

the measurement.

Using either of these filters precludes making measurements in the vicinity of the notch frequencies. These filters have a finite range of attenuation, generally 10 Hz or so. Thus, if the lock-in is making measurements at 70 Hz, do not use the 60 Hz notch filter! The signal will be attenuated and the measurement will be in error. When measuring phase shifts, these filters can affect phase measurements up to an octave away.

Anti-aliasing filter

After all of the signal filtering and amplification, there is an anti-aliasing filter. This filter is required by the signal digitization process. According to the Nyquist criterion, signals must be sampled at a frequency at least twice the highest signal frequency. In this case, the highest signal frequency is 100 kHz and the sampling frequency is 256 kHz so things are ok. However, no signals above 128 kHz can be allowed to reach the A/D converter. These signals would violate the Nyquist criterion and be undersampled. The result of this undersampling is to make these higher frequency signals appear as lower frequencies in the digital data stream. Thus a signal at 175 kHz would appear below 100 kHz in the digital data stream and be detectable by the digital PSD. This would be a problem.

To avoid this undersampling, the analog signal is filtered to remove any signals above 154 kHz (when sampling at 256 kHz, signals above 154 kHz will appear below 102 kHz). This filter has a flat pass band from DC to 102 kHz so as not to affect measurements in the operating range of the lock-in. The filter rolls off from 102 kHz to 154 kHz and achieves an attenuation above 154 kHz of at least 100 dB. Amplitude variations and phase shifts due to this filter are calibrated out at the factory and do not affect measurements. This filter is transparent to the user.

Input Impedance

The input impedance of the SR830 is 10 M Ω . If a higher input impedance is desired, then the SR550 remote preamplifier must be used. The SR550 has an input impedance of 100 M Ω and is AC coupled from 1 Hz to 100 kHz.