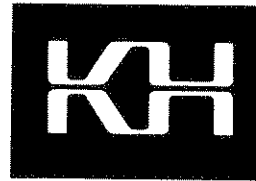


FILTER

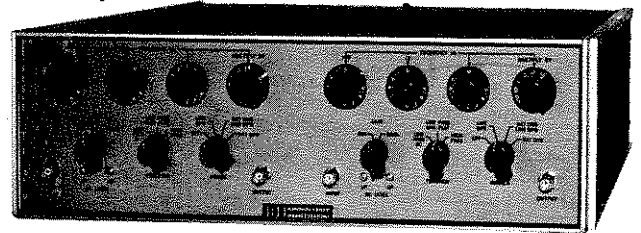
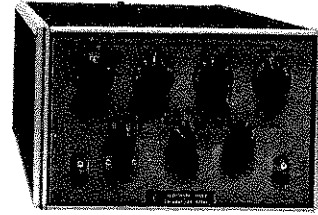
0.001 Hz to 99.9 kHz
 HIGH-PASS, LOW-PASS,
 BAND-PASS, BAND-REJECT
 VARIABLE FILTER
 models 3320 and 3322



models 3320/3322

- **Frequency range:** 0.001 Hz to 99.9 kHz
- **Frequency accuracy:** $\pm 2\%$
- **Pass Band Gain:** 0 db or 20 db
- **Attenuation slope:** 24 db/oct. (each channel)
- **Battery operation**
- **Maximum attenuation:** 80 db
- **Floating (ungrounded) operation**

MODEL 3320
 MODEL 3322



The Krohn-Hite Models 3320 and 3322 are all solid state, variable electronic Filters that are digitally tuned over the range from 0.001 Hz to 99.9 kHz. The Models 3320 (single channel) and 3322 (dual channel) have slopes of 24db per octave. Each channel can be operated in either the High-Pass or Low-Pass mode providing versatility never before available over this frequency range. When the two channels in the Model 3322 are operated in the same mode, set at the same cutoff frequency, and cascaded, an attenuation slope of 48 db per octave is obtained.

The frequency response characteristic of the Model 3320 and 3322 is a fourth-order Butterworth with maximal flatness for cleanest filtering in the frequency domain. For pulse or transient signal filtering, a front panel switch is provided to change the frequency response to RC optimum for transient-free filtering (see photo). Digital tuning permits cutoff frequency calibration accuracy of $\pm 2\%$ and excellent resettability enabling good repeatability of filter characteristics.

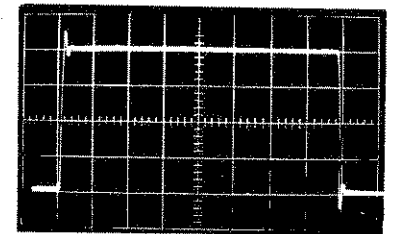
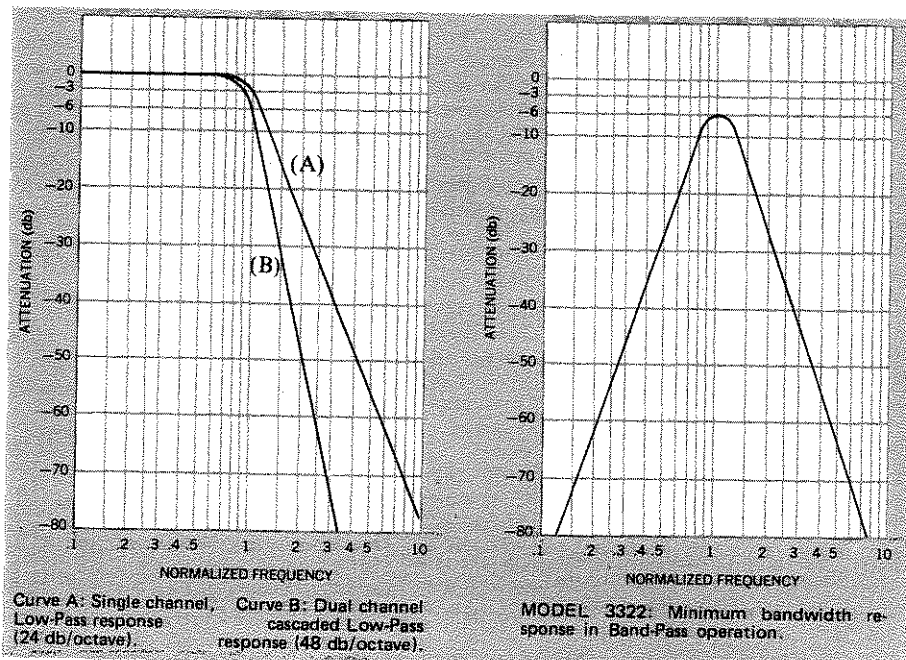
Front panel switch selects either 0 db or 20 db of passband gain for each channel. The 20 db gain position is extremely useful for improving the signal to noise ratio of low level

signals. The 10 megohm input impedance minimizes loading, and the 50 ohm output impedance improves high frequency performance.

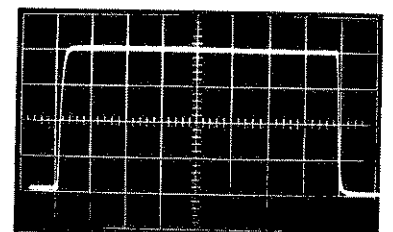
All filters are designed to operate from either AC line or from rechargeable, nickel cadmium batteries. The battery operation in the Models 3320 and 3322 is ideal for either remote applications, or when isolation from the AC line is required. Filters initially ordered without batteries may be easily converted to battery operation at any later date, by purchasing a battery kit from Krohn-Hite.

These filters are designed primarily for applications in the ultra-low frequency range. Their excellent cutoff frequency accuracy and resettability, coupled with stable dc output level and low distortion, results in a significant contribution to filter technology.

The 3300 Filter Series also includes the Models 3321, 3323, 3340, 3341, 3342 and 3343. Refer to separate bulletins for detailed specifications.



Response (in Low-Pass mode) to 1 Hz square wave, with cut-off at 1 kHz in Butterworth position.



Response to same square wave in Low Q position.

SPECIFICATIONS

Function:

MODEL 3320 (single channel):
 HIGH-PASS — 24 db per octave attenuation slope.
 LOW-PASS — 24 db per octave attenuation slope.
 MODEL 3322 (dual channel):
 Channels cascaded:
 HIGH-PASS — 48 db per octave attenuation slope.
 LOW-PASS — 48 db per octave attenuation slope.
 BAND-PASS — 24 db per octave attenuation slopes.
 Channels connected in parallel:
 BAND-REJECT — 24 db per octave attenuation slopes.

Cutoff Frequency Range:

0.001 Hz to 99.9 kHz

BAND	MULTIPLIER	FREQUENCY (Hz)	RESOLUTION (Hz)
1	0.001	0.001-0.999	0.001
2	0.01	0.01-9.99	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

Frequency control (each channel): Three rotary decade switches for frequency digits and a six position rotary multiplier switch.

Cutoff frequency calibration accuracy: ±2% from 0.05 Hz to 9.99 kHz, rising to ±10% at 0.001 Hz (less accurate in High-Pass mode at 0.001 Hz), ±10% from 10 kHz to 99.9 kHz (Band 6). Relative to pass-band level, the filter output is down 3 db at cutoff in the Butterworth (maximally flat) position and approximately 15 db 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 to 99.9 kHz.

HIGH-PASS MODE: Cutoff frequency setting between the range of 0.001 Hz and 99.9 kHz to the upper 3 db point of approximately 1 MHz.

BAND-PASS OPERATION (Model 3322): Variable within the cutoff frequency limits of 0.001 Hz to 99.9 kHz. For minimum band-width, the high-pass and low-pass cutoff frequencies are set equal. This produces an insertion loss of 6 db, with the —3 db points at 0.8 and 1.2 times the midband frequency.

BAND-REJECT OPERATION (Model 3322): Variable within the cutoff frequency limits of 0.001 Hz and 99.9 kHz. The low-pass band extends to DC. 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 high-pass or low-pass modes.

Maximum Attenuation: Greater than 80db for input frequencies to 1 MHz.

Pass-Band Gain (selected by front panel control):

0 ± .5 db or 20 ± .5 db for Bands 1 thru 5, 0 ± 1 db or 20 ± 1 db for Band 6.

Input Characteristics:

MAXIMUM VOLTAGE: ±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.

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. Band 6, 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° to 45°C.

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 rear terminal for chassis ground.

Power Requirements: 105-125 or 210-250 volts, single phase, 50-400Hz, 5 watts for Model 3320, 10 watts for Model 3322.

Optional Battery Kits:

MODEL 3320: Order Part No. BK-332. MODEL 3322: Order Part No. BK-334. Battery will operate 10 hours without recharging.

Optional Rack-Mounting Kits:

Part No. RK-58; permits installation of the 3320 into a standard 19" rack spacing.



Part No. RK-519; permits installation of the 3322 into a standard 19" rack spacing.



Optional Band Reject Kit:

Part No. BR-30; connectors and cable to adapt two channels for series or parallel operation.

Dimensions and Weights:

MODEL	H.	W.	D.	NET WGT.	SHIPPING WGT.
3320	5¼"	8⅝"	13½"	12 lbs/ 5.5 kgs	14 lbs/ 6.4 kgs
3322	5¼"	16⅝"	13½"	24 lbs/10.9 kgs	31 lbs/14.1 kgs

Specifications are subject to change without notice.

FILTER

0.001 Hz to 99.9 kHz HIGH-PASS, LOW-PASS, BAND-PASS, BAND-REJECT VARIABLE FILTER models 3340 and 3342

- **Frequency range:** 0.001 Hz to 99.9 kHz
- **Frequency accuracy:** $\pm 2\%$
- **Pass Band Gain:** 0 db or 20 db
- **Attenuation slope:** 48 db/oct. (each channel)
- **Battery operation**
- **Maximum attenuation:** 80 db
- **Floating (ungrounded) operation**

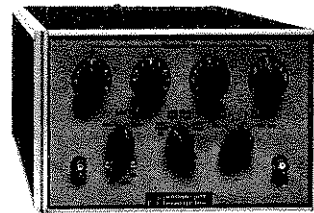
The Krohn-Hite Models 3340 and 3342 are all solid state, variable electronic Filters that are digitally tuned over the range from 0.001 Hz to 99.9 kHz. The Models 3340 (single channel) and 3342 (dual channel) have slopes of 48 db per octave. Each channel can be operated in either the High-Pass or Low-Pass mode providing versatility never before available over this frequency range. When the two channels in the Model 3342 are operated in the same mode, set at the same cutoff frequency, and cascaded, an attenuation slope of 96 db per octave is obtained.

The frequency response characteristic of the Model 3340 and 3342 is an eighth-order Butterworth with maximal flatness for cleanest filtering in the frequency domain. For pulse or transient signal filtering, a front panel switch is provided to change the frequency response to RC optimum for transient-free filtering (see photo). Digital tuning permits cutoff frequency calibration accuracy of $\pm 2\%$ and excellent resettability enabling good repeatability of filter characteristics.

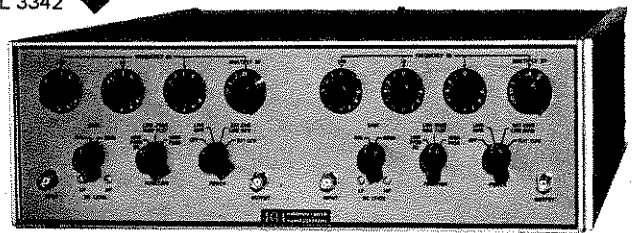
Front panel switch selects either 0 db or 20 db of passband gain for each channel. The 20db gain position is extremely useful for improving the signal to noise ratio of low level signals. The 10 megohm input impedance minimizes loading, and the 50



MODEL 3340



MODEL 3342

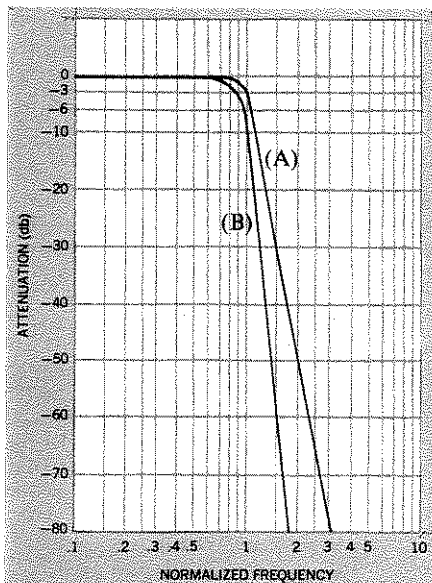


ohm output impedance improves high frequency performance.

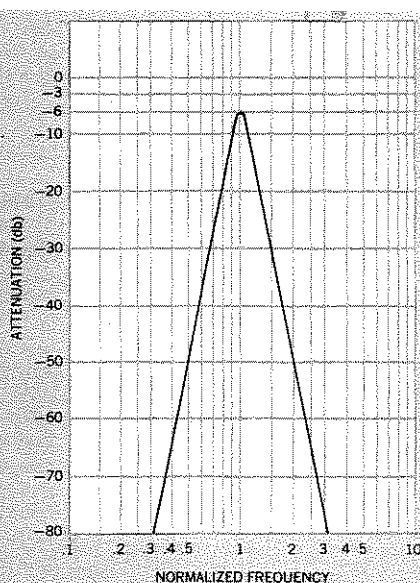
All filters are designed to operate from either AC line or from rechargeable, nickel cadmium batteries. The battery operation in the Models 3340 and 3342 is ideal for either remote applications, or when isolation from the AC line is required. Filters initially ordered without batteries may be easily converted to battery operation at any later date, by purchasing a battery kit from Krohn-Hite.

These filters are designed primarily for applications in the ultra-low frequency range. Their excellent cutoff frequency accuracy and resettability, coupled with stable dc output level and low distortion, results in a significant contribution to filter technology.

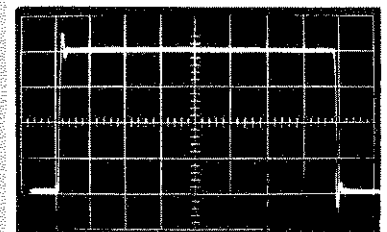
The 3300 Filter Series also includes the Models 3320, 3321, 3322, 3323, 3341 and 3343. Refer to separate bulletins for detailed specifications.



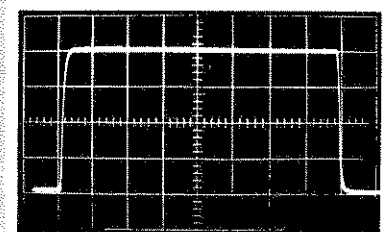
Curve A: Single channel Low-Pass response (48 db/octave). Curve B: Dual channel cascaded Low-Pass response (96 db/octave).



MODEL 3342: Minimum bandwidth response in Band-Pass operation.



Response (in Low-Pass mode) to 1 Hz square wave, with cut-off at 1 kHz in Butterworth position.



Response to same square wave in Low Q position.

SPECIFICATIONS

Function:

MODEL 3340 (single channel):
 HIGH-PASS — 48 db per octave attenuation slope.
 LOW-PASS — 48 db per octave attenuation slope.
 MODEL 3342 (dual channel):
 Channels cascaded:
 HIGH-PASS — 96 db per octave attenuation slope.
 LOW-PASS — 96 db per octave attenuation slope.
 BAND-PASS — 48 db per octave attenuation slopes.
 Channels connected in parallel:
 BAND-REJECT — 48 db per octave attenuation slopes.

Cutoff Frequency Range:
 0.001 Hz to 99.9 kHz.

BAND	MULTIPLIER	FREQUENCY (Hz)	RESOLUTION (Hz)
1	0.001	0.001-0.999	0.001
2	0.01	0.01-9.99	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

Frequency control (each channel): Three rotary decade switches for frequency digits and a six position rotary multiplier switch.

Cutoff frequency calibration accuracy: ±2% from 0.05 Hz to 9.99 kHz, rising to ±10% at 0.001 Hz (less accurate in High-Pass mode at 0.001 Hz), ±10% from 10 kHz to 99.9 kHz (Band 6). Relative to pass-band level, the filter output is down 3 db at cutoff in the Butterworth (maximally flat) position and approximately 18.5 db 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 to 99.9 kHz.

HIGH-PASS MODE: Cutoff frequency setting between the range of 0.001 Hz and 99.9 kHz to the upper 3 db point of approximately 1 MHz.

BAND-PASS OPERATION (Model 3342): Variable within the cutoff frequency limits of 0.001 Hz to 99.9 kHz. For minimum band-width, the high-pass and low-pass cutoff frequencies are set equal. This produces an insertion loss of 6 db, with the —3 db points at 0.9 and 1.12 times the midband frequency.

BAND-REJECT OPERATION (Model 3342): Variable within the cutoff frequency limits of 0.001 Hz and 99.9 kHz. The low-pass band extends to DC. The high-pass band has its upper 3 db point at approximately 1 MHz.

Response Characteristics:

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

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

Attenuation Slope: Nominal 48db per octave per channel in high-pass or low-pass modes.

Maximum Attenuation: Greater than 80db for input frequencies to 1 MHz.

Pass-Band Gain (selected by front panel control):

0 ± .5 db or 20 ± .5 db for Bands 1 thru 5, 0 ± 1 db or 20 ± 1 db for Band 6.

Input Characteristics:

MAXIMUM VOLTAGE: ±7 volts peak in the 0 db gain position ±0.7 volts peak in the 20 db gain position to 500kHz, 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.

HIGH-PASS MODE: ±100 volts.

IMPEDANCE: 10 megohms in parallel with 100pF.

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. Band 6, 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° to 45°C.

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 rear terminal for chassis ground.

Power Requirements: 105-125 or 210-250 volts, single phase, 50-400 Hz, 5 watts for Model 3340, 10 watts for Model 3342.

Optional Battery Kits:

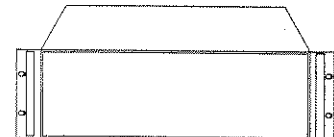
MODEL 3340: Order Part No. BK-332. MODEL 3342: Order Part No. BK-334. Battery will operate 10 hours without recharging.

Optional Rack-Mounting Kits:

Part No. RK-58; permits installation of the 3340 into a standard 19" rack spacing.



Part No. RK-519; permits installation of the 3342 into a standard 19" rack spacing.



Optional Band Reject Kit:

Part No. BR-30; connectors and cable to adapt two channels for series or parallel operation.

Dimensions and Weights:

MODEL	H.	W.	D.	NET WGT.	SHIPPING WGT.
3340	5 1/4"	8 5/8"	17"	14 lbs/ 6.4 kgs	16 lbs/ 7.3 kgs
3342	5 1/4"	16 5/8"	17"	28 lbs/ 12.8 kgs	35 lbs/ 16 kgs

Specifications are subject to change without notice.