Quick Start Guide for the Broadcast Quality Thetis CFC Audio Tools – W1AEX

To start, go through the levels of the basic audio chain components to assure that they are set optimally. The steps below will help you to establish a good starting point:

1. With the TX multimeter set for MIC, select your source (Mic in, Line in, or VAC) and then set the audio level so your voice peaks are regularly reaching close to 0 dB. Note that if you are using a dynamic microphone you may need to enable the 20dB Mic Boost option
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2. With the TX multimeter set for EQ, open the Equalizer menu at the top of the GUI console and select the "10-Band Equalizer" option. Note that you can customize the frequency point for each EQ slider but it is suggested that you try the default values initially. Adjust the equalizer sliders so that your audio source produces a relatively flat response with no over-emphasis in any part of your voice. Dynamic microphones tend to have a heavy low-end and electrets can be overly bright so each type typically needs to be treated differently. When you have flattened out the response of your audio source so there is no obvious over-emphasis, set the Preamp slider so your voice peaks are regularly reaching close to but not exceeding 0 dB.

3. With the TX multimeter set for LEVELER, adjust the Leveler's Max Gain setting so your voice peaks are regularly reaching 0 dB.

4. With the TX multimeter set for ALC, check to make sure your voice peaks are reaching 0 dB. If necessary, adjust the LEVELER so that your voice peaks regularly hit 0 dB. Note that this is essential for the Pure Signal algorithm to operate properly.

5. In the Transmit tab set your Transmit Filter to the desired bandwidth and then save your settings to a Transmit Profile.

The CFC (Continuous Frequency Compression) components include the PRE-EQ, CFC, POST-EQ, and the PHASE ROTATOR. Note that all of the CFC settings are stored within the TX profile that they are saved in to allow different settings within each TX profile. The steps below are suggestions for establishing a starting point to allow you to use the components to subjectively optimize your TX audio. To start out, if you have COMP enabled in the Console GUI, disable it for now. (Note that you may elect to enable that later if you wish to add a "hard limiting" compression effect to your transmit profile. Enabling CESSB will significantly raise your average power output and further accentuate the hard limiting effect when COMP is enabled.) Also, if Pure Signal is enabled, temporarily disable it so that the audio you hear with MON enabled is not pre-distorted.

1. PRE-EQ: In step 2 of the basic audio chain adjustments above you already set the EQ sliders to produce a relatively flat response for the microphone or audio rack that you are using and have set the Preamp slider so that you do not exceed 0 dB on voice peaks. Note that when the CFC option is enabled, the basic EQ will function as the Pre-EQ stage. If you are satisfied with your settings you can move on to the next step.

2. CONTINUOUS FREQUENCY COMPRESSOR: In the DSP menu tab select the CFC tab and place a check in the “CFC Enable” and “Post-CFC EQ Enable” boxes. The CFC interface offers an over-all gain slider called PRE-COMP and 10 individual sliders that allow you to assign different levels of compression to each assigned frequency point. While listening to your transmit audio with MON enabled, adjust the frequency band sliders upward or downward to control the amount of “punch” you wish to add to your voice in each area of the voice spectrum. When you have established settings that sound optimal for your voice, you can change the over-all compression level by adjusting the PRE-COMP slider upward or downward.

3. POST-EQ: While listening to your transmitted signal with MON enabled, use the Post-EQ form to tailor your transmit audio’s frequency response. Again, you can assign custom frequency values to each of the 10 sliders but it is suggested that you use the defaults initially. The PostEQ sliders give you complete control over the tonal quality of your signal to enhance clarity, brightness, and low-end response. As a last step, set your TX multimeter to ALC COMP and adjust the POST EQ GAIN slider so that you see several dB of ALC compression as you speak.

4. When you are satisfied with your CFC settings, go back to the Transmit menu tab and save your profile.

5. PHASE ROTATOR: This feature can be used to create symmetry or asymmetry in your transmitted audio. It’s a very individual adjustment as everyone’s voice has very different symmetry characteristics. The steps below will get you started:

- Set the Panadapter in OpenHPSDR to display the Scope.
- Select a transmit profile that has a fairly wide response and set the mode to LSB or USB.
- While transmitting, enable the phase rotator and as you speak observe your voice pattern.
- If your voice has more energy above the horizontal center line reduce the number of stages until better symmetry is observed.
- If your voice has more energy below the horizontal center line increase the number of stages until better symmetry is observed.
- Try setting the FREQ of the Phase Rotator to something other than 338 Hz if you believe most of the energy in your voice is higher or lower.
- When you have found a setting that is symmetrical with similar energy above and below the center line, save your TX profile.

Remember that while you are operating you can manually toggle COMP on or off to add a hardlimiting effect to your transmit audio if desired. If you have enabled CESSB it’s hard limiting effect will also be present each time COMP is enabled. Note that if COMP is enabled when you save your Transmit Profile then these features will be on by default.

These CFC adjustment steps should be considered to be a starting point for optimizing your transmitted audio. When you have become comfortable with the interface you might wish to change the frequency points for the CFC sliders so they span the transmitted bandwidth of each transmit profile you are working on. As an example, for a 3.0k sideband profile try the following

values: 50, 150, 300, 500, 750, 1250, 1750, 2000, 2500, 3000. There’s nothing magical about those numbers so experiment with values that give you the best tonal control for your intended bandwidth. It’s a very subjective area but by using the CFC Audio Tools you have complete control over the transmit audio your station produces. Also, if you are more comfortable with the traditional transmit audio adjustments, they are still there!