## EC Declaration of Conformity

EN 61326-1: Electrical equipment for measurement, control and laboratory use — EMC requirements (1997+A1: 1998)				
Conducted and Radiated Emissions	Electrostatic Discharge			
EN 55011 Group I class A: 1991	EN 61000-4-2: 1994			
Current Harmonic	Radiated Immunity			
EN 61000-3-2: 1995	ENV 50140: 1993			
Voltage Fluctuation Electrical Fast Transients				
EN 61000-3-3: 1995	EN 61000-4-4: 1995			
	Surge Immunity			
	EN 61000-4-5: 1995			
Conducted Susceptibility				
	EN 61000-4-6: 1996			
	Power Frequency Magnetic field			
	EN 61000-4-8: 1993			
	Voltage Dips/ Interrupts			
	EN 61000-4-11: 1994			

#### Low Voltage Equipment Directive 73/23/EEC & amended by 93/68/EEC Safety Requirements EN 61010-1: 1990+A1: 1992+A2: 1995; IEC 61010-1: 1990+A1: 1992+A2: 1995

#### FUNCTION GENERATOR- 72-7710 INSTRUCTION MANUAL

#### TABLE OF CONTENTS

1.	SAFETY SUMMARY	1
2.	INTRODUCTION	5
3.	SPECIFICATION	7
4.	FUNCTION DESCRIPTION	11
5.	USAGE DESCRIPTION	14
6.	MAINTENANCE	19

ii

# **1. SAFETY TERMS AND SYMBOLS**

Please take a moment to review these safety terms and symbols, which may appear in this manual or on Equipment to prevent damage to the Function Generator.



INSTRUCTION MANUAL

FUNCTION GENERATOR- 72-7710

DANGER High Voltage





WARNING. Warning statements identify condition or

practices that could result in injury or loss of life.



CAUTION. Caution statements identify conditions or practices that could result in damage to this product or

other property.

Protective Conductor Terminal

. (Ground) Earth Terminal

Frame or Chassis Terminal

# FOR UNITED KINGDOM ONLY

NOTE: This lead/appliance must only be wired by

competent persons

WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are coloured in

accordance with the following code:

Green/ Yellow: Earth Blue: Neutral Brown: Live (Phase)



As the colours of the wires in main leads may not correspond with the colours marking identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with the letter E or by the earth

symbol 😑 or coloured Green or Green & Yellow.

The wire which is coloured Blue must be connected to the

FUNCTION GENERATOR- 72-7710 INSTRUCTION MANUAL

terminal, which is, marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

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

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, cable

of 0.75mm<sup>2</sup> should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any moulded mains connector that requires removal /replacement must be destroyed by removal of any fuse & fuse carrier and disposed of immediately, as a plug with bared wires is hazardous if a engaged in live socket. Any re-wiring must be carried out in accordance with the information detailed on this label.

FUNCTION GENERATOR- 72-7710 INSTRUCTION MANUAL

#### **2. INTRODUCTION**

The 72-7710 Function Generator is a stable low distortion instrument, which generate signals in the frequency range up to 3MHz. Typical applications include a wide range of audio response testing applications, vibration testing, servo system evaluation, ultra sound applications, and etc.

#### • MAIN FEATURES

- 1. Low distortion waveforms (sine, triangular and square) and ramp signal.
- 2. Signal output in seven-decade stages, 0.3Hz to 3MHz
- 3. Duty cycle control with signal inversion capability.
- 4. External Voltage controlled Frequency (VCF).
- 5. Built in Frequency counter.
- 6. A second output for TTL or adjustable CMOS pulses.
- 7. 50 ohm main signal output with DC offset adjustment and 20dB attenuation capability.
- 8. Supplied with two BNC test leads and AC power cord set.

FUNCTION GENERATOR- 72-7710

INSTRUCTION MANUAL

#### • FEATURES:

\_

FEATURE	72-7710
COUNTER	v
TTL/CMOS	v
VCF	v
Duty Cycle Control	v

FUNCTION GENERATOR- 72-7710 INSTRUCTION MANUAL

#### **3. SPECIFICATION**

1.Main					
Frequency Range	0.3Hz~3MHz(7 Range)				
Amplitude	$\geq 10$ Vpp(into 50 $\Omega$ load)				
Impedance	50Ω±10%				
Attenuator	-20dB±1dB×2				
DC Officiat	<-5V~>5V				
DC Oliset	(into $50\Omega$ load)				
Duty Control	80%:20%:80% to 1MHz Continued variable				
Display	6 digits LED display				
2.Sine Wave					
Distortion	$\leq 1\%$ ,0.3Hz $\sim$ 200kHz				
Flatness	<0.3dB,0.3Hz~300kHz, <0.5dB,300kHz~3MHz				
3.Triangle Wav	e				
Linear	$\geq$ 98%,0.3Hz~100kHz, $\geq$ 95%,100kHz~3MHz				
4.Square Wave	·				
Symmetry	$\pm 2\%$ ,0.3Hz~100kHz				
Rise or Fall Time	$\leq 100$ ns at maximum output (into 50 $\Omega$ load)				
5.CMOS Output	ıt				
Level	4Vpp±1Vpp~14.5Vpp ±0.5Vpp adjustable				
Rise or Fall Time	$\leq 120$ ns				
6.TTL Output					
Level	$\geq$ 3Vpp				
Fan Out	20 TTL load				
Rise or Fall Time	$\leq 25$ ns				
7.VCF					
Input voltage	$0V \sim 10V \pm 1V(100:1)$				
Input Impedance	$10k\Omega\pm10\%$				
8.Frequency Co	punter				
Int./Ext.	Switch selector				
Range	0.3Hz~3MHz, (5Hz~150MHz EXT)				

#### FUNCTION GENERATOR- 72-7710 INSTRUCTION MANUAL

Accuracy	time base accuracy±1count			
Time base	±20ppm(23°C±5°C) after 30 minutes warm up			
Resolution	The maximum resolution is 10nHz for 1Hz and 0.1Hz for 100MHz.			
Input Impedance	1MΩ/150pF			
Sensitivity	$\leq$ 35mVrms(5Hz~100MHz), $\leq$ 45mVrms(100MHz~150MHz)			
9.General				
Power Source	AC115V, 230V±15%.50/60Hz			
Operation Environment	Indoor use, altitude up to 2000m. Ambient Temperature 0°C to 40°C. Relative Humidity 80%(Maximum). Installation category II Pollution Degree 2			
Storage temperature & Humidity	-10°C to 70°C. 70% (Maximum).			
Accessories	GTL-101×2, Instruction manual×1			
Dimension	251(W)x91(H)x291(D) m/m			
Weigh	Approx. 2.1kgs			



WARNING : To avoid electrical shock, the power cord protective grounding conductor must be connected to ground.

CAUTION : To avoid damaging the instrument, do not use it In a place where ambient temperature exceeds 40°C.



∕İ∖

'! `

**CAUTION** : To avoid damaging the instrument, do not input more than DC15V to V.C.F.(V.C.G.).

**CAUTION :** To avoid damaging the instrument, do not input more than AC150V to Frequency Counter FUNCTION GENERATOR- 72-7710 INSTRUCTION MANUAL

#### • Fig 4.1 FRONT PANEL



FUNCTION GENERATOR- 72-7710

INSTRUCTION MANUAL

#### • Fig.4-2 REAR PANEL



FUNCTION GENERATOR- 72-7710 INSTRUCTION MANUAL

#### **4. FUNCTION DESCRIPTION**

- 1. Power Switch Connect the AC power, then press power switch.
- 2. Gate Time Press the power switch; Gate time indicator will start to flash (the gate time of the internal counter is 0.01 second).
- 2a. Gate Time<br/>SelectorPress this key to change the gate time when used in the<br/>external counter mode. The change order is according<br/>to 0.01s, 0.1s, 1s, 10s cycle by pressing these keys.
- 3. Over Indicator In the external counter mode, the indicator is illuminated when the output frequency is greater than the range selected.
- 4. Counter Display Shows the external frequency by  $6 \times 0.3$ " green display, and shows the internal frequency by  $5 \times 0.3$ " green display.
- 5. Frequency Indicate the current frequency value. Indicator
- 6. Gate Time Indicate the current gate time (external. counter mode use only).
- 7. Frequency Range To select the required frequency range by pressing the relevant push button on the panel as shown in Table 1

FUNCTION GENERATOR- 72-7710

INSTRUCTION MANUAL

Table 1

Push bottom	1	10	100	1k	10k	100k	1M
	0.3Hz	3Hz	30Hz	300Hz	3kHz	30kHz	300kHz
Frequency Range							
	3Hz	30Hz	300Hz	3kHz	30kHz	300kHz	3MHz

- 8. Function Selector Press one of the three push buttons to select the desired output waveform.
- 9. Duty Function Pull out and rotate the knob to adjust the duty cycle of the waveform.
- 10. TTL/CMOS Selector When the knob is pushed in, the BNC terminal of <sup>(16)</sup> will output a TTL compatible waveform. If pulled out and rotated the knob can adjust the CMOS compatible output (5-15Vpp) from the output BNC<sup>(16)</sup>.
- 11. DC Offset Control Pull out the knob to select a variable DC level between ±10V, turn clockwise to set a positive DC level waveform and anticlockwise for a negative DC level waveform.
- 12.Output Amplitude<br/>Control with<br/>Attenuation<br/>OperationTurn clockwise for MAX. output and invert for<br/>a -20dB output. Pull the knob out for additional 20dB<br/>output attenuation.

FUNCTION GENERATOR- 72-7710 INSTRUCTION MANUAL

- 12a. 20dB Attenuation Press the knob to adjust a -20dB output.
- 13 Frequency Adjustment Press and turn clockwise the knob for MAX frequency and invert for MIN frequency. (Keep the pointer within the scale range on the panel.).
- 14. INT/EXT Counter Select internal counter mode (count the frequency of Selector model) or select EXT counter mode for an independent counter (input signal from BNC<sup>(15)</sup>).
- 15. EXT. Counter Accepts external signals for measurement. Input Terminal
- 16. TTL/CMOS TTL/CMOS compatible signal output Output Terminal
- 17. VCF/MOD Used to connect the input voltage required to perform Input Terminal the "voltage control frequency" operation or the EXT modulation operation.
- 18. Main Output Main signal output. Terminal
- 19. Power Switch 115V and 230V selectable.

INSTRUCTION MANUAL

### **5. USAGE DESCRIPTION**

The 72-7710 function generator can provide versatile waveforms of high efficiency. Familiarizing yourself with all of the functions of the 72-7710 thoroughly through both this operation manual and in practice will enable you to master the performance of this Tenma Function generator.

One of the best ways to observe waveforms is by connecting the instruments to an oscilloscope and watching the effect of different controls and waveforms through the oscilloscope.

#### 5-1.First-step check:

- (1) Ensure that the voltage of the main supply is compatible with this instrument. The label on the rear panel will indicate the required AC voltage.
- (2) Connect the instrument to the main supply using the power cord supplied.
- (3) Press PWR switch (1) and ensure all the rotary controls are pushed in, then rotate AMPL (12) knob to make the indication point up forward.
- (4) Rotate the FREQ (13) control fully anticlockwise.

#### **5-2.**Triangle, square and sine wave

- (1) First select Function (8), and select Range (7), rotate FREQ (13), to set the required frequency. (read out from display window).
- (2) Then, connect the Output (19), to an oscilloscope to observe the output signal, or connect to the circuit under test.
- (3) Rotate the AMPL 12 again to control waveform amplitude.
- (4) If an attenuation output signal is required, pull out AMPL (12) knob to obtain 20dB attenuation or press (12a) knob for additional 20dB attenuation..
- (5) The phase-relationship of the output waveform is shown in Figure 1 as below:
  - Figure 1.



INSTRUCTION MANUAL

#### **5-3.**Pulse wave generation

- (1) First press the key (  $\square$  ) Function (8); then select Range (7), and rotate FREQ (13), to set the required frequency range.
- (2) Connect the output-terminal (18) to an oscilloscope to observe the output signal.
- (3) Pull out and rotate the Duty knob (9) to adjust the width of pulse waveform.
- (5) Adjust the AMPL (12) knob to control the pulse amplitude.
- (6) Pull out the AMPL (12) knob to get 20dB attenuation of output.

### **5-4.Ramp wave generation**

- (1) First press the key (  $\bigwedge$  ) Function (8), then select Range (7), and rotate the FEEQ (13) knob to set required frequency range.
- (2) Connect the output-terminal (18) to an oscilloscope to observe the output signal.
- (3) Pull out and rotate the DUTY<sup>(9)</sup> to adjust the slope of the ramp waveform.
- (4) Adjust AMPL <sup>(12)</sup> knob to control the output amplitude of the ramp waveform.
- (5) Pull out AMPL (2) knob to obtain 20dB attenuation of output.

#### 5-5.TTL/CMOS signal output

- (1) First select Range <sup>(7)</sup>, rotate the FREQ <sup>(13)</sup> knob to set required frequency range.
- (2) Connect the BNC connector of TTL/CMOS<sup>(16)</sup> to an oscilloscope or to the circuit under test.
- (3) The output is a square waveform set to TTL level; (for general TTL integrated circuit.)
- (4) If the square waveform set to a CMOS level is required, you can pull

FUNCTION GENERATOR- 72-7710 INSTRUCTION MANUAL

out CMOS <sup>(10)</sup> knob to adjust voltage level.

## 5-6. Variation of external voltage-controlled frequency

This mode of operation allows the user to adjust the frequency of the function generator with an external DC control Voltage. It also provides an easy way to make adjustments.

- Select Function (a) first, then select the Range (7), and rotate FREQ (13) to set the required frequency range.
- (2) Connect an external control voltage  $(0 \sim 10V)$  to the VCF (1) connector via a suitable lead, the generated signal is on Output (1).
- (3) Other adjustments, such as AMPL <sup>(12)</sup> can be made by adjusting the AMPL <sup>(12)</sup> knob for attenuation; adjust Offset <sup>(11)</sup> for DC level; rotate the Duty <sup>(1)</sup> knob to change the output signal of the pulse or ramp waveform etc..

#### 5-7. Precaution item

- (1) Adjusting the DC OFFSET, will provide a change to the voltage of  $\pm 10V$  (no load) or  $\pm 5V$  (50 $\Omega$  load). However, if a signal is added the DC level, is still limited to  $\pm 20V$  (no load) or  $\pm 10V$  (50 $\Omega$  load). In case of over-voltage, the waveform will be clipped and appear as shown in Figure 2.
- (2) Output connector label  $50 \Omega$ , indicated that the signal source impedance is  $50 \Omega$ . To avoid oscillation, the connecting line should be as short as possible.
- (3) When adjusting the Duty knob anticlockwise, the ratio of positive state to negative state, expands to not less than 80:20. It can expand the square wave to pulse wave, the triangle wave to ramp wave and sine wave to unsymmetrical sine wave. As shown in Figure 3 the adjustment of the Duty control to obtain required waveform.

#### • Figure 2.



#### • Figure 3.



FUNCTION GENERATOR- 72-7710 INSTRUCTION MANUAL

#### **6. MAINTENANCE**

The following instructions should be used by a qualified person only. To avoid electrical shock, do not perform any service other than that contained in the operation instructions unless you are qualified to do so.

#### **6-1.**Fuse Rating and type

If the fuse blows, the TENMA 72-7710 FUNCTION GENERATOR will not operate. Try to determine and correct the cause of the blown fuse, then replace the fuse with correct rating and type shown as below:

FUSE Ratin	Rating Input		
115V	230V	Watts	VA
T 0.315A 250V	T 0.16A 250V	25	32



WARNING: For continued protection against fire, replace only with 250V fuse of the specified type and rating, and disconnect the power cord before proceeding fuse replacement.

### **6-2.Fuse Replacement Procedure**

If you wish to replace the fuse, the upper cover must be removed according to the following steps:

1). The handle must be turned downward 90 degrees first.



- FUNCTION GENERATOR- 72-7710 INSTRUCTION MANUAL
- 2). Pull apart the handle from the Function Generator. Please turn the handle left and right side slightly; this will make it easier to pull off the handle.



3). There are two washers inside of the two holes (the joints of handle and case) respectively. Use a screwdriver to pry open these washers.



#### FUNCTION GENERATOR- 72-7710 INSTRUCTION MANUAL

 Use a screwdriver to open the screw located at upper side of rear panel. Therefore, the upper cover can pull toward the backside. In the meantime, the upper cover is moved.



Note: To replace the upper cover, please reverse above steps.

## 7-3. Cleaning

To keep the instrument clean, wipe the case with a damp cloth and detergent. Do not use abrasives or solvents.