MANUEL D'INSTRUCTIONS
INSTRUCTIONS MANUAL

GF467F / GF467AF*

GENERATEUR DE FONCTIONS
FONCTIONS GENERATOR

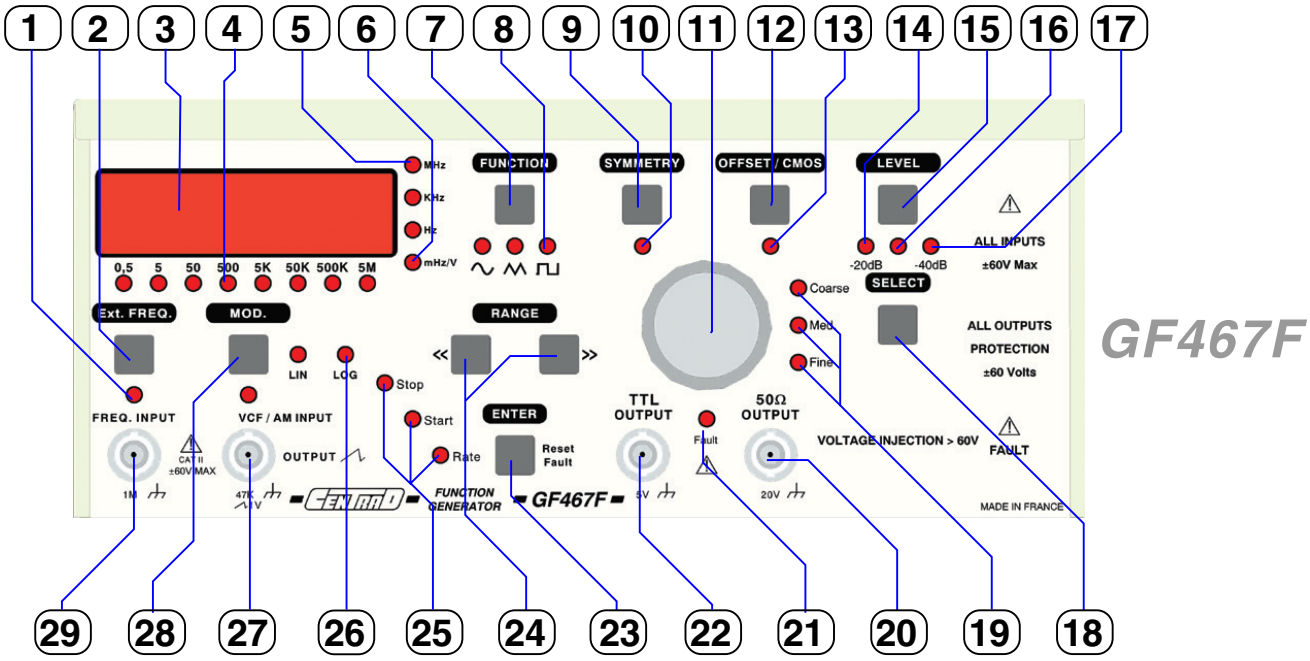
0.01 Hz - 5 MHz ∿∿⊓⊔⊿

Fréquencemètre 0 - 50 MHz

Frequencymeter 0 - 50 MHz

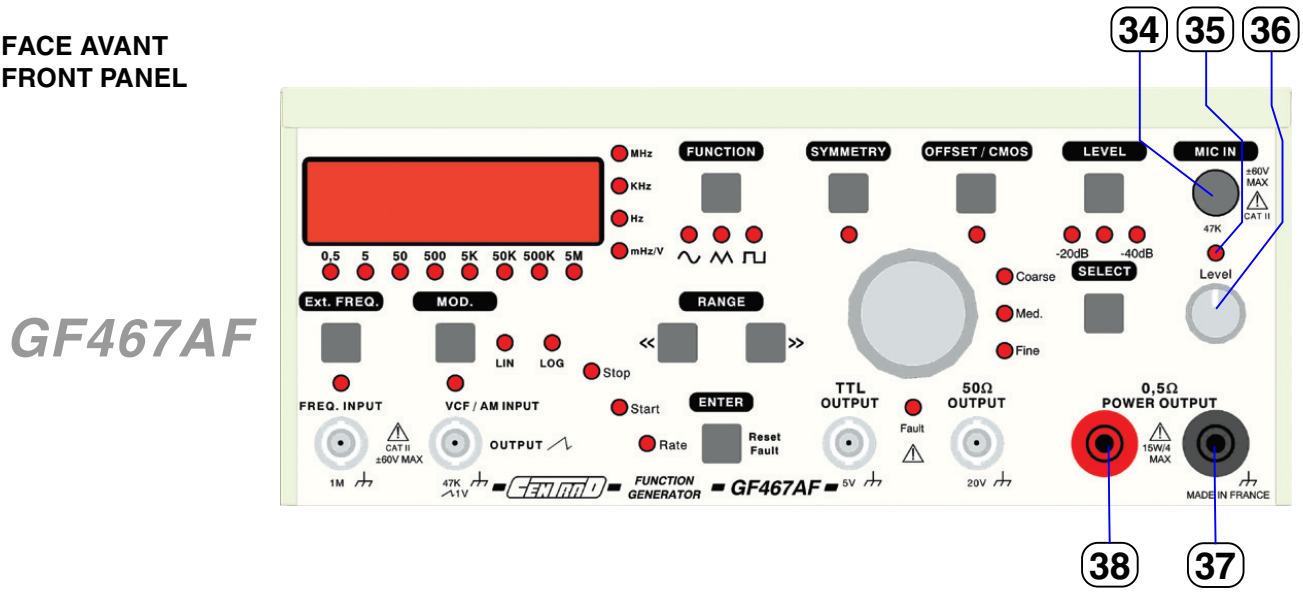
Amplificateur 15 W*

*Amplifier 15 W**

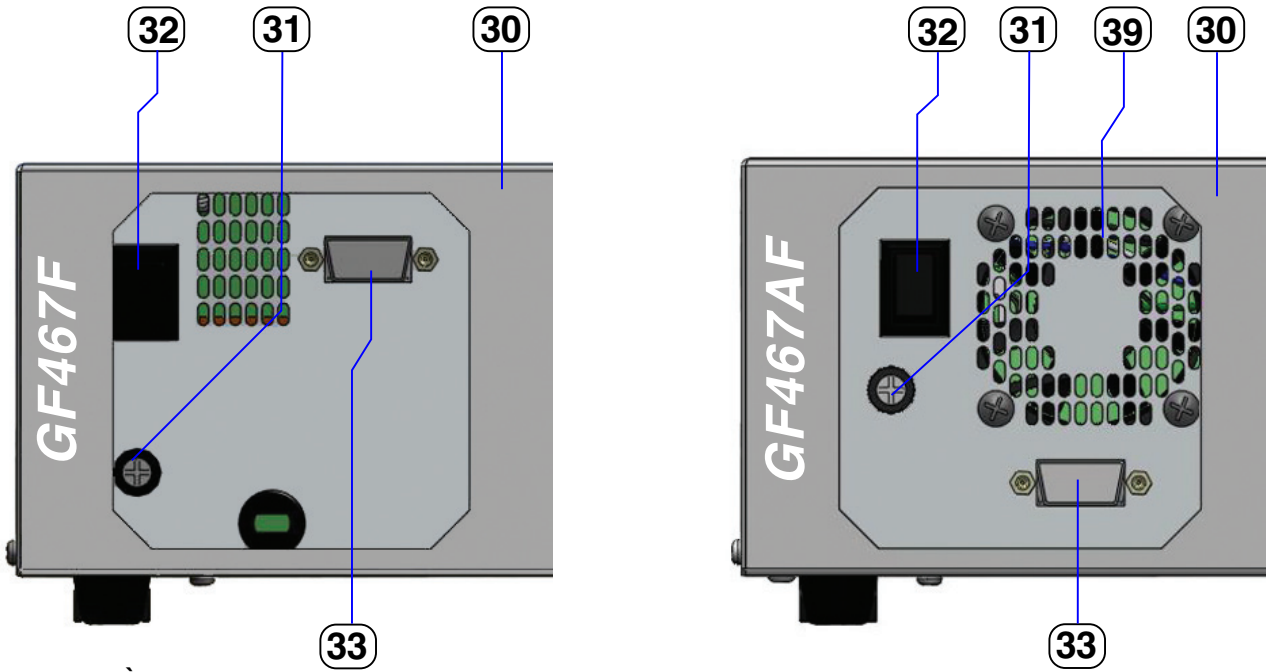


GF467F

FACE AVANT
FRONT PANEL



GF467AF



FACE ARRIÈRE
BACK PANEL

4000 4 333-Evo1 - 01/08

TABLE OF CONTENTS

1 - PRELIMINARY INFORMATION

1-1 INTRODUCTION

You just bought the **CENTRAD*** FUNCTIONS GENERATOR type GF 467F/AF. We thank you and congratulate you for your good choice. **elc** also proposes many electronic test instruments : POWER SUPPLIES, FREQUENCY METER, PANEL METERS, DECADES BOXES...

*CENTRAD is a registered trademark of the **elc** company.

Manufacturer	:	**elc** 59, avenue des Romains 74000 ANNECY - FRANCE
Phone	:	+33 (0)4 50 57 30 46 Fax : +33 (0)4 50 57 45 19
Instrument	:	**FUNCTIONS GENERATOR**
Trademark	:	**CENTRAD**
Type	:	**GF467F or GF 467AF**
Input voltage	:	230V AC 50/60 Hz

1-2 SAFETY INSTRUCTIONS

This instrument must be used according to this manual instructions.

No intervention is authorized inside the casing.

Made to be used indoors, do not expose to the rain.

The plug of the feeding cable being used as the switch off device, the instrument must be connected to a easily accessible mains socket (230V 50/60Hz).

For a natural and correct cooling, the generator must stand on its four rubber thrusts and the back must be widely cleared.

<u>Electrical overload</u> : Never apply, to the inputs, a voltage exceeding the specified ranges.

1-3 SYMBOLS AND DEFINTION

You will find following symbols on the instrument :

CAUTION ! RISK OF ELECTRIC SHOCK

EARTH TERMINAL

CAUTION ! REFER TO THE MANUAL

2 - PRELIMINARY INSTRUCTIONS

2-1 PACKAGING

The GF467F/AF package is intended to protect it during its transport.
Keep it, it may be useful later on.

Packing list

1 instructions manual 1 plastic protected cover 1 functions generator : GF 467F/AF
2 cardboard side covers

2-2 TECHNICAL FEATURES

Functions	:	Sine, triangle, square, impulse, offset, cmos (10Vpp Max), internal linear or logarithmic sweep and external VCF or FM modulation. Internal AM modulation with fixed frequency (440Hz) or external.
Frequency range	:	0.01Hz to 5MHz in 8 ranges.
Setting	:	Frequency adjustement : thumwheel switch 3 steps (big, medium, fine)
Drift	:	1% in 8 hours (after 30 minutes of working)
Sine wave	:	harmonic distortion : <1% and every harmonics below -30dB.
Square wave	:	rise and fall time of 30ns max (10 to 90%).
Triangular wave	:	non-linearity below 1% (up to 100KHz)
Duty cycle	:	adjustable from 20% to 80% continuously on all wave forms.
Frequency's sweep	:	Internal linear or logarithmic Sweep wave available on BNC socket, 1V level on 47KΩ ramp period : 5s to 10ms sweep depth : 1 to 100 range
Modulation input	:	input impedance : 47KΩ - BNC socket control voltage : ±10V for a frequency variation of ±500 maximum permissible voltage : ±60 V peak
Amplitude Modulation	:	440Hz internal fixed frequency (''LA'') or external on BNC socket
50Ω output		: stands steady short-circuits -BNC Socket
Amplitude adjustable from	:	0 to 20 V peak to peak without load 0 to 10 V peak to peak with a 50Ω load
Amplitude adjustement	:	±0.4dB from 0.01 Hz to 5MHz
Attenuator	:	fixed : 0 dB, -20dB, -40dB switchable variable from 0 to -40dB (total -80dB).
Offset voltage	:	**independent of the output attenuator** calibrated at 0V ± 10mV variable of ±10V without load, of ±5V with a 50Ω load
50Ω ouput protection	:	maximum voltage on reinjection ±60Volts peak
TTL Output	:	stands steady short-circuits -BNC Socket synchronous square wave 0 - 5 volts ; Duty cycle calibrated at 50% or adjustable from 20% to 80% continuously fan out > 10 - Rise and fall time < to 20ns.
TTL output protection	:	maximum voltage on reinjection ±60Volts peak
Frequency meter	:	Direct reading of the internal frequency of the generator or reading of the input «FREQ»
	:	8 automatic ranges from 10mHz to 50MHz. Reciprocal reading for very low frequencies.
Display	:	5 digits of 14mm
	:	4 leds for the units display (MHz, KHz, Hz, mHz)
	:	Quartz time base of 4MHz 50ppm
Typical accuracy	:	±0.025% +1digit
Input for external measurement	:	Impedance 1MΩ // 20 pF Typical sensitivity 10mV rms at 10 MHz after one hour working
Protection of the input	:	maximum permissible voltage ±60Volts peak

GF467AF only

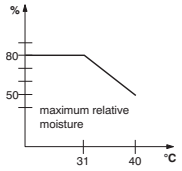
0.5Ω output	:	stands steady short-circuits - Floating outputs on 4 mm safety sockets Output impedance : 0.5Ω accuracy : ± 5% Power : 15W into 4Ω Max current : 2A Bandwidth : DC to 100 KHz Output voltage : ± 12,5V (open circuit) 7,8Vrms into 4Ω

4000 4 333-Evo1 - EN - 02/08

Amplitude adjustable from	:	0 to max by adjustment of the 50Ω output level. **-20dB and -40dB attenuators and Offset voltage have no action on the 0.5W output.**
0.5Ω output protection	:	Max voltage in reverse power surges : ± 60Volts peak
Amplifier input	:	6.35mm jack socket automatic switching immediatly on connection of a 6.35mm jack male plug. input impedance : 47KΩ ±10% sensitivity : 5mV maximum gain : 500
Gain adjustments	:	from 0 to max by trimmer bandwidth : DC to 100 KHz
Input Protection	:	maximum voltage before saturation of the preamplifier : ±350mV maximum permissible voltage : ±60 volts peak

OTHER SPECIFICATIONS

Power supply	:	mains 230V ± 10% - 50/60Hz
Input voltage	:	Double insulation irremovable cords with 2 poles
Consumption	:	30VA maxi for F version; 86VA maxi for AF version
Dimensions	:	P = 238mm L = 218mm H (folded feet) = 101mm H (unfolded feet) = 134mm
Weight	:	2.2 Kg for F version; 3.3 Kg for AF version
Conditions of use	:	+5°C to +40°C
Conditions of storage	:	-10°C to +50°C
Conditions of humidity	:	see graph
Safety	:	Classe **II**
	:	EN 61010-1 Standard - Overvoltage category II, pollution degree 2
EMC	:	EN 61326-1



3- CONTROLS DESCRIPTION (see graph page 2)

1 Warning of external frequency measure
2 Selector of the int. or ext. frequency meter
3 Indicator with 14mm LED
4 Warning Leds of the selected frequency range
5 LED of units of measurment
6 LED of units of measurment : mHz and voltage
7 Selector of signal's type
8 Selector of frequency range
9 Selector of the mode «symmetry setting»
10 LED of manual setting of the symmetry
11 Thumbwheel switch (parameters adjustment)
12 Selector of the mode «offset voltage»
13 LED of offset voltage
14 LED of -20dB fixed attenuation
15 Setting of the signal's amplitude level
16 LED of manual setting of the amplitude
17 LED -40dB fixed attenuation
18 Selector of thumbwheel switch finest's action
19 LED of thumbwheel switch finest's action
20 «50Ω ouptut», BNC socket
21 LED of protection activated
22 «TTL output», BNC socket
23 Reset selector/Functions validation
24 Selector of frequency range
25 Selector of modulation adjustment levels
26 LED of selected sweep type
27 BNC modulation input or AM/ ramp output
28 Selector of modulation type
29 BNC frequency meter input
30 Housing for mains cord
31 Fuse
32 ON/OFF switch
33 RS232 socket
34 External amplifier input
35 LED of external signal amplification
36 Amplification seeting of external signal
37 0.5**Ω** output socket
38 0.5**Ω** output positive socket
39 Fan

4 - DESCRIPTION OF THE DIFFERENTS FUNCTIONS

[2] SELECTOR OF THE INT. OR EXT. FREQUENCY METER «Ext. FREQ.»
[3] When the warning **[1]** is off, the indicator **[3]** shows the frequency of the generator's signal.
[1] [29] Pressing the selector **[2]**, the LED **[1]** is lightening and the frequency measure it is done in the BNC input **[29].**

The maximum permissible voltage is ± 60V.
ELECTRICAL OVERLOAD: Never apply to the inputs a voltage exceeding specified ranges.

The frequency range on the external frequency meter is from 10mHz to 50MHz.
The sensitivity curve is 10mVrms from 10mHz to 10MHz then it progressively increases to reach 35mVrms at 50MHz (this after 30mn warm-up)
If there is no signal on the FREQ **[29]** input, the LED **[3]** shows this : (-----).

As soon as a signal in the frequency and voltage range is present on the FREQ input **[29]**, the LED **[3]** shows its frequency. The display mode is automatical (decimal dot and range).
This frequency meter is reciprocal for low frequencies. It measures the signal period and converts it into frequency to show it. This automatic way of work allows to keep the accuracy when measuring very low frequencies (< 1Hz) and shorten the time of measurement.
However, to mesure 10mHz (which is 1/10mHz = 100 secondes), a maximum of 150 seconds is necessary before obtaining the first measure. After that, they will be rythmed according to the signal period, so in this case, each100 secondes.
Nota : for information, if the measure was made in frequency mode and with an accuracy of 10%, 1000 seconds (= 17mn) will be necessary !

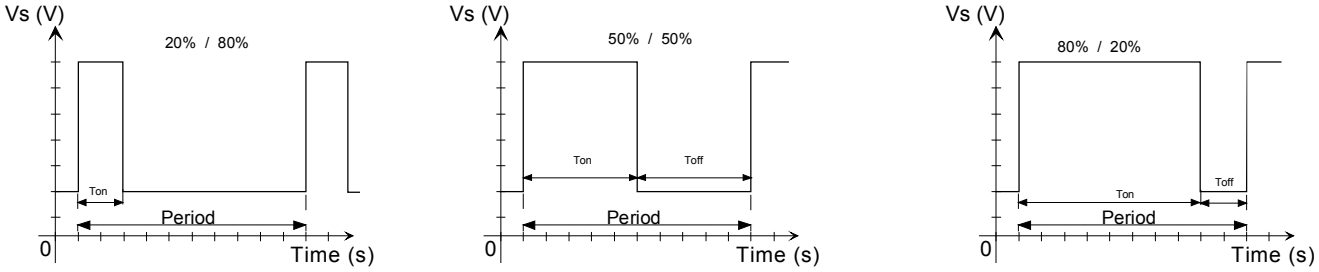
[3] FREQUENCY OR PARAMETERS DISPLAY

[5] The 5 digits LED indicators show frequency, voltage, duty cycle and modulation.
The LED **[5]** and **[6]** show the unit of measurement (MHz, KHz, Hz and mHz).
The LED **[6]** shows the measure of mHz seeting frequency and V in other adjustments.

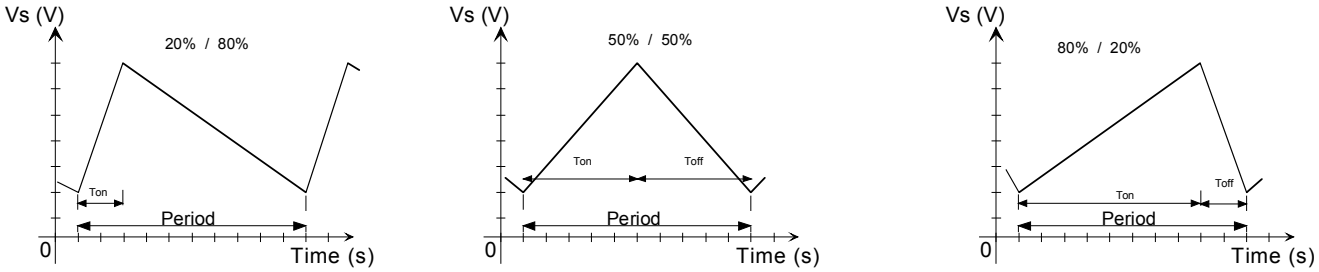
[24] SELECTOR OF THE FREQUENCY RANGE «RANGE»
The frequency ranges are selected by means of 2 selectors located in **[24]**.
A pressure on the selector **[24]** << selects the next range **[4]** towards the left.
A pressure on the selector **[24]** >> selects the next range **[4]** towards the right.
The control of the range is buckled on itself :
- if the 5M(*Hz)* warning is on and you press the selector >>, the next selected range will be 5(*Hz)*
- if the 5(*Hz)* warning is on and you press the selector <<, the next selected range will be 5M(*Hz).*

[7] SELECTOR OF SIGNAL'S TYPE (FUNCTION)
The selector of signal's type **[7]** allows to select one of the 3 wave forms : sine, triangle, square.
A pressure on the selector **[7]** displaces to the next function towards the right.
The control of the range is buckled on itself :
- If the led **[8]** ⊓⊔ is lightening and you press the selector **[7]** the next selected function will be sine ∿ .

[9] SELECTOR OF THE MODE SYMMETRY SETTING «SYMMETRY»
Symmetry adjustment is active on the output 50 Ohms **[20]** and TTL signal **[22].**
The led **[10]** flashes indicating that the mode «Symmetry Setting» is on, the display **[3]** shows the parameter on. After selection of the mode, the thumbwheel **[11]** allows adjustment by steps of 1% between 20% and 80%. A second pressure on the selector of symmetry reset it at 50/50. If you select another mode while symmetry is diferent from 50/50, the led **[10]** lights up constantly.
This mode is generally applied to square signals and allows to give the ratio of the time (at the top position) of the signal compared with its period.
Thus it is possible to modulate the signal's width and to generate pulses.
The signals of the diagrams bellow have respective duty cycles of 20/80%, 50/50% and 80/20% :



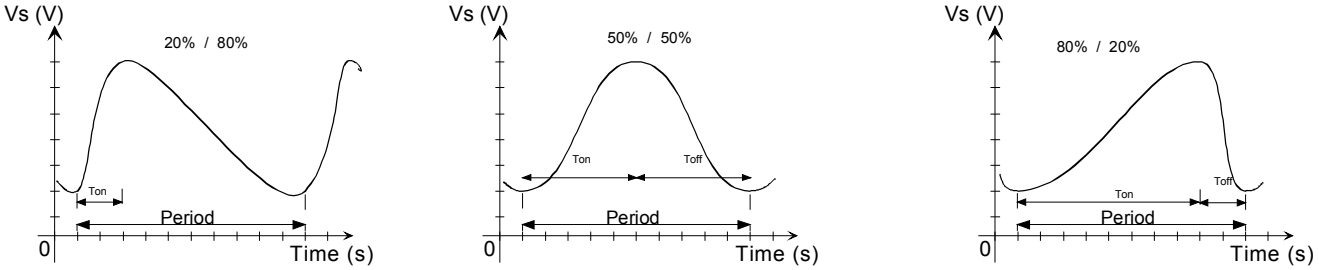
Use of the cyclic ratio with triangular signals
When the LED **[10]** is flashing and the LED **[8]** is in the triangular position ∿ , the symmetry's setting knob modifies the triangular signal in saw tooth signal or ramp.



4000 4 333-Evo1 - EN - 02/08

Use of cyclic ratio with sine signals

When the warning **[10]** is flashing and the warning **[8]** is in the sine position ∿, the symmetry'setting knob modifies the sine signals as indicated below :



[12] SETTING OF THE OFFSET IN THE 50 Ω OUTPUT «OFFSET/CMOS»

The led **[13]** flashes to indicate the setting of the offset is on. The display **[3]** shows the DC voltage of the signal. The tumbwheel switch **[11]** allows the setting of the offset. The 3 steps (big, medium, fine) of adjustment **[19]** can be used to do a finest setting (switch **[18]**).

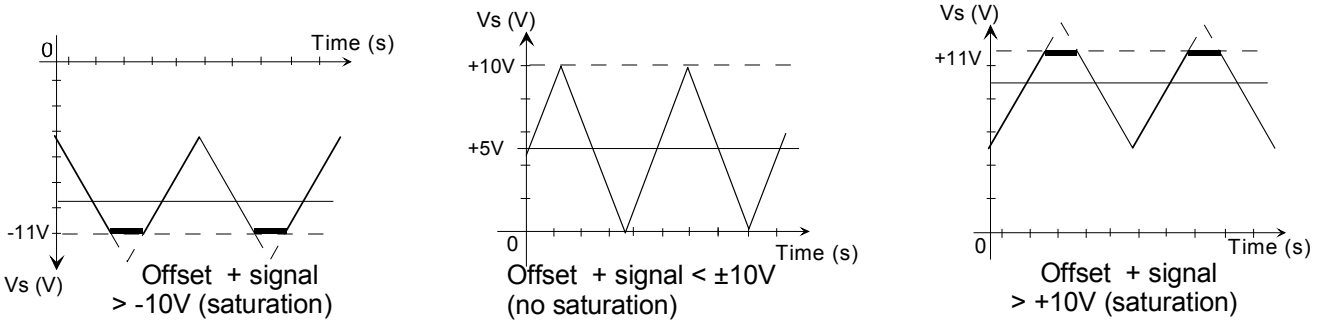
A second pressure in the switch of the offset reset it at 0Vdc. If you do another setting while the offset is diferent from 0Vdc, the led **[13]** lights up. The setting allows to bring to the alternative signal a continuous voltage adjustable between -10 to +10 Volts in open circuit.

This voltage is completely independent of the fixed [14] and variable [16] attenuators.

COMMENTS :

The output peak voltage of the amplifier is ± 10V. The amplifier reaches the saturation point at ± 11V.In order to obtain an accurate output signal, it is necessary not to exceed 10V as absolute value (offset + signal).

The output impedance of the GF467F/AF is 50Ω. If this output has a 50Ω load, internal resistance and load make a divider by 2 : the voltage range will be from -5V to +5V.



COMPLEMENTARY FUNCTION CMOS :

Reminder : ''Cmos'' is a function that allows to couple systematicaly the setting of level and the offset in order to obtain an output signal ever positive between 0 and 0.....+10V.

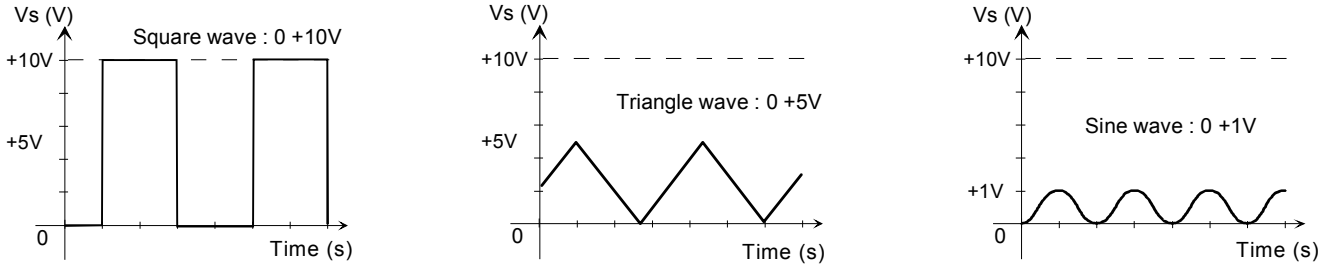
Start : a long push in the switch Offset **[12]** untill it indicates «ON»

Deactivation : idem until it indicates «OFF»

CAUTION : The offset generated by the function Cmos must be manually rebooted when the mode will be exit.

Nota : when the function Cmos is activated, the setting of the offset is not available.

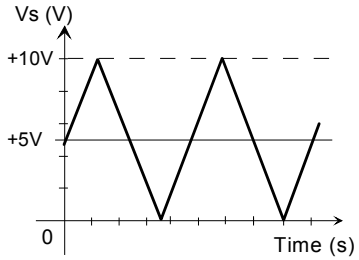
Signals Example :



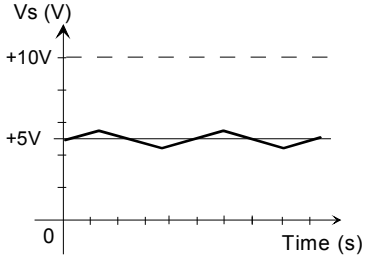
[15] SEETING OF THE LEVEL AND THE ATTENUATORS (LEVEL)

A push on **[15]** allows the setting of of the offset by the thumbwheel switch **[11]**. The led **[16]** flashes to indicate that the mode setting LEVEL is activated. The selector **[18]** activating **[19]** «Coarse, Med, Fine» can be used to make a finest adjust.

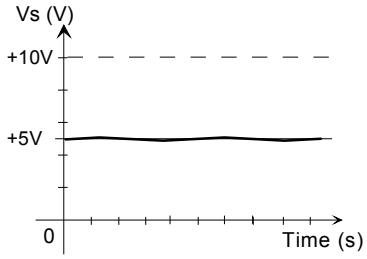
The GF467F/AF is fitted with three positions of fixe attenuation of the output signal.
A second push on the LEVEL switch **[15]** allows to activate the attenuators in the following sequences : 0dB, -20dB, -40dB, -20dB, 0dB...
The LED **[14]** and **[17]** are off in mode of 0dB fixed attenuation.
Mode fixed attenuation : -20dB (the output signal is divided by 10), the indicator **[14]** is lightening.
Mode fixed attenuation : -40dB (the output signal is divided by 100), the indicator **[17]** is lightening.
The setting by the thumbwheel **[11]** allows to attenuate the signal of -40dB with, at the bottom of setting the function DC (attenuation of -70dB).



Offset : 5V
Att : 0dB Signal : ±5V



Offset : 5V
Att : -20dB Signal : ±0.5V



Offset : 5V
Att : -40dB Signal : ±0.05V

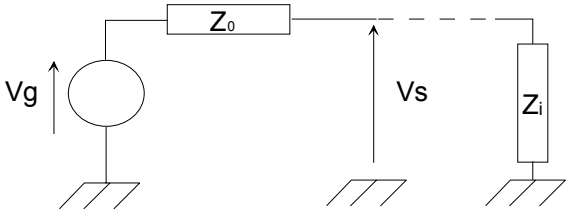
	0dB	**-20dB**	**-40dB**
Minimum amplitude	DC	DC	DC
Maximale amplitude	20V peak to peak	2V peak to peak	200mV peak to peak

[18] SELECTOR OF FINEST (SELECT)
This selector allows a setting plus or minus accurate of the functions on setting. The 3 leds **[19]** Coarse, Med, Fine, indicate the finest degree.

[20] 50Ω BNC OUPUT
The output signal of the generator is available at the female BNC connector **[20]**.
The internal impedance Zo is equal to 50Ω.
With the impedance Zi of the output connected stage, it makes an attenuator with ratio **Zi / (Zo + Zi).**

example :

Vs measured without load = Vg = 10 V peak to peak
with Zi = 50Ω, we obtain :
Vs = 10x (50 / (50 + 50) = 5 V peak to peak



When the output **[20]** is connected to a 50Ω load, the output amplitude is divided by 2.

This output can stand a steady short-circuit without damage for the instrument and it can stand a maximum voltage on reinjection of ±60V. (see **[21] - [23]**)

[22] TTL BNC OUTPUT
The TTL output signal ⊓⊔ of the generator is available at the female BNC connector **[22]**.
It is square-shaped and TTL and CMOS compliant. Its amplitude is fixed (5V) and its cyclic ratio is adjustable continuously from 20 to 80% thanks to the selector **[9]** and the thumbwheel.
The frequency is identical to the output signal present on **[20]**. Its internal impedance is of 50Ω.

This output can stand a steady short-circuit without damage for the instrument and it can stand a maximum voltage on reinjection of ±60V. (see **[21] - [23]**)

[23] RESET SELECTOR / FUNCTIONS VALIDATION «ENTER»
The generator GF467F/AF is fitted with a protection detecting voltage on reinjections liables to damage the output levels of the instrument.
As soon as the current in the output **[20]** or **[22]** exceeds the working limit threshold of the output level, the protection disconnects automatically these outputs.
the led **[21]** is lightening and report the fault.
After suppression of the fault, a pressure on the selector **[23]** allows to reset the outputs **[20]** and **[22]**.

4000 4 333-Evo1 - EN - 02/08

If the fault has not been suppressed, the protection will be activated immediately.

The maximum voltage on reinjection is of ±60V peak.

[28] SELECTOR OF MODULATION TYPE (MOD.)

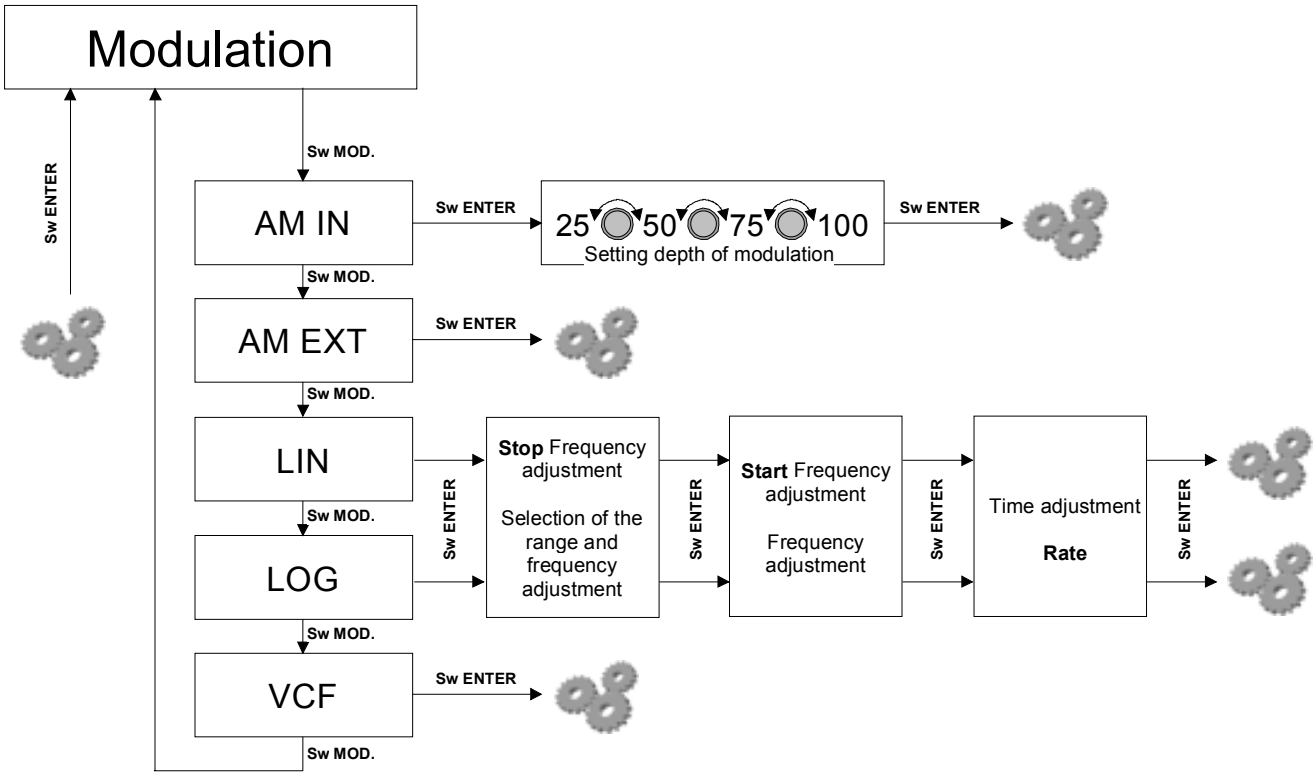
[26] The selection of the modulation mode in amplitude or frequency ('AM IN', 'AM EXT', 'LIN', 'LOG', 'VCF') is selected by means of the selector **[28]**.

Each pressure on the selector **[28]**, changes the modulation mode proceeding to :
AM IN > AM EXT > LIN > LOG > VCF > NONE > AM IN > ...

The functions LIN, LOG or VCF realise a frequency sweep which can be considered as a converter voltage > frequency.

So frequency is controled by a voltage which can be applied to the BNC input **[27]** in the VCF mode, or generated internally in the LIN and LOG configurations.
This control voltage, in the LIN and LOG's mode exits on the BNC **[27]** with an amplitude of 1V.

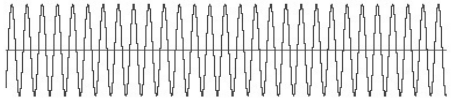
FLOWCHART OF THE DIFFERENT FUNCTIONS OF MODULATION :



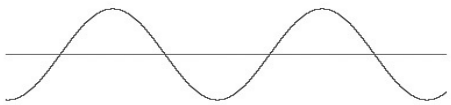
Amplitude Modulation :

AM internal modulation : Fixed frequency at 440Hz («la» of reference).
4 levels of deep modulation : 25%, 50%, 75%, or 100%.
Seettle the signal's carrier frequency and its output's amplitude (Vpp) before enter in modulation.

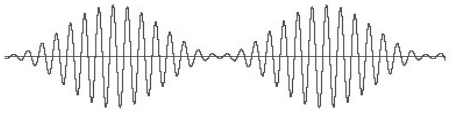
AM external modulation : Enter on BNC Modulation **[27]**
Acted as a ratio multiplier applicated to the signal's amplitude.
The depth depends on the input voltage; 1 Vrms corresponds to 100% for a Level of 10 Vpp output.



Carrier frequency of the generator seettled before the modulation be activated (Level - Frequency...)



Modulate signal :
- internal AM fixed at 440Hz, range adjustable at 25, 50, 75, 100%
- external AM, contingent of the the signal of entry



- 50 Ohms output **[20]**

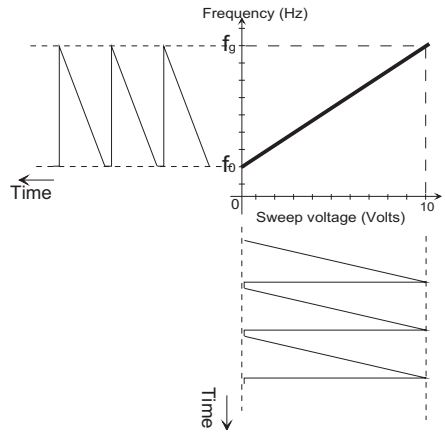
Linear 'LIN' or logarithmic 'LOG' sweep :

The linear mode is activated when the LED **[26]** LIN is lightening.
The logarithmic mode is activated when the LED **[26]** LOG is ligthening.
Internally, the GF467F/AF generates a ramp signal or a logarithm. Applying in the frequency control of the generator, the following transfer functions are obtained : (see examples next page)

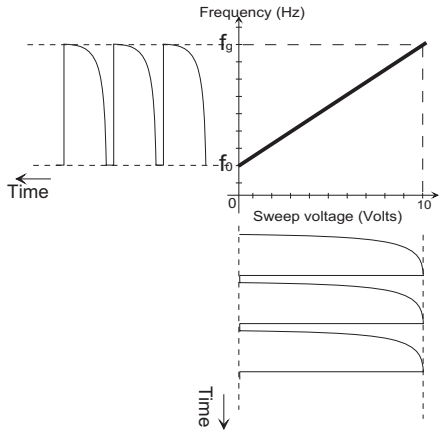
These two sweep forms only work when **f0 (Fstart) < fg (Stop).**

Adjustement **:** - activate the frequency sweep chosen (LED **[26]** LIN or LOG lightnening)
- adjust **fg** with the switch ranges **[24]** and the thumbwheel **[11]**, confirm with **[23].**
- adjust fo with the thumbwheel **[11]**, confirm with **[23].**
- adjust the period **(10ms to 5s)** with the tumbwheel **[11]**, confirm with **[23].**

LINEAR RAMP



LOGARITHMIC RAMP

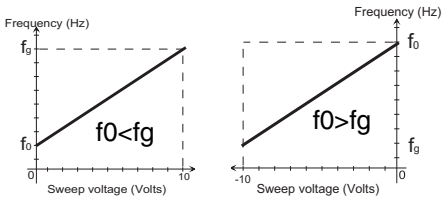


Voltage «Modulation» (=VCF) controlled frequency

When the LED **[9]** VCF is lightening, the output frequency is monitored by the voltage available at the BNC socket **[29]**.
A variation from 0 to +10 volts at the VCF input varies the output frequency from f0 to f0 x 500.
This frequency range is only possible when frequency is setting at is minimum.
In the same way, a variation from 0 to -10 volts at the VCF input varies the output frequency from f0 to f0 /500.
This frequency range is only possible when frequency is setting at is maximum.

Characteristic equation :
Output frequency = F0 x (1 + 50 x VCF input voltage > 0)
Output frequency = F0 / (1 - 50 x VCF input voltage < 0)

The BNC socket **[29]** is an input.
The maximum permissible voltage before damage is ± 60V.



Electrical overload :
Never apply to the inputs a voltage exceeding the specified ranges.

[30] FUSE
The fuse-holder is fitted with a 5x20 fuse T200mA 250V in the GF467F and a T630mA 250V in the GF467AF.

[31] ON/OF SWITCH
Switch pressed on « O »: the instrument is OFF
Switch pressed on « I »: the instrument is ON

COMPLEMENTARY FUNCTIONS OF THE GF467AF

[34] EXTERNAL AMPLIFIER INPUT
[35] The GF467AF is fitted with an input for an external signal. Immediately on the plugging in of a 6.35mm male jack, an automatic switching disconnects the generator's signal from the amplifier and replaces it by the signal present at **[34]**. The LED **[35]** lights. The gain is adjustable by trimer **[36]** from 0 to 500.
This input is a micro input, its sensivity is 5mVrms and its maximum voltage before saturation of the preamplifier is ±350mV. Its bandwidth is DC at 100 KHz.
The 6.35mm jack socket **[34]** is an input : **the maximum permissible voltage is ± 60V.**

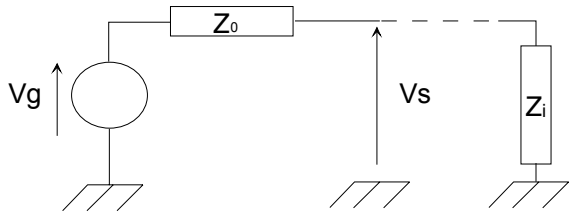
ELECTRICAL OVERLOAD:
Never apply to the inputs a voltage exceeding specified ranges.

[37] 0.5Ω OUPUT

Without connection in **[34]**, the output signal of the generator is available in both safety sockets.
The internal impedance Zo is equal to 0.5Ω.
With the impedance Zi of the output connected stage, it makes an attenuator with ratio : **Zi / (Zo + Zi)**

example :

Vs measured without load = Vg = 10 V peak to peak
with Zi = 4Ω , we obtain :
Vs = 10 x 4 / (0.5 + 4) = 8.89 V peak to peak



With a 4Ω load, the internal resistance and the load make a divider by 1,125 :
The Vg max value without load is ±12.5V. The voltage range Vs at the terminals of the load will be :
12.5 / 1.125 = ±11.11V so 7.85Vrms. The output power is thus of : $7.85^2 / 4 = 15.4W$

This output can stand a steady short-circuit without damage for the instrument and it can stand a maximum voltage on reinjection of ±60V. (The output disconnects automatically while the fault is present in the output).

[39] FAN

A system of temperature control monitores the fan, it works only when necessary.

5- WORKING

5-1 MOUNTING AND PLACING OF THE INSTRUMENT

The generator must stand on its two back rubber thrusts as well as on its two front legs (folded or fully unfolded).
Take the mains cord off its housing.
Let the back of the instrument widely cleared for the fan. Connect the mains cord to a 230VAC mains socket.
Your instrument is ready to operate.

5-2 USE

Press the ON/OFF **[32]** swith on I. The leds light up, then the display **[3]**.
Basically, the generator configuration is the last saved.
An autosave it is done each time the instrument is turn off.
However your instrument does not start correctly, turn it off 20 secondes at least and retry again.
The signal is then available on the 50Ω BNC **[20]** and in a logical form at **[22].**
A warm-up of 30 minutes is necessary in order to reach the announced specifications.

Configuration :
1- select the signal's form with **[7]**
2- select the frequency range with **[24]** and adjust frequency with **[11]**
3- select the attenuator with **[15]** and adjust the amplitude with **[11]**
4- select the mode «voltage offset» with **[12]** and adjust the value with **[11]**
5- select the signal's symmetry with **[9]** and adjust the ratio with **[11]**
6- select a modulation (if you want) with **[28]**

ADVICES :
For a signal amplitude between 200mVpp and 2Vpp, use the -20dB attenuator, the amplitude adjustement will be easier.
For a signal between 20mVpp et 200mVpp, use the -40dB attenuator for the same reason.

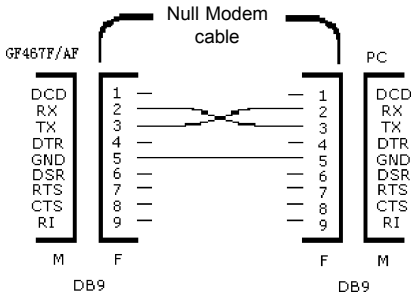
CAUTION
Adjust the signal amplitude in order to remain under the maximum voltage accepted by the load.

6- RS232 INTERFACE

The GF467F/AF is fitted with an RS232 interface very complete, convivial and simple of use.
All the functions available can be reached through this link.
This interface allows you to monitore and control the GF467F/AF with a PC as you were physically near the instrument.

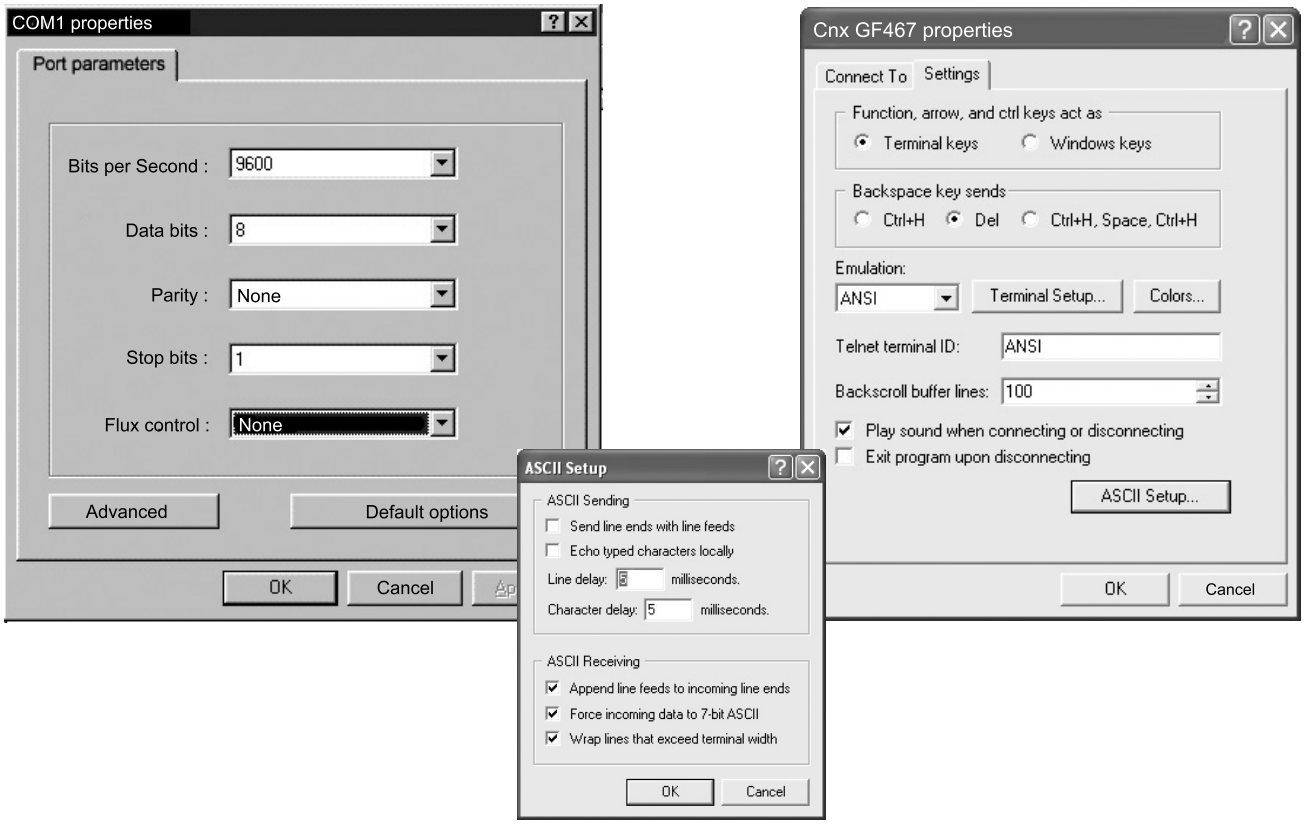
6-1 FAST STARTUP

Preparation of the comunication :
Connect the generator with the PC's serial port with a RS232 wire «null modem» (cross connections)
Nota :
If your PC has no RS232 plug, you can use an USB wire for RS232 (option) after having download the driver.
It is recommanded to use a shielded wire in order to minimise interferences due to data circulating between the instrument and the PC and its length do not exceed 3 meters.



- Use *«Hyper Terminal®»*, easy program to communicate via the serial port, present in all computers fitted with *Windows 95® or 98®* or XP ® : *«Start\Programs\Accessories\Communications \HyperTerminal»*
- Configure the port with the following parameters *(fig. 11)* :
Bits per Second : **9600**, *Data bits :* **8**, *Parity :* **None**, *Stop Bits :* **1** , *Flux control :* **None**

- Enter in the menu *File/Properties/Parameters (fig. 12)*
Check the box «*La touche Retour Arrière renvoie» :* Suppr, and then click on *Configuration ASCII (fig. 13)* :
In the frame *«Emission»*, do not check any case, put *5* in *«Line delay»*, and *«caracter delay»*.
In the frame *Réception*, check the 3 boxes and click *OK.*
- Save your configuration.
You can already start a dialogue with your generator GF467F/AF by remote access.



6-2 INTRODUCTION OF THE BASE'S DIALOGUE PROTOCOL

You can start the different functions available indicating a number of 2 figures *(cf board at the end of the manual)*.
The 2 figures replaces the action on the switch, it defines the mode selected.
The unit number replaces the action on the tumbwheel or a switch while a parameter has to be selected.
Validation and data sending or parameters sending it is done by means of the touch ***«Enter»*** *(Return)*

Example : To select the triangle function, enter: ***«0» «2» «Enter»***
Explanation : As indicated in the board, the *«0»* selects the *Fonction* and the *«2»* selects the parameter *triangle.*

To know a parameter value use the touch ***«?»***

Example : the following data ***«8» «0» «?»***, will indicate the current value of the «Level», for example : *2.5Vcc*

Nota : *To know a parameter*, the unit value has no interest.
Example : If you enter the following data ***«8» «2» «?»***, the «Level» will indicate too, for example : *2.5Vcc*

The action allowding to enter the digital data of the parameter to modify it is done by means of the ***«space»*** touch.
Example : To proceed the Level to 3,8 Volt, enter: ***«8» «0» «space» «3» «.» «8» «Enter»***
Nota : You can use unthinking the point or the comma.

6-3 USE OF THE PROTOCOL FOR FREQUENCY SETTING

The adjust of frequence it is done in few steps.
The first consists in choosing the range of adjust, the second in indicating to the generator the frequence to apply which must be included in range.
The generator allows two types to enter data :
- value in Hz (integer number) for frequences higher to kHz
- value in Hz with four decimal numbers after comma for frequences lower to kHz.

Example 1 :
Frequency to settle : 75,8 KHz.
Select first the range : 500K ; enter: ***«3» «6» «Enter»***
Enter the value : 75800 Hz ; enter: ***«4» «0» «space» «7» «5» «8» «0»«0»«Enter»***

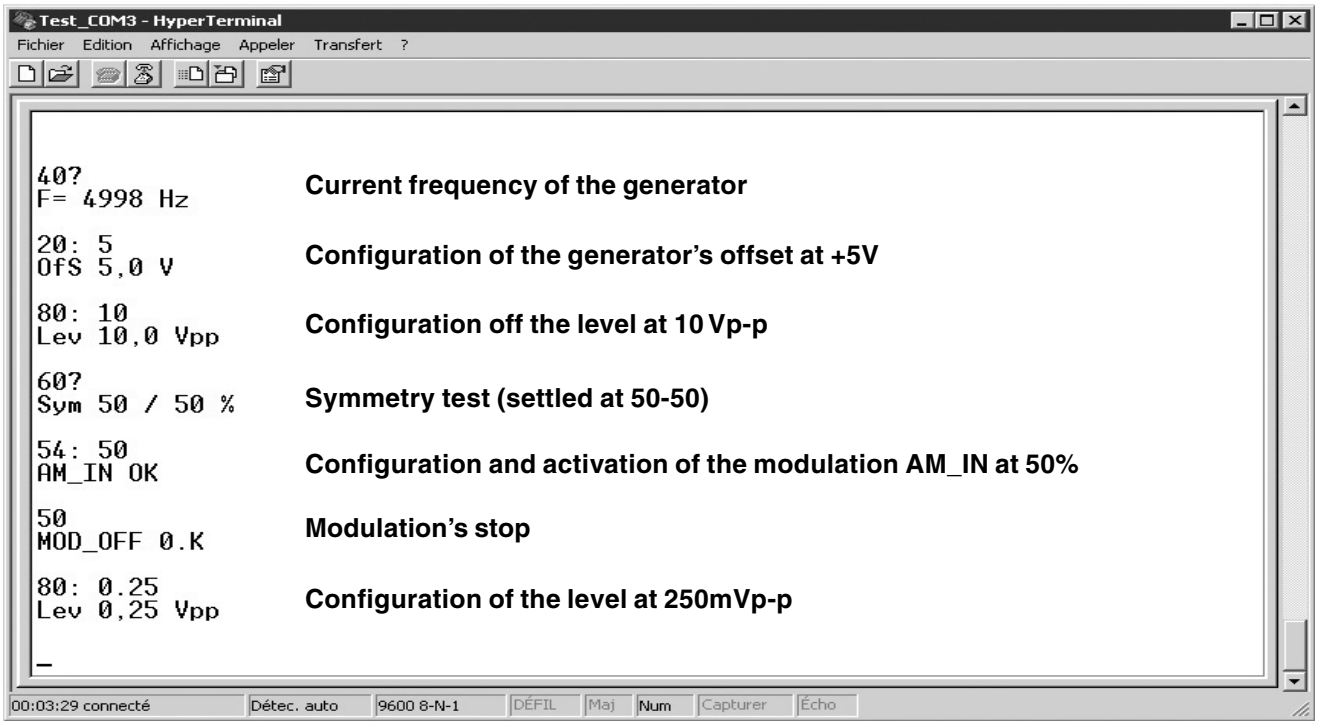
Example 2 :
Frequency to settle : 435 Hz.
Select first the range : 500Hz ; enter: ***«3» «3» «Enter»***
Enter the value : 435.0000 Hz ; enter: ***«4» «0» «space» «4» «3» «5»«.»«0» «0» «0»«0» «Enter»***

Example 3 :
Frequency to settle 0.95 Hz.
Select first the range : 5Hz ; enter: ***«3» «2» «Enter»***
Enter the value : 0.9500 Hz ; enter: ***«4» «0» «space» «0» «.» «9»«5»«0» «0» «Enter»***

6-4 USE OF THE PROTOCOL FOR SWEEP ADJUST

For use in LIN or LOG sweep, three parameters are necessary :
The Frequency Start, the Frequency Stop and the type of modulation with its period.
a) Configuration of Start frequency :
Settle the frequency as indicated in the §6-3 then enter the code "FSTART" : ***«5» «6» «Enter»***
b) Configuration of Stop frequency :
Settle the frequency as indicated in the §6-3 then enter the code "FSTOP" : ***«5» «7» «Enter»***
c) Configuration of the type of modulation and the period :
Enter the code corresponding to the type of modulation choosen and the period in ms.

Example : Modulation Lin 1s ; enter : ***«5» «1» «space» «1» «0» «0»«0»«Enter»***
To deactivate modulation, enter the code "Modulation OFF" : ***«5» «0» «Enter»***
The two parameters FStart and FStop are saved. You can directly start a new modulation keeping the same end stop.



For use in VCF :
Settle the frequency as indicated in §6-3 then anter the code "EXT" : ***«5» «3» «Enter»***
To deactivate modulation, enter the code : ***«5» «0» «Enter»***

6-5 USE OF THE PROTOCOL FOR AM ADJUST

a) **AM IN** : the depth of modulation can be activated with 4 stages : 25%, 50%, 75% or 100%.
Settle the frequency as indicated in §6-3.
Enter the code corresponding to that type of modulation and add depth of modulation.
Example : AM 75% ; enter: ***«5» «4» «space» «7» «5»«Enter»***
To deactivate modulation, enter: ***«5» «0» «Enter»***
b) **AM EXT** : Settle the frequency as indicated in §6-3.
Enter the code corresponding to that type of modulation to confirm it; enter: ***«5» «5» «Enter»***
To deactivate modulation, enter: ***«5» «0» «Enter»***

6-6 USE OF THE PROTOCOL FOR "CMOS" ADJUST

Settle the frequency as indicated in §6-1.
Enter the code corresponding to the function CMOS ; enter : ***«7» «1» «Enter»***
To deactivate the mode CMOS, enter: ***«7» «0» «Enter»***
Caution : In order to avoid possible takedown errors, when you stop the mode CMOS, the offset will not be deactivated.
If you want to return to an offset "0" enter the offset control; enter: ***«2» «0» «Enter»***

Reminder of the transmission protocol of RS232 :
- **Transmission speed : 9600 bauds (bits per second)**
- **No parity.**
- **1 Stop bit.**
- **Transmission of alphanumeric data in ASCII 7bits.**

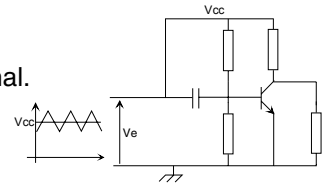
7 - TYPICAL APPLICATIONS

7-1 AMPLIFIER'S BANDWIDTH

Connect the output of the functions generator to the input of the amplifier under test, after the amplitude has been set properly. Load the output correctly and look at the signal on an oscilloscope.
Vary the frequency, while noting the variation of the Vs voltage compared with Ve remaining constant.
This ratio will be in dB : 20 Log (Vs/Ve).
The -3dB cut off is reached, when Vs has decreased within a ratio of $\sqrt{2}$ (agreed 1,414) with Ve remaining constant.
A square signal at the amplifier input allows to display faults in output, such as overshoot, bouncing, rise time...
Better than a sine wave, a triangular wave gives the maximum level before clipping.

7-2 TRANSISTOR AMPLIFIER WITHOUT EXTERNAL FEEDING

The voltage offset is independent from the output attenuator, so you can feed directly a small transisor application from the generator.
You have to take into account that the output resistor of the function generator is 50 Ω and the voltage offset is maximum from ±10V peak to empty.
Set the supply voltage of the mounting with the offset setting knob **[23]**.
Activate the -20dB attenuator. Set the wave, frequency and amplitude of the signal.
Connect the generator output to Ve.



7-3 TRANSFER FUNCTION :

The signal of a second functions generator or just the «saw tooth»sweep voltage of an oscilloscope applied to the VCF input **[23]** causes a frequency sweep. An oscilloscope connected to the output of the stage under test displays automatically the response curve.

7-4 SWITCHING THRESHOLDS :

For the dynamic testing of the switching levels of comparators or of different logical families, a low frequency triangular wave of adapted amplitude and offset, will be used.

7-5 SYSTEMS ANALYSIS :

Square, triangular or sine waves in low frequency are used for the analysis of servo control systems. So, static error, linearity, accuracy, rapidity, stability...are brought out.

7-6 TRANSFER FUNCTION OF AN ACOUSTIC ENCLOSURE

It is possible to draw the frequency response curve of an enclosure, while connecting it to the loudspeaker output 0.5Ω. An acoustic sensor positioned before the loudspeaker will reproduce the amplitude of the received signal.

8 - MAINTENANCE

No particular maintenance is required for this instrument. To avoid dust, humidity, shocks : your instrument will be grateful to you for that. For the cleaning, please use a smooth duster.
If the Leds **[3]**, **[4]**, **[6]** et **[34]** do not light up on switching on, check :
- if the «On/Off» switch is on
- the connection with the electrical supply network
- the plug where you connect your generator
- the protection fuse (GF467F : T200mA - 250V ; GF467AF : T630mA - 250V).

CAUTION : It is important to disconnect the main cord before replacing the fuse.

9 - AFTER SALES SERVICE

The after sales service is ensured by the **elc** company.
During ONE year, spare parts and servicing are under guarantee. This guarantee does not apply to instruments presenting faults or failures caused by an improper use (wrong mains voltage, shocks...) or which have been repaired outside our factory or the repair shops of our authorized agencies.

10 - DECLARATION OF CONFORMITY

according to ISO/IEC guide 22 and EN45014

Manufacturer : ELC
Address : 59, avenue des Romains 74000 Annecy FRANCE

declares the product

Name : Functions generator
Type : GF 467F / GF467AF

conform to following specifications :

Safety : EN61010-1: 2001
Class II, Overvoltage category II, pollution degree 2.

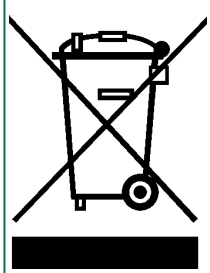
EMC : EN 61326-1:2006

Further information :
The product above is conformable to the requirements of the «Low voltage» directive 2006/95/CE and of the «Electromagnetic compatibility» directive 2004/108/CE.

Annecy, on February 28th, 2008

The manager
H. CURRI

ELIMINATION OF MANUFACTURING WASTES BY THE PRIVATE USERS IN THE EU



This symbol written in the product or in its packaging indicates that this product must not be throw in the garbage with your other waste.
Its your responsability to rid of your manufacturing wastes bringing it to a specialized sorting office for the recycling of electrical and electronic instruments.
Collection and recycling separated of your wastes will contribute to preserve natural resources and guarantee a recycling respectful of the Environment and human health.
For further information concerning the recycling center near your place of residence, contact your town hall, the elimination service of garbage heap or the store where you bought the instrument.

4000 4 333-Evo1 - EN - 02/08

ACCESS TO MENUS AND PARAMETERS VIA RS-232

Hexa		_0	_1	_2	_3	_4	_5	_6	_7
0_	**Function**	Sine	Square	Triangle					
1_	**Counter**	Int	Ext						
2_	**Offset**	Entry numeric value							
3_	**Range**	**0,1** (0,01 to 0,5 Hz)	**1** (0,1 to 5 Hz)	**10** (1 to 50 Hz)	**100** (10 to 500 Hz)	**1 K** (100 to 5 K)	**10 K** (1K to 50 KHz)	**100 K** (10K to 500KHz)	**1 M** (0,1 M to 5 MHz)
4_	**Frequency**	Entry numeric value							
5_	**Modulation**	OFF	LIN	LOG	EXT	AM IN	AM EXT	FSTART	FSTOP
6_	**Duty**	Entry numeric value							
7_	**Cmos**	OFF	ON						
8_	**Level**	Entry numeric value							
9_	**Attenuation**	0 dB	- 20 dB	-40 dB					

Satisfait(e) de votre acquisition ?

Alors, vous le serez également avec :

les alimentations de laboratoire

variables

AL 936N :
200Watts
2 x 0 à 30V
& 0 à 3A
série,
parallèle,
tracking

multiples

ALR3002M :
120Watts
0-5,6,12
ou 30V
0-25mA, 250mA,
ou 2.5A =
et
6, 12 ou 24V ~

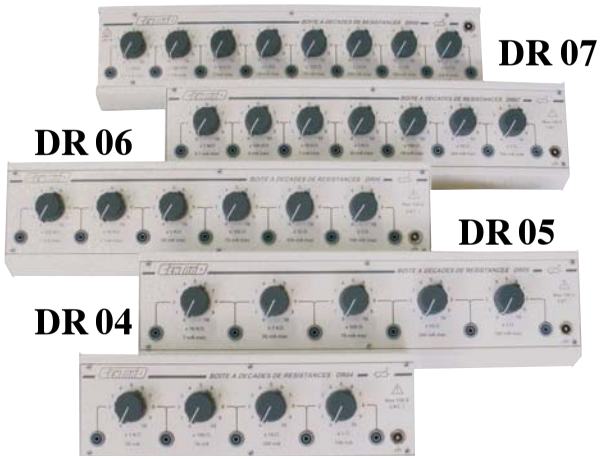
fixes

ALF2902M :
60 Watts
5 - 29 V =
ajustable
et chargeur
plomb

les boîtes à décades ROBUSTES

de résistances

DR 08



DR 07

DR 06

DR 05

DR 04

d'inductances

DL 07

de capacités

DC 05

les alimentations d'équipement

et les accessoires

Pour plus de détails, visitez notre site : www.elc.fr

Satisfied with your acquisition ?

So, you will also be satisfied with :

laboratory power supplies

adjustable

AL 936N :
200Watts
2 x 0 to 30V
and 0 to 3A
series,
parallel,
tracking

multiple

ALR3002M :
120Watts
0-5,6,12
or 30V
0-25mA, 250mA,
or 2.5A =
and
6, 12 or 24V ~

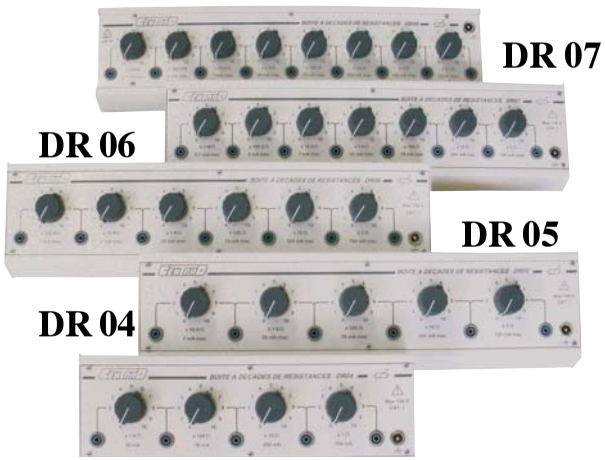
fixed

ALF2902M :
60 Watts
5 - 29 V =
adjustable
and battery
charger

ROBUST decade boxes

resistance box

DR 08



DR 07

DR 06

DR 05

DR 04

inductance box

DL 07

capacitance box

DC 05

OEM power supplies

and accessories

For more details, go to : www.elc.fr