Invariably, real world testing and design assessment must be done to balance system quality versus system complexity and cost.

**Front end filter**

A filter is needed on the front end of the signal path before any DSP occurs to avoid aliasing.

1. What filter topology?
   1. Multiple feedback, single amplifier biquad.
      1. PROS
         1. Higher stability
            1. Justification needed

\*This may be due to the amplifier gain not affecting the Q factor.

* + - * 1. Stability may become critical as one of the goals of this filter is to have a sharp cutoff by the Q factor using as little parts as possible to reduce cost, thus minimizing filter order.
      1. Sensitivity?
    1. CONS
       1. Does the amplifier gain directly affect the Q factor?
  1. Sallen and Key, single amplifier biquad.
     1. PROS
        1. Capacitor values can be the same
           1. This can reduce bulk cost.
     2. CONS
        1. Amplifier gain affects the Q factor
           1. If resistors are properly matched for a gain of 1
  2. Multiple Amplifier Biquads
     1. Out of the question due to unnecessary extra cost of extra op-amps.

Preliminary specs:

1. Lowpass or Bandpass
   1. Lowpass and coupling capacitor
   2. Bandpass
2. Passband
   1. 0 – 20kHz for lowpass
   2. 20 – 20kHz for bandpass
3. Stopband
   1. TBD

Problems:

Coupling capacitor is needed for a lowpass response. Will this affect signal response? If the capacitor value is small enough, any delay produced should be sufficiently small.

Bandpass filter is still going to pass some measure of DC, which is undesirable for the MCU. In order to avoid the DC portion, a coupling capacitor could be used. However, considering that low frequencys from 0 – 20Hz will create no aliasing, the justification for using a bandpass diminishes as there is the potential for extra components when the coupling capacitor for the lowpass filter essentially accomplishes the same job.

**Group Delay Equalizer**

**Inverter**

**General Issues**

1. Gain Bandwidth / Op-Amp attenuation
2. Transfer function characteristics?
   1. Butterworth, chebyshev, etc.
3. Amax ripple
   1. What is sufficient?

**Final Specs**

Front end filter:

1. Filter response type
   1. Butterworth
2. Filter topology
   1. Multiple feedback, single amplifier
3. Passband
4. Stopband
   1. TBD

<http://www.maximintegrated.com/en/app-notes/index.mvp/id/1762>