

1.2 SPECIFICATIONS

(Specifications in [] apply to Models 3321/3323).

Frequency Range

Models 3320 and 3322

High-Pass and Low-Pass cutoff frequencies continuously adjustable from 0.001 Hz to 99.9 kHz in six bands.

| <u>BAND</u> | <u>MULTIPLIER</u> | <u>FREQUENCY (Hz)</u> | <u>RESOLUTION</u> |
|-------------|-------------------|-----------------------|-------------------|
| 1 | 0.001 | 0.001 - 0.999 | 0.001 |
| 2 | 0.01 | 1 - 9.99 | 0.01 |
| 3 | 0.1 | 10 - 99.9 | 0.1 |
| 4 | 1 | 100 - 999 | 1 |
| 5 | 10 | 1,000 - 9,990 | 10 |
| 6 | 100 | 10,000 - 99,900 | 100 |

Models 3321 and 3323

High-Pass and Low-Pass cutoff frequencies continuously adjustable from 0.01 Hz to 99.9 kHz, in 5 bands.

| <u>BAND</u> | <u>MULTIPLIER</u> | <u>FREQUENCY (Hz)</u> | <u>RESOLUTION</u> |
|-------------|-------------------|-----------------------|-------------------|
| 1 | 0.01 | 0.01 - 9.99 | 0.01 |
| 2 | 0.1 | 10 - 99.9 | 0.1 |
| 3 | 1 | 100 - 999 | 1 |
| 4 | 10 | 1,000 - 9,990 | 10 |
| 5 | 100 | 10,000 - 99,900 | 100 |

Frequency Control (each channel)

Three rotary decade switches for frequency digits and a 6 [5] position rotary multiplier switch.

Cutoff Frequency Calibration Accuracy

$\pm 2\%$ from 0.05 Hz to 9.99 kHz, rising to $\pm 10\%$ at 0.001 Hz [0.01 Hz] (less accurate in High-Pass mode at 0.001 Hz [0.01 Hz]), $\pm 10\%$ from 10.0 kHz to 99.9 kHz (X100 Band). Relative to mid-band level, the filter output is down 3db at cutoff in the Butterworth (maximally flat) position and approximately 15db down when operated as a Low-Pass Filter in RC (transient-free) position.

Bandwidth

Low-Pass Mode: DC to cutoff frequency setting within the range from 0.001 Hz [0.01 Hz] to 99.9 kHz.

High-Pass Mode: Cutoff frequency setting within the range of 0.001 [0.01 Hz] and 99.9 kHz to the upper 3db point of approximately 1 MHz.

Band-Pass Operation (Models 3322, 3323): Variable within the cutoff frequency limits of 0.001 Hz [0.01 Hz] to 99.9 kHz. For minimum bandwidth, the High-Pass and Low-Pass cutoff frequencies are set equal. This produces an insertion loss of approximately 6db, with the minus 3db points at 0.8 and 1.25 times the midband frequency.

Band-Reject Operation (Models 3322, 3323): Variable within the cutoff frequency limits of 0.001 Hz [0.01 Hz] and 99.9 kHz. The Low-Pass band extends to dc and the High-Pass band has its upper 3 db point at approximately 1 MHz.

Response Characteristics

Butterworth: Maximally flat, four pole Butterworth response for optimum performance in frequency domain.

RC: Four pole damped response for transient-free time-domain performance.

Attenuation Slope

Nominal 24 db per octave per channel in Low-Pass or High-Pass mode.

Maximum Attenuation

Greater than 80 db for input frequencies to 100 kHz, rising to 60 db at 1 MHz.

Pass-Band Gain (selected by front panel control)

0 ± 0.5 db or 20 ± 0.5 db for bands 2 through 5 [1 thru 4], 0 ± 1 db or 20 ± 1 db for bands 1 and 6 [5].

Input Characteristics

± 7 volts peak in the 0 db gain position, ± 0.7 volts peak in the 20 db gain position to 500 kHz, decreasing to ± 3 volts peak (± 0.3 volts peak in the 20 db gain position) at 1 MHz.

Maximum DC Component Low-Pass Mode: Combined ac plus dc should not exceed ± 7 volts peak in the 0 db gain position and ± 0.7 volts peak in the 20 db gain position.

Maximum DC Component High-Pass Mode: ± 100 volts.

Impedance: 10 megohms in parallel with 100 pF.

Output Characteristics

Maximum Voltage: ± 7 volts peak to 500 kHz decreasing to ± 3 volts peak at 1 MHz, open circuit.

Maximum Current: ± 70 ma peak to 500 kHz decreasing to 30 ma peak at 1 MHz.

Impedance: 50 ohms.

Distortion: Typically less than 0.1% over most of the range.

Hum and Noise (0 db or 20 db gain position)

Less than 0.5 millivolts rms for a detector bandwidth of 100 kHz, rising to 2 millivolts rms for a detector bandwidth of 10 MHz. X100 band, High-Pass mode only, 2 millivolts rms for a detector bandwidth of 100 kHz, rising to 5 millivolts rms for a detector bandwidth of 10 MHz.

Output DC Level Stability

± 1 millivolt per hour, ± 1 millivolt per degree C.

Operating Temperature Range

-10°C to 45°C .

Front Panel Controls (each channel)

Frequency Hz: Three rotary decade switches and a six [five] position multiplier switch.

DC Levels: One each screwdriver adjustment control for LP and HP.

Function Switch: LOW-PASS RC, LOW-PASS MAX FLAT, HIGH-PASS.

Gain Switch: 0 db, 20 db.

Power Switch: OFF, LINE OPERATE, BATTERY CHARGE/LINE OPERATE, BATTERY OPERATE.

Floating (ungrounded) Operation

A switch is provided on rear of chassis to disconnect signal ground from chassis.

Terminals

Front panel and rear of chassis, one BNC connector for Input, one for Output, each channel. One multipurpose connector on rear for chassis ground.

Power Requirements

105-125 or 210-250 volts, single phase, 50-400 Hz, 5 watts for Models 3320 and 3321, 10 watts for Models 3322 and 3323.

Dimensions and Weights

| Model | Cabinet Size/ Weight | Height | Width | Depth | Net | Gross |
|-----------|-------------------------|---------|---------|---------|----------|----------|
| 3320/3321 | U. S. | 5 1/4" | 8 5/8" | 13 1/2" | 12 lbs | 14 lbs |
| | Metric | 13.3 cm | 21.9 cm | 34.3 cm | 5.5 kgs | 6.4 kgs |
| 3322/3323 | U. S. | 5 1/4" | 16 5/8" | 13 1/2" | 24 lbs | 31 lbs |
| | Metric | 13.3 cm | 42.2 cm | 34.3 cm | 10.9 kgs | 14.1 kgs |

Optional Rack-Mounting Kits

RK-58: Models 3320, 3321



RK-519: Models 3322, 3323

Optional Battery Kits

Part No. BK-332, Models 3320, 3321; Part No. BK-334, Models 3322, 3323.

1.3 FILTER CHARACTERISTICS

The flexibility of adjustment of bandwidth is shown in Figure 2. Low-pass and High-Pass operation is shown in curves (1) and (2). The solid lines show the maximally Flat Butterworth operation while the dotted lines show the RC characteristic.