

WebSDR DSP Features

Where did these features come from?

These added features (*DSP Noise Reduction, Notch 2 and High Boost*) have been added to the client side of the code, written by the folks at the Northern Utah WebSDR and not with the direct participation (but with the knowledge of) the original author of the WebSDR software, P.T. de Boer, PA3FWM.

If you have questions about these added features, or if you operate a WebSDR system and are interested in adding them to your system please direct inquiries to sdrinfo@sdrutah.org and not PA3FWM, the original author.

NOTE:

These new features are **not** available on the "mobile" version of the WebSDR pages in order to allow their use on the widest variety of mobile/portable devices.

These features are also **not** in the audio path for audio recordings made using the WebSDR's "record" feature.

The "DSP Noise reduction" "Notch2" and "High Boost" features.

The original automatic notch filter that was called "Autonotch" is now called "Notch1".

Unlike the new "Notch2" filter, the original "autonotch" filter operates on the server side of the signal path and its operation can reduce the strength of strong CW notes (carriers) and reduce the S-meter deflection and prevent AGC action on that signal.

Unfortunately the original "Autonotch" notch filter (Notch1) is susceptible to other strong signals meaning that it can be prone to "hunting" in the presence of strong modulation - and with weaker signals, it may not reliably "lock" on CW notes at all.

DSP Noise reduction:

Also added is a noise reduction filter that can take out some of the background "hiss" and improve the signal-noise ratio, this is the same type of filter that can be found on nearly all HF transceivers these days.

It can reduce the background hiss on medium to strong signals, reducing this hiss can reduce fatigue.

Weaker SSB signals may benefit from noise reduction to improve intelligibility.

The readability of CW signals may be improved by the nature of the filter to converge on coherent signals (like CW notes) and reject noise.

Like any filters of this type, it probably will not help with signals that are very weak and "in the noise", in the presence of only noise, this filter will cause a "hollow" barrel-like sound, this is normal and is the nature of the filter.

There are currently four settings for the DSP Noise reduction filter:

Low. The noise-reduction effects are fairly light and are probably the best choice for casual listening.

Medium. This has stronger noise-reduction effects, but more apparent artifacts, particularly on background (white) noise when no signals are present in the form of a "swishing" sound.

High. This has even more strong noise-reduction effects, it may or may not help with intelligibility

Strong. This filter is designed to have even stronger noise-reduction, its adaption rate is quite slow compared to the others, but it can be fairly effective in some cases.

This setting often tends to make audio sound a bit "quieter" and cut the "highs" a bit, the "High Boost" feature was added to help mitigate this effect.

A few comments about DSP noise reduction:

DSP noise reduction works by quickly "locking on" to the voiced elements of human speech and filtering out the rest. This works because voiced human speech consists of tones.

For signals that range from good to "moderately" noisy, this works quite well - but when signals are very weak, it may actually reduce intelligibility in some cases because the "tones" of the speech are increasingly difficult to discern from the background noise.

When only noise is present or signals are very weak, the noise reduction tries to lock on to the random elements of noise causing the "swishing" (or "voices in a barrel") effect.

Because of its nature, this filter will also "lock on" to tones and it may be useful for CW use in some cases.

Note that this filter is adaptive and it takes time for it to "lock" onto a signal - and the higher settings take even more time to do this, so it may not be the best choice for rapid-fire contesting.

For casual listening, the Low setting is recommended as its effects are moderate, offering reasonable noise reduction without being too strong or causing deleterious effects on weak signals.

It is recommended that DSP noise reduction be turned OFF if you are trying to use any digital mode - and this is true not only for the WebSDR, but for ANY radio with DSP filtering.

The "Notch2" filter.

This filter uses digital signal processing techniques to detect a coherent signal - like pure tone like a CW note (carrier) and remove it, because it is in the audio path its action will have no effect on the S-meter, but it may be more effective in removing weaker carriers that may still be annoying, but too weak to be reliably locked onto by "Notch1".

For very strong interfering signals you may wish to use both Notch1 and Notch2.

Of course, one should not try to use any notch filter with CW or digital modes as this filter's job is to remove the very signals comprising such signals!

The "High Boost" setting

This setting boosts the high audio frequencies by 6 dB with the "knee" of the upward curve centered on 1500 Hz. The purpose of this setting is to boost the "highs" which can boost the intelligibility of speech.

This feature may be helpful if you are using a higher setting of the DSP noise reduction, or you may have age-related hearing loss.

Any problems that might be caused by these features?

The DSP Noise Reduction, Notch2 and High Boost functions are client side - that is, they are run on your computer rather than the WebSDR server itself.

What this means is that they will increase processor load on your end - something that may cause intermittent audio issues on slower computers - particularly if you have minimized the browser window in which you are running the WebSDR.

It has also been observed that in general, the Firefox browser seems to work better than most other browsers.

The Chrome browser (and its derivatives, Brave, Iron etc) seems to have more trouble on some computers running the WebSDR's web page, which can cause issues such as audio drop-outs.

If this happens, check to see if the sound card's speaker output sample rate is set to 48000 Hz (in Windows) rather than something higher like 96000 or 192000 - or simply try using FireFox.

"I reloaded the page, but DSP noise reduction (or related option) suddenly isn't working"

There's a quirk related to the "tick" boxes and drop-down settings on the WebSDR - and other similar boxes on other web pages and that is that if you reload or refresh the web page, the boxes or selections may look as though they are active, but they will not be.

For example: If you were to select a DSP setting of Low, the DSP noise reduction would start working - but if you refreshed the page, it may still show that selection, but the DSP noise reduction would not be active.

The work-around is to select Off (or any other setting than the current one) and then select Low again to reinstate the filter.

This same quirk applies to practically every option on the WebSDR page from the frequency to the waterfall setting to the volume setting - and everything in between. This is not a bug per-se, but just the way the HTML/Javascript that is being used works.