

3 Packages and CTAN

The Comprehensive T_EX Archive Network (CTAN) is a repository of Web documents and files from HTTP and FTP servers worldwide which contain copies of almost every piece of free software related to T_EX and L^AT_EX.

Always try CTAN first

CTAN should *always* be your first port of call when looking for a software update or a feature you want to use. To help prevent overload on the volunteers, please don't ask the [network help resources](#) until you have checked CTAN and the [FAQ](#) ([section 3.3.3 on page 67](#)) first.

CTAN is based on three main servers, and there are several online indexes available. There are complete T_EX and L^AT_EX systems for all platforms, utilities for text and graphics processing, conversion programs into and out of L^AT_EX, printer drivers, extra typefaces, and (possibly the most important) the L^AT_EX packages. The three main servers are:

- T_EX Users Group: www.ctan.org/
- UK T_EX Users Group: www.tex.ac.uk/
- Deutschsprachige Anwendervereinigung T_EX e.V. (DANTE, the German-speaking T_EX Users Group); dante.ctan.org/

In addition, there are dozens of mirrors of [CTAN](#) around the world, run by ISPs, companies, universities, and other institutions. These automatically update themselves from the three main servers, so for a speedy download from your closest server, you can go to [mirrors.ctan.org](#) and it will redirect you to your nearest mirror site.

3.1 Packages and classes

Add-on (plug-in) features for \LaTeX are known as *packages*. Most of them can be used with any document class, to add extra formatting features. There over 5,000 packages, and several hundred of them are pre-installed with a full distribution of \LaTeX and can be used in your documents immediately. They are all stored in subdirectories of your \TeX installation directory, named after each package. To find out what packages are available and what they do, you should use the [CTAN search page](#) which includes a link to Graham Williams' comprehensive package catalogue. There are two main types of package:

Packages: A \LaTeX package is a file or collection of files containing extra commands and programming which add new formatting features, or modify those already existing. Installed package files all end with `.sty` (they used to be called 'style files') and they may also contain ancillary files as well like fonts or configurations files.

Classes: A \LaTeX *class* is a special kind of package which provides formatting template features for a whole document. There are many of these, and several dozen of them are pre-installed with \LaTeX . Class files all end with `.cls` and additional classes can also be downloaded from [CTAN](#).

When you try to typeset a document which requires a package which is not installed on your system, \LaTeX will warn you with an error message that it is missing (see [section C.3.3.7 on page 254](#)), and you can then download the package and install it using the instructions in [section 3.2 on page 59](#).

However, many \TeX distributions can now catch this error, and offer to download and install the missing class or package for you right there

and then, and then carry on typesetting. This feature, the T_EX Live Package Manager (*tlmgr*), is not yet available in all distributions of L^AT_EX, so check your documentation to see if it is working in your version. This useful facility avoids you having to do manual package installation except for a few packages that are very old or do not conform to the TDS standard (see [section 3.2.1 on page 60](#)).

You can also download updates to packages you already have, both the ones that were installed along with your version of L^AT_EX as well as ones you have added. Updates occur when a class or package author finds and fixes a bug, or adds a new feature. All package updates on CTAN are automatically announced on the Usenet newsgroup [comp.text.tex](#). See [section 3.2 on page 59](#) for details of how to install packages and updates.

There is no limit to the number of packages you can have installed on your computer (apart from disk space!), but there is probably a physical limit to the number that can be used inside any one L^AT_EX document at the same time, although it depends on how big each package is. In practice there is no problem in having even a couple of dozen packages active (this document uses over 30).

3.1.1 Using an existing class

We've already seen how to do this in [section 2.1.1 on page 34](#): it's the document class name that you put in curly braces in the `\documentclass` line at the start of a L^AT_EX document.

All classes have *options* (we saw some in use in the Quick Start document). The class documentation will explain what they are for and how to use them.

3.1.2 Using an existing package

To use a package already installed on your system, put a `\usepackage` command in your document Preamble with the package name in curly braces, as we have already seen in earlier chapters. For example, to use the `xcolor` package, which lets you typeset in colours (I warned you this was coming!), you would type:

```
\documentclass [11pt, a4paper, oneside] {report}
\usepackage {xcolor}
\begin {document}
```

```
...  
\end{document}
```

This makes available a `\color` command and many others, and several sets of predefined palettes of colours which you can specify using options.

You can include several package names in one `\usepackage` command by separating the names with commas, and you can have more than one `\usepackage` command.

If you use the package options, you must give the package its own separate `\usepackage` command, like `geometry` and `xcolor` shown below:

```
\documentclass[11pt,a4paper,oneside]{report}  
\usepackage{pslatex,palatino,avant,graphicx}  
\usepackage[margin=2cm]{geometry}  
\usepackage[svgnames]{xcolor}  
\begin{document}  
\title{\color{Crimson}Practical Typesetting}  
\author{\color{StateBlue}Peter Flynn\Silmaril Consultants}  
\date{\color{ForestGreen}January 2016}  
\maketitle  
\end{document}
```

(Incidentally, don't actually do this: it's a very crude and cumbersome way to do colours in titling. It's fine for a one-time short document, but it will interfere with running heads if you use them; and if it's for a repeatable style we'll see in Chapter 7 starting on page 161 how it can be automated as part of the `\maketitle` command and kept out of the author's way.)

Exercise 8. Add colour

Use the `xcolor` package to add some colour to your document. Stick with primary colours for the moment.

Use the `geometry` package to change the margins.

Reprocess and print your document if you have a colour printer (monochrome printers should print it in shades of grey).

The `geometry` package has options to let you specify margins, page and paper sizes, header and footer depths, and a lot of other page-geometry dimensions. The `xcolor` package has options to let you specify which of several standard palettes of colours you want to use.

It's really important to read the documentation for the package concerned to find out what can be done and how to do it: see [section 3.1.3](#) up next.

3.1.3 Package documentation

To find out what commands a package provides (and thus how to use it), you need to read the documentation. The simplest way is to use your command window and type `$texdoc` followed by the package name. This will bring up the documentation in your PDF or DVI viewer. Alternatively, use your system's file finder to look for the package name — it should turn up the package directory itself as well as the documentation directory — what you're looking for is a PDF or DVI document.

If that doesn't find it, in the `texmf/doc` directory of your installation there should be subdirectories full of `.dvi` and `.pdf` files, one for every package installed. These can be previewed or printed like any other DVI or PDF file (see [section C.4.1 on page 255](#)). If your installation procedure has not installed the documentation, the files can all be viewed or downloaded from the package's page on CTAN — www.ctan.org/pkg/ followed by the package name.

Before using a package, you should read the documentation carefully, especially the subsection usually called 'User Interface', which describes the commands the package makes available. You cannot just guess and hope it will work: you have to read it and find out.

See the next section for details of how to generate the documentation for additional packages you install yourself.

3.2 Installing classes and packages

If you're using a system which has the `tlmgr` auto-installer, you don't need this section except for very rare occasions. The TeX Live Package Manager can be used to find, download, and install packages without you needing to know anything about where they come from or where

Exercise 9. Read all about it

Find and view (or print) the documentation on the [geometry](#) package you used in [section 3.1.2](#) on [page 58](#).

Investigate some of the other package documentation files in the directory.

they get put. The rest of this chapter is for people who want to do it by hand.

If you have to install a package manually, you can use the indexes on any [CTAN](#) server to find the package you need and the directory where it can be downloaded.

3.2.1 Downloading packages

Some packages are available as ZIP files in T_EX Directory Structure (TDS) format, which is faster and more convenient to use. Others are just plain zip files, or you can download all the needed files individually.

3.2.1.1 Downloading a TDS package zip file

If you go to a package's [CTAN](#) page (<http://ctan.org/pkg/name>) this will show the package details, and if the package is available in TDS format, there will be a link labelled 'TDS archive' with a file ending in [.tds.zip](#).

Download this and unzip it straight into your personal T_EX directory, where L^AT_EX will find it first, overriding any other version that might have been installed with your distribution. The correct place for your personal T_EX directory is described in [section A.2](#) on [page 217](#).

3.2.1.2 Downloading a non-TDS package zip file

If there is no TDS zip file, there will be a prominent link at bottom right labelled 'Download the contents of this package in one zip archive'.

Download the zip file to a **temporary directory**. If you use Windows, create a folder like `Computer\System\Users\your_name\temp`

or just `C:\tmp` or `C:\temp` for this;¹ Mac and Linux systems already have a `/tmp` directory.

Unzip it, then move the files into the directories as shown in Table 3.1 on page 63.

3.2.1.3 Manual download

If there is no ZIP file at all, what you need to look for is almost always *two files*, one ending in `.dtx` and the other in `.ins`. The first is a `DOCTEX` file, which combines the package programs and their documentation in a single file. The second is the installation program (much smaller). You **MUST** always download *both* these files (and maybe others in the download folder) if there is no ZIP file.

3.2.1.4 Other package downloads

If neither the two files nor the package ZIP are there, it means one of two things:

- Either* the package is part of a much larger bundle which you **SHOULD NOT** normally update yourself unless you are updating your entire `LATEX` system;²
- or* it's one of a few rare or unusual packages still supplied as a single hand-made `.sty` or `.cls` file originally written for the now obsolete `LATEX 2.09`,³ or perhaps by an author who has a doctrinal or philosophical objection to using `DOCTEX`.

3.2.2 Installing a class or package manually

There are four steps to installing a `LATEX` class or package:

-
- ¹ `MiKTEX` users **MUST** note that you cannot process `.ins` files inside `MiKTEX`'s own installation folders: you have to process them elsewhere first, hence the need for a temporary directory.
 - ² For example, there is no separate `xcolor.dtx` and `xcolor.ins` for the `xcolor` package because it forms part of the `graphics` bundle, which is included with all `LATEX` systems anyway. Such packages change very rarely, as they form part of the kernel of `LATEX` and are very stable. You should never try to update these packages in isolation.
 - ³ Almost all of these have been updated to work with `LATEX 2ε`, so they should be installed as in step 3 on the next page, but there are a few remaining.

On Unix-based systems (including Mac OS X and GNU/Linux), that's all you need to do. On Windows systems running MiKTeX, you MUST reindex your File Name Database (FNDB, see step 4 on page 64) before L^AT_EX will be able to find the new files.

1. Extract the class or package files

Use your directory browser or file manager (eg *My Computer*, *Finder*, *Thunar*, *Dolphin*, etc) to find the folder where you unzipped or downloaded the `.dtx` and `.ins` files.

Run L^AT_EX on the `.ins` file. That is, open the file in your editor and process it as if it were a L^AT_EX document (which it is), or if you prefer, type `$latex` followed by the `.ins` filename in a command window in the directory where the file is.

This will extract all the files needed from the `.dtx` file (which is why you must have both of them present in the directory).

If this is a non-TDS zip file, or individually-downloaded files, note down or print the names of the files created if there are a lot of them (read the log file if you want to see their names again).

2. Create the documentation

Run *PDFL^AT_EX* on the `.dtx` file *twice*. This will create a `.pdf` file of documentation explaining what the package is for and how to use it. Two passes through L^AT_EX are needed in order to resolve any internal crossreferences in the text (a feature we'll come onto later). If there is a B^IB_TE_X file of references, or if you need the Index, you will need to process *bibtex*, *biber*, *makeindex*, or other ancillary programs. I *very strongly recommend* doing this with the `Build` menu of your editor, or with the *latexmk* tool.

3. Install the files

This step is not needed if you used a TDS zip file.

Move the files created in step 1 on the facing page from your temporary directory to the right subdirectories in your personal T_EX directory (see below). *Always* put the files in your 'personal' T_EX directory tree, *a)* to prevent your new package accidentally overwriting master files in the main T_EX directories; and *b)* to avoid your newly-installed files being overwritten when you next update your version of T_EX. Never, *never*, NEVER put files into your T_EX distribution's main directory tree. (If you are updating a shared system, however, you can put the files into the *local* (shared) T_EX directory tree.)

Table 3.1: Where to put files from packages

Type	Subdirectory	Description
.cls	tex/latex/ <u>classname</u>	Document class file
.sty	tex/latex/ <u>packagename</u>	Package (style) file
.bst	bibtex/bst/ <u>packagename</u>	BIB _T E _X style file
.dvi	doc/ <u>packagename</u>	package documentation
.pdf	doc/ <u>packagename</u>	package documentation
.fd	tex/latex/mfnfss	Font Definition files for METAFONT fonts
.fd	tex/latex/psnfss	Font Definition files for PostScript Type 1 fonts
.fd	tex/latex/ <u>typeface</u>	Font Definition files for other fonts
.mf	fonts/source/public/ <u>typeface</u>	METAFONT font outline
.pfb	fonts/type1/ <u>foundry/typeface</u>	PostScript Type 1 outline
.ttf	fonts/truetype/ <u>foundry</u>	TrueType font files
.otf	fonts/opentype/ <u>foundry</u>	OpenType font files
.afm	fonts/afm/ <u>foundry/typeface</u>	Adobe Font Metrics
.tfm	fonts/tfm/ <u>foundry/typeface</u>	T _E X Font Metrics
.vf	fonts/vf/ <u>foundry/typeface</u>	T _E X virtual fonts
.png	tex/generic	PNG images
.jpg	tex/generic	JPG images
others	tex/latex/ <u>packagename</u>	other types of file unless instructed otherwise

If there are configuration or other files, read the documentation to find out if there is a special or preferred location to move them to.

'The right place' sometimes causes confusion, especially if your T_EX installation is old or does not conform to the TDS. For a TDS-

conformant system, 'the right place' is your personal \TeX directory tree unless you are a systems manager updating a shared machine, in which case it's the local \TeX directory tree. Your personal \TeX directory tree is in your home directory (folder):

- Unix & GNU/Linux systems: `~/texmf/`.
- Apple Macintosh OS X: `~/Library/texmf`.
- Windows systems: `Computer/username/texmf` (on obsolete Windows systems you can use `C:\texmf`).

Create this directory now if it does not already exist. You will need to create subdirectories within this directory: see [Table 3.1 on the previous page](#).

Often there is just a `.sty` file to move but in the case of complex packages there may be more, and they belong in different locations. For example, new $\text{BIB}\TeX$ packages or font packages will typically have several subdirectories of files to install. This is why it is important to create a subdirectory for the package within your personal \TeX directory, rather than dump the files into `misc` along with other unrelated stuff.

4. Shared systems and $\text{MIK}\TeX$: update your index

On Unix & GNU/Linux systems (including Apple Macintosh OS X) you **MUST NOT** run the \TeX indexer program or create an `ls-R` database in your personal \TeX directory. These systems search your personal \TeX directory automatically.

Otherwise:

- Windows $\text{MIK}\TeX$ users (only) **MUST** use the $\text{MIK}\TeX$ Administration program to add your new personal \TeX folder to $\text{MIK}\TeX$'s search tree when you first create it.
After that, each time you update files in there, you **MUST** run the File Name DataBase (FNDB) updater in the $\text{MIK}\TeX$ Administration program, otherwise \TeX will never see your newly-installed files.
- If you are updating a shared system, putting the files into the local \TeX directory tree, you **MUST** run your \TeX indexer program afterwards to update the package database.

This program comes with every modern version of \TeX and is variously called *texhash*, *mktexlsr*, or even *configure*, or it might just be a mouse click on a button or menu in your configuration system (like $\text{MIK}\TeX$'s). Read the documentation that came with your installation to find out which it is.

On $\text{MIK}\TeX$ and shared systems, run your \TeX indexer program after making changes

This step is *essential*, otherwise nothing will work.

Exercise 10. Install a package

Download and install the latest version of the `enumitem` package (which implements inline lists, among many other pieces of list formatting).

The *tlmgr* auto-updater is widely used in \TeX Live systems *except* where \TeX has been installed from Debian-based Unix *system* packages. On Windows and Apple Mac, and on Unix systems where \TeX Live has been installed from the TUG DVD or download, *tlmgr* is the normal way to update packages. The manual process described above is *only* for those cases where *tlmgr* cannot be used.

This includes the thousands of installations which do not conform to the `TDS`, such as old shared Unix systems and some Microsoft Windows systems, so there is no way for an installation program to guess where to put the files: *you* have to know this yourself. There are also systems where the owner, user, or installer has chosen *not* to follow the recommended `TDS` directory structure, or is unable to do so for policy or security reasons (such as a shared system where she cannot write to a locked disk or directory).

The reason for having the local `texmf` directory (usually called `texmf-local` or `texmf.local`) is to provide a place for local

modifications on a shared or managed system (such as a server) which will override but otherwise not interfere with the main T_EX installation directory tree. Your installation should already be configured to look in the personal and local directories first, so that any updates to standard packages will be found there *before* the copies in the main `texmf` tree. All modern T_EX installations do this, but if not, you can edit `texmf/web2c/texmf.cnf` (or on a shared system, ask your systems manager or support person to do so). There is an example in [section A.5 on page 226](#).

3.2.3 Replicating the TDS

If you have a distribution which has installed an auto-updater like *tlmgr* then you'll probably never have to update a package manually anyway, so you won't need this section unless you need to install something from outside the standard distribution such as a private, corporate, or commercial package or typeface.

The T_EX Directory Structure is documented at www.tug.org/tds/. I find it useful to make the subdirectory structure of your personal T_EX directory (eg `texmf`, see [section A.2 on page 217](#)) the same as that of the main installation `texmf` directory, so that I have all the main branches of the tree ready for future use. Examine the subdirectories of `texmf/tex/latex/` in your installation for examples. For additions to packages which came with your L^AT_EX distribution, you can then use the same subdirectory name and position in your personal T_EX directory as the original used in the main `texmf/...` directory. L^AT_EX will then always use the updated version.

If you want to recreate the entire subdirectory structure ready for use, you can do it under Unix & GNU/Linux systems (including Apple Macintosh OSX) with the commands below. This example uses the Ubuntu/Debian directory `/usr/local/share/texmf` rather than MacT_EX's `/usr/local/texlive/yyyy/texmf-dist` (replacing `yyyy` with the year of the MacT_EX distribution) or Red Hat's `/usr/share/texmf-local`, so modify the `$cd` command appropriately, and on a Mac, use `~/Library/texmf/{}` in the second command:

```
cd /usr/local/share/texmf
find . -type d -exec mkdir -p ~/texmf/{} \;
```

Windows provides no way of doing this, although you could install *Cygwin*, which provides you with the standard Unix tools in a Command window.

3.3 Where to go for help

The indexes and documentation files in your T_EX installation and on CTAN are the primary online resource for self-help on specific packages, and you should read these carefully before asking questions about packages.

3.3.1 Beginners start here

A very valuable list of Dos and Donts is maintained on [StackExchange](#) listing the most common mistakes that newcomers make. Once you've got started with L^AT_EX, especially if you have learned it informally from colleagues, it's worth having a look at this just to make sure you avoid the easiest pitfalls.

3.3.2 The Minimal [Non-]Working Example or MWE

If you want to send an example of what you're trying to do to one of the forums, mailing lists, or newsgroups listed here, you **MUST** send an Minimal [Non-]Working Example (MWE). This is your L^AT_EX document pared right down to the bare metal: remove *all* non-relevant packages, *all* non-relevant commands and formatting, and send **ONLY** the absolute bare minimum necessary to show what doesn't work. Unless you do this, you are wasting everyone's time, including your own.

There is an excellent article by Talbot at tug.ctan.org/info/dickimaw/dickimaw-minexample.pdf which explains the procedure in fine detail (Talbot, 2014).

And guess what? While doing this, you often find you discover for yourself what the problem was, saving you and thousands of others the trouble of working it out afresh!

3.3.3 The FAQ

For general queries you should read the Frequently-Asked Questions (FAQ) document so that you avoid wasting your time and

others' by asking about things for which there is already an easily-accessible answer.

The [FAQ](#) is managed by the UK T_EX Users Group and can be found at www.tex.ac.uk/faq/.

3.3.4 StackExchange

The web site tex.stackexchange.com is a carefully-managed and well-structured question-and-answer site for T_EX and L^AT_EX. You can vote answers up or down according to their quality or usefulness, but there are strict rules about how you ask questions, the same as for [comp.text.tex](#) below.

3.3.5 The T_EXhax mailing list

Another support resource is the mailing list texhax@tug.org. Again, feel free to ask questions, but again, try to answer the question yourself first (and say what you've tried in your message).

3.3.6 Web sites

The T_EX Users Group, as well as most local user groups, maintains a web site (www.tug.org) with lots of information about various aspects of the T_EX system. See Appendix 4 starting on [page 261](#) for information on joining TUG.

3.3.7 Usenet News

The Usenet newsgroup [comp.text.tex](#) is the principal forum for other questions and answers about T_EX and L^AT_EX, as well as the principal place where new CTAN packages are announced.

Feel free to ask questions, but please do not ask frequently-asked questions: read the [FAQ](#) instead. The people who answer the questions do so voluntarily, unpaid, and in their own time. It is also important that for specific queries you include a [Minimal \[Non-\]Working Example](#) — a very short whole L^AT_EX file that others can download and typeset, to see exactly what your problem is.

There is a very detailed guide to how to get the best out of asking questions on Usenet at www.catb.org/esr/faqs/smart-questions.html#intro.

To access Usenet news, type the following [URI](#) into your browser's 'Location' or 'Address' window: [comp.text.tex](#) (if your browser doesn't support Usenet news, install one of the many free newsreaders⁴ — see the list at [en.wikipedia.org/wiki/List_of_Usenet_newsreaders](#)).

3.3.8 Google L^AT_EX list

There is a Google Groups mailing list for L^AT_EX users at [groups.google.com/group/latexusersgroup?hl=en](#).

3.3.9 Commercial support

If you need commercial levels of support, such as 24-hour phone contact, or macro-writing services, you can buy one of the several excellent commercial versions of T_EX listed in [Table 1 on page xxix](#), or contact a consultancy which deals with T_EX (details on the TUG Web site and in issues of TUGboat).

⁴ Note that this means newsreaders for the Usenet News (NNTP) service. It does *not* mean syndication readers for RSS, which are a different thing entirely — these are unfortunately also sometimes referred to as 'newsreaders'.

