



A L^AT_EX Tour, part 1: The basic distribution

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Introduction

In this article¹ I hope to give a ‘guided tour’ around the files that make up the basic L^AT_EX distribution. Subsequent articles in this mini-series will cover other packages by the L^AT_EX development team, and also some of the main contributed packages.

The primary source for L^AT_EX is the ‘CTAN’² network of archives, so if I refer to path names of files this relates to the CTAN file structure. Note however that if you obtained L^AT_EX as part of a ‘pre-packaged’ T_EX distribution, then these files may have been moved (typically documentation files may be separated from T_EX source files). Hopefully this will not cause any confusion.

The Components of L^AT_EX

The L^AT_EX distribution at the CTAN archives is organised into the following directories.

base Contains the core L^AT_EX files. You need at least these files for a minimal L^AT_EX installation.

unpacked Includes *all* the files in **base** together with the result of ‘unpacking’ the source files. (More about this later.) Thus when obtaining L^AT_EX you should get either **base** or **unpacked**, but not both. Getting the former saves on time transferring the files, but getting the latter saves time that would be taken unpacking the source files, so which is preferable depends on the relative speed (and cost) of your machine and your connection to the archives.

packages Consists of seven independent L^AT_EX ‘extensions’ that are written and supported by the L^AT_EX developers (or the American Mathematical Society) — **amsfonts**, **amslatex**, **babel**, **graphics**, **mfnfss**, **psnfss** and **tools**.

These packages will be described in more detail later in the series.

¹ This is a slightly edited version of an article that first appeared in the UKTUG journal *Baskerville* 6.1.

² The Comprehensive T_EX Archive Network: <ftp.tex.ac.uk> (UK), <ftp.dante.de> (Germany), in the USA the mirror <ftp.cdrom.com> of the UK archive should be used in preference to the original CTAN host of <ftp.shsu.edu> which is unfortunately unreliable at the present time.

fonts The metafont sources and T_EX font metric files of a few fonts that L^AT_EX requires that are not part of the original plain T_EX distribution.

doc This directory is not part of the main L^AT_EX distribution, it is generated by the CTAN archives. As a convenience for those people that have not yet installed L^AT_EX, some of the main introductory documentation files which are available as L^AT_EX files in the base distribution are made available in this directory as dvi and PostScript files.

contrib This directory contains an ever growing number of contributed L^AT_EX packages, and other extensions, that have been contributed by L^AT_EX users. They are not part of the ‘official’ L^AT_EX distribution, but many of them form a vital part of any ‘working’ L^AT_EX installation. The packages are divided into two sub-directories ‘**supported**’ and ‘**other**’, however at the current time one should ignore this distinction when looking for packages to fetch from the archives. Contrary to expectations some of the best supported packages are distributed (at their author’s request) from **contrib/other**.

Unfortunately (for mainly historical reasons) people in search of contributed L^AT_EX packages also need to look in more distant CTAN directories. Firstly, the **macros/latex209/contrib** area on CTAN contains packages that were written for the previous version of L^AT_EX that has been obsolete since June 1994. Any packages that are still distributed from this L^AT_EX 2.09 tree are likely to be less than well supported, but you can still find some useful files there. Secondly, there are some packages that work with multiple formats, not just L^AT_EX, and these are to be found under **macros/generic** or in their own top-level directory, such as **macros/musictex**.

Documentation in the Base Distribution

The documentation that comes with L^AT_EX is of two forms: plain (ASCII) text files with extension **.txt**, or L^AT_EX documents distributed as L^AT_EX source with extension **.tex**. Generally speaking the text files are mainly of interest to people installing L^AT_EX, who may need information before they have a working system. Information of more general interest to L^AT_EX users is normally distributed as a L^AT_EX document.

The ASCII text files

Installation instructions

00readme Provides a general introduction to the system, and should be the first file to look at when installing L^AT_EX for the first time.

install Provides ‘generic’ installation instructions, but for many T_EX versions more specific instructions that have been contributed by the authors or users of those systems; thus **emtex** gives instructions for the popular emT_EX implementation, **web2ctex** gives specific instructions on installing under UNIX, etc.

tex2 If you have a T_EX that pre-dates version 3.0 (which was released in 1989) by far the best thing to do is to update your T_EX, but if that is really not possible this file details how L^AT_EX may be built under T_EX2.

autoload Describes the installation of an ‘autoloading’ version of L^AT_EX. This produces a much smaller format by saving less common commands in external files rather than in memory. These files are automatically ‘autoloading’ as required. This version of L^AT_EX is particularly recommended if you are using a small installation (for instance a ‘small’ emT_EX on a sub-386 PC).

Other text files

legal Contains the copyright notices and distribution conditions for L^AT_EX.

bugs Contains instructions on how to compile a bug report (see below).

patches Describes the L^AT_EX patch mechanism that is used for distributing small updates between the ‘full’ releases. This file also contains a list of all the files that have changed since the last full release.

changes A Change Log of all the changes made to the L^AT_EX files. This is mainly intended for internal use by the L^AT_EX developers, but some people like to read it.

The L^AT_EX ‘guides’

These documents are distributed as L^AT_EX source (i.e., .tex files) although as noted in the above introduction, the CTAN archives distribute most of them in ready-formatted versions in the directory **latex/doc** so you can read these before installing L^AT_EX if you wish. Unlike the ASCII text files described above, most of these documents are primarily intended for *users* of the system rather than system managers and software installers.

usrguide *L^AT_EX 2_ε for Authors*. This document describes all the main new features of the 2_ε release of L^AT_EX. It was written originally with the user of the old L^AT_EX 2.09 in mind, but newcomers to L^AT_EX who have never used the old version should still gain something by reading this document. It does not however cover the majority of L^AT_EX commands that were not changed, and so it is not a substitute for a full L^AT_EX manual.

clsguide *L^AT_EX 2_ε for class and package writers*. A companion to **usrguide**, gives details of the L^AT_EX commands for structuring class files and extension packages.

fontguide *L^AT_EX 2_ε font selection*. For font addicts only, but if you want to know the detailed specification of the ‘New Font Selection Scheme’ commands, here is the place to look.

cfgguide *Configuration options for L^AT_EX 2_ε*. Discusses what you can (and can not) do to configure a L^AT_EX installation to the requirements of your local site.

ltx3info *The L^AT_EX3 Project*. A brief summary of the aims of the L^AT_EX3 project, the group of volunteers that has taken on the maintenance and development of L^AT_EX.

modguide *Modifying L^AT_EX*. This document discusses some of the rationale behind the L^AT_EX distribution conditions as expressed in **legal.txt** and **cfgguide.tex**. Unless you are making a distribution of a modified version of L^AT_EX, or are particularly interested in software copyright issues, you probably do not want to read this.

L^AT_EX News

As well as these larger documents there are a series of one-page ‘newsletters’. A new one is produced with each full release of L^AT_EX. These detail any changes that have occurred in L^AT_EX or the main extension packages over the six months since the previous release. (L^AT_EX releases occur at regular intervals, in June and December of each year.) Currently the four files **ltnews01–ltnews04** are distributed; these correspond to the four releases of L^AT_EX since June 1994.

Example Documents

There are two (very) small example documents, as described in the L^AT_EX book by Leslie Lamport.

small2e A very small (1 page) L^AT_EX document.

sample2e A slightly larger document.

Documented sources

The source for the \LaTeX format, and for all the packages and classes in the core distribution is distributed as ‘`dtx`’ files. These are \LaTeX documents which may be processed in the usual way to produce typeset documentation. For example a command such as `latex ltpictur.dtx` would produce documented source of the picture mode commands. The files with names of the form ‘`lt...dtx`’ make up the source of the \LaTeX format. If you want to produce a combined document incorporating all these files, you may process `source2e.tex`. This document will produce a typeset version of the \LaTeX sources, together with change log and index. It is well over 500 pages long, and so may take a long time to produce. It may produce an index that is too large to be handled by the ‘`makeindex`’ program on smaller machines.

Errata

The principal documentation for \LaTeX is the two books *\LaTeX : A Document Preparation System*, and *The \LaTeX Companion*. Errata for these (and the German edition of *The Companion*) are available as `manual.err`, `compan.err` and `begleit.err`.

The \LaTeX Bug Report Database

As described in the file `bugs.txt` mentioned above, the \LaTeX 3 project maintain a database of bug reports for \LaTeX .

If, after checking with colleagues, reading the manual, etc., you decide that some behaviour of \LaTeX is incorrect then you may send a message to the \LaTeX bug database. Before doing this you should check that your \LaTeX is not more than one year old (the bug may have been fixed in a recent release). If you have access to the World Wide Web, you may access the database and see if the problem is already reported by using the search page accessible from: <http://www.tex.ac.uk/CTAN/latex/bugs.html>.

If you decide to send a report, two files are available to help compose a message in the correct format:

`latexbug.tex` \LaTeX this file and you will be prompted for information such as your name, and the name of a test file that shows the problem. A mail message will be written to the file `latexbug.msg` which should be sent to `latex-bugs@uni-mainz.de`. (You should *always* use `latexbug.tex` to generate messages to be sent to this bug address. It is an interface to a database (the GNU GNATS problem

tracking system) and can not handle messages that are not in the special format written by `latexbug.tex`.

`latexbug.el` For users of the GNU Emacs text editor, a more convenient interface is provided by this file. It runs `latexbug.tex` automatically, and provides online help for filling in the various fields, and finally automatically mails the message to the correct address.

Docstrip files

As mentioned above, \LaTeX is distributed as documented sources. The files that are actually used by \TeX are extracted from these files by running `docstrip.tex`. The \LaTeX distribution contains many files with extension `.ins` that control how `docstrip` extracts each file. Most of these are never used individually, as they would just ‘unpack’ one small part of the distribution. The file `unpack.ins` is a ‘master’ installation script that calls the smaller install files in turn and so unpacks the whole distribution. Normally running \TeX on this file is the first step in installing \LaTeX . This step may be omitted however if the `unpacked` directory is obtained from CTAN rather than `base`. `unpacked` is *exactly* the result of obtaining `base` and running \TeX on `unpack.ins`. If you have a slow machine you may prefer this route as it saves unpacking time, but conversely it requires downloading more files, so if you are transferring the files via a slow connection such as a modem then you may prefer to get the smaller ‘base’ distribution.

There are three install files that are *not* included into `unpack.ins` so you may have need to run these if you need the following features.

`autoload` Processing `autoload.ins` will generate the source file for the ‘autoload’ version of \LaTeX , `latexa.ltx`, as described in the file `autoload.txt`. This should be processed with $\text{\texttt{iniTeX}}$ to create a format file to be used in place of the standard `latex.fmt`. As well as the modified format, various packages are created containing the code that has been taken out of the format. Normally these do not need to be invoked explicitly as they are loaded on demand when they are needed. Currently the following package files are produced.

`autopict` Source for picture mode.

`autotabg` Source for tabbing environment.

`autoerr` The texts of most \LaTeX error commands.

`autofss1` Less used font selection commands.

autoout1 Code related to `\enlargethispage`.

The autoload format is still quite experimental, and so the range of such ‘autoloading’ packages may change with future releases.

cmextra Processing `cmextra.ins` installs the ‘fd’ files for the ‘concrete’ variants of the Computer Modern fonts, and also the AMS Cyrillic fonts.

olddc If using the Computer Modern fonts in the 8-bit ‘T1’ encoding, \LaTeX defaults to using the ‘dc fonts’. During 1995 these fonts were updated and the names of the fonts *changed*. Thus the 10pt roman font corresponding to `cmr10` is now `dcr1000` rather than `dcr10`. The install file `unpack.ins` includes `newdc.ins` so by default \LaTeX will use the new 1995 names (dc fonts release 1.2 or later) when using T1 font encoding. If you still have the old dc fonts, then you must process `olddc.ins` to produce suitable fd files referring to the old names.

The Standard \LaTeX Classes

The general appearance of a \LaTeX document, and the specification of the commands available is specified in a *document class*. This may be further modified by loading *packages*, as described in `usrguide`. In this section I give a brief overview of the available classes in the base distribution. They all have extension `.cls` (after being unpacked from the `.dtx` source file during the installation process).

article ‘Article Class’. In some sense the canonical reference class against which all others are judged. This class (which is generated from the same `classes.dtx` source as `report` and `book` described below) is a mixed blessing. On one hand it provides quite a rich collection of commands for marking up documents that means that it serves well as as the basic ‘generic’ class to be used when no more suitable specific class is available. On the other hand the visual appearance of documents produced with this class is very distinctive. Many people who say they “don’t like \LaTeX ” and so use some other format such as plain, in fact are misled into believing that \LaTeX *is* this class. In fact by loading `article` and then making small adjustments one can produce very different visual designs. The class files for *Baskerville* and *TUGboat* are examples of such non-standard classes based on `article`.

However for many purposes, portability is more important than original typographical design, and in these cases the `article` class has the big advantage of being installed at all \LaTeX sites.

report ‘Report Class’. Very similar to `article` (and produced from the same source). The main differences are that this class has a higher level of sectioning command (`\chapter`) than is available in `article`, and the front matter is typeset differently.

book The `book` class is again very similar to `report` with the addition of a few extra features for controlling the front matter and back matter. It is unlikely that you would want to use this class ‘as is’ for a book, as you would almost certainly want to spend some effort (and perhaps money!) on an original design. However it can be used as a basis or example of the implementation of a \LaTeX class for book production.

letter This provides commands for producing one or more letters. Many sites use this as a basis for producing site-specific letter class files, for instance with a modified heading that inserts a departmental logo and address.³

proc Proceedings class. This is a variant of `article` class (and inputs the `article.cls` file when used). It defaults to two column mode and makes one or two other small adjustments. It may be used as a model for how make a class that builds on another.

slides The `slides` class. This class essentially provides the functionality that was formally built into `SL \LaTeX` . It provides a mechanism for producing pages suitable for projecting on an overhead projector. It is described in the \LaTeX book, and some people like it; however if you are making a lot of such presentations you may prefer to look at the contributed classes `seminar` (T. v. Zandt) or `foiltex` (J. Hafner). These provide alternatives to the standard class that many people find more useful.

As well as these ‘Standard Classes’ the base distribution contains a few other special purpose classes.

minimal This is the minimal \LaTeX class. It just sets up a text area, and a font in a single size. None of the normal sectioning or font size commands are available. This class is not intended to be used in documents, but it is often useful when testing macros as it loads very quickly.

ltxguide A special purpose class for the ‘ \LaTeX guides’ mentioned earlier.

ltnews The class file used for the ‘ \LaTeX News’ news sheets.

³ One should be able to find details of such local variants in the famous ‘local guide’.

ltxdoc This class is used in all the `dtx` documentation files. It is based on the `article` class and the `doc` package, but with additional commands for documenting the \LaTeX sources. It was not conceived as a class for general use, but some people find it convenient to use it when documenting their own package files.

Standard Packages

Encoding Packages

One of the main features of the 2e release of \LaTeX is that it attempts to remove all ‘hard wired’ assumptions about the encodings being used, both for input and also in the fonts used for typesetting.

It maintains a strict distinction between the *Input Encoding* and the *Output Encoding*. The input encoding relates to the text that you type; this may be a standard encoding such as ASCII (the traditional 7-bit encoding) or ISO Latin-1, or a platform-specific encoding such as ‘Windows ANSI’ as used on Microsoft Windows 3.x machines. The output encoding for text fonts is usually either OT1 (the encoding devised by Knuth and implemented in the original Computer Modern \TeX fonts) or T1 (the new \TeX encoding also known as ‘Cork’ after the meeting where it was agreed).

\LaTeX maintains this separation by *always* translating input to an *Internal Encoding*. This is essentially traditional \TeX 7-bit input. This internal encoding is then translated to the encoding used in the font without reference to the original input mechanism used. Thus if you specify an input encoding that includes the character \acute{e} you may type that directly at the keyboard, and see it as a single character; however internally \LaTeX will treat this as `\’{e}`. If you are using 7-bit OT1 encoded fonts this command will use the `\accent` primitive to add an acute to the `e`; however if you are using T1 fonts, the existing \acute{e} will be accessed directly. Note however that the position of \acute{e} in the output encoding (T1) is typically *different* from the position of the character in the input encoding used.

inputenc Specifies that an 8-bit input encoding is being used. A package option should always be used which sets up the default encoding. The currently available options include `latin1`, `latin2`, `ansinew`, `cp437`, `cp437de`, `applemac`. (The two IBM codepage 437 variants differ in just one slot; the former uses β , the latter uses β .)

So typical usage (to specify ISO Latin-1 input conventions) would be:

```
\usepackage[latin1]{inputenc}
```

fontenc Specifies the default output encoding for text fonts. Currently the available options are OT1 and T1. So to specify that fonts in the the T1 (Cork) encoding be used in the document one would declare:

```
\usepackage[T1]{fontenc}
```

Remaining Packages in the Base Distribution

alltt Defines the `alltt` environment, similar to `verbatim` except that `\`, `{` and `}` retain their usual \TeX meanings.

doc The package defining the commands used for documenting all the \LaTeX code in the distribution.

shortvrb This package (really a small part of the `doc` package) defines the `\MakeShortVerb` command that allows shorthands like `|\foo|` instead of `\verb|\foo|` This is very convenient if you are documenting \TeX or some other situation where you need to make a lot of use of short sections of verbatim text.

exscale For mainly historical reasons \LaTeX always uses the math extension font (used for brackets and sum and integral signs etc.) at the same size, whatever the current font size. This package modifies this behaviour so that magnified fonts are used at larger sizes. At the same time it makes the plain \TeX commands `\big`, `\bigg` etc., work as expected in conjunction with \LaTeX size commands.

flafter \LaTeX floats such as the `figure` and `table` environment can float *up* to the top of the current page. This means that it is possible that the figure appears before its first reference. Some publisher’s styles do not allow this. `flafter` redefines the float placement algorithm so that a float never appears before its position in the source file, so by using this package, and placing the `figure` environment after the first reference to the figure, one can ensure that a figure will appear after the reference.

graphpap The `\graphpaper` command produces a grid for use in the `picture` environment.

ifthen Provides an ‘if ... then ... else ...’ programming construct for use in \LaTeX packages. Many of the examples in *The \LaTeX Companion* assume this package has been loaded.

makeindx Implements support for generating an index.

pict2e This package produces an error message to say that it has not been written. The documentation in the `pict2e.dtx` source file suggests alternative packages for extending `picture` mode, `pspicture` (D. P. Carlisle), `pspic` (K. K. Thorup), and the very powerful `pstricks` (T. V. Zandt).

showidx This causes the argument of each `\index` command to be printed on the page where it occurs. See also `idx.tex` described below.

syntonly Used to process a document without typesetting it. On some systems this speeds things up considerably, and so may (possibly) be useful while debugging documents.

tracefmt This allows you to control how much information about \LaTeX 's font loading is displayed.

latexsym Loads the special \LaTeX symbol font and then defines commands such as `\Box` that use this font. These commands were defined by default in \LaTeX 2.09.

newlfont Defines 'old' font commands to act in the 'new' way. For example it makes `\rm` essentially equivalent to `\rmfamily`. This package is not now recommended but is distributed so old documents written using the \LaTeX 2.09 version of this package still work.

oldlfont A companion to `newlfont`. This package is only to be used for old documents that used the \LaTeX 2.09 package of the same name.

Font Definition Files

Unpacking the \LaTeX distribution creates dozens of 'font definition files' with extension `.fd` from their documented sources (with extension `.fdd`). These map the internal \LaTeX model of fonts on to the external file names as used on your system. Normally you never need to load these explicitly into a \LaTeX document and they will not be considered in detail here except to say that if you obtain some new fonts from the \TeX archives, make sure to also get the related `fd` files, and install them where \LaTeX can find them.

Makeindex Styles

The distribution includes three styles (with extension `.ist`) for the `makeindex` index generator. They modify the `makeindex` defaults so as to work with the special requirements of the `doc` package.

gind Produces indices of command definition and use.

gglo Produces 'change log' entries (using the \LaTeX `\glossary` command rather than `\index`).

source2e This style is produced only if the \LaTeX document `source2e.tex` is processed. It is almost identical to `gind.ist` but defines 'I' to be in the series 'I-J-K' rather than 'I-II-III'. This is needed for the numbering conventions used in that document.

Miscellaneous Utilities and Files

idx.tex Print out index entries in your document.

lablst.tex Generate list of labels used in a document. You may prefer instead to have the labels show up in the margins of your drafts, in which case use the `showkeys` package from the 'tools' collection to be described later in this 'tour'.

ltxcheck.tex This 'document' should always be processed after \LaTeX has been installed. It produces no output but checks that various components of the system are configured correctly for your machine type.

nfssfont.tex Test file for testing a font. A more extensive font test is available if you use the `fontsmpl` package from the 'tools' collection.

testpage.tex Test file for checking the accuracy of a printer. This is particularly useful to see if you need to specify any offsets to your printer driver to ensure that the printed text is correctly positioned on the paper.

Makefile.unx A very simplistic template 'Makefile' for installing the \LaTeX base distribution under UNIX. Many UNIX \TeX distributions come with far more suitable installation procedures. For example the excellent 'te \TeX ' distribution allows you to install \TeX , \LaTeX , `metafont`, `dvips`, `xdvi`, and a host of other utilities and fonts just by typing `sh install.sh`.

latex209.def This file is loaded whenever a document beginning with `\documentstyle` is seen. It forces \LaTeX into '2.09 compatibility mode' which is a slow, but a fairly accurate, emulation of the old version of \LaTeX . This enables old documents to be processed under the current system.

Conclusion

The base distribution described here is only really a bare minimum \LaTeX installation. Most sites would want to install all of the \LaTeX files from the CTAN `latex/packages` directory, and some of the contributed packages as well. These other files will be covered in future installments of this 'tour'. Part 2 will cover the `tools` and `graphics` distributions. Part 3 will cover `babel`, `mfnfss` and `psnfss`. Part 4 will cover

the AMS L^AT_EX distributions `amsfonts` and `amslatex`.
If I am still feeling keen, later parts may venture out
to describe some of the more popular contributed
packages.

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