POWERSDR™/OPENHPSDR USER NOTES

This document is intended to describe the operation of certain PowerSDR™ features that are unique to HPSDR or have been modified / improved and operate differently on HPSDR hardware.

AM/SAM – Demodulation (NR0V, 2012-10-30)

- For AM Demodulation & SAM Demodulation, the "Fade Leveler" function will often reduce fading and improve the audio for AM. It operates by removing the fading carrier and replacing it with a much more stable carrier. Note that if this function is used with the Automatic Notch Filter, you may wish to select the "Post-AGC" option for the ANF. Otherwise, the ANF will notch out the carrier before the AGC and therefore the carrier will not have the intended quieting and stabilizing effect.
- For SAM Demodulation, Sideband Selection (LSB+USB, LSB, or USB) is available. If interference exists on one side of the AM signal, the alternate sideband may be selected to avoid the interference. Selecting a single sideband also sometimes eliminates the "flutter" occasionally heard on AM signals.

AM – Modulation (NR0V, 2012-10-23)

- As with all other modes, it is strongly recommended that for AM operation the transmit ALC be enabled.
- The carrier level control on the Transmit setup tab adjusts the ratio of carrier to audio.
  - The normal setting is 100.0. At this level, assuming sufficient mic gain, you will achieve 100% modulation. The ALC limits the audio such that you will not exceed 100% modulation. At this setting, with no modulation, the ALC meter should show -6dB.
  - When another station is receiving you with a synchronous detector, you may be able to reduce the carrier level and, assuming sufficient signal strength, the synchronous detector may still be able to lock on the signal and demodulate it correctly. Note that this reduction in carrier will produce distortion on a normal AM detector. At a carrier level of 0, you have no carrier, i.e., you are transmitting DSB.
  - If you wish to modulate at less than 100%, increase the carrier level above 100. The ALC will reduce the audio accordingly such that the total signal remains with the limits required by the HPSDR transmitter card.
- Note that the modulation algorithm prevents "carrier shift." This means that the carrier level will NOT vary based upon the level of the modulation.

Automatic Noise Reduction (NR0V, 2012-10-07)

- Expectations:
    - LMS Noise Reduction algorithms work best when the signals already have a good signal-to-noise ratio; they can be very effective in providing a quiet background under these circumstances. This is really their purpose.
    - It is unlikely that you will be able to pull an otherwise unreadable signal out of the noise with this type algorithm.
    - This algorithm is CPU intensive. The CPU load increases with the number of taps and with sample rate.

- Use:
    - Set the AGC Gain line just above the noise floor for best operation. (So AGC doesn't undo what the ANR is trying to do.)
    - Baseline values to try FOR 192K SAMPLE RATE:
        - Taps = 256   (increase to expand frequency range, generally reduces noise)
        - Delay = 64   (generally increase to reduce noise)
        - Gain = 100*   (decrease to reduce noise)
        - Leak = 100   (Increase to reduce noise)
        - *Lower values of gain may work very well on CW signals.
    - The Pre-AGC position in the processing pipeline should generally be used. Post-AGC may work better in certain situations, for example, fast QSB.

Automatic Notch Filter (NR0V, 2012-10-07)

- Expectations:
    - This algorithm is CPU intensive. The CPU load increases with the number of taps and with sample rate.
    - Increasing gain allows the algorithm to more effectively lock onto and notch carriers. HOWEVER, at higher gains the algorithm will begin to generate distortion on speech. I.e., there is a tradeoff between notching effectiveness and speech distortion.

- Use:
    - Baseline values to try FOR 192K SAMPLE RATE:
        - Taps = 256   (increase to expand effective frequency range)
        - Delay = 64   (lower to increase maximum effective frequency)
        - Gain = 200   (increase to more effectively lock onto carriers)
        - Leak = 100
    - The Pre-AGC position in the processing pipeline should generally be used. Post-AGC may work better in certain situations, for example, fast QSB, or when listening to AM with the Fade Leveler enabled.

Transmit ALC (NR0V, 2012-10-23)

- ***IT IS STRONGLY RECOMMENDED THAT TRANSMIT ALC ALWAYS BE ENABLED.***
- With HPSDR, it is necessary to limit the signal transferred to the transmitter hardware to below a particular level; otherwise, very broadband splatter can result. The transmit ALC does this limiting.
- Proper operation of the ALC is indicated by the fact that the ALC Meter will not exceed 0dB.
- Normal settings for ALC parameters are:
  - Attack = 2ms
  - Decay = 10ms
  - Hang = 500ms