Bench Notebook — Analogue Filter Board

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Notebook 3

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9 June

1 Oscilloscope probe calibration

Compensated both scope probes against the built-in 1 kHz square wave before starting: probe 1 needed a small trim (slightly overcompensated out of the box), probe 2 was fine as received.

2 Low-pass filter characterisation

Built the first-pass RC low-pass on the breadboard: R = 1.6 kΩ, C = 100 nF, giving a calculated corner of

$$f_c = \frac{1}{2\pi RC} \approx 995 \text{ Hz}.$$

Swept the input from 100 Hz to 10 kHz at 1 V_{pp} and logged the output amplitude:

Freq. (Hz)	Output (V_{pp})
100	0.99
500	0.94
1000	0.70
2000	0.44
5000	0.19
10000	0.10

Table 1: Filter sweep, first breadboard pass

Measured corner (–3 dB point, 0.707 V_{pp}) lands close to 1 kHz, consistent with the calculated value.

10 June

1 Op-amp gain stage

Added the op-amp gain stage after the filter. Target gain 10 V/V using R_f = 10 kΩ, R_g = 1 kΩ in a non-inverting configuration.

Measured DC offset at the output with no input: 4 mV, well within spec for this part. Gain measured at 1 kHz: 9.7 V/V, close enough to the 10 V/V target that the 1% resistor tolerance accounts for the gap.

2 Low-pass filter characterisation

Re-ran the sweep with the amplifier stage in place to check for interaction between the two stages. Corner frequency unchanged; the amplifier's input impedance is high enough not to load the filter.

Follow-up: move from breadboard to a soldered prototype before the next set of measurements — breadboard parasitic capacitance may be softening the roll-off above 5 kHz.

12 June

1 Op-amp gain stage

Soldered prototype on stripboard. Re-measured gain: 9.8 V/V, DC offset 3 mV. Noise floor visibly lower than the breadboard version on the scope.

2 Oscilloscope probe calibration

Probe 1 drifted slightly since the 9th; re-trimmed compensation before today's measurements.