1) (a) $f_{cutoff} = \frac{1}{2\pi RC}$

$2000 = \frac{1}{2\pi R(47nF)}$

$R = \frac{1}{2\pi(2000)(47\times10^{-9})} = 1693.14\ \Omega$

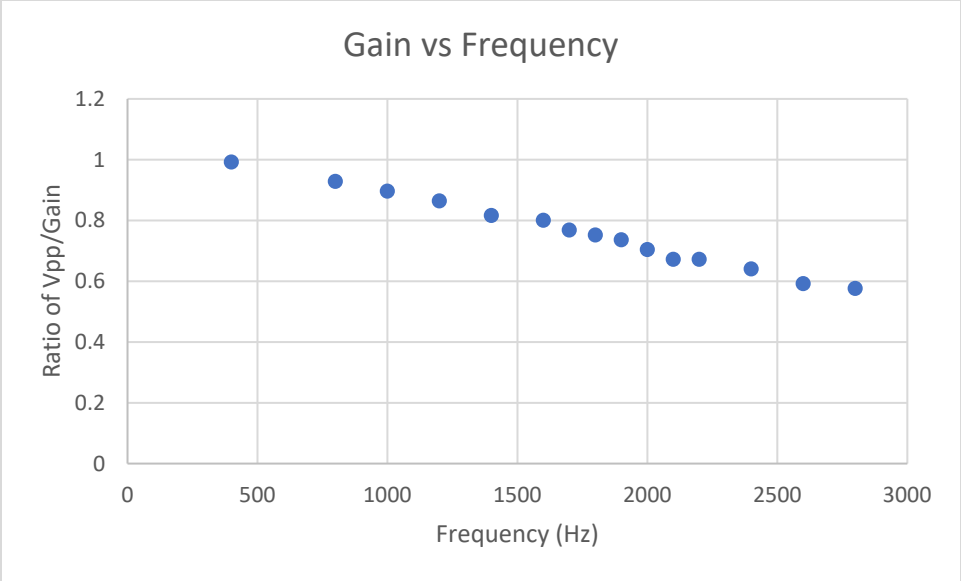
$1\ k\Omega + 680\ \Omega$ resistors in series

(b) Measured Resistance: $1.682\ k\Omega$ $f_{cutoff} = 2004.7\ Hz$

Capacitance: $47.2\ nF$

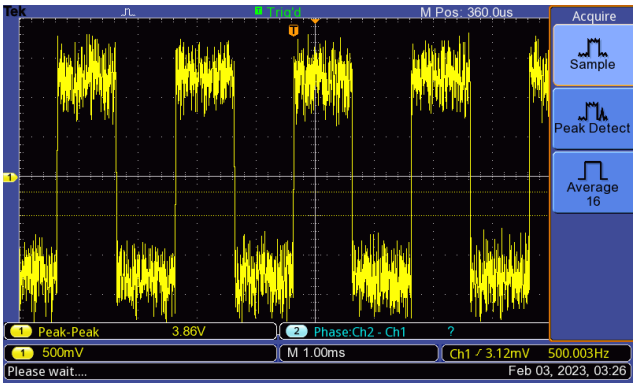
2)

Input Frequency (Hz)	V_{pp} (V)	Gain (V_{pp}/V_{in})
400	4.98	0.996
800	4.68	0.936
1000	4.52	0.904
1200	4.28	0.856
1400	4.12	0.824
1600	3.92	0.784
1700	3.84	0.768
1800	3.72	0.744
1900	3.64	0.728
2000	3.56	0.712
2100	3.44	0.688
2200	3.38	0.676
2400	3.24	0.648
2600	3.08	0.616
2800	2.92	0.584

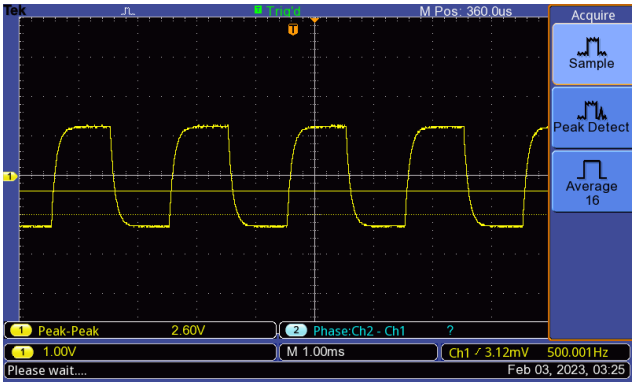


The 70% Gain mark occurs around 2000Hz, which is expected.

Noisy Square Wave, Unfiltered

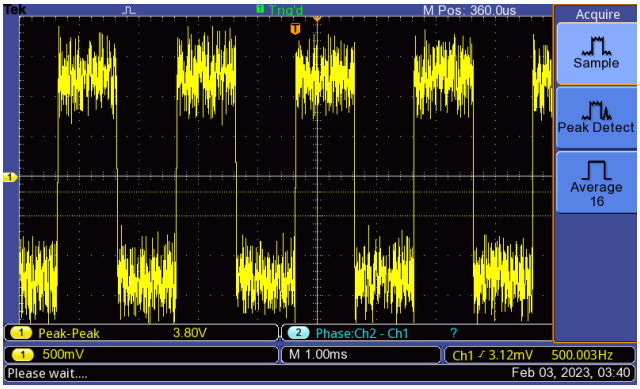


Filtered Wave

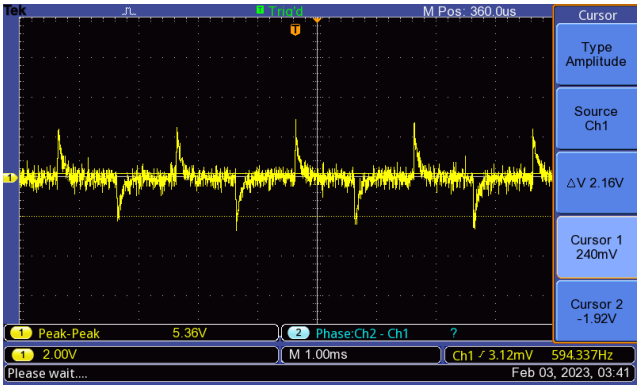


2) RC High Pass Filter

Noisy Square Wave, Unfiltered



Filtered Wave (Scaled for stability in oscilloscope)



3) RC 2-stage Low Pass Filter

$R_1 = 999.8\,\Omega$ $C_1 = 46.9\,nF$

$R_2 = 9.829\,k\Omega$ $C_2 = 4.53\,nF$

$$f_{c\,calc} = \frac{1}{2\pi\sqrt{R_1 R_2 C_1 C_2}} = 3482.8\,Hz$$

$$f_{c\,actual} = f_{c\,calc}\sqrt{\sqrt{2}-1} = 2241.5\,Hz$$

Input Frequency (Hz)	V_{pp} (V)	Gain (V_{pp}/V_{in})
400	4.96	0.992
800	4.64	0.928
1000	4.48	0.896
1200	4.32	0.864
1400	4.08	0.816
1600	4.00	0.800
1700	3.84	0.768
1800	3.76	0.752
1900	3.68	0.736
2000	3.52	0.704
2100	3.36	0.672
2200	3.36	0.672
2400	3.20	0.640
2600	2.96	0.592
2800	2.88	0.576