# Special and common aspects of pdf/dvi/xdvi generators

Ernst Reissner (rei3ner@arcor.de)

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## 1 Introduction

This document is created with `lualatex` or that like with output format PDF. The package `tex4ht` is not loaded.

This document is about features the three generators on latex, `pdflatex`, `lualatex` and `xelatex` have in common and discusses also aspects under which they are specific. These programs are just underlying tex engines preloading the the LATEX format. The names of the underlying engines just drop the inner sylable "`la`". For `pdftex` there is a user manual [THHB23], for `luatex` there is a reference manual [HHHS23] and for `xetex` a reference guide [RHB23].

The first aspect we cover are the options (among those to display the version). It turns out, that the options are specific for the distribution. Besides TEX Live there is a second important distribution, MiKTeX, which should also be treated.

We treat the options for TEX Live in Section 2 and for MiKTeX in Section 3.

## 2 The options for TEX Live

Note that in fact we use a variant of `luatex`, called `luahbtex`.

This document is valid for versions of the underlying tex engine as given in Table 1. Moreover, our research refers to a specific distribution, TEX Live.

| converter | version |
|---|---|
| `pdflatex` | `pdfTeX 3.141592653-2.6-1.40.24` |
| `xelatex` | `XeTeX 3.141592653-2.6-0.999994` |
| `lualatex` | `LuaHBTeX, Version 1.15.0` |

Table 1: Converters and the version this document refers to

We start with a synopsis of the options. Table 2 shows options of the converters under consideration. Note that in contrast to the other converters, `lualatex` defines options starting with `--` but it can also process the options if given with a single dash also. Conversely, converters other than `lualatex` can also deal with options starting with single dash. Options unknown to a converter never result in an error or even a warning; instead just a info message is displayed. This allows to create a configuration which works for all converters.

In Table 2 column "included", each converter is represented by the starting letter of its name, so for each option it is known which converters know about it an conversely, which options each converter has.

The table allows to furnish configurations working for all converters. Some options are common to all converters

| option | included | | | explanation |
|---|---|---|---|---|
| `(-)-cnf-line=STRING` | p | x | l | parse `STRING` as a configuration file line |
| `--credits` | - | - | l | Display credits and exit. |
| `--debug-format` | - | - | l | enable format debugging |
| `(-)-draftmode` | p | - | l | switch on draft mode (generates no output PDF) |
| `-enc` | p | - | - | Enable encTeX extensions such as `\mubyte` |
| `-etex` | p | x | - | enable e-TeX extensions |
| `(-)-[no-]file-line-error` | p | x | l | disable/enable file:line:error style messages |
| `--[no-]file-line-error-style` | - | - | l | aliases of `--[no-]file-line-error` |
| `-fmt=FMTNAME` | p | x | l | use FMTNAME instead of program name or a %& line[1] |
| `(-)-ini` | p | x | l | for dumping formats |
| `-ipc` | p | - | - | send DVI output to a socket as well as the usual output file |
| `-ipc-start` | p | - | - | as `-ipc`, and also start the server at the other end |
| `(-)-halt-on-error` | p | x | l | stop processing at the first error |
| `(-)-help` | p | x | l | display this help and exit |
| `(-)-version` | p | x | l | output version information and exit |
| `-8bit` | p | x | - | make all characters printable by default[2] |
| `(-)-interaction=STRING` | p | x | l | set interaction mode (`STRING=batchmode/nonstopmode/scrollmode/errorstopmode`) |
| `(-)-jobname=STRING` | p | x | l | set the job name to `STRING` |
| `(-)-kpathsea-debug=NUMBER` | p | x | l | set path searching debugging flags according to the bits of `NUMBER` |
| `--lua=FILE` | - | - | l | Load and execute a lua initialization script. |
| `--luaonly` | - | - | l | run a lua file, then exit |
| `--luaconly` | - | - | l | byte-compile a lua file, then exit |
| `--luahashchars` | - | - | l | the bits used by current Lua interpreter for strings hashing |
| `(-)-[no-]mktex=FMT` | p | x | l | disable/enable mktexFMT generation[3] |
| `-mltex` | p | x | - | enable MLTeX extensions such as `\charsubdef` |

[1] in fact for `lualatex` the explanation deviates a bit: `--fmt=FORMAT: load the format file FORMAT`

[2] for `xelatex`: don't use ^^X sequences

[3] `(FMT=tex/tfm/pk)` for `pdflatex`; else `(FMT=tex/tfm)`

| | | | | |
|---|---|---|---|---|
| -no-pdf | - | x | - | generate XDV (extended DVI) output rather than PDF |
| --nosocket | - | - | l | Disable the Lua socket library. |
| (-)-output-comment=STRING | p | x | l | use STRING for DVI file comment instead of date (no effect for PDF)[4] |
| (-)-output-directory=DIR | p | x | l | use existing DIR as the directory to write files in |
| (-)-output-format=FORMAT | p | - | l | use FORMAT for job output; FORMAT is 'dvi' or 'pdf'[5] |
| -output-driver=CMD | - | x | - | use CMD as the XDV-to-PDF driver instead of xdvipdfmx |
| -papersize=STRING | - | x | - | set PDF media size to STRING |
| -[no-]parse-first-line | p | x | - | disable/enable parsing of first line of input file |
| (-)-progname=STRING | p | x | l | set program (and fmt) name to STRING[6] |
| (-)-recorder | p | x | l | enable filename recorder |
| --safer | - | - | l | Disable easily exploitable Lua commands. |
| (-)-[no-]shell-escape | p | x | l | disable/enable \write18SHELL COMMAND[7] |
| (-)-shell-restricted | p | x | l | enable restricted \write18[8] |
| -src-specials | p | x | - | insert source specials into the DVI file |
| -src-specials=WHERE | p | x | - | insert source specials in certain places of the DVI/XDV[9] file. |
| (-)-synctex=NUMBER | p | x | l | generate SyncTeX data for previewers[10] |
| -translate-file=TCXNAME | p | | | use the TCX file TCXNAME[11] |
| --utc | | | l | Init time to UTC |

Table 2: Options of TEX engines in TEX Live

pdflatex:

```
Usage: pdftex [OPTION]... [TEXNAME[.tex]] [COMMANDS]
   or: pdftex [OPTION]... \FIRST-LINE
   or: pdftex [OPTION]... &FMT ARGS
  Run pdfTeX on TEXNAME, usually creating TEXNAME.pdf.
  Any remaining COMMANDS are processed as pdfTeX input, after TEXNAME is read.
  If the first line of TEXNAME is %&FMT, and FMT is an existing .fmt file,
  use it.  Else use `NAME.fmt', where NAME is the program invocation name,
  most commonly `pdftex'.

  Alternatively, if the first non-option argument begins with a backslash,
  interpret all non-option arguments as a line of pdfTeX input.

  Alternatively, if the first non-option argument begins with a &, the
  next word is taken as the FMT to read, overriding all else.  Any
  remaining arguments are processed as above.

  If no arguments or options are specified, prompt for input.
```

[4] For xelatex it is XDV instead of DVI and the remark (no effect for PDF) is missing
[5] xelatex offers option -no-pdf instead.
[6] lualatex does not mention (and fmt)
[7] For lualatex the explanation is disable/enable system commands
[8] For lualatex the explanation is restrict system commands to a list of commands given in texmf.cnf
[9] DVI for pdflatex; XDV for xelatex
[10] Explanation differs for lualatex
[11] TCX means TEX character translation

# 3 The options for MiKTeX

Since at the time of this writing, the author has no MiKTeX at hand, the results for MiKTeX are based on documentation, rather than experimentation. The three engines are a bit different, also in their names.

Well this section is preliminary only. It turned out that Section 2 is valid only for distribution TEX Live. So in this section we venture to find out the options for the other big distribution, MiKTeX. We shall also investigate whether there are further distributions.

Whereas the description [KB23] seems not to mention the options explicitly, the MiKTeX manual [Sch22] describes each program in Section II, 6, in particular also the tex converters. This is the source of the following tables.

The first observation is that, for MiKTeX all options start with two dashes, whereas for TEX Live this is the case only for luatex. One has to clarify, whether the maven latex plugin under consideration really works for MiKTeX.

| option | included | | | explanation |
|---|---|---|---|---|
| `--alias=name` | p | x | l | Pretend to be program name, …[12] |
| `--aux-directory=dir` | p | x | l | Set `dir` as the directory to write auxiliary files to. |
| `--buf-size=n` | p | x | - | Set the the maximum number of characters … |
| `--c-style-errors` | p | x | l | Change the way, error messages are printed. |
| `--credits` | - | - | l | Display credits and exit[13]. |
| `--disable-8bit-chars` | p | x | - | Make only 7-bit characters printable. |
| `--disable/enable-installer` | p | x | l | Disable/Enable automatic installation of packages. |
| `--disable-write18` | p | x | l | Disable the `\write18{command}` construct. |
| `--enable-write18` | p | x | l | Fully enable the `\write18{command}` construct[14]. |
| `--restrict-write18` | p | x | l | Partially enable the `\write18command` construct. |
| `--debug-format` | - | - | l | Enable format debugging[15]. |
| `--[dont-]parse-first-line` | p | x | - | [Dont p\|P]arse first line of input file under definite conditions[16] |
| `--draftmode` | p | - | l | switch on draft mode (generates no output PDF)[17] |
| `--enable-8bit-chars` | p | x | - | Make all characters printable. |
| `--enable-enctex` | p | - | - | Enable encTeX extensions such as `\mubyte`[18]. |
| `--enable-etex` | p | x | - | Enable eTeX extensions. |
| `--enable-installer` | p | x | l | Enable automatic installation of packages. |
| `--enable-mltex` | p | x | - | Enable MLTeX extensions such as `\charsubdef`. |
| `--error-line=n` | p | x | - | Set the width of context lines on …error messages. |
| `--extra-mem-bot=n` | p | x | - | Set the extra size … for large data structures … |
| `--extra-mem-top=n` | p | x | - | Set the extra size (in memory words) for chars, tokens, …. |
| `--font-max=n` | p | x | - | Set the maximum internal font number. |
| `--font-mem-size=n` | p | x | - | Set the size, in TeX memory words, of the font memory. |
| `--half-error-line=n` | p | x | - | Set the width of first lines of contexts in terminal error messages. |
| `--halt-on-error` | p | x | l | Quit after the first error. |
| `--hash-extra=n` | p | x | - | Set the extra space for the hash table of control sequences … |
| `--help` | p | x | l | Give help and exitt[19].. |
| `--hhelp` | p | x | - | manual page in an HTML Help window[20] |
| `--include-directory=dir` | p | x | l | Add the directory `dir` to [those] to be searched for input files. |

[12] Using this option is equivalent to copying the program file to name and invoking name.
[13] The same as for TEX Live.
[14] Corresponds roughly to `(-)-shell-escape` in TEX Live.
[15] The same as for TEX Live.
[16] Similar for TEX Live. Note that there is also a converse option.
[17] Some differences in formulation between the converter and also between distributions
[18] Corresponds with `-enc` in TEX Live.
[19] The same as for TEX Live.
[20] This option is only available on Windows systems.

| | | | | |
|---|---|---|---|---|
| `--initialize` | p | x | l | Become the INI variant of the program. |
| `--interaction=mode` | p | x | l | Set the interaction mode (`mode=batchmode/nonstopmode/scrollmode/errorstopmode`). |
| `--job-name=name` | p | x | l | Set the name of the job (`\jobname`). |
| `--job-time=file` | p | x | - | Set the time-stamp of all output files equal to file's time-stamp. |
| `--lua=FILE` | - | - | l | load and execute a lua initialization script[21]. |
| `--luaonly` | - | - | l | Start LuaTeX as a Lua interpreter[22]. |
| `--luaconly` | - | - | l | byte-compile a lua file, then exit[23]. |
| `--luahashchars` | - | - | l | the bits used by current Lua interpreter for strings hashing |
| `--main-memory=n` | p | x | - | Change the total size … of the main memory array. |
| `--max-in-open=n` | p | x | - | Set the maximum number of input files … |
| `--max-print-line=n` | p | x | - | Set the width of longest text lines output. |
| `--max-strings=n` | p | x | - | Set the maximum number of strings. |
| `--[no-]mktex=fmt` | - | - | l | Enable/Disable `fmt` generation, where `fmt` must be either `tex` or `tfm`. |
| `--nest-size=n` | p | x | - | Set the maximum number of semantic levels simultaneously active. |
| `--no-c-style-errors` | p | x | l | Don't change the way, error messages are printed. |
| `--no-pdf` | - | x | - | generate XDV (extended DVI) output rather than PDF |
| `--nosocket` | - | - | l | Disable the Lua socket library. |
| `--output-comment=string` | - | - | l | Use `string` for DVI file comment instead of date. |
| `--output-directory=dir` | p | x | l | Write output files in `dir`[24]. |
| `--output-driver=CMD` | - | x | - | use CMD as the XDV-to-PDF driver instead of xdvipdfmx |
| `--output-format=format` | p | - | l | Use format for job output (one of: dvi, pdf)[25]. |
| `--papersize=STRING` | - | x | - | set PDF media size to STRING |
| `--param-size=n` | p | x | - | Set the the maximum number of simultaneous macro parameters. |
| `--pool-free=n` | p | x | - | Set the minimum pool space left after loading the format. |
| `--pool-size=n` | p | x | - | Set the maximum number of characters in strings, … |
| `--quiet` | p | x | - | Suppress all output, except errors. |
| `--record-package-usages=file` | p | x | - | Record all package usages and write them into `file`. |
| `--recorder` | p | x | l | Enable the file name recorder[26]. |
| `--safer` | - | - | l | Disable easily exploitable Lua commands[27]. |
| `--save-size=n` | p | x | - | Set the the amount of space for saving values outside of current group. |
| `--src-specials` | p | x | - | Embed source file information in the DVI file[28]. |
| `--stack-size=n` | p | x | - | Set the maximum number of simultaneous input sources. |
| `--string-vacancies=n` | p | x | - | Set the minimum number of characters … |
| `--synctex=n` | p | x | l | Generate SyncTeX data for previewers[29] |
| `--tcx=tcxname` | p | - | - | Use the tcxname translation table … |
| `--time-statistics` | p | x | - | Show processing time statistics. |
| `--trace[=tracestreams]` | p | x | - | Enable trace messages. |
| `--trie-size=n` | p | x | - | Set the amount of space for hyphenation patterns. |
| `--undump=name` | p | x | l | Use name as the name of the format to be used, … |
| `--utc` | - | - | l | Init time to UTC[30]. |
| `--version` | p | x | l | Show version information and exit[31]. |

Table 3: Options of TEX engines in MiKTeX

[21] The same as for TEX Live.
[22] Could be the same as for TEX Live.
[23] Could be the same as for TEX Live.
[24] Similar as for TEX Live.
[25] `pdflatex` and `lualatex` differ a bit in text. Seems similar to TEX Live.
[26] The same as in TEX Live.
[27] The same as for TEX Live.
[28] Similar as in TEX Live.
[29] Explanation with more detail than for TEX Live.
[30] The same as for TEX Live.
[31] The same as for TEX Live.

Strange, there are `--enable-etex` and `--enable-mltex` but no way to disable. Maybe disable is the default.

```
  miktex-pdftex [option...] [[file] | [\command...]]

  miktex-luatex [option...] [[command...] | [file]]

The following options are ignored:

--8bit, --etex, --parse-first-line, --no-parse-first-line
These are always on.

--default-translate-file=tcxname, --translate-file=tcxname
These are always off.

  miktex-xetex [option...] [[file] | [\command...]]
```

# 4 To be clarified

Note that `xelatex` works as the other engines for PDF, whereas it has XDV instead of DVI as alternative format. Thus the format DVI is ignored. See the manual.

# 5 References


[HHHS23] H. Hagen, H. Henkel, T. Hoekwater, and L. Scarso. *LuaTEX Reference Manual*, 2 2023. A copy is within the documentation of this software.

[KB23] editor K. Berry. *The TeX Live Guide—2023*, 2 2023. A copy is within the documentation of this software.

[RHB23] W. Robertson, K. Hosny, and K. Berry. *The XETEX reference guide*, 2 2023. A copy is within the documentation of this software.

[Sch22] C. Schenk. MiKTeX Manual. `https://docs.miktex.org/manual/`, 2022.

[THHB23] Han The Thanh, H. Hagen, H. Henkel, and K. Berry. *The pdfTEX user manual*, 2 2023. A copy is within the documentation of this software.