

GETTING STARTED WITH T_EX LIVE

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Abstract

T_EX Live is a complete L^AT_EX distribution, sponsored by T_EX user's groups worldwide. It can be conveniently installed from a CD-ROM that contains pre-compiled binaries for most operating systems. This article presents an overview of the contents of the **T_EX Live** CD-ROM, its installation, and gives some tips to optimise its use.

1 INTRODUCTION

T_EX Live [1] is based on Thomas Esser's teTeX system. Its first version was released in May 1996, with versions 2 through 4 appearing at yearly intervals. **T_EX Live** Version 5 is expected for April 2000. **T_EX Live** provides a complete T_EX system: T_EX, L^AT_EX 2_ε, METAFONT, MetaPost, plus many other programs such as makeindex, dvips, xdvi and BIBT_EX and contains a very large set of macros and PostScript fonts plus a lot of documentation. It uses the Web2c (7.3) C-language part of Donald Knuth's T_EX web sources, takes full advantage of the customisable Kpathsea (KPS) libraries and implements the standard T_EX Directory Structure (TDS). **T_EX Live** works on Unixes, Windows32, Amiga, Apple, and NeXT systems and the distribution can be run either directly from the CD-ROM or installed on a hard disk.

Figure 1 shows schematically files used by L^AT_EX [2, 3]. All needed system files are available on the CD-ROM.

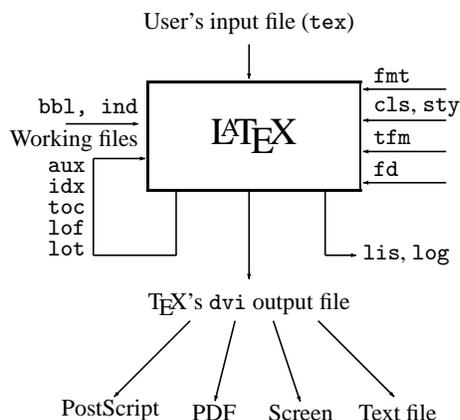


Figure 1: Files used by L^AT_EX

2 STRUCTURE AND CONTENTS

The main top-level directories on the CD-ROM are:

`bin` executable programs arranged by platform;
`tldoc` documentation for **T_EX Live**;

`FAQ` frequently Asked Questions (multiple languages);
`man` documentation in the form of Unix man pages;
`source` program sources (compressed tar archives);
`support` T_EX-related software *not* installed by default;
`systems` packaged T_EX systems separate from the main **T_EX Live**, with subdirectories for:

`macintosh` CMacTeX ready to install;
`msdos` DOS T_EX package emTeX;
`os2` OS/2 T_EX package emTeX/TDS and EPMTFE shell.

`texmf` main support tree of macros, fonts and documentation.

The **T_EX Live** `texmf` tree consists of various “collections”, each of which has a set of “packages”, of which there are over 400 on the CD-ROM. Normal installation allows the user to copy all of a collection to a local hard disk from the CD-ROM, but it is also possible to install just one package of a collection. The collections are:

`ams` The American Mathematical Society macro packages and fonts.

`bibtex` BIBT_EX styles and databases.

`doc` General guides and documentation in various formats, including HTML and PDF.

`dvips` Support for Rokicki's DVI-to-PostScript driver.

`etex` Support for ϵ -T_EX.

`fonts` Font sources, metrics, PostScript and bitmap forms.
`formats` Eplain, RevT_EX, phyzzx, texsis, alateX, text1, lollipop, etc.

`generic` Extra macros for use with any format.

`graphics` Macro packages for graphics.

`lang` Support for non-English languages.

`latex` L^AT_EX, including official tools and all L^AT_EX 2_ε contributed packages.

`metapost` Support for MetaPost.

`omega` Support for Ω.

`pdftex` Support for pdfT_EX.

`plain` Macros for plain T_EX.

`systems` Binaries for Unix and Win32 platforms.

`texlive` Basic material for the distribution.

Each of the collections is divided into *basic* (1), *recommended* (2) and *other* (3).

3 INSTALLATION ON UNIX

The **T_EX Live** CD-ROM can be used in three ways:

1. Mount the CD-ROM on the file system, adjust the PATH variable, and run everything off the CD-ROM. This takes very little disk space, and gives immediate

access to everything on the CD-ROM. Although the performance will not be optimal, it is perfectly acceptable on, for instance, PCs running Linux.

2. Install all or part of the system to the local hard disk. This is the best method for many people, if they have enough disk space to spare (a minimum of about 10 megabytes, or 100 megabytes for a recommended good-sized system).
3. Install selected packages to work either with an existing TeX system or a TeX Live system installed earlier.

We explain the essentials for the two first methods below. Information about the third method or more details about the TeX Live CD-ROM and its use are available in the documentation in the directory `tldoc` on the CD-ROM.

3.1 Running TeX Live from the CD-ROM

TeX Live, being a Web2c port, allows you to run programs simply by adding the appropriate directory under `bin` on the CD-ROM to your `PATH` so that the support files will be found. The following shows the list of available systems and the corresponding directories.

DEC Alpha OSF/1 (4.0)	alpha-osf4.0
HP9000 HPUX 10.10	hppa11-hpux10.10
Linux (on Intel Pentium)	i386-linux
SGI IRIX (6.2)	mips-irix6.2
IBM RS 6000 AIX (4.1.4)	rs6000-aix4.1.1
Sun Sparc Solaris (2.5.1)	sparc-solaris2.5.1
Windows 95 or NT (Intel)	win32

If you want to change a setting on your local system, or update or add a file, you have to maintain a parallel, writeable, TeX tree on your hard disk; this is searched before the main tree on the CD-ROM. You must define it by setting the `VARTEXMF` environment variable, as shown in the example below.

For instance, on an Intel PC running Linux you can mount the TeX Live CD-ROM on `/cdrom` by issuing the command:

```
>> mount -t iso9660 /dev/cdrom /cdrom
```

Then, the directory containing the binaries for the given architecture are included into the search path by updating the `PATH` variable.

```
PATH=/cdrom/bin/i386-linux:$PATH  
export PATH  
VARTEXMF=/my-local-TeX-dir/  
export VARTEXMF
```

These commands can also be added to your `.profile` script.

On other Unix systems, or when in doubt, the local system support guru should be consulted for help on how to mount a CD-ROM or which local directories to use.

3.2 Installing TeX Live to hard disk

All of the necessary steps to install all or part of the distribution on your hard disk are achieved by mounting the CD-ROM, changing to the top-level directory, and typing:

```
>> sh install-cd.sh
```

This script works by accessing lists of collections and packages from the CD-ROM, and trying to guess what sort of computer system you are on. It should start by displaying the following:

```
Initializing collections...  
Done initializing.  
Counting selected collections...  
Done counting.  
Calculating disk space for collections...  
Done calculating that.  
Initializing system packages...  
Done initializing system.
```

Figure 2 shows the main control screen.

```
=====> TeX Live installation procedure <=====  
  
Note: Letters/digits in <angle brackets> indicate menu  
      items for commands or configurable options  
  
Proposed platform: Intel x86 with GNU/Linux  
<P> over-ride system detection and choose platform  
<C> collections: 24 out of 34, disk space: 163071 kB  
<S> systems:    1 out of 8, disk space: 7925 kB  
                total disk space: 170996 kB  
<L> install level (1: basic, 2: recommended, 3: all): 2  
<D> directories:  
    TEXDIR      (The main TeX directory): /usr/TeX  
    TEXMFLOCAL (local styles directory): /var/TeX-local  
<O> options:  
    [ ] alternate directory for generated fonts ( )  
    [ ] alternate directory for configuration ( )  
    [ ] create symlinks in standard directories  
    [ ] do not install macro/font doc tree  
    [ ] do not install macro/font source tree  
    [ ] only install free software  
<I> start installation, <H> help, <Q> quit  
Enter command:
```

Figure 2: Main control screen

The main control screens lets you change four things:

1. the type of system you are on, or want to install for;
2. the collections you want to install, at the *basic*, *recommended* or *other* level;
3. the location on your hard disk to put the files;
4. some runtime behaviour features.

You choose options by typing a letter or number and pressing “return”. In the example, a Linux ELF system has been detected, the default of all collections to *recommended* level has been chosen, and the default installation directory is `/usr/local`; note that the disk space required for the current installation configuration is also displayed. If you

make a suggested setup, you need about 171 megabytes of disk free; however, the basic setup will only take about 20 megabytes, and you can enhance it with selected packages as you need them.

Under the directory you choose for installation, the installation script will put the binaries in a subdirectory of `bin`, and the support tree in `texmf`.

The `options` item lets you specify where to create new font files (on shared systems the \TeX tree is mounted read-only for most users), whether to make symbolic links for the `man` and `GNU info` pages in the “standard” locations, and so on. You will probably need “root” permissions to write to such directories, or, more generally to install \TeX in system directories.

When you choose `<C>` for “collections”, you will see a display with the available collections, the level of installation selected, and the disk space required (Figure 3).

```

=====
name          selection      size
<1>  bibtex    [recommended]    8294 kB
<2>  doc       [recommended]    24943 kB
<3>  dvips     [recommended]    552 kB
<4>  etex      [recommended]    1382 kB
<5>  fonts     [recommended]    39781 kB
<6>  formats   [recommended]    22743 kB
<7>  generic   [recommended]    4618 kB
<8>  graphics  [recommended]    9584 kB
<9>  lang       [recommended]    10219 kB
<U>  latex     [recommended]    19844 kB
<V>  metapost  [recommended]    4269 kB
<W>  omega     [recommended]    6809 kB
<X>  pdftex    [recommended]    3031 kB
<Y>  plain     [recommended]    3030 kB
<Z>  texlive   [recommended]    2590 kB
                                SUM: 163071 kB
=====
global commands: select <N>one <B>asic R<E>commended
                  <A>ll for all collections
<R>  return to platform menu
<Q>  quit

Enter command to modify current selection:

```

Figure 3: Selecting collections

You can set alternative levels of installation for each collection, ranging from *none* to *all*. You can either set this for all collections at once, or choose a particular collection and set its level (Figure 4 shows this for the `<U>` option, which allows you to customise the collection of \LaTeX styles).

When you are finished, return to the main screen, and ask the installation to start. It will take each of the collections and systems that you requested, consult the list of files on the CD-ROM, and build a master list of files to transfer. These will then be copied to your hard disk. If you installed a system, an initialisation sequence is now run (creating format files, etc.). When this has finished, all you need do is add the correct subdirectory of `bin` in the \TeX installation to your path to start using \TeX .

```

=====
Collection: LaTeX styles
=====
Style files and document classes for LaTeX2e
=====
<N> No packages
<B> Basic packages [ 9338 kB]
<E> Basic + Recommended packages [ 19844 kB]
<A> All packages [ 61961 kB]
=====
<R> return to collection menu
<Q> quit

Enter command:

```

Figure 4: Customising a collection

3.3 The `texconfig` program

After the installation program has copied all files to their final locations, the program `texconfig` must be run to configure the system to fit local needs. This can be called at any time to change the setup, such as when adding new printers, or rebuilding the file database.

4 INSTALLATION UNDER WINDOWS

This section only applies to systems running Windows 9x or NT. If you run Windows 3.1, you will have to install `emTeX`, or `DJGPP \TeX` (from the top level `systems` directory) by hand.

It is also necessary to have your Windows set up so that it uses the Microsoft Joliet extensions for reading CD-ROMs; simply look at the CD-ROM in Explorer and see whether it shows long, mixed-case, file names. If it does not, you cannot use the ready-to-run system on the CD-ROM.

This Win32 \TeX systems includes a `dvi` previewer, `Windvi` similar in usage to `xdvi` on Unix. Documentation is in `texmf/doc/windvi/windvi.html`.

4.1 Running from the CD-ROM

You can run all the \TeX programs directly off the CD-ROM, and have access to all the macros and fonts immediately, at the price of a slower performance than if you install on the hard disk. To do this, you must add the `bin/win32` directory of the CD-ROM to your `PATH`, using the Windows configuration software. Now you can run the programs at a command prompt, or use the shareware `WinEdt` editor, which runs the programs from convenient menus.

4.2 Installing to your hard disk

Installation is started by letting the CD autostart, or by running the program `setup.exe` in the `setupw32/setup` directory, which works by accessing lists of collections and packages from the CD-ROM. It will allow you to select

the level at which each collection is installed and permits you to omit the documentation and/or source segments of the packages if your disk space is limited. You will be prompted for directories in which to install the main distribution, and your local configuration. In addition, you will be able to install a shareware T_EX editor, WinEdt, and the PostScript viewer Ghostscript (*Please respect the shareware status of WinEdt and register your copy if you intend to carry on using it.*).

When installation is complete, you will have to restart Windows, and then you can either run the T_EX programs from a command prompt, or via WinEdt’s menus (if you opted to install it).

5 RUNNING T_EX Live

T_EX Live uses the Web2c path searching library Kpathsea to locate the files it needs. This library uses a combination of environment variables and a few configuration files to optimise searching the T_EX directory tree. Web2c 7.3 can handle more than one directory tree simultaneously, which is useful if one wants to maintain T_EX’s standard distribution and local extensions in distinct trees. To speed up file searches the root of each tree has a file `ls-R`, containing an entry showing the name and relative pathname for all files “hanging” under that root.

5.1 Kpathsea path searching

Let us first describe the generic path searching mechanism of the Kpathsea library.

We call a *search path* a colon- or semicolon-separated list of *path elements*, which are basically directory names. A search path can come from (a combination of) many sources. To look up a file “my-file” along a path “`./dir`”, Kpathsea checks each element of the path in turn: first `./my-file`, then `/dir/my-file`, returning the first match (or possibly all matches).

In order to adapt optimally to all operating systems’ conventions, on non-Unix systems Kpathsea can use filename separators different from “colon” (“`:`”) and “slash” (“`/`”).

To check a particular path element *p*, Kpathsea first checks if a prebuilt database (see Section 5.2) applies to *p*, i.e., if the database is in a directory that is a prefix of *p*. If so, the path specification is matched against the contents of the database.

If the database does not exist, or does not apply to this path element, or contains no matches, the filesystem is searched. Kpathsea constructs the list of directories that correspond to this path element, and then checks in each for the file being sought.

A search path can come from many sources. In the order in which Kpathsea uses them:

- a user-set environment variable (e.g., `TEXINPUTS`);
- a program-specific configuration file (e.g., dvips’s `config.ps`);

- the contents of the `texmf.cnf` configuration file (e.g., a line like “`TEXINPUTS=/c:/d`”);
- compile-time defaults.

5.2 Filename databases

Kpathsea goes to some lengths to minimize disk accesses for searches. Nevertheless, at installations with many directories, searching each possible directory for a given file can take an excessively long time (this is especially true if many hundreds of font directories have to be traversed.) Therefore, Kpathsea can use externally-built “database” files (one per directory tree). They are named `ls-R` and map files to directories, thus avoiding the need to exhaustively search the disk.

The recommended way to create and maintain these “`ls-R`” files is to run the `mktexlsr` script included with the distribution. To ensure that the database is always up to date, it is easiest to rebuild it regularly with a program such as `cron`. Thus, changes in the installed files—perhaps after installing or updating a L^AT_EX package—will automatically update the file `ls-R`.

If a file is not found in the database, by default Kpathsea goes ahead and searches the disk. However, if a particular path element is preceded by “`!`” in the `texmf.cnf` configuration file, then *only* the `ls-R` databases will be searched for that element, never the disk.

5.3 Locating a file

The `kpsewhich` program exercises path searching independent of any particular application. This can be useful as a sort of `find` program to locate files in T_EX hierarchies. The program is called as follows:

```
>> kpsewhich option... filename...
```

A short description of the available options, as well as of the format identifiers that are recognised by the `-format` option that guide the search are shown by typing:

```
>> kpsewhich --help
```

Let us have a look at Kpathsea in action.

```
>> kpsewhich article.cls
/usr/local/texmf/tex/latex/base/article.cls
```

We are looking for the file `article.cls`. Since the “`.cls`” suffix is unambiguous we do not need to specify that we want to look for a file of type “`tex`” (T_EX source file directories). We find it in the subdirectory `tex/latex/base` below the “`TEXMF`” root directory. Similarly, we find the class file for the proceedings of the Joint Accelerator Conferences in the local directory:

```
>> kpsewhich JAC99.cls
./JAC99.cls
```

The Jacow proceedings use the PostScript Type1 fonts Times-Roman. The font metrics that allow T_EX to know the size of the characters are found in T_EX font metrics (tfm) files. For Times-Roman this file is called ptmr.tfm, and you can find out where it resides as follows:

```
>> kpsewhich ptmr.tfm
/usr/local/texmf/fonts/tfm/adobe/times/ptmr.tfm
```

The dvips program which is used for generating the PostScript output from a dvi file uses a configuration file config.ps. We can find where it lives as follows (since the suffix .ps is ambiguous we must specify the kind of file we are looking for with the help of the format option):

```
>> kpsewhich -format "dvips config" config.ps
/usr/local/texmf-cern/dvips/config/config.ps
```

The contents of this file contains the line:

```
p psfonts.map
```

This file psfonts.map maps the internal font names used by T_EX to the external names used by the PostScript interpreters. Let us find this file.

```
>> kpsewhich psfonts.map
/usr/local/share/texmf/dvips/config/psfonts.map
```

When you actually look at the contents of this file, you will see lines of the type:

```
rptmb Times-Bold
rptmbi Times-BoldItalic
rptmbo Times-Bold ".167 SlantFont"
rptmr Times-Roman
rptmri Times-Italic
rptmro Times-Roman ".167 SlantFont"
rptmrre Times-Roman "1.2 ExtendFont"
rptmrn Times-Roman ".8 ExtendFont"

psyr Symbol
psyro Symbol ".167 SlantFont"
```

The first column is the name used by T_EX when dealing with PostScript fonts, while the second column is the PostScript name of the base font as declared in its Type1 font file. The commands inside quotes at the right-hand side are PostScript routines to deform (slant or extend) the characters of the font.

5.4 Debugging actions

Sometimes it is necessary to investigate how a program resolves file references. To make this feasible in a convenient way Kpathsea offers various debug levels:

- 1 stat calls (file tests). When running with an up-to-date ls-R database this should almost give no output.
- 2 References to hash tables (like ls-R database, map files, configuration files).
- 4 File open and close operations.

- 8 General path information for file types searched by Kpathsea. This is useful to find out where a particular path for the file was defined.
- 16 Directory list for each path element (only relevant for searches on disk).
- 32 File searches.

A value of -1 will set all the above options; in practice you will probably always use this level for debugging.

Similarly, with the dvips program, by setting a combination of debug switches, one can follow in detail where files are being picked up from. Alternatively, when a file is not found, the debug trace shows in which directories the program looks for the given file, so that one can get an indication what the problem is.

Generally speaking, as most programs call the Kpathsea library internally, one can select a debug option by using the KPATHSEA_DEBUG environment variable, and setting it to (a combination of) values as described in the above list.

An example of the use of these debug settings with the dvips program, where we ask for a full debug, is the following:

```
>> dvips -d-1 my_file.dvi -Pcms -o
```

6 CONCLUSION

We have shown how the T_EX Live distribution offers a simple and self-contained tool to install in a straightforward way a modern, complete, and up-to-date T_EX system on a personal computer or workstation. Precompiled binaries for the most-used operating systems are available on the CD-ROM, which also contains most L^AT_EX packages that you will ever need in your daily work. Moreover, it is easy to customise the setup and it is simple to maintain, add, or update packages in a separate T_EX tree. Finally, additional tools allow for easy debugging when problems arise.

7 REFERENCES

- [1] *T_EX Live — Unix and Windows TeX on a CD-ROM*. <http://tug.org/texlive/>
- [2] Leslie Lamport. *L^AT_EX: A Document Preparation System: User's Guide and Reference Manual*. 2nd edition. 1994, Addison-Wesley, Reading, Mass.
- [3] Michel Goossens, Frank Mittelbach and Alexander Samarin. *The L^AT_EX Companion*. 1994, Addison-Wesley, Reading, Mass.