

SIGMA300 RESIDUAL ECHO SUPPRESSION (RES) PLUG-IN FOR SIGMASTUDIO USER GUIDE

ANALOG DEVICES, INC.

www.analog.com

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1 Introduction

This document describes how to use the Sigma300 Residual Echo Suppression (RES) Plug-in for SigmaStudio.

1.1 Scope

The document is intended to assist software developers integrating the Sigma300 RES Plug-in for SigmaStudio into a SigmaStudio schematic application. A basic understanding of SigmaStudio is recommended. Also, a basic understanding of acoustic echo cancellation is recommended.

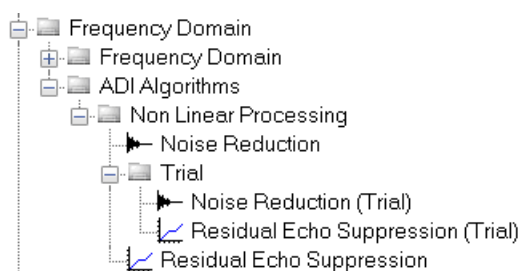
1.2 Integration

Previous versions of this Plug-in must be removed from SigmaStudio before adding a new version.

To remove an old version of this Plug-in, launch SigmaStudio and select *Add-Ins Browser* from the *Tools* menu. Within the *Add-Ins Browser* window, highlight *RES.dll* if it exists, and click *Delete Item* to remove. Save the settings by selecting *Save* from the *File* menu.

To register this Plug-in into the SigmaStudio development environment, select the *Add-Ins Browser* from the *Tools* menu. Within the *Add-Ins Browser* window, select *Add DLL* from the *File* menu. Browse to the location of *RES.dll* and add the DLL. Save the settings by selecting *Save* from the *File* menu.

Upon successful registration, the Plug-in can be found in the Block Schematic tab in the *Tree ToolBox* window as shown below.



1.3 Organisation of this Guide

Section 1 : This section contains the introduction.

Section 2 : Lists the specifications of the Plug-In.

Section 3 : Describes the example usage.

1.4 Acronyms

ADI	Analog Devices Inc.
AEC	Acoustic Echo Cancellation
DLL	Dynamic Link Library
DM	Data Memory
GUI	Graphical User Interface
HPF	High pass filter
PM	Program Memory

Table 1: Acronyms

1.5 References

Refer to SigmaStudio and SigmaDSP documentation available on the Analog Devices website.

1.6 Additional Information

1.6.1 Other Information

For more information on the latest ADI processors, silicon errata, code examples, development tools, system services and devices drivers, technical support and any other additional information, please visit our website at www.analog.com/processors.

2 Specifications

2.1 Version Information

The RSE Plug-in for SigmaStudio is developed and tested under SigmaStudio version 3.14 and will work with later versions.

2.2 Target Platform

Sigma300 and Sigma350 series family of processors.

2.3 Overview

The figure below shows the RES Plug-in. Several GUI controls are provided to allow the user to configure the Plug-in in SigmaStudio.

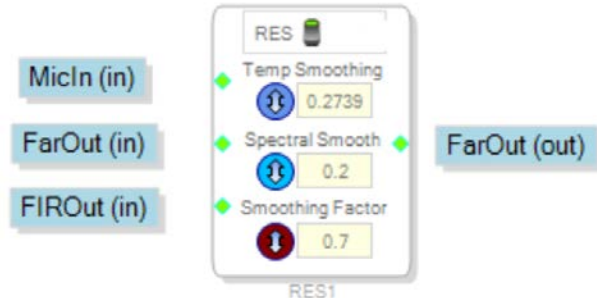


Figure 2: RES GUI

2.4 I/O pins

2.4.1 Inputs

The Plug-in inputs are shown in Figure 1 and described in the following table. Note that all of the inputs are complex frequency domain block inputs.

MicIn (In)	Input signal from near end microphone FFT.
FarOut (In)	Input signal from AEC FarOut FFT.
FIROut (In)	Input signal from AEC FIROut FFT.

Table 2: Inputs

2.4.2 Outputs

The Plug-in outputs are shown in Figure 1 and described in the following table.

FarOut (Out)	Far end output signal. This goes to an IFFT or to other frequency domain processing, for example the Noise Reduction plug-in
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Table 3: Outputs

2.5 GUI Controls

The Plug-in provides the following GUI controls to set the run-time parameters of the module. For Temporal and Spectral smoothing factors, decreasing the value will increase the amount of smoothing. Too much smoothing will degrade speech quality, too little smoothing will cause audible artifacts. The Smoothing factor controls the amount of residual echo suppression. Increasing the value will increase the amount of suppression. Too much or too little suppression may cause audible artifacts. The default values were determined to pass ITU compliance and it is not recommended to change them.

GUI control	Description	Range
RES on/off switch	On: AEC enabled, Off: AEC bypassed	
Temporal Smoothing	Controls amount of temporal smoothing	0.1 to 1.0 (default is 0.2739)
Spectral Smoothing	Controls amount of spectral smoothing	0.1 to 1.0 (default is 0.2)
Smoothing factor	Controls amount of residual echo suppression	0.1 to 1.0 (default is 0.7)

Table 4: GUI controls

2.6 Resource Usage

2.6.1 Memory

The plug-in requires 3K words of data memory.

2.6.2 MIPS

The plug-in uses 4 MIPS at 8 kHz sample rate.

3 Example Usage

The RES plug-in operates in the block domain, and its inputs and outputs are complex frequency domain signals, so its inputs typically come from an FFT and its output goes to an IFFT. The RES plug-in is used together with the AEC plug-in. The RES plug-in typically operates at 8 kHz sample rate. For a system with 48 kHz I/O this requires decimation and interpolation. Two example implementations are provided: standard and wideband. Standard uses one RES plug-in at 8 kHz sample rate as shown in Figure 2. Wideband uses two RES plug-ins at 8 kHz sample rate, with an effective sample rate of 16 kHz as shown in Figure 3. The two examples are complete AEC solutions, both example implementations include the NR plug-in for noise reduction, which can be removed or bypassed if necessary. Note in the figures RES is shown as NLP.

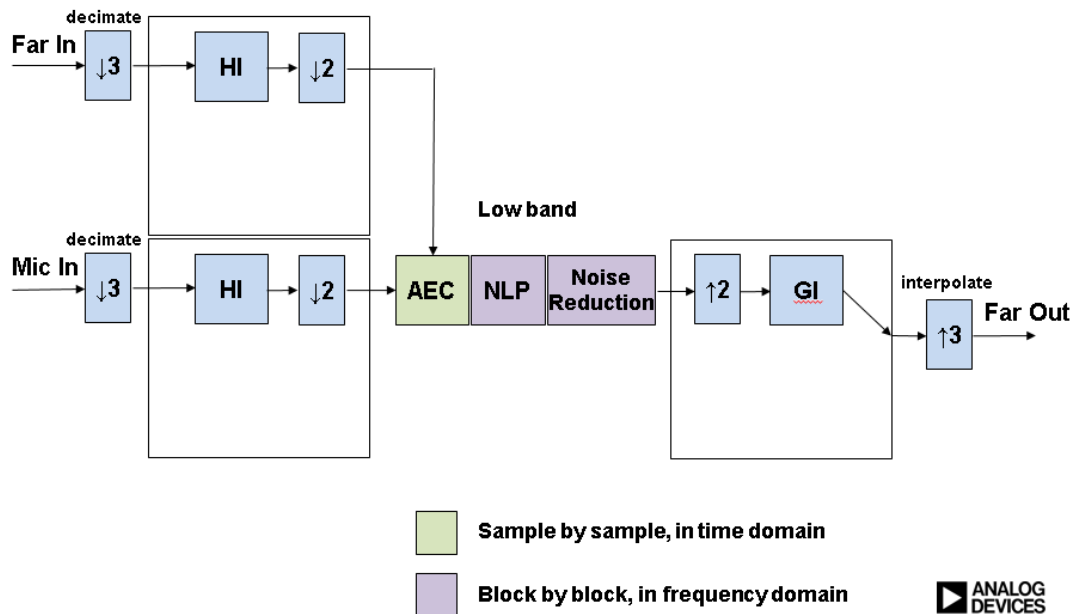


Figure 2: Standard AEC

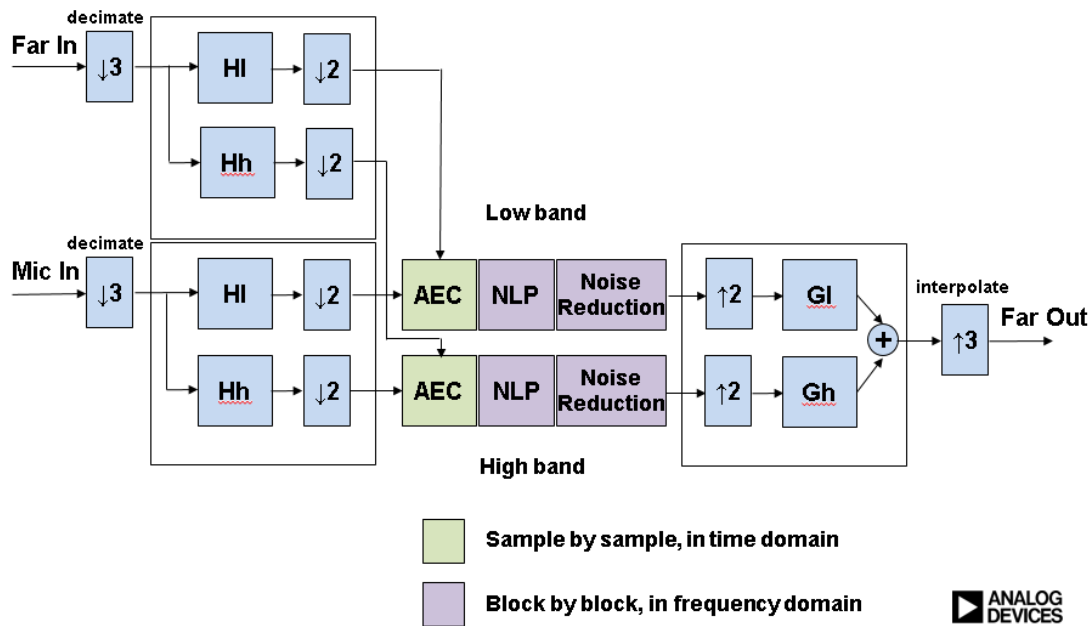


Figure 3: Wideband AEC

3.1 Example Projects

Refer to the provided example projects `Sigma300_AECNR_Standard_GUI.dsproj` and `Sigma300_AECNR_Wideband_GUI.dsproj`.