

C-NORMALIZER

USER'S MANUAL

Loudness and True Peak normalization for Harmonic's Rhozet® Carbon Coder
according to BS-1770 (rev. 3) and EBU R128

beDSP[®]

Rhozet Carbon Coder

Target: D10 OP1A PAL 50Mbps 16x3

Advanced Filter

Setup Video Filter Audio Filter

Preview

Duration: 3:00:00 Play Original

Duration: 3:00:00 Play Result

Audio Source: Sample Sound

Audio	Value
Plugin usage	Analyze and process
Number of audio groups	2
First Group Channels Layout	5.1+2
Second Group Channels Layout	5.1+2
Third Group Channels Layout	2
Fourth Group Channels Layout	2
Normalization	
Normalization Parameter	Program Loudness
Target Program Loudness (LUFS)	-23.000
Target Max SL (LUFS)	-01.000
Target Max TP (dBTP)	-1.000
Output	
Path to log file	
Frame Rate	23.976

Description:
Specify the format for the second audio channels group. This contains audio channels from 8 to 15. The numbered options have the following meaning: 1 - one mono track; 2 - one stereo track; 2+2 - two stereo tracks; 2+2+2 - three stereo tracks; 2+2+2+2 - four stereo tracks; 5.1 - one surround track; 5.1+2 - one surround and one stereo track; 2+5.1 - one stereo and one surround track.

Windows taskbar: 16:20, 20/02/2014

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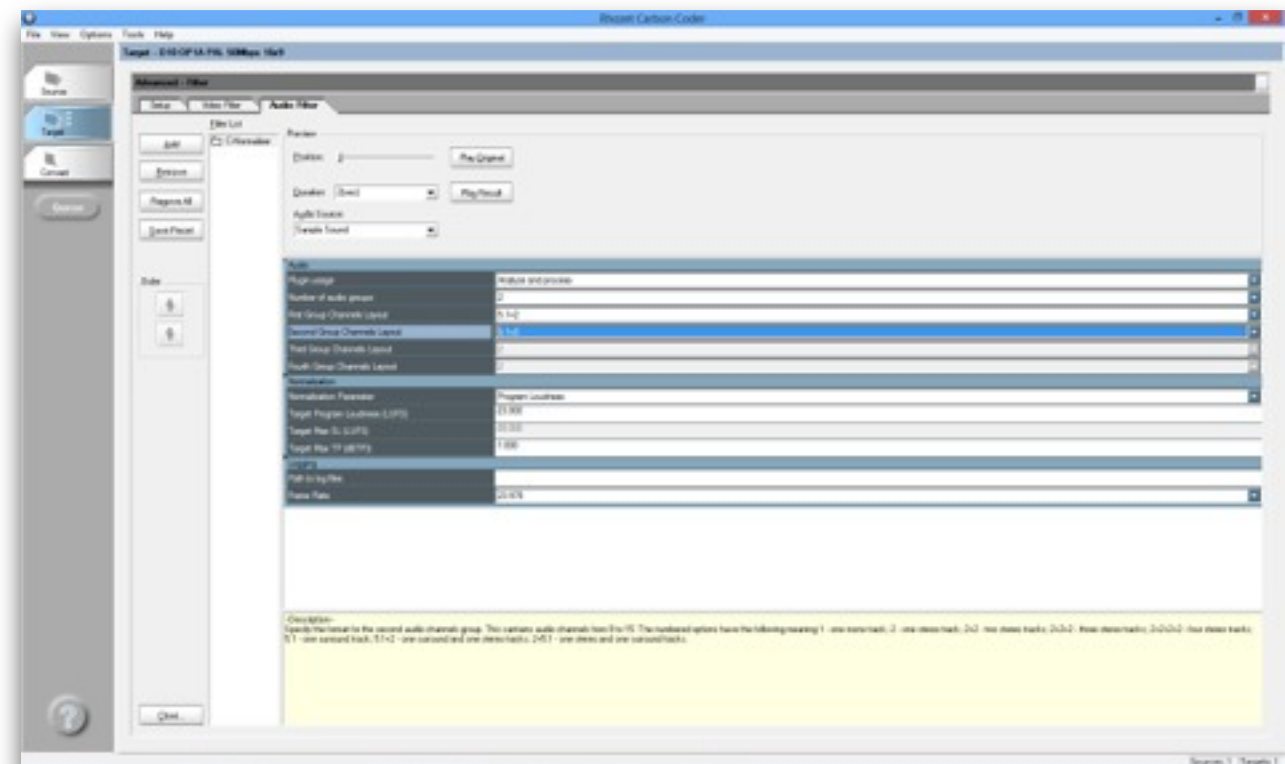
1. C-Normalizer

Loudness and True Peak normalization at your hand

It is well known that one fundamental problem that occurs in audio broadcasting is the loudness level oscillations of the audio materials. In a perfect world, where all the programs have an equal, universal loudness level, the listener can set his level and leave it in that position as long as he wants, without worrying that the next program or commercial break will pump his ears.

In order to achieve this goal, it is required that all the mixes be done according to the loudness standards and so, to have the same audio loudness perception for all the programs that will be broadcasted. As we all know, this is something hard to achieve in the real world, due to the diversity of programs.

For solving this problem we created a plugin for Harmonic's Rhozet[®] Carbon Coder that automatically measures the loudness and true peak values of the materials and normalize them according to a specified target.

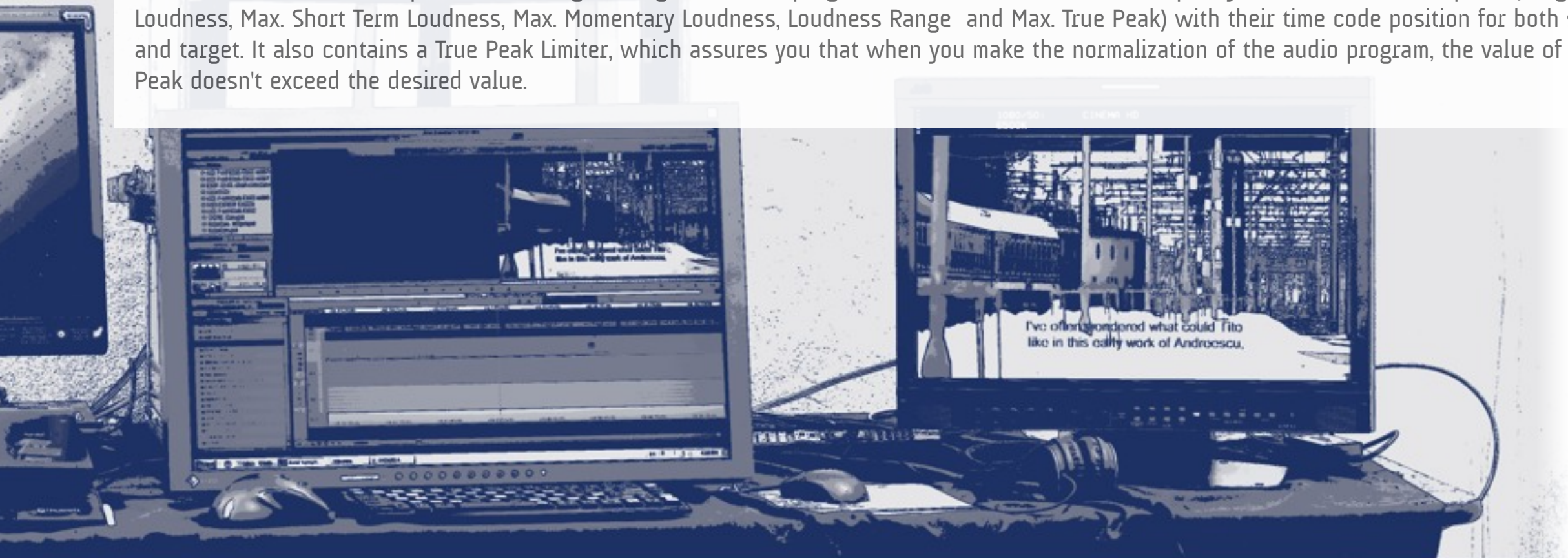


Loudness Normalization not means constant loudness!

Using the loudness normalization doesn't mean that the loudness will be constant during the whole program, but in this way, the average loudness will be the same for all the programs. So, you can change your loudness level according to your artistic needs, using (in most cases) a greater dynamic range than with the classic peak normalization. That means you don't have to worry about the listener being disturbed, because the average loudness of the whole program will be equal with the target value that you choose. This is useful in all the stages of the broadcasting: production, distribution and transmission.

The measurements can be done for up to 32 channels. C-Normalizer is fully compliant with loudness measurement standards : ITU-R BS.1770-3 (with the relative gate of -10 LU) and EBU R-128. The normalization is done according to the desired value of Program Loudness or Max Short Term Loudness. In most cases, in order to maintain the original program dynamics, the normalization consist in a simply linear gain modification.

Besides, C-Normalizer is capable of creating two log files of the program material, for evaluation and quality control of the descriptors (Program Loudness, Max. Short Term Loudness, Max. Momentary Loudness, Loudness Range and Max. True Peak) with their time code position for both source and target. It also contains a True Peak Limiter, which assures you that when you make the normalization of the audio program, the value of Max True Peak doesn't exceed the desired value.



Plugin Features

- Audio Loudness and True Peak Normalization;
- Channel Formats: up to 32 audio channels available for processing;
- Fully compliance with Loudness standards: BS-1770(rev. 3) and EBU R128 specifications;
- Complete loudness measurements using universal descriptors: Program Loudness, Max. Short Term Loudness, Max. Momentary, Loudness, Loudness Range and Max. True Peak;
- Normalization Parameter: Program Loudness or Maximum Short Term Loudness;
- In order to maintain the original program dynamics, the normalization resumes when is possible, at a linear gain modification;
- Fast brick wall True Peak Limiting with variable threshold and release time, that acts only when necessary;
- Logging of : Program Loudness, Max. Short Term Loudness, Max. Momentary Loudness, Loudness Range and Max. True Peak with their time code position for both source and target;

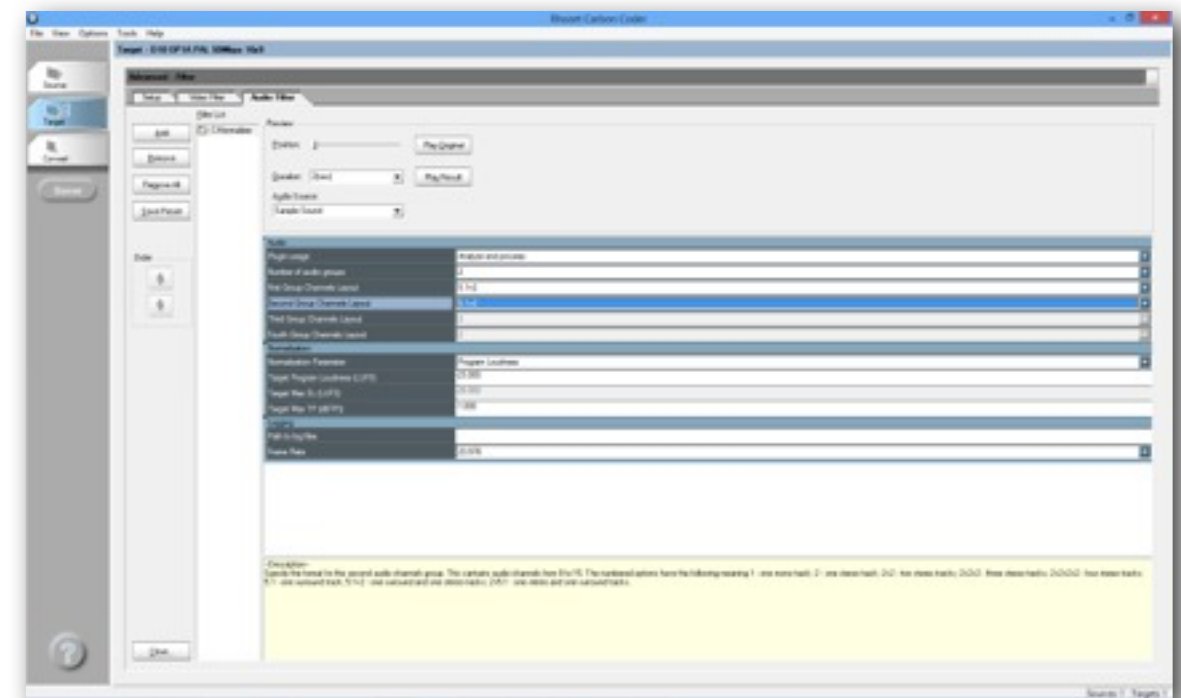


Figure 1: C-Normalizer

Loudness Descriptors

- **Integrated Loudness or Program Loudness** (in LUFS¹) - describes the long-term integrated loudness of an audio material from 'start' to 'stop'. This is measured using standards specifications: ITU-R BS.1770-3 (with the relative gate of -10 LU) and EBU R-128. The gate is used to not integrate in the loudness measurement the audio signal below -10 LU (for Settings see page 9). This ensures that an audio material with long periods of silence will not be too loud after a possible loudness normalization.
- **Momentary Loudness** (in LUFS) - calculated with a time window of 400 ms;
- **Max ML** (in LUFS)- the maximum value of the Momentary Loudness of the entire program calculated with a time window of 400 ms;
- **Short Term Loudness** (in LUFS) - calculated with a time window of 3 s;
- **Max SL** (in LUFS) - the maximum value of the Short Term Loudness of the entire program calculated with a time window of 3 s
- **Loudness Range** (in LU²) - loudness dynamic range from 'start' to 'stop' that helps you decide if dynamic compression is necessary;
- **True Peak Max Level** (in dBTP³) - indicates the maximum value of the signal waveform in the continuous time domain (this value is calculated using inter-sample peaks that can be missed in quantization).

1. LUFS - Loudness, K-Weighting, referenced to digital Full Scale

2. LU - Loudness Units: 1 LU = 1 dB

3. dBTP - deciBel referenced to digital Full Scale measured with a True Peak meter

Channels Format

- Up to 32 audio channels available for processing
- Channels are organized in 4 groups, with 8 channels per group
- The possibility to select the audio groups you want to process (between 1 and 4)
- Configurable channels layout (see table 1) for each audio group
- Channels which are not covered in groups will be passed unprocessed
- The channels order is important, so for custom channel routings, please use Carbon Coder channels mixer

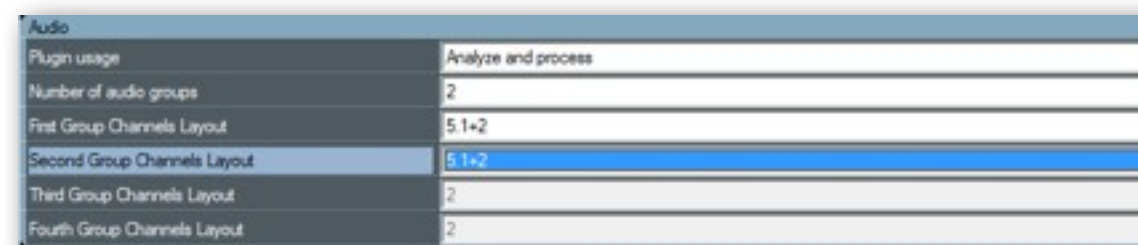
Normalization

The normalization can be done either by *Program Loudness* or *Max Short Term Loudness*. If the normalization mode is set to:

- “*Program Loudness*” then the processing will be done so the Program Loudness will be equal with the desired target value;
- “*Max Short Term Loudness*” then the processing will be done so the Short Time Loudness will be lower than the Max Short Term Loudness desired value.

True Peak Limiter

The C-Normalizer plugin also contains a True Peak Limiter, which assures you that when you make the normalization of the audio program, the value of Max True Peak doesn't exceed the target value.

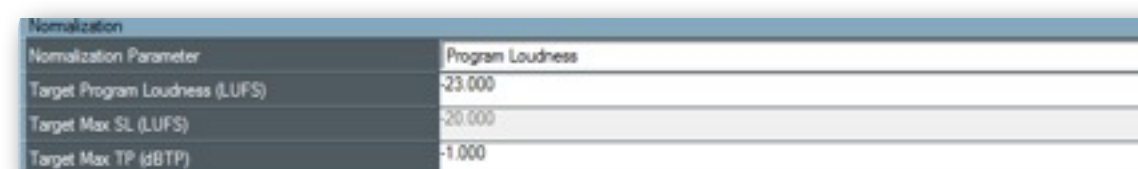


Audio	
Plugin usage	Analyze and process
Number of audio groups	2
First Group Channels Layout	5.1+2
Second Group Channels Layout	5.1+2
Third Group Channels Layout	2
Fourth Group Channels Layout	2

Figure 2: Channels Format Settings

1	first mono track
2	first stereo track
2+2	first two stereo pairs
2+2+2	first three stereo pairs
2+2+2+2	four stereo pairs
5.1	one surround track (L R C LFE Ls Rs)
5.1+2	one surround track and one stereo track
2+5.1	one stereo track and one surround track

Table 1: C-Normalizer Channels Layout



Normalization	
Normalization Parameter	Program Loudness
Target Program Loudness (LUFS)	-23.000
Target Max SL (LUFS)	-20.000
Target Max TP (dBTP)	-1.000

Figure 3: Normalization Settings

Log files

Logging	
Path to log files	
Frame Rate	23.976

Figure 4: Logging Settings


C-Normalizer is capable of creating a daily log file of the program material, for evaluation and quality control of the main descriptors: Program Loudness, Max. SL, Max. ML, LRA and Max. True Peak. The file contains for each process the values of descriptors and their time code position. The time code positions are generated according with the frame rate selected by the user.

Filename	Pass	StartingChannelIndex	EndChannelIndex	ChannelsFormat	Integrated Loudness	Loudness Range	Max True Peak	TC	Max ShortTerm Loudness	TC	Max Momentary Loudness	TC
Log started: 29 Jan 2014 1:19:43pm												
JobAt_13:19:43	Analyze	0	5	5.1	-26	9.9	-9:00:00:20:02		-20:00:01:59:06		-17:50:00:35:19	
JobAt_13:19:43	Analyze	6	7	Stereo	-23.2	10.2	-5:60:00:35:11		-17:30:01:59:06		-14:60:00:35:14	
JobAt_13:19:43	Analyze	8	13	5.1	-19.8	11.6	-4:80:01:05:01		-13:60:01:59:06		-10:30:01:57:02	
JobAt_13:19:43	Analyze	14	15	Stereo	-19.7	12.4	-0:90:02:00:12		-13:70:01:59:06		-10:90:02:00:12	
JobAt_13:19:43	Analyze	16	21	5.1	-24.6	11.9	-5:20:01:56:18		-15:90:01:59:06		-11:10:01:57:00	
JobAt_13:38:37	Process	0	5	5.1	-15.9	9.1	-1:50:00:20:02		-10:70:01:59:02		-8:60:00:35:14	
JobAt_13:38:37	Process	6	7	Stereo	-16.2	9	-1:40:00:35:11		-12:00:01:59:02		-9:20:00:35:14	
JobAt_13:38:37	Process	8	13	5.1	-16.2	10.1	-1:30:00:58:20		-10:00:01:59:02		-7:10:01:57:00	
JobAt_13:38:37	Process	14	15	Stereo	-16.1	10.6	-1:20:02:00:12		-11:50:01:07:20		-8:90:00:06:06	
JobAt_13:38:37	Process	16	21	5.1	-16.5	11.1	-1:10:01:56:19		-9:40:01:59:02		-6:30:01:57:02	
JobAt_13:58:29	Analyze	0	1	Stereo	1.5	2.8	3:10:01:05:04		2:80:01:50:06		3:60:00:49:07	
JobAt_13:58:29	Analyze	2	3	Stereo	1.5	2.8	3:10:01:05:04		2:80:01:50:06		3:60:00:49:07	
JobAt_13:58:29	Analyze	4	5	Stereo	1.5	2.8	3:10:01:05:04		2:80:01:50:06		3:60:00:49:07	
JobAt_13:58:29	Analyze	6	7	Stereo	1.5	2.8	3:10:01:05:04		2:80:01:50:06		3:60:00:49:07	
JobAt_14:1:25	Process	0	1	Stereo	-15	2.6	-13:40:01:05:04		-13:80:01:49:22		-12:90:00:49:07	
JobAt_14:1:25	Process	2	3	Stereo	-15	2.6	-13:40:01:05:04		-13:80:01:49:22		-12:90:00:49:07	
JobAt_14:1:25	Process	4	5	Stereo	-15	2.6	-13:40:01:05:04		-13:80:01:49:22		-12:90:00:49:07	
JobAt_14:1:25	Process	6	7	Stereo	-15	2.6	-13:40:01:05:04		-13:80:01:49:22		-12:90:00:49:07	


Figure 4: Log files

2. Installation and Authentication

Thank you for choosing C-Normalizer!

Once you have downloaded the package  **C-Normalizer** and you own a serial number, please follow the next steps for installation and authentication of your product.

Installation

1. Double click on the icon  **C-Normalizer** and an installation window will appear (see Figure 5). Press the **Next** button to start the installation;

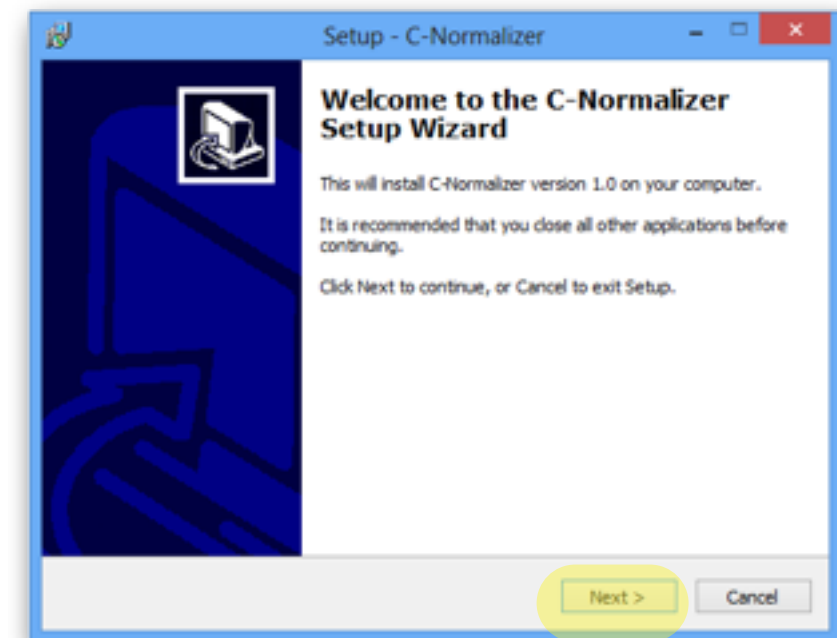


Figure 5: Installation window

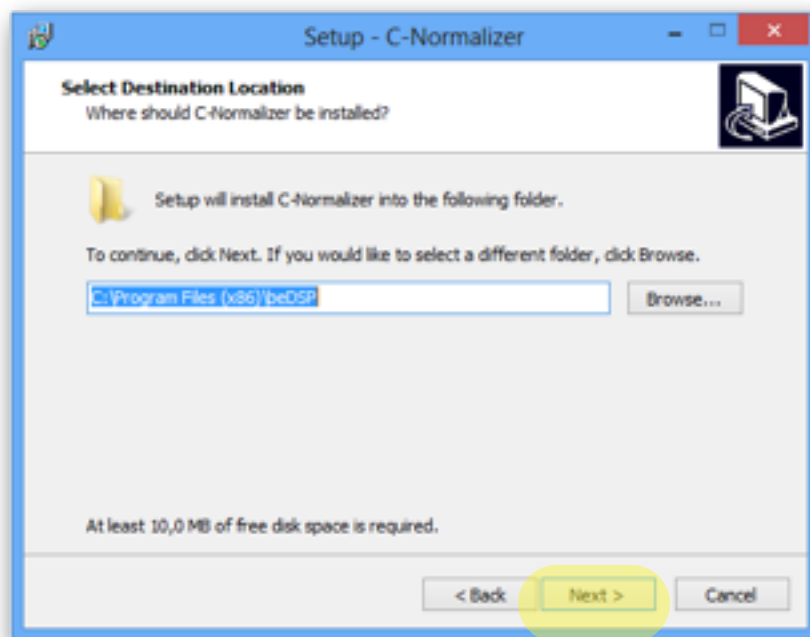


Figure 6: Destination of the installation

2. **Select a Destination** for the installation (see Figure 6) and then press the **Next** button if you have the necessary free space;

3. Press the **Install** button to continue with the installation (see Figure 7);

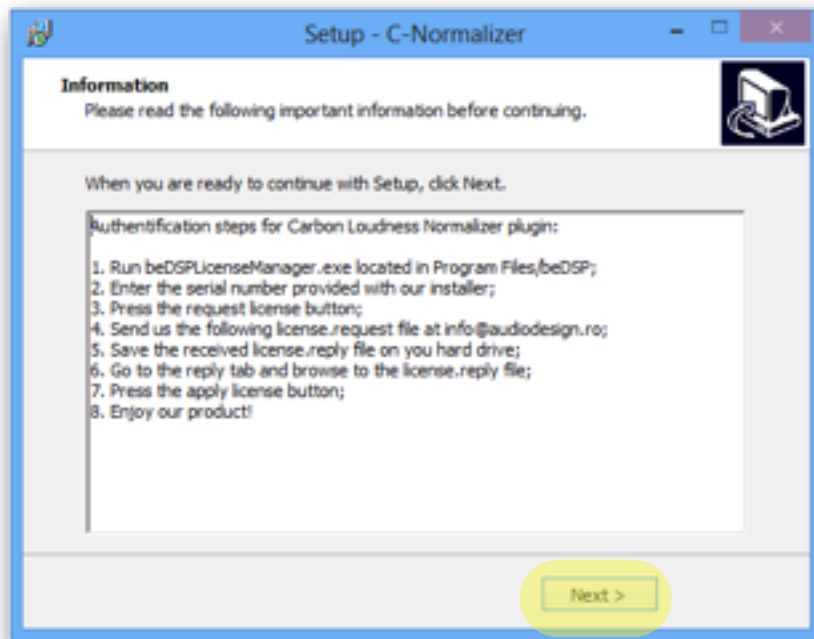


Figure 8: Information window

4. Wait till the installation is completed and an information window appears (see Figure 8). After you read it press the **Next** button.

5. Press the **Finish** button and pass to the **Authentication** part (see Figure 9).

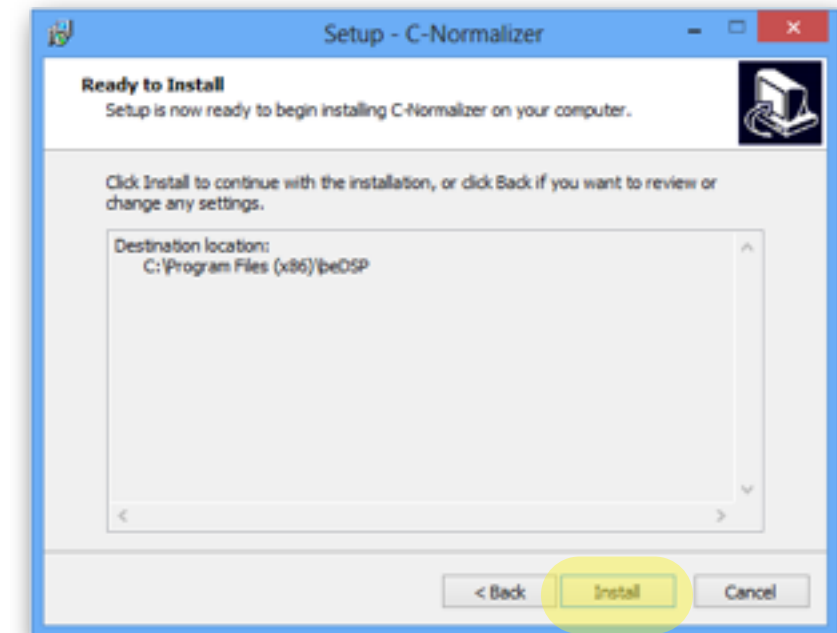


Figure 7: Installation

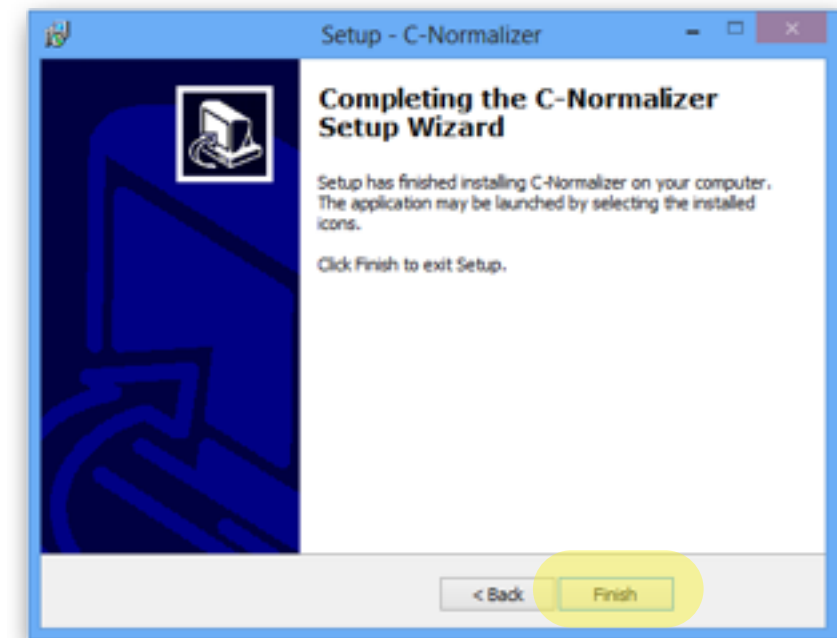



Figure 9: Installation completed

Authentication

Go to the **ProgramFiles** where you will find the authentication folder : **beDSP**.

1. Double click on the icon  **beDSPLicenseManager** and an authentication window will appear (see Figure 10) with two tabs: **REQUEST** and **REPLY**.
2. Select the **REQUEST** tab and enter you Serial Number that you received when you bought the product. Press the **Request License** button (see Figure 10). and **license.request** will be automatically generated.

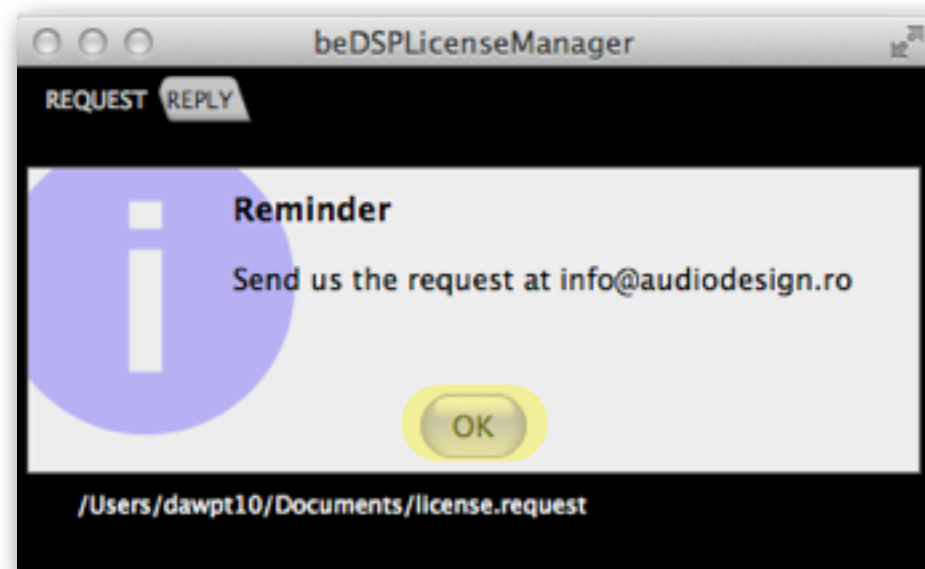


Figure 11: Authentication request

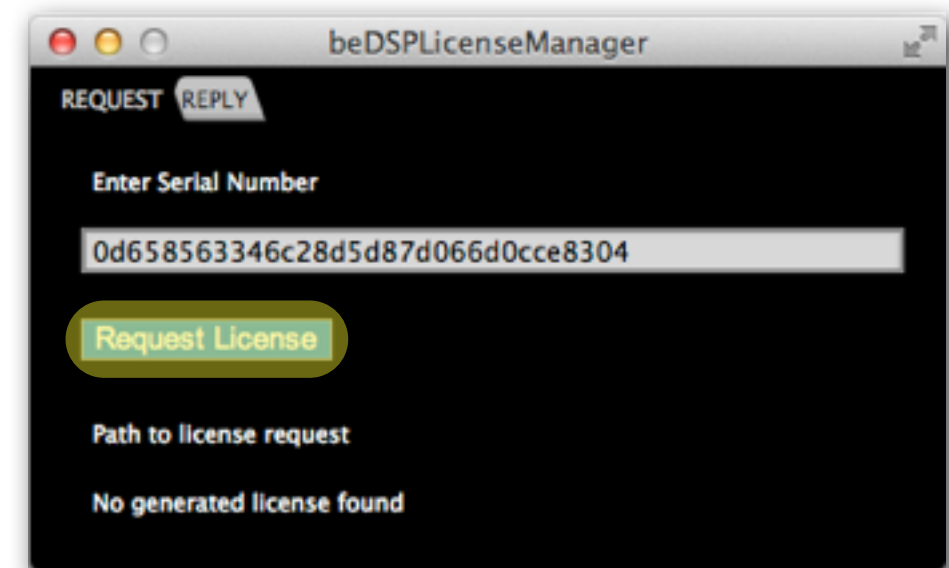


Figure 10: Authentication window - REQUEST

3. An information window appears (see Figure 11). When you will press the **OK** button, your mail will be opening with the **license.request** file as attachment. You must send it at the address: **info@audiodesign.ro**.

Note: If you don't have your mail address configured on the computer, please access you mail address and send the **license.request** file that you will find at the path specified in the button of the authentication window (in this case the path is: **/Users/dawpt10/Documents/license.request**) at **info@audiodesign.ro**.

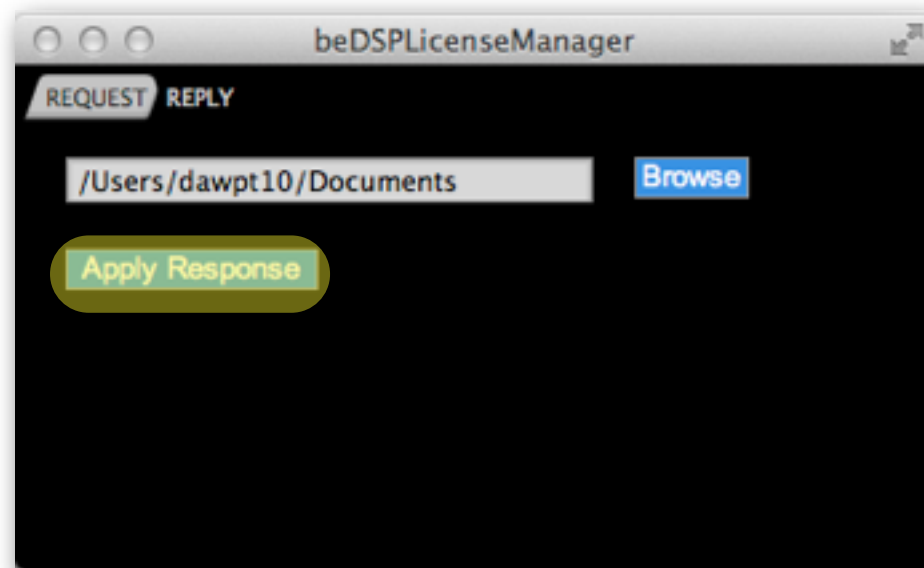


Figure 12: Authentication window - REPLY

3. Once you send the request, you will receive at you mail address a **license.rely** file as an answer. Please save it on your hard drive.
4. Select the REPLY tab of the authentication window and browse the **license.rely** file (see Figure 12). Press the **Apply Response** button.

5. A confirmation window will appears that specifies you the kind of license you have and till when it is available (see Figure 13). Press **OK** and enjoy our product!

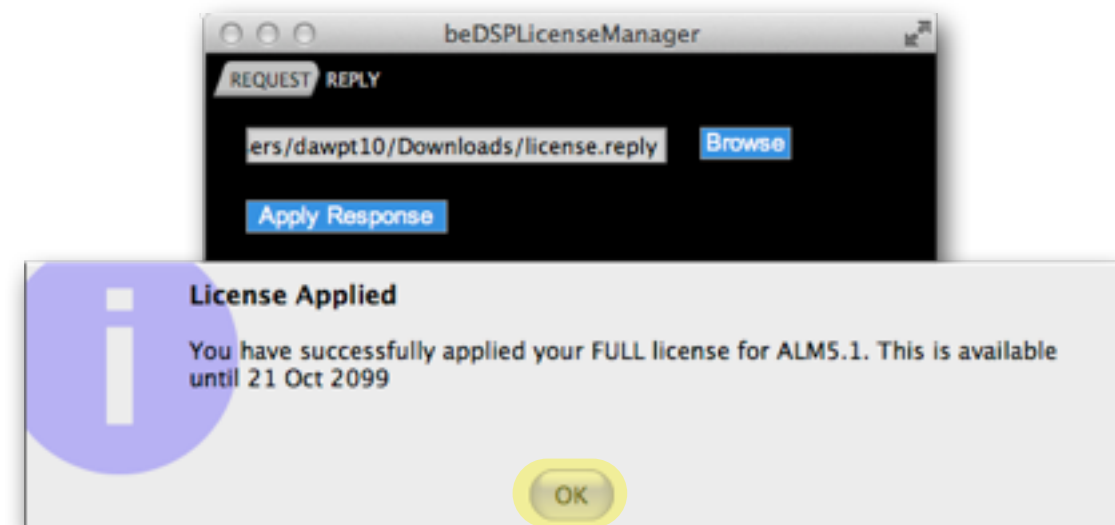


Figure 13: License Applied

3. How does it work?

Loudness and True Peak normalization at your hand



Figure 14: Parameters

1	first mono track
2	first stereo track
2+2	first two stereo pairs
2+2+2	first three stereo pairs
2+2+2+2	four stereo pairs
5.1	one surround track (L R C LFE Ls Rs)
5.1+2	one surround track and one stereo track
2+5.1	one stereo track and one surround track

Table 2: C-Normalizer Channels Layout

Before beginning the normalization, you need to set up some parameters.

Audio Settings:

- **Plugin usage** - choose the way you want to use your plugin: **Process** (to normalize your audio material) or **Analyze and Process** (first to analyze the audio material and then to normalize it).
- **Number of audio groups** - the number of audio groups that you want to process (from 1 to 4).
- **Groups Channels Layout** - 1, 2, 2+2, 2+2+2, 2+2+2+2, 5.1, 5.1+2 or 2+5.1 (see table 2).



The groups and tracks not chosen are left unprocessed so you can configure your normalization the way you want.

Normalization Settings:

- **Normalization Parameter** –The normalization will be done according to this parameter: **Program Loudness** or **Max SL** (Maximum Short Term Loudness).
- **Target Program Loudness (LUFS)** – the target value of *Program Loudness* : Europa **-23.00**, America **-24.00**, or any value you need (from -30.0 to -12.0).
- **Target Max SL (LUFS)** – target value of *Max Short Term Loudness*: usually **-20.00**, but you can choose any value you need (from -30.0 to -12.0).
- **Target Max TP (dBTP)** – target value of *Max True Peak* : usually **-1.00**, but you can choose any value you need (from -12.0 to 0.0).

Log Settings:

- **Path to log files** – where to save the log files (the default path is: C:\Documents\CNormalizerLogs\).
- **Frame Rate** – Video frames rate used for time code logging. This must be the same with the frame rate of the original video material. You can choose one of the next usual video frame rates: **23.976, 24, 25, 29.97, 30, 50, 59.94, 60**.

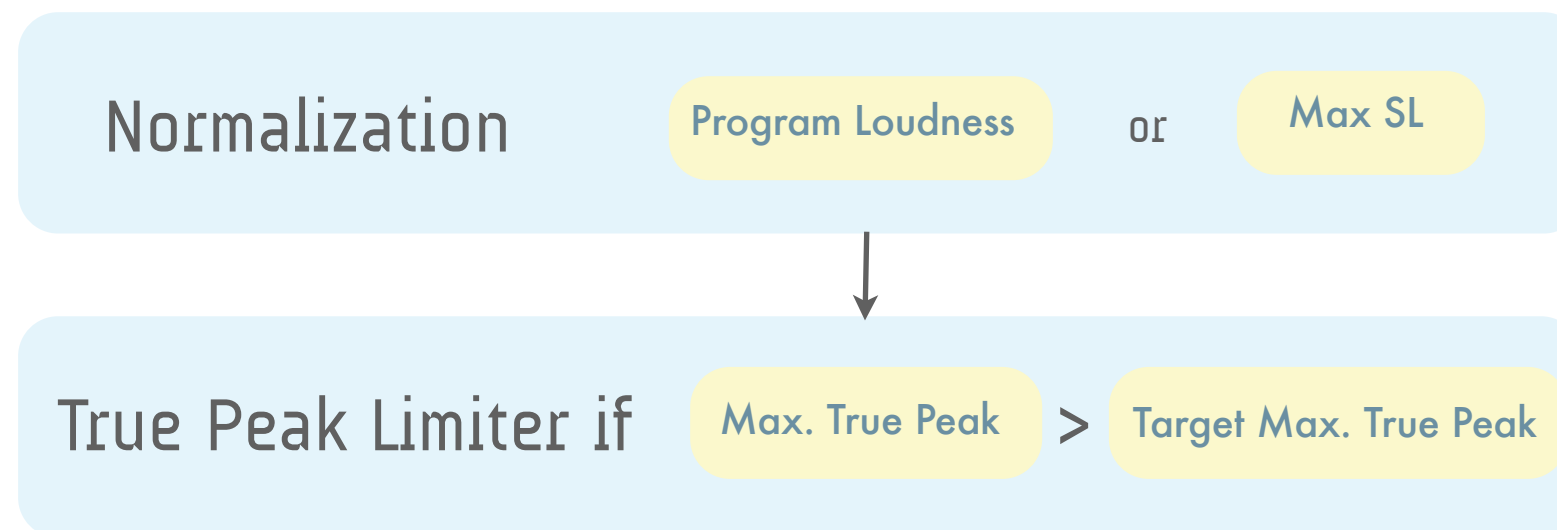


Figure 15: Workflow

Next, according to the values of Program Loudness and Max. True Peak parameters of the original audio material, several different scenarios are possible:

a. Normalization after the Program Loudness parameter

a.1. First it is necessary to calculate the gain defined as:

$$\text{Gain}_{L_k} \text{ (dB)} = L_k \text{ target} - L_k \text{ measured}$$

If the measured Program Loudness is lower than the target value, the gain will be positive, and if it is wider, the gain will be negative. The normalization only consists in the amplification or attenuation of the entire program with the gain obtained above, Gain_{L_k} .

a.2. After normalization, it is necessary to verify if the Max. True Peak Level exceeds its correspondent target value. If it exceeds, the True Peak Limiting block is applied to obtain a lower Max. True Peak⁽¹⁾.

b. Normalization after the Max. SL parameter

b.1. First it is necessary to calculate the gain defined as:

$$\text{Gain}_{SL} \text{ (dB)} = \text{Max SL target} - \text{Max SL measured}$$

If the Max SL measured is greater than the target value, the gain will be negative and the normalization resumes at an attenuation of the entire program with the gain obtained above Gain_{SL} . If the Max SL measured is lower than the target value, the audio material will not be

1. Note that after the True Peak Limiting block, the Program Loudness Level will not be perfectly equal with the Program Loudness Level desired.

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C-Normalizer

Loudness and True Peak Normalizer
for Harmonic's Rhozet® Carbon Coder
according to BS1770(rev.3) and EBU R128

Contact

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e-mail: support@bdsp.net