User Guide

V8.5.0

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Contents

CONTENTS 2

1. EFF OVERVIEW 5

About the Product 5
Media File Support 5
Eff Versions 6
Measure 6
Comply 6
Eff Options 6
Watch folder 6
Dolby E 6
Dolby Digital and Dolby Digital Plus 6
Dialog Intelligence 6
P2 Support 6

2. BASIC OPERATING GUIDE 7

The User Interface (UI) 7
Step One - Select a Mode 8
Step Two - Select a Profile 8
Step Two a - Select just analysis or also Correction etc 9
Step Three - Select a Single Source File 9
Step Four - Logs and Graphs 10
Dialogue Intelligence 10
Step Four (a) – XML and CSV Logs – Hong Kong and Korean special function 11
Channel Groupings 12
Step Five – Create a Report 13
Step Six - Correcting a File 14
Step Seven - Watch Folder 14
Important Note 14
Analysis 16
Correction 17
Errors 18
Reports 18
Watch Folder Properties: 19
Watch Folder Options 19
Cache Options 20
Auto Start Watch folder 21

4. SETTINGS 22

Profile Settings 22
Measurement 23
Dialog Intelligence 23
PPM/VU Meters 24
Peak Meters 24
Correction 24
Measurement Window 24
Detect and Ignore Tone 25
Enable Corrections 26
How Eff changes audio levels 26
Channel Layout 26

5. EFF MENU BAR 28

User Interface (UI) Language 28
Eff menu **28**
Advanced menu **28**
Language Options 28
Error Options 29
Loudness Processor Options 29
Tone Detection Options 30
Dolby Options 30
Dolby Digital/Digital Plus Options 31
Loudness Range Correction Options 31
Silent Frame Detection Options 32
AAC Encoder Options 32
Email Notification Options 33
Loudness Log Options 33
IMF File Options 34
Watch Folder Options 34
Cache Options 34
Logging menu **34**
Database menu **35**
Import and Export Profiles 35
Import and Export Settings 35
Database Upgrade 35
Help menu **36**

6. PARAMETERS, THRESHOLDS AND TOLERANCES **37**

Loudness Specification **37**
Loudness Integration Time **37**
Loudness Units **38**
Loudness Range (LRA) **38**
Program Loudness **38**
Program Loudness Tolerance **38**
Loudness Specifications In Detail **39**
B.S 1770-1 39
B.S 1770-3 39
EBU R128 (configurable) 39
Short Term Loudness 39
Momentary Loudness 39
ATSC A/85 39
TR-B32 39
Leq(A) 39
Korean 40
Leq(M) 40
PPM Scale 40
PPM Threshold 40
PPM Tolerance 40
Volume Meter (VU) 40
True Peak 40
Sample Peak 40
Measurement/Correction Window **40**
Detect and Ignore Tone 41

7. LICENCING **42**

Evaluation Licenses **42**
Extend Licence 42
Eval Options 42
Permanent Licences **43**

Licence Data 43
Licence Features 44
Block Licence 46
Activation Data 46

8. FREQUENTLY ASKED QUESTIONS 47

What are PPM, VU and Loudness? 47
Why are Loudness and PPM important? 47
What is BS 1770/1771? 47
What is EBU R128? 48
What is True Peak Measurement? 48
What file formats does Eff support? 48
What are Momentary, Short Term and Program Loudness? 48
What is 'Gating'? 48
What is Loudness range (LRA)? 48
Why do some files take longer to fix? 49

9. LIST OF UNITS USED IN LOUDNESS MEASUREMENTS 50

10. COMPUTER SPECIFICATION 51

APPENDIX 1. P2 FILE PROCESSING 52

APPENDIX 2. DOLBY E SUPPORT 54

APPENDIX 3. MULTIFILES SUPPORT 55

Multi-files Operation 56

APPENDIX 4. COPYRIGHT INFORMATION 58

Logos 58
Licenses 58

1. Eff Overview

Emotion File Finish (**Eff**, but pronounced simply as 'F') is a software product designed to ensure loudness compliance for multimedia files. The software allows both analysis and normalisation to a number of user-defined specifications. **Eff** is available on Windows and OSX platforms.

About the Product

Eff opens media files and measures Loudness, PPM and True Peak. Loudness can be measured to the following standards:

- BS 1770 (at version 4 at time of writing)
- BS 1771 (this is a standard for metering loudness)
- EBU R128
- ATSC A/85
- TR-B32
- OP59
- AGCOM 219/09/CSP
- Leq (A)

Eff is EBU mode compliant as specified by EBU Tech 3341. The Loudness values can be measured in LUFS (if using R128), LKFS (BS 1770/1771 and non-European Loudness standards) and LU (if a specific reference level is given, following BS1771). The PPM values are measured and displayed to both Type I Ballistics (used by DIN and Nordic Scales) and Type II Ballistics (used by BBC and EBU Scales). Volume (VU) is measured to Direct, France or US/Australia standards. For the UK, DPP file mode is also supported.

True Peak is measured in line with the method specified in BS1770-3.

Loudness Range (LRA) is measured as per the EBU R128 specification. A processor is included with **Eff** which if enabled will apply overall compression to the entire audio so as to achieve compliance with a LRA threshold.

Eff allows you to normalise audio levels within files so they meet user-defined specifications.

Media File Support

Eff supports the following media file types

- WAV, including 'normal WAV, Broadcast WAV, and the RF64 extension (all are normally .WAV)
- AIFF
- MPEG PS
- MXF (OP1A)
- MXF (OP Atom) support included in P2 option, and with multifile option.
- MOV (all standard (not reference MOV) versions that use PCM audio)
- LXF Nexio
- GXF

Notes

- Reference MOV files are not supported. However the audio essence is usually carried in .WAV files and these are supported.
- AVI files containing PCM (uncompressed) audio are supported. AVI with compressed audio are not supported.

Eff supports a range of Dolby features as options. This includes support for dialog intelligence, and for analysing and adjusting media files containing Dolby E encoded audio and Dolby Digital and Dolby Digital Plus encoded audio. Emotion Systems has also developed **Engine**, which has Dolby E encode and decode capability, Dolby Digital and Dolby Digital Plus Encode, Dolby E and Dolby ED2 guardband measurement and correction, and advanced AC3 metadata detection and reporting, in addition to loudness.

Eff Versions

Eff is available in two versions, Measure and Comply

Measure

This is a manual tool that measures individual files in a variety of formats, and reports on the loudness and audio levels present in the files. Measure works with media files containing up to 16 channels of audio. The audio can be present as multiple mono streams, or single streams containing multiple audio tracks. Measure lets you create PDF reports. It does not create new media files.

Comply

Comply has all of the functions of Measure, and adds the ability to ensure Loudness compliance in normal media files, and to work with 'Multifiles', which are when a full soundtrack consists of multiple mono WAV, AIFF or OP-ATOM MXF files.

When Comply has to increase audio levels to meet a Program Loudness requirement, it can, if configured, use its built in True Peak processor to ensure that the new audio still meets the True Peak threshold defined in the profile.

Eff Options

The following options are available for **Eff**.

Watch folder

This option adds one watch folder to **Eff**. The watch folder has to be associated with one of the user created profiles. **Eff's** watch folder runs on the users desktop, from a normal user log-in, and monitors one folder. As files appear in that folder, **Eff** measures them according to your configuration, then creates a new media file, and an XML and PDF report. The watch folder option also includes the ability to create a daily summary report in XML format, listing everything processed in a 24 hour period. The summary report is automatically closed and a new report is started each night.

Dolby E

This option lets **Eff** measure and adjust one Dolby E soundtrack within a media file.

Dolby Digital and Dolby Digital Plus

This option lets **Eff** measure and adjust one Dolby Digital or Dolby Digital Plus soundtrack within a media file.

Dialog Intelligence

This option lets **Eff** measure loudness using Dolby's Dialog Intelligence algorithm to gate the audio, to only include dialog sections. When **Eff** corrects a file, you can select the Dialog Intelligence gated Loudness value, instead of the Program Loudness value. All other combination of measurements remain available in conjunction with this option. Dialog Intelligence is commonly used for ATSC A85 measurements.

P2 Support

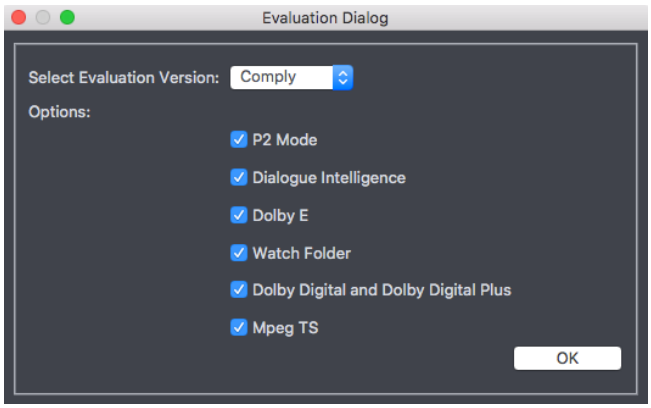
This option provides support for the legacy P2 file format, and **Eff** is capable of processing the XML files within a P2 fileset, and can correctly read and correct the sequential MXF files used by P2. This option is only compatible with the Comply version of **Eff**.

2. Basic Operating Guide

This section contains a very basic guide showing how to open a file, analyse it and to make it Loudness compliant. It also contains instructions on using the Watch Folder feature. Subsequent sections contain more detail on the product.

Running **Eff** Evaluation version

When you open **Eff** evaluation software, you are presented with a dialog showing every option that is available. Each option has a checkbox next to it. If you wish to evaluate any given option, click to enable that option. This dialog re-appears each time you start **Eff**, giving you easy opportunity to check which options you need before making a purchase decision.

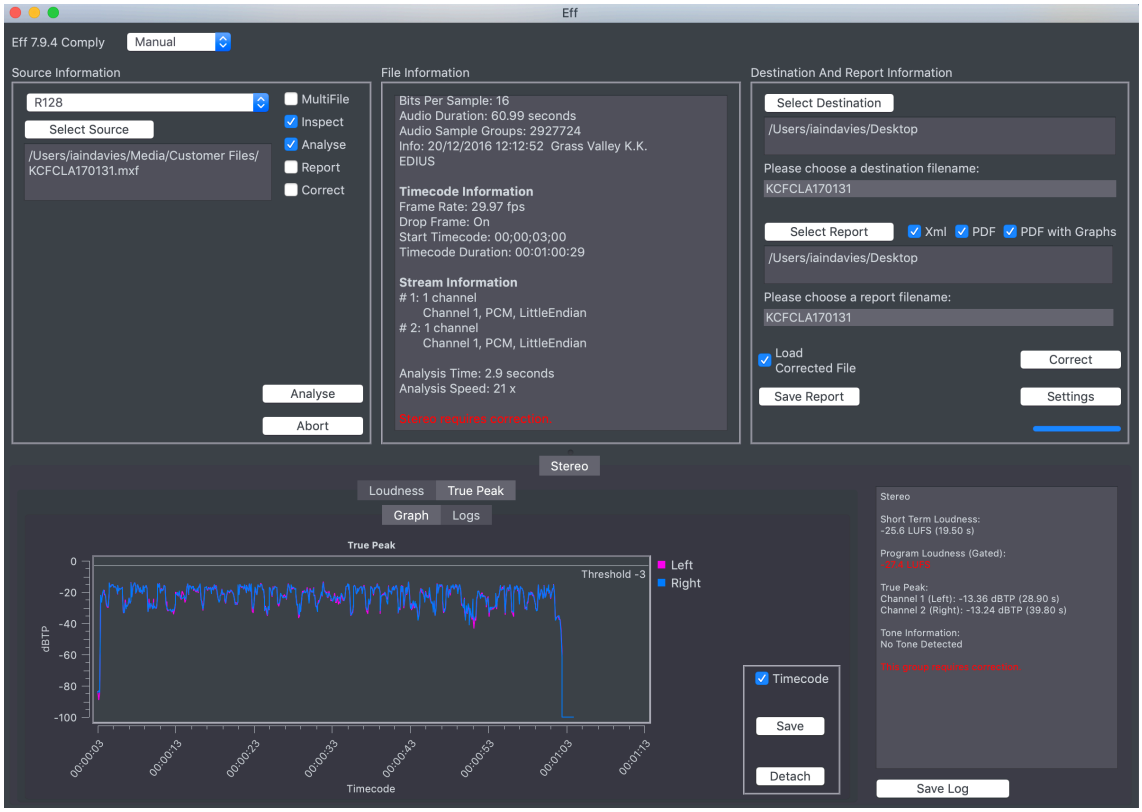


In this screenshot, I have chosen to evaluate **Eff** Comply, rather than **Eff** Measure, and I have enabled all possible options.

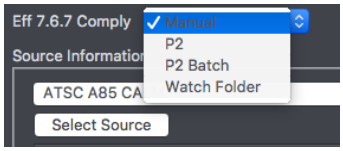
Once you click the OK button, the main **Eff** user interface opens.

The User Interface (UI)

The following image shows the UI after a file has been analysed. The data displayed will vary depending upon the number of audio channels in the file and your configuration. There is also a settings section which is not open in this view, but appears on the right side of the UI when the ‘Settings’ button is pressed.



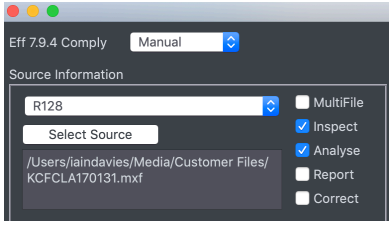
Step One - Select a Mode



Start by selecting Manual mode from the drop down menu. Steps Two to Four explain how to use **Eff** in Manual mode. The next chapter of the manual describes how to use the Watch Folder.

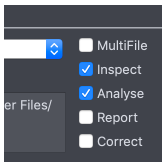
P2 mode (optional) is described in an appendix.

Step Two - Select a Profile



In Manual Mode first select a profile from the drop down box. The program allows you to create any number of profiles and save them to a database. During installation, a sample database from Emotion Systems will normally be installed. Any profile in the database can be edited or deleted as required. Clicking where the above screen image shows “R128” will display the list of preconfigured profiles that are available. Alternatively, jump to section 3 of this manual for information on how to configure your own profiles.

Step Two a - Select just analysis or also Correction etc



Eff gives you a number of choices when you open the file.

- MultiFile – for when using stems
- Inspect – tells **Eff** to display metadata from the file, which is virtually instant
- Analyse – tells **Eff** to measure loudness in the file
- Report – Tells **Eff** to automatically create a report from the result of the analysis
- Correct – Tells **Eff** to automatically continue after the analysis and to create a corrected file

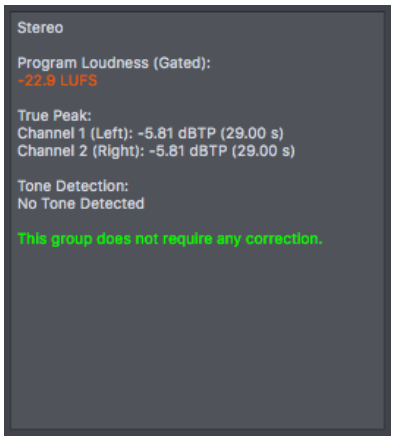
MultiFile (described in Appendix 3) lets **Eff** open multiple mono files, then combine the audio for analysis and correction purposes, then creates a similar set of files, but containing corrected audio.

By using the three controls for Analysis, Report and Correct, you can configure **Eff** to work in the way that you need. For example, if all three are selected, then when you open a file, **Eff** will analyse it, create appropriate reports showing the measurements and levels in the file, and also create a new file with corrected audio. However if you do not need corrected files but still want reports, you could just select Analyse and Reports.

If you select to Correct the file, and/or to create reports, then you will need to select appropriate Destination folder and Report folder BEFORE choosing the file to open, otherwise **Eff** is unable to continue.

Step Three - Select a Single Source File

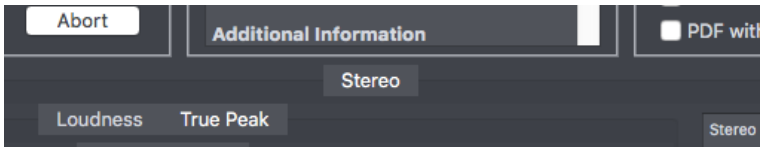
Start by clicking the Select Source button, which allows a .WAV, .MOV, .MPEG (.MPG), .AIFF (.AIF), .MXF, .GXF or .LXF file to be opened. Note that regular wav, broadcast wav and RF64 wavs are all supported. **Eff** supports stereo pairs containing Dolby E data, if the Dolby option is purchased. If not, it will be necessary to exclude those tracks in the channel layout dialog.



The file will be analysed and measurements displayed in the section on the bottom right of the main UI. Any values above their thresholds will be displayed in red. The last line will highlight whether the currently

displayed group needs correcting to meet your targets, or not.

Where the file contains multiple channel groupings (eg, multiple stereo tracks, or a stereo and a 5.1), buttons appear to let you select each grouping in turn. Graphs and measurements update to reflect the currently selected grouping.



In the screenshot shown above, the file only contains a single Stereo, and that is shown in the centre of the screen image. Had there been multiple groupings, they would be listed next to where it displays ‘Stereo’ above.

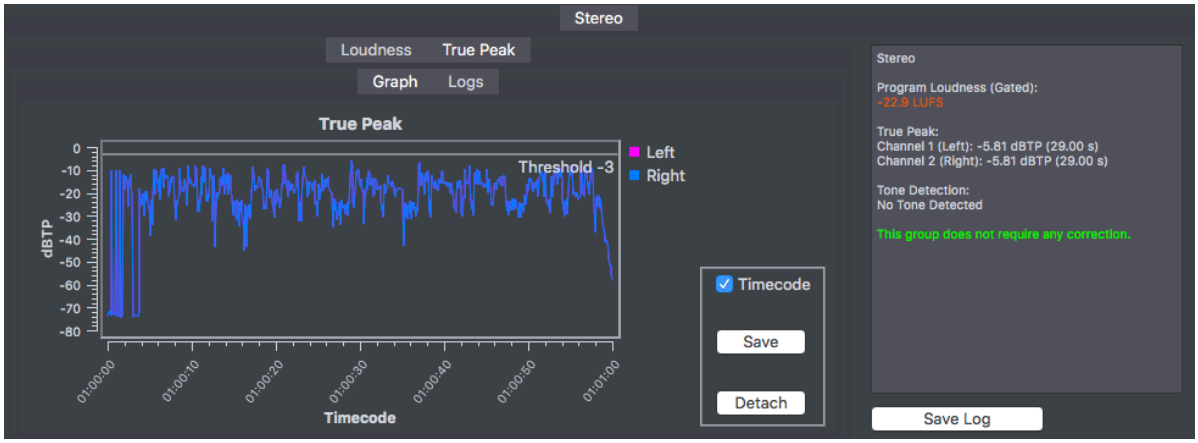
Please Note: WAV, AIFF files, MPEG-1 Layer II, GXF, LXF, QuickTime and OP1a MXF Files are supported. Only those with the following properties can be tested:

- Up to 16 channels
- Sample Rate 48 kHz and 44.1kHz
- 16 or 24 bit
- Uncompressed audio

The following **additional** property is supported only in MPEG-1 Layer II files

- MP2 Audio

Step Four - Logs and Graphs



The data, that can be displayed graphically or in logs, is limited to the measurements specified in the active profile. If any required measurement is missing, edit the profile to add it in, then re-measure the file.

Dialogue Intelligence

The Dolby Dialogue Intelligence meter operates by monitoring the input to the loudness meter and isolating the segments and channels that contain dialogue from those that do not. Once the dialogue (anchor) elements are isolated, a speech-gated loudness measurement can be calculated.

For loudness metering modes that have more than one gating technique (Dialogue Intelligence with Gating would utilise speech gating and level gating), the Dolby Dialogue Intelligence meter automatically selects the gating technique that is most appropriate to the content being measured. It achieves this by examining the amount of speech contained within the content. If the amount (as a percentage) exceeds the speech threshold defined in the profile then speech gating is employed. Otherwise the alternative gating technique is invoked.

The program loudness graphs and logs plot the program loudness value as more audio data is added, with the

final value showing the program loudness over the entire duration.

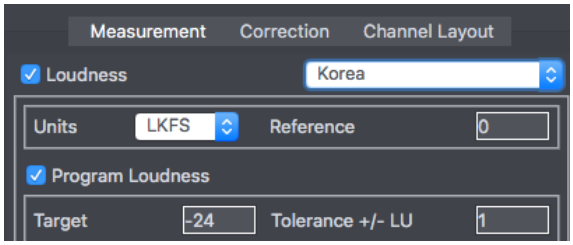
As more audio data is added to the Dolby Dialogue Intelligence meter it re-examines the amount of the speech content. If the speech content is above the threshold, the speech-gated value will be plotted and logged. If below the threshold then the level-gated value will logged and plotted. Due to this switch, the graph may show several dBs of change as the meter switched between speech-gating and level-gating. The resulting program loudness value will take into account the speech content over the entire duration of the file and select the appropriate speech-gated or level-gated value to use.

A log of all the loudness and PPM values can be shown in the logs section. Logs can display all values calculated, or only show values where the value exceeds the user-configured threshold. This tab will also display summary information such as maximum values, loudness range, and True peak. Any values which exceed defined thresholds will be shown in red.

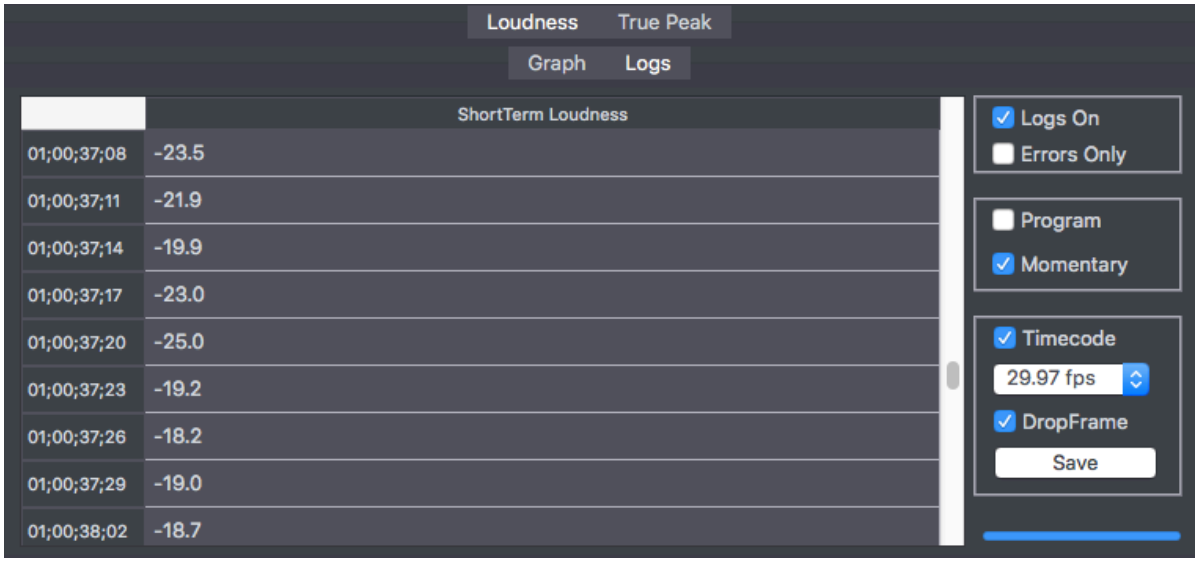
Eff allows the user to break down the audio file in to a number of different channel configurations, with the graphs and logs of each of these channel groupings made visible independently. **Eff** can work with media files containing up to sixteen channels of audio, and options are provided to direct **Eff** as to how to partition the detected audio, into groupings of mono, stereo and 5.1 as applicable.

Step Four (a) – XML and CSV Logs – Hong Kong and Korean special function

It is a Korean regulatory requirement that logs of loudness values taken at 0.1s intervals must be created. In order to access this function, you need to create a loudness profile using the 'Hong Kong' or 'Korea' Loudness standard. The Hong Kong or Korean standard is available to select from the drop down of international Loudness standards, and is shown in the screen image below.



Once you analyse a file using a loudness profile created with the Hong Kong or Korean Loudness standard, it becomes possible to save CSV logs of the various parameters that have been selected for measurement.

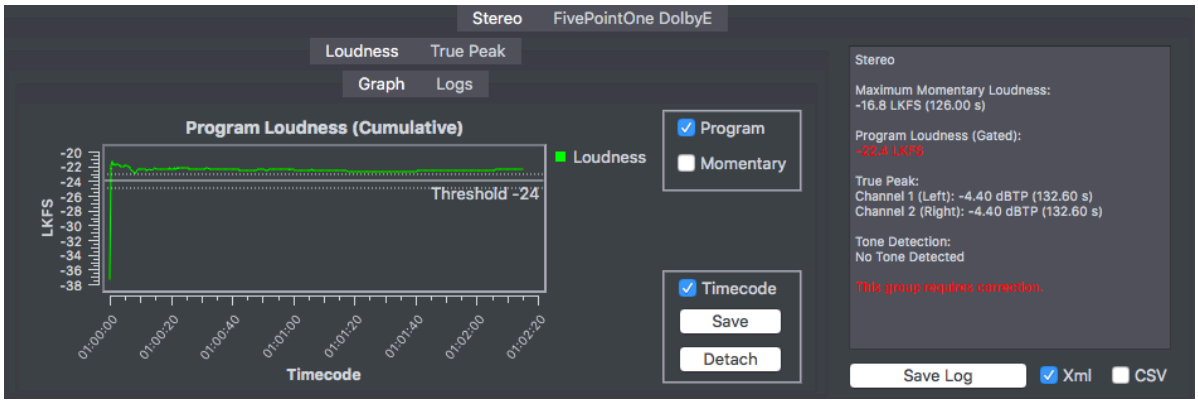


On the right side of the above screen image is displayed measurements for the selected audio group (mono in this case). At the bottom of this section you can select whether to create a full log in XML and/or in CSV format. Clicking Save Log gives you an opportunity to enter a root filename for both log files.

	A	B	C	D
1	FileName	2016 Titles.wav		
2	SOM	00:00:00:00		
3	EOM	00:02:25:00		
4	DUR	00:02:25:00		
5	IntegratedLoudness	-39.8		
6		Time	MomentaryLoudness	IntegratedLoudness
7		0	-45.8	-100
8		0.1	-42.4	-100
9		0.2	-40.7	-100
10		0.3	-39.5	-39.4
11		0.4	-39.3	-39.5
12		0.5	-39.4	-39.5
13		0.6	-39	-39.4
14		0.7	-38.7	-39.2
15		0.8	-38.5	-39.1
16		0.9	-38.3	-39
17		1	-38.1	-38.9
18		1.1	-38.1	-38.8
19		1.2	-37.3	-38.6
20		1.3	-36.8	-38.4
21		1.4	-36.2	-38.2
22		1.5	-35.4	-37.9
23		1.6	-34.6	-37.6

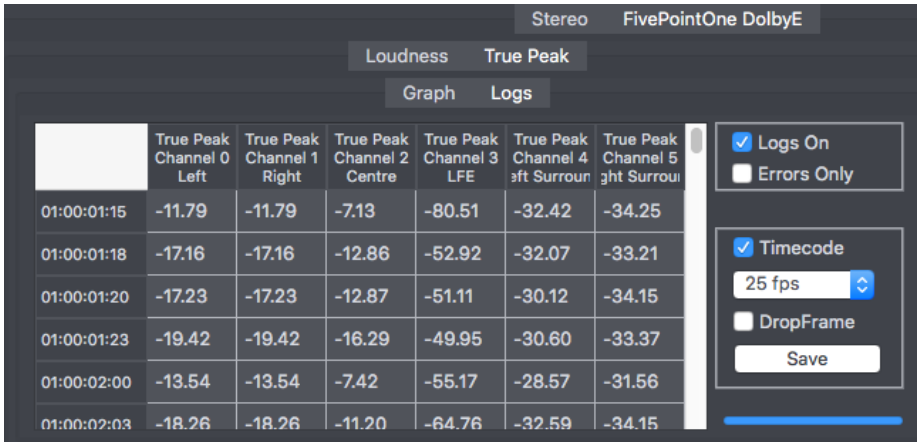
Channel Groupings

Where there are multiple audio channels in a file, these will normally be grouped together as 5.1 or stereo, for example. These different channel groups are selectable for display. To navigate between the different channel groups click on the appropriate tab along the top of the logs area. Within each group tab there is the option to view either loudness or PPM. Under either of these tabs either a graph or a log can be displayed. In the example shown below, we are looking at a four channel file, containing one stereo PCM track, and a second two channel track that contains Dolby E 5.1. The 'Stereo' button is highlighted, so we are seeing the graph and results from the first stereo pair. To see the graph and results for the Dolby 5.1, we should click 'FivePointOne Dolby E'.

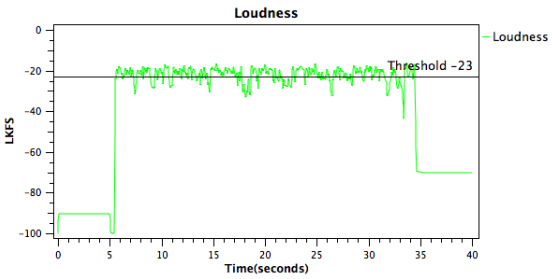


By default, graphs display time in seconds on the horizontal axis, but will instead display timecode if the option is selected. In this case, the timecode will be based on actual timecode if this was detected in the source file, or zero-based timecode will be used.

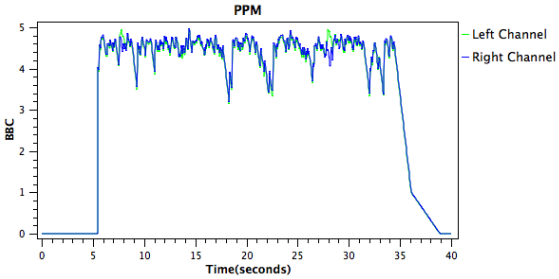
Rather than see graphs, it is possible to see the measurements numerically, by clicking the ‘Logs’ button. To view only the errors and where they occur in the file select the ‘Errors Only’ checkbox.



Graphs that are displayed in the Graph tab, will display each channel within the channel grouping. This can be detached from the main UI by clicking the detach button, or exported via a png image using the save function.

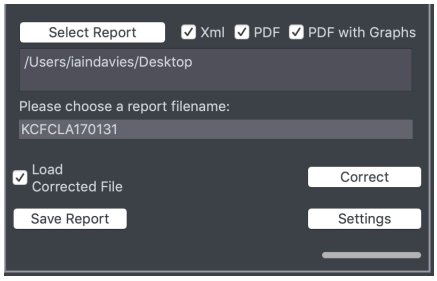


There will be one set



of graphs per track.

Step Five – Create a Report

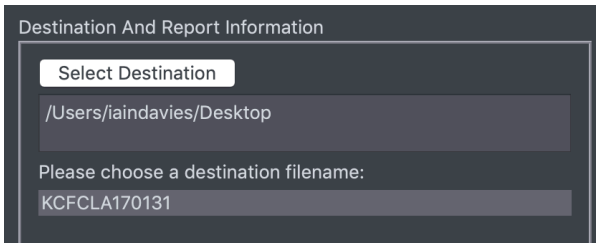


Once file analysis is complete, it is possible to create a report using the “Save Report” button. Using the three selection buttons you can choose whether to create reports in either of XML or PDF format, or both, and whether to include graphs in the PDF reports.

Reports always contain the Emotion Systems logo in the top right corner. The top left corner of the report will contain the logo contained in the file “customer.png”. This file can be freely replaced with another file of the same name and format, containing your own logo. The png image will be scaled to fit the available space. If you are replacing the default logo, save your version into c:\users\public\emotiondata or /users/shared/emotiondata overwriting the default ‘customer.png’ file.

Step Six - Correcting a File

Click on the Select Destination Button to choose a file directory for the fixed file. The filename will automatically default to the original filename, and this name can be edited as required. Note that for 'multifile' mode, **Eff** instead writes out a folder of new files. It is not possible to specify the names of these files, so instead you must choose a new folder.



Click the Correct Button to create a fixed file.

The file will be fixed according to the profile chosen in Step One. For more information on how to change these parameters see Chapter Four.

Once the file has been fixed a notification message will appear.

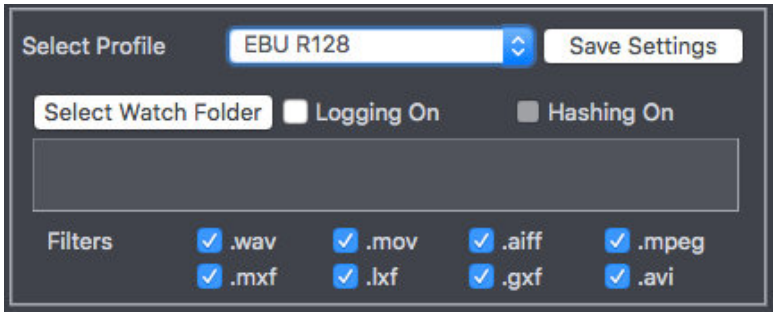
Step Seven - Watch Folder

The Watch Folder (sometimes called a Hot Folder) is an option only available with **Eff** Comply. The watch folder works with one of the saved profiles. When you save the watch folder settings, you are also selecting the profile to be used by the watch folder.

Important Note

It is important to note that the Watch folder UI does not display the settings profile being used. If you open the Settings area, and look at the 'Profiles Setting' tab, this lets you review the profiles BUT THIS IS NOT NECESSARILY THE PROFILE BEING USED WITH THE WATCH FOLDER. You must click the 'Watch Folder Settings' tab to see which profile is currently active within the Watch Folder.

To use the watch folder, start by setting up and saving a measurement/correction profile. Then click 'Watch Folder Settings'.



From the 'Select Profile' dropdown, pick your chosen loudness profile.

Click 'Select Watch Folder', and select the location of the folder to watch, using the file browser dialog. This folder can be a location on an internal disk, or on your local network.

The file filters check boxes enable different file types within the watch folder. In the image above, the watch folder will work will all supported file types, as all types are 'ticked'. Note that any file types **not** ticked will **not** be detected by the watch folder.

The watch folder mechanism provides two logging options.

'Logging On' – If you select this, **Eff** keeps track of filenames and the date last modified, for all files that pass through the watch folder. This means that if **Eff** detects that a file is placed into the watch folder for which it recognises the filename/date modified, then it will not be processed a second time.

'Hashing On' – With this setting, **Eff** calculates a signature for each file that is dropped into the watch folder. Any subsequent file placed into the watch folder with the same signature will not be processed. The signature that is calculated is independent of filename or date modified.

NOTE – Use of the Logging and Hashing features are only recommended if you do not configure the watch folder to move the files out of the watched folder after processing. These features will slow the analysis of files and are not needed if the files are moved out after processing.

The various folders and actions for the watch folder are defined in four tabs, split into 'Analysis', that covers moving and renaming files that pass without needing processing, or files that fail, and you don't wish them to be processed. The Correction tab covers how you choose to process and move files that failed to meet the original thresholds. Where multiple thresholds are defined in the profile, **Eff** provides additional options that are used if the file cannot be automatically processed to meet every threshold.

The Error tab covers unsupported file types, whilst the Reports tab enables different report types, and specifies the locations into which the reports are placed.

There are a lot of options available within the watch folder interface, based on requests from users. However a typical workflow will only use a few of the options.

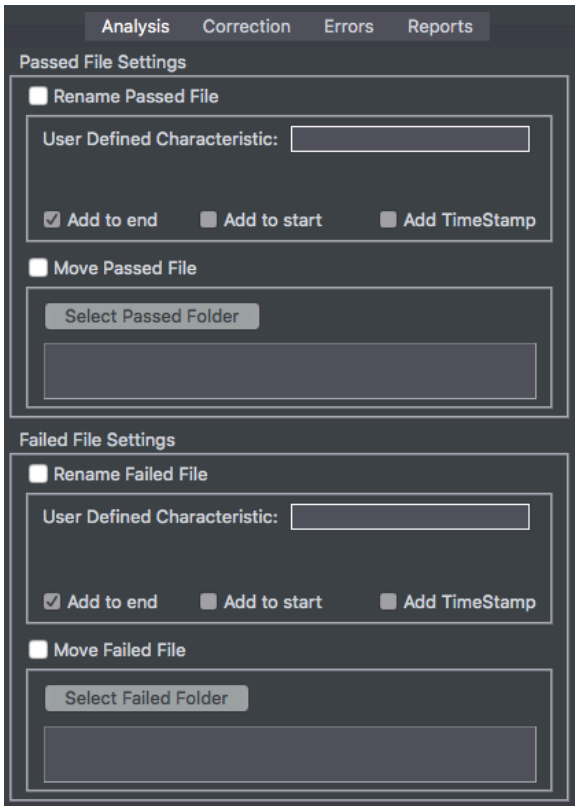
The following section describes each of these in more detail.

Watch Folders:

Analysis

On the 'Analysis', we define 'Passed' files to be those files that already meet the targets defined in your chosen profile, without any processing being required. For these files, you can choose to rename the files with the addition of a user defined string of characters, and/or by adding a timestamp onto the filename.

Whether you choose to rename the file or not, you have an option to move the file to another location. We recommend that you move files out of the watch folder once they have been analysed by **Eff**.

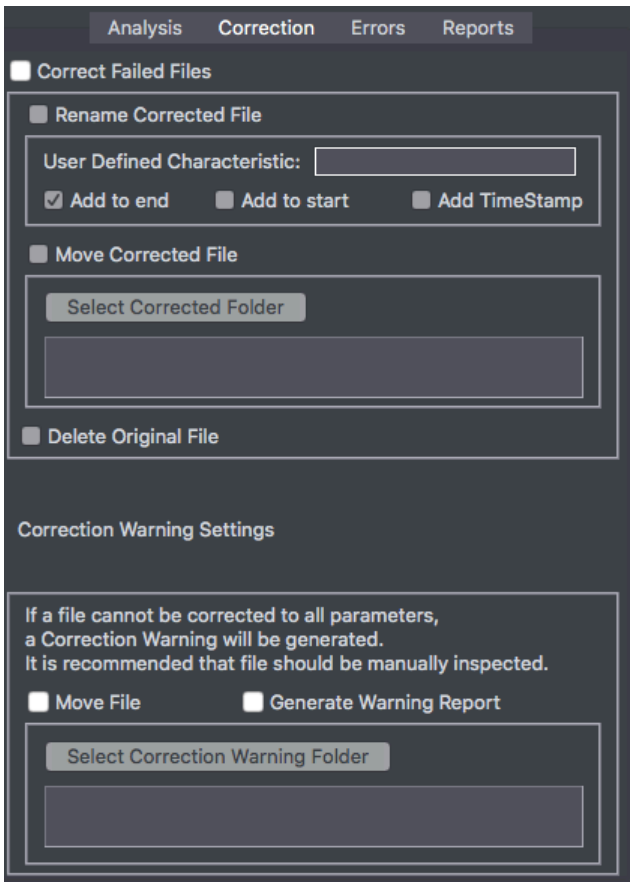


Likewise, we define 'Failed' files to be those that do not meet the targets defined in the profile. The same Rename and Move options exist for Failed files, as for Passed files.

This mechanism gives you the option for an output folder for failed files, so that if you wish to reject these files and ask the supplier to fix them, they are all kept together.

Alternatively you may wish to fix all the failed files, without renaming them. In this instance, you would move the failed files to a temporary folder. Then in the correction tab you would select to correct these files, and to move them to the final output folder, which could be the same folder that the 'passed' files were moved to. Using a temporary folder is essential if you do not wish to rename the files. If it is preferred to create new files with a different filename, this can be done directly on the 'Correction' tab.

Correction



In the majority of cases, you would select the 'Correct Failed Files' option at the top of this section. Therefore all files that did not meet the required thresholds will be submitted to the processing section of **Eff**. They will be adjusted in line with the settings defined in the chosen profile.

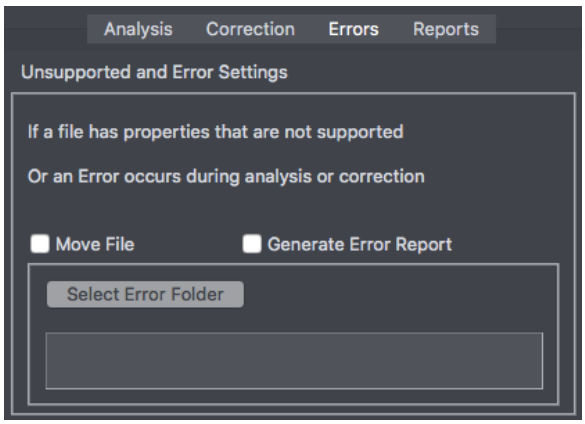
Rename and Move options are available, which work in an identical fashion to those on the 'Analysis' tab.

Now that the file that failed has been processed to meet the targets, you can use the 'Delete Original File' option to remove the original source.

If you don't ever wish to delete the source file, then you can use the 'move failed files' option on the analysis page in conjunction to the 'correct failed files' on this page, so that you have one output folder containing all the files that failed before they were processed, and a second output folder containing all the files that previously failed and have now been corrected. Of course this option doubles the number of files.

Lastly on the 'correction' tab there are options concerning files that cannot be processed by **Eff** to meet all parameters. In this instance, **Eff** can move the file to an output folder, and optionally generate warning messages. For files that cannot be processed to meet all configured targets, the file is not processed at all, i.e. It is not partially processed, but left untouched, and we recommend manual inspection and processing for all files thus segregated.

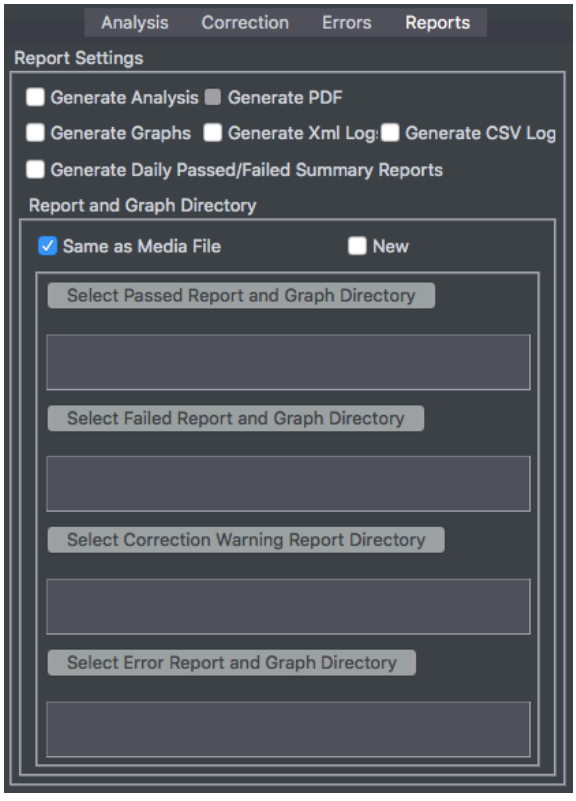
Errors



The Errors tab concerns media files that **Eff** is unable to correctly open. This would typically be for files where there is an error in the coding, or it uses a type of codec not yet supported by **Eff**. These files can be moved and an optional error report created. When you come across unsupported file types, please contact support@emotion-systems.com to see if an update to **Eff** is available that corrects the issue. If not, then if possible please provide a file sample to Emotion Systems so that we can potentially add support.

Reports

The final tab in the Watch folder section concerns optional reporting.



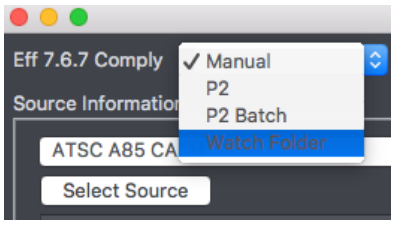
Here you can configure **Eff** to create an XML Analysis report for every file that is processed, which can optionally also create graphs as png files, plus **Eff** can also directly create PDF reports, in which case the

graphs will be embedded within the PDF. There are also daily summary reports available. These reports are produced each day, around 1am, and each day the previous days file is closed and retained, and a new file started.

Underneath there are options to specify the destination for the various report types.

This concludes the detail on how to configure the watch folder. The next stage is to enable watch folder processing.

First set the Mode to Watch Folder.

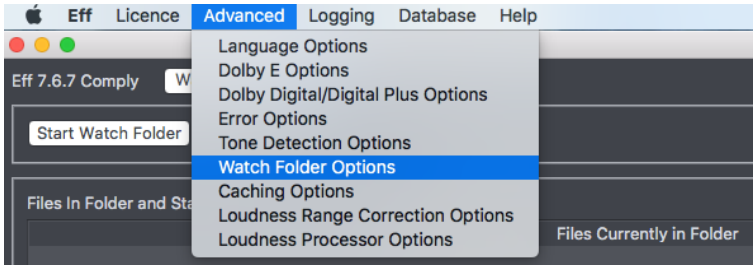


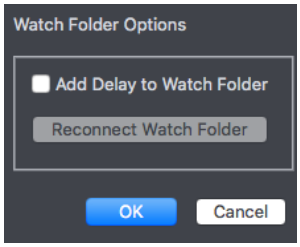
Once selected, the manual part of the UI will be disabled. As soon as the mode is set to Watch Folder, the Watch Folder Monitor window appears, and will list all the processable media files contained in that folder. This provides a visual check before you start.

Once the Watch Folder is selected, additional options can be selected from the Advanced menu in the main application menu bar.

Watch Folder Properties:

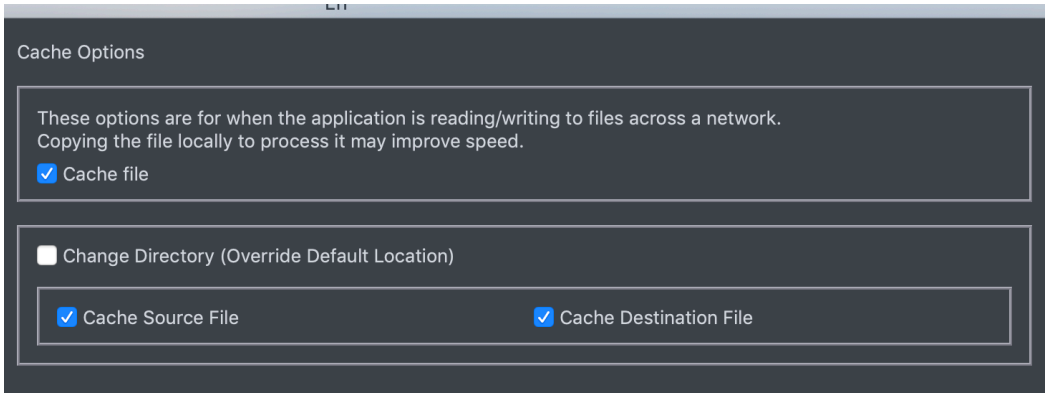
Watch Folder Options





This dialog is available from the Advanced menu, and controls using the Watch Folder in instances when files are very slow to appear, such as when monitoring a FTP site. It is normal in FTP sites for files to stop growing occasionally, and sometimes to remain the same size for several minutes, then resume being transferred. Although directly monitoring a FTP site is not recommended, if you need to do this, then clicking the 'Add Delay' check box lets you specify a time in minutes. When enabled, **Eff** will permit files to stop growing for this period of time before deciding that the file is complete and ready for processing.

Note that this will add a delay to every file that is processed so only use when essential.



Cache Options

This dialog provides controls that can speed up Watch Folder operation, when the files are stored in a network location, and network speeds are slow compared to direct access speeds. In the initial dialog there are only two options, to choose whether to enable file caching. If 'Cache Files' is enabled, then other settings appears as shown here.

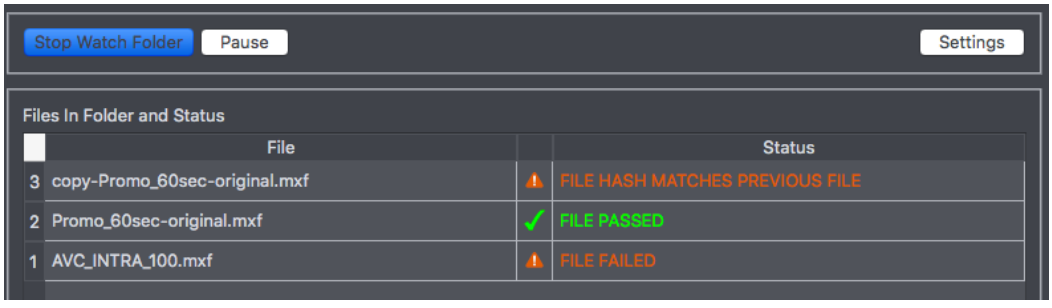
If using this option, we recommend selecting 'New Directory' and choosing a local folder to hold your cached files. This way you know exactly where these files are.

For most circumstances, selecting to cache both Source and Destination files will provide the fastest processing, although this is dependent upon your hardware.

When using this option, source files are copied across the network to the local cache folder, and processed there, with destination files being created in that same location. Once created, the new files are then moved to the destination location specified in the main Watch Folder settings.

Once everything is configured as required, click the **Start Watch Folder** button.

Clicking the Pause button will pause the Watch Folder. If the Watch Folder is in the middle of processing a file – it will complete processing that file before pausing. Please be patient, the Pause command will be actioned once the processing has finished.



The files in the Watch Folder will be displayed in the Watch Folder Monitor view. The filename, processing status and file status is shown.

The processing status is as follows:

Eff has not processed this file

Eff has successfully finished processing this file

The files that have been tested are given a range of status messages.

File Failed	Levels in the file exceeded the thresholds in the configuration.
File Failed Then Corrected	Levels in the file exceeded the thresholds in the configuration, and a new file has been created that meets the configured thresholds
Waiting for Processing	**Eff** has not yet started on this file
Still Copying	**Eff** has detected new files being placed in the hot folder, but the copy operation has not yet completed.
Processing	This file is now being processed.
File Hash matches previous file	This indicates that an identical copy of a previously processed file has been added to the watch folder (when the Hashing mode has been enabled)

When files start processing, a progress bar appears at the bottom right of this view. This bar fills from 0 to 100% for each separate process being carried out in each file. Each audio group is analysed individually, so if there are four stereo pairs in the file, this will go from 0 to 100% four times for analysis. If your profile also corrects files, then each stereo pair being corrected would also go individually from 0 to 100%.

To end the Watch Folder session, click the Stop Watch Folder button. **Eff** will then wait until it has finished processing any files it is working on before closing the watch folder.

Auto Start Watch folder

If you only use the Watch Folder, **Eff** can be set to auto start directly with an active watch folder. You need to start **Eff** from a command line, using '**Eff** WATCHFOLDER'.

In OSX,
the command would be something like -

open **Eff**.app --args WATCHFOLDER

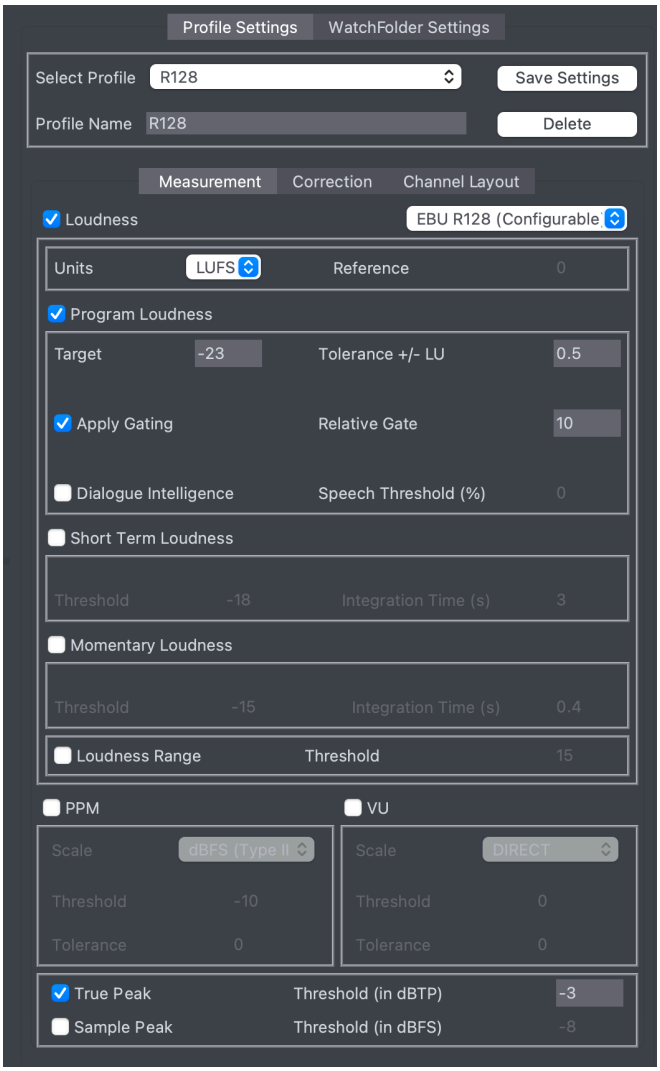
In Windows,
the command would be something like -
c:\program files\emotion systems\eff WATCHFOLDER

4. Settings

Two types of settings are available with **Eff**. Settings controlling the overall operation of the product are available from the main menu bar, whereas parameters and settings for the loudness profiles and Watch Folder configuration are available from the Settings pane. This Settings pane is described below, whilst the menus are described at the end of this chapter.

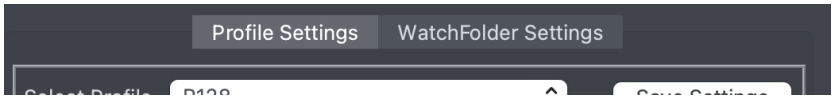
To access the Profile and Watch Folder settings, click the Settings button, which is on the right hand edge of the main UI, roughly half way down.

A new section of UI appears. Clicking the same button closes this. The Settings area can also be undocked from the main window by clicking and dragging on its title bar.



Profile Settings

This section contains details on how to set a profile. When the program is used for the first time a default profile is created. This can be configured or deleted as required. The 'Profile Settings' are where you choose loudness standard, and the thresholds for measurement and adjustment. The 'Watch Folder Settings', which are only available as an option for **Eff** Comply, is where you choose the location of the Watch Folder, and destination choices for processed files.



In an attempt to clarify the active profile, note that whenever you change any parameter in the profile or Watch Folder settings, that parameter will be highlighted in green, until you have saved the profile.

Note also that you must independently choose the profile for use whilst measuring, from the profile that you are currently editing. In other words, you could select a profile names 'France' whilst measuring files, and then decide to edit a profile called 'Germany'. This will not affect your 'France' profile. However **Eff** will attempt to detect that you have edited a profile that is not selected, and prompt you to change to the newly edited profile, when you next select a file to measure

First Click on the Profile Settings Tab. Then, at the 'Select Profile' dropdown, either choose an existing profile, or select 'Add New +' to create a new profile.

Enter the profile name in the correct box and click save settings. Profiles can be deleted by pressing the delete button. This will delete the profile being displayed in the settings tab.

When **Eff** is opened for the first time it will create a placeholder profile named Example Profile - this can be renamed or edited as required.

When a profile is saved, **Eff** will prompt the user to reload the file using the saved profile settings.

Each profile has three different sections of settings – Measurement, Correction and Channel Layout

Measurement

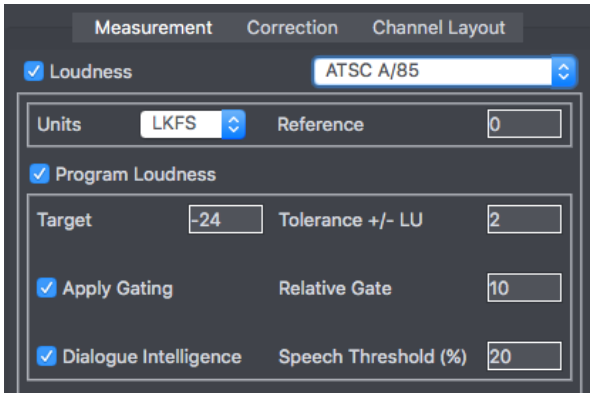
The Measurement section allows the settings to be customised. Within this section **Eff** can be customised to analyse loudness and PPM, as well as to cope with a variety of different specifications and requirements such as True peak or Loudness Range.

When the profile has been set up accordingly, press the Save Settings button to save. If the settings tab is closed before saving then any changes made will be lost.

In the Measurement tab, start by choosing if you need to enable a loudness measurement. Then select the appropriate Loudness 'types' that you wish to measure from the drop down menu. Then make selections from the items below. The available choices vary depending on the selected loudness standard. For example, choosing R128 as the base specification then provides a choice of Program, Short Term and Momentary Loudness, whereas choosing TRB-32 only has the Program Loudness available.

Dialog Intelligence

When selecting ATSC A-85 as the base loudness specification, the option to select Dialog Intelligence is also available.



Dialog Intelligence is specified in A85 as an optional algorithm that may be used. Normally a delivery specification will state whether this is to be used or not. However the most important factor is to be consistent, as programs normalised with dialog intelligence will usually be at a different level to programs normalised without dialog intelligence.

We recommend that the Speech Threshold should be 40% unless your delivery specification states a value. Note that if you use 40% but the file is subsequently measured using a different speech threshold, the resultant measurement is likely to be different, and could be substantially different.

PPM/VU Meters

In addition to Loudness, **Eff** can measure audio levels in other standards. So you may include measurement of PPM, and you would select the required standard from the 'Scale' dropdown, and enter an appropriate threshold, or measure VU as an alternative.

Peak Meters

Lastly, **Eff** can measure True Peak, using the algorithm specified in BS1770-3, or it can measure Sample Peak.

Correction

The Correction Tab lets you create a measurement/correction window, and choose what actions **Eff** takes with files that do not meet the configured parameters.

Measurement Window

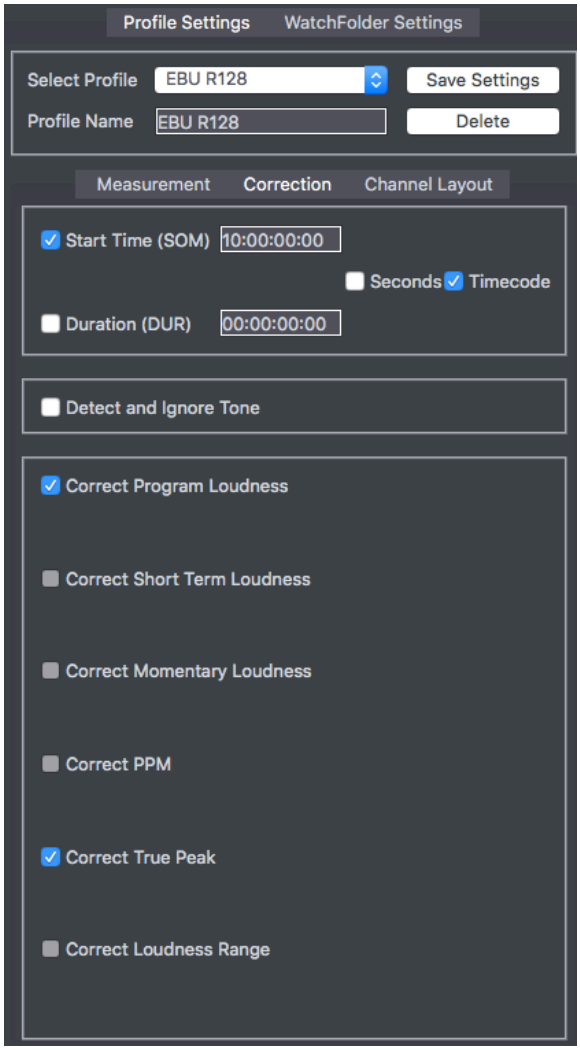
At the top there is an optional section to use a measurement/correction window. This can be configured in seconds or in timecode. This is provided so that the bars and tone section at the start of some files is not included in the analysis, so doesn't cause incorrect measurements, and of course so that the level of the tone is not adjusted when the audio levels in the main part of the file are adjusted.

If you select 'Seconds' then you can enter a Start Time, which is the delay from the very beginning of the file, before measurement and correction starts. The second parameter, Duration, is optional, but if a value is entered, this is defining a 'window'. Audio within this window is measured, and potentially adjusted, whilst audio outside this window is entirely unchanged.

The 'Timecode' option is only suitable for use with files that contain a defined timecode. A start timecode value is entered in a similar way compared to using the 'Seconds' mode. The start timecode is an absolute value, not a delay from the start of the file. For example, if the file does have timecode, and the first frame in the file is 09:58:45:00 and a start value of 10:00:00:00 is entered, then **Eff** treats the file as starting at 9:58:45, and 'plays' the file until timecode 10:00:00:00 is reached, then only starts measuring from that point. In this case, this would give the same results as being in Seconds mode, and specifying a Start value of 75 seconds.

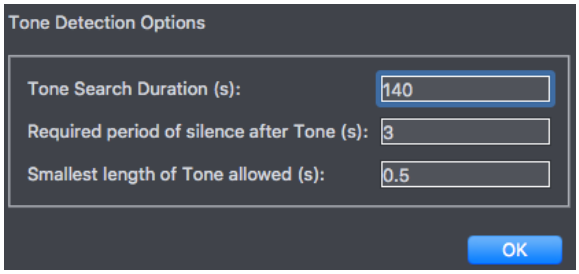
The 'Duration' value in Timecode mode is still treated as an offset, so in the above example, to have a duration of 30 seconds, the Duration value would be entered as 00:00:30:00.

If you specify a timecode value, but **Eff** does not detect timecode in the source file, then a warning is displayed, and **Eff** reverts to measuring and correcting from the very start of the file.



Detect and Ignore Tone

Under the measurement window there is an automatic method for detecting the region of bars and tone at the start of many media files, and excluding this from the measurement and correction process. On the main application menu bar, in the Advanced menu, you can select 'Tone Detection Options' to configure this feature.



Tone Search Duration determines how long in to the file that **Eff** will look for tone. The "required period of silence" determines how long a silence needs to be to determine that this is the end of tone, and is normally three seconds for most standard formats.

Finally we can exclude very short periods of tone in case there are tiny fragments that are confusing the algorithm.

Generally you can enable this function for all media and never have to worry about the presence of bars and tone again.

Enable Corrections

Eff is able to process files for multiple targets or thresholds simultaneously. Every measurement that is currently enabled will be displayed in this Correction tab for optional correction. You can select all correction processors, or none – as many as needed.

How Eff changes audio levels

Note that when **Eff** adjusts the audio level, it will always make an identical adjustment on every audio channel of a group. I.e. all 6 channels in a 5.1 group would have the same level of adjustment, and both channels in a stereo group would have the same level of adjustment. If **Eff** is working with a file containing several separate audio tracks (i.e. an 8 channel file consisting of four stereo pairs) then each audio track is measured and processed independently. This means that gain or attenuation is applied separately to each audio track, as required so that each track ends up meeting the configured target.

Apart from when the measurement window function is used, as described above, or the True Peak processor is used; the entire duration of the file will be given the exact same level of adjustment. Therefore there is no change to the audio mix, and no loss of quality because of any form of clipping or compression. Apart from possible rounding errors due to limited bit resolution, the actual attenuation process used by **Eff** is reversible.

Channel Layout

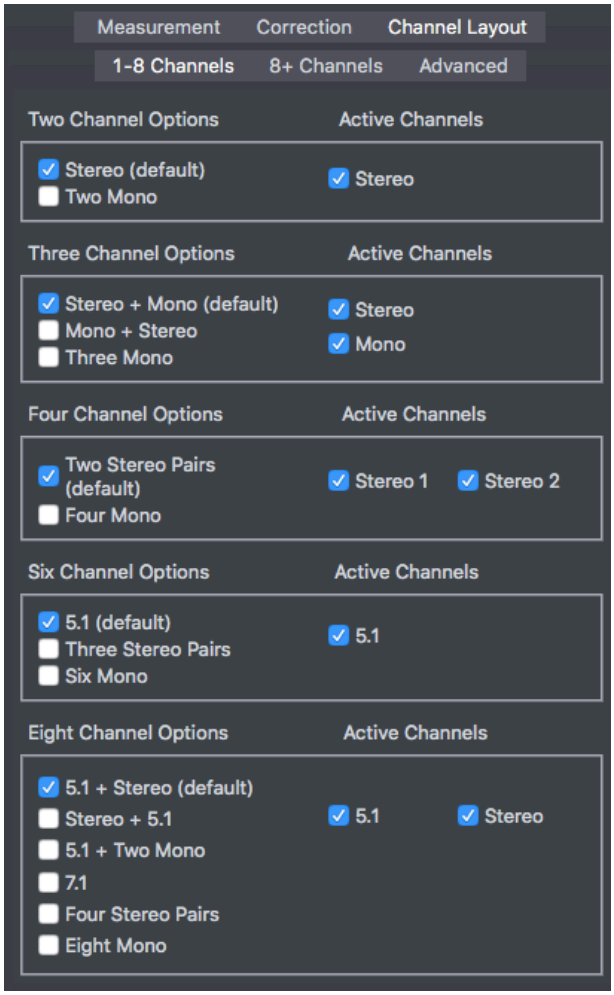
When files contain more than a single audio channel, there are choices about how the channels are being used. Frequently there is no information in the file describing the layout, and therefore **Eff** includes tools to allow the user to specify the channel layout.

Additionally, MXF files in particular frequently contain unused audio channels. These have no effect in normal use, but it is undesirable for **Eff** to measure and normalise the audio levels in channels that are present, but not being used.

The Channel Layout controls show the different layouts that **Eff** supports, and indicates the default choices that **Eff** will make when a given number of channels are detected in a file. The choice of active channels dynamically changes in the UI, based on the selected channel option. Thus if **Eff** finds two channels in a file, this can be treated as one stereo pair, or as two mono tracks, depending on the configuration.

Eff handles up to 16 channels of audio.

The 'Advanced' settings are for instances where a stereo pair is actually two separate (mono) language tracks within the source file, but will a selected mono track will be broadcast in both left and right on playback, for example. Therefore **Eff** has to know the play-out configuration, and can then measure and correct the loudness based on how loud it will be on play-out, rather than how loud it is within the actual file.


Measurement
Correction
Channel Layout
1-8 Channels
8+ Channels
Advanced
Two Channel Options
Active Channels
Stereo (default)
Two Mono
Stereo
Three Channel Options
Active Channels
Stereo + Mono (default)
Mono + Stereo
Three Mono
Stereo
Mono
Four Channel Options
Active Channels
Two Stereo Pairs (default)
Four Mono
Stereo 1
Stereo 2
Six Channel Options
Active Channels
5.1 (default)
Three Stereo Pairs
Six Mono
5.1
Eight Channel Options
Active Channels
5.1 + Stereo (default)
Stereo + 5.1
5.1 + Two Mono
7.1
Four Stereo Pairs
Eight Mono
5.1
Stereo

5. Eff Menu Bar

User Interface (UI) Language

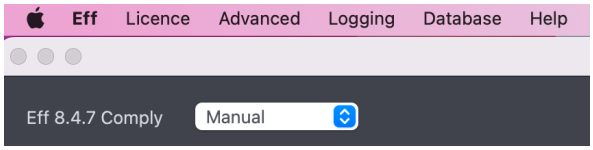
The **Eff** UI defaults to the English language.

The Japanese language is also available, and other languages may be added in future. To switch languages, go to the Advanced menu, on the main menu line for the application, and select ‘Language Options’.

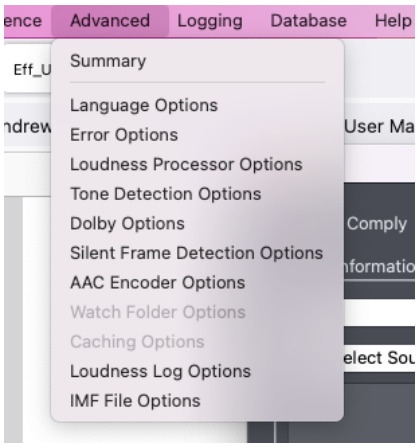
From the dialog that appears, select the chosen language then click OK. The chosen language setting is retained when **Eff** is closed and re-opened

Eff menu

This lets you display the ‘About **Eff**’ information.

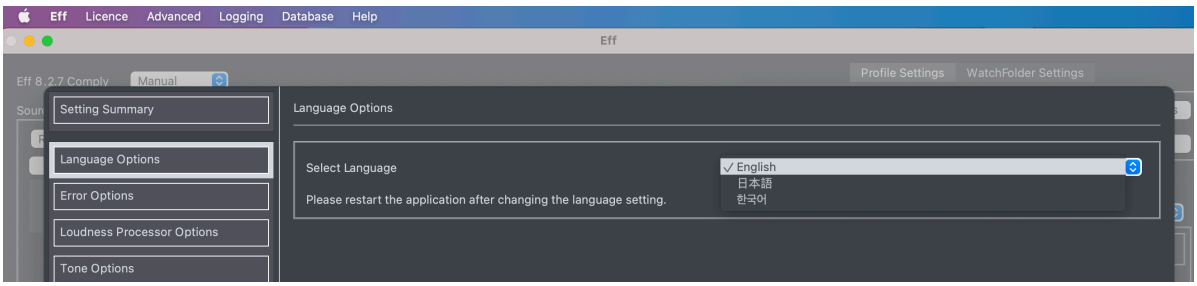


Advanced menu



Language Options

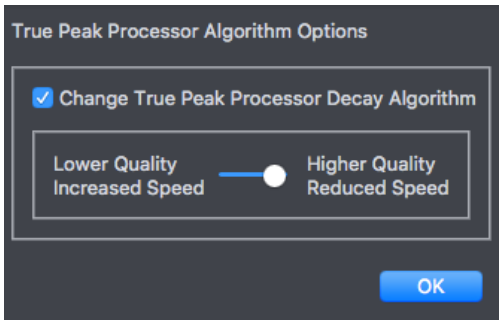
Selects the UI language: Japanese, Korean and English are the choices.



Error Options

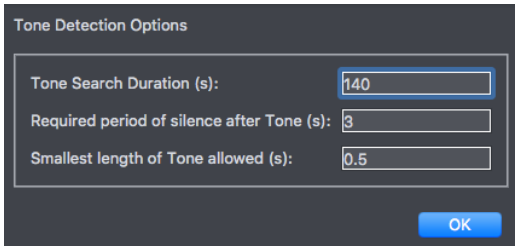
The 'Truncated Audio' option is concerned with media files that contain both video and audio. By default, **Eff** will expect the audio duration to match the video duration, and if there is a mismatch it would reject a file with an appropriate error message. However, some products do create files where the audio is shorter than the video, generally by part of one frame. If you have files that are rejected due to truncated audio, then this option can be used to accept files that are shorter by a small amount, whilst still rejecting files with a larger discrepancy, which are likely to be incorrect.

Loudness Processor Options



As part of making audio compliant with international loudness specifications, **Eff** is often required to adjust True Peaks. If the True Peak threshold is set in compliance with the recommendations in EBU R128, ATSC A85 and the other standards, then this setting should be left on the "Higher Quality" setting. However if you have a delivery specification with an extremely low maximum True Peak requirement, then the amount of processing required will slow the operation of **Eff**. Only in these circumstances would we recommend adjusting the slider in this dialog towards the faster but lower quality setting. If you need to adjust this control then it is essential that you process and review a range of files of different genre, to ensure that you are obtain satisfactory results.

Tone Detection Options

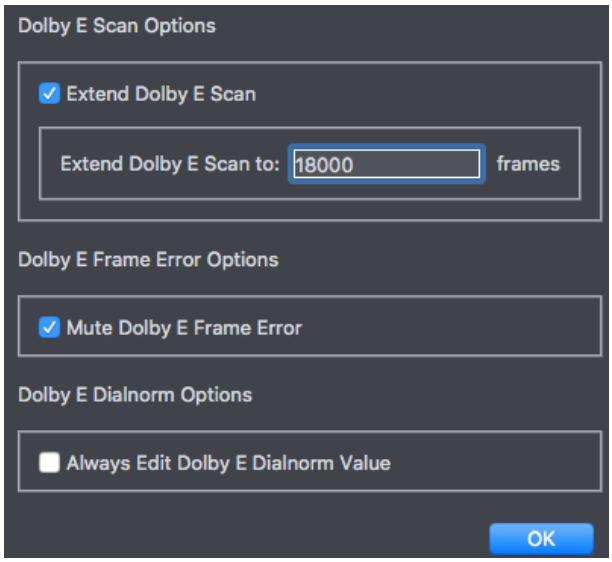


Tone Search Duration determines how long in to the file that **Eff** will look for tone. The "required period of silence" determines how long a silence needs to be to determine that this is the end of tone, and is normally three seconds for most standard formats.

Finally we can exclude very short periods of tone in case there are tiny fragments that are confusing the algorithm.

Generally you can enable this function for all media and never have to worry about the presence of bars and tone again.

Dolby Options



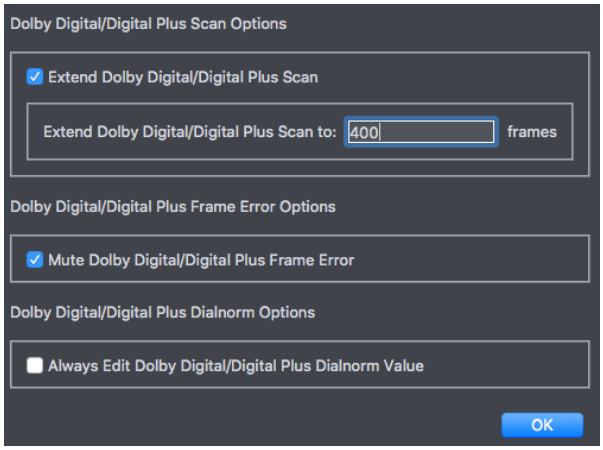
These options are part of the Dolby E option.

Extending the Dolby E scan determines how far into the file is searched looking for Dolby E. Whilst it is normal to have Dolby E encoded audio starting right at the beginning of the file, sometimes there is a section of PCM audio first. Using this option, you can configure **Eff** to find Dolby E audio that starts later in the file.

Muting Dolby E frame error is an option when processing Dolby E encoded files that contain errors. **Eff** lets you either reject the file, for strict checking of the Dolby E stream, or alternatively **Eff** can mute all the frames that contain Dolby E frame errors. If there are very few such frames, then muting is acceptable.

The 'dialnorm' is a piece of metadata written in to a Dolby stream, and acts as an instruction for end-user requirement on how to set the playback volume. This metadata is always set when **Eff** is used to correct the audio. However if you enable this setting, then **Eff** will set this metadata whilst doing a measurement only. Therefore you can set the metadata to the correct value as determined by the original loudness, without changing the actual audio itself.

Dolby Digital/Digital Plus Options



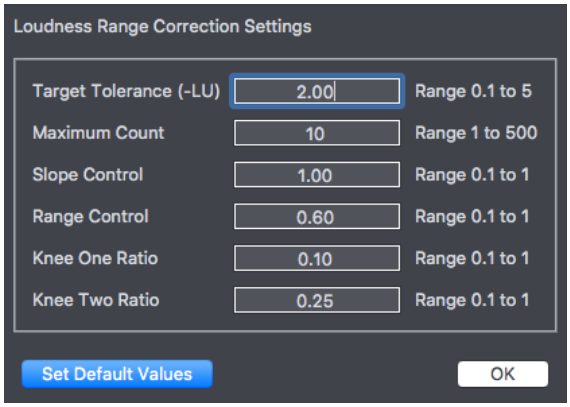
These options are part of the Dolby Digital Pro and Dolby Digital Pro Plus option.

Extending the Dolby Digital and Dolby Digital Plus scan determines how far into the file is searched looking for Dolby encoded audio. Whilst it is normal to have Dolby Digital encoded audio starting right at the beginning of the file, sometimes there is a section of PCM audio first. Using this option, you can configure **Eff** to find Dolby Digital audio that starts later in the file.

Muting Dolby Digital frame error is an option when processing Dolby Digital encoded files that contain errors. **Eff** lets you either reject the file, for strict checking of the Dolby Digital stream, or alternatively **Eff** can mute all the frames that contain Dolby Digital frame errors. If there are very few such frames, then muting is acceptable.

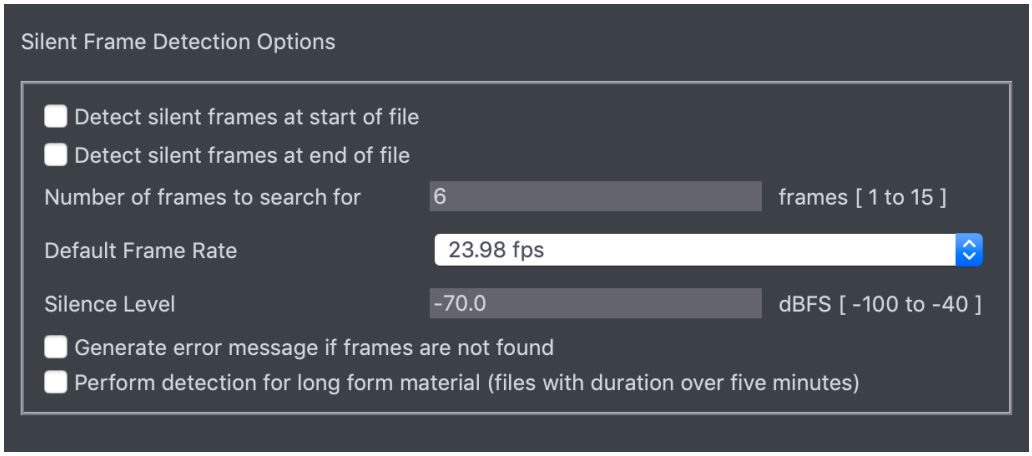
The 'dialnorm' is a piece of metadata written in to a Dolby stream, and acts as an instruction for end-user requirement on how to set the playback volume. This metadata is always set when **Eff** is used to correct the audio. However if you enable this setting, then **Eff** will set this metadata whilst doing a measurement only. Therefore you can set the metadata to the correct value as determined by the original loudness, without changing the actual audio itself.

Loudness Range Correction Options



This dialog contains settings to finely adjust the algorithm used for Loudness range (LRA) correction. We **do not** recommend changing any of these settings. However if you are getting unsatisfactory results when using the LRA processor, please contact the Technical Support department at Emotion Systems, for advice.

Silent Frame Detection Options



Eff has the ability to check for a number of silent frames at the start and/or end of files. Note this refers to the very start of the file. You need to specify the number of frames to check for. Since not all files contain frame rate information, you also need to specify this. You also have to chose an appropriate silence level which is useful, for example, with audio that may have background hiss/white noise.

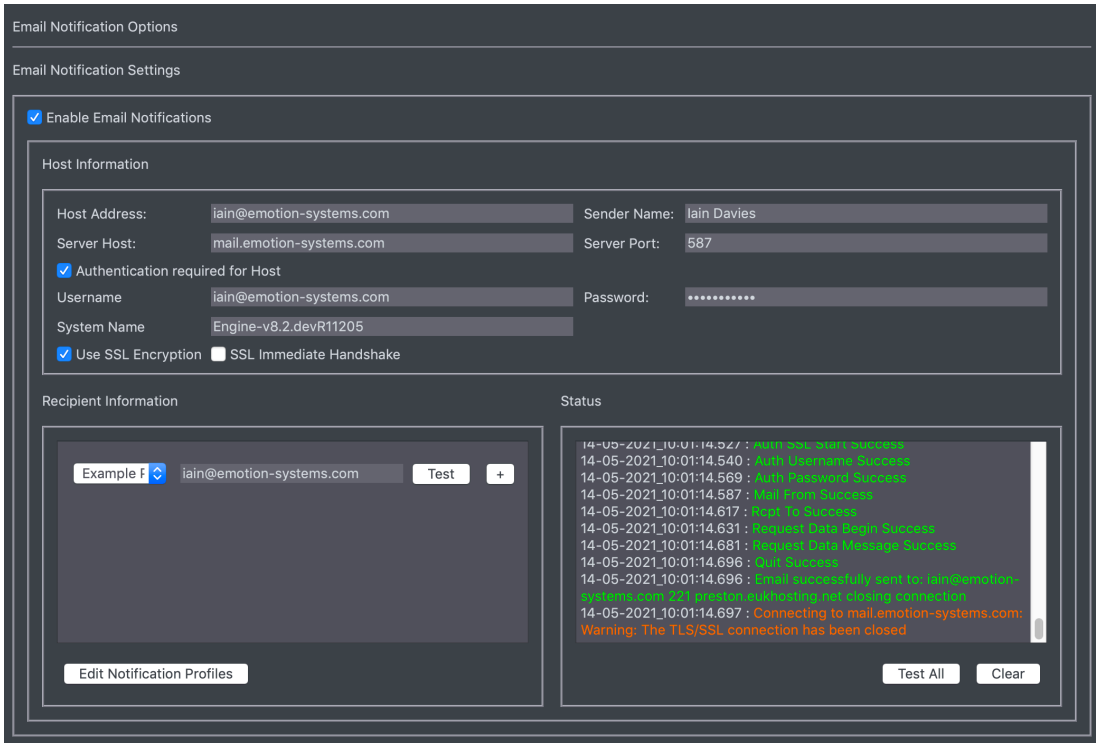
Eff will display an appropriate error message, and halt the processing if no matching silences are found, and the 'Generate Error' option is enabled.

AAC Encoder Options

The setting a used based on the file input bitrate value.
The maximum, where the slider is set to highest point, is 100%.
The lowest point of the slider is 50% the target data-rate.

Email Notification Options

Eff has the ability to send email notifications when configured events occur.



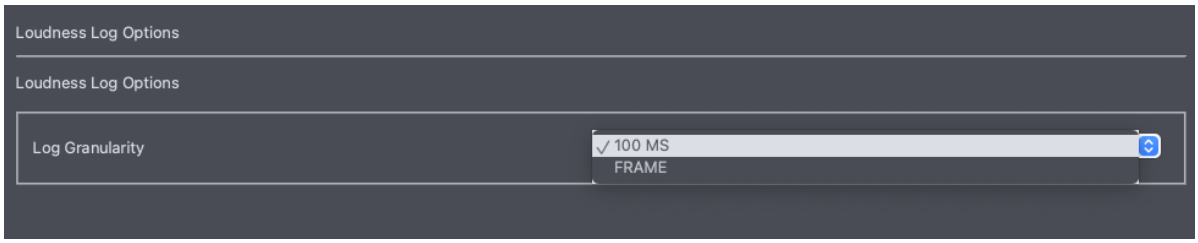
Start by configuring email details in the same way as you would on a regular email client. Note that you are entering details to send emails only, so the 'server port' is the SNMP port, not a receive port.

Once details are entered, click the 'Test All' button. This will try to send an email using the details that you have entered. The status display will show if this is successful.

Next you need to create notification profiles. These are the different circumstances for which you would like emails to be sent.

Lastly you choose one of these profiles, and type in an email address for that notification.

Loudness Log Options



The Loudness Log Option allows you to set the Log reporting to be set to either 100mS per logged detail or by per FRAME.

If you are using Report Logs with Eve (Emotion Verification Engine) you **MUST** use FRAME for the Log Granularity

IMF File Options

- *This is a future feature place-holder*

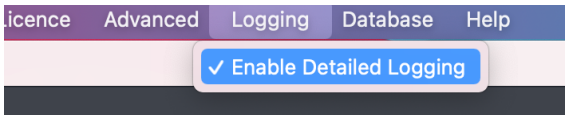
Watch Folder Options

See previous description. Section 2.

Cache Options

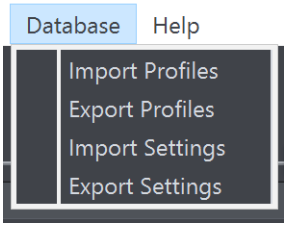
See previous description. Section 2.

Logging menu



This enables additional logging when running **Eff**, which can be useful if the software is performing incorrectly. The Emotion Systems technical support department will request these logs as part of debugging an issue.

Database menu



There are four choices which can be set into two sections:

1) Import and Export of Loudness Profiles
2) Import and Export of the Eff Settings

Import and Export Profiles

Selecting Import Profiles lets you open a previously exported XML file. You can then import any or all of the loudness profiles from that XML file, in to your database.

Loudness profiles can be exported and imported using this menu. Selecting Export Profiles displays a dialog of showing all loudness profiles in your database. You can select any or all of these, and export these settings to a XML file.

Import and Export Settings

This is a method of saving the specific settings set through the 'Advanced' tab using the Export Settings.

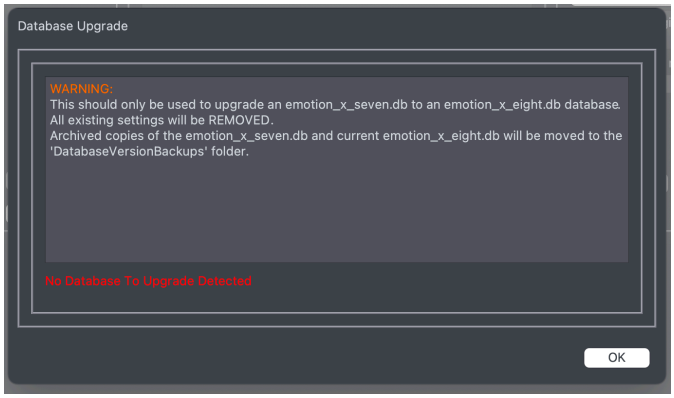
This allows to choose a location to copy it to and save it with a suitable name.

To retrieve the save settings you use the Import Settings. Navigate to, select and Import the saved Exported Settings file.

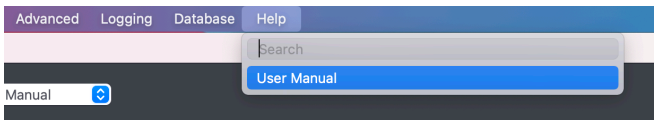
This is only supported when importing and export to the same release of Eff.

Database Upgrade

The Database Upgrade section is only relevant on older versions (version 7) of **Eff**. This option allows the user to upgrade from the version seven.db to eight.db.



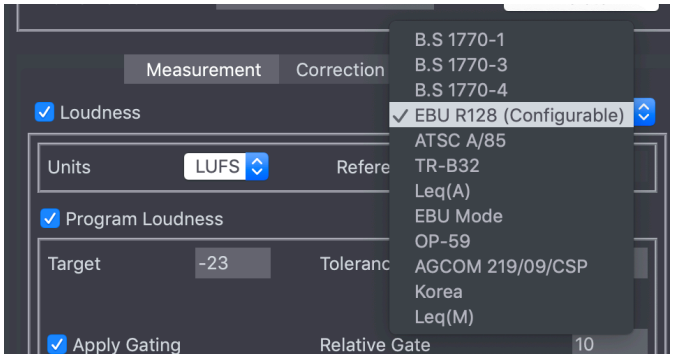
Help menu



This lets you open the PDF user manual that is installed with **Eff**. You will need a PDF viewer to be installed.

6. Parameters, Thresholds and Tolerances

Loudness Specification



The Loudness Integration Specification can be set to:

- B.S 1770-1
- B.S 1770-3
- B.S 1770-4
- EBU R128 (configurable)
- ATSC A/85
- TR-B32
- Leq(A)
- EBU Mode
- OP59
- AGCOM 219/09/CSP
- Korea
- Leq(M)

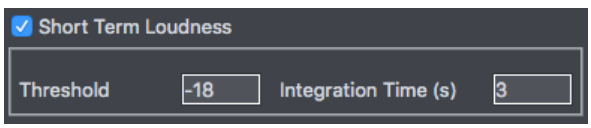
(Note that BS 1770-3 only differs from BS 1770-2 in that the True Peak measurement algorithm has been changed slightly. **Eff** measures loudness using the algorithm specified in BS 1770-2/3. **Eff** measures True Peak using the algorithm specified in BS 1770-3).

Each specification has slightly different properties including:

- Integration Time
- Units
- Gating
- Short Term and Momentary Options

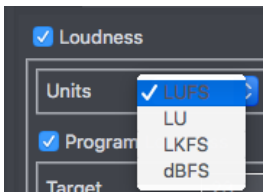
(See below for a detailed explanation of each specification)

Loudness Integration Time



The Integration Time specifies the sliding window time interval over which the loudness measurement is calculated. The value can be set from 0.1s to 29s. EBU R128 type applications can use two separate non-gated loudness measurement – Short Term and Momentary. They are in effect identical apart from Short Term uses a 3 second integration period and Momentary uses a 0.4 second integration period. **Eff** lets you change these times from the default values but note that if you do, you will not be measuring to the R128 specification.

Loudness Units



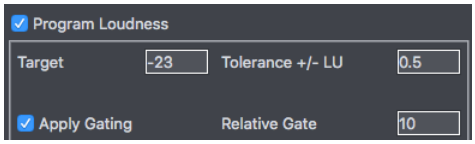
The Loudness Units can be set to LKFS, LU, LUFS or dBFS. These are dependent on which Loudness Specification is chosen.

If LU is chosen as the units, a reference level must also be set. If LUFS/LKFS, dBFS is chosen, the reference will be set to 0 and the Reference Line Edit disabled.

Loudness Range (LRA)

The Maximum Loudness Range, or LRA can be defined. This is the greatest value that the loudness range is permitted to be. LRA is somewhat related to dynamic range, but is a measure calculated to ignore the effects of the very loudest and the very quietest material, so is more representative of the range that commonly occurs. As a very rough guide, typical commercials might have a LRA of around 5, and typical sitcoms and documentaries might have LRA values under 10. However original cinema material could have LRAs exceeding 25, and such a wide variation is not always suitable for certain listening environments. Therefore it can be useful to measure and, potentially, to reduce the LRA.

Program Loudness



The Program Loudness Threshold can be defined. Program Loudness (sometimes referred to as Integrated Loudness) is a value taken over the entire duration of the file. It takes overlapping 400ms blocks and discards those below the absolute threshold of -70 LKFS to obtain a loudness value. It then calculates a relative threshold, which is a *definable LU value (referred to in **Eff** as the Relative Gate)* below this loudness value. It then discards all blocks below this relative threshold and calculates the Program Loudness value with the remaining data.

Program Loudness Tolerance

The Tolerance of the Program Loudness can be set. The tolerance concerns how much deviation from the set Loudness Value there can be, without being considered an error. Different Loudness specifications recommend different tolerances. EBU R128 specifies a zero tolerance for closed files as opposed to live material but a tolerance of 1 LU when working with live material, although a metering tolerance of +- 0.5LU is permitted. As this is a metering tolerance, we recommend that you always correct to the exact value (-23.0 LUFS for EBU R128). ATSC A/85 is normally used with a tolerance of 2 LU.

Loudness Specifications In Detail

B.S 1770-1

- Integration Time is variable. **Eff** will prompt 3s
- Gating is not applicable to this specification, so the 'Program Loudness' measurement is not available.
- Units are LKFS (LU may also be used).
- Threshold is variable. **Eff** will prompt -23 LKFS.

B.S 1770-3

- Integration Time is variable. **Eff** will prompt 3s
- Program Loudness is enabled for this specification. **Eff** prompts a threshold of -23 LKFS and a relative gate of 10 LU.
- Program Units are LKFS (LU may also be used).
- Threshold is variable. **Eff** will prompt -23 LKFS.

EBU R128 (configurable)

- This Specification allows two loudness measurements – Short Term and Momentary (both use the B.S 1770 algorithm)
- Program Loudness is enabled and values are variable. **Eff** prompts a threshold of -23 LKFS and a relative gate of 10 LU
- Units are LUFS (LU may also be used)

Short Term Loudness

- Integration Time is variable. **Eff** will prompt 3s
- Threshold is variable. **Eff** will prompt -23 LUFS.

Momentary Loudness

- Integration Time is variable. **Eff** will prompt 0.4s
- Threshold is variable. **Eff** will prompt -23 LUFS.

ATSC A/85

- This uses the B.S 1770 algorithm
- Gating is not selected but can be enabled
- Units are LKFS
- Threshold is usually -24 LKFS
- Tolerance is usually +-2 LU
- The optional Dialogue Intelligence algorithm provided by Dolby is normally used for A85 measurements, but is not compulsory according the the A/85 specification.

TR-B32

- Uses B.S 1770-3 algorithm
- Measures a single Program Loudness value over the entire file with threshold at -24 LKFS and a relative gate of 10 LU

Leq(A)

- This specification uses the Leq algorithm with an A-Weighted filter
- Integration Time is variable. **Eff** will prompt 10s
- Gating is not applicable to this specification
- Units are dBFS
- Threshold is variable. **Eff** will prompt -23 dBFS

Korean

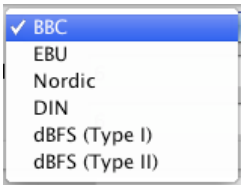
The Korean Loudness specification is based upon BS1770-3, with the addition of a special CSV log mode. This log mode lets you create CSV (and XML) files containing all measured Loudness values, logged at 100ms intervals. The logs are available in the lower half of the user interface, to the right of the graph display.

Leq(M)

- This specification uses the Leq algorithm with a M-Weighted filter

PPM Scale

This determines which PPM Scale to use.
The PPM Scale can be set to BBC, EBU, Nordic or DIN. Nordic and DIN use Type I Ballistics. BBC and EBU use Type II Ballistics. The scale can also be set to dBFS using either Type I or Type II Ballistics.



PPM Threshold

The Maximum PPM Threshold can be defined. This is the greatest value that the PPM is permitted to be. Any value above this will be considered an error. This value can be defined as a decimal.

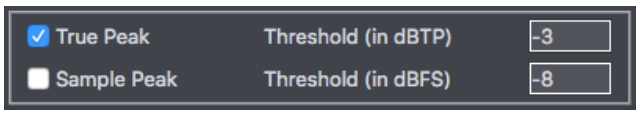
PPM Tolerance

The Tolerance of the PPM Values can be set. The tolerance concerns how much deviation from the set Loudness Value there can be, without being considered an error. This value can be defined as a decimal. (This parameter is only considered in the measurement settings)

Volume Meter (VU)

A Volume meter can be used as an alternative to the PPM meter. This option allows users to specify a threshold and tolerance as well as specify which scale to display the values on. Options include Direct, US/Australia and France scales; each with different reference values.

True Peak



The Maximum True Peak Threshold can be defined. This is the greatest value that the True Peak is permitted to be. Any value above this will be considered an error.

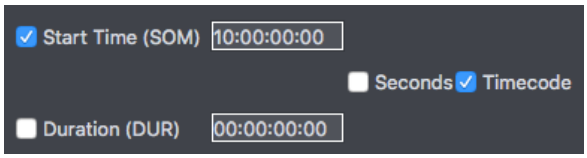
Sample Peak

Sample Peak is based upon actual samples, so this measurement finds the highest sample in the content, then compares this to the maximum possible sample in the scale and expresses the value in dBFS format.

Measurement/Correction Window

Eff has a feature to define a measurement window, such that **Eff** only measures audio within this window. If the window is used, the audio levels are only adjusted within this window. This covers the issue of line-up tones, or other unwanted material from leading to an incorrect measurement.

The 'Measurement/Correction Window' works in two different ways, depending on whether you choose 'Seconds' or 'Timecode'.



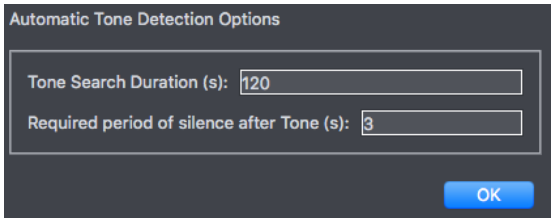
If you select 'Seconds' then you can enter a Start Time, which is the delay from the very beginning of the file, before measurement and correction starts. The second parameter, Duration, is optional, but if a value is entered, this is defining a 'window'. Audio within this window is measured, and potentially adjusted, whilst audio outside this window is entirely unchanged.

The 'Timecode' option is only suitable for use with files that contain a defined timecode. A start timecode value is entered in a similar way compared to using the 'Seconds' mode. However this start timecode is now an absolute value, not a delay from the start of the file. For example, if the file does have timecode, and the first frame in the file is 09:58:45:00 and a start value of 10:00:00:00 is entered, then **Eff** treats the file as starting at 9:58:45, and 'plays' the file until timecode 10:00:00:00 is reached, then starts measuring. In this case, this would give the same results as being in Seconds mode, and specifying a Start value of 75 seconds.

The 'Duration' value in Timecode mode is still treated as an offset, so in the above example, to have a duration of 30 seconds, the Duration value would be entered as 00:00:30:00.

Detect and Ignore Tone

Under the measurement window there is an automatic method for detecting the region of bars and tone at the start of many media files, and excluding this from the measurement and correction process. On the main application menu bar, in the Configure menu, you can select ‘Tone Detection Options’ to configure this feature.



7. Licencing

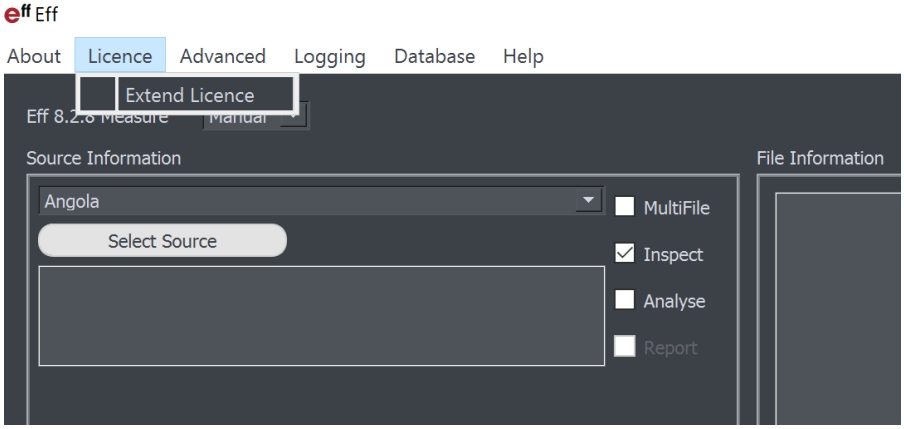
Eff uses a software licensing scheme.

All versions of **Eff** have a licence menu. The options vary depending on whether you are using evaluation software, or have purchased a full licence. For full licences, this opens a dialog providing a range of options.

Evaluation Licenses

Extend Licence

The Engine Evaluation licence is valid for 10 days. Under special circumstances, it is possible to extend the duration of an evaluation. Please contact support@emotion-systems.com for details.

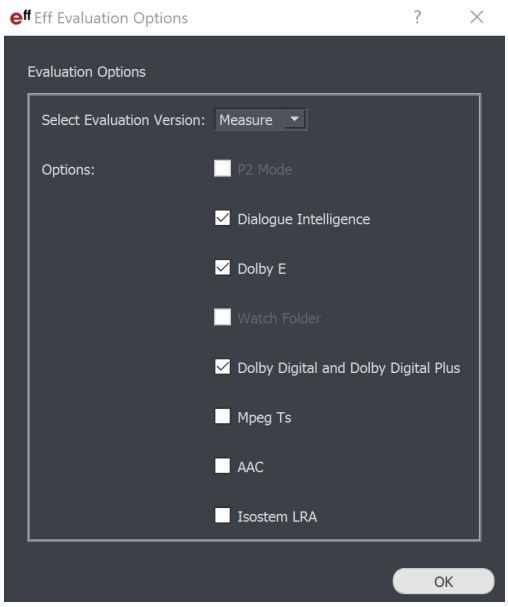


Eval Options

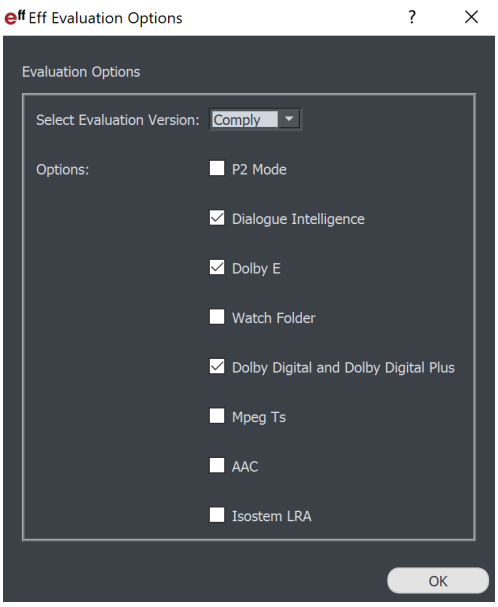
This dialog lets you enable or disable different options during an evaluation.

When you start of evaluation, you can set additional options which are reflected as licenced features.
Here are the default screens prior to evaluating features. These features are enabled by ticking the corresponding boxes, this will give you a chance to try the different different features and see which you need.

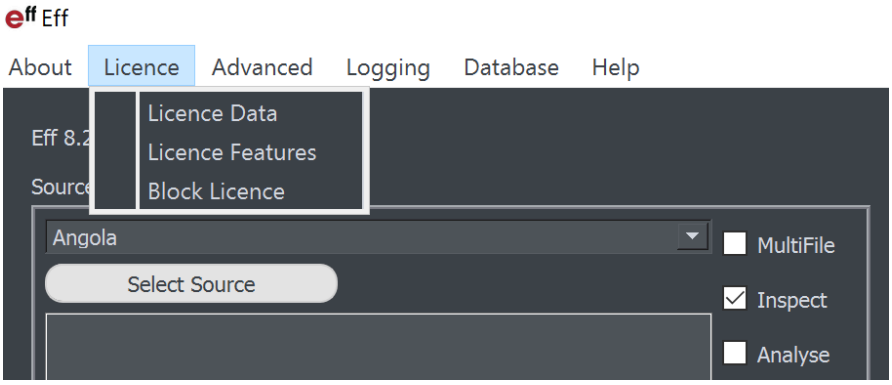
Measure:



Comply:

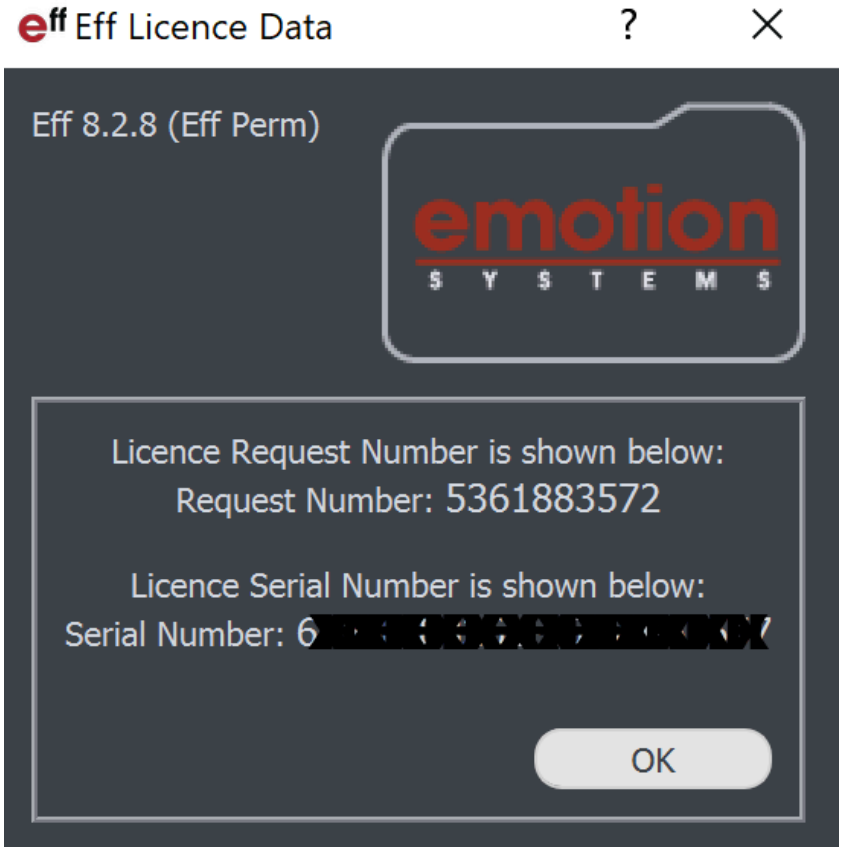


Permanent Licences



When the Permanent Licence **Eff** installer is used, you are prompted to do the initial activation, and the Eff application can only be opened once this is completed.

Licence Data



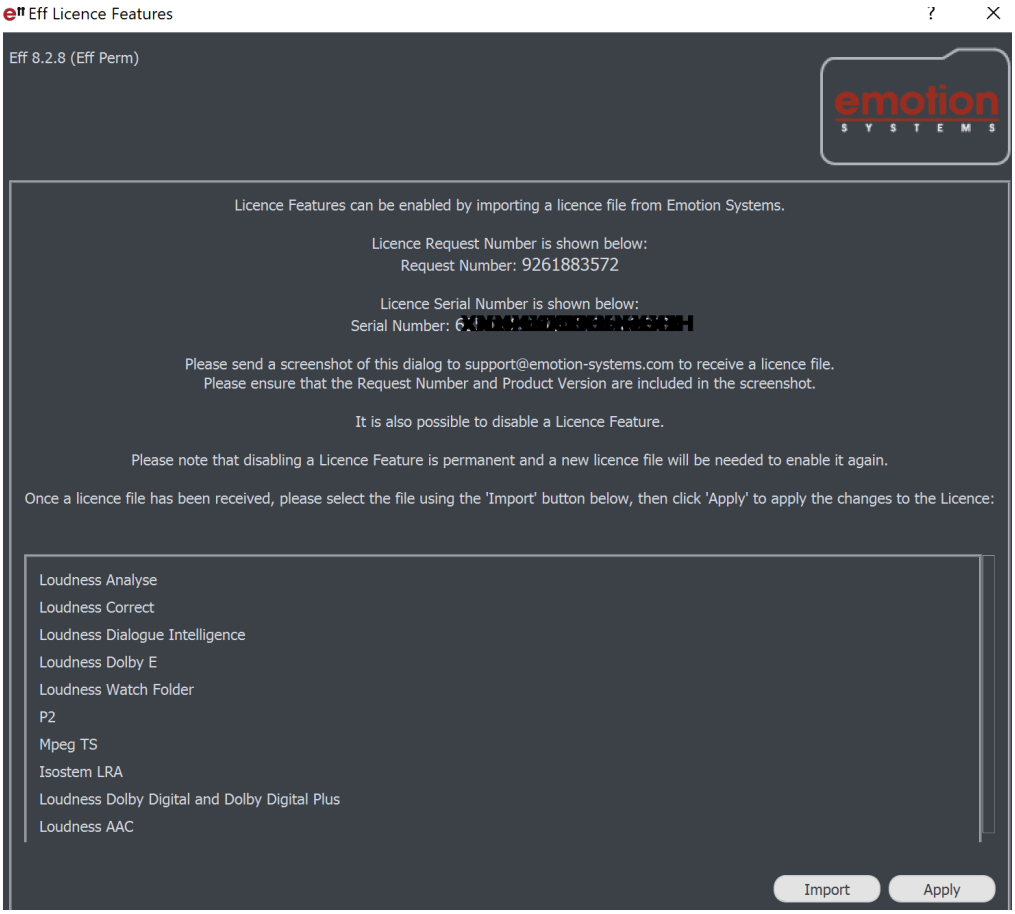
This displays information on the Engine licence, including the Serial Number and the Request Number. If you have to contact Emotion Systems with any licence questions, you will need to provide this information.

Licence Features

Licenced features are added by support@emotion-systems.com supplying a features file in the form as an xml file. These are customer specific and are supplied when **Eff** is purchased or if they are upgraded.

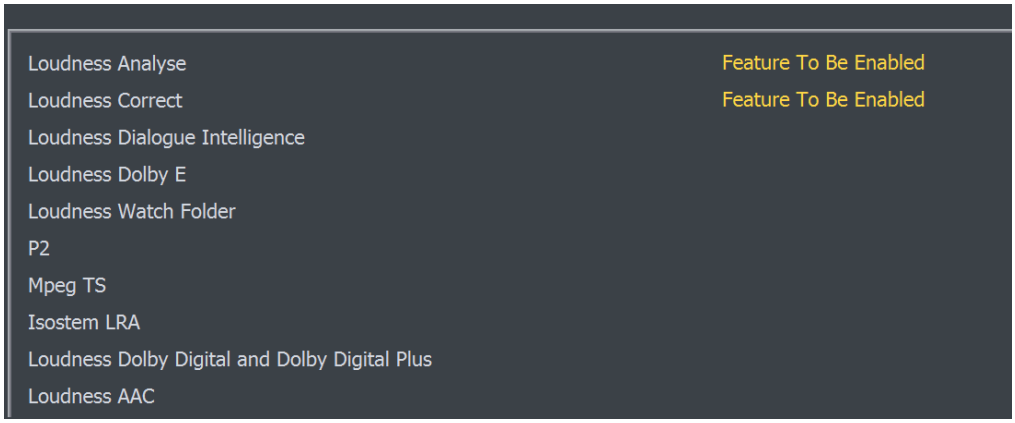
After **Eff** has been activated the next step is to apply the initial features xml file. This will be supplied in the same email as the activation code.

Once **Eff** is started, the user will need to go to Licence > Licence Features.

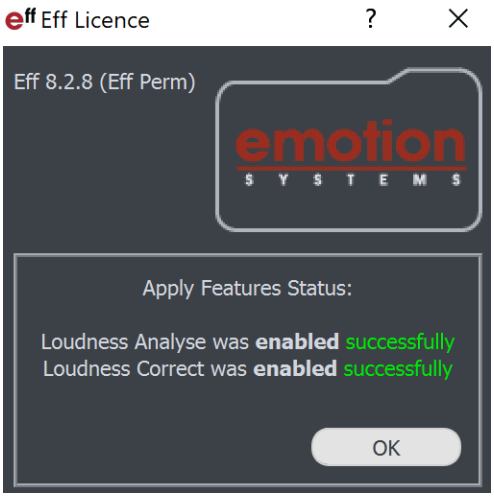


Make sure you can access the features xml file, click on the Import button.

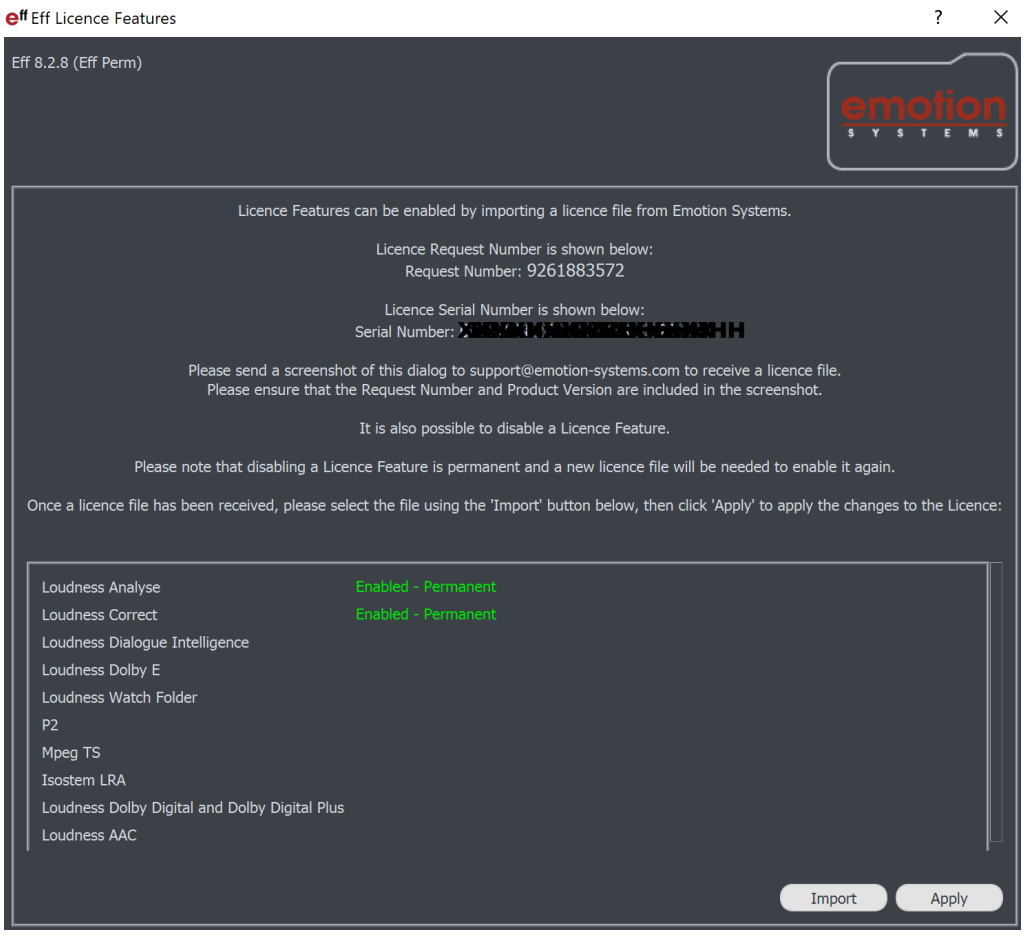
Navigate and select the xml file .



and then click on Apply.



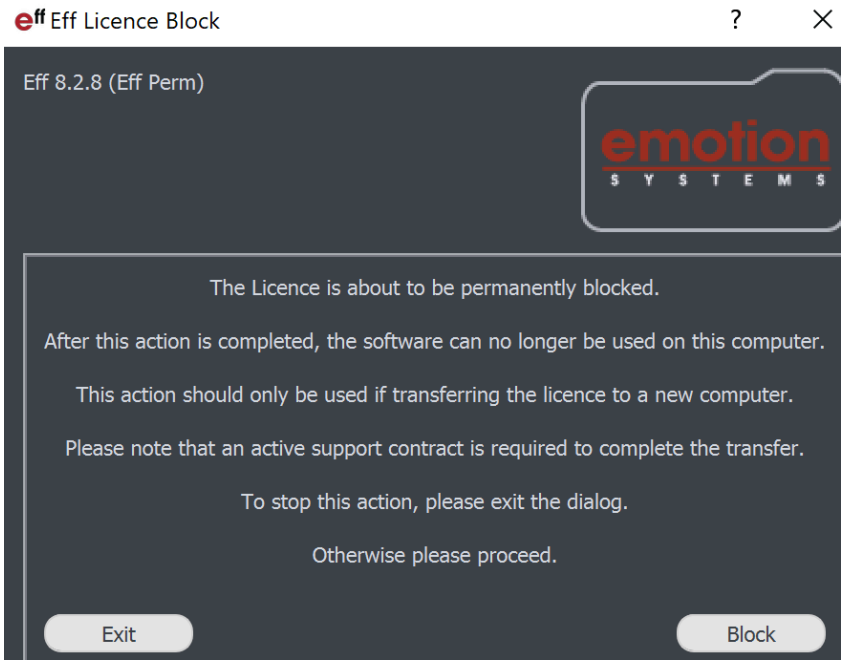
This dialog displays a list of all possible options, and shows which you currently have enabled. If you have purchased additional options after the initial purchase, this dialog is used to activate them.



If new features are purchased a feature xml file will be issued by support@emotion-systems.com.

That file will need to be applied using the same process as when the initial featured was installed.

Block Licence



This dialog is used to block the licence on the current computer, as a prelude to moving the licence to a new computer. Before blocking the licence, open the Licence Data dialog and take a screenshot of that information. Then, after confirming that you wish to block the licence, a window opens displaying two numbers. You will need to send those two numbers to Emotion Systems, in order to free up the licence for reinstallation. Contact support@emotion-systems.com before doing this procedure. If you open this dialog inadvertently, remember to click the 'Exit' button, not the 'Block' button.

Activation Data

This displays information relating to your license. Note however that only the first 20 or so digits of your serial number are displayed. Do not use this part serial number when installing and re-licensing on to a new computer, as only the original and full serial number will work. The full serial number is shown on your original delivery note, and copies of this are available on request from support@emotion-systems.com

8. Frequently Asked Questions

What are PPM, VU and Loudness?

PPM (Peak Program Meter) is a commonly used measure, showing the (near) instantaneous level of the audio. Frequently there is a second meter added, supplying a ‘peak hold’ function, making it easier to see the maximum levels reached.

The PPM measurement is specified in IEC 60268-10. There are two ballistics in common use (ballistics refers to the speed of response, so how quickly the metered reading increases or decreases as the signal increases or decreases). The ballistics are called 'Type I' and 'Type II'. Type I ballistics are used in DIN PPM measurements. Type II ballistics are used in BBC and EBU PPM measurements.

VU (Volume Unit) is a simpler method of measuring the volume of a file. This meter measures the amplitude of the signal sent through without applying filters, although a large averaging function is added to both the rise and fall of the meter, giving it a 'slow' response. It is considered rather outdated since the introduction of PPM and Loudness meters.

Loudness is a newer measurement, and attempts to put a figure on ‘how loud’ the material appears to be to the listener. How a person ‘hears’ the loudness is based on many factors, such as type of programme material, the listeners mood and health, and whether they like the programme material, so it is quite subjective. The Loudness measurement attempts to put a number on how an average listener might respond to the programme material.

Why are Loudness and PPM important?

Loudness and PPM are used as references to control the maximum audio levels in broadcast material. The issue is that a program and the commercial that follow it may have the same maximum PPM levels, but the commercial will frequently be perceived as louder. Having a loudness measurement means that there is now a tool such that the audio levels in the commercial may be adjusted to provide the same perceived loudness as the program that preceded it.

What is BS 1770/1771?

BS1770 is an ITU standard, which provides the basic algorithm for measuring Loudness. It also contains the algorithm for true peak measurement. BS1770 does not state which averaging period to use, nor what thresholds are appropriate. BS1771 is the ITU standard, which describes how a real time loudness meter should look and respond. In relation to **Eff**, the important detail from BS1771 is that it introduces the concept of measuring in LU, or loudness units, which are arranged such that the target loudness is 0LU. BS1770 measures using LKFS, or Loudness Full Scale, K weighted. On the LKFS scale, the target loudness will be a negative figure, such as -18 LKFS. Technically speaking, LU and LKFS are not the same as dB. However the specification is designed such that a change in level of 1 dB will change the LU or the LKFS figure by a value of 1.

There are three different versions of BS 1770. The most recent is BS1770-3 and this supersedes the previous version. The essential changes in the different versions are as follows

BS1770 – original. Defined loudness measurements
BS1770-2. Added a specific gating method, now used for Program Loudness.
BS1770-3. Included a tightly defined True Peak measurement algorithm. This was loosely defined in previous versions, meaning that equipment from different manufacturers could give different readings. With the algorithm specified in BS1770-3, True Peak readings from any product should agree.

What is EBU R128?

R128 is a specification written by the EBU. It uses the loudness algorithm in BS1770 as its core technology, but R128 specifies three different scenarios, and the threshold and averaging periods for each scenario. Two of these are very similar to BS1770, whilst the third adds a gate function, which excludes very quiet signals from the calculation of the result. The R128 specifies reporting values in LUFS, or Loudness Units, Full Scale.

What is True Peak Measurement?

The PPM measurement contains a small amount of time averaging of the audio. Thus the actual instantaneous level may be higher than the PPM value. Additionally, as audio is converted from digital to analogue, a Reconstruction filter has to be used. This filter has to recreate values 'between' every pair of sample points, which could be higher or lower than the value of the actual samples. In fact, the true peak level of audio is often around 8dB higher than the maximum PPM value. For the audio not to clip when converted to analogue, there must be sufficient headroom available for the True Peak measurement not to exceed 0dB, which is why the maximum PPM value is always set less than the maximum.
EBU R128 states that the true peak level should not exceed -1dB.

What file formats does Eff support?

Currently **Eff** supports wav (including Broadcast wav and RF64 wav), mov, AIFF, MPG and OP1a and OP-Atom MXF files. In all file types, the **Eff** supports up to 8 channel audio or up to 16 channel if the '16 channel' option is purchased. Both 48kHz and 44.1kHz are supported.

For MOV files, **Eff** supports uncompressed RGB, or YUV Quicktime video formats. It also supports most formats with compressed video as long as they have uncompressed audio.

What are Momentary, Short Term and Program Loudness?

These are terms introduced in EBU R128 to classify loudness measurements made with different integration times. Momentary loudness uses an integration time of 0.4 seconds whereas short term uses 3 seconds. Program loudness gives a single loudness value for the entire file, that is to say the integration time is equal to the total file length. Program loudness also uses a gating technique to calculate the total loudness.

What is 'Gating'?

This is a term used in EBU documentation; aimed at reducing the impact of background noise and clutter on the loudness value of a file. If a specification includes something like -6 Relative gate, or -6rel, this means that the gate audio level works 6 LU below the main measurement threshold. So if your threshold is -23 LKFS, then the gate would be -29 LKFS. So the gate threshold is -6 LKFS relative to the main threshold.

What is Loudness range (LRA)?

This measurement describes the difference between the minimum and maximum loudness values measured in a program. It is a statistical measure, and avoids extremes, so that a single very loud gunshot during a program will not affect the LRA measurement. The EBU R128 does not specify a maximum permissible LRA figure, but suggests it should be monitored to ensure the figure remains fairly constant. As a guideline, the EBU suggests that the LRA is unlikely to exceed 25 LU.

Why do some files take longer to fix?

Some of the Quicktime files may take longer to fix due to their size. During fixing, the entire file must be copied, not just the audio data, and this can take several minutes. The wave files, which are much smaller, take significantly less time to copy. In terms of fixing - having a fast disk subsystem will speed up copying time and therefore reduce the time it takes to fix the file.

Some measurements are slower to calculate than others. For example, True Peak is computationally the slowest value to calculate, so adding or removing this calculation from a profile makes a significant difference to the processing time.

9. List of Units used in Loudness Measurements

- **LU -** This stands for Loudness Units, defined in BS1771
- **LKFS** - Loudness units, Full Scale, K Weighted, defined in BS1770
- **LUFS** - Loudness units, Full Scale, defined in EBU R128.
- **dBFS** – Decibel, Full scale used for measuring volume with PPMs
- **Reference Level** - This applies to measuring loudness on the LU or LUFS scales, and is the offset applied to the results of the loudness calculation, such that the target figure is defined as 0 on whichever scale is chosen. This does not apply when using the LKFS scale.

10. Computer Specification

The following workstation specifications are recommended in order to take full advantage of the **Eff** application:

Eff is available on Windows, Mac OSX and Linux systems. The software is compatible with all 64 bit versions of Windows 8.1 to Windows 10, and Server 2012 and Server 2016, together with all versions of Mac OS from 10.7 (Lion) to Catalina (10.15), alternatively you can run versions 8.2.7 and 8.2.8 of **Eff** on Big Sur.

(Note **Eff** is a 64 bit application so can not be installed on to 32 bit operating systems)

Mac OS 10.8 onwards require a manual configuration change to the Security and Privacy settings before **Eff** is permitted to run.

To make this change, open the 'System Preferences', then select the Security and Privacy icon. On the General page, as shown above, you must **allow apps** to be downloaded from – **Anywhere**. Once this change has been made, **Eff** can be downloaded and installed.

Windows XP is not supported and will not work. Windows 7 (64bit) is not supported, but may work.

For processing WAV and AIFF files, any computer of modest specifications is suitable. A dual core pentium based system with 4GB RAM is likely to be fine for short form, whilst 8GB minimum would be required for long form content (ie audio duration greater than 90 minutes)

For processing uncompressed QuickTime and MXF, especially for long form content, a decent specification is required, due to the size of the basic files. We recommend a recent generation Core i7 based machine with minimum 16GB RAM, or better, to achieve best performance.

For watch folder based applications, where files are stored on the network, the limitations on processing times are likely to be the speed of the network and the speed of network-based storage. If the watch folder is on a network disk, then we recommend fitting the **Eff** computer with a second hard disk, and assigning this as a cache folder, within the watch folder settings (Local File Cache Options, from the Configure menu). Using a fast disk in the **Eff** computer can make a substantial difference. Therefore we recommend using a 1TB SSD.

If this user manual does not cover any specific issues, please contact
support@emotion-systems.com
Tel +44 (0) 1635 522 786

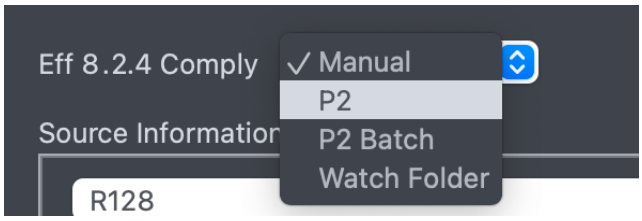
Appendix 1. P2 File Processing

Eff has a special mode to support P2 files. This is a separate option and is not included with the standard product.

P2 files should always exist within a defined directory structure. At the 'Root' there is a folder named 'CONTENTS'. Within that folder should be folders titled 'AUDIO', 'CLIP', 'VOICE', 'ICON', 'PROXY' and 'VIDEO.

These folders contain one or more video files, in OP Atom MXF format, plus all the audio associated with each separate video file, again in OP Atom MXF format. There are are BMP files showing thumbnails for each video sequence, plus XML files that contain the structure of each separate sequence. The P2 fileset supports multiple video and associated audio sequences within the CONTENTS container, and the media may span multiple MXF files.

To use P2 files within **Eff**, start by selecting 'P2' or 'P2 Batch' from the main drop down, at the very top left of the UI. The main UI changes to the P2 UI.



P2 mode is used when manually processing a single P2 fileset, and provides access to all the normal **Eff** measurement features, such as display of graphs and logs and so on.

P2 Batch mode is intended to be used when working with a file system containing a number of individual P2 filesets. In this mode, operation is largely automated

Select your appropriate profile, which is configured in the usual way from the 'Settings' section, and then click to 'Select Root Folder'. In the 'File Open' dialog, navigate to a CONTENTS folder, and select it. Do not navigate into the CONTENTS folder itself – it is necessary to choose the actual CONTENTS folder.

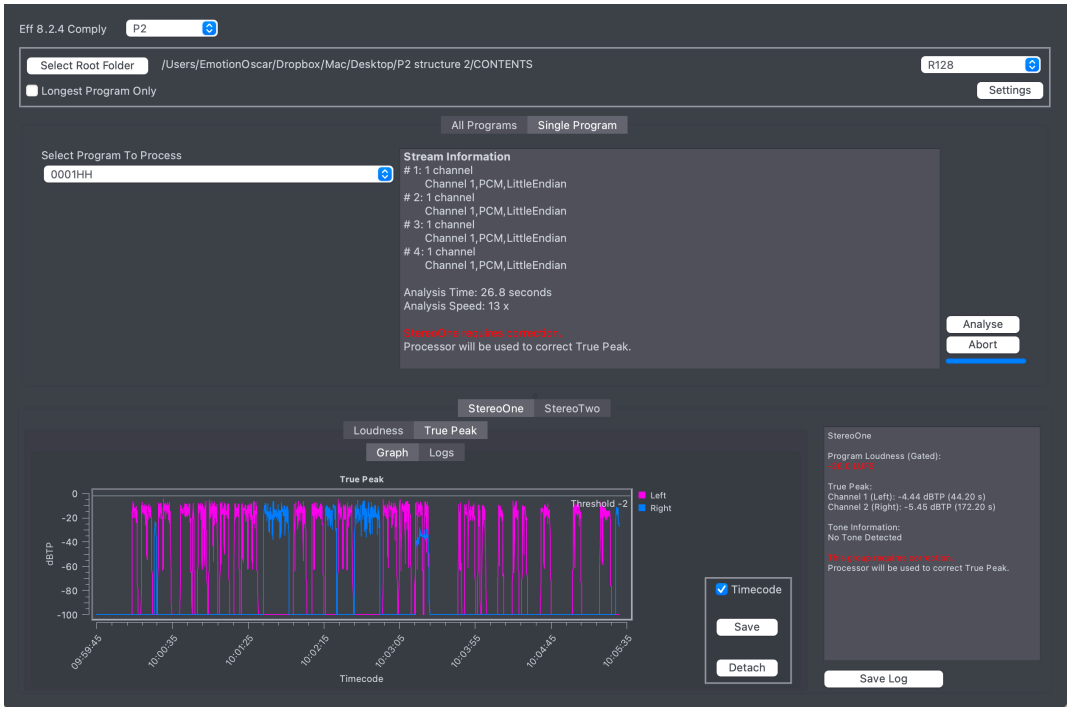
The UI will now display a list of all 'programs' found within the P2 fileset, towards the top of the UI, and underneath is shows a scrollable list of the various clips contained in the CONTENTS folder. The list displays video thumbnails, a list of how the material is spanned across multiple MXF files (if applicable) and a list of all the audio files associated with each clip. Where the video spans across multiple files, the name of this particular clip is highlighted in green and its position in time is shown in relation to the other clips that are related.

There is a 'check-box' for each clip, where you may choose whether to include each particular clip for processing.

All clips that are selected will be analysed, by clicking the 'Analyse All' button. If the 'Correct Files' check box is ticked, then new files will be created.

In order to maintain the integrity of the P2 fileset, all newly created files adopt the same name and folder locations as the original source files. The original files are moved into a new folder called 'OLD_AUDIO', which also includes a timestamp in the folder name.

The default analysis and processing takes place on the 'All Programs' tab. If you wish for the normal **Eff** type interface, and full details for each item, select the 'Single Program' tab. Note though that 'Single Program' gives access to the full set of analysis tools, but does not provide any new file creation features. To adjust levels and create new files, it is necessary to use the 'All Programs' tab.



In this section, you start by selecting an individual program to analyse/process, from the drop down on the left. The drop down contains the list of all programmes, with the spanned ones correctly shown as containing multiple clips.

During processing, **Eff** will open the required audio files that match the selected video program, and takes into account the channel layout defined in the main Settings.

Once the selected program has been analysed, the usual status information, graphs and logs are accessible from the UI.

Appendix 2. Dolby E Support

Eff can optionally support Dolby E. There is also an option to use Dolby's Dialog Intelligence measuring algorithm. Dolby functions are not included in the standard product.

As a loudness compliance tool, the Dolby option lets **Eff** open a Dolby E encoded media file, such as MXF. Once the file is selected, **Eff** can decode the audio to PCM, measures the levels and compares those measurements to any of the Loudness standards supported in **Eff**. Then **Eff** can modify the audio to make it comply to a loudness standard, re-encode the audio back to Dolby E, then wrap it back into a file that is identical to the source, apart from having modified audio levels and modified Dolby E metadata.

When used in this way, **Eff** can measure Program Loudness using the whole duration, as required in R128, or it can measure dialogue only, using the optional Dolby Dialog Intelligence algorithm.

Loudness Compliance operations with Dolby E encoded files

When **Eff** is used to analyse files, the detection of Dolby E encoded tracks is automatic. If no Dolby E tracks are discovered, then the channel layout information configured in the profile is used. If any Dolby E encoded tracks are detected, then all other tracks are treated as stereo PCM tracks. The layout for the Dolby E track is determined by the Dolby metadata.

If **Eff** is used to adjust the loudness of Dolby E tracks, then the new file will contain the same structure as the source. PCM stereo tracks in the source will be adjusted independently. The separate sections within the Dolby section are also adjusted independently. For example, if the Dolby data indicates a 5.1 track and a stereo track, then the levels in the 6 channels of the 5.1 are adjusted up or down in order to make the loudness of the 5.1 grouping meet a target value, and the levels in the 2 channels of the stereo are also adjusted up or down to make that signal meet the loudness requirement. Therefore different adjustments are made to the stereo as compared to the adjustment made to the 5.1 data.

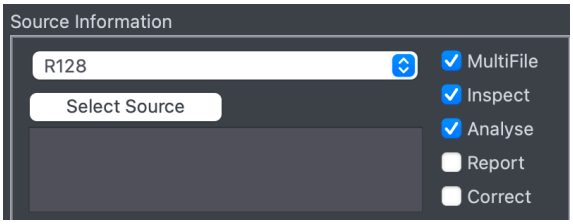
In the case of loudness compliance, the Dolby metadata in the output file is largely unchanged, and there is no user control of this metadata.

Appendix 3. Multifiles Support

In most cases, media files contain multiple audio channels within a single file. For example, an MXF file might have 16 tracks of audio, which could be split into a mixture of stereo and 5.1 groups.

However sometimes material is supplied as a number of individual mono files, and two files have to be used together to create a stereo group, and six files have to be used together to create a 5.1 group.

To cater for this possibility, **Eff** has a 'Multifile' option, selected by ticking the check box to the right of the 'Select Source' button. Note that Multifiles are only supported in **Eff** Comply.



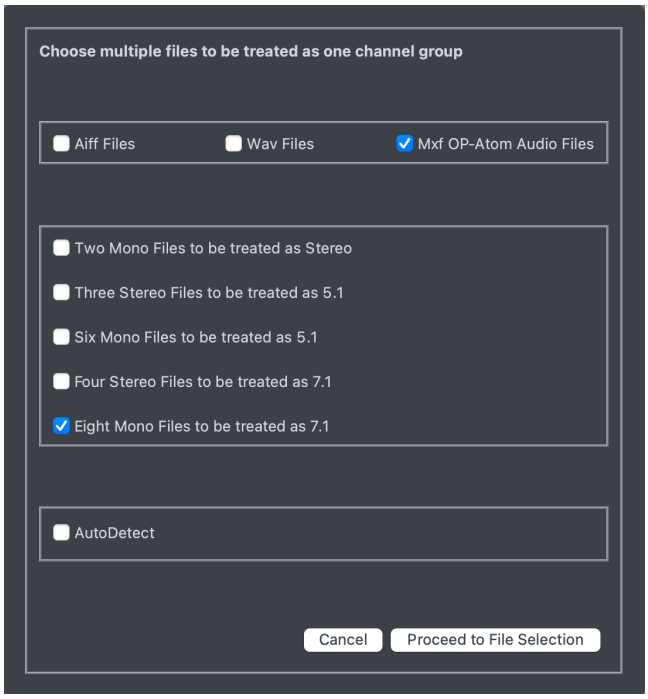
With Multifile selected, **Eff** works in a similar way to normal, but additional dialogs appear when choosing files to analyse. **Eff** internally merges the files, and measures True Peak, PPM and VU for each individual file, and measures your chosen loudness parameters across the merged file. Note that if a 5.1 grouping is selected, the LFE channel is not included in any calculations of Loudness. However all six channels will be adjusted if **Eff** is being used to correct a file. Multifile works with WAV, AIFF and MXF-OP-ATOM files.

Eff supports the following groupings of individual files-

- 4x stereo as 7.1 audio
- 8x mono as 7.1 audio
- 6x mono files for 5.1 audio
- 3x stereo for 5.1 audio
- 2x mono for stereo.

Multi-files Operation

To use multifiles, select the check box and click 'Select Source'. Firstly select whether the source files are WAV, AIFF or MXF-OP-ATOM, and then select the number of files to open, and how the audio should be grouped.



For 2x monos acting as stereo
Load the independent left and right channel files into the appropriate box.

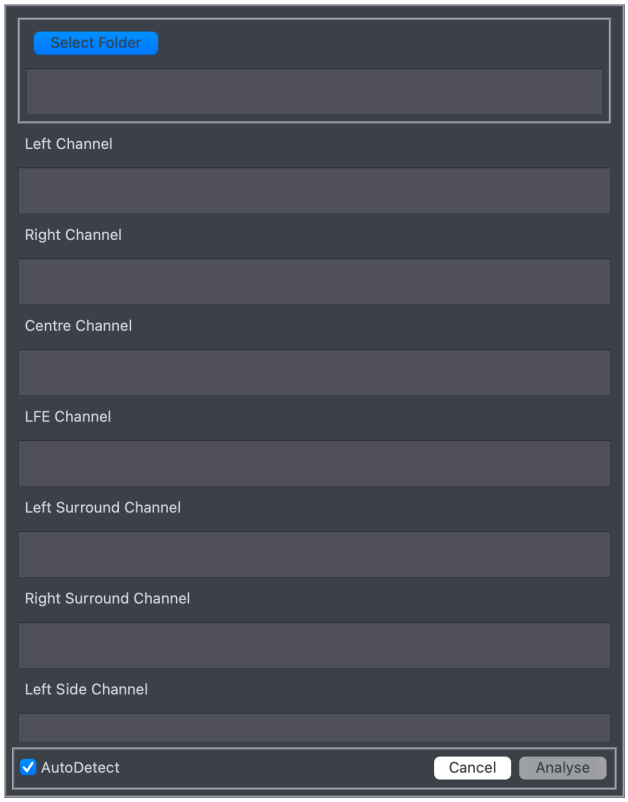
For 3x stereos acting as 5.1
Load the files containing left and right, central and LFE, back left and back right into the appropriate box.

For 6x monos acting as 5.1
Load the files containing left, right, left back, right back, central and LFE channels into the appropriate box.

For 8x monos acting as 7.1
Load the files containing left, right, centre, LFE, left back, right back, left side and right side channels into the appropriate box.

For 4x stereos acting as 7.1
Load the files containing left and right, centre and LFE, left back and right back, left side and right side channels into the appropriate box.

Clicking ‘Proceed to File Selection' takes you to a dialog to select all the different files that you need **Eff** to measure. However, if the 'AutoDetect' box is selected, then a 'Configure' button appears. Selecting this displays a dialog where you define a unique string that **Eff** searches for in the filenames, and thereby can automatically assign files to the correct channels.



The user designates a 'string' for each channel and **Eff** will search a folder of files for the appropriate string in the filenames, and use that file as the corresponding channel. Common practice is to number files from 0 to the maximum, or to use .L. .R. .C. .LFE. .Ls. .Rs. somewhere in the filename, and to have a '.' character before and after the unique identifier. Note that the search strings in this dialog are CASE SENSITIVE. Once these are entered, click Save. You now have to specify a folder that contains the set of files for the particular job. Note this implies that each folder can only contain the multifiles for one job. Each additional fileset must be stored in a unique folder.

Once the files have been internally combined and measured, you have a couple of choices. If you have included the optional 'WAV Extract' facility, then you can create a single WAV file that contains the data from the individual files. Thus this creates multi-channel WAV files.

If you wish to loudness process the files, you must then select a destination folder. Note that **Eff** creates new files having the identical filenames to the original files, and therefore the new files must be written in to a new folder.

When **Eff** processes a set of files, it always applies the identical adjustment to all channels. So to adjust the Program Loudness, identical gain or attenuation is applied to all channels. If you are using the True peak Processor, then the amount of processing is determined by the channel with the highest True Peak value, but the amount of correction required to correct that channel is also applied to all other channels. This ensures that the 3D location of a sound is not affected, as it would be if only a single channel were processed.

Appendix 4. Copyright Information

Logos

The Emotion Systems logo and the **Eff** logo, both as shown below, are trademarks of Emotion Broadcast Systems Ltd and must not be used without permission.

Licenses

Emotion Systems software uses libraries from the FFmpeg project under the LGPLv2.1

The **Eff** products include three libraries – avcodec-53.dll, avformat-53.dll and avutil-51.dll

These libraries are not modified by Emotion Systems. No part of the FFmpeg libraries used by Emotion Systems are owned by Emotion Systems, and Emotion Systems puts no restrictions on the use of FFmpeg libraries supplied with **Eff** software beyond those required by the FFmpeg project. Although Emotion Systems software is supplied under a EULA, the FFmpeg libraries are specifically excluded from this EULA.

Source code for the three specified FFmpeg libraries is available on request from Emotion Systems, or can be downloaded from www.ffmpeg.org

Additional information on FFmpeg may be found at http://www.ffmpeg.org/