

General instructions

- This instrument is designed for use indoors, in an environment with a pollution level of 2, at an altitude of less than 2000 m and at a temperature of between 0°C and 40°C, with 70 % relative humidity up to 40°C.

- Definition of **installation categories** as per IEC 664-1 standard:

CAT I: *Cat.I equipment is used to connect to circuits where measures are taken to limit temporary voltage surges to an appropriately low level.*
Example: protected electronic circuits

CAT II: *This is equipment which consumes energy, powered from a fixed installation.*
Example: household appliance and portable tool power supplies

CAT III: *Cat.III equipment consists of fixed installations where reliability and equipment availability would be covered by special specifications.*
Example: industrial machinery or instrument power supplies

CAT IV: *Cat.IV equipment is used at the source of an installation.*
Example: power feeder

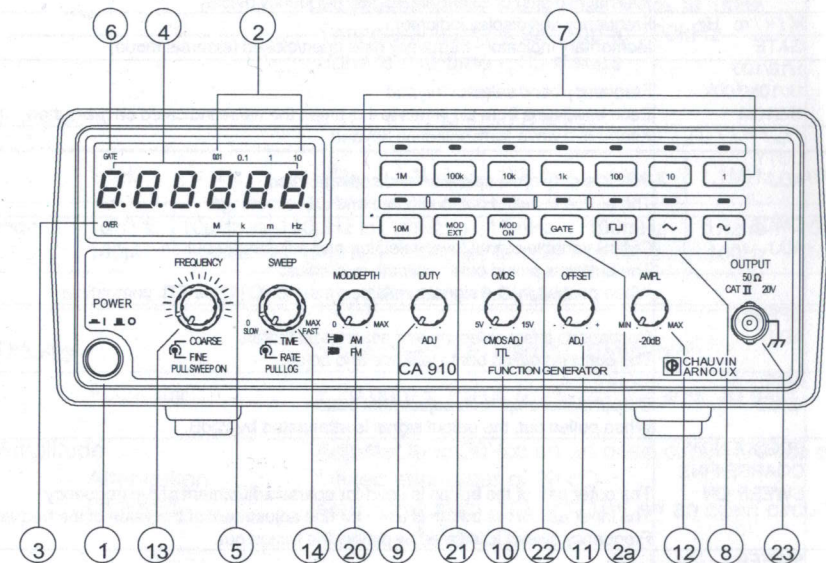
- Ensure that air vents are not obstructed when using the instrument.
- The equipment was fully checked from a mechanical and an electrical standpoint before shipment. Every precaution was taken to ensure that you receive the instrument undamaged. However, it is advisable to make a quick check to detect any possible damage during transport; in this event, contact our sales department immediately and notify the haulage company of the legal reservations. If you return the instrument, you should use the original packaging and indicate the reasons for the return as clearly as possible in a note enclosed with the equipment.

Garantie, Maintenance, Repair and Metrology

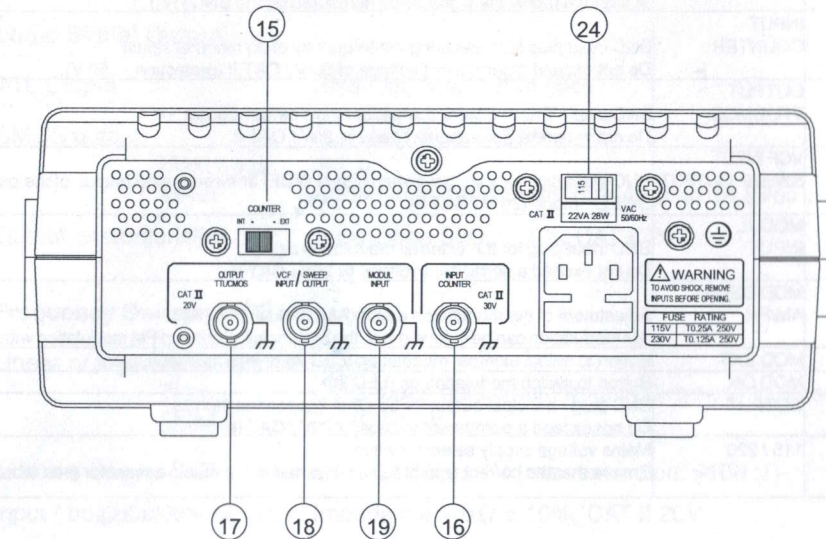
- Unless otherwise stated, our warranty is valid for 24 months from the date of sale of the equipment (extract from our general terms and conditions of sale, provided on request).
- **Before opening the instrument**, disconnect it from the mains power supply and from the measuring circuits and make sure you are not charged with static electricity which could irreparably damage the instrument's internal components.
- Any adjustment, maintenance or repair of the instrument **with the power on** must only be carried out by qualified personnel after taking note of the instructions in this manual.
- A «**qualified person**» is someone who is familiar with the installation, the construction, the application and the dangers present. This person is authorised to power up and power down the installation and equipment, in compliance with safety regulations.
- Repair : return your instrument to our distributor for any work to be done within or outside the guarantee.
- Clean the instrument with a damp cloth. Never use abrasive products or solvents.

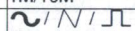
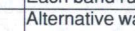
Description of the instrument

Front



Back



Markers	Unit	Functions
1	Power	On / off switch
2	0,01/0,1/1/ 10	Gate duration indicator for frequency measurement
2a	GATE	Gate duration selection button for frequency measurement Values possible for the external frequency meter: 0.01 sec, 0.1 sec, 1 sec or 10 secs. Fixed value of 0.01 secs for measurement of the generator's internal frequency
3	OVER	Band overrun indicator for external frequency measurement
4		Internal (5 digits) or External (6 digits) frequency display
5	M / k / m Hz	Frequency unit display indicator
6	GATE	Momentary indicator - frequency gate open/closed (external mode)
7	1/10/100 1k/10k/100k 1M/10M	Frequency band selector keypad Each band runs from 0.1 times to 1.1 times the value indicated on the button
8	 /  / JL	Alternative wave-form selection keypad
9	DUTY ADJ	Variable duty cycle selection and setting button The button is pulled out to validate and adjust settings.
10	CMOS ADJ	CMOS variable output level selection and adjustment button The button is pulled out to validate and adjust . When pushed in, the signal available on the BNC [17] is TTL compatible
11	OFFSET ADJ	Continuous offset selection and adjustment button The button is pulled out to validate and adjust.
12	AMPL -20dB	Output signal amplitude adjustment button When pulled out, the output signal is attenuated by 20dB.
13	FREQUENCY COARSE/FINE SWEEP ON	The outer part of the button is used for coarse adjustment of the frequency. The inner part of the button is used for fine adjustment of the value of the frequency. Frequency sweep is initiated by pulling the button out.
14	SWEEP TIME/RATE/LOG	The outer part of the button is used for adjusting the sweep time. The inner part of the button is used to define frequency excursion. When the button is pulled out, the sweep law is logarithmic; when pushed in, it is linear.
15	COUNTER INT/EXT	Selector switch - internal counter operation (generator frequency) or external (apply the signal to be measured on the BNC [16])
16	INPUT COUNTER	BNC input plug for measuring the frequency of an external signal Do not exceed a permanent voltage of 30 V / CAT II (protection - 150 V).
17	OUTPUT TTL/CMOS	BNC plug - TTL or CMOS compatible logic output signals Do not exceed a permanent voltage of 20V / CAT II.
18	VCF INPUT SWEEP OUTPUT	BNC input plug for external sweep signal (VCF) or sweep ramp output of the generator in SWEEP mode (20 V / CAT II)
19	MODUL INPUT	BNC input plug for the external modulation signal Do not exceed a permanent voltage of 20V / CAT II.
20	MOD/DEPH AM/FM	Adjustment of the modulation depth (AM) or deviation (FM) AM modulation can be selected with the button pulled out and FM modulation with it pushed in.
21	MOD EXT	Button to select external modulation (LED lit) or internal modulation
22	MOD ON	Button to switch modulation on (LED lit)
23	OUTPUT	BNC plug - principal output for 50-Ohm impedance signals Do not exceed a permanent voltage of 20V / CAT II.
24	115 / 220	Mains voltage supply selector switch Ensure that the correct type of fuse is inserted in the mains connector (see label).

Technical specifications

Principal output

Wave-form Sinus, square, triangle, pulse, ramp
Distorsion sinus 1% typical, < 5% at 1kHz
Triangle linearity \geq 98% up to 100kHz
Square rise time \leq 35 n secs

Frequency 0.1Hz to 10MHz in 8 bands

Bands	1.1Hz	11Hz	110Hz	1.1kHz	11kHz	110kHz	1.1MHz	10MHz
Resolution	1 μ Hz to 100 μ Hz	10 μ Hz to 1mHz	100 μ Hz to 10mHz	1mHz to 100mHz	10mHz to 1Hz	100mHz to 10Hz	1Hz to 100Hz	10Hz to 100Hz
Fixed gate duration = 0.01 secs								

Display 5 or 6 green LED digits, 10mm high
Accuracy \pm 20 ppm \pm 1 digit (23°C \pm 5°C) after 30 mins

Amplitude Adjustable to 20Vcc on an open circuit (10Vcc on 50 Ω)
Attenuation 1 fixed attenuator of 20 dB
OFFSET Adjustable from -10V to +10V on an open circuit (-5V to + 5V on 50 Ω)

Variable duty cycle Continuous adjustment from 15% to 85%

Output characteristics Impedance 50 Ω \pm 10%, CAT II 20V

Logic Signal Output

TTL Output Rise / fall time < 20 n secs

CMOS output Rise / fall time < 120 n secs

Max. frequ.
Level

2MHz
Continuous adjustment from 4Vcc to 14,5Vcc \pm 0.5Vcc

Output characteristics Impedance 50 Ω \pm 10%, CAT II 20V

Frequency Sweep (INT/EXT)

Linear or logarithmic internal sweep

Time Continuous adjustment from 500 m secs to 30 secs
Output 0 - 10V \pm 1V

External Sweep (VCF) Level 0 - 10V \pm 1V (max excursion. >100 :1)

Input / output characteristics Impedance 10k Ω \pm 10%, CAT II 20V

■ Modulations (INT/EXT)

Amplitude modulation	Depth 0 - 100%
Modulation signal	
Internal	Modulation frequency 1kHz Carrier 100Hz - 10MHz (-3dB)
External	DC modulation frequency -500kHz Level 10 Vcc for 100% modulation
Frequency modulation	Deviation 0 - ±5%
Modulation signal	
Internal	Modulation frequency 1kHz
External	DC modulation frequency -20kHz Level 10 Vcc for 10% deviation

Input characteristics Impedance 10kΩ ± 10%, CAT II 20V

■ External frequency meter

Frequency bands	5Hz to 100MHz	100MHz to 150MHz
Trigger sensitivity	35 mVeff	45 mVeff

Max. resolution 1μHz to 1Hz according to measurement time and frequency

Measurement time Gate duration (adjustable from 10 m secs to 10 secs)

Accuracy ± 20 ppm ± 1 digit (23°C ± 5°C) after 30 mins

Input characteristics 1MΩ / 150nF, CAT II / 30V (protection 150V)

General specifications

■ Environment	Reference temperature	23°C ± 2°C
	Operating temperature	0 to 40°C
	Storage temperature	-10°C to 70°C
	Altitude	< 2000 m
	Pollution level	2
	Relative humidity	70% up to 40°C
■ Power supply	Rated voltage	115V - 220V - 230V - 240V ±10%, 50/60Hz
	Installation category	CAT II 300V
	Consumption	25 W max.
	Fuse	115V: T 0.25A 250V 220V, 230V, 240V : T 0.125A 250V
■ EMC	EN 61 326 (04/97) + A1 (06/98)	
■ Mechanical specifications	Dimensions (h x l x d)	91 x 251 x 291 mm
	Weight	2,2 kg

Functional description

The function generator offers a complete array of wave-forms and a high level of performance but is still easy to use. To take advantage of its many possibilities, the user should practice the various steps described in this chapter.

In all cases, it is advisable to connect an oscilloscope to the generator output in order to view the results of the various adjustments made directly on its screen.

■ Using the instrument for the first time

- 1) Ensure that the mains voltage supply is compatible with that selected at the back of the instrument (24).
The characteristics of the fuses to be used are marked on the label.
- 2) Use the mains lead provided to connect the generator to the power supply.
- 3) Ensure that all the selector buttons on the front are pushed down and the selector (15) on the back is in the INT position.
- 4) Switch the power on with the on/off button (1).
- 5) Connect an oscilloscope to the principal output (23) using a 50 Ohms BNC-BNC standard lead
- 6) Turn the AMPL control (12) so that the mark is near the top
- 7) Also turn the FREQUENCY (13) COARSE and FINE buttons towards the top.
- 8) After setting the oscilloscope, you will see a square signal in the 1kHz band (default configuration), whose exact frequency is indicated on the generator's display.

■ Basic adjustment of the Triangle, Square and Sinus signals

- 1) Select the desired wave-form (8), then the frequency band (7); your choice is displayed by the LED indicators.
- 2) Turn the FREQ button (13) first using the COARSE adjustment and then the FINE; check the value obtained on the display.
- 3) The AMPL control (12) allows the amplitude of the alternating signal to be defined on the principal output (23).
- 4) Pull the OFFSET button (11) out then turn it to superpose direct voltage on the alternating signal chosen.
- 5) By pulling the AMPL button (12), you will obtain an attenuation of 20dB on the principal output (i.e. division by a factor of 10), including the offset if activated.
- 6) A TTL/CMOS logic output is available at the back of the instrument and the phase relationship of the various types of signals is described in figure 1.

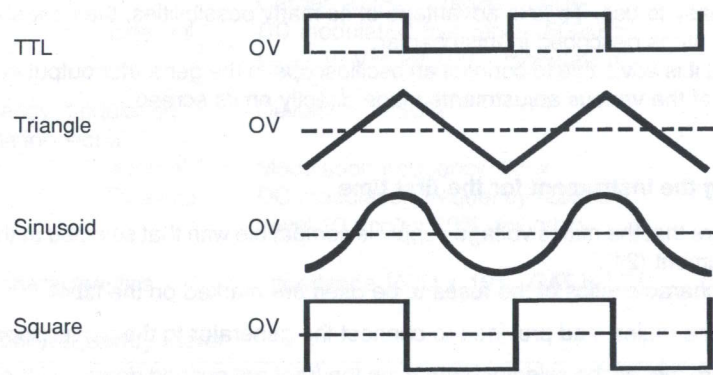


figure 1

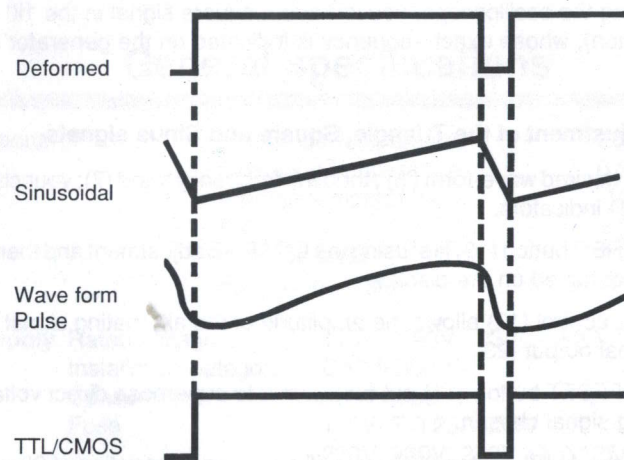


figure 2

■ Generating a Pulse

- 1) First select a square wave-form (\square) with the controls (8) ; choose a frequency band (7), then adjust it accurately with FREQ button (13).
- 2) Connect an oscilloscope to the principal output (23) and adjust it.
- 3) Adjust the output level with the AMPL control (12).
- 4) If you pull out the AMPL button (12), you will attenuate the signal by 20dB.
- 5) Pull and turn the DUTY selector button (9) to adjust the width of the pulse required (see figure 2); note that the peak-peak amplitude is stable and the signal's RMS changes with the duty cycle.
- 6) If necessary, adjust the frequency slightly with the FREQ button (13).

■ Generating a Ramp

- 1) First select a triangular wave-form (\triangle) with the controls (8) ; choose a frequency band (7), then adjust it accurately with FREQ (13).
- 2) Connect an oscilloscope to the principal output (23) and adjust it.
- 3) Adjust the output level with the AMPL control (12).
- 4) If you pull out the AMPL button (12), you will attenuate the signal by 20dB.
- 5) Pull and turn the DUTY selector button (9) to adjust the slope of the ramp required (see figure 2); note that the peak-peak amplitude is stable and the signal's RMS changes with the duty cycle.
- 6) If necessary, adjust the frequency slightly with the FREQ button (13)

■ TTL/CMOS logic output

- 1) Choose the frequency band (7), then adjust more accurately with the FREQ button (13).
- 2) Connect an oscilloscope to the TTL/CMOS (17) output at the back of the generator and adjust it; you will observe a square signal at two levels, 0 and 5 volts, corresponding to the TTL circuit standard.
- 3) If you wish to work with CMOS level logic signals, pull out the CMOS button (10) to adjust the upper level.

■ Internal frequency sweep

- 1) First select the desired wave-form with the controls (8), then choose a frequency band (7).
- 2) Connect an oscilloscope (preferably analogue) to the principal output (23) and adjust it.
- 3) Define the limit of the upper frequency with the FREQ button (13).
- 4) Pull out the FREQ FINE button (13) to initiate the sweep.

- 5) Adjust the sweep time to pass from the lower to the upper frequency with SWEEP/TIME (14) (30 secs max is obtained by turning the button as far as it will go to the left).
- 6) Adjust the frequency excursion value with SWEEP/RATE (14) (maximum excursion is obtained by turning the button as far as it will go to the right).
- 7) Pull out the SWEEP/RATE button (14) in order to execute the sweep according to a logarithmic law (LOG).

☞ **The frequency excursion can only be adjusted in active sweep mode, this sweep cannot be stopped during a cycle.**

■ Voltage-Controlled Frequency

This mode enables the user to define the generator frequency value by means of external instructions given to the instrument.

- 1) Select the desired wave-form(8) ; choose a frequency band (7) then adjust accurately with the FREQ button (13).
- 2) Apply direct voltage in the range -10V to +10V to the VCF INPUT terminal (18) located at the back of the instrument; positive voltage will reduce the value of the initial frequency, while negative voltage will increase it.
- 3) Connect an oscilloscope to the main output (23), observe the result and check the frequency obtained on the generator display.

☞ **a) All the generator's controls will remain active and will enable you, for example, to modify the amplitude, wave-form and offset.**

b) To obtain the widest possible frequency band variation with the VCF INPUT instructions, you must choose the right initial frequency since it has to stay within the same band.

It must be the lowest possible in the band if you want to increase it or, vice versa, the highest if you want to reduce it.

■ Internal AM or FM modulation

- 1) First select the desired wave-form (8) ; choose a frequency band (7), then adjust it accurately (13).
- 2) Connect an analogue oscilloscope to the principal output (23) and adjust it.
- 3) Press the MOD ON button (22) to activate modulation.
- 4) You can choose between AM modulation (amplitude) and FM (frequency) by pulling out or pushing in the MOD/DEPH control (20).
- 5) Set the depth (AM) or deviation (FM) by turning the same MOD/DEPH button (20); the highest value is obtained by turning the button as far as it will go to the right.

■ Precautions for use

☞ Superposition of an OFFSET DC of a level that can reach $\pm 10V$ (live circuit) or $\pm 5 V$ (50-Ohm load) on a sufficiently large alternating signal may saturate the output amplifier; in any event, the composite signal obtained is limited to $\pm 20 V$ (live circuit) or $\pm 10 V$ (50-Ohm load) and any overrun is interpreted by a trimmed wave-form (see figure 3).

☞ As the generator's output impedance is fixed at 50 Ohms, it is the receiver's impedance that defines the level of voltage available at its terminals, particularly the maximum voltage.

☞ Connection to an unsuitable receiver may lead to oscillation and a particularly sensitive deformation of the signal for square waves and high frequencies; this effect can be eliminated by using a 50-Ohm adaptation load and a short BNC cable.

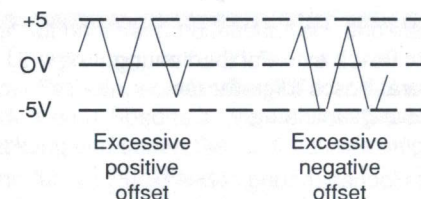


figure 3