

INSTRUCTION MANUAL FOR  
LOW FREQUENCY FUNCTION GENERATOR

MODEL 453E

KIKUSUI ELECTRONICS CORP.

On Power Supply Source, it is requested to replace the related places in the instruction manual with the following items.

(Please apply the item of  $\checkmark$  mark.)

- Power Supply Voltage: to \_\_\_\_\_ V AC
- Line Fuse: to \_\_\_\_\_ A
- Power Cable: to 3-core cable (See Fig. 1 for the colors.)

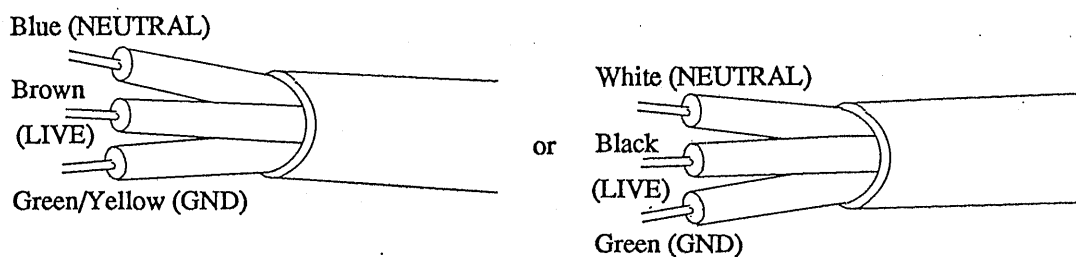


Fig. 1

Please be advised beforehand that the above matter may cause some alteration against explanation or circuit diagram in the instruction manual.

- \* AC Plug: In case of Line Voltage 125V AC or more, AC Plug is in principle taken off and delivered, in view of the safety.  
(AC Plug on 3-core cable is taken off in regardless of input voltages.)  
To connect the AC Plug to the AC power cord, connect the respective pins of the AC Plug to the respective core-wires (LIVE, NEUTRAL, and GND) of the AC power cord by referring to the color codes shown in Fig. 1.

Before using the instrument, it is requested to fix a suitable plug for the voltage used.

The Model 453E Function Generator consists of an ultra-low frequency oscillator circuit and a DC output (Log f output) generator circuit. The former provides very stable output of sine wave, triangular, sawtooth, or square wave signal for a range of 0.0008 Hz - 1,200 Hz in six decade ranges. The latter produces a DC signal which is proportional to logarithm of the oscillation frequency. The oscillation frequency is virtually flat for the full range. When the waveform selector or frequency selector is turned, the new waveform or frequency is immediately obtained without any substantial transients. The output voltage (peak-to-peak) can be read on the panel voltmeter which indicates the voltage of the output terminal in the open status.

### SPECIFICATIONS

<u>Frequency range:</u>	0.0008 Hz - 1,200 Hz
Range factors:	x0.001, x 0.01, x 0.1, x1, x10, and x100
Dial scale:	0.8 - 12, linear scale
Accuracy:	2% + ( $\pm 0.03$ of dial scale)
Stability:	Better than $\pm 1\%$ (excluding ranges x0.001 and x0.01) for 5 - 60 minutes after turning on the power. Better than $\pm 0.5\%$ for $\pm 10\%$ line voltage variation.
<u>Output:</u>	Sine, triangular, sawtooth, or square wave; balanced or single-ended.
Load resistance:	2 k $\Omega$ minimum
Maximum output voltage:	30 V <sub>p-p</sub>
Frequency response:	$\pm 0.2$ dB maximum ( $\pm 1$ dB maximum for sawtooth wave); reference level at 1,000 Hz
Distortion (sine wave):	1% maximum for 20 - 100 Hz, 2% maximum for 100 - 1,000 Hz
Output impedance:	Approx. 25 $\Omega$
Stability:	Better than $\pm 2\%$ for $\pm 10\%$ line voltage variation
Voltage deviation:	Less than $\pm 3\%$ between sine wave, triangular wave, and square wave
<u>Voltmeter:</u>	0 - 30 V <sub>p-p</sub>
Measurement:	Measures the output terminal voltage (open status) through half-wave voltage-doubler rectification
Accuracy:	3% of full scale (excluding sawtooth wave)

Sync. signal output:

Synchronized with positive peaks of sine, triangular, or sawtooth wave or with leading edges of square wave.

Voltage: -10 V<sub>p-p</sub> minimum

Pulse width: 5 μsec. maximum

Log f output:

Output voltage:  $E_{out} (V) = 4 \log_{10} f (Hz)$

Accuracy: Better than ±(0.1% +20 mV).

(The percentage denotes the error of the output voltage from the theoretical value calculated by substituting the dial-indicated "f" in the above equation for  $E_{out}$ .)

Stability:

Load regulation: Less than 2 mV for 1 kΩ load.

Line voltage regulation: Better than ±(0.5% +10 mV) for ±10% line voltage variation.

Minimum load resistance: 1 kΩ

Output terminals: Floating, either positive or negative terminal may be grounded.

Power requirements: 100 V, 50/60 Hz AC, approx. 160 VA

Dimensions: 520 mm width, 240 mm high, 404 mm deep

(Maximum dimensions): 545 mm width, 260 mm high, 455 mm deep

Weight: Approx. 20 kg.

Accessories: Instruction manual 1  
Inspection report 1  
Short bars 2

(Distortion test filter ... internally mounted)

## DESCRIPTION OF PANEL CONTROLS

- POWER:** Main switch of the function generator. As this switch is set in the ON position, the generator is energized and its frequency dial is illuminated. Approximately 30 seconds of stabilization period must be allowed after turning on this switch.
- FUNCTION:** This switch selects the sine, triangular, sawtooth, or square wave. A new waveform is instantaneously obtained as this selector is turned, without any substantial output voltage change. The phases of the sine and triangular waves are identical; that of square wave leads the above two waves by 90 degrees.
- FREQ:** This knob is for continuous adjustment of the oscillation frequency. As this knob is turned counterclockwise, the frequency dial turns counterclockwise and the frequency increases. Note that, if the dial is directly turned by holding its center knob, an excessively large force which might damage the dial mechanism could be applied to the mechanism.
- FREQ RANGE:** This selector (outer one of concentric knobs) determines the oscillation frequency range. The output frequency is determined as indicated by the frequency dial multiplied by the factor determined by this selector. The multiplication factor is selectable in six steps from 0.001 to x100. The output voltage remains constant irrespective of changing of the output frequency, and the newly selected frequency output is immediately usable at the same output voltage level.

- OUTPUT VOLTS CHECK:** The inner one of the above concentric knobs. As this knob is turned clockwise by 30 degrees, the output terminals are made open and the voltmeter indicates the open-terminal output voltage ( $\frac{1}{2}$  output terminal voltage). As you release the knob, it automatically returns to the original position.
- AMPLITUDE:** The output voltage increases from zero volt as this knob is turned clockwise. The maximum voltage is 30 Vp-p. When the voltage is increased beyond the maximum voltage, distortion increases greatly.
- DC BAL:** Semi-fixed resistor for DC balance of output amplifier. This control must be so adjusted that the DC component of output amplifier is made zero.
- OUTPUT:** These output terminals supply a balanced output or a single-ended output (connect either one of the red terminals to the GND terminal). When the load resistance is smaller than the specified minimum load resistance (2 k $\Omega$ ), the output voltage will be reduced and distortion will increase.
- LOG f OUTPUT:** These output terminals supplies a DC output which is proportional to logarithm of the oscillation frequency. Employing an X-Y recorder, semi-logarithmic characteristic curves with the frequency axis in logarithmic scale can be readily obtained. The terminals are isolated from the chassis, and either polarity can be readily obtained using the short bar (supplied as an accessory). The terminals are protected against overload and short-circuiting. Although the output voltage may drop when the output terminals are overloaded or short-circuited, the normal voltage is restored immediately after such an abnormal state is eliminated.