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SAFETY TERMS AND SYMBOLS

These terms may appear in this manual or on the product:



WARNING: Warning statements identify condition or practices that could result in injury or loss life.



CAUTION: Caution statements identify condition or practices that could result in damage to this product or other property.

Measurement category I is for measurements performed on circuits not directly connected to MAINS.

Measurement category II is for measurements performed on circuits directly connected to the low voltage installation.

Measurement category III is for measurements performed in the building installation.

Measurement category IV is for measurements performed at the source of the low-voltage installation.



DANGER
High
Voltage



ATTENTION
Refer to
Manual



Protective
Conductor
terminal



Frame or
Chassis
Terminal



Earth
(ground)
Terminal

1. PRODUCTION INTRODUCTION

The model GAD-201G Automatic Distortion Meter is designed to measure the total distortion down to 0.1% full scale at any frequency between 20Hz and 20kHz.

The instrument provides the function of automatic tuning, auto ranging and automatic level control circuit to save the time of adjustment, frequency tuning control and input level setting control.

The instrument uses two meters allowing simultaneous level and distortion measurements. The range selection for both distortion and level measurements is automatically made with a reed relay.

The instrument also equips with a frequency holding selector to keep a spot frequency in a suitable condition to measure distortion factor of audio equipment, such as FM/AM radios, stereo amplifiers, tape recorders,...etc.

Besides, the instrument uses X axis and Y axis two outputs to observe the waveforms of the input signal and the total harmonics. All these features allow an easy measurement of Lissajous' figure distortion and the analysis of distortion accuracy.

2. SPECIFICATIONS

Distortion Measurements	
Measure Range	0.1% to 10% full scale in 7 ranges by auto ranging
Fundamental Frequency range	20Hz to 20kHz 3 ranges continuous fine adjustment, 3 spot frequency: 400Hz, 1kHz, and 10kHz $\pm$ 1% only
Input level	100mVrms to 300Vrms
Fundamental Harmonic Rejection Ratio	80dB above
Secondary Harmonic Accuracy	Within $\pm$ 1dB at a basic frequency of 20Hz to 20kHz.
Residual Distortion	Less than 0.03% (including hum and noise)
Maximum Input Voltage	DC +AC peak, 400V or less
AC Voltage Measurements	
Level measurement on AC voltage ranges	1mVrms to 300Vrms full scale in 12 ranges by auto ranges
Decibel range	-60dB to +50dB in increments of 10dB -60dBm to +50dBm in increments of 10dBm
Decibel scale	-20dB to +1dB (0dB=1V) -20dBm to +3.2dBm (0dBm=1mW, 600 Ω)
Accuracy	Within $\pm$ 3% of full scale (at 1kHz)
Frequency response	Within $\pm$ 0.5dB, 20Hz to 200kHz for 100mV to 300mV ranges Within $\pm$ 1dBm, 20Hz to 200kHz for 1mV to 30mV ranges
Residual noise	Less than 10 μ V with input short circuit
Input impedance	100k Ω $\pm$ 10%, 70pF or less (unbalance)

Output terminal	X Output: Approx. 1Vrms at full scale in measuring input level Y Output: Approx. 500mVrms at full scale in measuring distortion Factor (total harmonic signal output)
Output impedance	Approx. 600Ω
Power source	100/120/220/240V, 50/60Hz, 25VA, 10Watts
Stability against line voltage fluctuation:	The indication of line voltage fluctuation is changed to $\pm 10\%$, within $\pm 0.5\%$ of full scale.
Dimensions	310 (W) × 165(H) × 265(D) mm
Weight	Approx. 4.6 kg
Accessories	Test leads GTL-103 × 1 User Manual × 1
Operation Environment	Indoor use Altitude up to 2000m Installation category II Pollution Degree 2



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



CAUTION: To avoid damaging the instrument, don't use it in a place where ambient temperature exceeds +50°C.

3. PRECAUTIONS BEFORE OPERATION

Unpacking the instrument

The product has been fully inspected and tested before shipping from the factory. Upon receiving the instrument, please unpack and inspect it to check if there is any damage caused during transportation. If any sign of damage is found, notify the bearer and/or the dealer immediately.

Checking the Line Voltage

The instruments can be applied with any kind of line voltage shown in the table below. Before connecting the power plug to an AC line outlet, make sure the voltage selector of the rear panel is set to the correct position corresponding to the line voltage. It might be damaged the instrument if connected to the wrong AC line voltage.

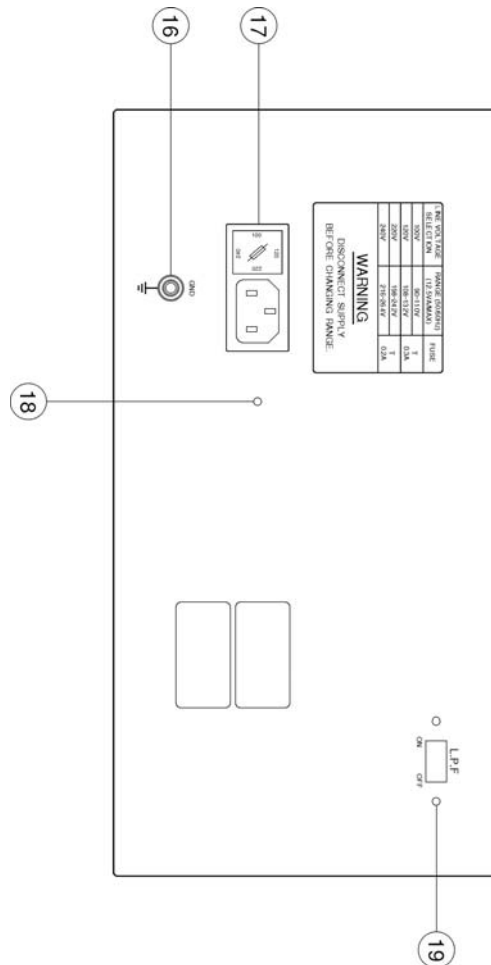
When line voltages are changed, replace the required fuses shown as below:

Line voltage	Range	Fuse	Line voltage	Range	Fuse
100V	90-110V	T 0.3A	220V	198-242V	T0.2A
120V	108-132V	250V	240V	216-264V	250V

Maximum input voltage

Any input voltage over the maximum specific voltage can damage the instrument. The specific voltage is determined by how much the peak value of the input signal is adding plus the superimposed DC voltage.

- **Rear Panel**



(1) INPUT terminal

The terminal is used commonly for the measurements of distortion factor and AC voltage.

(2) AUTO and HOLD function control

The pushbutton is used for automatic measurement or holding the desired range during testing.

(3) Function and Frequency range selector

The selectors are used to set a basic frequency range of distortion factor. Simultaneously use the frequency knob referring to (15) to set a basic frequency range, then, press the spot button and one of three buttons to select a desired spot frequency.

(4) X-output terminal

A binding post terminal is used for observing signal waveforms. Connect the terminal to the “X” input of oscilloscope to observe Lissajous’s figure. The full scale position of output voltage is about 1V rms.

(5) GND output terminal

Ground the terminal when the X and Y output is used.

(6) Y-output terminal

The terminal is used to observe signal waveforms, which is used as a total harmonic signal output during distortion measurement. Connect the terminal to the “Y” input of oscilloscope to observe Lissajous’s figure. The full scale position of output voltage is about 0.5V rms.

(7) Power switch

Push the switch to left, and the pilot lamps corresponding to the measuring range will light up to indicate that the distortion meter is energized and ready for operation.

(8) Measuring range pilot lamps

Pilot lamps corresponding to the scale stage will light up according to the voltage level and distortion factor of the input signal.

(9) LEVEL zero adjustment

This is for mechanical zero adjustment of Level pointer.

(10) DISTORTION zero adjustment

This is for mechanical zero adjustment of Distortion pointer.

(11) LEVEL meter

The meter is to detect mean values, calibrate sinewave input and indicate effective values. Its scale stages are 0~1.12, 0~3.5, -20~+1dB, and -20~+3.2dBm.

(12) DISTORTION meter

The scale stages are 0~1.12%, 0~3.5%, and -20~+1dB.

(13) HIGH pilot lamp (tuning Frequency)

The lamp lights when the center frequency of the basic signal rejection filter is lower than the basic input frequency.

(14) LOW pilot lamp (TUNING FREQ.)

The lamp lights when the center frequency of the basic signal rejection filter is higher than the basic input frequency.

(15) TUNING FREQ. setting knob

The knob is used to adjust the frequency to a desired value.

(16) Power Cord

Connect the power cord to a suitable AC source.

(17) Fuse holder

For circuit protection.

(18) GROUND terminal

The terminal is connected to both the cabinet and signal input grounding.

(19) L.P.F.(Low Pass Filter) switch

This slide switch can select "Low Pass Filter" function which is at 3dB of 100kHz nominally.

5. OPERATING INSTRUCTIONS

1) Power on

- Set the POWER switch to “OFF” position.
- Check zero setting—If offset, adjust the pointer to zero by using a small screwdriver.
- Set the POWER switch to “ON” position.

2) Before applying an input signal

The instrument would be damaged by any applied signal which has an excessive input voltage larger than 350Vrms. Make sure the input voltage of the signal is less than 350Vrms.

3) AC voltage measurement

- The range will be selected automatically when a signal is connected to the input terminal, and the corresponding pilot lamps are lighting on.
- The reading value is obtained above one third of scale of meter at least.

4) The decibel scale

The numerals under the pilot lamps correspond to the decibel (dB) scale that ranges from 0 to +50dB. The decibel numerals correspond to the voltage scale that ranges from 1V to 300V. If the range indicates 300mV to 1mV, it is necessary to add -60dB to the mentioned decibel value.

5) Distortion measurement

In order to reject the fundamental harmonics, the distortion meter is required the adjustment of the notch filter frequency. The instrument provides Automatic Level Control (ALC) and automatic synchronization, but it is required to adjust the frequency for continuous measuring function.

- Use FREQUENCY RANGE selector to set the input basic fundamental frequency range to :

x 1	20Hz to 200Hz
x 10	 200Hz to 2kHz
x 100	 2kHz to 20kHz
- Use TUNING FREQ. knob (15), the push buttons “HIGH”(13) and “LOW”(14) to minimize the reading value of the meter.
- When the basic frequency of the input signal is equal to the fundamental frequency, the lamps of the TUNING FREQ. is on. Turn the knob to the left (the pilot lamp of “HIGH” is on) or to the right (the pilot lamp of “LOW” is on) to increase or decrease the fundamental frequency, then turn off two lamps.
- Connect the oscilloscope to X/Y output terminal, when the pointer of the meter indicates the full scale position on 100% range, the Lissajous’ figures can be observe as shown on the Fig. 3 (a) below.

Then, adjust (15) TUNING FREQ. knob to obtain the figure as shown on the Fig. 3 (b) and (c).



Fig. 3

6. MAINTENANCE

The following instructions should be performed by the qualified personnel only in order to avoid electrical shock. Do not perform any servicing other than the operating instructions unless you are qualified to do so.

6-1. Line fuse replacement

If the fuse is blown, the instrument would not work. Try to determine and correct the cause of the blown fuse. The input power fuse is located within the instrument in a fuse clip. When replacement is required, install (T0.3A 100V/120V), (T0.2A, 220V/240V) as indicated on the rear plate.



WARNING: For continued fire protection. Replace fuse only with the specified type and rating, and disconnect the power cord before replacing fuse.

6-2. Cleaning

Clean the front panel and case with denatured alcohol or a mild solution of detergent and water. Do not use aromatic hydrocarbons or chlorinated solvents because they will react with the plastic materials of the instrument.