Understanding Noise Blanking (NB) and Noise Reduction (NR) in SDRconnect™

This article explains the difference between Noise Blanking and Noise Reduction as implemented in SDRconnect. While the same type of Noise Blanking that was used in SDRuno (via the NB buttons) is implemented in SDRconnect, the Noise Reduction used is completely new.

Noise Blanking

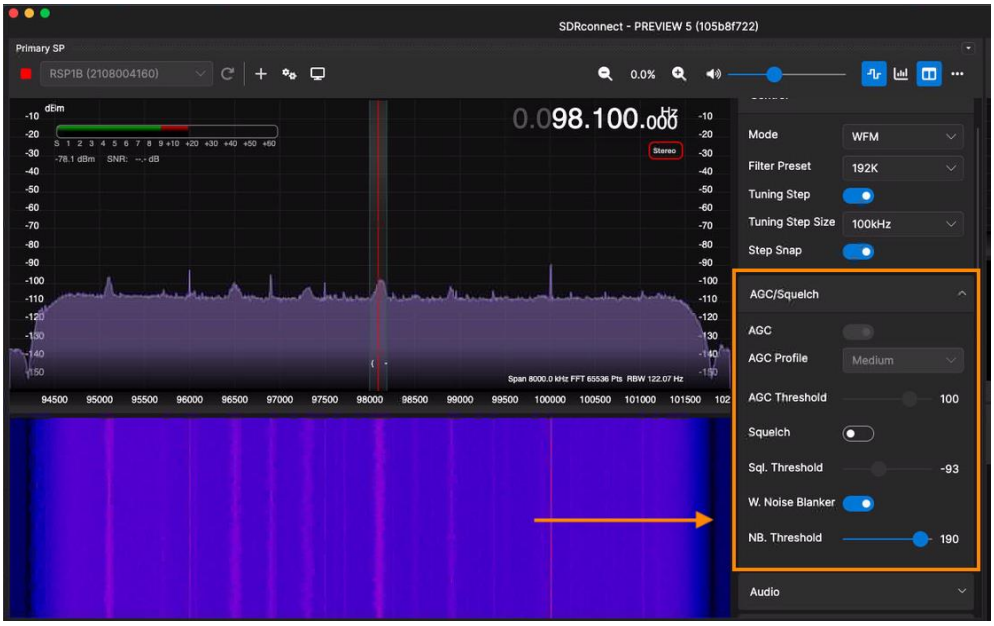
There are two types of Noise Blanking employed. These are Wide Band Noise Blanking and Narrow Band Noise Blanking. The difference is that one works off the full IQ spectrum and the other works off the down-sampled and filtered (Aux SP) signal. Noise Blanking is most useful in dealing with Impulse Noise. It will do nothing as far as Gaussian White Noise is concerned. Impulse Noise is a particular type of interference that typically comes from switched mode power supplies or switching inverters. These produce quite regular voltage spikes at the switching frequency and if the switching frequency is low, then the spikes will be very close together and will appear 'noise-like' on the spectrum display.

Noise Blanking works on the time domain samples and takes a running average of the samples from the ADCs as a baseline reference level for the total signal. Transient voltage spikes associated with impulse noise will tend to give short term large increases in the ADC sample magnitude and so the software uses a blanking threshold that is user defined. If the individual sample magnitudes are greater than the than the blanking threshold, then this sample is 'blanked' or set to a very low value. This can be a useful way of 'discarding' samples that contain the voltage transient or impulse noise.
This why, if the blanking threshold is set to a value that is below the average signal level, then all samples are blanked, and you see nothing on the spectrum display. So to get the best out of this, you need careful adjustment.

The wideband noise blanker tends to be the better of the two and that is primarily because it works at the full sample rate and with a higher sample rate and larger number of signals, the rolling average measurement of the incoming signal tends to be more constant. It is also much easier to see the impact of the threshold adjustment as you can monitor regions of spectrum where there are no wanted signals to look to see what happens to the 'Noise floor' as you adjust the threshold.

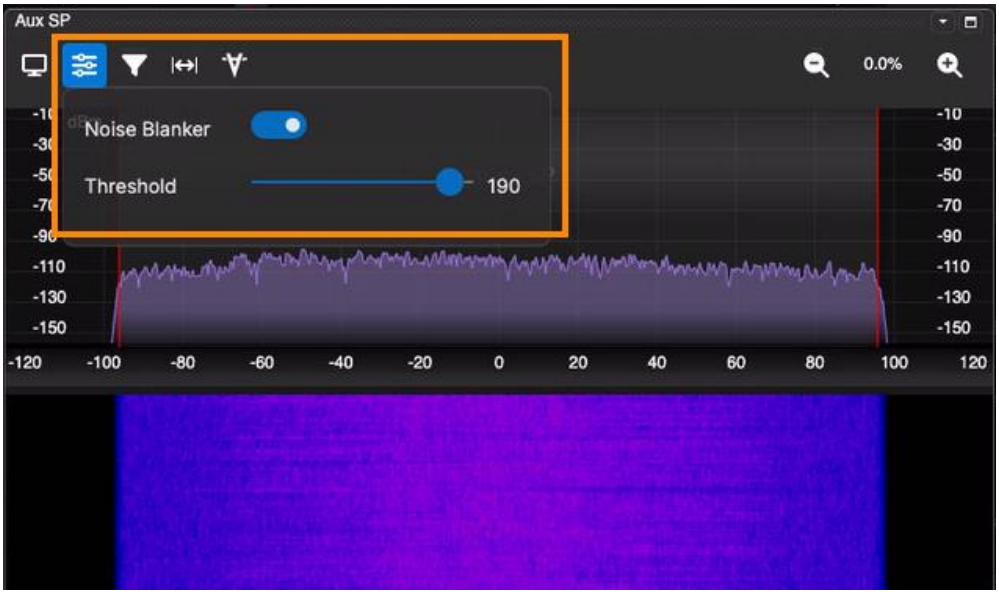
Noise Blanking Settings in SDRconnect

The Wide Band Noise Blanking controls can be found in the sidebar under "AGC/Squelch":



The toggle is used to turn blanking on/off and the slider is used to adjust the threshold.

Since the Narrow Band Noise Blanker works on the Aux SP signal the controls are revealed by an icon at the top of the AuxSP window:



Again there is an on/off toggle and a threshold slider.

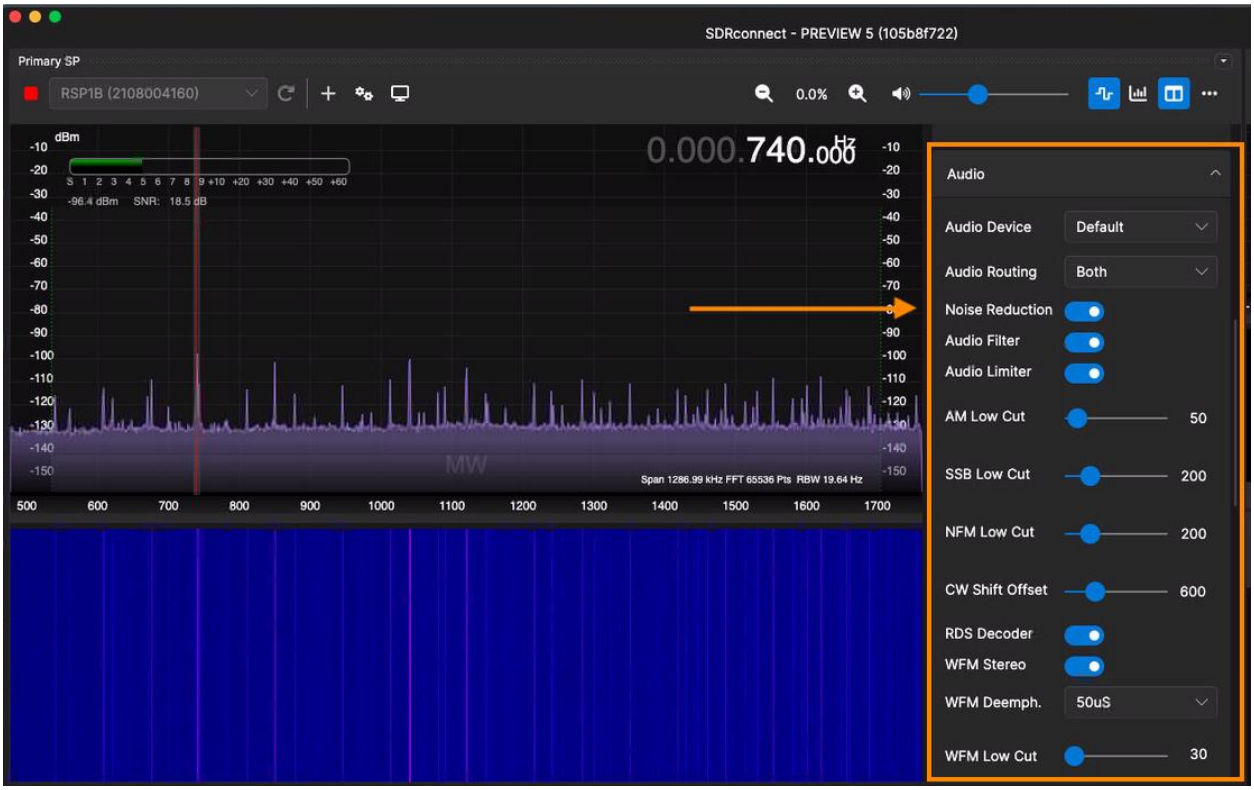
Noise Reduction

The Noise Reduction implementation in SDRconnect is completely different to the approached used in SDRuno (NR button). This is different from Noise Blanking, and you'll notice there is no threshold slider. This is because this system *doesn't* work by comparing ADC sample magnitude against a threshold.

Instead, the system analyses the audio signal and uses something that is rather like a neural network for speech recognition. Imagine that you listen to someone talking in the presence of background interference and then repeat what you hear them saying without the background noise. The brain is brilliant in picking out speech through a process of pattern recognition. If the background noise becomes too high, then the ability to understand the speech breaks down and you simply cannot repeat what was said with any accuracy. (This is just an analogy, and the system doesn't work as well as the human brain, but you can get an idea of the principle). So this system works best with speech and it also works best with reasonably high SNRs (signal to noise ratios), where the speech is easily understood. In these circumstances, the NR is extremely effective in removing all types of noise and improving the 'listening experience'.

However, it will *NOT* pull very weak signals out of high levels of background noise, so it should be turned off in this case.

The Noise Reduction is turned on by a simple toggle in the Audio portion of the sidebar:



Noise Cancellation

The dual tuner RSPduo has diversity tuning and this can be used for noise cancellation. Here you can use manual control of the phase and amplitude to subtract the unwanted interference received by one antenna (closer to the interference source) from the wanted signal being received by the main antenna. This is becoming extremely relevant as the sources of electrical interference from power supplies, LED lighting etc proliferate.

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