How to change the layout with LaTeX 2.09

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The LaTeX principle

Everything that is printed consists of two components: content and layout. The author provides the contents, the publisher's layout designer provides the layout, the typesetter puts the contents into the desired layout, and the printer puts it onto the paper.

These steps are clearly separated by LaTeX:

- The author specifies the contents in the document, i.e. in the `.tex` file.

- The layout designer specifies the layout in the document style, i.e. in one or more `.sty` files.

- LaTeX typesets the contents (i.e. everything between `\begin{document}` and `\end{document}`, using the layout that results from the main document style and the document-style options specified in the `\documentstyle` command.

- The device driver prints the results.

Four main styles (`article`, `report`, `book`, `letter`) and several options (`twoside`, `twocolumn`, etc.) are distributed together with LaTeX, and many more are available in the style collections that can be found on various servers (Aston, Heidelberg, Stuttgart, SHSU and so on).

Now, let us assume that you are an author who wants to print something in a certain layout.[1] If you find a document style or document-style option that produces just this layout, all you need to do is copying that file to your computer and naming it in the `\documentstyle` command. If no such style exists yet, just write your own, and don't be afraid: it's not so complicated as you may think.

How to proceed

For most cases, I recommend the following way:

1. Find an original LaTeX style file that produces a layout which has some similarities with your required layout, and note all the differences between that original layout and your required layout.

2. Find the original definitions of all the features that have to be changed.

3. Write a document-style option that contains the modified versions of these definitions.

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[1] Of course, this layout has to be specified by a professional designer — either hire such a professional to design it for you, or follow a professionally designed layout that you have seen somewhere and that suits your needs...

4. Specify the name of the original document style as the argument (i.e. between the curly braces) in the `\documentstyle` command, and add the name of your new document-style option as the last option between the square brackets.

Since LaTeX reads first the main document style and then the document-style options, your modified definitions will override the original ones.

Thus, the problem is reduced to the question: where do I find the original layout definitions and an explanation of how to modify them?

Where to find the original definitions

Since Leslie Lamport's LaTeX manual is aimed at authors, not at layout designers, the required information is distributed over several places. I recommend the following search order:

1. the LaTeX manual,

2. the files `article.doc`, `art10.doc`, etc., which contain the definitions from the corresponding `.sty` files, but with explanations added on comment lines,

3. the file `latex.tex`,

4. Donald Knuth's TeX book.

For the new version 3.0 of LaTeX, Frank Mittelbach und Rainer Schöpf have promised to provide a separate and complete documentation of the style designer interface.

The following hints and examples refer to the current LaTeX version 2.09.

An example

Let's look at a simple example: in an article that contains several sections with a large number of mathematical equations, the equations must be numbered separately in each section rather than consecutively throughout the article.

In the LaTeX manual, we learn that in the `report` document style something similar is provided: there, equations are numbered separately in each chapter.

In the file `report.doc` we find the following definitions:

```
\@addtoreset{equation}{chapter}
\def\theequation{\thechapter
                .\arabic{equation}}
```

The first line resets the equation counter at each chapter, and the second one defines the equation label to consist of the chapter counter, a full stop and the equation counter.

Therefore, we write the following new definitions to a file that we call `eqpersec.sty`:

```
\@addtoreset{equation}{section}
```

```
\def\theequation{\thesection
              .\arabic{equation}}
```

Of course, the file must contain more than just these two lines: we need comment lines that state the name of the file, its author, the version (date of last change), an explanation of its purpose and usage, and explanations of the definitions. Also, we properly end it with \endinput. Figure 1 shows the complete file.

With this file being available, we can change the equation numbering scheme by specifying the new style option name eqpersec in

```
\documentstyle[11pt,eqpersec]{article}
```

Now that we have mastered this exercise, let us have a look at some other typical layout problems.

Page dimensions

Changes to the page grid are rather simple: they can be achieved by setting the appropriate length parameters.

From the LaTeX manual, we learn the following: vertically, each page consists of the following parts (from top to bottom)

- 1 inch plus \topmargin white space on top,
- \headheight space for the running head,
- \headsep white space below the running head,
- \textheight space for the main text (including figures, tables and footnotes),
- \footskip space for the running foot (including the white space above it),
- and the rest of the paper height for the white space at the bottom.

Horizontally, normal pages[2] consist of the following parts (from left to right):

- 1 inch plus \oddsidemargin (for odd-numbered pages, or \evensidemargin for even-numbered pages) white space on the left,
- \textwidth space for the main text (including indentations), which may be split into two columns separated by \columnsep,
- \marginparsep white space between text and marginal notes,
- \marginparwidth space for marginal notes,
- and the rest of the paper width for the white space on the right.

Section headings

Let us assume that we want to change the section headings in two respects: they must be less prominent, i.e. use a smaller typeface and smaller vertical

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[2] i.e. pages where marginal notes are to appear in the right margin.

spacing, and hyphenation must be disabled within the headings.

In the file art10.doc we find the following definition:

```
\def\section{\@startsection
      {section}{1}{\z@}%
      {-3.5ex plus -1ex minus -.2ex}%
      {2.3ex plus .2ex}%
      {\Large\bf}}
```

and similar definitions for subsections etc. The absolute values of the fourth and fifth parameters specify the spacing before and after the heading, and the sixth parameter specifies its style. Therefore, we arrive at the following modified definition:

```
\def\section{\@startsection
      {section}{1}{\z@}%
      {-1.75ex plus -0.5ex minus -.1ex}%
      {1.15ex plus .1ex}%
      {\secshape\large\bf}}
```

(and similar ones for subsections etc.), with an extra definition

```
\def\secshape{\rightskip=0pt plus 1fil
              \hyphenpenalty=2000\relax}
```

which sets the text ragged right without hyphenating.

Running headers and footers

From our sources we learn that running headers and footers are specified by page styles, and that page styles are defined by commands of the form \ps@*name*, which can then be selected by the \pagestyle command.

Now we want to define a new page style myfootings that produces a running footer similar to the running header of the myheadings page style, but — to make matters even more complicated — with a horizontal line above.

In file article.doc, we find the following definition for the myheadings pagestyle:

```
\def\ps@myheadings{\let\@mkboth\@gobbletwo
    \def\@oddhead{\hbox{}\sl\rightmark \hfil
              \rm\thepage}%
    \def\@oddfoot{}%
    \def\@evenhead{\rm \thepage \hfil
              \sl\leftmark\hbox {}}%
    \def\@evenfoot{}%
    \def\sectionmark##1{}
    \def\subsectionmark##1{}}
```

The definitions of \@oddhead, \@oddfoot, \@evenhead and \@evenfoot specify the running headers and footers of odd and even numbered pages, respectively, either as a line or as a \parbox of width \textwidth. Within these lines, \rightmark

and \leftmark are variable texts that can be inserted with the \markboth and \markright commands, and \thepage is the page number. We define

```
\def\ps@myfootings{\let\@mkboth\@gobbletwo
    \def\@oddfoot{\parbox{\textwidth}%
        {\rule{\textwidth}{0.4pt}\\[2pt]
        \mbox{}\small\sl\rightmark \hfill
        \small\sl Seite~\thepage}}%
    \def\@oddhead{}%
    \def\@evenfoot{\parbox{\textwidth}%
        {\rule{\textwidth}{0.4pt}\\[2pt]
        \small\sl Seite~\thepage \hfill
        \leftmark \mbox{}}}%
    \def\@evenhead{}%
    \def\sectionmark##1{}
    \def\subsectionmark##1{}}
```

and put this definition into a file myfoot.sty. To switch on this page style, we have to specify the document-style option myfoot, to specify the page style myfootings and to fill in the variable texts:

```
\documentstyle[11pt,myfoot]{article}
\pagestyle{myfootings}
\markboth{News of \today}{News of \today}
```

Paragraphs

Let us assume that we want paragraphs to be separated by a certain amount of vertical space and without horizontal indentation (although some people consider this a bad practice).

The obvious way is to set \parskip and \parindent accordingly. In order to help LaTeX to find the best places for page breaks, we give \parskip a non-zero stretch component. Thus we arrive at the following:

```
\parskip=0.5\baselineskip
\advance\parskip by 0pt plus 2pt
\parindent=0pt
```

However, this has some undesired side effects:[3] the vertical spacing before, after and within lists and other environments depends on the value of \parskip, too. From the LaTeX manual we learn the following spacing conventions for list-like environments:

- \parskip plus \topsep before the first item of a list (before the environment),

- \parskip plus \itemsep between items, and

- \parsep only between paragraphs within one item.

If we want all these skips to equal \parskip,[4] then we have to set \parsep to \parskip, and both \topsep and \itemsep to zero. However, it is not sufficient to set these values globally. Rather, the initialization macros for the list at the various nesting levels have to be redefined. Figure 2 shows what has to be added to our paragraph shape definitions.

Where to find more information

For all who want to know more about "How to change the layout with LaTeX 2.09", I have written a booklet of about 30 pages — in German. It is available freely. The LaTeX source files (including their own special document-style options) can be obtained via Bitnet from the server listserv@dhdurz1 in Heidelberg — GET the file LAYOUT ZOOUUE and decode and unpack it to obtain the files layout.tex, layout2.tex, refman.sty and german.sty. Members of the German-speaking TeX users group can also obtain it on a PC diskette from the DANTE association in Heidelberg.

At the European TeX Conference 1990 in Cork,[5] Frank Mittelbach and Rainer Schöpf announced that version 3.0 of LaTeX will contain several significant changes (improvements) to the document-style design interface of LaTeX, and that they will provide a complete documentation of this interface in addition to the traditional LaTeX user's manual. The completion of the LaTeX 3.0 project will be announced via *TUGboat* in due time.

Acknowledgements

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[3] at least in the current LaTeX version 2.09.

[4] which, however, leaves no visual distinction between lists within paragraphs from lists at the beginning or end of a paragraph.

[5] see *TUGboat* 12, no. 1 (1991), pp. 74–79. Editor's note: An update on the LaTeX 3.0 project appeared in *TUGboat* 13, no. 1 (1992), pp. 96–101.

Figure 1: Example of a complete style option file

```
% This is EQPERSEC.STY by H.Partl, TU Wien (Austria)
% Last change: 7 Feb 1990
% Document-style option for LaTeX 2.09,
% to make equations numbered per section,
% to be used only with the document style 'article'.

% Reset equation counter at each section:
\@addtoreset{equation}{section}

% Equation label = section number dot eqation number:
\def\theequation{\thesection .\arabic{equation}}

\endinput
```

Figure 2: Modifications for the list environments

```
\def\@listI{\leftmargin\leftmargini
    \topsep\z@ \parsep\parskip \itemsep\z@}
\let\@listi\@listI
\@listi
\def\@listii{\leftmargin\leftmarginii
    \labelwidth\leftmarginii
    \advance\labelwidth-\labelsep
    \topsep\z@ \parsep\parskip \itemsep\z@}
\def\@listiii{\leftmargin\leftmarginiii
    \labelwidth\leftmarginiii
    \advance\labelwidth-\labelsep
    \topsep\z@ \parsep\parskip \itemsep\z@}
```