

Delay/Attenuate- Single Channel

Section 1.0: Introduction

1.1 Overview

Delay/Attenuate Timeslots – Single Channel Application is an addition to the already existing Echo Test Solutions suite of applications. This application also facilitates Low Delay Echo Path Modeling.

1.2 Main Features

- Transmission of data, voice or file on **single timeslot**;
- Multiple instances of the application can be opened simultaneously
- The application can be implemented in firmware/hardware. This enhancement in the implementation enables to have a very low delay in the processed signal compared to the existing software based implementation.
- This application also allows you to apply; delay, attenuation (gain), and/or filtering to a received signal on a single timeslot. You may also mix-in additional signals from other sources, including speech signals inserted via VF input. Speech signals inserted via VF input and Gaussian noise signals or Tone generated internally within the application.

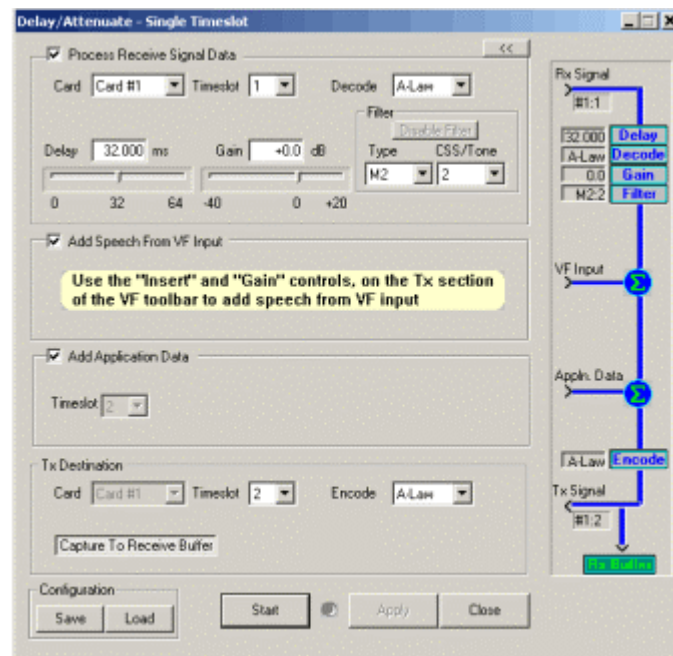


Figure 1: Application Overview

This application can receive and transmit on only one of the boards. Launching multiple instances of this window to work on a second card is allowed and recommended. There are a number of different operating configurations available. The most common and useful among are:

- **Low delay (Real-time) echo-path simulation:** This application is implemented in firmware/hardware, to support real-time echo path modeling. The key aspect is, the application overhead delay is within one sample or 1.25 milliseconds. It can also simulate all G.168 echo-path models.
- **Looping back a processed signal:** Applying delay, attenuation, and/or filtering to a received signal and retransmitting the processed signal on the same board on which it was received. Speech and/or noise may also be mixed in. The following diagram illustrates this configuration.

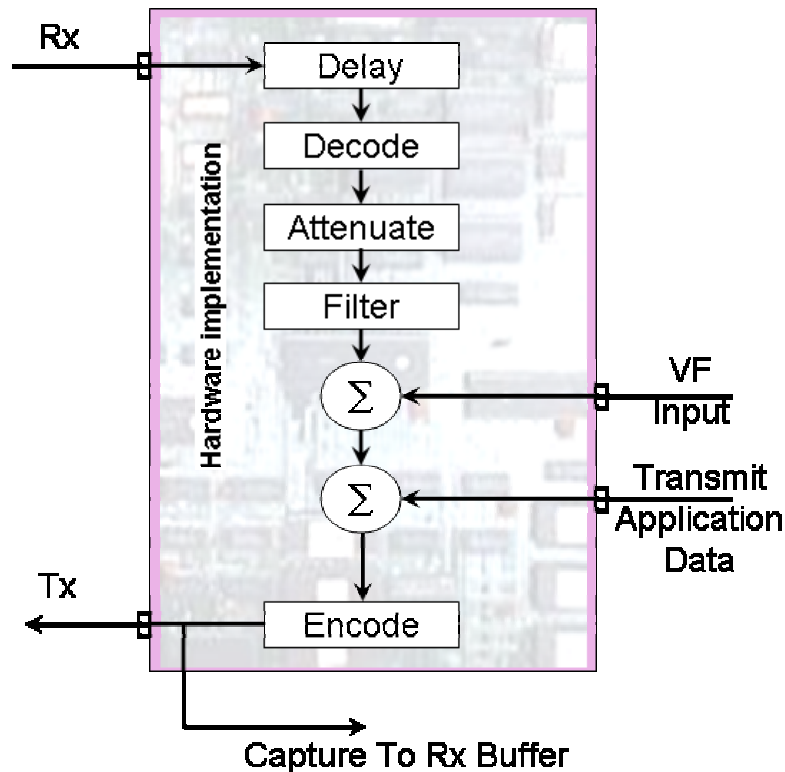


Figure 2: Looping back a processed signal

- **Applying pure delay to a signal:** A received signal is delayed before being retransmitted. This configuration is illustrated in the figure below.

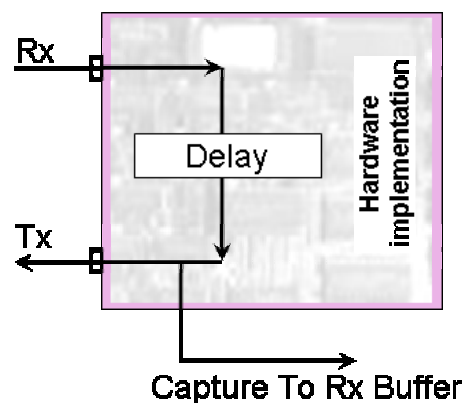


Figure 3: Inserting a pure delay

1.3 User Interface

This section describes the operation of the controls in Delay/Attenuate – Single Timeslot Application.

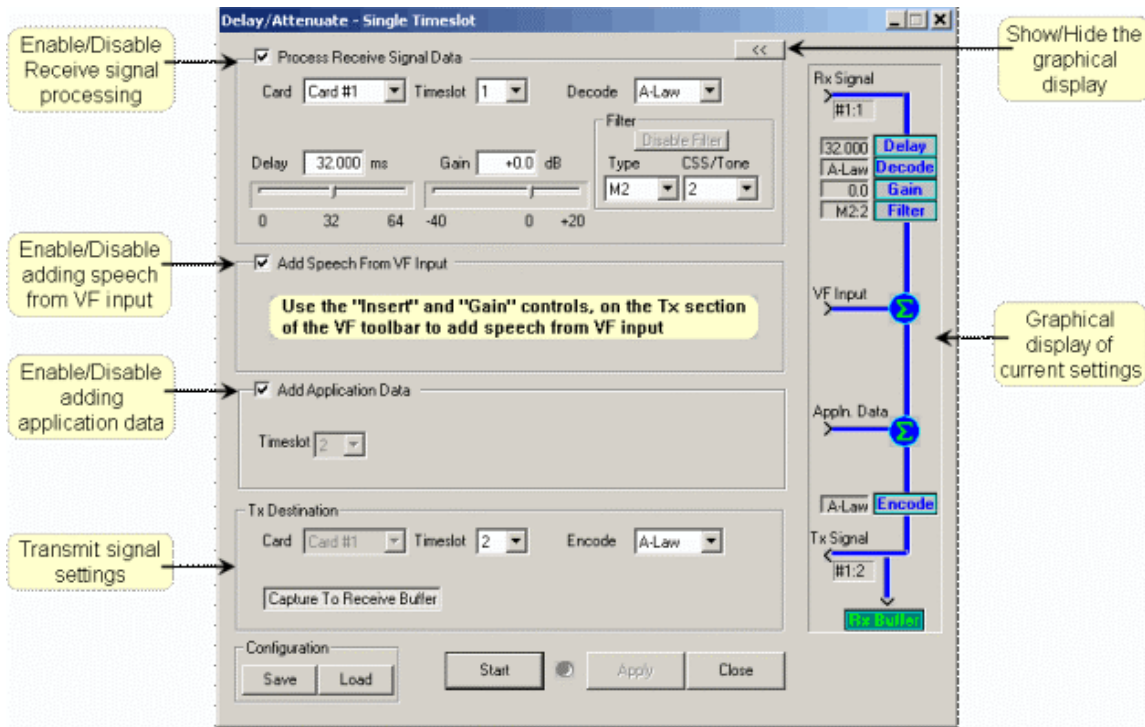


Figure 4: User Interface Description

Section 2.0: Selecting Cards and Timeslots

2.1 Card and Timeslot selection

The user can select the Rx and Tx timeslots differently. However, in this application the receiving and transmitting cards must be the same.



Figure 5: Selecting Card and Timeslot

2.2 Selecting the Transmit Destination

The transmit card will be the same as the receive card. You can select the transmit timeslot different from the receive timeslot. Transmit encoding can be selected as A-Law, u-Law or none. If no decoding (None) is selected on the receive signal, the encoding will also become None. The Capture To Receive Buffer toggle control will enable you to capture the transmitted data to the receive buffer, so that you will be able to use the visualization screens such as "Power Spectral" to view the transmitted data.

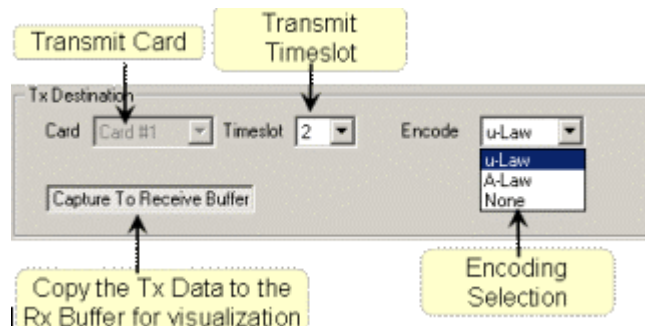


Figure 6: Different options set for Transmission procedure

2.3 Add speech from VF input

For more details on adding speech from VF input refer Section 3.0:

2.4 Adding application data

For more details on adding application data refer Section 4.0:

2.5 Processing the receive signal data

The following are the steps to process a received signal:

- Check the Process Receive Signal Data checkbox to enable processing of the Received signals.
- Select the card and timeslot using the card and timeslot controls.
- Select a Delay value, appropriate for your testing. You can either type in a value or use the slider control to arrive at a specific value within the allowed range. The precision for Delay value is 0.125 milliseconds.
- Select an encoding scheme (A-Law, u-Law or None). If either A-Law or u-Law is selected you can specify the Gain value as well as the filter.
- Select or enter a Gain value, which can have a granularity of 0.1 dB.
- Select a filter type and signal type. The filter type can be M1 to M8 and the signal type can be 1 (CSS) or 2 (Tone). All together you can have 16 combinations of filter selection.

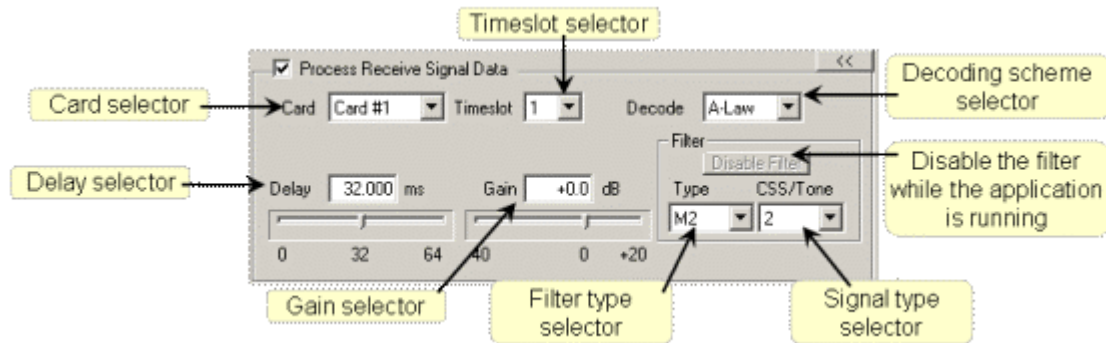


Figure 7: Processing the received data

2.6 ITU Specifications

Given below are the ITU specifications corresponding to the Filter type and the Signal type (CSS/Tone) selections. Please see ANNEX C, Tables C.1A and C.1B of G.168 specifications, dated: 06/2002 for further information.

#	Filter Type	CSS/Tone	Scaling Factor	Minimum ERL for CSS/Tones (dB)
1	M1	1 (CSS)	1.39×10^{-5}	6
2	M1	2 (Tone)	1.22×10^{-5}	6
3	M2	1 (CSS)	1.44×10^{-5}	6.55
4	M2	2 (Tone)	6.78×10^{-6}	6
5	M3	1 (CSS)	1.52×10^{-5}	6
6	M3	2 (Tone)	9.66×10^{-6}	6
7	M4	1 (CSS)	1.77×10^{-5}	6
8	M4	2 (Tone)	1.07×10^{-5}	6
9	M5	1 (CSS)	9.33×10^{-6}	6
10	M5	2 (Tone)	7.05×10^{-6}	6
11	M6	1 (CSS)	1.51×10^{-5}	6
12	M6	2 (Tone)	8.60×10^{-6}	6
13	M7	1 (CSS)	2.33×10^{-5}	11.06
14	M7	2 (Tone)	6.58×10^{-6}	6
15	M8	1 (CSS)	1.33×10^{-5}	9.27
16	M8	2 (Tone)	4.58×10^{-6}	6

Table 1: ITU Specifications

Section 3.0: Adding Speech from VF Input

3.1 Procedure for adding speech from VF Input

You can add speech using VF input, and then transmit it through the transmit timeslot. You can also mix the VF input with the processed received signal and then transmit it.

Follow the steps given below for adding speech from VF input:

- Check the **Add Speech From VF Input** checkbox to enable adding the signal from VF input. See the below figure.
- Check the **Insert** control on the VF Toolbar to start inserting signal from VF input.
- Adjust the gain value using the **Gain** control.
- The timeslot selected on the VF toolbar is not relevant as far as this application is concerned. For example if the transmit timeslot for this application is selected to be 2 and the VF input timeslot is selected as 5 then, on the transmitted T1/E1 signal, the timeslots 2 and 5 will contain the inserted VF signal. Depending on the other settings on this application, the transmitted signal on timeslot 2 will be summations of the processed receive signal and (or) the application data (please see the next section on adding application data).

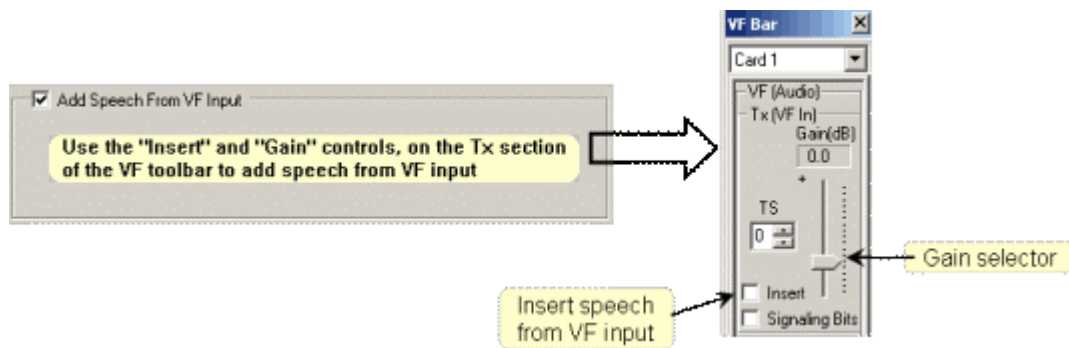


Figure 8: Adding a speech from VF input

Section 4.0: Adding Application Data

4.1 Procedure for adding application data

You can add the internally generated application data to the transmitted timeslot. Once you select the transmit timeslot, any internally generated data such as Tone, Gaussian noise etc on that particular timeslot will be added to the transmitted signal.

Follow the below steps to add application data to the transmit timeslot.

- Check the Add Application Data checkbox to enable adding the application data.
- Use the menus **Intrusive Test | Transmit Tone** or **Intrusive Test | Transmit Gaussian Noise** to internally generate a signal. Make sure to select the same timeslot as that we selected for transmit, in the Delay Attenuation application. Click the **Send** or **Generate** button on the dialogs as the case may be, to generate the signal.

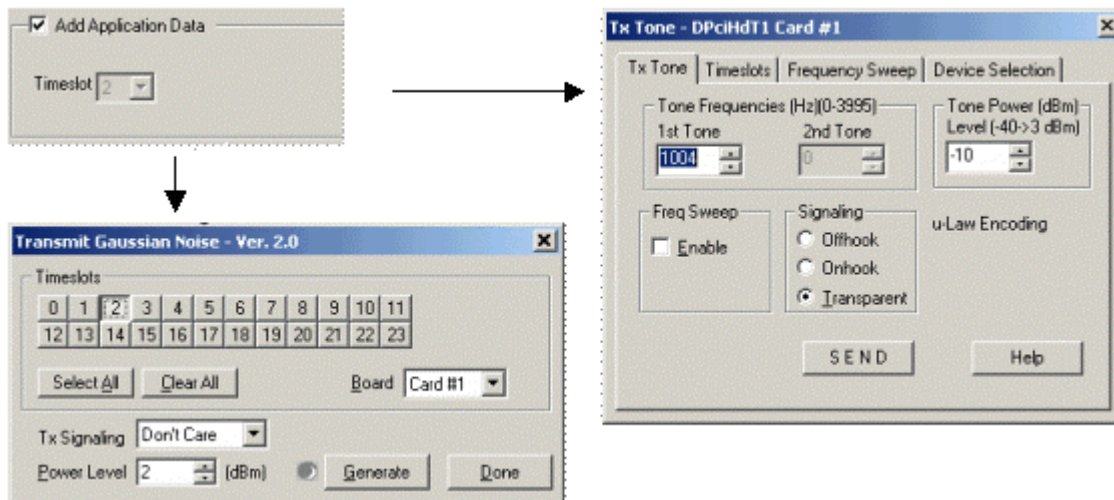


Figure 9: Procedure for adding Application Data

- **Starting the application**

Once the configuration is complete, you can start the processing by pressing the **Start** button (Figure 10). While this application is running, the Green LED near the Start button will blink continuously until you hit the **Stop** button to stop the processing. Additionally if the graphical view is visible, it will show an animated display of the flow of data from the various input points to the output (transmit) point.

4.2 Saving and loading the settings

If you want to save a particular configuration, you can use the Save and Load buttons. Using the Save button you can save the current settings to a file. These settings can be later loaded back to the dialog by using the Load button.

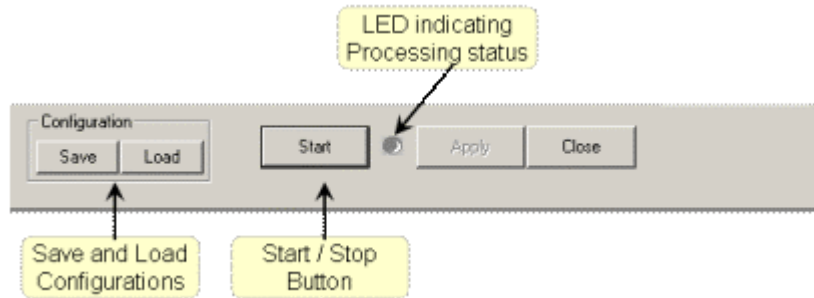


Figure 10: Save and load configuration