EC Declaration of Conformity

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<tr>
<td>Conducted and Radiated Emissions</td>
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<tr>
<td>EN 61000-3-2: 1995</td>
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<td>Current Harmonic</td>
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<td>EN 61000-3-2: 1995</td>
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<td>Voltage Fluctuation</td>
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Safety Requirements

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
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.

! 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.

DANGER High Voltage

ATTENTION refer to Manual

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
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 0.75mm² 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.

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.
3. SPECIFICATION

1. Main
   Frequency Range: 0.3Hz ~ 3MHz (7 Range)
   Amplitude: ≥ 10Vpp (into 50Ω load)
   Impedance: 50Ω ± 10%
   Attenuator: -20dB ± 1dB × 2
   DC Offset: < -5V ~ > 5V (into 50Ω load)
   Duty Control: 80%:20%:80% to 1MHz Continued variable
   Display: 6 digits LED display

2. Sine Wave
   Distortion: ≤ 1%, 0.3Hz ~ 200kHz
   Flatness: < 0.3dB, 0.3Hz ~ 300kHz, < 0.5dB, 300kHz ~ 3MHz

3. Triangle Wave
   Linear: ≥ 98%, 0.3Hz ~ 100kHz, ≥ 95%, 100kHz ~ 3MHz

4. Square Wave
   Symmetry: ± 2%, 0.3Hz ~ 100kHz
   Rise or Fall Time: ≤ 100ns at maximum output (into 50Ω load)

5. CMOS Output
   Level: 4Vpp ± 1Vpp ~ 14.5Vpp ± 0.5Vpp adjustable
   Rise or Fall Time: ≤ 120ns

6. TTL Output
   Level: ≥ 3Vpp
   Fan Out: 20 TTL load
   Rise or Fall Time: ≤ 25ns

7. VCF
   Input voltage: 0V ~ 10V ± 1V (100:1)
   Input Impedance: 10kΩ ± 10%

8. Frequency Counter
   Int./Ext. Switch selector
   Range: 0.3Hz ~ 3MHz, (5Hz ~ 150MHz EXT)
### Accuracy
- Time base accuracy: ±1 count
- Time base: ±20 ppm (±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
- ≤35mVrms (5Hz~100MHz), ≤45mVrms (100MHz~150MHz)

### Resolution
- The maximum resolution is 10nHz for 1Hz and 0.1Hz for 100MHz.

### 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-101x2, Instruction manual x1

### Dimension
- 251(W) x 91(H) x 291(D) mm

### Weight
- Approx. 2.1kgs

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**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.

**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.

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**Fig 4.1 FRONT PANEL**
4. FUNCTION DESCRIPTION

1. Power Switch  
   Connect the AC power, then press power switch.

2. Gate Time Indicator  
   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 Selector  
   Press this key to change the gate time when used in the external counter mode. The change order is according 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 × 0.3” green display, and shows the internal frequency by 5 × 0.3” green display.

5. Frequency Indicator  
   Indicate the current frequency value.

6. Gate Time Indicator  
   Indicate the current gate time (external counter mode use only).

7. Frequency Range Selector  
   To select the required frequency range by pressing the relevant push button on the panel as shown in Table 1
Table 1

<table>
<thead>
<tr>
<th>Push bottom</th>
<th>1</th>
<th>10</th>
<th>100</th>
<th>1k</th>
<th>10k</th>
<th>100k</th>
<th>1M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>0.3Hz</td>
<td>3Hz</td>
<td>30Hz</td>
<td>300Hz</td>
<td>3kHz</td>
<td>30kHz</td>
<td>300kHz</td>
</tr>
<tr>
<td></td>
<td>3Hz</td>
<td>30Hz</td>
<td>300Hz</td>
<td>3kHz</td>
<td>30kHz</td>
<td>300kHz</td>
<td>3MHz</td>
</tr>
</tbody>
</table>

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 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.

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 Control with Attenuation Operation
    Turn clockwise for MAX. output and invert for a –20dB output. Pull the knob out for additional 20dB output attenuation.

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 Selector
    Select internal counter mode (count the frequency of model) or select EXT counter mode for an independent counter (input signal from BNC).

15. EXT. Counter Input Terminal
    Accepts external signals for measurement.

16. TTL/CMOS Output Terminal
    TTL/CMOS compatible signal output

17. VCF/MOD Input Terminal
    Used to connect the input voltage required to perform the “voltage control frequency” operation or the EXT modulation operation.

18. Main Output Terminal
    Main signal output.

19. Power Switch
    115V and 230V selectable.
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 \(^{18}\), 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.
5-3. Pulse wave generation

1. First press the key ( ∫ ) 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.
4. Adjust the AMPL 12 knob to control the pulse amplitude.
5. Pull out the AMPL 12 knob to obtain 20dB attenuation of output.

5-4. Ramp wave generation

1. First press the key ( ∫ ) Function 8, then select Range 7, and rotate the FREQ 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 9 knob to adjust the slope of the ramp waveform.
4. Adjust AMPL 12 knob to control the output amplitude of the ramp waveform.
5. Pull out AMPL 12 knob to obtain 20dB attenuation of output.

5-5. TTL/CMOS signal output

1. First select Range 7, rotate the FREQ 13 knob to set required frequency range.
2. Connect the BNC connector of TTL/CMOS 18 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 out CMOS 10 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.

1. Select Function 8 first, then select the Range 7, and rotate FREQ 13 to set the required frequency range.
2. Connect an external control voltage (0 ~ 10V) to the VCF 17 connector via a suitable lead, the generated signal is on Output 18.
3. Other adjustments, such as AMPL 12 can be made by adjusting the AMPL 12 knob for attenuation; adjust Offset 11 for DC level; rotate the Duty 9 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 ±10V (no load) or ±5V (50Ω load). However, if a signal is added the DC level, is still limited to ±20V (no load) or ±10V (50Ω load). In case of over-voltage, the waveform will be clipped and appear as shown in Figure 2.
2. Output connector label 50Ω, indicated that the signal source impedance is 50Ω. 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.
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:

<table>
<thead>
<tr>
<th>Fuse Rating and Type</th>
<th>Rating Input</th>
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<tbody>
<tr>
<td>115V 0.315A 250V</td>
<td>25 Watts</td>
</tr>
<tr>
<td>230V 0.16A 250V</td>
<td>32 VA</td>
</tr>
</tbody>
</table>

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.

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.
4). 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.