

## APPLICATION TECH NOTE

**PRODUCTS SUPPORTED:**  
All CONVERGE Pro 2 Products

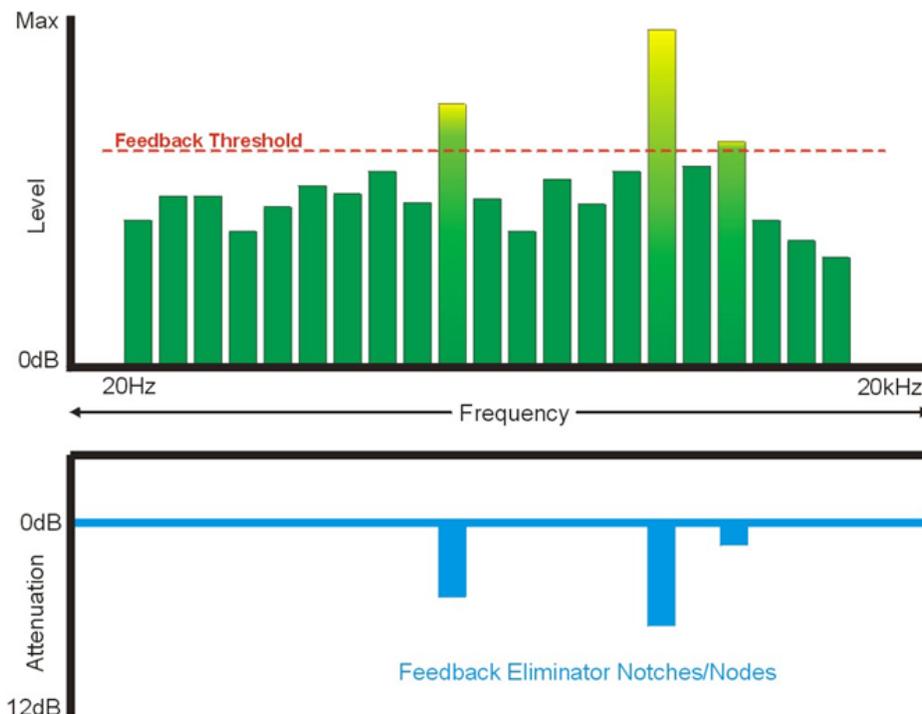
CLEARONE DOCUMENT NTS-0057-001  
(REVISION 1.0) OCTOBER 2017

FEEDBACK ELIMINATOR

### OVERVIEW

The Dynamic Automatic Resonance Eliminator (DARE™) dynamically eliminates feedback in sound reinforcement applications. Sometimes microphones in a conference room are routed to the speakers in that same room to enable participants in that room to hear each other more clearly. In such cases there is always a potential for local feedback. This is because the speaker audio is picked up by the mics which in turn sends the audio back to the speakers creating a continuous audio loop which builds into a loud squeal or hum. This feedback will be focused on very specific pitches (frequencies) called nodes; each room will have a unique pattern of feedback nodes.

The Feedback Eliminator is designed to identify the specific feedback nodes of a room and then filter out those nodes with very narrow “notch” filters which will remove feedback with minimal effect on the overall sound. The top portion in the figure below shows various frequencies of the reinforcement audio with certain frequencies being emphasized by the nature of the room and the audio equipment; this produces feedback nodes. The bottom portion of the figure shows these nodes removed by the feedback eliminator.



## CONFIGURING AND CALIBRATING VOICE LIFT

When voice lift is present, i.e. when local mics are routed to local speakers for sound reinforcement, *calibrating voice lift should be done only after the mic inputs and amplifier and speaker outputs have been calibrated*. Calibrating voice lift means finding the **optimum gain before feedback**.

- » **NOTE:** Make sure that this mic uses a Custom Reference for AEC, and that this mic's audio is excluded from that reference. For further information see our technical application document "CONVERGE Pro 2 AEC Referencing" in the Resource Library: [http://www.clearone.com/resources#professional\\_audio](http://www.clearone.com/resources#professional_audio)

### PART 1: RECOMMENDED STEPS FOR CONFIGURING VOICE LIFT

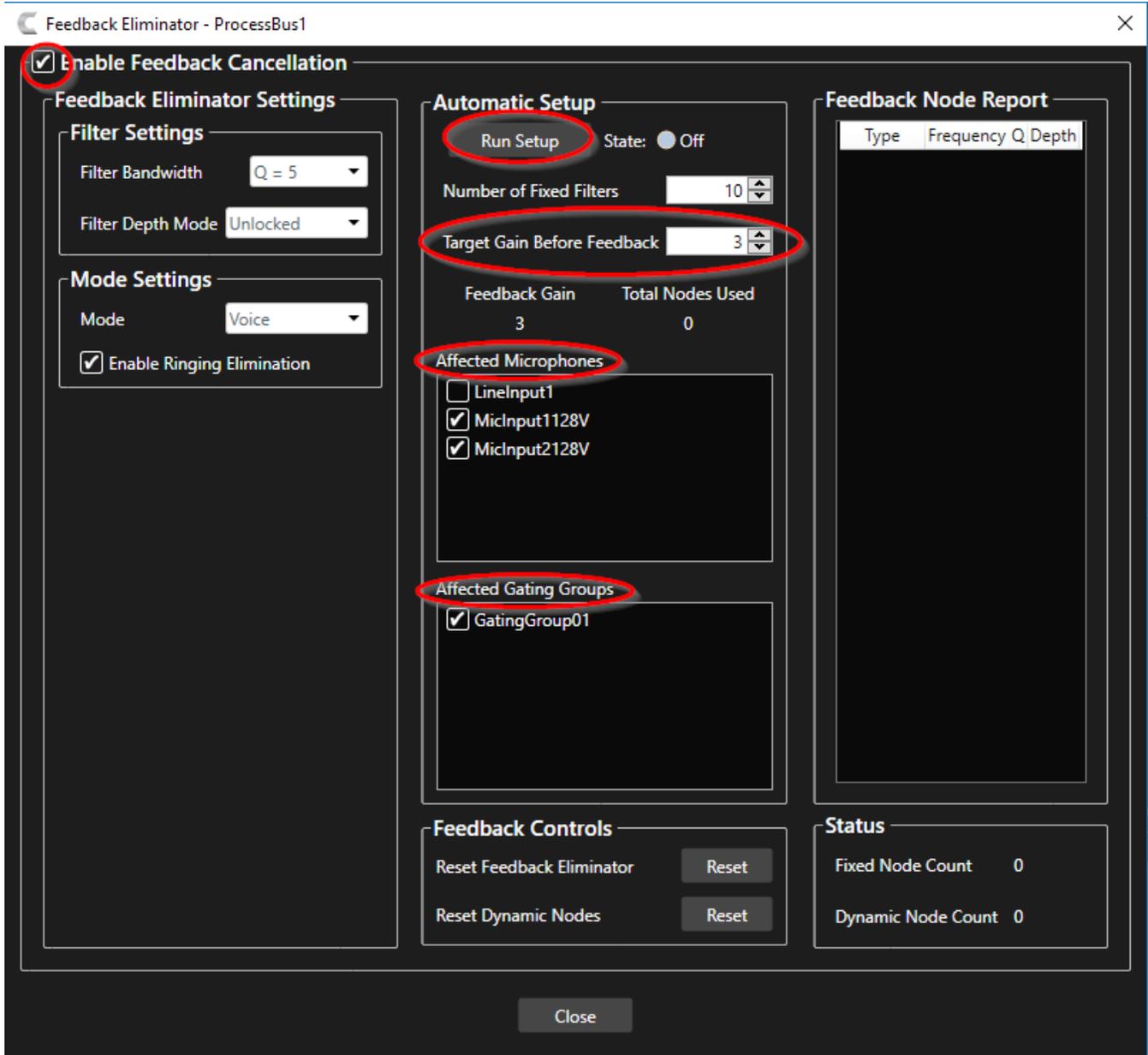
1. Calibrate the gains on this site following ClearOne's recommendations. In particular, make sure that the mic inputs and the external amplifier have been properly calibrated. For more information, see our technical application document "Optimizing Gain Structure": [http://www.clearone.com/resources#professional\\_audio](http://www.clearone.com/resources#professional_audio)
2. Route the mic input to a process bus using a purple, Pre-AEC, crosspoint.
3. Set the gain on this process bus to -65dB.
4. Route this process bus to an amplifier or speaker output.
5. Adjust the gain level of the voice lift using this process bus.
  - » **NOTE:** Do not use the mic input gain settings to adjust voice lift volume levels. Instead, make sure that the mic inputs gains have been optimized as explained above.
6. Begin to slowly increase the gain level of this process bus until you start to hear the mic ringing or feeding back into the speakers.
7. Once you find the gain setting where the mic first starts to ring or feed back, reduce the gain by about 6dB to prevent feedback.

The screenshot displays the software interface for configuring voice lift. It is divided into two main sections: a crosspoint matrix and a process bus control panel.

**Crosspoint Matrix:** This section shows a grid of connections between various inputs and outputs. The inputs listed on the left are: MicInput1\_128V, MicInput2\_128V, LineInput1, Beamformer1, USB128V\_L\_Rx, VoIP1\_Rx, VoIP2\_Rx, and ProcessBus1. The outputs listed at the top are: LineOut128V\_1, USB128V\_L\_Tx, VoIP1\_Tx, VoIP2\_Tx, ProcessBus1, and Fader1. A red circle highlights the connection between ProcessBus1 and ProcessBus1, which is set to 0. Another red circle highlights the connection between ProcessBus1 and LineOut128V\_1, which is also set to 0.

**Process Bus Control Panel:** This section shows the settings for ProcessBus1. It includes a Gain control set to 0.0 dB, a Feedback control set to -65 dB, and an Output control set to -97 dB. The Gain control is highlighted with a red circle.

This typically will be the optimum gain before feedback.



## PART 2: FEEDBACK ELIMINATOR SETUP FOR CONVERGE PRO 2

To increase the maximum gain before feedback, use the Feedback Eliminator. Go to the processing block and run the feedback eliminator setup, as follows:

1. Adjust the gain of the processing block until you start to get a little ringing or feedback, then revert back a couple of dB.
2. Set the Optimum Gain Before Feedback to 3 or 4dB or possibly a little higher.
3. Check the relevant boxes for Affected Mics and Affected Gating Groups. Affected mics are any mics that are routing to this processing block, and Affected Gating Groups are any groups that contain these mics. It will temporarily adjust certain mic settings to give the best results.
4. Click the "Run Setup" button. The feedback eliminator will begin to add temporary gain and also add filter nodes to prevent feedback. The process completes when the target gain is reached, at which point the temporary gain is removed. If all the filter nodes are used up before the target gain is reached, then the setup process is stopped and the temporary gain is removed.

## DEFINITIONS OF THE SETTINGS FOR THE DARE™ FEEDBACK ELIMINATOR

**Enable Feedback Cancellation:** Check the check box to activate the Feedback Eliminator on this processor channel.

**Filter Bandwidth** adjusts the width (frequency range) of the filters. The value “Q = 5” provides wider filters and the value “Q = 10” provides a narrower filter affecting fewer frequencies. The lower the “Q” value the wider the filter. Narrower filters will have less effect on the overall sound, whereas wider filters will eliminate more feedback.

**Filter Depth Mode:** Filter depth is the amount by which a fixed filter reduces (attenuates) the node frequency. When “Unlocked” it allows the Feedback Eliminator to dynamically adjust the filter depth of fixed filters. When set to “Locked” it locks the filter depth so that it can't be adjusted; if feedback then occurs at that frequency a dynamic filter is added to eliminate it.

**Mode Settings:** Voice and Music presets are available to fine-tune the feedback eliminator. Voice mode is the more aggressive setting.

**Enable Ringing Elimination:** Allows the Feedback Cancellation to attempt to suppress ringing. This setting adjusts slowly to eliminate ringing.

### Number of Fixed Filters

The DARE™ Feedback Eliminator has 16 notch filters available to filter out feedback nodes; these are shared between Fixed Filters and Dynamic Filters. The frequencies of the Fixed Filters do not change in response to changing room conditions; they are intended to deal with the primary feedback frequencies that are caused by a combination of the room resonant frequencies and mic and speaker characteristics.

### Target Gain Before Feedback

When the **Feedback Eliminator Setup** runs it will set filters to allow for a target maximum reinforcement gain level. As the setup is running it will slowly increase the gain of the audio passing through the Feedback Eliminator until the target value is reached or the number of filters used is equal to the max number of fix filters. The maximum Target Gain is 8dB.

**Affected Microphones:** Before clicking Run Setup it is a good idea to select the Affected Mics. This is not required but will disable certain mic features to achieve more optimum results.

**Affected Gating Groups:** Before clicking Run Setup it is a good idea to select the Affected Gating Groups. This is not required but will disable certain gating group features to achieve more optimum results.

**Dynamic Filters** are added as necessary during system use to deal with acoustic and level changes that occur during the course of a conference or presentation. The number of dynamic filters is 16 minus the number of fixed filters. When the maximum number of dynamic filters is reached the dynamic filters will roll over. If, for example, there are 16 filters and a new dynamic filter is added it will replace and eliminate the first dynamic filter so the total count stays at 16. Dynamic filter frequency remains fixed once added and can only increase attenuation (until reset). It is usually better to have more fixed filters than dynamic filters. In cases where conditions are more changeable and unpredictable, such as when a mic is being move around the room, more dynamic filters may be needed.

**Reset Feedback Eliminator:** Clicking Reset clears all settings related to this feature.

**Reset Dynamic Nodes:** Clicking Reset only clears dynamic filters; Fixed Filters remain in place. When room conditions change significantly, such after room remodeling or a change in the loudspeaker system, resetting the dynamic nodes is recommended.

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