

MODEL 462
SWEEP GENERATOR
OPERATIONAL MANUAL

KIKUSUI ELECTRONICS CORP.

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1. GENERAL

Kikusui Electronics' Model 462 is an electronic sweep generator having a frequency range from 20Hz to 200kHz without switching range switch.

Furthermore sweep frequency range can be expanded from 2Hz up to 200kHz, if frequency offset is adjusted at the lowest frequency. Sine wave output can be obtained from a terminal on the frontpanel, fixed sine and triangular wave are available from the rear panel.

Model 462 has two logarithmic sweep mode, one is automatically repetitive sweep, the other is manual trigger start-stop mode. In start-stop mode, when the equipment is triggered by a manual switch, oscillation starts at the lowest frequency and stops at the highest frequency.

Also VCG (VOLTAGE CONTROL GENERATOR) frequency is proportional to input applied voltage, maximum frequency 200kHz can be obtained at maximum 10V input voltage.

The repetition rate of the sweep generator can be varied continuously within a range of 0.1 to 100 sec. Considering the automatic frequency measurement, Model 462 is provided with timebase output terminal for connecting an oscilloscope or X-Y recorder on the rear panel.

As described above, Model 462 can be widely applied to many types of measurement and tests such as frequency response test of audio amplifiers, filter characteristic measurement, FM signal source test or sound/vibration test as a voltage control generator, sweep generator or function generator as well as an ordinary generator.

2. SPECIFICATIONS

Oscillation mode	1. VCG (Linear) 2. Continuous Sweep (Logarithm) 3. Manual Trigger Sweep (Logarithm) 4. Dial
Frequency range	2Hz to 200kHz
Dial scale	2Hz to 200kHz; divided in nearly geometric ratio
Frequency Offset	8% (When offset is adjusted) Approx. ± 20 Hz (Adjustable less than 2Hz with the knob)
Frequency stability	Within $\pm 0.5\%$ against $\pm 10\%$ fluctuation of power voltage
Output waveform	Sine-wave Triangular, Square wave (Fixed output, max. 10Vp-p, from the terminal on Rear Panel)
Maximum open output voltage	More than 30Vp-p
Output impedance	$600\Omega \pm 20\%$
Amplitude stability	Within $\pm 0.5\%$ against $\pm 10\%$ fluctuation of power voltage
Frequency characteristics	Within ± 0.3 dB at 1kHz
Distortion factor	Less than 1% within 20Hz to 60Hz Less than 0.6% within 60Hz to 70kHz Less than 1.5% within 70kHz to 200kHz
Repetition period of time base	0.1 sec. to 100 sec. (Sweep width 10,000)
Ranges	0.1sec.~1sec., 1sec.~10sec., 10sec.~100sec.
Sweep range	20Hz to 200kHz (Dial used) Less than 2Hz to 200kHz (Adjustable frequency offset)

VCG

Control frequency range	2Hz to 200kHz
Control voltage	0 to +10V
Input frequency range	DC to 2kHz
Time base output	0 to 10V peak
Sync output	More than -10V peak
Pulse width	Less than 2 μ sec.
Power requirement	100V, 50/60 Hz, approx. 12.5 VA

Dimensions	200(W) x 140(H) x 330(D) mm
(Maximum dimensions)	200(W) x 160(H) x 420(D) mm

Accessories	Operational manual
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3. OPERATION

3-1 Front panel descriptions

1) POWER

Power pushbutton switch. When pushed and locked. Power is on and the Pilot lamp lights to indicate a ready state.

If high accuracy is needed, warm up time is required for 30 minutes, because the circuits employed thermal oven for stabilizing an Anti-log converter circuit.

2) MODE LINEAR

Variable frequency mode switch to select VCG operation, sweep (continuous, manual trigger) and dial depending upon the application.

*VCG

In VCG mode, oscillation frequency can be controlled by external applied voltage, and relationship between frequency and applied voltage is proportional.

For a example, when applied voltage is +10V, frequency is 200kHz. If 20kHz frequency is required, applied voltage is +1V.

*SWEEP CONT (LOG)

When the equipment is used for continuous sweep operation, select this position.

Slope variable frequency is logarithmic.

*MANUAL TRIG For manual operation of sweep run up or run down, set this position of the Mode switch. When manual trigger switch is set at Down position, the equipment oscillates at the frequency which is set by the frequency dial. Then if Trigger switch is set at up position, run up sweep start, and stop at the upper frequency which is set by the upper frequency dial. Reverse operation of above mention means run down sweep from upper frequency to lower frequency.

*DIAL When the frequency is controlled by the dial (lower frequency dial), This position should be set.

- 3) VCG INPUT VCG input terminal used when the oscillator frequency is controlled by an external voltage. When the input voltage increases from +10mV to +10V, the oscillation frequency increases up to 100,000 times.
- 4) LOWER FREQ (DIAL) Lower frequency dial in the sweep mode. When turns it clockwise, the oscillation frequency increases. In case of continuous oscillation mode, use this dial for setting the frequency. In VCG mode of operation, dial control circuit is cut off.

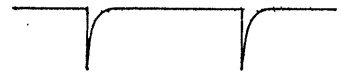
- 5) UPPER FREQ Upper frequency dial in the sweep mode. When turns it clockwise, the oscillation frequency increases. In VCG mode of operation, dial control circuit is cut off.
- 6) FREQ OFFSET Offset control of oscillation frequency is calibrated at the center position, can be adjust frequency within $\pm 20\text{Hz}$.
- 7) SWEEP STOP Sweep state indicator lighting shows sweep stopped or finished for reference of manual mode of operation.
- 8) SWEEP TIME A control knob of the sweep repetition rate from 0.1~100 sec. is divided in 3 decade range: 0.1~1sec., 1~10sec., 10~100sec. Fine control provides inter-range adjustment. Clockwise rotation increases repetition rate. At the fully clockwise rotation repetition rate is calibrated.
- 9) OUTPUT Control knob of output voltage. Clockwise turning increases the output voltage. With no load, more than 30Vp-p is obtained: When the output terminal is terminated with 600Ω , more than 15Vp-p. A BNC type receptacle located below this knob is the output terminal.

3-2 Rear panel descriptions

1) SYNC OUTPUT

The sync pulses obtained at this terminal synchronize with the negative peak of the sine-wave or the positive peak of the triangular-wave or the full of the square-wave, which are taken out at the OUTPUT terminal.

Sync pulse



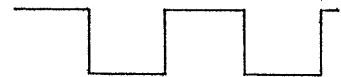
Sine-wave




Triangular-wave



Square-wave



2) 

Output terminal for Square-wave, fixed 10Vp-p can be obtained and output resistance is 600Ω.

3) 

Output terminal for triangular-wave. fixed 10Vp-p can be obtained and output resistance is 600Ω.

4) TIME BASE
OUTPUT

Time base output voltage can be obtained from this terminal used for observing frequency characteristic curves on oscilloscope or recording response by X-Y recorder. So output voltage is proportional to oscillation frequency with 600Ω output resistances.

- 5) SWEEP STOP
SIG. OUTPUT
Sweep stop signal provides for pen-up operation of X-Y recorder recording characteristics curves. Output voltage is 0V during sweeping , +10V output resistance approx. $1k\Omega$ at the stop state.
- 6) FUSE
Used for AC power line, 0.5A rated.
- 7) Power Cord
Connected to 100V AC , 50/60 Hz

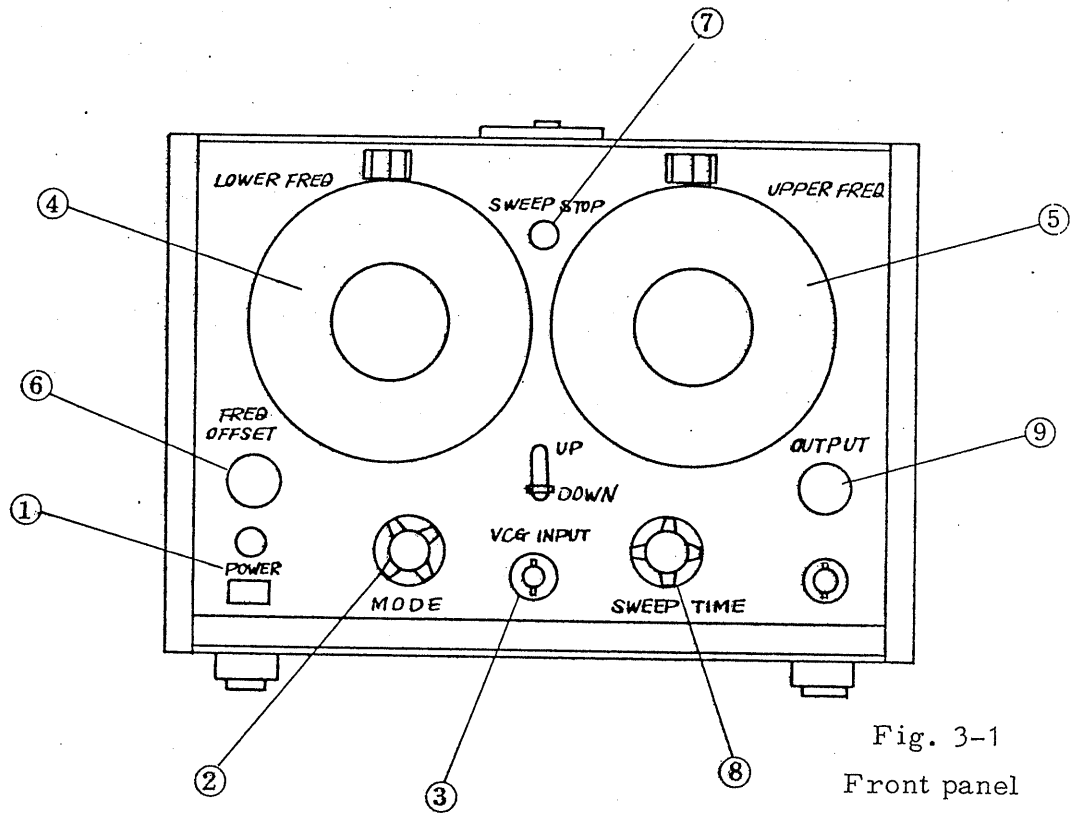


Fig. 3-1
Front panel

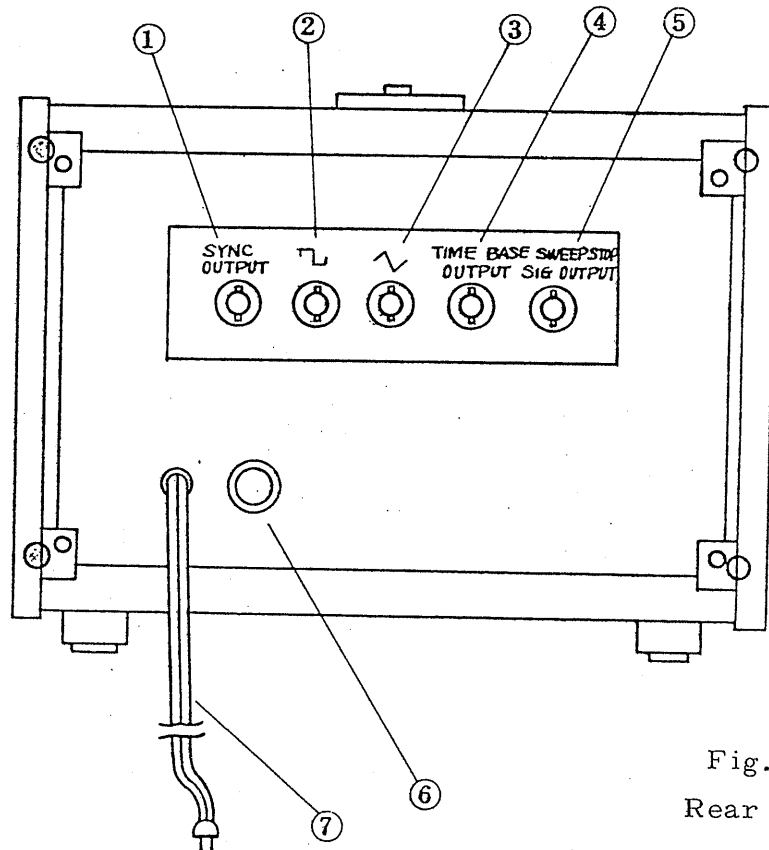


Fig. 3-2
Rear panel

3-3 Applications

Model 462' field application is considered great many, but we show here fundamental applications to master how to use it.

Example (1) To sweep frequency from 200Hz to 20Hz with repetition rate of 1sec.

Procedure

1. Set a position MODE switch to SWEEP CONT
2. Turn the SWEEP TIME switch to the 1-0.1sec. position and adjust the VARIABLE knob to be 1sec.
3. Set the LOWER FREQ dial to 200Hz
4. Set the UPPER FREQ dial to 20kHz
5. If accurate upper or lower frequency is required, Connect frequency counter to output terminal of Model 462, and set MODE switch to the MANUAL TRIG SWEEP. Set the trigger switch to LOWER position, adjust lower frequency with frequency counter. In adjustment of upper frequency, set the switch to upper position.

Example (2) Observation of frequency response of amplifier on oscilloscope with sweep signal from 2Hz to 200kHz, repetition rate 10sec. (vertical axis is used as a amplitude. horizontal used as a frequency)

Procedure

1. Set the MODE switch to SWEEP CONT
2. Turn the SWEEP TIME switch to the 10-100sec. position and turn the VARIABLE knob 1sec.

3. Set the LOWER FREQ dial to 20Hz
4. Adjust FREQ OFFSET knob of the Model 462 to oscillate at 2Hz
5. Set the UPPER FREQ dial to 200kHz
6. If accurate upper or lower frequency is required, connect frequency counter to output terminal of Model 462, and set MODE switch to the MANUAL TRIG SWEEP.

Set the trigger switch to LOWER position, adjust lower lower frequency with frequency counter.

In adjustment of upper frequency, Set the switch to upper position.
7. Connect Model 462, the oscilloscope and the amplifier to be measured as shown in Fig. 3-3
8. Set the vertical sensitivity range of the oscilloscope according to the output voltage level to the amplifier and set the horizontal axis to the external input terminal.

Since the output voltage at the TIME BASE OUTPUT terminal is 0 to 10V, adjust the horizontal sensitivity of the oscilloscope so that the desired trace is obtained on the CRT screen.
9. If the amplifier has such a response that the amplitude at a 200kHz is reduced 6dB with respect to that at 2Hz, the amplitude at 200kHz of the waveform displayed will be approx. one half that at 2Hz as shown in Fig. 3-4

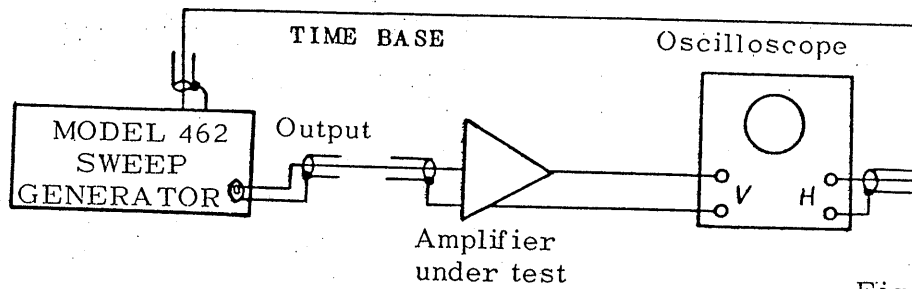


Fig. 3-3

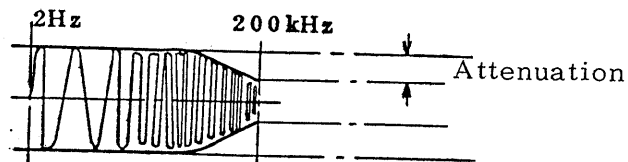


Fig. 3-4

Example (3) Recording frequency response of an amplifier under test on X-Y recorder with sweep range from 20Hz to 500kHz, repetition rate 20sec.

Procedure

1. Set the MODE switch to MANUAL TRIG SWEEP position
2. Set the SWEEP TIME knob to 100 to 10sec., and adjust VARIABLE knob of the Model 462 to be 20sec.
3. Set the LOWER FREQ dial to 20Hz
4. Set the UPPER FREQ dial to 50kHz
5. Connect a terminal of time base output located on the rear to an X-axis input terminal of the recorder.
6. Feed the output voltage of the Model 462 to the equipment under test, and convert AC signal output of the equipment to DC voltage by AC-DC converter. Converted DC voltage is applied to the Y-axis of the recorder.

7. Throw the MANUAL TRIG switch to up or down, then Model 462 start run-up or run-down sweep.

Example (4) Control oscillation frequency from 20Hz to 200kHz with external control voltage.

Procedure

1. Set MODE switch to VCG position
2. Application of control voltage +1mV to +10V is equivalent to oscillate the frequency 20Hz to 200kHz.
3. If AC voltage is used as control voltage, connect a regulated DC source in series with the control voltage source in order to prevent the control voltage to be negative.

If the voltage is negative, the equipment does not operate.