

Op Amps Design Exercise

Background

1. A sensor with an output range of +25mV to -25mV, is to be interfaced to an 8 bit $\pm 5V$ ADC. Design the interface circuit (and check your design on Electronic Workbench).
2. (Advanced) If the sensor had an output range of +25mV to +75mV, how would you modify the circuit (Hint: see '3' below).

Assessment

You are required to write a report (i.e., a report has introduction, conclusion, references etc.). The report must contain EWB printouts of the circuit and instruments (i.e., traces/ readings proving that your circuit works/ doesn't work). A comparison of laboratory measurements with EWB, should form a further brief section.

Further Design Considerations to be discussed in the report:-

- What are the supply rails voltage restrictions?
- Is the output inverted?
- Are there any bandwidth/ frequency response concerns?
- If the input to your circuit was micro volts instead of milli volts, what modifications may be necessary.

Notes

1. Simplify the problem e.g. Break the circuit up into parts and test each part (if necessary) separately. Use the function generator to provide a signal covering the voltage range needed e.g., $\pm 25mV$ (or with a voltage offset) and the oscilloscope to monitor the signals produced.
2. You may need to use more than one Op Amp. Ask yourself why?
3. Remember that an Op Amp is a differential amplifier i.e., if one input is held at a constant voltage, then voltages greater than that, are amplified positively (negatively for an inverting amplifier) and those less than the reference voltage are amplified negatively (positively).
4. If your circuit works in Electronic Workbench, try connecting to the ADC and perhaps a bar graph display or logic analyser (NB you may need to use Help or look at sample circuits in the EWB library and use a low frequency).

Op-Amp Design Exercise Feedback

Report structure	Clear & concise		Poor (e.g. no introduction or conclusion)
Clarity, style	Clear & readable		Poor
Background	Sets scene well		Not included or poor
Uses EWB simulations	Well, and prove design works		Poor or not used
Discussion	Clear with realistic level of detail		Superficial
Advanced circuit	Good attempt		Poor or not complete
Appendix /references etc.	Good		Poor
Overall i.e. understands op-amps	Good		Little understanding

Mark:

Key: >70% = Comprehensive report and good attempt, >60% = Realistic attempt, >50% = Indication of working solution, > 40% = attempted and in report form. **NB a more comprehensive feedback sheet may be used.**

Comments: