

## Wavetest Audio Diagnostics and Verification Tool

Copyright 2004-2006

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Platform: Windows 2k or higher.

Interface: Command-line

### Brief Description

The Wavetest tool is an application written in C++ designed to comprehensively measure the differences in format and sample data between an audio file under test and an audio file reference. These measurements include sample rate, sample depth, sample precision, channel number, and file size. Test failure is determined by a mismatch of these measurements between the files or a file I/O error. A pass result verifies the file format and data are bit-for-bit accurate.

### Wavetest key distinctions:

- 1) Pertinent statistics for all measured differences are displayed on the console along with standard fail and warning notifications. These statistics include error totals, sample precision details, channel locations, and sample locations for errors found.
- 2) A warning and failure threshold is provided for file size differences to prevent a false positive result in the case of a dramatically different number of samples or zero data in either the test or reference audio. The user can set the failure threshold for the file size difference.
- 3) Additionally, Wavetest is designed to facilitate test automation scripting. The integer return value can be used for passing error information back to the automation script for debugging or for setting a pass/fail threshold. The return value type is flexible depending on the context set by the user (See Return Value Definitions).

A sample alignment feature has been added to compensate for time delays common to outputs from perceptual audio decoder implementations such as AC-3, MP3, AAC, etc.

File formats with header information, such as PC WAV, will be parsed and stored in the application automatically. For raw PCM files, pertinent information must be supplied from the command-line interface.

### Supported:

- Raw PCM
- WAV file
- 8, 16, 20, 24, and 32-bit sample depths
- Unlimited channels
- Unlimited sample rates

Additionally, the program has a waveform generator feature that is inactive as of v1.4. This can be re-activated if needed.

### Features

- Format verification
- Binary accuracy verification
- Error location statistics
- Sample precision diagnostics
- Flexible pass/fail criteria
- File size guards
- Time alignment parameter

## Applications

Wavetest is useful in regression testing by objectively verifying explicit attributes of an audio file by comparison to a known reference. In the case of discrepancies, the thorough error reporting is also instrumental for debugging. Example: Digital audio software development.

The program is also useful when evaluating processes that implement technology with varying levels of precision in the math such as rounding. All sample discrepancies are tallied and categorized for each level of bit-precision. This provides important information as to the degree of accuracy for qualitative analysis depending on the requirements of the user.

Example: Comparing a software reference output to an IC implementation.

## Return Value definitions

The screen output is self-explanatory and will provide most of the useful measurement information. The return value can be changed to provide flexible pass/fail criteria for automated test scripting. The 3 return value options are:

1. `-e 0` (default)  
Maximum sample difference in bits normalized to a 32-bit container. This is useful for test automation so a single threshold for pass/fail may be set regardless of sample bit-depth. Other than a 1-bit value, this is a range, not an actual difference value.
2. `-e 1`  
Maximum sample difference in decimal value. This is useful for debugging the actual size of the maximum sample error.
3. `-e 2`  
Minimum sample precision in bits. This is the bit precision range that matches the reference waveform with no errors.

Errors other than measured sample difference, such as bad file I/O, will return a general fail value. This is currently set at maximum unsigned 16-bit value.

## Versions and Usage

Excerpt from source:

```
// v1.0 4/30/2004 Initial audio compare tool written by Eric Netherland copyright.
// v1.1 4/5/2005 Exit value == max sample precision difference
// v1.2 4/14/2005 -t time align offset feature
// v1.3 12/3/2005 -e switch for error exit value
// v1.4 01/09/2006 -m max size threshold percentage
void WavetestHelp()
{
    cout << "[Wavetest.exe] - Audio file format and data comparison tool v1.4\n";
    cout << " Supports 8, 16, 20, 24, and 32-bit wave and PCM multichannel input\n";
    cout << "Usage: ";
    cout << "Wavetest -it<filename> -ir<filename> <options>\n\n";
    cout << " -it<*.ext> Test file input file\n";
    cout << " -ir<*.ext> Reference file input file\n";
    cout << " -s<> Sample rate (for PCM input)\n";
    cout << " -b<> Bit width (for PCM input)\n";
    cout << " -c<> Channel number (for PCM input)\n";
    cout << " -t<> Time align in samples\n";
    cout << " -e<> Audio error exit value type:\n"
        << " 0=Normalized max error in bits: DEFAULT\n"
        << " (Max sample diff in bits + (32 - sample bitwidth) )\n"
        << " 1=Max sample difference in decimal value\n"
        << " 2=Min precision: (Sample bitwidth - max sample diff in bits)\n";
}
```

```
cout << " -m<> File size mismatch tolerance percentage. Default=10%\n";  
cout << " -h /? This help.\n"; }
```

Future version additions

Phase verification

Amplitude verification

Automated time align

GUI front-end with drag-and-drop file I/O

XML log output