Introduction

TAPClean Front End ("TAPClean FE" henceforth) is a graphical environment for analyzing and handling the contents of tape images in TAP and DC2N DMP format.
It relies on the engine provided by TAPClean, a console application derived from Final TAP (console version) whose source code is distributed under the terms of the GPL license.

TAPClean FE is not just a front end program as its name might suggest. In fact, it incorporates unique features not found in TAPClean, such as:

- Interactive report of the tape contents with graphical breakdown
- Hex monitor, Disassembler, and CBM BASIC untokenizer for PRG files
- TAP editor
- TAP splitting tool
- TAP repair tool for CBM files
- Graphical TAP/DMP analysis tool

Please note that TAPClean FE is not distributed under the terms of the GPL license, yet it is freeware.

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Final TAP is (C) 2001-2006 Stewart Wilson, Subchrist Software.

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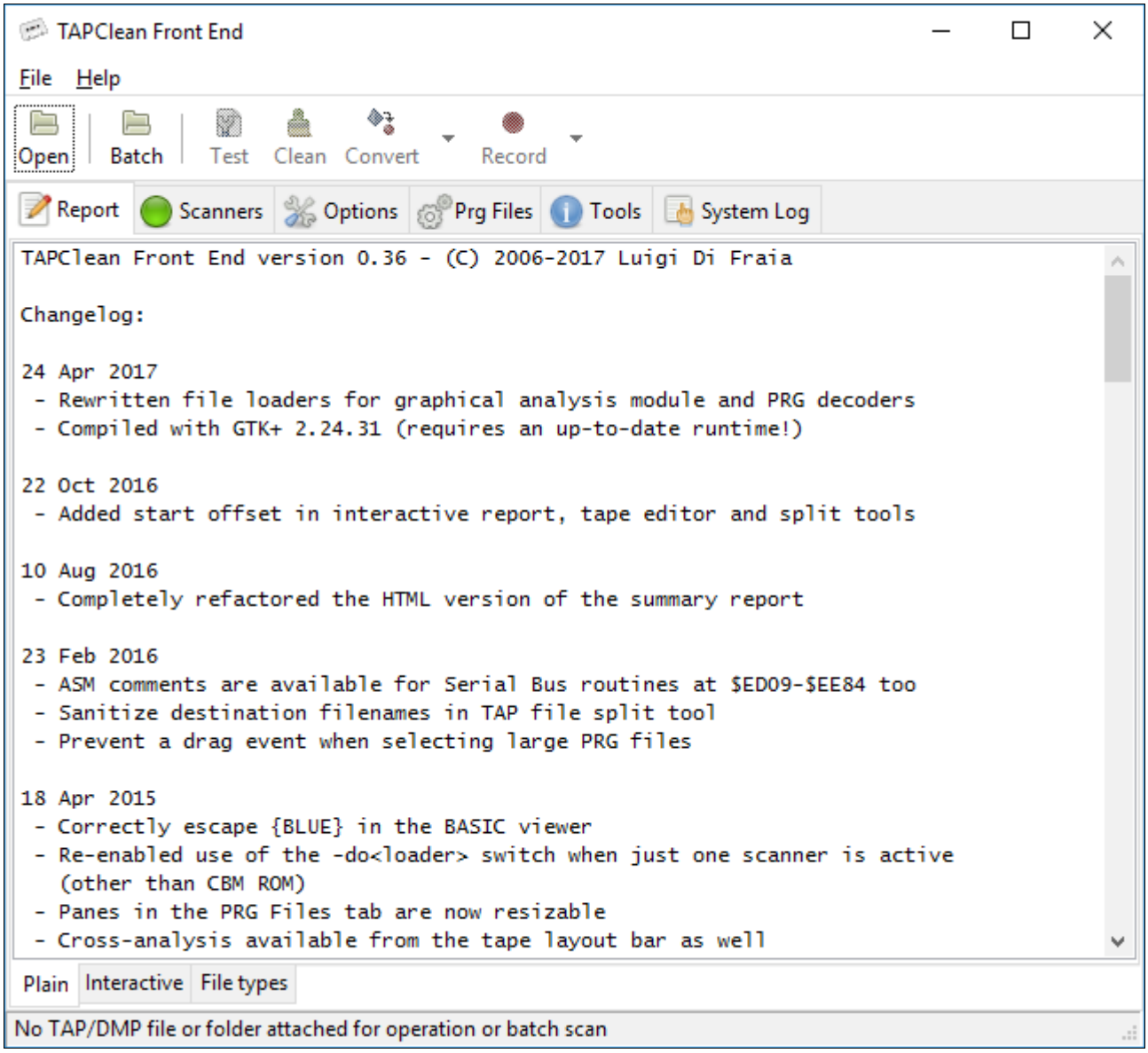
Installation

TAPClean FE doesn't include an installer. For manual installation, the contents of the distribution archive need to be extracted in a location of the file system where the user has write permission.

In order to maximize user experience and ease of use, TAPClean and TAPClean FE are distributed together in binary form for Windows and Debian/Ubuntu Linux. TAPClean FE requires the GTK+ 2.24.31+ runtime installed under Windows.

Executing TAPClean FE

Upon starting TAPClean FE, the main window is displayed.



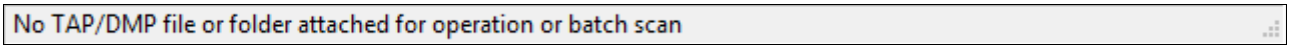
The Toolbar - part 1

The toolbar area comprises 6 buttons, 4 of which are initially disabled.

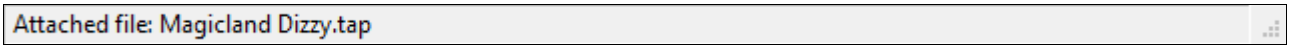
Open

This button is used to select a TAP or DC2N DMP file to work with. Upon selecting a file all of the toolbar buttons are enabled to start working with that file:

When no file has been selected yet, the status bar looks as per image below:



If a file is then selected, the status bar keeps track of the filename:



By default when TAPClean FE is executed it looks for the environment variable TAPHOME: If found, the "Open" command initially refers to the folder as specified by TAPHOME.

Batch

This button is used to perform a batch analysis of all of the tapes contained in a folder. The analysis can scan subfolders recursively if configured in the options (see later).
It should be noted that up to version 0.24 the batch analysis was only available for TAP files in TAPClean. Batch analysis of DC2N DMP files was introduced in version 0.25.

As with "Open", "Batch" initially refers to the folder specified by TAPHOME, if defined.

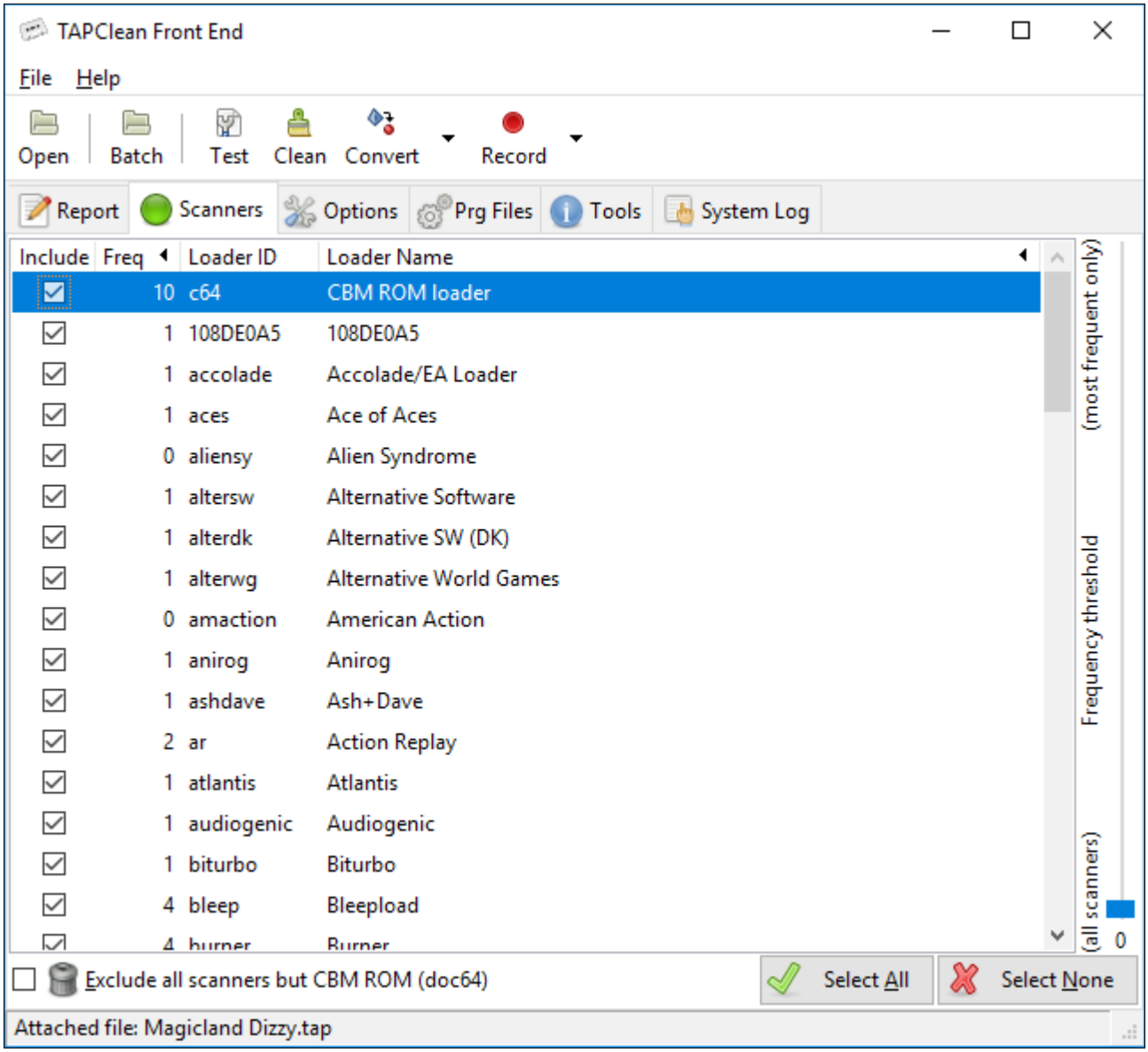
Prior to discussing the function of the other toolbar buttons, it is convenient to have a look at the various options that can be configured to perform a tape image analysis.

The Tabbed area - part 1

This area comprises a number of tabs, two of which are used to show the analysis report and the execution log. These will be discussed in detail later on, when we'll look at the analysis controls.

Scanners

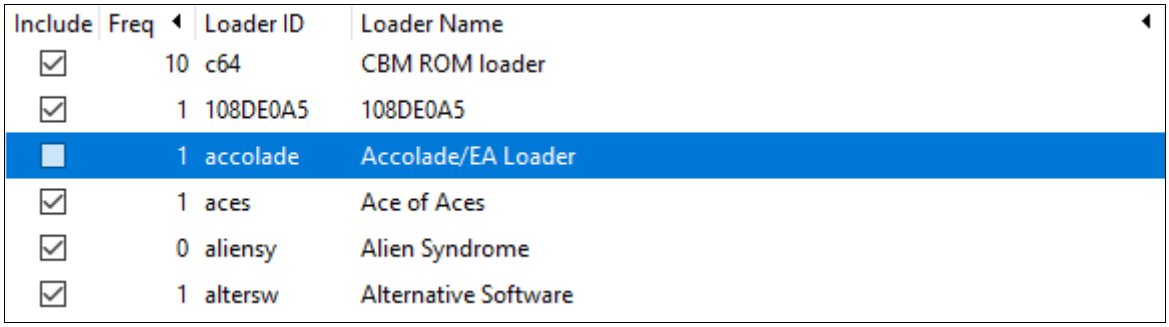
This tab contains a list of the file formats that are searched for and checked for integrity, where possible, within the opened tape image. The component in TAPClean that looks for each format is referred to as "scanner", hence the reference here.



The list shown above is entirely read upon startup from the file *scanners.txt* that's located in the folder from where TAPClean FE is executed (i.e. the current working directory). The

only exception is about the CBM ROM one which is built-in and does not require inclusion in *scanners.txt*.
Using the copy in the current working folder means that the application can be forced to read in and use a different subset of scanners (e.g. a stripped down list of the available ones), based on the current working directory. Symbolic links can be created to obtain this result as well.

This list can be controlled directly, by checking in or out any subset of the scanners (excluding the built-in CBM ROM one), as shown in the example below where the "Accolade/EA Loader" has been excluded:



Include	Freq	Loader ID	Loader Name
☑	10	c64	CBM ROM loader
☑	1	108DE0A5	108DE0A5
☐	1	accolade	Accolade/EA Loader
☑	1	aces	Ace of Aces
☑	0	aliensy	Alien Syndrome
☑	1	altersw	Alternative Software

The reason for which a subset of scanners may require being excluded during the analysis is that they may trigger false recognitions. File type mismatch is often the reason beyond an incomplete recognition or recognition with errors in TAPClean.

It should be noted that the order in which the scanners are used in TAPClean is relevant. If an area of the tape image file has been acknowledged to use a certain format by mistake then, under normal circumstances, that area cannot be acknowledged again while looking for another file format.
Finally, the order in which the scanners are used in TAPClean is not as shown in the above list. The order is hardcoded in TAPClean and has been engineered based on experience.

In case of large tape images where the file formats in use are already known, it may be worth selecting just those file formats, to speed up the analysis process and avoid misrecognition as well. The "Select None" button button comes handy in those circumstances where users want to check out all of the scanners because just a few ones need to be selected.

Similarly, the "Select All" button would check back in all of the scanners for usage.

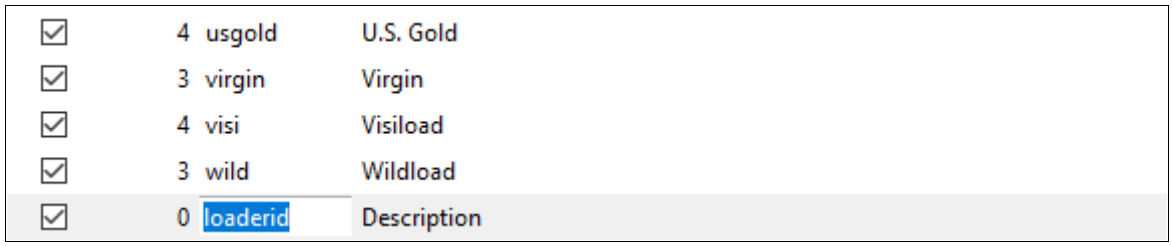
An additional mechanism for scanner selection is based on their frequency of occurrence in commercial tapes. Normalized frequency values have been selected based on field expertise. Only those scanners whose frequency of occurrence is greater than or equal to the selected "Frequency threshold" are activated.

The "Exclude all scanners but CBM ROM (doc64)" checkbox is used to override the settings for what concerns checked in and checked out scanners. If this option is enabled then the only active file format searched for during the analysis is the CBM ROM one.

It is often convenient to activate this option where it's known that the only file format used in a tape is the CBM ROM one. Also, it may be useful to activate this option to make a quick scan of the selected tape image and let TAPClean guess which formats are expected to be therein. This attempt is done by checking the CBM ROM files (usually part of the boot sequence) for known portions of code that uniquely identify a file format (also referred to as "signatures").

A right mouse click over the list of scanners brings up a contextual menu as per image below:

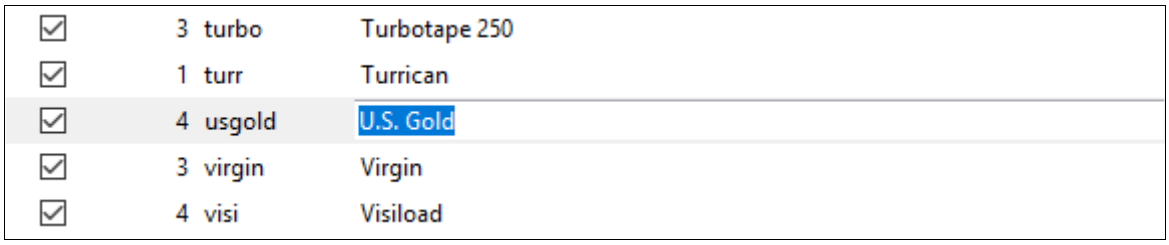
The first available option is "Manually add a scanner", which adds a row to the list of known scanners in edit mode:



At this point the user can enter the loader id, "<loaderid>", passed as argument to TAPClean (which is automatically prepended by "-do"/"-no") to include/exclude the new scanner when it is checked in/out. The frequency of occurrence along with a description can be provided for the new scanner as well.

The reason for which a new scanner can be defined is that support for that scanner may be added in TAPClean but not yet listed in TAPClean FE until the next update of the latter, which comes with an up-to-date version of *scanners.txt*. In fact, the latter is intended to be part of TAPClean at some point of its development.

Similarly, the details of an existing scanner can be changed by clicking on the values for that scanner:



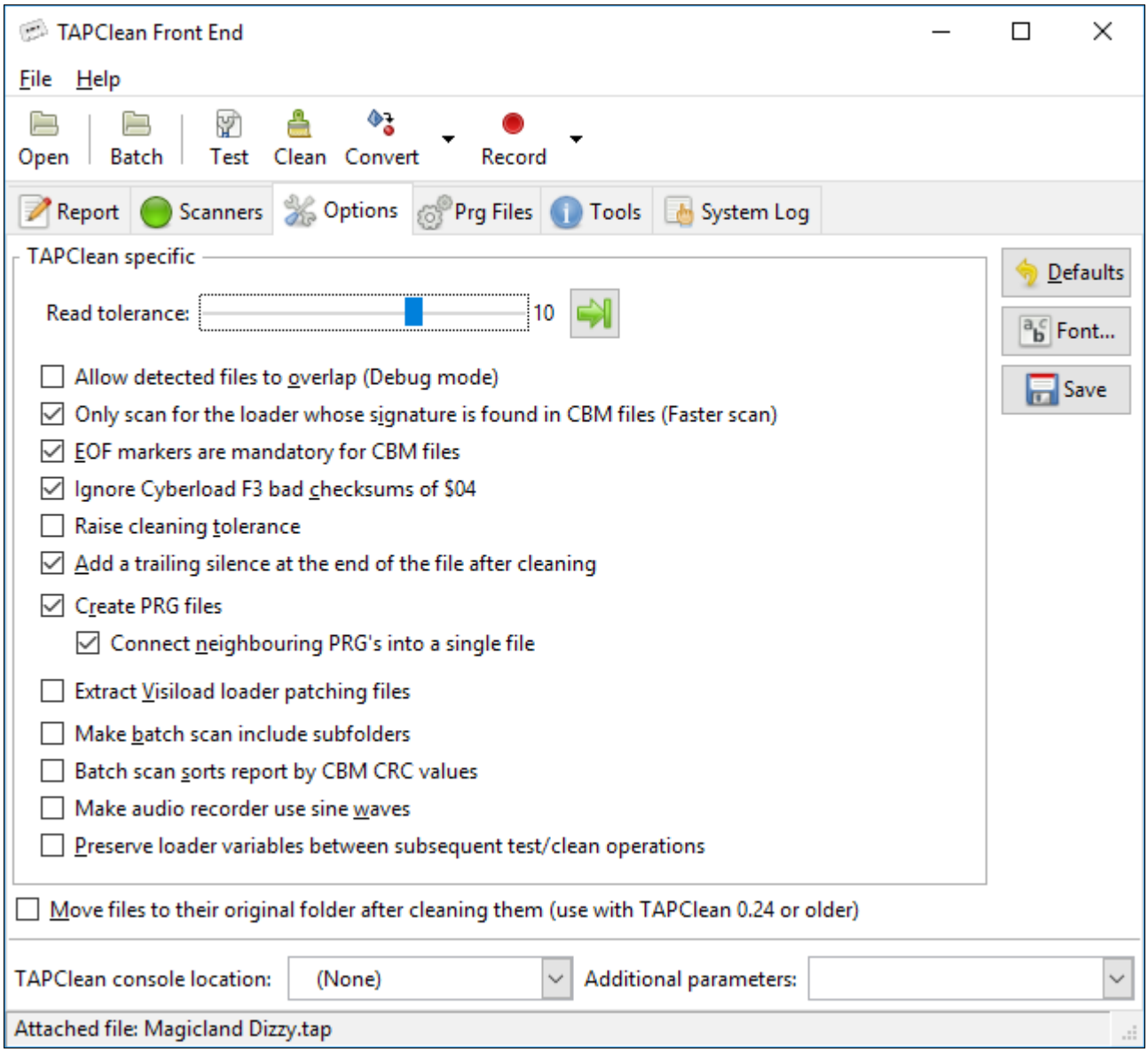
Finally, it should be noted that the list of known scanners can be alphabetically ordered by clicking on the attribute "Loader Name". This may come handy when renaming an existing scanner or adding a new scanner to the list.

When satisfied with the list of scanners, the user can save it by using the context menu option "Save current list". The list gets created/overwritten (without confirmation) in the

folder from where TAPClean FE has been executed.

Options

This tab contains the configurable options that are handed over to TAPClean to affect the type of analysis done and the results produced.



Read tolerance

This is the value of the read tolerance used when pulses in a tape image are checked against the optimal values expected for each known format.
The default value of 10 should be sufficient for the main part of the tape images, unless of course the quality of the tape image is not very good, which would produce read errors during the analysis. In the latter case the user may try to increase this value. It is advised to check the quality of the tape dumping process if the default value doesn't apply to any of the tape images that have been made during the process.

Allow detected files to overlap

This option should only be used when in the analysis report (more on this later) GAPs (i.e. unrecognized areas) appear where it is expected to find data files.
In fact, what may happen is that due to a failure, either at the medium level or with the tape dumping process, a silence appears within a data file. In TAPClean the position of silence points is identified in the very beginning of the analysis process. Since files cannot overlap with other files or silence points that have already been recognized, the original data file in which the silence appears does not get recognized at all.
The user can allow detected files and silence points to overlap. It's usually a question of unexpected silence points within other files and not file overlap in the sense the word "overlap" could suggest.
The results may get messy in case of misrecognition: when allowing file overlap one area of the tape image can be recognized to use more than one format, thus resulting in unexisting data files. It is for this reason that a tape image cannot be cleaned while file overlap is enabled.

Only scan for the loader whose signature is found in CBM files

If this option is enabled then the set of running scanners is reduced to the one (including its variants) whose signature is found in the CBM files at the beginning of the tape image. Of course, if this option is enabled and a known signature is found in the CBM files then the analysis process may be a lot faster. The drawback occurs when the tape image also contains additional files using a format that is not the one whose signature has been found: these files will not be recognized, thus producing GAPs.

EOF markers are mandatory for CBM files

Even if uncommon, some CBM files lack the end of file markers. What happens is that those files will not get recognized during the analysis. Disabling this option will improve the detection percentage of CBM files that lack those markers, for they will be acknowledged during the analysis.

Ignore Cyberload F3 bad checksum of $04

It has been discovered that sometimes Cyberload F3 files come with a wrong checkbyte, whose value is $04. This would result in a checksum error condition in TAPClean that is concerned to check data integrity by actually verifying files against their checkbytes where available.
With Cyberload F3 a wrong checkbyte value of $04 should not be considered as an indicator of file corruption. Therefore, if this option is enabled then a wrong checksum value of $04 in Cyberload F3 files doesn't trigger a checksum error in TAPClean.

Raise cleaning tolerance

If this option is enabled then the upper limit of the tolerance used to discriminate pulses during the cleaning process can grow far past the read tolerance value.

Add a trailing silence at the end of the file after cleaning

If this option is enabled then a 5 second trailing silence is added at the end of the file after cleaning.

Create PRG files

If this option is enabled then file data is extracted to PRG files. PRG files can then be inspected by means of other tools embedded in TAPClean FE and grouped in the tabbed area named "Prg Files".

Connect neighboring PRG's into a single file

If this option is enabled then a block of data that spans across multiple adjacent files is joined into a single PRG file.

Extract Visiload loader patching files

If this option is enabled then Visiload loader patching files are decoded and their CRC value used to calculate the overall CRC of the data within the tape image. Also, PRG files are created out of them if PRG creation is enabled.
Those Visiload patching files are used by the Visiload loader to modify its own code during the loading process. They usually contain a few ASM instructions of no interest to the end user.

Make batch scan include subfolders

If this option is enabled then the batch scan is performed recursively on subfolders.

Batch scan sorts report by CBM CRC values

If this option is enabled then the batch scan report is sorted by CBM CRC values. This feature has proven to be really useful to identify games that use the same file format. In that case, there's a good chance that the contents of the first CBM Data file are the same, thus producing the same CRC value.
In fact, it is common with commercial software on tape that the first CBM Data file contains the loader used to load the remainder of the files at a higher speed. That's why these are often referred to as "turbo loaders".

Make audio recorder use sine waves

If this option is enabled then sine waves are used instead of square ones by the audio converter to sample the resulting audio file. More on the audio converter later on.

Preserve loader variables between subsequent test/clean operations

If this option is enabled then loader variables are stored and re-used for subsequent test/clean operations. This is particularly useful for testing "side 2" of those tapes whose loader parameters can only be extracted from "side 1", e.g. Cyberload in "The Last Ninja".

Move files to their original folder after clean

If this option is enabled then each cleaned file is moved to the folder where the source file is. It should be noted that this option is not handed over to TAPClean but provided by TAPClean FE itself. Also, this option is only meaningful for releases of TAPClean older than 0.25 as starting from such version the file is moved by TAPClean itself.

TAPClean console location

This is the folder where TAPClean is expected to be found. It defaults to the folder from where TAPClean FE has been executed. This also means that different versions of TAPClean can be used in conjunction with TAPClean FE simply by starting TAPClean FE from a different location or using this option to pick up the version of TAPClean the user wishes to work with.
Under normal operations it is advised to keep TAPClean and TAPClean FE in the same folder, along with *scanners.txt*. It should also be noted that if TAPClean is not found then TAPClean FE will not complain.

Additional parameters

This is a group of additional parameters silently passed to TAPClean. The dropdown button provides a list of valid built-in parameters.
As example, VIC20 tapes can be analyzed by passing the -20 parameter to TAPClean.

Buttons

The "Defaults" button is provided to restore default values.
The "Fonts..." button allows selection of the fonts used in text areas of the application.
Finally, the "Save" button saves current option values to the system folder for local application data (falling back to the application folder if not possible).

The Toolbar - part 2

This paragraph covers the details of tape image analysis, cleanup, and conversion.

Test

This button is used to perform the analysis of the tape image that has been previously opened. Despite of the fact TAPClean can analyze more than one tape image when executed, thus preserving some information between each analysis, it's not actually possible to do so by means of TAPClean FE. The analysis refers to just one tape image in turn.
When the analysis is finished, the tabbed areas "Report", "Prg Files", and "System Log" are updated with information about the analysis.

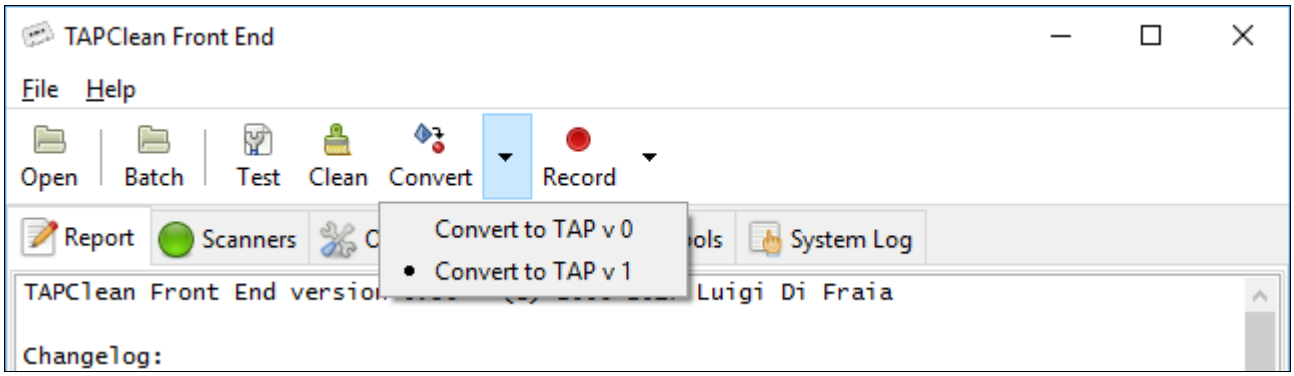
Clean

This button is used to perform the analysis and cleaning of the tape image that has been previously opened. Despite of the fact TAPClean can analyze and clean more than one tape image when executed, thus preserving some information between each analysis, it's not actually possible to do so by means of TAPClean FE. Just one tape image in turn can be processed.
When the cleaning process is finished, the tabbed areas "Report", "Prg Files", and "System Log" are updated with the relevant information.

Please note that the purpose of cleaning a tape image is not to save disk space. Yes, a cleaned file improves compression ratio, but that's not the point.
Tape images are cleaned to restore their quality and remove noise. The cleaning process often changes the total load time of a program because of the fact the image is completely remastered using average timings that are not recalculated on a per tape basis.
It is strongly advised to keep the raw tape image somewhere safe for future comparison. Besides, if it is proven that the cleaning process is buggy and gets fixed, the user will later on be able to clean the raw image properly.

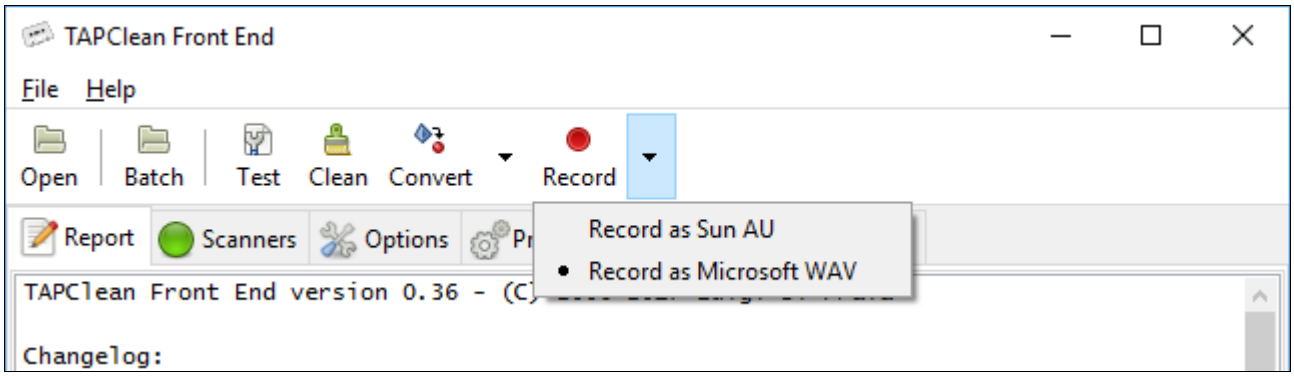
Convert

This button is used to convert the opened file into either TAP version 0 or 1.
A drop-down menu is used to select the output format as per image below:



Record

This button is used to convert the opened file into an audio file using either the AU or WAV format.
A drop-down menu is used to select the output format as per image below:



The use of those audio files is recording them to either a tape directly or to a CD (and then possibly to tape) to play them back on a real computer for which the contents are intended.

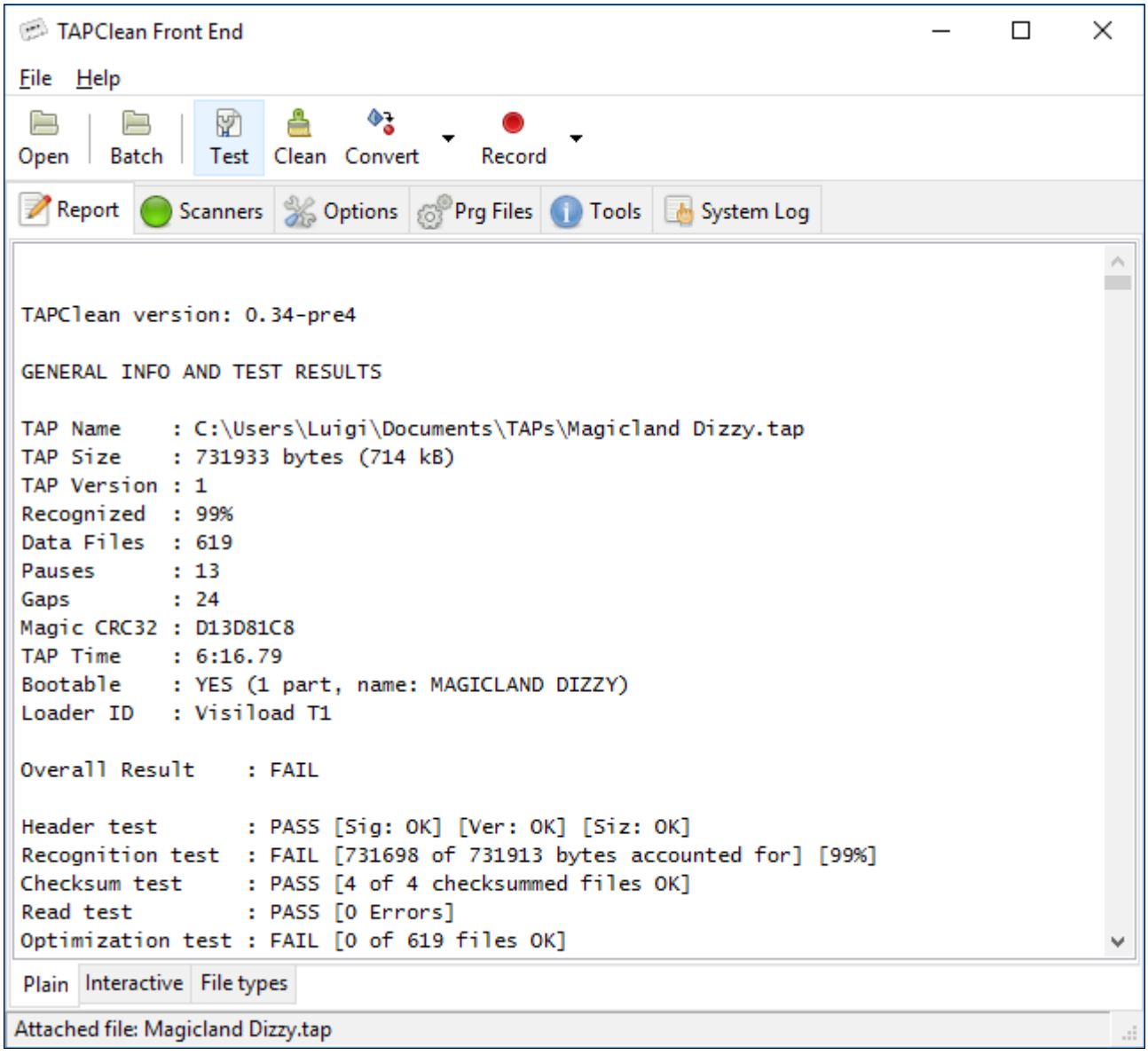
The Tabbed area - part 2

Back on this topic to illustrate the use of the "Report", "Prg Files", and "System Log" areas.

Report

Plain

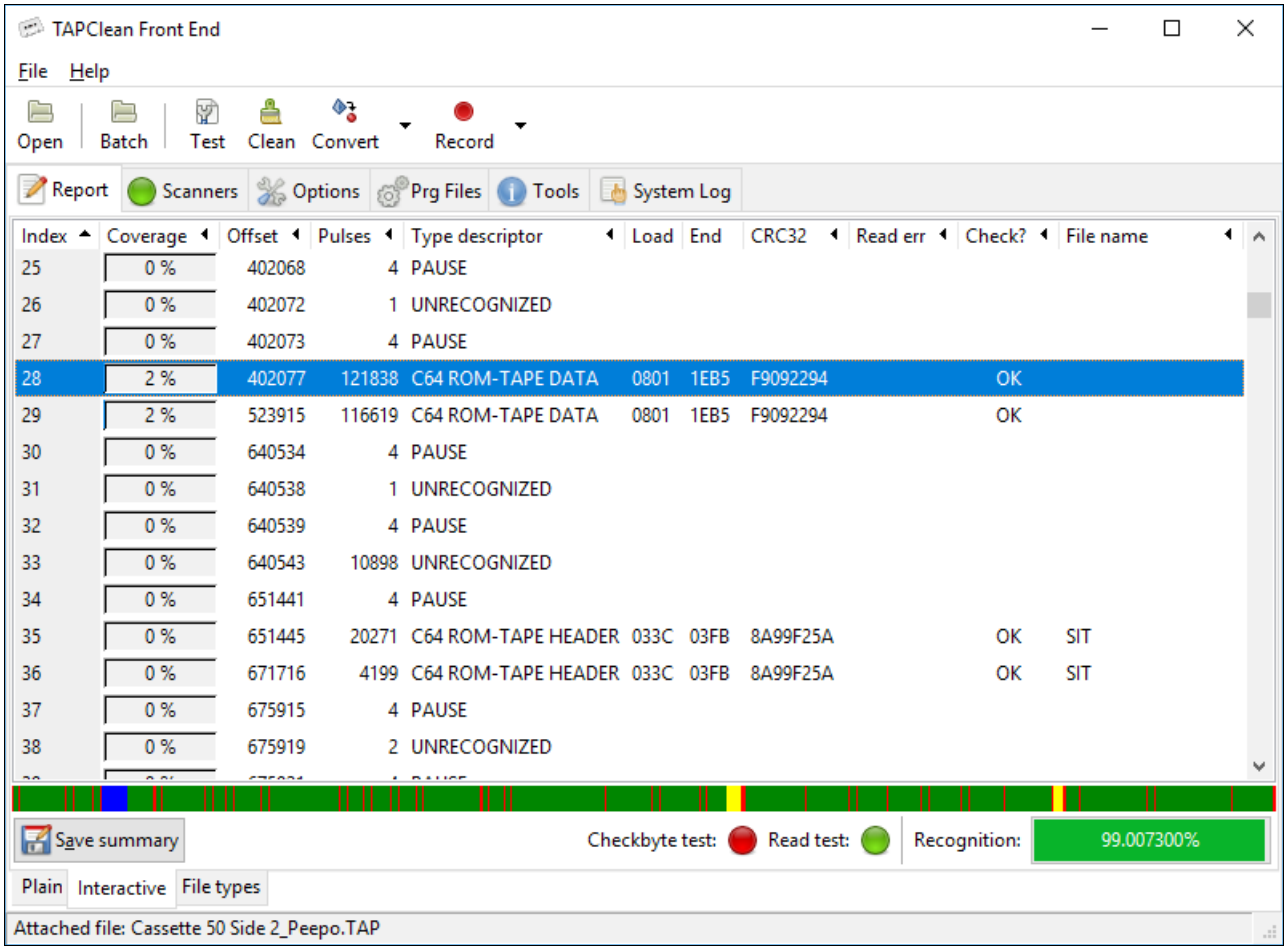
This area shows the report generated by TAPClean upon analyzing or cleaning a tape image. The report will look like the one provided below:



Interactive

An interactive report is also available when analysing or cleaning a tape image. The tab "Interactive" at the bottom of the "Report" page is used to switch between the two different reports.

The interactive report provides a summary table generated by parsing the TAPClean report and a tape layout bar that shows which areas of the tape image have been recognized (green), recognized but with read errors and/or failing checkbyte test (yellow), not recognized (red), and actually selected within the table (blue):

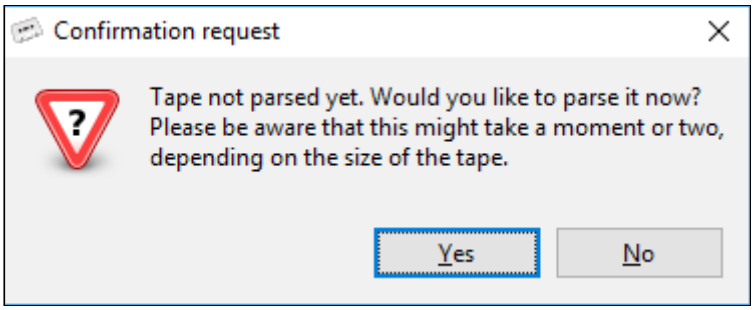


Clicking inside the tape layout bar highlights the relevant row in the summary table.

The result of checkbyte tests (to check the data integrity of those files that use some sort of content check) and read tests (to check the integrity of the encoding itself) are available at the bottom of the report page. The status images will be red if these tests fail, green otherwise.

For TAP files only, a right mouse click over each file brings up a contextual menu as per image below:

The "Show in graphical tape analysis tool" option is used to jump to the beginning of the selected file in the graphical tape analysis tool. If the attached TAP file has not yet been parsed within the analysis tool, then the user is prompted for confirmation, as per image below:

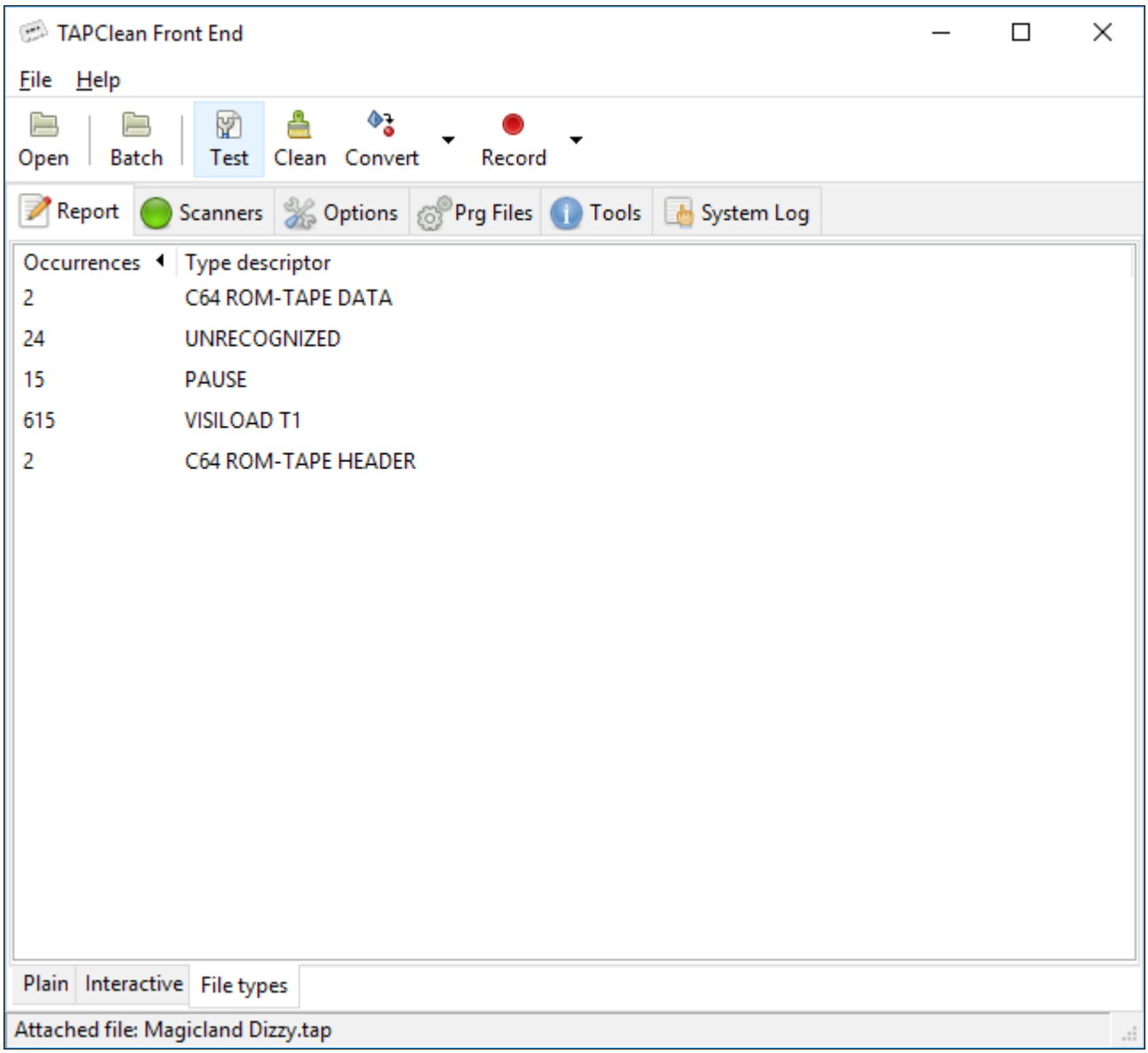


Save summary

The summary table can be exported to a HTML file by means of the provided button.

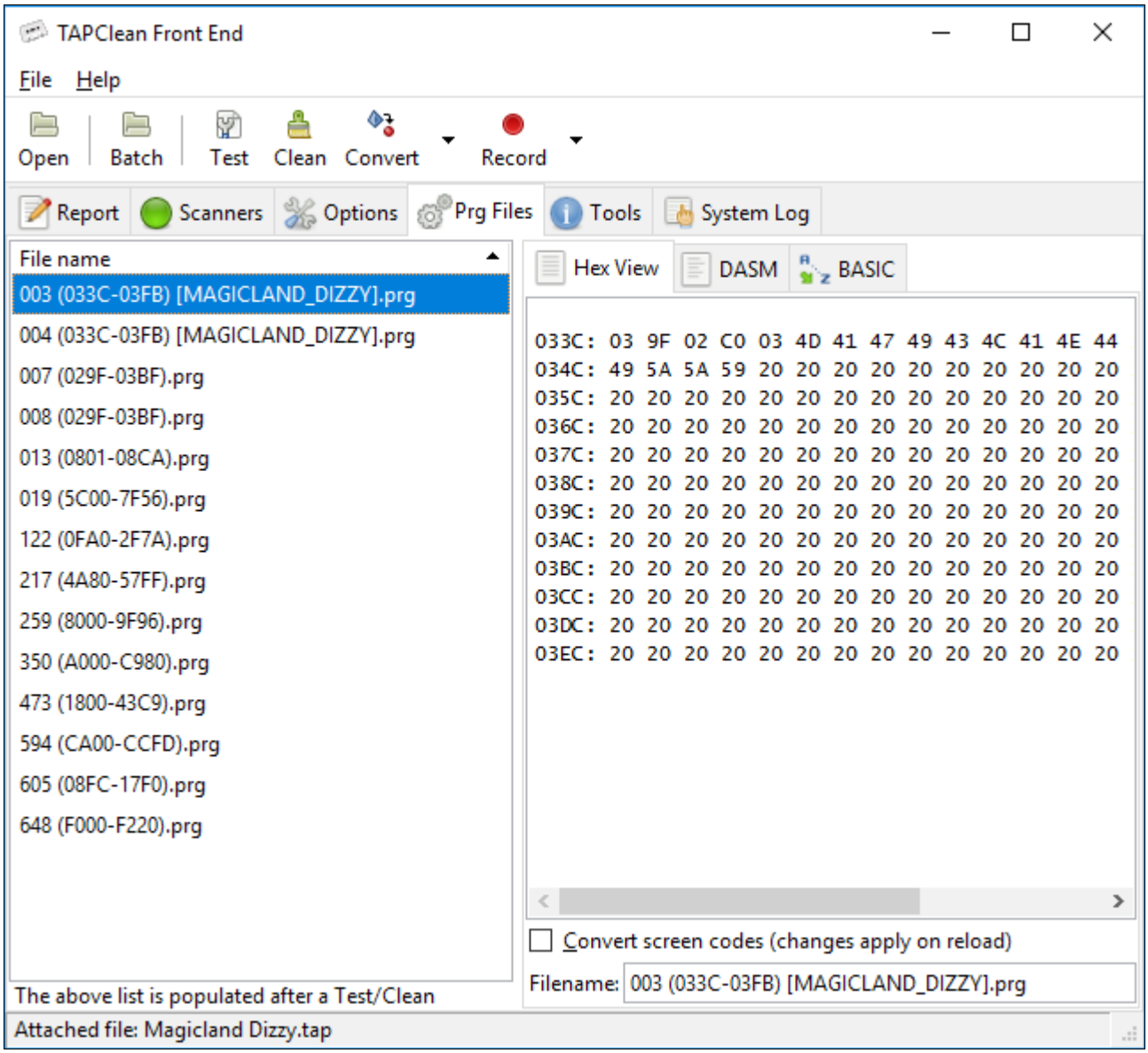
File types

This additional tab offers a view of the file types occurring in the tape image, as per image below:

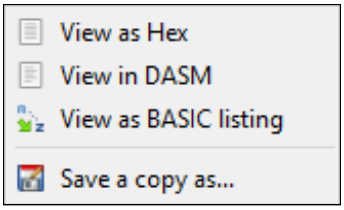


Prg Files

If PRG file generation is enabled, the PRG files generated by TAPClean upon analyzing or cleaning a tape image will be available for content inspection here. An example is given in the image below:

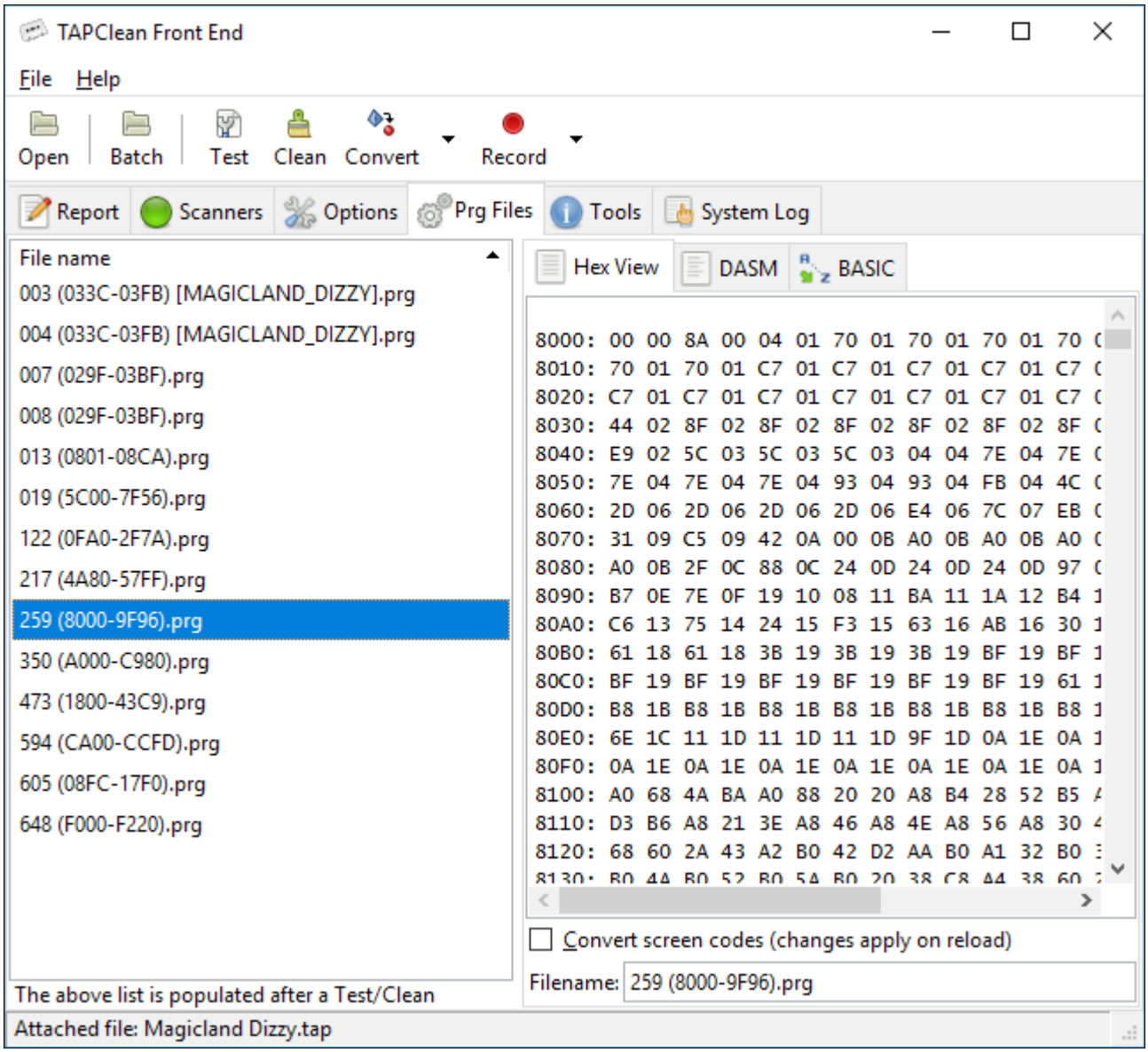


Upon selecting a PRG file with a single left mouse click it gets decoded in the active viewer. Alternatively, a right mouse click brings up a contextual menu as per image below:



Hex View

The Hex viewer comes handy when it is required to have a quick look at the contents of a file.

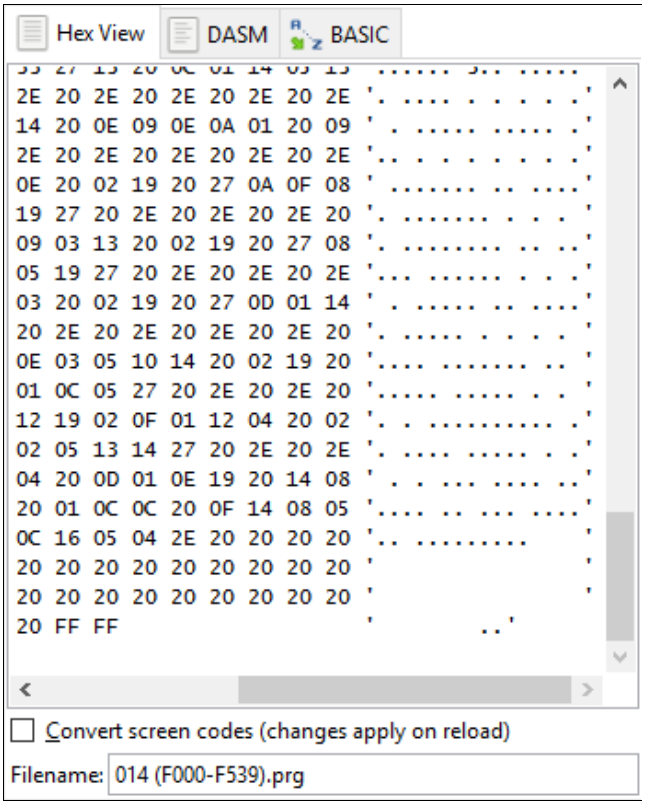


Convert screen codes

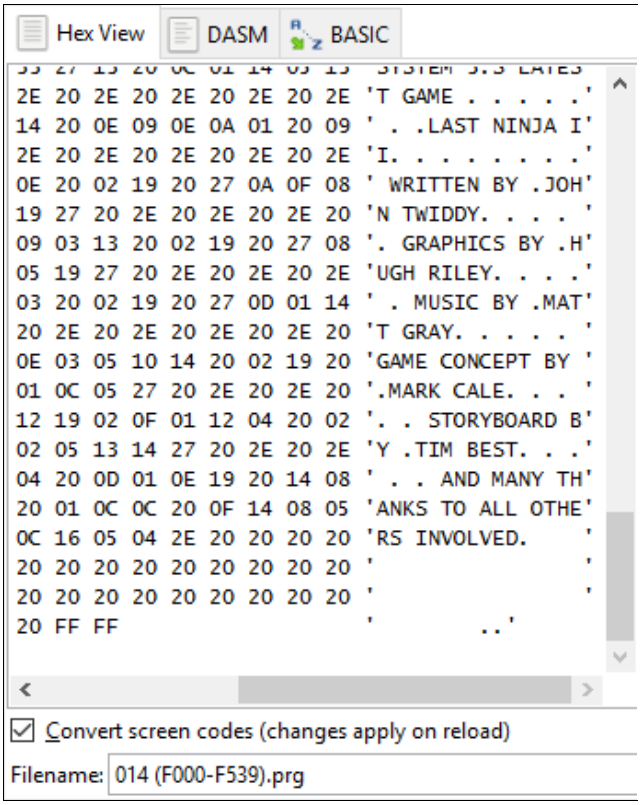
This option is useful when looking for strings within a file. The text to be shown on screen in capital letters in a CBM computer does not use printable ASCII values. Therefore it is not easy to spot this kind of text in a hex viewer. The conversion forces some of the screen codes to become printable ASCII characters.

An example of the use of this feature is given by the following comparison:

Without conversion



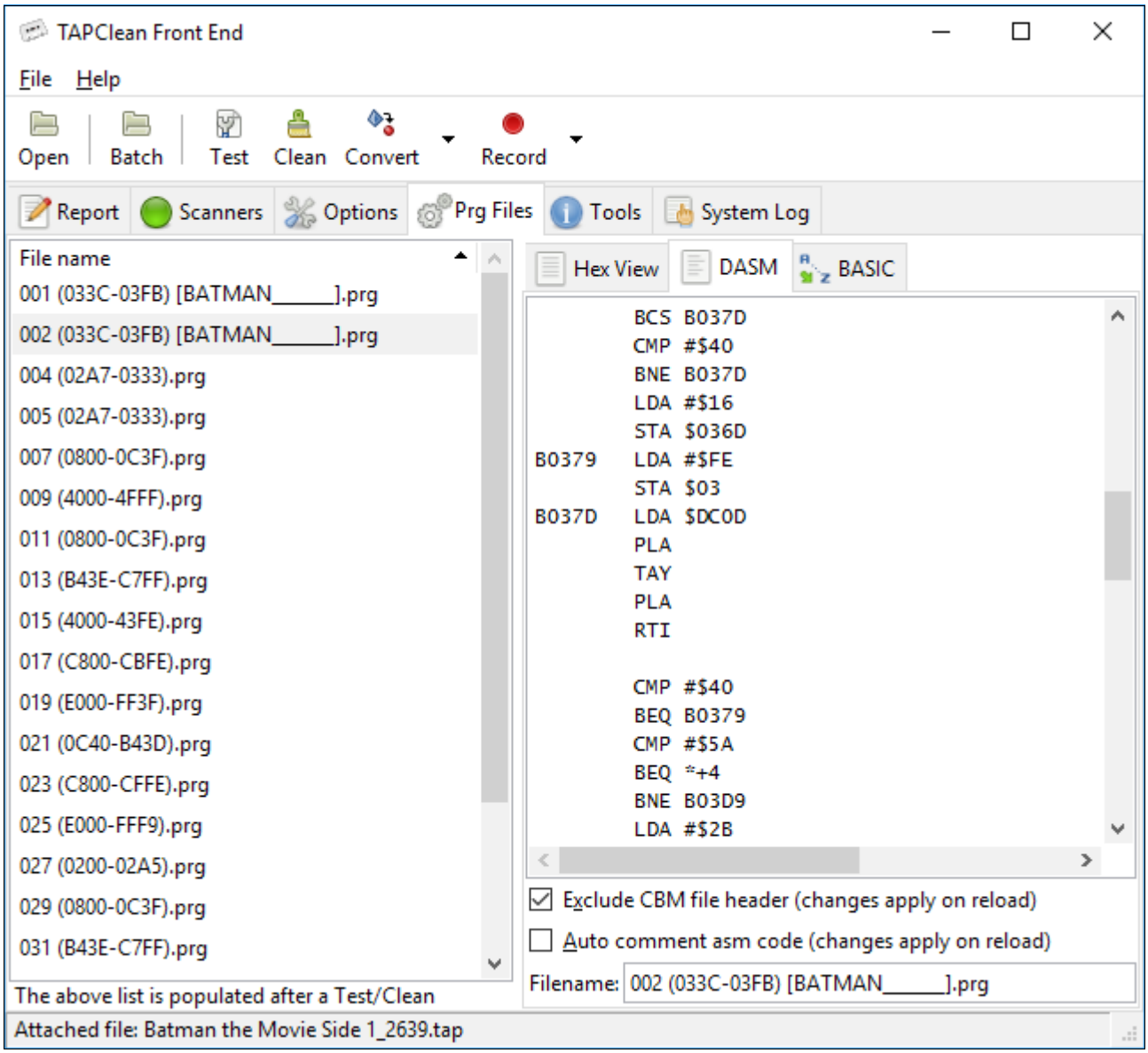
With conversion



Comparative images to demonstrate the use of the screen code conversion

DASM

DASM is a hassle-free 6510 disassembler that does not require massive configuration or knowledge to be used. The purpose of having a disassembler in TAPClean FE is to be able to quickly look at the ASM code used by commercial loaders and small files.
However, it is not intended to be the ultimate disassembler for the 65** family of processors. In fact, it is meant to produce an ASM listing that may be quickly read and re-assembled.

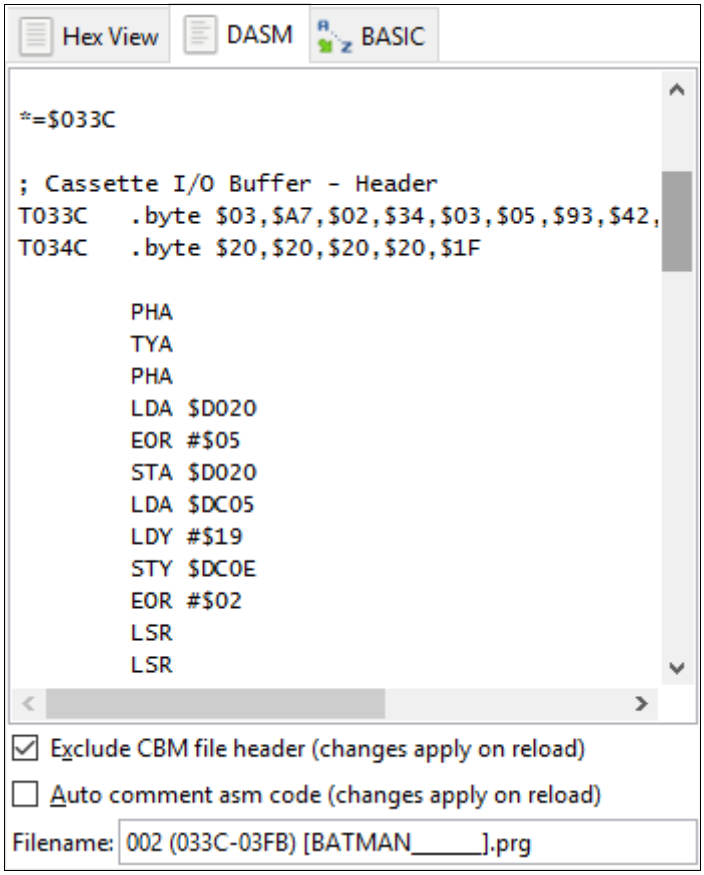


The above example shows just a few of the interesting features available in DASM:

- automatic labelling for: branch points, subroutines, absolute jumps, and tables
- generation of a cross-reference for: conditional branches, subroutine calls, and jumps

Exclude CBM file header

This option is particularly useful when disassembling a CBM header file that contains part of a turbo loader code. When enabled, DASM doesn't attempt to disassemble the file information at the start of the CBM header.



As the above image shows clearly, the CBM header area used for file type, start+end addresses, and filename (from $033C to $0350) is not disassembled at all when this option is enabled.

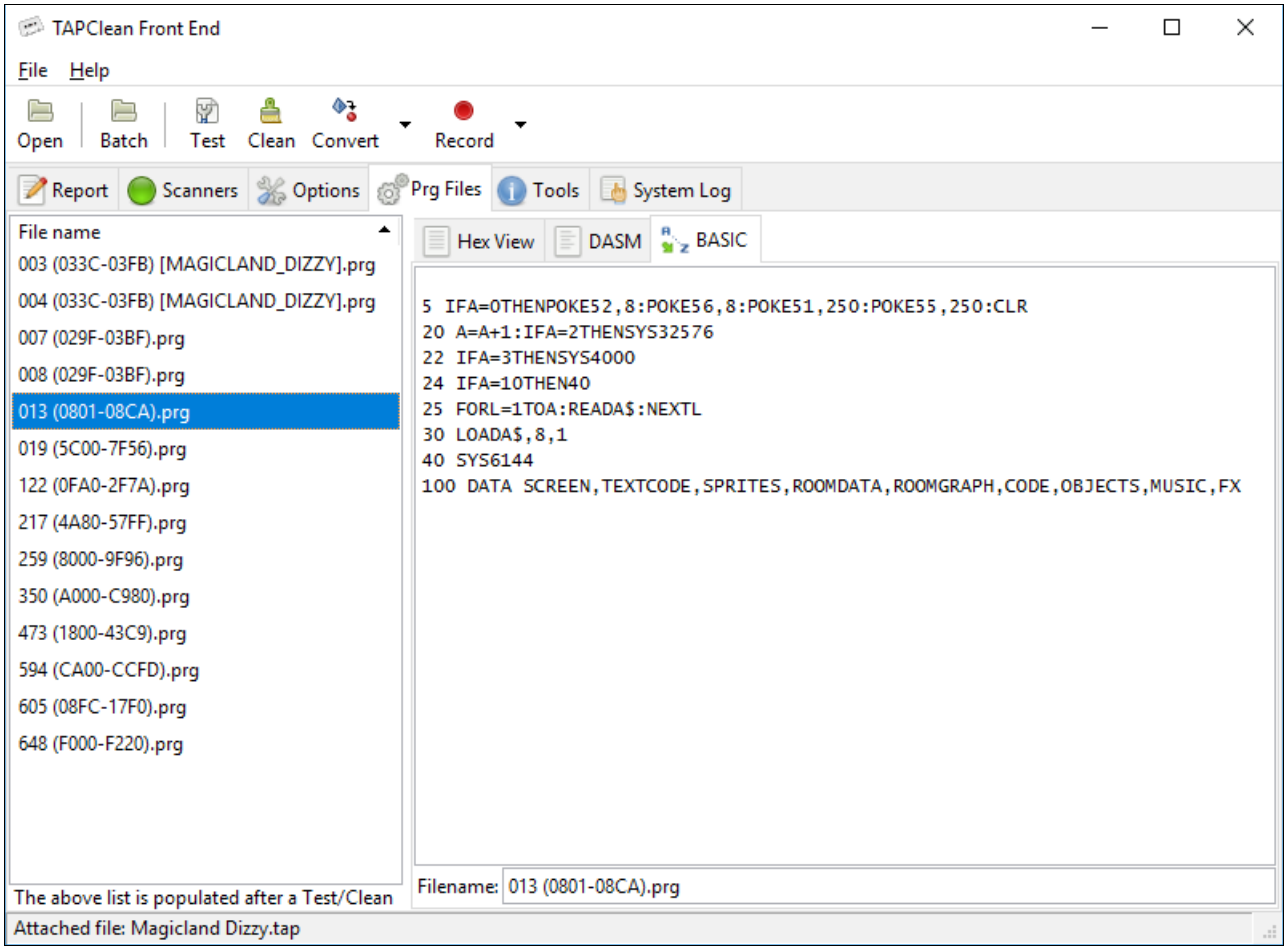
Auto comment asm code

If this option is enabled then the source code is commented automatically. Comments are available for:

- VIC-II registers at $D000-$D02E
- VIC-II mirror registers at $D040-$D3FF
- SID registers at $D400-$D41C
- SID mirror registers at $D420-$D7FF
- CIA #1 registers at $DC00-$DC0F
- CIA #2 registers at $DD00-$DD0F
- Serial Bus routines at $ED09-$EE84
- File I/O routines at $F291-$F658
- Kernal Jump Table at $FF81-$FFF5
- 6510 Hardware Vectors at $FFFA-$FFFF

BASIC

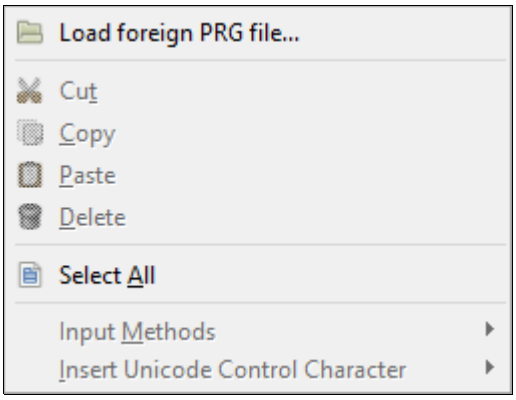
The BASIC viewer is a CBM BASIC V2 compatible untokenizer that can be used to have a quick look at BASIC programs.
However, it is not intended to be the ultimate BASIC untokenizer.



It should be noted that the set of CBM special characters is not rendered as such: each of them is escaped, e.g. 0x05 is shown as {WHITE} and 0x89 is shown as {F2}.

Displaying foreign PRG files

TAPClean FE is also capable of displaying the contents of PRG files that were not produced by TAPClean. The Hex viewer, DASM, and the BASIC viewer allow doing so by means of a right mouse click on their text area. When doing so, a contextual menu pops up as per image below:

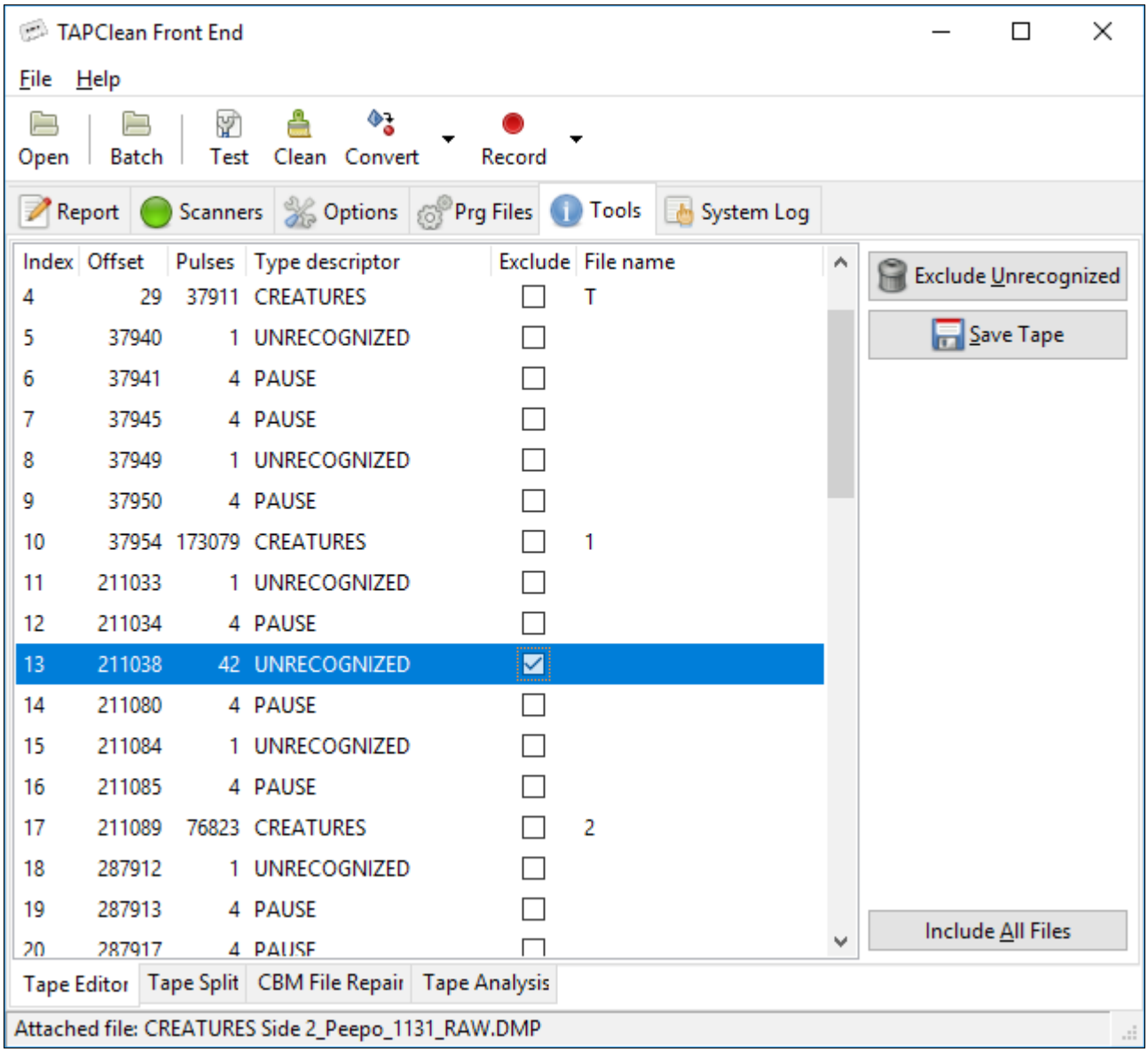


The first option brings up a file selection dialog to select the PRG file to process.

Tools

Tape Editor

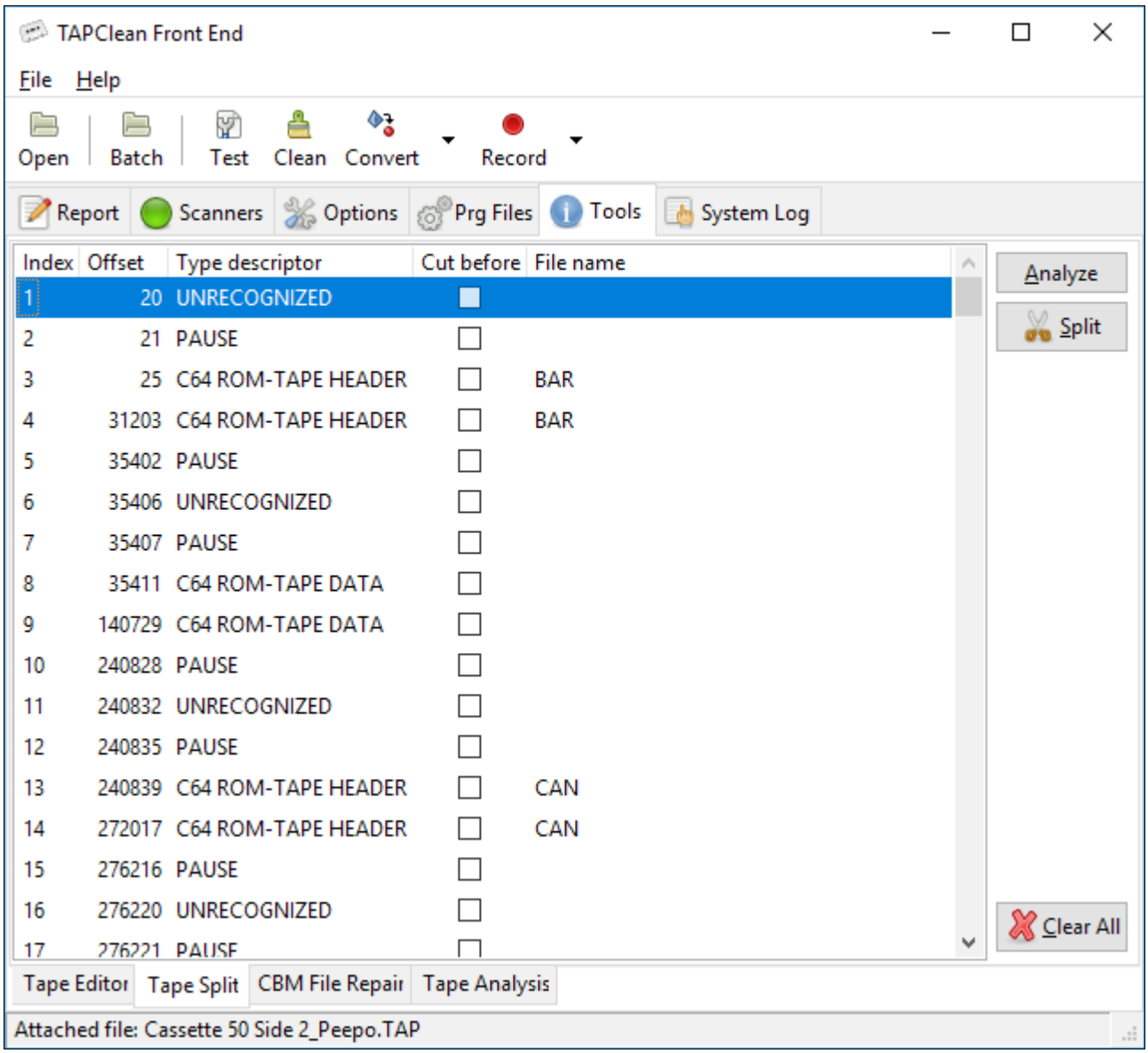
At present, the TAP file editor can be used to remove blocks from a TAP file, which is particularly useful when an optimized tape contains small unrecognized areas that are not necessary.
This tool saves users from editing TAP files in a hex editor, which has the added burden of having to fix the data size inside the TAP file header.



As with the interactive report, a right mouse click over each file brings up a contextual menu used to jump to the beginning of the selected file in the graphical tape analysis tool.

Tape Split

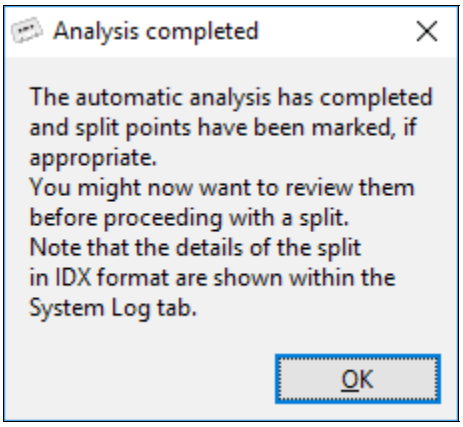
An automated TAP file splitting tool is available to e.g. split compilations into single TAP files, as per image below:



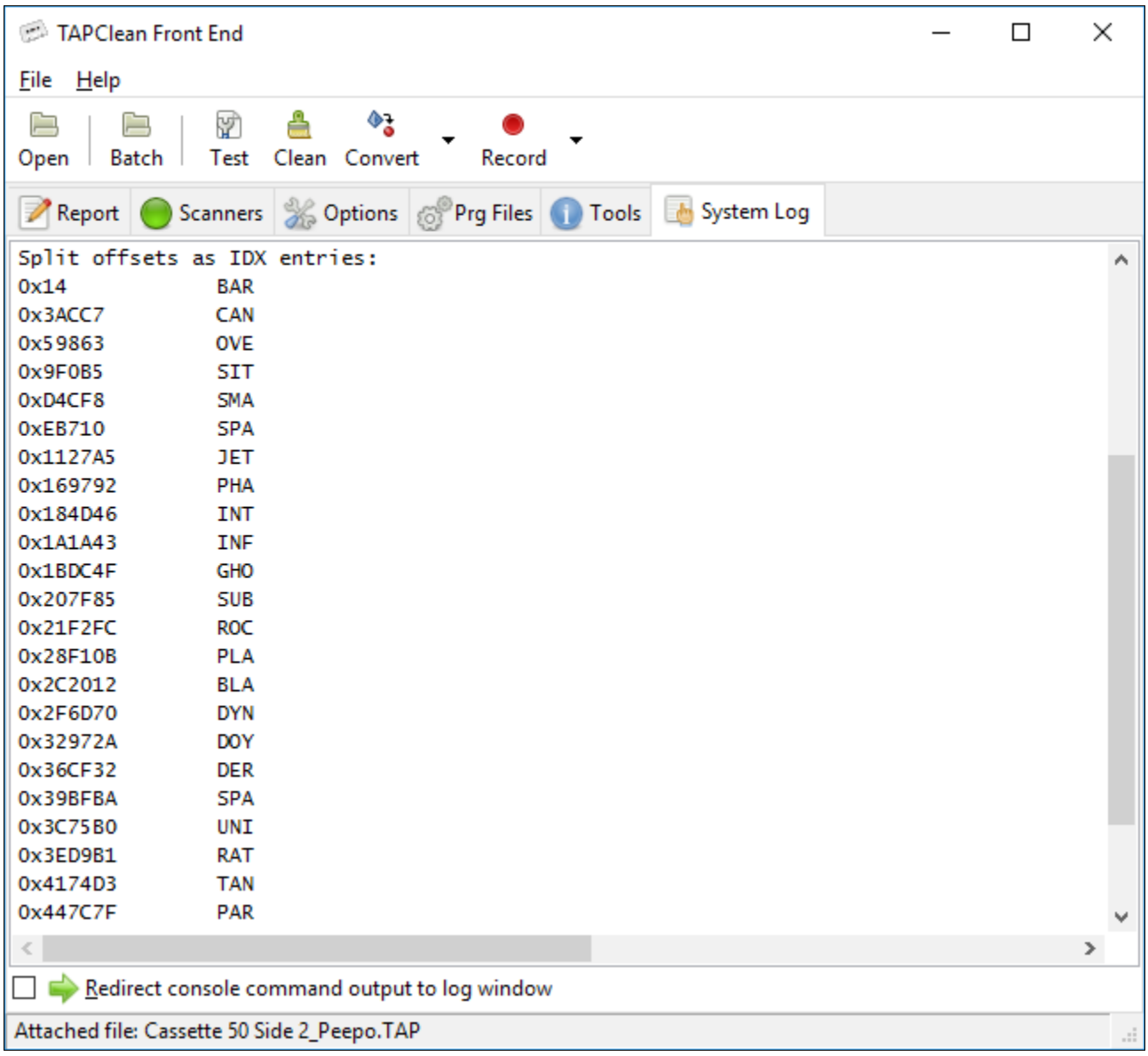
As with the interactive report, a right mouse click over each file brings up a contextual menu used to jump to the beginning of the selected file in the graphical tape analysis tool.

The tool is capable of identifying the start of a CBM boot file and to mark it as a split point via the "Analyze" button.

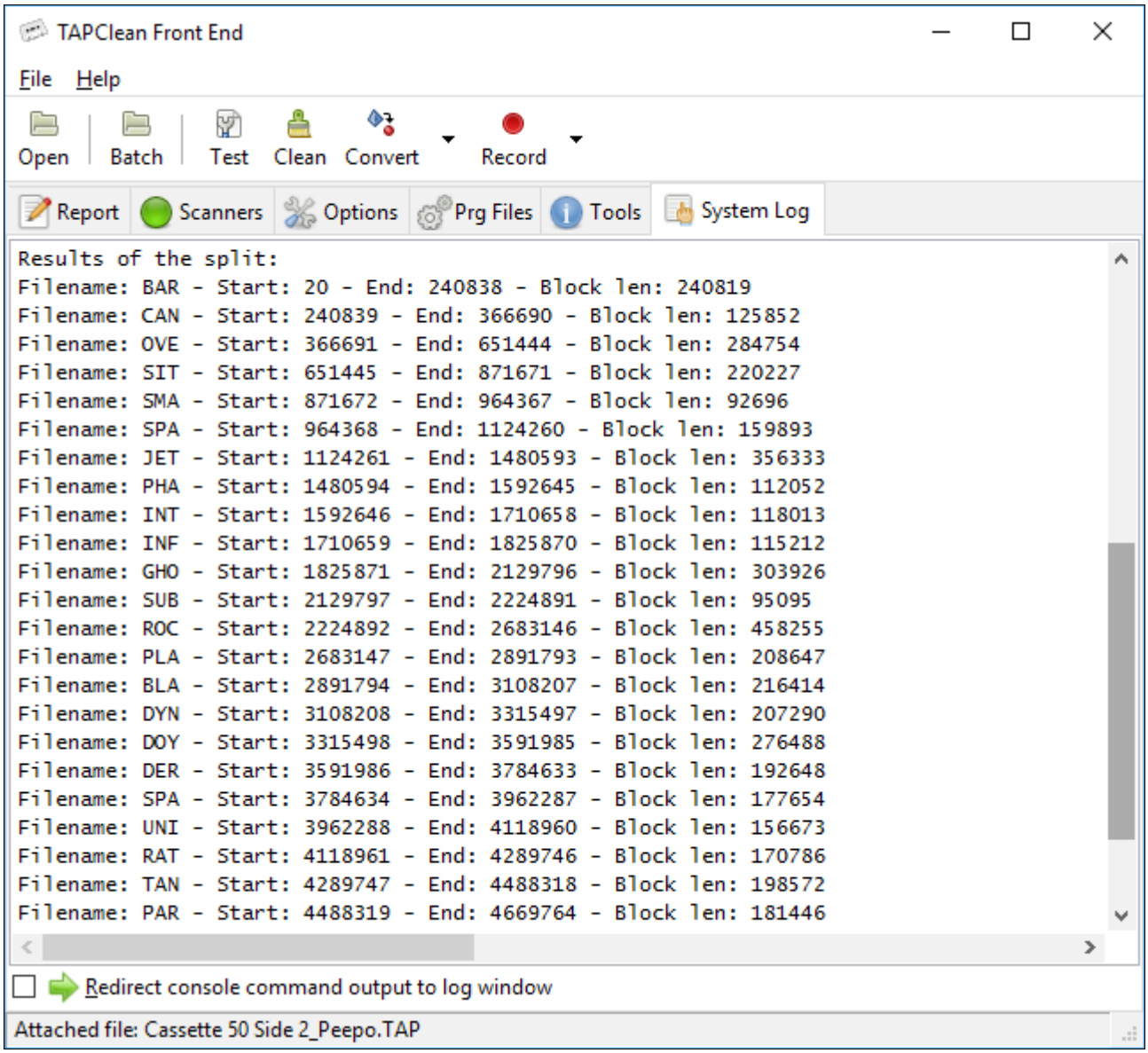
Users can either manually mark split points in the first instance or use the results of the analysis as a starting point, as suggested by the image below:



Upon analysing a TAP file for split points, the details of recommended split points are also made available as IDX data in the "System Log" tab, as per image below:



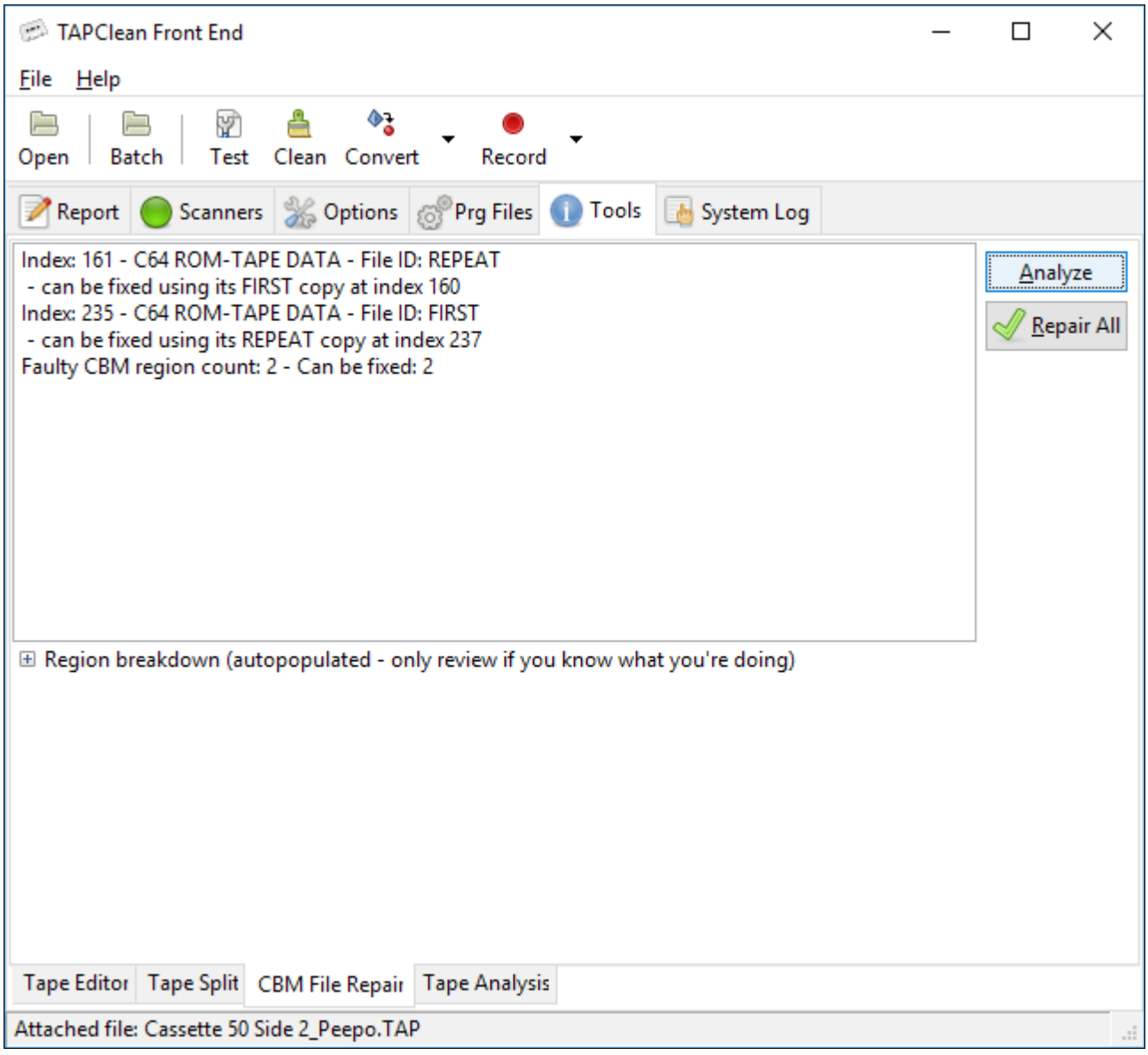
The details of the split are available in the "System Log" tab, as per image below:


TAPClean Front End
File Help
Open Batch Test Clean Convert Record
Report Scanners Options Prg Files Tools System Log
Results of the split:
Filename: BAR - Start: 20 - End: 240838 - Block len: 240819
Filename: CAN - Start: 240839 - End: 366690 - Block len: 125852
Filename: OVE - Start: 366691 - End: 651444 - Block len: 284754
Filename: SIT - Start: 651445 - End: 871671 - Block len: 220227
Filename: SMA - Start: 871672 - End: 964367 - Block len: 92696
Filename: SPA - Start: 964368 - End: 1124260 - Block len: 159893
Filename: JET - Start: 1124261 - End: 1480593 - Block len: 356333
Filename: PHA - Start: 1480594 - End: 1592645 - Block len: 112052
Filename: INT - Start: 1592646 - End: 1710658 - Block len: 118013
Filename: INF - Start: 1710659 - End: 1825870 - Block len: 115212
Filename: GHO - Start: 1825871 - End: 2129796 - Block len: 303926
Filename: SUB - Start: 2129797 - End: 2224891 - Block len: 95095
Filename: ROC - Start: 2224892 - End: 2683146 - Block len: 458255
Filename: PLA - Start: 2683147 - End: 2891793 - Block len: 208647
Filename: BLA - Start: 2891794 - End: 3108207 - Block len: 216414
Filename: DYN - Start: 3108208 - End: 3315497 - Block len: 207290
Filename: DOY - Start: 3315498 - End: 3591985 - Block len: 276488
Filename: DER - Start: 3591986 - End: 3784633 - Block len: 192648
Filename: SPA - Start: 3784634 - End: 3962287 - Block len: 177654
Filename: UNI - Start: 3962288 - End: 4118960 - Block len: 156673
Filename: RAT - Start: 4118961 - End: 4289746 - Block len: 170786
Filename: TAN - Start: 4289747 - End: 4488318 - Block len: 198572
Filename: PAR - Start: 4488319 - End: 4669764 - Block len: 181446
Redirect console command output to log window
Attached file: Cassette 50 Side 2_Peepo.TAP

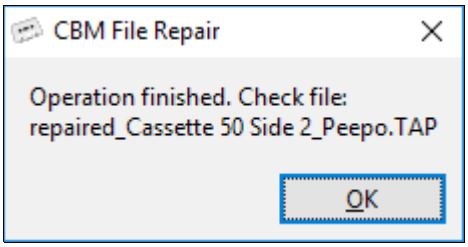
CBM File Repair

An automatic CBM file repair tool is available to repair one of the two copies of a CBM file should one be faulty and the other one healthy.

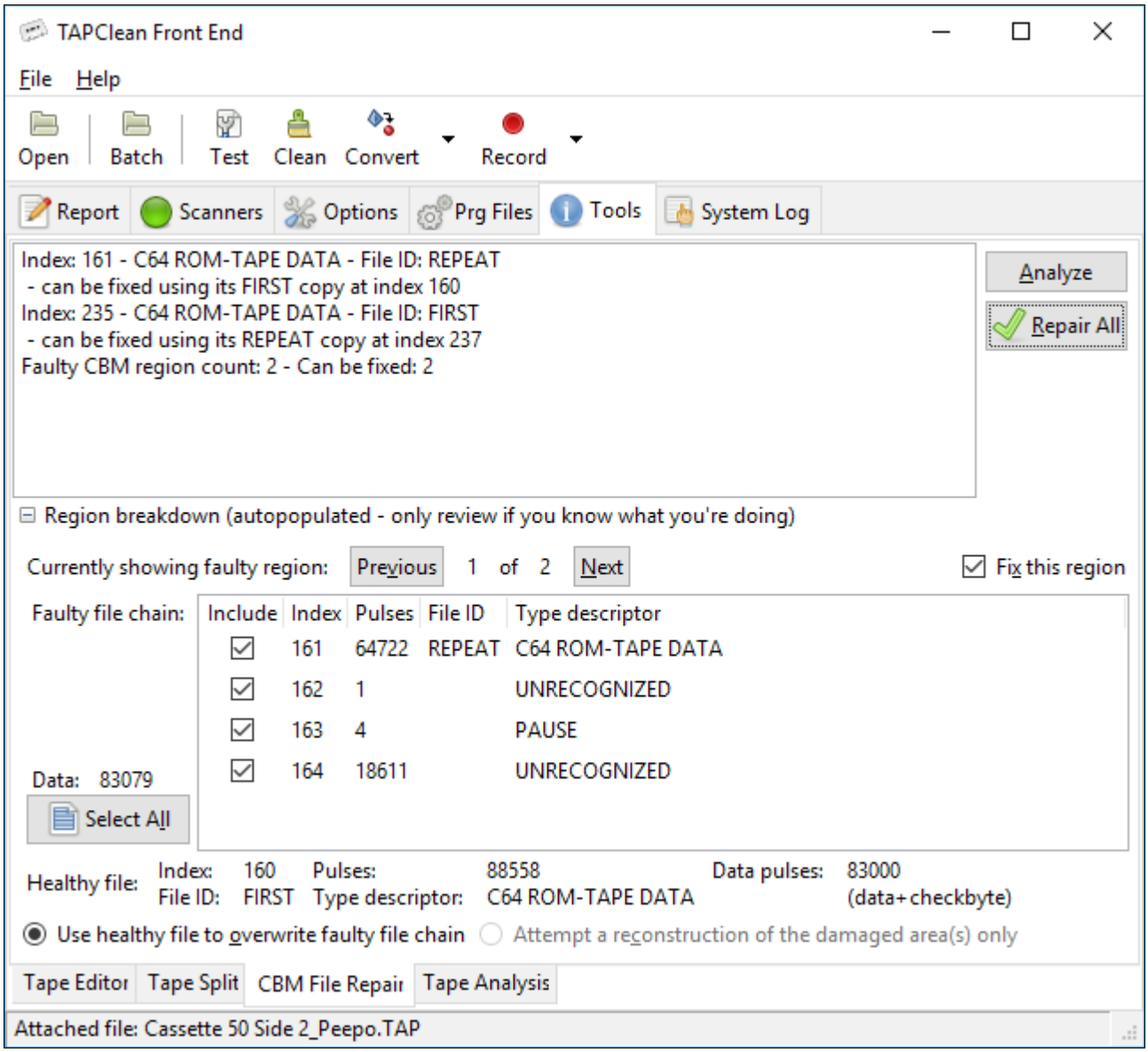
In order to check whether the above scenario occurs for a TAP file, the "Analyze" button can be used, as shown below:



After the analysis has been carried out (and, optionally, a review), the "Repair All" button will repair those CBM files that *can* be fixed:



Advanced users can review the details of each faulty file and its healthy copy by expanding the "Region breakdown" control, as per below:

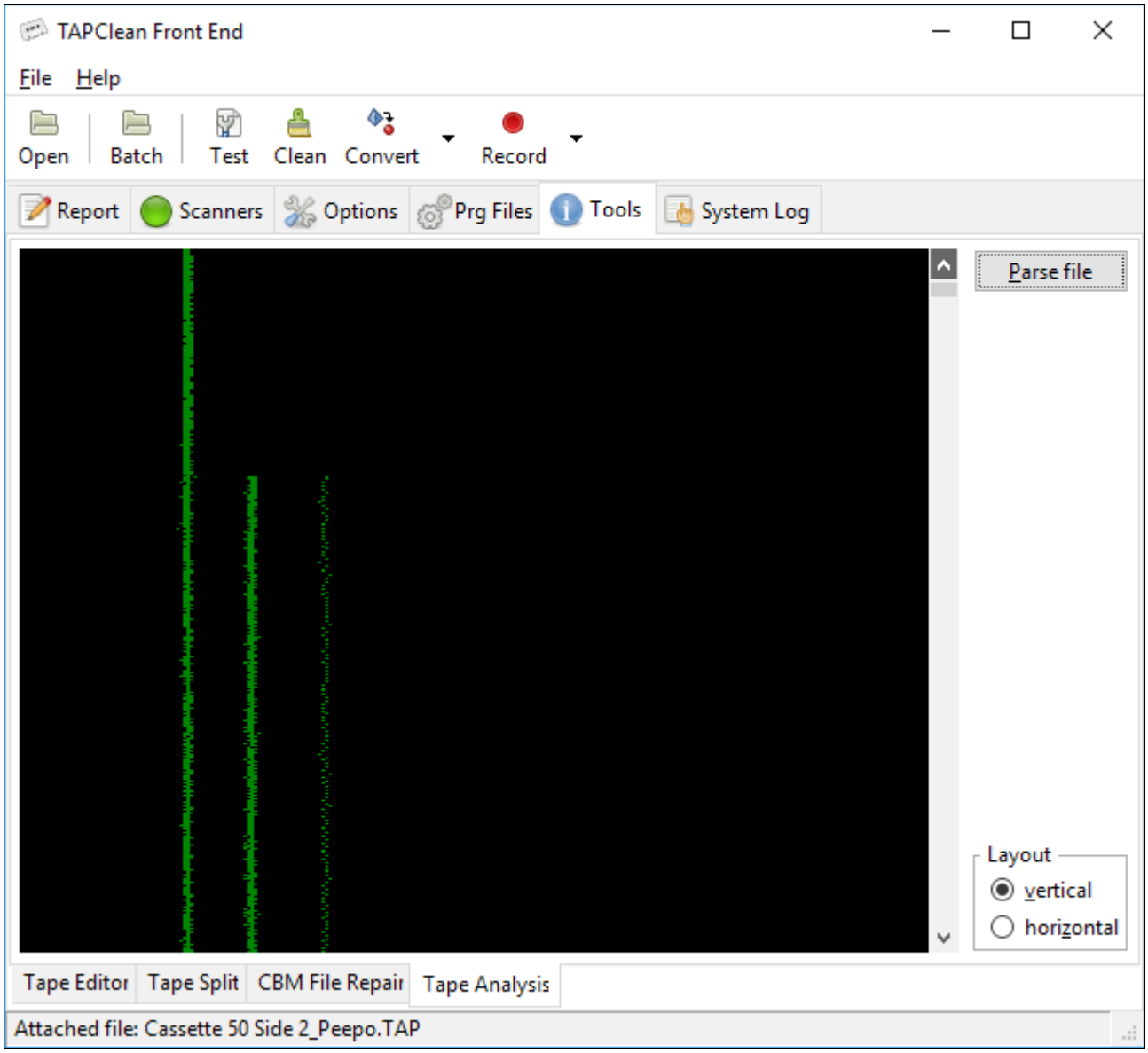


As with the interactive report, a right mouse click over each file of the faulty chain brings up a contextual menu used to jump to the beginning of the selected file in the graphical tape analysis tool.

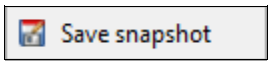
Tape Analysis

A graphical tape analysis tool is provided in order to inspect tape image contents.

The pulse trace can be arranged vertically or horizontally.

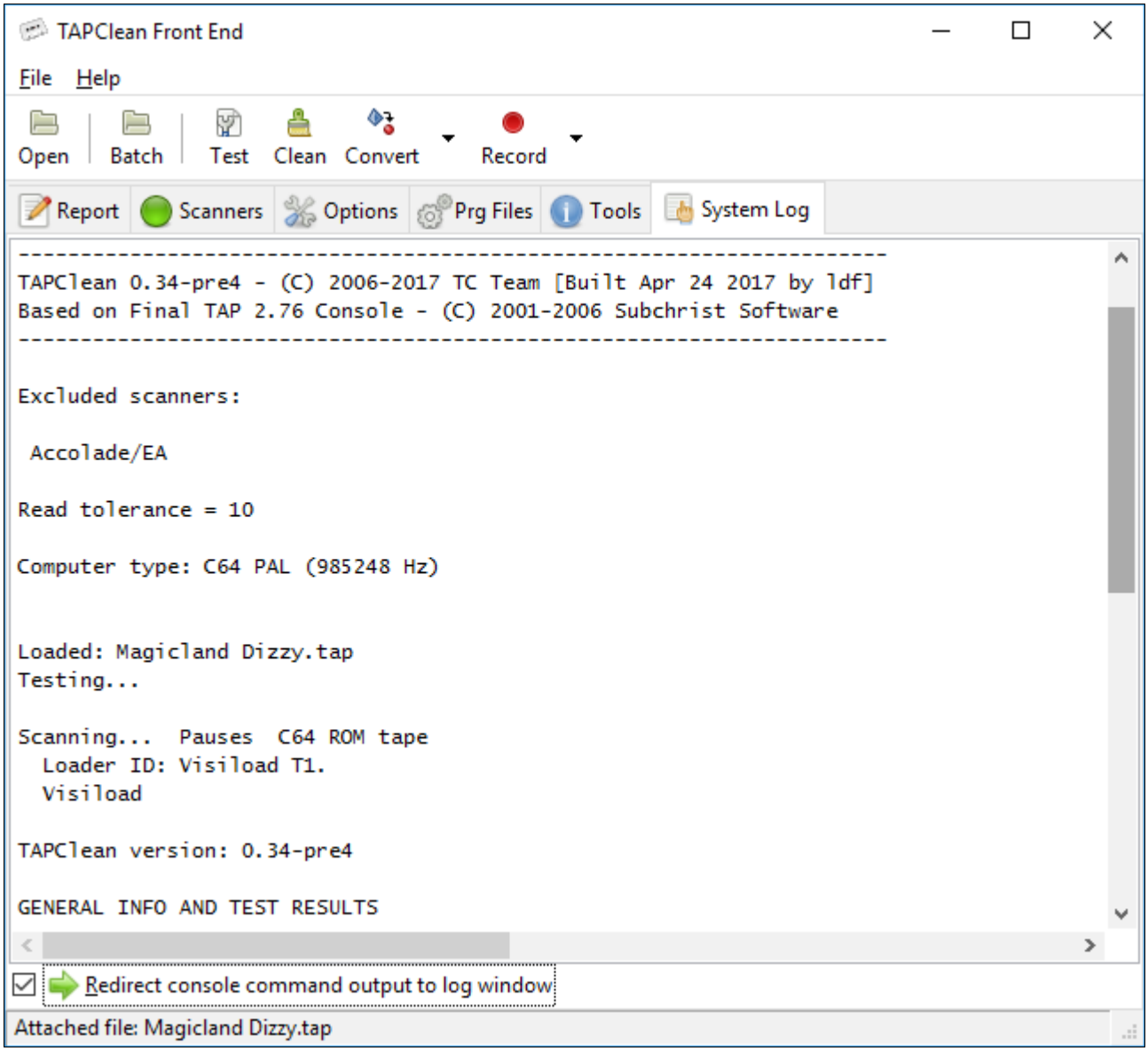


A right mouse click over the trace brings up a contextual menu that can be used to take a snapshot of the current view, as per image below:



System Log

This is the last tabbed window available in the main window. It tracks commands used to invoke TAPClean.



It should be noted that this area is editable: the user can add comments and remove content. It may be handy to copy and save the contents of this area after the analysis of tape images.

Redirect console command output to log window

If this option is enabled then the output from the TAPClean console program is redirected to the log window.