IR Denormalizer - User Manual

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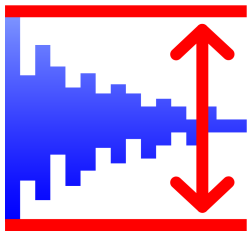

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1 Introduction

For auralisation and post-processing, Odeon is capable of exporting impulse responses (IRs) in several formats, including binaural, ambisonics, and surround (J00, BFormat00 and SurRound00 respectively). In order to ensure that these IRs are stored with the highest possible precision, they are normalized before being written to disk. Normalization guarantees that each impulse response makes full use of the dynamic range of the WAV format, thereby avoiding clipping and maximizing audio quality.

However, this normalization procedure has the side effect of removing the relative level differences between different impulse responses. To keep track of this adjustment, Odeon stores the applied normalization factor in the header of each exported WAV file. This makes it possible to undo the normalization at a later stage, restoring the correct level relationships between responses.

In many applications, particularly when comparing multiple receiver positions, performing multi-channel auralisations, or preparing data for external acoustic analysis, it is essential to recover the true amplitude differences. The IR Denormalizer application was developed to facilitate this process. It enables the batch processing of impulse responses exported from Odeon, automatically rescales them using the stored normalization factors, and allows the user to apply additional scaling when required. In this way, the tool provides a straightforward means of restoring physically meaningful relative levels while maintaining flexibility for further processing and calibration.

2 Installation

1. Download the executable from https://odeon.dk/downloads/ir-denormalizer/
2. No installation is required. Simply run the executable from the location you have stored it. The first time you run the app, Windows may display a security warning. You can safely proceed and run the app.

3 User interface overview

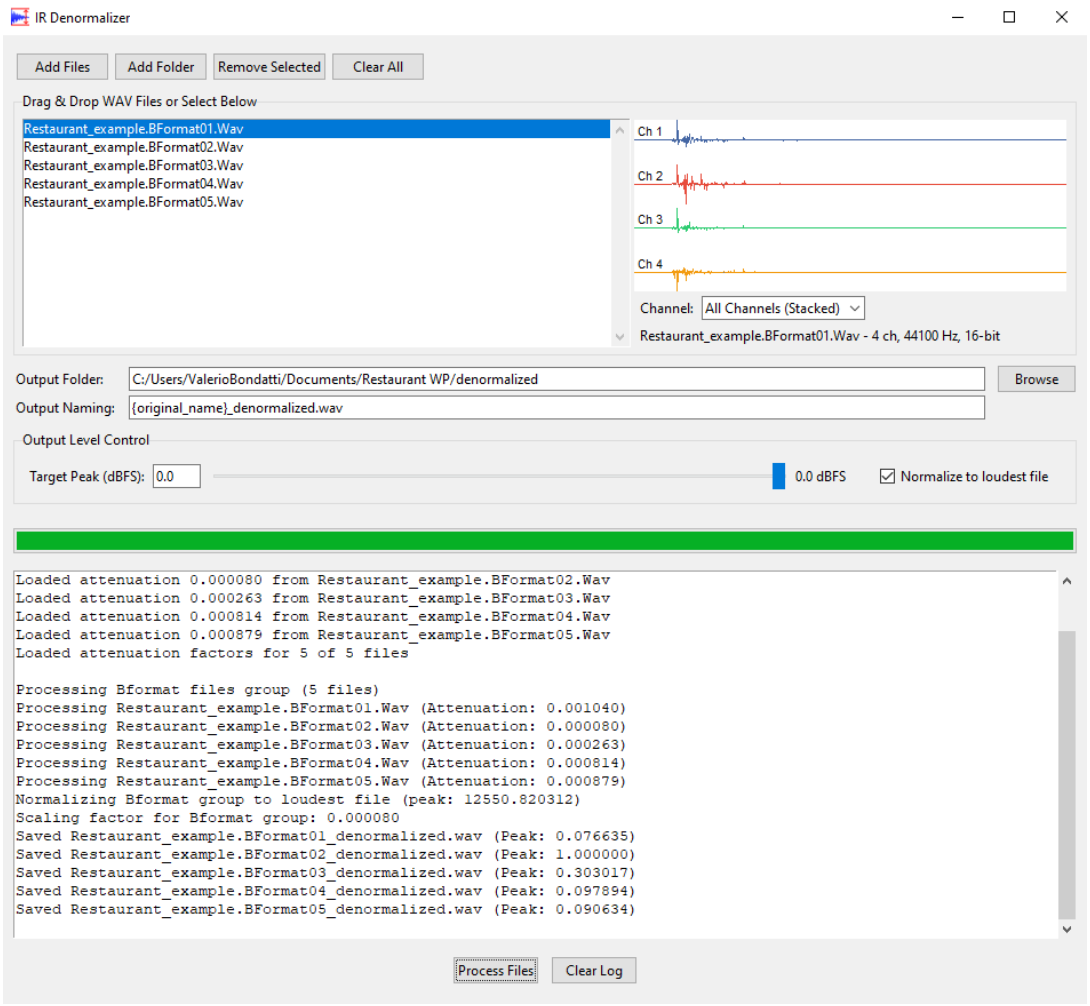

Figure 1: Main application window

3.1 Main components

- **File operations panel**: Add files/folders, remove selections.
- **File list**: Display of selected WAV files with drag-and-drop support.
- **Waveform preview**: Visual display of audio waveforms with channel navigation.
- **Output settings**: Output folder selection and file naming templates.
- **Level control**: Target level adjustment and normalization options.
- **Progress bar**: Processing status indicator.
- **Console log**: Detailed processing messages and error reporting.

3.2 Waveform display features

- Channel selector slider for multi-channel files.

- Single channel view for files with more than 6 channels.
- Multi-channel view for files with 6 or fewer channels.
- Automatic bit depth and format detection.

4 Getting started

4.1 Loading files

Files can be added through:

- **Add files** button: Select individual WAV files.
- **Add folder** button: Recursively add all WAV files from a folder.
- **Drag and drop**: Directly drag files into the application window.

4.2 Output configuration

- Specify output directory using the **Browse** button.
- Customize output filenames using templates:
  - `{original_name}` - Keep original filename without extension.
  - `{date}` - Include current date (DD-MM-YYYY).
  - `{time}` - Include current time (HH-MM).

5 Processing options

5.1 Level Control

- **Target Peak**: Set desired output level in dBFS (-24dB to 0dB).
- **Normalize to loudest file**: When enabled, scales all files in a group to match the loudest file's peak.
- **Fixed gain mode**: Applies the same gain adjustment to all files after scaling by the individual attenuation factor.
- **Clipping**: The application will display a warning if clipping occurs.

5.2 File grouping

The application automatically groups files according to the following naming patterns:

- **J-files**: Binaural IR files containing 'J' in filename.
- **BFormat**: Ambisonic B-format files, a multichannel audio format used for Higher Order Ambisonics (HOA), containing 'Bformat' in filename.
- **SurRound**: Multi-channel audio files, with each channel routed to specific a speaker of the related standardized audio system. These files contain surround-related terms in filename ('SurRound', 'SR', 'LCRS', '5.1', '7.1').
- **Other**: All other files not matching above patterns.

6 Processing workflow

6.1 Step-by-step process

1. Load WAV files containing 'attn' chunks.
2. Application extracts attenuation factors from each file.
3. Files are grouped by type (J, Bformat, Surround).
4. Each group is processed separately.
5. Files are denormalized using their specific attenuation factors.
6. Level adjustment is applied based on user settings.
7. Processed files are saved to output directory.

6.2 Understanding the Console output

The console provides detailed information about:

- Files being processed.
- Attenuation factors found.
- Any warnings or errors.
- Processing statistics.

Example output:

```
Added 5 files

=== Starting processing ===
Loaded attenuation 0.001040 from Restaurant_example.BFormat01.Wav
Loaded attenuation 0.000080 from Restaurant_example.BFormat02.Wav
Loaded attenuation 0.000263 from Restaurant_example.BFormat03.Wav
Loaded attenuation 0.000814 from Restaurant_example.BFormat04.Wav
Loaded attenuation 0.000879 from Restaurant_example.BFormat05.Wav
Loaded attenuation factors for 5 of 5 files

Processing Bformat files group (5 files)
Processing Restaurant_example.BFormat01.Wav (Attenuation: 0.001040)
Processing Restaurant_example.BFormat02.Wav (Attenuation: 0.000080)
Processing Restaurant_example.BFormat03.Wav (Attenuation: 0.000263)
Processing Restaurant_example.BFormat04.Wav (Attenuation: 0.000814)
Processing Restaurant_example.BFormat05.Wav (Attenuation: 0.000879)
Normalizing Bformat group to loudest file (peak: 12550.820312)
Scaling factor for Bformat group: 0.000080
Saved Restaurant_example.BFormat01_denormalized.wav (Peak: 0.076635)
Saved Restaurant_example.BFormat02_denormalized.wav (Peak: 1.000000)
Saved Restaurant_example.BFormat03_denormalized.wav (Peak: 0.303017)
Saved Restaurant_example.BFormat04_denormalized.wav (Peak: 0.097894)
Saved Restaurant_example.BFormat05_denormalized.wav (Peak: 0.090634)
```

7 Error handling

7.1 Common error messages

The application provides detailed error messages in the console log to help users identify and resolve issues:

7.1.1 File loading errors

- `"Invalid WAV file (too small): filename"`
  - **Description**: The file is smaller than a valid WAV header (12 bytes).
  - **Solution**: Check if the file is corrupted or incomplete. Try re-exporting from your audio software.
- `"Not a valid WAV file: filename"`
  - **Description**: The file doesn't have a valid RIFF WAVE header.
  - **Solution**: Verify the file is a proper WAV file. Convert from other formats if necessary.
- `"No 'attn' chunk found in file: filename"`
  - **Description**: The file doesn't contain the required attenuation data chunk.
  - **Solution**: Ensure files are exported from Odeon with attenuation information. Check export settings.
- `"Unsupported bit-depth-bit format"`
  - **Description**: The application doesn't support this specific bit depth.
  - **Solution**: Verify that all input files are proper Odeon exports with attenuation data.
- `"Input file is nearly silent"`
  - **Description**: The file's maximum amplitude is below 0.0001 (-80 dBFS).
  - **Solution**: Check if this is intentional. If not, verify the file hasn't been improperly gain-staged.

7.1.2 Processing errors

- `"Warning: No attenuation factor found for filename, skipping"`
  - **Description**: The file was loaded but no attenuation data could be extracted.
  - **Solution**: Verify the file contains proper 'attn' chunk data. Re-export from Odeon if necessary.
- `"Could not decode attenuation from filename"`
  - **Description**: Attenuation data was found but couldn't be interpreted.
  - **Solution**: The attenuation format may be incompatible. Check Odeon version and export settings.
- `"No files with valid attenuation factors found"`

- **Description**: None of the selected files contained usable attenuation data.
- **Solution**: Verify all files are proper Odeon exports with attenuation information enabled.

- "WARNING: *filename* will be clipped!"
  - **Description**: The processing will cause digital clipping in this file.
  - **Solution**: Reduce the target level, enable normalization, or accept that clipping will occur.

7.1.3 User action errors

- "No files selected for processing"
  - **Description**: The process button was clicked but no files are loaded in the software list.
  - **Solution**: Add files using the file operations buttons or drag-and-drop.
- "Output folder is required"
  - **Description**: No output directory has been specified.
  - **Solution**: Click the "Browse" button and select a valid output folder.
- "Files already in list, skipping duplicates"
  - **Description**: Attempted to add files that are already in the processing queue.
  - **Solution**: This is informational. The application prevents duplicate processing automatically.

7.2 Success messages

- "Loaded attenuation *value* from *filename*"
  - **Description**: Successfully extracted and decoded attenuation factor.
  - **Note**: The value shown is the exact attenuation factor that will be applied.
- "Processed *count* files"
  - **Description**: Completion message showing how many files were successfully processed.
  - **Note**: This count excludes files with errors or missing attenuation data.
- "Added *count* files via drag & drop"
  - **Description**: Confirmation of successful file addition through drag-and-drop.
  - **Note**: Only valid WAV files are counted in this total.

7.3 Troubleshooting tips

- Always check the console log for detailed error information.
- Verify that all input files are proper Odeon exports with attenuation data.
- Ensure you have write permissions for the output directory.
- For multi-channel files, use the channel selector to verify all channels contain IR audio data.

8 Shortcuts

- **Enter**: Apply exact dB value from text entry.
- **Click & Drag**: Select multiple files in list.
- **Ctrl+A**: Select all files (standard listbox behavior).

9 Support

For technical support or bug reports, please provide:

- Complete error messages from console log.
- Sample files demonstrating the issue.
- Operating system information.

Contact: support@odeon.dk

10 Version history

- v1.0 (February 2026) - Initial release