



**DSP Concepts, LLC.**

# Audio Weaver

## Quick Start Guide



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## 1. Introduction

The Audio Weaver from DSP Concepts, LLC., is an environment for developing optimized embedded audio software. It enables algorithm and product developers to more quickly and efficiently develop audio products and technology. The Audio Weaver is suitable for the entire lifecycle of an algorithm, from basic research, to optimization and productization, integration into end products, and ongoing legacy support. The Audio Weaver automates many of the mundane tasks associated with developing embedded algorithms and allows the designer to focus on creating new features and adding sophisticated functionality.

This Quick Start Guide helps you install the Audio Weaver software and introduces the primary features and capabilities. We'll show you how to run example systems natively on your PC and process audio in real-time. Additional information can be found in two other documents. First, the *Audio Weaver User's Guide* provides detailed setup instructions and a complete description of the the associated MATLAB commands. Second, if you are using an external DSP target, refer to the setup instructions that were provided with your board. Most of the examples shown in this guide can be run on your DSP board.

## 2. Software Installation and Setup

The Audio Weaver installer is contained in the file AWINstaller.exe. Run the installer and select a location to install the files. The application can be placed anywhere on your hard drive. We'll use <Audio Weaver> to refer to the base installation directory throughout this document.

The installer will place an Audio Weaver icon on your desktop.



Double click the icon to launch the Audio Weaver Server application the first time. If you are using an external DSP target, you'll need to configure it using the Target→Change Connection menu item.

MATLAB communicates with the Audio Weaver server via TCP/IP. If your computer has a firewall or virus checking software installed, you may get a warning message the first time you launch the server and the first time you try and connect via MATLAB. Unblock the firewall to allow the connection.

## 3. Running Audio Weaver Script (.aws) Files

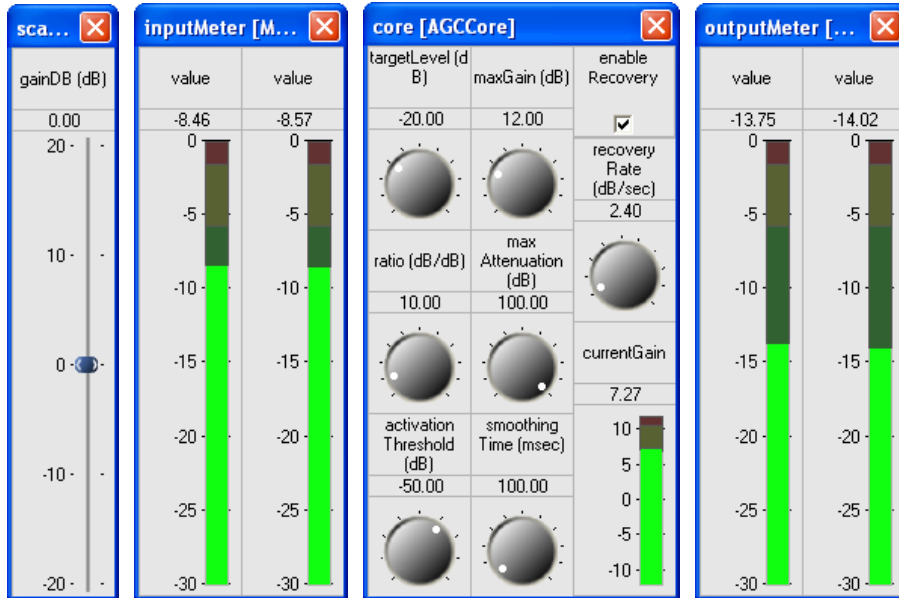
Audio Weaver Script files are preprogrammed text files containing commands for the Audio Weaver Server. The script files are identified by a .aws extension. The example script files are located in

<Audio Weaver>\Examples\Scripts\float

These scripts are suitable for the PC and floating-point targets, like the SHARC. If you are running on a fixed-point target, like the Blackfin, then select the scripts in

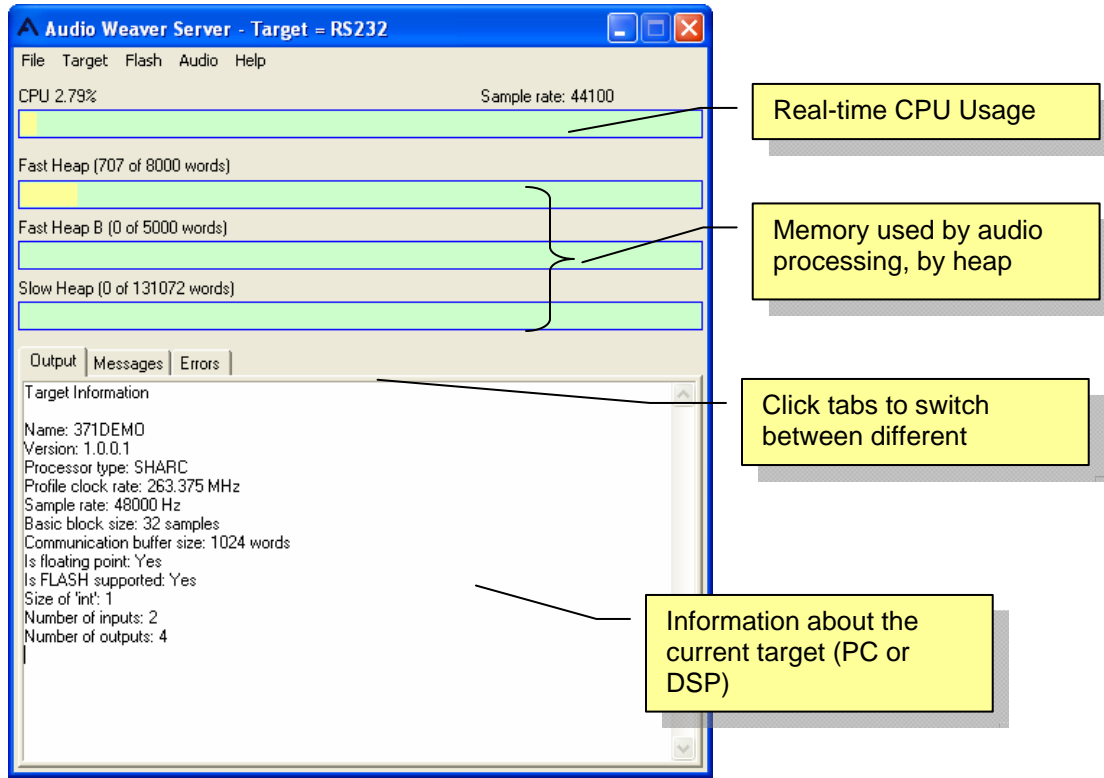
<Audio Weaver>\Examples\Scripts\fract32

Double click on a script file to activate the example. For example, double-clicking on agc\_example.aws creates an automatic gain control and displays the following inspectors:



Most examples include real-time audio processing and a user interface. If you are running natively on the PC, then an MP3 file will be played for each example. A short description of each example can be found in chapter 9 of the User's Guide.

The Audio Weaver Server window is shown below. For each example, you can read off the CPU and memory usage from the provided meters.



The Audio Weaver contains a large number of compiled in audio modules that are organized as separate libraries. For example, there are separate libraries for floating-point, fixed-point, and frequency domain processing audio functions. The PC contains the complete set of audio modules with each library being a separate DLL. An embedded target, on the other hand, contains a subset of these modules due to memory limitations.

You can see the list of available audio modules by selecting Target→List Modules. You'll see something similar to:

```

195 Classes on Target

From BasicAudioFloat32DLL.dll:
1001 ModuleAbs
1002 ModuleAdder
1003 ModuleAGCAutoAttackRelease
1004 ModuleAGCCore
1005 ModuleAGCCoreAR
1006 ModuleAGCGainComputer
1007 ModuleAGCLimiterCore
1008 ModuleAGCMultiplier
1009 ModuleAGCNoiseGateCore
1010 ModuleAGCRelease
1011 ModuleBalance
1012 ModuleBiquadCascade
    
```

```
1013 ModuleBiquad
1014 ModuleBiquadSmoothed
```

## 4. Using MATLAB

Begin by setting up MATLAB's path to include the directory

```
<Audio Weaver>\Matlab
```

This directory contains the primary set of MATLAB scripts used by the tool. The MATLAB menu item "File → Setup Path..." can be used to update the path. Once the path is set, issue the command:

```
awe_init;
```

once at startup. This configures additional directories and initializes a global variable that controls the behavior of the Audio Weaver. It also launches the Audio Weaver Server, if needed.

### 4.1. On line help

All of the MATLAB Audio Weaver functions have usage instructions within the function header. To get help on a particular function, type

```
help function_name
```

Additional help is available for audio modules. The command

```
awe_help
```

creates a list of available audio modules in the MATLAB command window. A partial list is shown below:

```
>> awe_help
abs\_module
adder\_module
agc\_auto\_attack\_release\_module
agc\_core\_ar\_module
agc\_core\_module
agc\_gain\_computer\_module
agc\_limiter\_core\_module
agc\_module
```

Each of the modules appears as a hyperlink, and clicking on an item provides detailed module specific help. The help provided is above and beyond the comments shown in the file header and accessed via the standard MATLAB "help" command. For example, detailed help for the FIR filter module is obtained by the command

```
awe_help fir_module
```

### 4.2. Running MATLAB Example

Example MATLAB scripts are found in

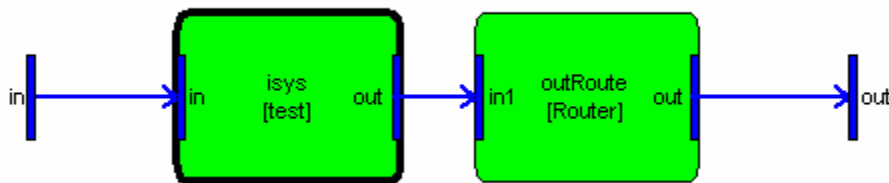
```
<Audio Weaver>\Examples
```

To run the automatic gain control example, type

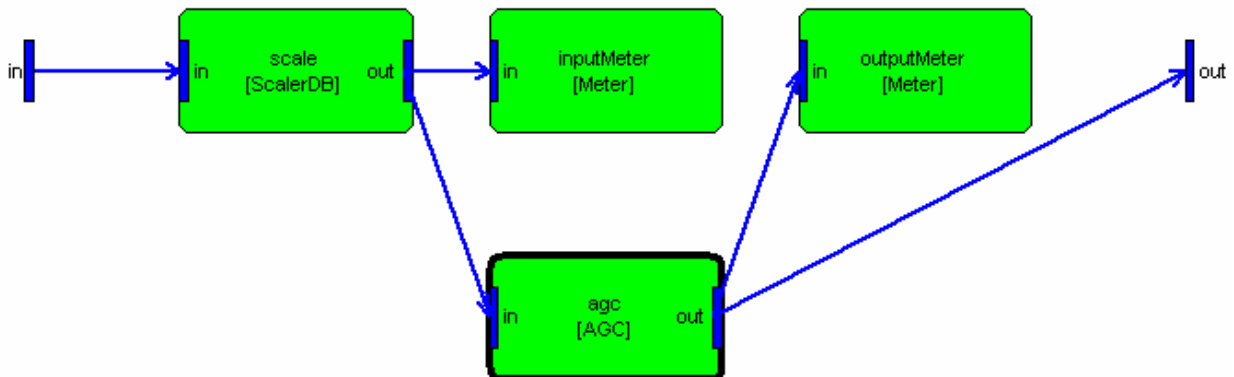
```
SYS=agc_example;
```

The script will send commands from MATLAB to the Audio Weaver Server (the same commands in the agc\_example.aws file) to instantiate the audio processing and draw a user interface.

The example also creates a MATLAB figure window showing the internal details of the system. You'll first see:



This is the top-level system. The module "isys" with a dark outline denotes a subsystem. Right-click on "isys" and select "Navigate in" to see the internal details of the subsystem.



You can also right-click on a module and select "Inspect..." to draw the corresponding inspector panel.

The return variable, SYS, is a MATLAB object and you can treat it as a standard MATLAB

structure. Examining SYS, you will see the internal modules and variables. You can set or get parameter values using MATLAB scripts.

```
>> SYS.isys
isys = test //

        scale: [ScalerDB]
inputMeter: [Meter]
        agc: [AGC]
outputMeter: [Meter]
```

You can also obtain detailed profiling information for the system using the target\_profile(SYS) command:

Wire Index	Type	numChannels	blockSize	FAST_HEAP	FAST_HEAPB	SLOW_HEAP
1	Input	2	32	69	0	0
2	Output	4	32	133	0	0
3	Scratch	2	32	69	0	0
4	Scratch	1	32	37	0	0
5	Scratch	2	32	69	0	0
Totals	-----			377	0	0

```
Total ticks per block:          154348.8
Average ticks per block execution: 4102.8 (2.66 %)
Instantaneous ticks per block execution: 4099.0 (2.66 %)
Peak ticks per block execution:    4144.0 (2.68 %)
```

Module Name	Class	%CPU	Ticks/Process	FAST_HEAP	FAST_HEAPB	SLOW_HEAP
-----	-----	-----	-----	-----	-----	-----
	Match	2.564	3955.1775	101	0	0
.isys	test	2.2151	3416.9386	86	0	0
.isys.scale	ScalerDB	0.18863	290.9973	12	0	0
.isys.inputMeter	Meter	0.46138	711.7802	18	0	0
.isys.agc	AGC	1.1042	1703.1564	38	0	0
.isys.agc.core	AGCCore	0.88183	1360.1604	27	0	0
.isys.agc.mult	AGCMultiplier	0.22234	342.996	11	0	0
.isys.outputMeter	Meter	0.4609	711.0047	18	0	0
.outRoute	Router	0.34889	538.2388	15	0	0
= Match // Outer subsystem to match processing to target						
isys: [test]						
outRoute: [Router]						

## 5. Next Steps

This concludes our quick tour of the Audio Weaver. You should next:

1. Read the tutorial provided in the Audio Weaver User's Guide
2. Browse the Audio Weaver Module Library to get a feel for the breadth of the audio modules
3. Read the setup instructions provided with your hardware target