

**MODEL 4302**  
**DUAL 24 dB/OCTAVE FILTER**  
**1/10 DECADE STEPS**

## DESCRIPTION

The Model 4302 Dual Filter is a high performance, low priced, general purpose filter for use in the laboratory as well as in multiple channel data acquisition applications. Covering the 10 Hz to 1 MHz frequency range, the 4302 consists of a pair of identical 24 dB/octave filter channels, each of which can be used as a high pass or low pass filter with selectable gain of 1 or 10. The two filter channels can be connected in series to produce a single 24 dB/octave bandpass, a 48 dB/octave high pass, or a 48 dB/octave low pass filter, with selectable gain of 1, 10 or 100. Butterworth (Normal) or Bessel (Pulse) modes can be selected by front panel switches. Frequency and pulse response curves are shown below. AC/DC input coupling switches on the front panel make it possible to use one or both channels as AC or DC coupled low pass filters. In the AC mode, large DC offsets can be accommodated, and the filter will have a low frequency cutoff at approximately .07 Hz.

Specifications (on the next page) of the 4302 are uniformly outstanding. Of particular interest are its very low distortion – .005% at 20 volts peak to peak output, 25 $\mu$ volts self noise, 100 dB outband rejection performance, and 100 dB crosstalk attenuation. Frequency accuracy is  $\pm 3\%$  of setting.

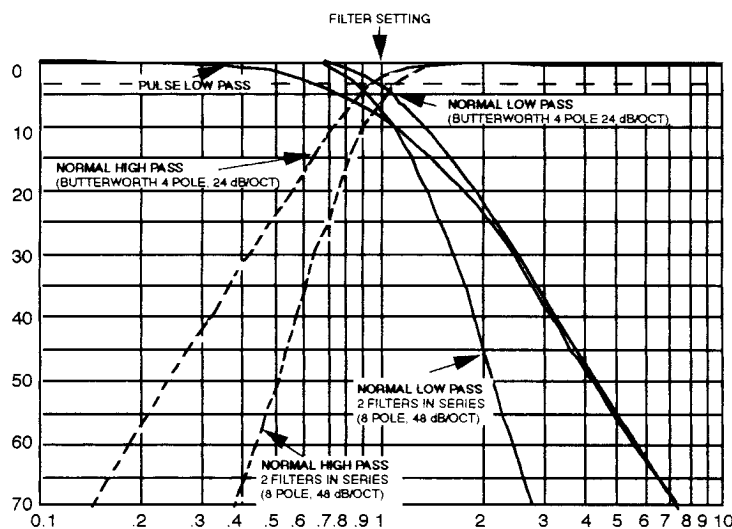


Figure 1 Normalized Response

## RESOLUTION AND ACCURACY

Continuously tunable filters are inherently qualitative instruments with, at best, 5% accuracy, poor reproducibility of settings, and poor frequency and phase shift characteristics. If a filter must be set with high resolution, there is a strong implication that the user wants to know accuracy where the cutoff frequency is. This cannot be determined from the dial settings of a continuously tunable filter — and must therefore be measured, a time consuming and expensive process.

DL Instruments solves this by offering filters with switch-selectable frequency settings. These filters use the internationally accepted 1/10 decade frequency step (10 steps per decade on a logarithmic scale). This permits operation with octave, decade, and other convenient bandpass settings, and provides sufficient frequency resolution for general laboratory and data acquisition applications. These filters have the advantage of compactness, ease of use, and freedom from operator error.

The Model 4302 Dual Filter has 3% frequency accuracy and offers exceptional performance and versatility at a modest cost.

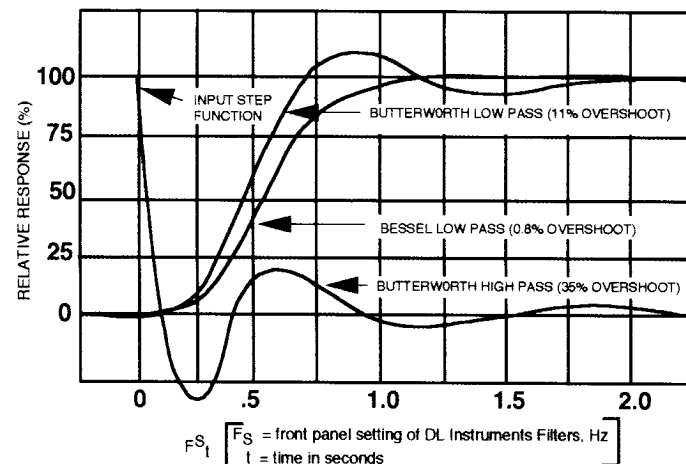


Figure 2 Step Response of 4 Pole Filter

## 4302 SPECIFICATIONS (per channel)

<b>FILTER MODES</b>	Low-pass (Normal)	4 pole Butterworth LP for maximum flat amplitude response	
	Low-Pass (Pulse)	4 pole LP with maximum flat time delay (approaches Bessel)	
	High-Pass (Normal)	4 pole Butterworth HP (upper -3 dB at approx. 950 kHz (-4 dB typical at 1 MHz)	
<b>FREQUENCY SETTINGS</b>	1.00, 1.25, 1.60, 2.00, 2.50, 3.15, 4.00, 5.00, 6.30, 8.00, 10.0		
<b>FREQUENCY RANGES</b>	<b>MULTIPLIER</b>	<b>FREQUENCY RANGE</b>	
	x10 <sup>1</sup>	10 – 100 Hz	HP or LP
	x10 <sup>2</sup>	100 – 1 kHz	HP or LP
	x10 <sup>3</sup>	1K – 10 kHz	HP or LP
	x10 <sup>4</sup>	10K – 100 kHz	HP or LP
	x10 <sup>5</sup>	100K – 1 MHz	LP only
<b>CORNER FREQUENCY ACCURACY</b>	±3% (NORMAL: -3.01 dB; PULSE: -8.36 dB) except 100 kHz to 1 MHz Typical frequency response between 100 kHz and 1 MHz will be within ±2% dB of ideal response shown in Figure 1.		
<b>ATTENUATION SLOPE</b>	24 dB/octave; 80 dB/decade each filter. Cascade for 48 dB/octave low-pass or high-pass: For 48 dB/octave low-pass, set filters equal. Cutoff frequency is 10% lower than setting (Figure 1) For 48 dB/octave high-pass, set filters equal. Cutoff frequency is 10% higher than setting (Figure 1)		
<b>MAXIMUM ATTENUATION</b>	Better than 100 dB to 100 kHz. Typically 80 dB at 1 MHz (Measured at x10 gain, 10 Hz LP)		
<b>VOLTAGE GAIN</b>	Switch selectable 1 or 10; ±3%		
<b>DISTORTION (Typically)</b>	x 1 gain:	Less than .03%, 1 kHz	
	x 10 gain:	Less than .005%, 1 kHz (20V pp, no load or 10V pp into 600Ω)	
<b>HUM AND NOISE</b>	Less than 75μV rms (100 kHz NBW) x 1 gain Less than 25μV rms (100 kHz NBW) x 10 gain (both referred to input)		
<b>INPUT</b>	<b>Modes</b>	AC (.07 cutoff), DC; selected by front panel switching	
	<b>Maximum Input Voltages (Diode Protected Input)</b>	DC Mode: 20V pk to pk for linear operation	
		AC Mode: ±200 VDC and 20V pk to pk signal	
	<b>Impedance</b>	22MΩ//30 pF	
<b>Connector</b>	BNC on front panel		
<b>OUTPUT</b>	<b>Maximum Output Swing</b>	20V pk to pk, no load; 10V pk to pk into 600Ω	
	<b>Impedance</b>	600Ω ±1%, DC coupled	
	<b>Offset</b>	Less than 50 mV typical	
	<b>Connector</b>	BNC on front panel	
<b>POWER</b>	88 – 110 VAC 104 – 130 VAC 192 – 240 VAC 220 – 260 VAC	50 – 400 Hz, 4 Watts voltage range may be selected by reversing card in fuse holder	
<b>FUSE</b>	125 mA, Slow Blow		
<b>ENVIRONMENT</b>	0°C to +55°C Operating; -55°C to +85°C Storage; R.H. 95%		
<b>DIMENSIONS AND WEIGHT</b>	3.5" high x 8.5" wide x 13" deep 6 lbs, 10 1/2 oz		
<b>ACCESSORIES</b>	Model RM-1 Rack Mounting Kit for Two Filters Model RM-2 Rack Mounting Kit for Single Filter		