Service and Warranty

Krohn-Hite Instruments are designed and manufactured in accordance with sound engineering practices and should give long trouble-free service under normal operating conditions. If your instrument fails to provide satisfactory service and you are unable to locate the source of trouble, contact our Service Department at (508) 580-1660, giving all the information available concerning the failure.

DO NOT return the instrument without our written or verbal authorization to do so. After contacting us, we will issue a Return Authorization Number which should be referenced on the packing slip and purchase order. In most cases, we will be able to supply you with the information necessary to repair the instrument, avoiding any transportation problems and costs. When it becomes necessary to return the instrument to the factory, kindly pack it carefully and ship it to us prepaid.

All Krohn-Hite products are warranted against defective materials and workmanship. This warranty applies for a period of one year from the date of delivery to the Original Purchaser. Any instrument that is found within the one year warranty period not to meet these standards, will be repaired or replaced. This warranty does not apply to fuses or batteries. No other warranty is expressed or implied.

Krohn-Hite Corporation reserves the right to make design changes at any time without incurring any obligation to incorporate these changes in instruments previously purchased.

Modifications to this instrument must not be made without the written consent of an authorized employee of Krohn-Hite Corporation.

MODEL 1200B

0.2Hz to 3MHz

Linear Sweep Function Generator

Operating Manual

KROHN-HITE CORPORATION

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Figure 1 - Model 1200B Function Generator

SECTION 1
GENERAL DESCRIPTION

1.1 INTRODUCTION

The Krohn-Hite Model 1200B, illustrated in Figure 1, combines a function generator and ramp generator in one instrument. An exclusive feature of the 1200B is WAVEGUARD™, a unique output protection circuit that protects the generator's MAIN (HI) OUTPUT from damage, if a voltage is accidentally placed across the output terminals. The WAVEGUARD circuit recovers automatically when the external voltage is removed.

The main generator provides sine, triangle and square waveforms from 0.2Hz to 3MHz. Frequency is controlled by a tuning knob with display providing a 1500: 1 tuning range with a 3 band, decade multiplier. A fine-tune vernier provides ±2.5% adjustment of the frequency setting (you will need a frequency counter to see the change in some cases). Frequency may be also controlled externally by an AC or DC voltage applied to the external voltage control (VC) input.

The auxiliary ramp generator amplitude is continuously adjustable from 5mV p-p to 20 volts p-p, open-circuit. Output impedance is a constant 50 ohms. A simultaneous LO (-20dB) output is also provided.

Additional features include: ±10V variable DC offset and an auxiliary TTL output.

A rack-mounting kit, part number RK-39 is also available.

The generator is carefully inspected, aged and adjusted before shipment, and should be ready for operation when it is unpacked. If it appears to have been damaged in shipment, file a claim with the freight carrier, and notify Krohn-Hite or its nearest sales office immediately.

1.2 SPECIFICATIONS

Specifications apply at 25℃, ±5℃ at maximum output voltage, and frequency control setting between 2 and 300, unless otherwise noted.

Waveforms: Sine, triangle, TTL, ramp.

Frequency Range: 0.2Hz to 3MHz.

Frequency Control: Single turn log control, tunable from 0.2 to 300 in Hertz, and a 3 position multiplier providing a 1500:1 coverage in each multiplier position. Separate fine-tune vernier provides 5% adjustment.

BAND	MULTIPLIER	FREQUENCY RANGE (Hz)
1	1	0.2 - 300
2	100	20 - 30k
3	10k	2k - 3M

Frequency Accuracy: ±5% typical, ±20% maximum.

Main Output:

Waveforms: Sine, square, triangle.

Output: HI LEVEL (0dB): 20 volts p-p open-circuit, 10 volts p-p across 50 ohms.
LO LEVEL (-20dB): 20 volts p-p open-circuit, 1 volt p-p across 50 ohms.

Isolation: Can be floated up to ±200 volts peak between output and instrument case.

Amplitude Stability (Maximum Amplitude):
10 minutes 0.02%
24 hours 0.1%

Amplitude Control: Infinite resolution vernier. Minimum output less than 5 millivolts.

Frequency Response: Sine wave, less than 0.1dB from 0.2Hz to 300kHz; 1.0dB to 3MHz.

Sine Wave Distortion: Less than 0.5% from 2Hz to 300kHz; 3% to 3MHz.

Square Wave: Rise and fall time, less than 40ns; total aberrations less than 5% with 50 ohm termination.

DC Components: All waveforms are normally symmetrical about ground with nominal zero DC volts. At maximum output, drift is less than 5 millivolts per degree C.

Triangle Linearity: Greater than 99% from 0.2Hz to 300kHz; 95% to 3MHz.

Time Symmetry: Sine, square, triangle 99% from 0.2Hz to 300kHz.

Operational Modes: Continuous or linear sweep.

Sweep Characteristics

Sweep Range: Maximum 1500:1 up or down; upper and lower limits set by FREQuency control and START FREQUENCY control.

Sweep Duration: 1000s - 1ms in two ranges; 1000s - 1s, 1s - 1ms.

Ramp Output: +5V peak sawtooth, frequency adjustable with DURATION control, .002Hz - 1kHz. Ramp retrace, less than 75µs. Output impedance, constant 600 ohms.

External Frequency Control (VC):

Range: 1500:1.

Voltage Control Range: Maximum of zero to ±3volts dc. (A maximum of ±25 volts dc may be applied to the VC input without damage to the circuitry).

Input Impedance: 10k ohms.

Variable DC Offset: ±10 volts open-circuit, ±5 volts across 50 ohms. Push-button ON- OFF Control with separate vernier. (reduced by -20dB on LO output).

TTL Output: TTL pulse at generator frequency, drives up to 10 TTL loads; rise and fall times less than 15ns.

Operating Ambient Temperature Range: -10℃ to 45℃.

Controls: Front panel contains FREQUENCY control, frequency VERNier, START FREQuency, DURATION, AMPLITUDE, DC OFFSET and push-button controls for frequency range MULTiplier, MAIN OUTput waveform selector, SWP on, sweep range multiplier, and POWER switch. Rear panel contains LINE switches, SYMmetry ADJust, DC LEVEL ADJustment and GROUND switch.

Terminals: Front panel only, BNC connectors for HI and LO outputs, TTL output, RAMP output, and VC input.

Power Requirements: Switch selectable, 90-110, 108-132, 180-220, or 216-264 volts, single phase, 50-400Hz, 13 watts.

Dimensions and Weights:

Cabinet Size/Weight	H	W	D	Net	Gross
U.S.	3.5”	9”	8.5”	5 lbs	7 lbs
Metric	9cm	23cm	21.7cm	2.3kg	3.2kg

Optional Rack Mounting Kit (see Figure 2): Part No. RK-39; permits installation of the Model 1200B into a standard, 19" rack spacing.

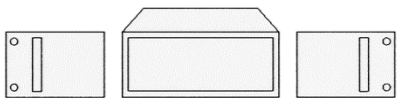

Figure 2. Optional Rack Mounting Kit

Specifications apply at 25℃, ±5℃ at maximum output voltage unless otherwise noted.

Specifications are subject to change without notice.

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SECTION 2
OPERATION

2.1 POWER REQUIREMENTS

The Model 1200B is designed to operate from a single phase, 50-400Hz AC power source of 90-110, 108-132, 180-220 or 216-264 volts. Complementary LINE switches on the rear panel allow the 1200B to be powered from one of the above 4 voltage ranges. The AC power receptacle located on the rear panel, is a standard 3-pin connector. A detachable 3 wire line cord is provided with the instrument.

The fuse receptacle contains either a 1/8 ampere slow blow fuse (90-132 volt operation) or a 1/16 ampere slow blow fuse (180-264 volt operation).

To turn the instrument on;

a) Set the LINE switches for the correct AC line voltage range;
b) Check for or insert the properly rated fuse into the fuse receptacle and secure;
c) Make sure the front panel POWER switch is off (out) before you connect the line cord to the AC power source;
d) Depress the POWER switch and allow the generator to warm up for several minutes.

> CAUTION!
>
> The cover of this instrument should not be removed when the instrument is connected to an AC power source, because of the potentially dangerous voltages that exist within the unit.

2.2 OPERATING CONTROLS AND CONNECTORS (see Figure 3)

2.2.1 Front Panel

Power: ON-OFF switch and power ON indicator light.

Frequency: Hz/STOP FREQ: Single turn control knob, displayed in Hertz from 0.2 to 300, with a separate, fine-tune VERNier, plus a 3 position, push- button MULTiplier switch, X1, X100 and X10K. Effective frequency tuning range is 1500:1. The output frequency is in Hz, times the MULTiplier setting, with the VERNier in its (0) position. In the sweep mode of operation the FREQuency control and MULTiplier determine the sweep frequency STOP limit, while the START FREQ control determines the start of the sweep frequency.

SWP: Push-button switch that converts the generator to continuous sweep operation. When the SWP button is depressed the frequency sweep will always begin at the START FREQ setting.

Start Freq: Single turn potentiometer for adjusting the start of the frequency sweep.

Duration: Single turn potentiometer that determines the sweep duration (rate). Sweep duration is continuously adjustable from 1000 seconds to 1 second, or 1 second to 1 millisecond.

X1K (duration): Push-button control that selects a sweep duration range of 1000s - ts (depressed) or 1s - 1ms (out).

Waveform: A position, push-button switch for selecting sine, square, triangle output waveforms.

Amplitude: Single turn, infinite resolution control for adjustment of the output amplitude from 5mV p-p to 20 volts p-p, open circuit.

DC Offset: Push-button ON-OFF switch, plus separate single turn vernier, for offsetting the DC level of the output waveform between ±10 volts, open-circuit. The combined DC offset plus AC signal should not exceed ±10 volts, open-circuit, or clipping of the waveform may occur.

Main Out:

HI: The selected waveform appears at this output.

Impedance: 50 ohms.

LO: The selected waveform appears at this output, attenuated by -20dB with respect to the HI output.

Impedance: 50 ohms.

VC In: Provides for external voltage control of frequency. A maximum control voltage of zero to ±3 volts dc will vary the generator frequency to the maximum range of 1500:1.

Input impedance: 10k ohms.

TTL Out: TTL pulse, coincident with generator frequency, in phase with the main output square wave. Will drive up to 10 TTL loads. Rise and fall times, less than 15ns. Fixed zero to +5 volt linear ramp, rate coincident with sweep DURATION control. Ramp retrace, less than 75µs.

Output impedance: 600 ohms.

Ramp Out: Fixed zero to plus 5 volts linear ramp, rate coincident with sweep DURATION control.

Ramp retrace: <75µs.

Output impedance: 600 ohms.

2.2.2 Rear Panel

Line: Complimentary line switches for selecting 120 or 240 volt operation, and NORMal or Low line conditions. The 120/240V LINE switch determine the proper voltage range (90-132V or 180-264V) while the NORM/LO LINE switch selects the NORMal (108-1232, 216-264) or Low (90-110, 180-220) line voltage.

SYM ADJ: Potentiometer for periodic adjustment of the waveform symmetry.

DC Output Level: Potentiometer for periodic adjustment of the MAIN OUTPUT DC level.

2.3 OPERATION

2.3.1 Frequency Hz/Stop Freq Control and Multiplier

The generator frequency is controlled by the main tuning (FREQUENCY Hz/STOP FREQ) control and MULTiplier. The frequency tuning control has an overall tuning rage of 1:1500. The 3 position, push-button MULTiplier multiplies the frequency setting by a factor of 1, 100, or 10K (10,000). A separate, single-turn VERNier provides additional fine adjustment of ±2.5% of the frequency setting. With the VERNier in the calibrated (0) position, the generator frequency is the display setting, in Hertz times the MULTiplier.

When the generator is used in the SWP mode, the FREQUENCY FREQ knob determines the stopping point of the frequency sweep.

2.3.2 Internal Sweep Operation

When the front panel SWP button is depressed the generator frequency will continuously sweep between the limits set by the START FREQ control and the FREQUENCY Hz/STOP FREQ control, at a rate determined by the SWP DURATION control. The generator frequency may be either swept up or down, up to a maximum of 1500:1, over the calibrated portion of the tuning range.

To operate the Model 1200B as a sweep generator proceed as follows:

Select the frequency range within which you wish to sweep by selecting the appropriate frequency MULTiplier range.

SWEEP RANGE	MULTiplier
0.2Hz-300Hz	X1
20Hz-30kHz	X100
2kHz-3MHz	X10k

Set the FREQUENCY Hz/STOP FREQ control to the beginning (start) frequency of the desired sweep range.

Connect an oscilloscope to the MAIN OUT connector and adjust the START FREQ control until the frequency stops sweeping. This sets the start frequency at the display setting.

Tune the FREQUENCY Hz/STOP FREQ control until the display reads where you want the frequency sweep to stop.

Depress the SWP-on button.

Once the start frequency is set by the START FREQ control, the stop frequency can be varied over any portion of the FREQUENCY range, without affecting the start frequency. The generator frequency will sweep linearly over the limits set by the START FREQ control and STOP FREQ control.

To set the sweep duration, connect a counter to the RAMP OUT and adjust the DURATION control to the desired sweep rate. The DURATION control is a single turn potentiometer that will adjust the sweep duration continuously from 1 second to 1 millisecond. When the DURATION X1K multiplier is in the recessed position, the sweep duration range will be multiplied by a factor of 1,000 (1k). The sweep duration will then cover a range of 1000 seconds to 1 second.

When the generator is used in the non-sweep mode, the RAMP OUT, consisting of a fixed, zero to +5V linear ramp may be used independently of the main generator, with frequency controlled by the DURATION control.

2.3.3 External Frequency Control (VC)

The generator frequency may also be controlled by an external voltage applied to the VC (voltage control) input. A maximum control voltage of zero to ±3 volts will vary the generator frequency up to a ratio of 1500:1 within the range of the frequency control. The VC voltage will vary the frequency as the ratio of:

$$\Delta F = \frac{100\text{Hz}}{\text{Volts}} \text{X MULTiplier X VC Voltage}$$

The VC control is used as follows:

With the FREQUENCY set to its lowest end, a zero to positive-going ramp voltage applied to the VC input will sweep the generator frequency upwards, by as much as 1:1500.

If the frequency is set to its high end, and a zero to negative-going ramp voltage is applied, the generator frequency will be swept down by 1500:1.

A sinusoidal waveform applied to the VC input will modulate (FM) the main output frequency about the frequency control setting.

As a further example of (2.3.3) above, suppose you wish to modulate the generator frequency ±20% of the frequency setting. Let us select arbitrary numbers, e.g., frequency set to 10kHz (100 x 100), frequency of modulation, 10Hz. From the frequency to VC voltage expression,

Given: $\Delta F = \frac{100Hz}{Volt}$ x MULTiplier x VC Voltage

Where: $\Delta F = \pm 20\%$ x 10kHz $= \pm 2$kHz

Therefore, $\text{VC Voltage} = \frac{\Delta F}{\text{MULTIplier}} X \frac{1V}{100Hz}$

$$= \frac{\pm 0.2 \text{ X } 103\text{Hz X } 1\text{V}}{100 \text{ X } 100\text{Hz}}$$

= ±0.2 Volts

A sinusoidal voltage of ±0.2 volts at a rate of 10Hz is required.

2.3.4 Variable DC Offset

The variable DC OFFSET Control consists of a push-button ON-OFF switch plus a single turn potentiometer. It is used to vary the DC level of the output wave-form. The OFFSET potentiometer will vary this level from minus (-) 0 volts to plus (+) 10 volts. The combined peak AC plus DC offset should not exceed ±10 volts peak, otherwise clipping of the waveform may occur.

2.3.5 Waveguard™ Circuit

The exclusive WAVEGUARD™ output protection circuit is connected across the generator's HI output terminals. The circuit prevents damage to the generator's output amplifier stage, if a voltage greater than ±12V is accidentally placed across the HI output terminal.

WARNING!

When the WAVEGUARD™ circuit is activated, it will short-circuit the applied voltage to ground.

A low-ohm resistor is in series with the WAVEGUARD™ circuit and the HI output terminal, to protect the output circuit from exceeding its maximum, continuous current rating.

At low frequencies, the circuit will recover automatically when the external voltage is removed; at higher frequencies, it may be necessary to tum the amplitude down or shut the power off momentarily to reset the circuit after the external voltage is removed.

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SECTION 3
INCOMING INSPECTION AND CHECKOUT

3.1 INTRODUCTION

The following procedure should be used to verify that the generator is operating within specifications, both for incoming inspection and for routine servicing. Tests should be made with the cover in place, and the procedure given below should be followed in sequence. Familiarize yourself with the initial setup and operating procedures outlined in Section 2, Operation.

> ***CAUTION!***
>
> The cover of this instrument should not be removed when the instrument is connected to an AC power source, because of the potentially dangerous voltages that exist within the unit.

3.2 EQUIPMENT REQUIRED

a) Oscilloscope: bandwidth from DC to 30MHz, vertical sensitivity 5mV/cm, AC/DC coupled.

b) Frequency counter: capable of frequency measurements between 0.2Hz and 3MHz, 0.1% accuracy. (General Radio Model 1192-B, or equivalent).

c) AC Differential Voltmeter (ACVM): 3MHz bandwidth, capable of measuring AC voltages from zero to 20 volts, and voltage variations less than 0.1dB (1%). (Fluke Model 931A or equivalent).

d) DC Voltmeter (DCVM): DC voltage measurements from zero to ±50 volts. (Fluke Model SOOOA or equivalent).

e) Calibrated DC Voltage Source: zero to ±3 volts. (Krohn-Hite Model 526 DC Source/Calibrator or equivalent).

f) Distortion Analyzer: (Krohn-Hite Model 6900B or equivalent).

3.3 PROCEDURE

After allowing the instrument to warm up for at least 30 minutes, set the controls to the following positions:

FREQUENCY Hz/STOP FREQ	30
MULTiplier	X100
SWP	Off
AMPLITUDE	Max CW
Waveform	Sine Wave
DC OFFSET	Off
CHASSI/FLOATING	Chassis

3.3.1 Waveforms

Connect the oscilloscope to the generator's MAIN OUT, (HI Level). Operate the Waveform switch in each of its positions; the waveforms should be present and at least 20 volts peak to peak. Connect the scope to the LO Level output; waveform amplitude should be at least 2 volts peak to peak.

3.3.2 Amplitude Control

Reconnect the scope to the HI Level output. Vary the Amplitude control from maximum to minimum; the waveform amplitude should diminish by more than 60dB. Return the AMPLITUDE control to its maximum CW position. Connect a 50 ohm load across the generator's HI OUTPUT; the amplitude should diminish by one-half. Repeat this for the LO OUTPUT. Remove the 50 ohm load.

3.3.3 DC Offset

The variable DC OFFSET Control allows the waveform DC level to be varied ±10 volts peak. Turn the AMPLITUDE control to its maximum CCW position, and connect the scope or DCVM to the HI Level Output. Push the variable OFFSET Control "ON" and vary the control through its range; you should be able to vary the main output DC level by ±10 volts. Push the OFFSET Control to "OFF".

3.3.4 Frequency Controls and Accuracy

Rotate the FREQUENCY control through its range to insure that it turns smoothly (as an analog control, the lower frequency end of the control may jump sharply. To have a better indication of the frequency you are setting, use a frequency counter.); observe the output waveform on the scope and check to see that the frequency increases as the control is rotated from its low end to its high end. Operate the MULTiplier in each of its positions and check that the output frequency increases by x100 steps. Connect the frequency counter to the MAIN OUT, (HI Level, Waveform switch squarewave) and check the accuracy of the FREQUENCY in each position of the MULTiplier. Frequency accuracy is ±20%.

3.3.5 External Voltage Control (VC)

An external voltage applied to the VC input will vary the frequency of the generator about the frequency control setting and MULTiplier. Reconnect the frequency counter to the MAIN OUT. Connect the calibrated DC source to the VC input. Vary the DC source and observe the change in the generator's frequency; a change of ±0.1 volt on the VC input will correspond to a frequency change of approximately 10Hz times the MULTiplier setting.

Disconnect the DC voltage source from the VC input.

3.3.6 Sweep Operation

To check the sweep operation, set the sweep controls to the following positions:

SWP On	(recessed)
START FREQ	Max CCW
DURATION	1s
DURATION x 1K	Off (Out)

Connect the oscilloscope to the RAMP OUT and check to see that the RAMP is present and its amplitude is zero to +5V. Turn the DURATION Control Max CW; the duration should decrease to approximately 1ms. Depress the duration x1 K button; the ramp duration should increase to approximately 1 second.

Connect the oscilloscope to the MAIN OUTPUT. The start of the frequency sweep is adjusted by first setting the FREQUENCY Hz/STOP FREQ control to the desired frequency, and then by adjusting the START FREQ Control until the frequency stops sweeping. The FREQUENCY Hz/STOP FREQ control is then tuned to the desired stop frequency. Observe that the frequency sweep range varies as you vary the FREQUENCY Hz/STOP FREQ setting. Return the SWP Control to the off (extended) position.

3.3.7 Frequency Response

The frequency response of the generator is defined as the variations in the amplitude of the output waveform, as the frequency of the generator is varied through its specified range. The response specifications apply to sinewave output, only. The response of the generator may be checked by 1 of 2 methods. If the ACVM is used, connect it to the generator's MAIN OUT and observe the variations in amplitude as the frequency is tuned through its range.

The alternative and perhaps more convenient method is to sweep the generator frequency using the internal sweep, and observe the swept response on the scope. To use this method, set the FREQUENCY Hz/STOP FREQ control to 300 x 10k; depress the SWP button and adjust the duration control for 1ms. Adjust the START FREQ control until the frequency stops sweeping, then tune the Frequency Control to 0.2. This will sweep the generator frequency down from approximately 3MHz to 2kHz.

For either method, the variations in output amplitude are specified as less than 0.1dB (approx. 1%) up to 300kHz, and less than 1.0dB to 3MHz. Return the SWP button to the off (extended) position.

3.3.8 Sinewave Distortion

Connect the distortion analyzer to the generator's MAINOUT. Set the Waveform switch to sinewave. Check the distortion of the output at the various frequencies. Distortion should be less than 0.5% from 2Hz to 300kHz.

For distortion measurements between 300kHz - 3MHz, the use of a Wave or Spectrum Analyzer is recommended. Distortion is specified as less than 3% to 3MHz.

3.3.9 TTL Output

Connect the oscilloscope to the TTL output, and set the generator frequency to between 1-10kHz. Check to see that the waveform amplitude is between approximately +0.3V to +3.0V.