## 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.

| BAND | MULTIPLIER | FREQUENCY (Hz) | RESOLUTION |
|---|---|---|---|
| 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.

| BAND | MULTIPLIER | FREQUENCY (Hz) | RESOLUTION |
|---|---|---|---|
| 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

±2% from 0.05 Hz to 9.99 kHz, rising to ±10% at 0.001 Hz [0.01 Hz] (less accurate in High-Pass mode at 0.001 Hz [0.01 Hz]), ±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.

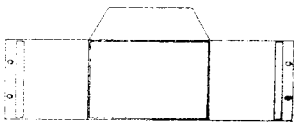
### Power Requirements

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.