or trash incinerator, or leave batteries under direct sunlight.
- Do not immerse batteries in water or otherwise get them wet.
- Do not charge batteries, that appear to be leaking, discolored, rusty, deformed; emit an odor
- Use only battery charger adapter supplied with the Comb Generator to charge the batteries.

### **Environmental Conditions**

This equipment is designed for indoor and outdoor use and is safe under the following environmental Conditions:

- Temperature: 5° C to 40° C
- Maximum relative humidity: 80%

## Warranty

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Com-Power warrants to its Customers that the products it manufactures will be free from defects in materials and workmanship for a ***period of 3 years***. This warranty shall not apply to:

- Transport damages during shipment from your plant.
- Product operated outside their specification.
- Improperly maintained or modified.
- Consumable items, fuses, power cords, cables, etc.
- Normal wear
- Calibration
- Product is shipped outside the United States without the prior knowledge of Com-Power.

In addition, Com-Power shall not be obliged to provide service under this warranty to repair damage resulting from attempts to install, repair, service or modify the instrument by personnel other than Com-Power service representative. Under no circumstances does Com-Power recognize or assume liability for any loss, damage or expense arising, either directly or indirectly from the use or handling of this product, or any inability to use this product separately or in combination with other equipment.

When requesting warranty services, it is recommended that the original packaging material be used for shipping. Damage due to improper packaging will void warranty.

In the case of a complaint, a label should be attached to the housing of the instrument which describes briefly the faults observed. If at the same time the name and telephone number (dialing code and telephone or direct number or department designation) is stated for possible queries, this helps towards speeding up the processing of warranty claims. In order to obtain service under this warranty, Customers must contact the Com-Power.



## Product Description

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### Overview

The CGC series Comb Generators are reference signal sources for verifying conducted emissions test setup which uses Line Impedance Stabilization Networks. They were designed for EMC laboratories use. They are ideal for quickly detecting malfunctioning equipment in the test setup in between full calibration intervals. These malfunctions may go undetected, unless it they are checked often. Full site calibration although more accurate is time consuming is not practical for a quick test. By comparing Comb Generator data taken at regularly, the EMI lab can ensure that all the test equipment and accessories are operating within the expected operating range. If any abnormality is detected, it can be quickly investigated and rectified before it causes measurement errors.

The conducted Comb Generators can also be used for comparing two or conducted emissions test setups

### Items included with each Comb Generator.

Equipment, accessories, and documents supplied with the model CGC-255E and CGC-510E Comb Generators are as follows:

- User's guide
- Custom wooden storage box
- Battery Charger adapter
- Test data (optional reference data at extra cost)

## Controls & indicators

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### Front Panel



#### Output connector /plug

The comb generator output is available on the North American Plug (NEMA 5-15) located on the front. This allows the Comb Generator to be plugged directly into the LISN that uses a matching socket for powering equipment under test. If the LISN has other types of power connection, please call Com-Power for assistance or use a suitable adapter.



Please do not connect the NEMA 5-15 plug of comb generator into the LISN while the LISN is plugged into a live AC/DC power source it could lead to potentially hazardous situation that might result in personnel injury. Please ensure to disconnect the power to the LISN before plugging in the comb generator.

### Back Panel



### Power

The power button on the back panel enables or disables the signal output.

**Frequency selection switch**

The toggle switch allows users to select the frequency step size. The user can select between 50 kHz and 250 kHz with CGC-255E and 100 kHz and 500 kHz with CGC-510E.

**Green LED**

The green LED lights up when the power switch is turned ON indicating Comb Generator output is available for measurement.

**Battery Low indicator**

When red battery Low LED is lit, the internal battery needs recharging. The output may not be reliable when the LED is on. Charge the battery with the supplied adapter, you may use the comb generator while it's charging. The approximate time to fully charge the battery is 8 hours.

## Theory

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The conducted Comb Generators use an impulse to generate its step frequency output. It uses a stable power supply and signal shaping circuit to obtain relatively stable signal output with frequency components extending up to 115 MHz.

The Comb Generators operates on battery power. The battery output is controlled by a voltage the regulator circuit to provide stable power output to the signal generating circuit. The signal generating circuit consists of a clock generator, impulse generator, wave shaping circuit and output matching. The signal frequency is generated by a crystal oscillator. An impulse in time domain corresponds to a flat output across the entire frequency spectrum in frequency domain. An ideal impulse, by definition is an infinite magnitude pulse with zero rise and fall time with no duration. Such a pulse is not practical; however, the models CGC-255E and CGC-510E conducted Comb generators use this principle to get an output across a wide band. The highly stable frequency output from the oscillator is used to generate an impulse with very short duration and sharp rise and fall times. The shaping circuit was designed for improved stability, extended frequency response, and output impedance matching to 50 ohms. Since the circuit cannot generate an ideal impulse with zero rise and fall times.

This theory describes the general behavior of the field, but each Comb Generator may behave slightly different than the other due to circuit variation. Since the Comb Generators were designed to provide a reference reading at a given frequency, this limitation is not a problem.

## Application

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### Measurement Procedure

- Make sure the Comb Generator batteries are charged and the low battery indicator is not on. The CGC series Comb Generators can be powered by the supplied DC adapter during the test, but Com-Power recommend using it's battery power to avoid any potential RF interference.
- Plug the Comb Generator Directly into the EUT Power socket on the LISN (See figure below). The LISN can remain connected to the AC power source.
- Turn Conducted Comb Generator on using the power switch on the back.
- Select the desired frequency step size using the toggle switch.
- Select the LISN line to test either from the front panel or remotely if this option is available.
- You can gather test data using the conducted emissions test software or you can gather the same data manually tuning to each frequency on the spectrum analyzer or receiver and recording the peak amplitude displayed.
- Make sure to use exact setup for all future measurements. Changing any component in your setup may invalidate this test.



## Typical Direct Output

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These are Conducted Comb Generator outputs connected directly into a spectrum analyzer input.

### Typical Output - 50 kHz Step Size

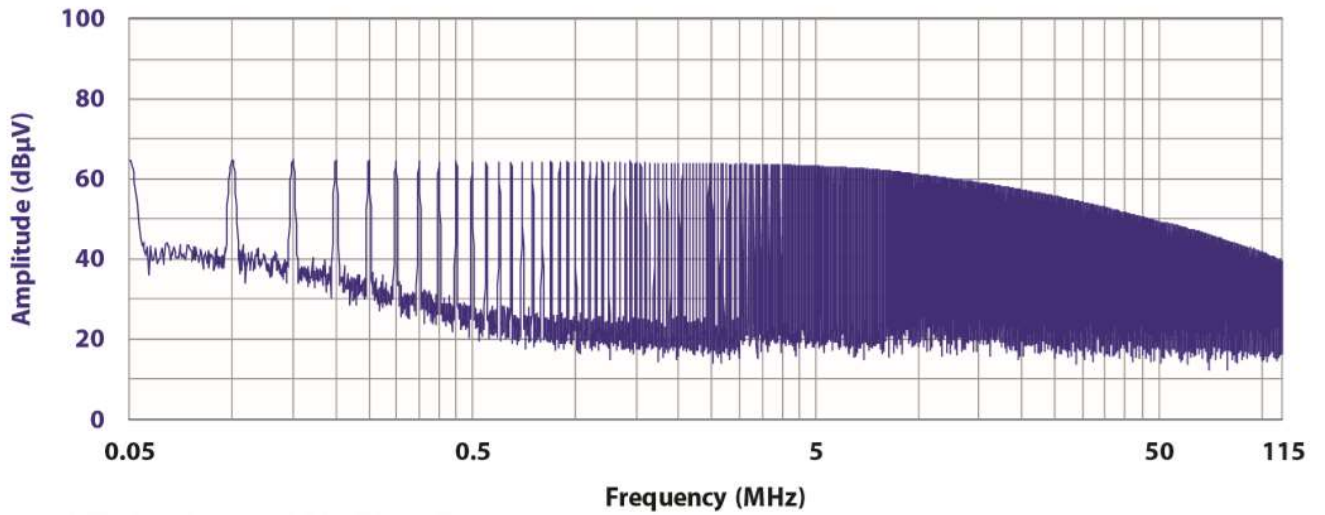


Figure 1

### Typical Output - 250 kHz Step Size

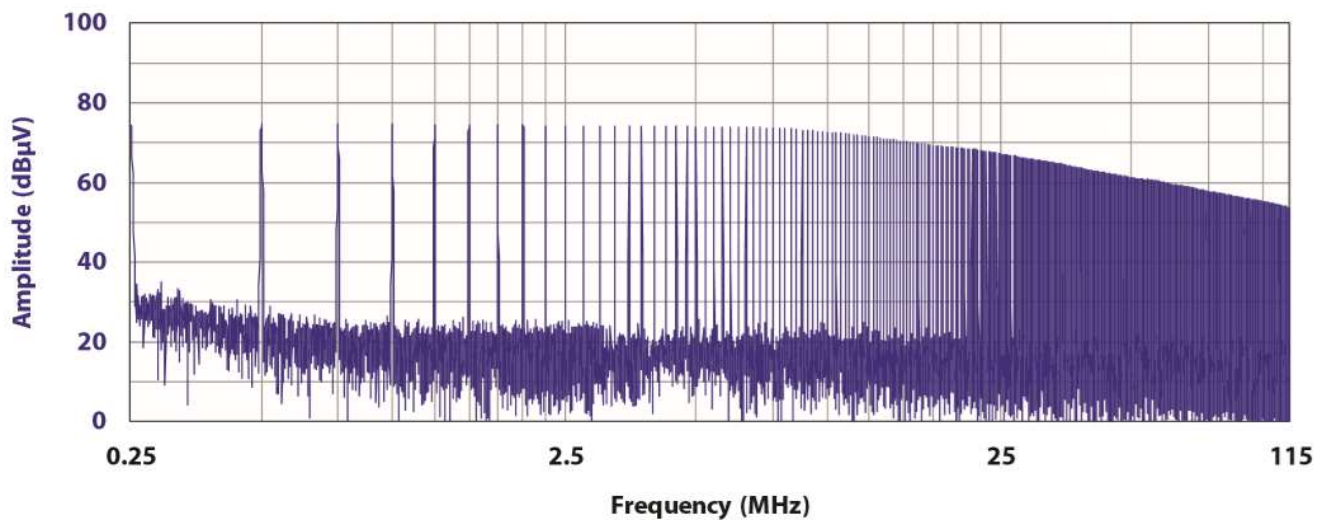


Figure 2

### Typical Output - 100 kHz Step Size

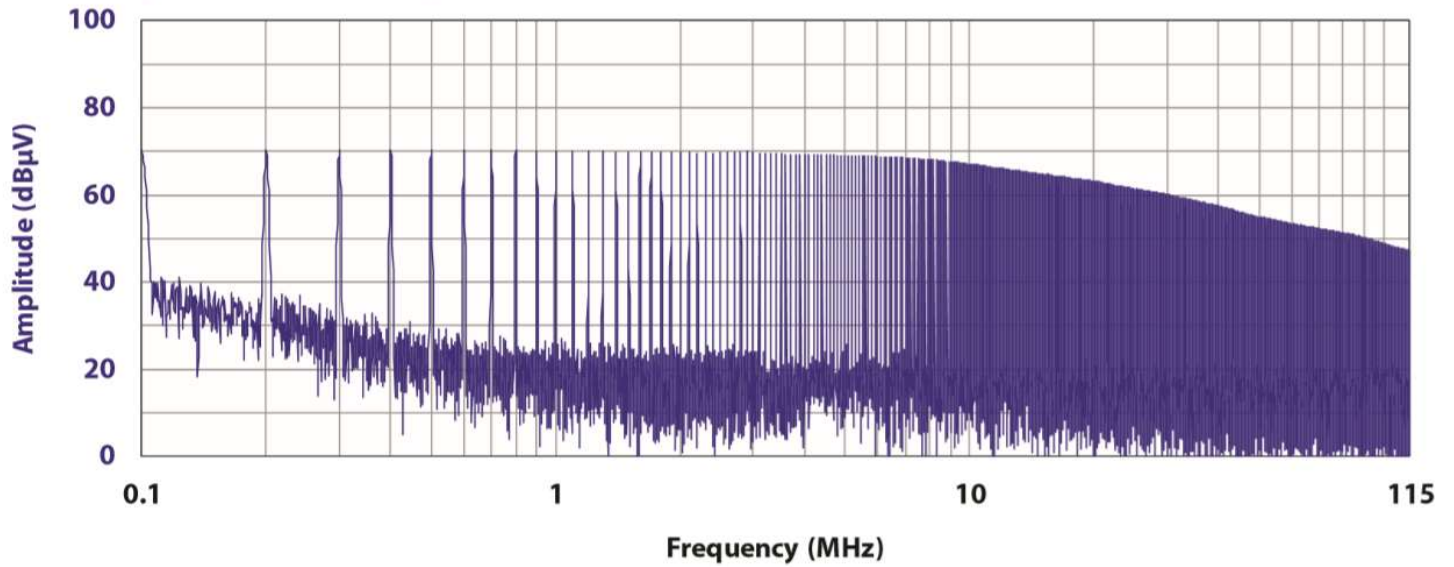


Figure 3

### Typical Output - 500 kHz Step Size

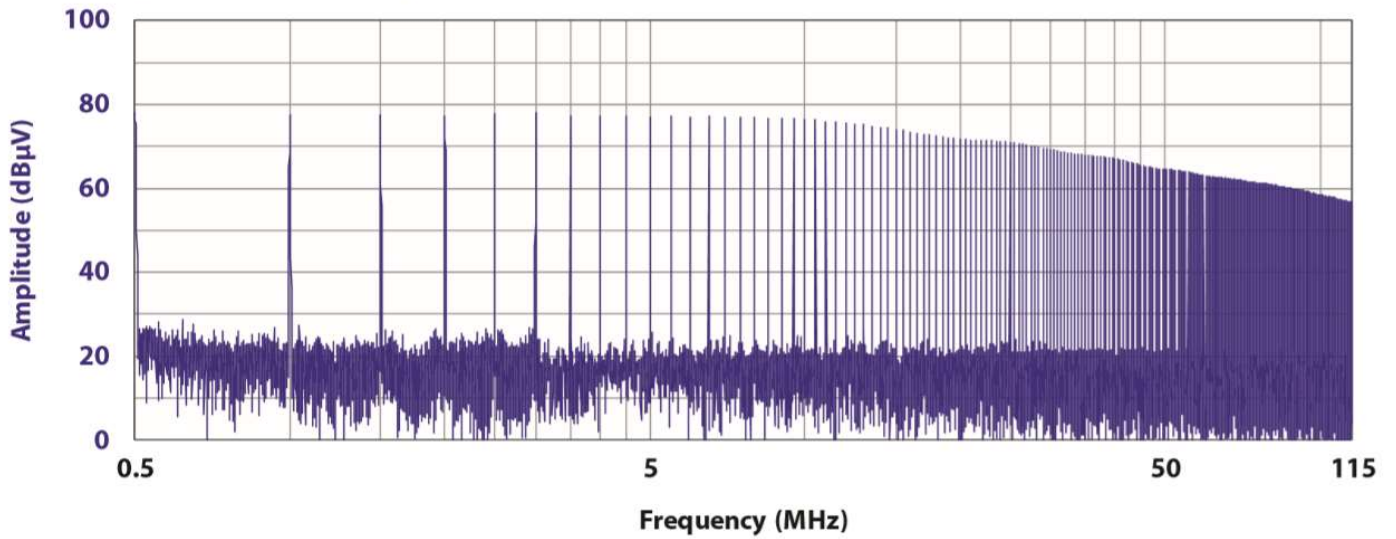


Figure 4