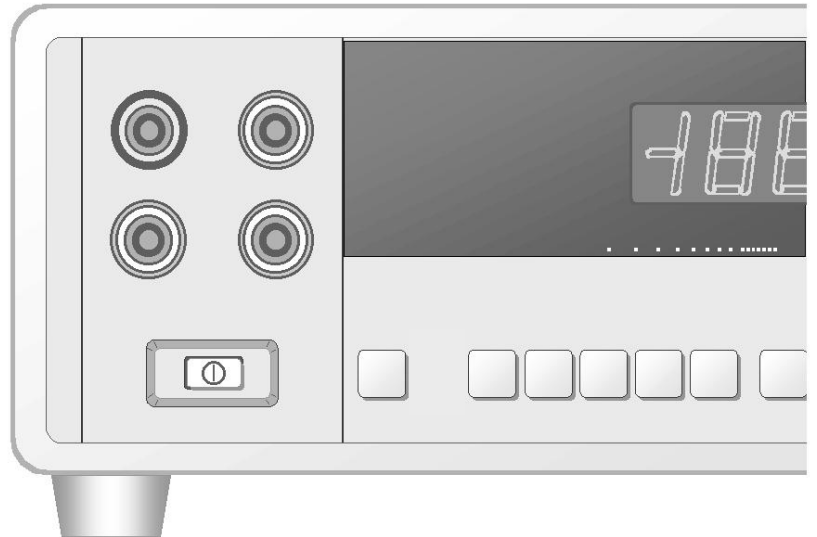




Bench-top Instrument

AG-7001C Audio Generator Operation Manual



 EZ Digital Co.,Ltd.

WARRANTY

Warranty service covers a period of one year from the date of original purchase.

In case of technical failure within one year, our service center or sales outlet free of charge will provide repair service.

We charge customers for repair after the one-year warranty period has been expired. Provided that against any failure resulted from the user's negligence, natural disaster or accident, we charge you for repairs regardless of the warranty period.

For more professional repair service, be sure to contact our service center or sales outlet.

Introduction

Thank you for purchasing a EZ product. Electronic measuring instruments produced by EZ Digital are high technology products made under strict quality control. We guarantee their exceptional precision and utmost reliability. For proper use of the product, please read this operation manual carefully.

Note

1. To fully maintain the precision and reliability of the product use it within the range of standard setting(temperature 10C~35C, humidity 45%~85%)
2. After turning of power, please allow a pre-heating period of as long as some 10 minutes before use.
3. This equipment should be used with a triple line power cord for safety.
4. For quality improvement the exterior design and specification of the product can be changed without prior notice.
5. If you have further questions concerning use, please contact the EZ Digital service center or sales outlet



Safety Summary

Please take a moment to read these operating instructions thoroughly and completely before operating this instrument. Pay particular attention to WARNINGS used for conditions and actions that pose hazard to the user and CAUTIONS used for conditions and actions that may damage the instrument.

- Always to inspect the instrument and other accessories for any sign of damage or abnormality before every use.
 - Never ground yourself and keep your body isolated from ground.
 - Never touch exposed wiring, connections or any live circuit conductors.
 - Do not install substitute parts or perform any unauthorized modification to the instrument.
 - Use caution when working above 60V DC or 30V AC rms. Such voltages pose a shock hazard.
 - Remember that line voltage is present on some power input circuit points such as on-off switches, fuse, power transformers, etc., even when the equipment is turn off.
 - Also, remember that high voltage may appear at unexpected points in defective equipment.
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1. PRODUCT DESCRIPTION

1-1. Introduction

This instrument is a audio generator with a signal output in frequency from 10 Hz to 1 MHz in 5 overlapping ranges and a step attenuator added. This generator can also be used without a external frequency counter through direct readout of the output frequency by 6 digit green LED display. It may be synchronized with other instruments and accepts at external sync signal from another source. Push button key switches are easy to select frequency, function and attenuation level. This compact and light weight instrument is very useful for R&D, laboratories, factory, and field service of various electronic equipment as a signal source for high performance audio instruments.

1-2. Technical Specifications

FREQUENCY RANGE: 10 Hz to 1 MHz, in 5 decade steps, variable control 10 : 1 (overlapping ranges)

x 1 RANGE	:	10 Hz to 100 Hz
x 10 "	:	100 Hz to 1 KHz
x100 "	:	1 KHz to 10 KHz
x 1K "	:	10 KHz to 100 KHz
x 10K "	:	100 KHz to 1 MHz

FREQUENCY ACCURACY : $\pm 5\%$ OF FULL SCALE

■ SINE WAVE CHARACTERISTICS

OUTPUT VOLTAGE : 8 Vrms or more(open circuit)

OUTPUT IMPEDANCE(UNBALANCED) : Approx. 600 Ω

FREQ. CHARACTERISTICS(REF. 1 KHz) : $\pm 2.5V$ for 10 Hz to 1MHz

DISTORTION FACTOR : 50 Hz--100 KHz : 0.1 %

: 100 Hz--500 KHz : 0.5%

■ SQUARE WAVE CHARACTERISTICS

OUTPUT VOLTAGE : 10 V_{pp} or more.
OVERSHOOT : 2% or less(at 1 KHz, max. output)
RISE AND FALL TIME : 220 nS or less(at max. output)
DUTY RATIO : 50% ±5%(at 1 KHz, max. output)

■ EXTERNAL SYNCHRONIZATION CHARACTERISTICS

SYNCHRONIZING RANG: ± 1 %/V_{rms}
MAX. INPUT VOLTAGE : 10 V_{rms}
INPUT IMPEDANCE : Approx. 10 KΩ

■ OUTPUT ATTENUATOR (min. 100 dB)

4 STEP ATTENUATOR : 0 dB, - 10 dB, -20 dB, -40 dB(Accuracy: ± 1 dB)
VARIABLE : -60 dB or more

■ FREQUENCY COUNTER CHARACTERISTICS

FREQUENCY RANGE : 0.2 Hz to 50 MHz With Auto Range.
DISPLAY : 6 digit green LED, Gate time, MHz, KHz,Hz,mHz.
SENSITIVITY : 100 mV_{rms}
INPUT IMPEDANCE : 1 MΩ/ 25 pF
MAX. INPUT VOLTAGE : 250 V_{pp}
TIME BASE : 10 MHz
ACCURACY : TIME BASE ERROR ± 1 COUNT

■ PRE-PROGRAMMED SWITCHES

400 Hz, 1 KHz (usable in audio and modulation), Accuracy : ±0.5%

■ DIMENSION AND WEIGHT

Dimension : 255(W)x255(D)x90(H)mm
Weight : Approx.2.0Kg

1-3. Equipment Ratings

- Power : AC 230V/115V, 50/60 Hz, 10 W
- Plug and Socket : 3 wire ac power plug and 3 wire outlet
- Fuse : 100 mA/ 250V F type

- Operating Environment:
 - TEMPERATURE : 0 °C to + 40 °C
 - HUMIDITY : up to 85% to 40°C without temperature extremes causing condensation within the instrument.

- Storage Environment
 - TEMPERATURE : -20°C to +70°C
 - HUMIDITY : below 85% RH

- Insulation Category II : Portable equipment of local level.
- Pollution Degree : 2
- Protection to IEC 529 : Ordinary

1-4. Supplied Accessories

- User's Manual ----- 1
- BNC cable ----- 1
- Power cord ----- 1
- Fuse(spare) ----- 1

Specification are subject to change without notice.

2. INSTALLATION

2-1. Initial Inspection

This instrument was carefully inspected both mechanically and electrically before shipment. It should be physically free of damage. To confirm this, the instrument should be inspected for physical damage in transit. Also, check for supplied accessories.

2-2. Connecting AC Power

This instrument requires ac 230v 50-60 Hz power through 3-conductor ac power cable to be fit into three-contact electrical outlet to secure grounding. If forced to use 2-conductor cable, use ground terminal in rear panel for grounding instrument.

CAUTION

THIS INSTRUMENT IS SET TO AC 230V. BEFORE POWERING ON THIS INSTRUMENT, MAKE SURE THE VOLTAGE OF THE POWER SOURCE IS AC 230V. IN CASE OF AC115V, SWITCH SHOULD BE SELECTED DOWN TO115V POSITION.

2-3. Cooling And Ventilation

No special cooling and ventilation is required. However, the instrument should be operated where the ambient temperature is maintained.

2-4. Position

This instrument is built as a bench-type instrument with rubber feet and tilt stand in place. Stand-up angle can be adjusted by rotating angle of carrying handle.

2-5. Warming-Up

Allow more than 20 minutes for the unit to warm up so that it is stabilized and ready for use.

3. OPERATION

3-1. Controls, Indicators And Connectors

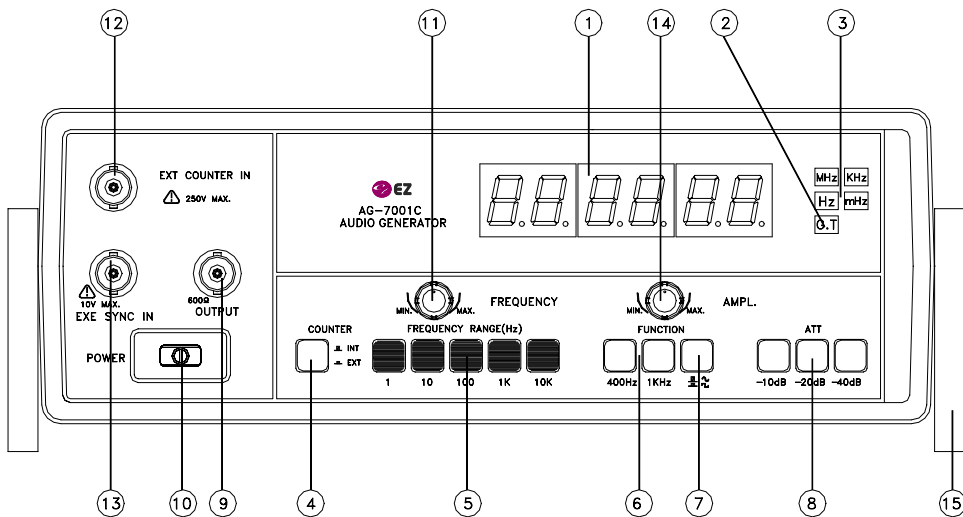


FIG 1. FRONT PANEL OPERATOR'S CONTROLS

- ① LED DISPLAY : Displays Internal or External Frequency.
- ② GATE TIME INDICATOR : Indicating gate time of INT/EXT frequency counter.
- ③ MHz, KHz, Hz, mHz ANNUNCIATOR : Frequency counting unit.
- ④ INT/EXT FREQUENCY COUNTER SELECT SWITCH
 Push in : External frequency counter
 Push out : Internal frequency counter.
- ⑤ FREQUENCY RANGE SWITCHES: Frequency range select switch.
- ⑥ PRE-PROGRAMMED SWITCHES FOR 400 Hz AND 1 KHz
 When pressed to the each switch, the output frequency is constant without tuning the frequency range and variable.
- ⑦ WAVE FORM SELECTOR SWITCH
 Output wave form selector switch, when Push out "■", the output signal is sine wave, when Push in "■", the signal is square wave.
- ⑧ ATTENUATOR: 4-position output attenuator select attenuation's of 0 dB to -70dB.

- ⑨ OUTPUT : output BNC terminal for both sine wave and square wave.
- ⑩ POWER SW : Push type switch. turning on the power when pressed.
- ⑪ FREQUENCY DIAL: This dial adjust the output frequency.
- ⑫ EXT COUNTER INPUT BNC
This input BNC can be use as an external frequency counter.
- ⑬ EXT SYNC INPUT BNC
External synchronizing signal input BNC for connection of synchronizing signal.
- ⑭ AMPLITUDE VR
Amplitude adjust to continuously vary the amplitude of output voltage.
- ⑮ TILT STAND :Pull out to adjust tilt

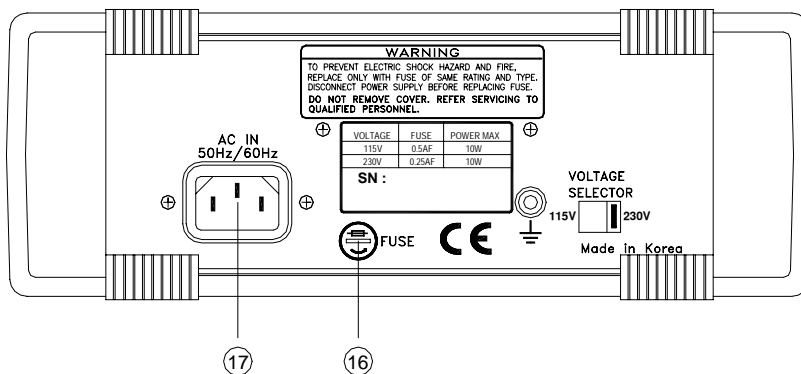


FIG 2. REAR PANEL

- ⑯ FUSE HOLDER : Replacing fuse with unscrewing.
- ⑰ AC INLET : For connection of the supplied AC power cord.

3-2. Operating Instruction

This test will allow you to check the functions of unit at certain time intervals without using any special test equipment.

■ MEASURING EQUIPMENT REQUIRED

- (1) Oscilloscope, Bandwidth ≥ 20 MHz
- (2) Frequency Counter bandwidth ≥ 10 MHz
- (3) Distortion analyzer
- (4) BNC cable
- (5) Termination(600Ω)

■ POWER ON SELF CHECK

- (1) Before switching on the instrument, ensure that the power voltage is matched to the voltage setting of the instrument.
- (2) Set frequency range Switch ⑤ to the push on position.
- (3) Select the sine or square wave form output, using the push button switch.⑦
- (4) Adjust to the amplitude VR medium range.⑭
- (5) Connect BNC cable to the oscilloscope input.
- (6) Press the power switch ⑩ the unit is ready for operation.
Allow about 10 minutes for the unit to warm up so that it is stabilized.
- (7) Press the wave form select switch ⑦ to the "■" position to obtain sine waves.
Press the switch to the "■" position for square waves.

■ FREQUENCY SELECTION

Set the frequency range switch ⑤ to the desired range, then set the frequency dial ⑪ so that indicates your frequency.

EXAMPLE : TO SET THE 5 KHz, Press the frequency range switch ⑤ x100 and set the pointer of the frequency dial to "50" on the mid position. The frequency thus selected is : $50 \times 100 = 5 \text{ KHz}$.

■ ADJUSTMENT OF OUTPUT VOLTAGE

The output voltage from OUTPUT BNC ⑨ , be it sine wave or square wave, can be continuously varied by AMPLITUDE VR ⑭ and stepped by attenuator.

- EXAMPLE : TO ADJUST OUTPUT VOLTAGE TO 10 mV rms,
- . Connect a voltmeter capable of measuring AC 1 Vrms to output BNC.
 - . Set the attenuator to (0) dB and then adjust amplitude V R until the voltmeter indicates 1 Vrms. A voltage 1 Vrms will appear at output BNC.
 - . Set attenuator to -40 dB. The voltage of 10 mV rms appears at OUTPUT BNC.

■ PRE-PROGRAMMED SWITCHES FOR 400 Hz AND 1 KHz OUTPUT
Programmed frequency(400 Hz, 1 KHz) usable in audio mode and modulation, is constant and continuously output without tuning the frequency range switch and variable.

NOTE

Carefully select the cable used for the output connector. Some cable cause poor frequency characteristics for sine wave form and poor leading edge characteristics for square wave form.

■ EXTERNAL SYNCHRONIZING INPUT

By applying an external sine wave signal to EXT SYNC in BNC ⑬, the oscillating frequency can be synchronized to the external signal. The synchronizing range is increased in proportion as the input voltage is increased as shown in FIG. (1),, indicating that the synchronizing range is about $\pm 1\%$ per input voltage of 1 V.

EXAMPLE : Suppose that the input signal voltage is 1 Vrms and the oscillating frequency of is between 990 Hz to 1010 Hz ($1 \text{ KHz} \pm 1 \text{ KHz} \times 1 \% / \text{V} \times 1 \text{ V} = 1 \text{ KHz} \pm 1 \text{ KHz} \times 0.01$), the frequency can be synchronized with 1 KHz of input signal.

NOTE

NEVER APPLY AN EXTERNAL VOLTAGE OF 10V OR MORE (PEAK VALUE OF AC AND DC) TO EXT SYNC IN BNC. IT WILL AFFECT AMPLITUDE AND DISTORTION FACTOR. IT IS THEREFORE ADVISABLE THAT OSCILLATING FREQUENCY BE FIRST SYNCHRONIZED WITH A LOW INPUT SIGNAL VOLTAGE (LESS THAN 1 VRMS) AND THEN THE VOLTAGE BE INCREASED.

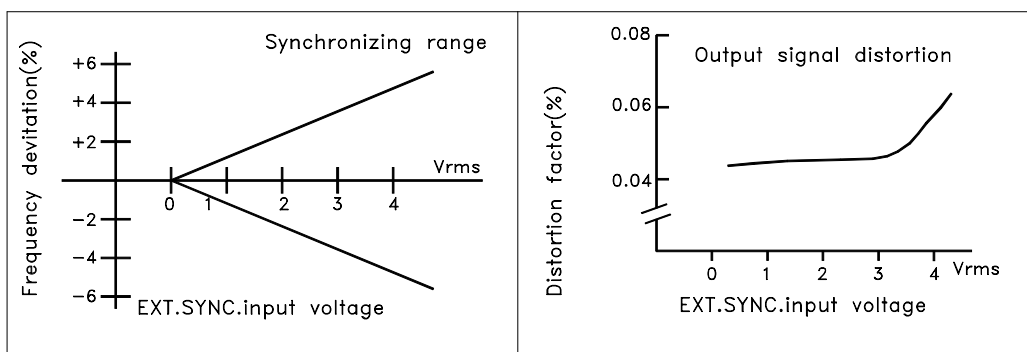


FIG. 3. EXT. SYNC. INPUT VS FREQUENCY DEVIATION AND DISTORTION

3-3. Frequency Counter

If you want to use this instrument as an external frequency counter, press the push button switch (④) (■ EXTERNAL FREQUENCY COUNTER MODE) and connect external signal to be measured, with EXT INPUT BNC at front panel. the input frequency is displayed on 6 digit LED display.

CAUTION

1. APPLICATION OF INPUT VOLTAGES HIGHER THAN THE LIMITS LISTED IN THE SPECIFICATIONS SECTION MAY DAMAGE THE COUNTER. BEFORE APPLYING ANY SIGNAL TO THE INPUTS, MAKE CERTAIN THAT IT DOES NOT EXCEED THESE SPECIFIED MAXIMUMS.
2. FREQUENCY COUNTER GROUND POINTS ARE CONNECTED DIRECTLY TO EARTH GROUND. ALWAYS CONNECT FREQUENCY COUNTER GROUND ONLY TO GROUND POINTS IN THE CIRCUIT UNDER TEST.

4. MAINTENANCE

CAUTION

IT IS ESSENTIAL FOR SAFETY TO PROPERLY MAINTAIN AND SERVICE THIS INSTRUMENT

WARNING

VOLTAGES WITHIN THIS INSTRUMENT ARE SUFFICIENTLY HIGH TO ENDANGER LIFE.
COVERS MUST NOT BE REMOVED EXCEPT BY PERSONS QUALIFIED AND AUTHORIZED TO DO SO AND THESE PERSONS SHOULD ALWAYS TAKE EXTREME CARE ONCE THE COVERS HAVE BEEN REMOVED.

4-1. Fuse Replacement

- Disconnect and remove all connections from any live power source.
- Unscrew fuse holder by screw driver.
- Locate the defective fuse and remove it by gently pulling-out.
- Install a new fuse of the SAME SIZE AND RATING.
- Screwing fuse holder.

CAUTION

MAKE SURE THAT THE RATED AND SPECIFIED FUSES ARE USED FOR REPLACEMENT.

4-2. Adjustment And Calibration

It is recommendable to regularly adjust and calibrate this instrument. Performance and procedures should be executed by qualified and authorized personnel only

4-3. Cleaning and decontamination

The instrument can be cleaned with a soft clean cloth to remove any oil, grease or grime. Never use liquid solvents or detergents. If the instrument gets wet for any reason, dry the instrument using low pressure clean air at less than 25 PSI. Use care and caution around the window cover areas where water or air could enter into the instrument while drying.

5. OTHERS

5-1. Circuit Description

1) Wien Bridge Oscillator

The wien bridge oscillator circuit elements consist of the capacitance elements, which may be switched over for 5 range by the frequency range switch, except programmed 2 range of 400 Hz and 1 KHz and the variable resistor controlled by

the frequency variable. The elements provide means to vary the oscillating frequency continuously over 10 times if frequency on one range, thus determining any desired frequency within the entire frequency range from 10 Hz to 1 MHz.

The amplifier circuit for the oscillator circuit is composed of a 2-stage differential amplifier circuit. First stage is a high input impedance circuit with FET while the driver stage is a wide band, high amplification type circuit with transistors featuring high cut-off frequency.

The output stage is a S.E.P.P. circuit using complementary transistors. The output voltage is feedback with positive polarity through the oscillator elements to form an oscillating circuit, while it is also feedback with negative polarity through the non-linear thermistor to stabilize the amplitude.

2) Square Wave Shaping Circuit

The square wave shaping circuit is a schmidt trigger circuit in which the sine wave signal from the oscillator circuit is shaped into a square wave. It is composed of an emitter coupled schmidt trigger circuit and a buffer amplifier, thus providing sufficient rising and falling characteristics.

3) Output Circuit

The output circuit converts the impedance of signal from the OUTPUT control and feeds the signal to the output attenuator at a low impedance. It is a S.E.P.P. O.C.L circuit employing complementary transistor to provide sufficiently low output impedance characteristics over the range from DC to 1 MHz.

4) Output Attenuator

The position output attenuator selects attenuation's of 0 dB to -70 dB. At the 0 dB position with the output amplitude VR control turned fully clockwise, the output voltage(sine wave: open circuit) is more than 8 Vrms. The output impedance is rated for 600Ω .

5) Power Supply

The power supply circuit is powered by 230V ac and delivers the sufficient DC \pm 22V stabilized by large capacity smoothing capacitors and a voltage stabilizer.

5-2. Applications

■ Use As Sine wave Oscillator

- (1) With low distortion factor, it can be used for measurement of distortion characteristic of amplifier.
- (2) With wide bandwidth, it can be used for measurement of characteristic of amplifier.
- (3) It can be used as a signal source of impedance bridge.
- (4) Built-in frequency counter reads direct the internal frequency and external frequency.

■ Use As Square Wave Oscillator.

This instrument features excellent rising and falling characteristics. It has no coupling capacitors in the output stage, so the SAG(deflection of top section) is as low as 5% at 50 Hz. By applying such a good square wave to an amplifier input, various characteristics of amplifier can be observed on an oscilloscope.

CAUTION

● CONNECTING LEADS SHOULD BE AS SHORT AS POSSIBLE.

Use of a long shield cable will affect high frequency amplitude characteristics because of its own line capacitance.

● OUTPUT WAVE FORM AFTER SWITCHING ON.

Because of the use of direct coupled circuits throughout the entire stage, DC voltage will appear about 20 to 30 seconds later when normal output wave form is obtained.

● OUTPUT VOLTAGE VARIATION DUE TO AMBIENT TEMPERATURE.

A thermistor is used to control the oscillating voltage. Care should be excessive temperature variation because the thermistor is normally affected by ambient temperature variation.

● IMPEDANCE MATCHING.

Any related equipment to be connected to OUTPUT BNC should be checked to see that its input impedance matches the output impedance 600Ω .

