Printing booklets with LaTeX*

Peter Wilson†
The Herries Press

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Abstract

The booklet package provides some aid in printing simple booklets or signatures for longer books.

Contents

1 Introduction

In normal usage the booklet package subverts LaTeX into putting pairs of pages onto a single page. For example, the contents of pairs of A4 portrait pages can be rotated and printed as two A5 portrait pages side by side on an A4 landscape page.

In 1993 Timothy Van Zandt wrote the 2up generic macros for printing more than one page on a physical sheet [Zan93]; his original code and documentation

*This file (`booklet.dtx`) has version number v0.7a, last revised 2005/06/01.

†`herries dot press at earthlink dot net`

is in appendices A and B. The booklet package is a poorman's version of some of the 2up macros specifically for (pdf)LaTeX.

The 2up and booklet packages cannot be used simultaneously in one document.

This manual is typeset according to the conventions of the LaTeX docstrip utility which enables the automatic extraction of the LaTeX macro source files [GMS94].

Section 2 describes the usage of the booklet package and commented source code is in Section 3. Timothy Van Zandt's original macros and documentation are supplied in the appendices.

2 The booklet package

The code provided by the booklet package is meant to help with some aspects of booklet printing.

Basically, the pages of documents processed with the booklet package will be reordered and scaled so that they can be printed as four pages per physical sheet of paper, two pages per side of the sheet. The default expectation is that the original document is in a portrait orientation and the pages are printed rotated onto a landscape sheet. Folding the sheet in half will produce a half-sized document, again with portrait orientation.

Professionally printed books have many pages printed per sheet of (large) paper, which is then folded and cut where necessary to produce a *signature* of several smaller sheets. Folding a sheet in half produces a one sheet *folio* signature with four pages. Folding it in half again and cutting along the original fold gives a two sheet *quarto* signature with eight pages. Folding in half again, results in a four sheet *octavo* signature with 16 pages, and so on through *16mo*, *32mo*, to *64mo* with six folds and 128 pages. *Octavo* is the most popular of these.

Other folds can produce other signatures. For example a *sexto*, obtained by folding in half and then folding in thirds, is a three sheet signature with 12 pages.

The main differences between the 2up macros and the booklet package are:

- 2up is generic but booklet can only be used with (pdf)LaTeX.
- 2up can be used for more than booklets
- booklet adds the notion of signatures and reduces the need for \boxes.
- booklet adds means of automatically controlling portrait/landscape printing.

2.1 Options

When the noprint option is used the package is essentially vacuous. That is, it behaves as though it had not been used at all, with the exception that LaTeX will not hiccup at any of the package commands that may be used in the document; these commands will also do nothing.

The print option must be used if you want the package to work as advertised. The reasons for the print and noprint options are explained later in Section 2.3.

The booklet package can also take one option from each of two groups.

The first group of options specifies how many pages there should be to a hypothetical signature. The options are: four, eight, sixteen, and thirtytwo. TeX has to hold all the pages for a signature before it outputs any of them, and TeX is memory limited.

If you have a duplex printer you can print out the document double-sided and then just fold the sheets forming each signature ready for binding. If you don't have a duplex printer, then the sheets can be photocopied (1-to-2 sided) ready for folding.

The second group of options are for selecting one of the package's predefined layouts. These options include:

twouparticle — for portrait pages with wide margins (similar to those in the standard LaTeX article, book and report classes) and no marginal notes, to go on landscape sheets.

largetypeblock — for portrait pages with a larger (wider and/or longer) typeblock and/or marginal notes, to go on landscape sheets.

1to1 — for portrait pages where the original is designed to fit on half-sized paper, to go on landscape sheets.

landscape — for landscape pages to go onto portrait sheets. Pairs of original landscape pages will be printed at the top and bottom of a portrait page. This option is called automatically if the landscape option is used for the document class.

The default options are noprint, twouparticle and thirtytwo.

2.2 Commands

The *source* is the document as it would be normally typeset by LaTeX (i.e., without using the booklet package).

The *target* is the desired document as it should be printed using the booklet package.

`\source` The command `\source{`⟨*mag*⟩`}{`⟨*width*⟩`}{`⟨*height*⟩`}` specifies the source sheets, where ⟨*width*⟩ and ⟨*height*⟩ are the width and height for the pages of the orginal document (the document that LaTeX would process without the booklet package). The ⟨*mag*⟩ argument is the magnification factor.

The default definition of `\source` is:
`\source{\magstep0}{\paperwidth}{\paperheight}`
which corresponds to a full size default page.

`\target` The command `\target{`⟨*mag*⟩`}{`⟨*width*⟩`}{`⟨*height*⟩`}` specifies the target sheets, where ⟨*width*⟩ and ⟨*height*⟩ are the width and height for the sheets that will be used for printing with the package. For example, `\target{...}{11in}{8.5in}` would be typical for a (portrait letterpaper) source being put onto a (landscape) letterpaper target.

`\magstepN` `\magstepminusN` The package puts two pages onto a single sheet. It often happens that in order to do this the natural size of the text pages has to be changed, via the

⟨*mag*⟩ argument noted above. The macro `\magstepminusN`, where $0 \leq N \leq 5$ is a shrinkage factor; similary, `\magstepN` specifies a magnification factor. For example, the default `\target` is specified as:

```
\target{\magstepminus1}{\paperheight}{\paperwidth}
```

whereas the target for the largetypeblock option is:

```
\target{\magstepminus2}{\paperheight}{\paperwidth}
```

which shrinks the original pages more than the default `\target` does.

The booklet package uses the `\source` and `\target` specifications to decide on how to scale and position the orginal full size source pages onto half of a target sheet.

Normally there is no need to change the default `\source` but it may be useful sometimes to change the `\target`. For example, if the text on source letterpages is very wide it could be useful to print on legal paper instead. In this case `\target` can be defined as:

```
\target{\magstepminus2}{14in}{8.5in}
```

`\pagespersignature` If none of the signature options are suitable, then `\pagespersignature{`⟨*num*⟩`}` may be used to specify ⟨*num*⟩ pages per signature. For example, if you wanted a *sexto* signature then use `\pagespersignature{12}`.

`\ifprintoption` The command `\ifprintoption` is set TRUE if the print option is used otherwise it is set FALSE.

`\setdvipstargetpages` If you are using LaTeX to generate a `.dvi` file the `\setdvipstargetpages` macro sets up the correct target page sizes in the `.dvi` file assuming that subsequent processing will be via a program that understands `dvips \special` commands.

`\setpdftargetpages` If you are using pdfLaTeX to generate a `.pdf` file the `\setpdftargetpages` macro sets up the correct target page sizes for pdfLaTeX.

`\pagesepwidth` `\pageseplength` `\pagesepoffset` A line may be drawn between the output text pages. The length of the line is `\pageseplength` (default 6.5in), and line starts a distance `\pagesepoffset` from the bottom (side) of the printed sheet (default 1in). The line thickness is specified by the length `\pagesepwidth`, which is initially defined to be 0pt (i.e., the line is normally invisible). To see a dividing line use `\setlength` to change the value of `\pagesepwidth`; in LaTeX ruled lines normally have a thickness of 0.4pt.

`\twoupclearpage` `\twoupemptypage` The command `\twoupclearpage` outputs the current target page (like LaTeX's `\newpage`). The command `\twoupemptypage` inserts a completely empty page into the target.

`\ifuselandscape` `\ifprintoption` The command `\ifuselandscape` is set TRUE if the landscape option is used otherwise it is set FALSE.

`\checkforlandscape` The macro `\checkforlandscape` evaluates the value of `\ifprintoption` and the current value of `\ifuselandscape` and sets `\ifuselandscape` to TRUE if the document requires landscape printing (when either both the landscape and noprint options are used, or when just the print option is called for), or to FALSE if the document should be printed in the normal portrait orientation (when either both the landscape and print options are used, or when just the noprint option is used without landscape).

Note that as `\checkforlandscape` may change the value of `\ifuselandscape`, the command is only guaranteed when `\ifuselandscape` accurately indicates the

presence or absence of the landscape option.

In version 0.7 of the package the macro `\setdvipstargetpages` was introduced and the macro `\setpdftargetpages` was modified with the result that `\checkforlandscape` was effectively no longer needed. It is left to maintain upward compatibilty for older documents.

2.3 Usage

You use the booklet package just like any other package:
`\usepackage[<options>]{booklet}`
but some other things need taking care of as well.

If you are making any changes to the values of `\paperwidth` or `\paperheight`, say through the geometry package or the memoir class, then the booklet package must be called *after* those changes have been made. In this case you may have to specify a different `\source` than usual, but I think that this is probably unlikely.

`\special` Under normal circumstances printing should be done onto landscape oriented paper instead of the usual portrait orientation. If you are using the `dvips` program for transformation from the `.dvi` to a `.ps` file, then you can use the command `\special{landscape}` in the preamble so that the output is organised for landscape. Other drivers may support similar commands, or command line options for accomplishing this.

For example, it may happen that if you use `ghostview` (or `gsview`) to look at `dvips` PostScript output of the final printing that the text appears upside down. Putting:
`\special{!TeXDict begin /landplus90{true}store end}`
just before the `\begin{document}` may cure this.

I use a LaserJet printer with a duplex printing capability (i.e., printing can be done on both sides of a sheet in one pass). When printing in duplex mode I also found that it was very convenient to change the binding from the long to the short side of the paper; the sheets were then all set for folding. Using `dvips` and the 5SiMx LaserJet I found that the following commands in the preamble let me change the printer settings from the document.

```
\special{!TeXDict begin <</Duplex true>> setpagedevice end} % duplex
\special{!TeXDict begin <</Tumble true>> setpagedevice end} % short binding
```

How these would fare with another printer or program, I have no idea. The CTAN subdirectory `/dviware/dvipsconfig` contains a set of files for performing the above operations, and more, as command line options for `dvips`.

If you can only do simplex printing (one side only), then when photocopying from one-sided to two-sided, alternate printed pages need to be rotated 180 degrees before being fed into the copier.

The following physical analogy of how the package works with portrait pages may help in achieving results that you want.

- Write the original text on portrait oriented transparent material (e.g., viewfoils) which is the same size as that specified by the `\source` macro. Mark the centre — the point where the diagonals intersect — of each original page.
- Take a sheet of paper the same size as that specified by the `\target` macro and in landscape orientation. Mentally divide this in half by a vertical line and then mark the centre points of the two (left and right) halves.
- Take an even numbered original sheet, portrait orientaion, and place it on top of the landscape oriented target sheet with its centre point coincident with the left half centre point. Do the same with an odd numbered original sheet except that its centre is coincident with the right half centre point.
- Take the assembly to a photocopier and make a copy onto a target sized sheet. This is the final result.

The analogy for landscape originals is similar with the obvious changes in the orientations.

Not that the analogy does not include any scaling. If the size of the target is relatively small then the texts on the original sheets may overlap or extend outside the physical target sheet. If the target is relatively large then there may be too much white space around the texts. The ⟨*mag*⟩ arguments to the `\source` and `\target` macros are provided to adjust the source/target text sizes. Scaling does not affect the positions of the texts.

If you are planning to produce a booklet in the first place, then design the initial page layout as though it would be printed on half-sized paper. This will produce a better end result as no scaling will be necessary. The `1to1` option is provided for just this case.

If the original pages look too crowded after printing, you can specify another `\target` with a larger shrink factor (e.g., `\magstepminus3` instead of `\magstepminus2`). Conversely, too much white space can be countered by decreasing the shrink factor (e.g., `\magstepminus1` instead of `\magstepminus2`).

The following are the default settings of `\source` and `\target` (the source and target sheets are the same size) for the different layout options.

twouparticle:

```
\source{\magstep0}{\paperwidth}{\paperheight}
\target{\magstepminus1}{\paperheight}{\paperwidth}
```

largetypeblock:

```
\source{\magstep0}{\paperwidth}{\paperheight}
\target{\magstepminus2}{\paperheight}{\paperwidth}
```

1to1:

```
\source{\magstep0}{\paperwidth}{\paperheight}
\target{\magstep0}{\paperheight}{\paperwidth}
```

If the original is not planned to be produced as a booklet, then obtaining respectable looking full size and booklet results may require some trial and error in determining good values for magnifications and/or target paper sizes. The original page margins may also need changing for the booklet output.

LaTeX is not very happy if it is forced to save some pages instead of outputting each one as it is finished. It shows its displeasure by messing up any internal references in the document, for example a Table of Contents or an Index. To counter this, run LaTeX on the document *without* the print package option until all references have stabilised. Then put the command `\nofiles` in the preamble, use the print option, and run LaTeX a final time before printing. (The `\nofiles` command stops LaTeX from generating new `.aux`, `.toc` files, etc., but it will still use any old versions).

The following gives an indication of how the relevant portion of a preamble may look.

```
% possibly change default \paperwidth and/or \paperheight
% \usepackage[noprint,...]{booklet}         % use this
% \usepackage[...]{booklet}                 % or this for initial runs
% \usepackage[print, ...]{booklet} \nofiles % use this for final run
% perhaps change \target
\ifpdf                          % from the ifpdf package
  \pdfoutput = 1                % generate pdf output
  \setpdftargetpages            % set output page size
\else
  \setdvipstargetpages          % use this for dvi output
\fi
...
```

It is safer to use the package without the print option for the initial runs rather than not using the package at all; doing it this way will stop LaTeX from complaining if you happened to have used any of the booklet commands in the document.

TeX allocates a new box for each page in the first signature and then these are reused for each subsequent signature. Large signatures may use up all available boxes in which case TeX will tell you. It is much more probable, though, that TeX will run out of memory before this happens.

Here is a real example of one booklet setup for typesetting a 68 page book. I used the memoir class but afterwards I'll point out how to do the equivalent with the book class.

```
\documentclass[letterpaper,11pt]{memoir}
% typeblock size of 5.5+ by 4 inches
\settypeblocksize{5.5in}{4in}{*}
\addtolength{\textheight}{\onelineskip}
\setlrmargins{2in}{*}{*}
\setulmargins{2.25in}{*}{*}
\checkandfixthelayout

% \usepackage[noprint]{booklet}
```

```
\usepackage[print,1to1]{booklet} \nofiles
\pagespersignature{16} % 16 pages per signature

\ifpdf
  \setpdftargetpages
\else
  \setdvipstargetpages
\fi
\ifprintoption  % tweak dvi output only for final printing
  \special{!TeXDict begin /landplus90{true}store end}
  \special{!TeXDict begin <</Tumble true>> setpagedevice end}
\fi

\begin{document}
\pagestyle{empty}
% Want a blank sheet before the title page
\hbox{}\cleardoublepage
% half-title page here
\cleardoublepage

% title page here
\clearpage

% copyright page here
\cleardoublepage

\pagestyle{plain}
\pagenumbering{roman}
\tableofcontents*
\cleardoublepage
\pagenumbering{arabic}
\pagestyle{headings}

\chapter{First}
% and so on

% want some blank endpapers to get enough pages into
% the last signature for easy binding
\clearpage
\hbox{}\clearpage\hbox{}\cleardoublepage
\end{document}
```

Using the book class just involves changing how the page layout is specified:

```
\documentclass[letterpaper,11pt]{book}
% typeblock size of 5.5 by 4 inches
\setlength{\textheight}{419pt} \setlength{\textwidth}{289pt}
\setlength{\oddsidemargin}{72pt} \setlength{\evensidemargin}{108pt}
\setlength{\topmargin}{55.9pt} \setlength{\footskip}{27.5pt}
\setlength{\headheight}{14.6pt} \setlength{\headsep}{19.9pt}
```

```
% \usepackage[noprint]{booklet}
...
```

If you try and use a non-zero magnification with a document that has any 'true' lengths, for example the amsbook class, TeX itself will complain with an error message of the form:

```
!Incompatible magnification (833);
the previous value will be retained
```

Try forcing LaTeX to continue and check the output because you might be lucky and it looks alright.

Here is another example from a posting to `comp.text.tex` by Gordo in the thread *booklet problem*, 2005/05/26.

```
\documentclass[twoside,10pt]{article}
\setlength{\paperwidth}{5.5in}
\setlength{\paperheight}{8.5in}
\setlength{\topmargin}{-0.3in}
\setlength{\textheight}{6.9in}
\setlength{\oddsidemargin}{0.0in}
\setlength{\evensidemargin}{-0.5in}
\setlength{\textwidth}{4.0in}
\usepackage{makeidx}
%\usepackage[noprint,1to1]{booklet} % initial runs for ToC and index
\usepackage[noprint,1to1]{booklet} \nofiles % final printing run
\source{\magstep0}{5.5in}{8.5in}
\target{\magstep0}{11in}{8.5in}
\setpdftargetpages
\pagespersignature{120}
\makeindex
\begin{document}
\pagenumbering{roman}
\begin{titlepage} ... \end{titlepage} % the title
...
\newpage
\begin{titlepage} \mbox{} \end{titlepage} % back cover
\end{document}
```

As yet another example, you can produce this manual as a booklet. Change the first part of this file to read:

```
\documentclass[twoside]{ltxdoc}
\usepackage{url}
\usepackage{ifpdf}
\addtolength{\evensidemargin}{-0.75in}
% \usepackage[noprint]{booklet} % initial runs
\usepackage[print,largetypeblock]{booklet}\nofiles\pagespersignature{48} % final run
%\usepackage[draft=false,
```

```
%            plainpages=false,
%            pdfpagelabels,
%            bookmarksnumbered,
%            hyperindex=false
%          ]{hyperref}
\ifpdf
  \setpdftargetpages
\else
  \setdvipstargetpages
\fi
\providecommand{\phantomsection}{}
\makeatletter
  \@mparswitchfalse
\makeatother
...
```

The hyperref package interferes with the `\setpdftargetpages` macro so it is commented out. The largetypeblock option is used otherwise the marginal notes can fall off the edges of the pages in the final printing; the `\evensidemargin` is also altered for the same reason. The value for `\pagespersignature` is to ensure that only a single signature is produced (you can decrease this if you are willing to bind multiple signatures).

The original source of the 2up package is included at the end of this manual. It may provide some more insights into how to use the booklet package. Be careful, though, as the two packages differ in some significant details.

3 The package code

The package code essentially consists of modifications to the 2up macros, which are given in section A. I could not have written the booklet package without Timothy Van Zandt's 2up macros.

As much as possible I have tried to keep to the original 2up macro names. However, the 2up and booklet packages cannot be used in the same document.

The code is actually in two packages, `booklet.sty` which provides the commands that the user sees, and `bkltprnt.sty` which is used by `booklet.sty` to do all the hard work.

3.1 Preliminaries

Announce the name and version of the packages, which require LaTeX 2_ε.

```
1 ⟨*usc⟩
2 \NeedsTeXFormat{LaTeX2e}
3 \ProvidesPackage{booklet}[2005/03/23 v0.7 booklet printing]
4
5 ⟨/usc⟩
6 ⟨*prnt⟩
```

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{bkltprnt}[2005/03/23 v0.7 support for booklet printing]

⟨/prnt⟩
```

3.2 The main booklet code

The booklet package provides the user commands. Then, if the print option is used it calls the bkltprnt package to do the work.

```
⟨*usc⟩
```

`\twoup@end` For the print and noprint options.

```
\newcommand*{\twoup@end}{\endinput}

```

`\pageseplength` `\pagesepwidth` `\pagesepoffset` Lengths for the dividing rule.

```
\newdimen\pageseplength
\newdimen\pagesepwidth
\newdimen\pagesepoffset

```

`\ifsidebyside` TRUE if pages are to be placed side-by-side on the sheet. I have changed the original `\if@sidebyside` to `\ifsidebyside` so that a user can call it easily. I don't don't implement the `\if@twosided`.

```
\newif\ifsidebyside
  \sidebysidetrue

```

`\ifuselandscape` `\ifprintoption` Booleans for some options and for if the final printing should be landscape.

```
\newif\ifuselandscape
  \uselandscapefalse
\newif\ifprintoption
  \printoptionfalse

```

`\c@signature` `\c@sigcount` Counters for signature handling.

```
\newcounter{signature}
\newcounter{sigcount}
  \setcounter{sigcount}{0}
```

`\pagespersignature` A user-level command for setting the number of pages wanted in a signature. I initialise these to 32.

```
\newcommand*{\pagespersignature}[1]{\setcounter{signature}{#1}}
  \pagespersignature{32}

```

\magstepminus A useful extension of the \magstep macro.

```
\def\magstepminus#1{%
  \ifcase#1 \@m\or 833\or 694\or 579\or 482\or 401\fi\relax}
```

\target Vacuous versions of the user-level macros.
\source
\setpdftargetpages
\setdvipstargetpages

```
\newcommand*{\target}[3]{}
\newcommand*{\source}[3]{}
\newcommand*{\setpdftargetpages}{}
\newcommand*{\setdvipstargetpages}{}
```

\targettopbottom Vacuous version of the user command.

```
\newcommand*{\targettopbottom}{}
```

\twoupemptypage vacuous versions of the user commands.
\twoupclearpage

```
\newcommand*{\twoupemptypage}{}
\newcommand*{\twoupclearpage}{}
```

\checkforlandscape Sets the value of \ifuselandscape to (\ifuselandscape XOR \ifprintoption).

```
\newcommand*{\checkforlandscape}{%
  \ifx\ifuselandscape\ifprintoption
    \uselandscapefalse\else\uselandscapetrue\fi}
```

Now declare the print, noprint and landscape options, prepare to pass any other options to bkltprnt, and execute the options.

```
\DeclareOption{print}{\printoptiontrue\def\twoup@end{}}
\DeclareOption{noprint}{\printoptionfalse\def\twoup@end{\endinput}}
\DeclareOption{landscape}{\uselandscapetrue}
\DeclareOption*{\PassOptionsToPackage{\CurrentOption}{bkltprnt}}
\ProcessOptions\relax
\ifuselandscape
  \PassOptionsToPackage{landscape}{bkltprnt}
\fi
```

Now call \twoup@end, which is either \endinput or vacuous, after which the bkltprnt package is called (if \twoup@end was vacuous).

```
\twoup@end

\RequirePackage{bkltprnt}
```

The end of this package.

```
⟨/usc⟩
```

3.3 The main bkltprnt code

63 ⟨∗prnt⟩

\@targetwidth
\@targetheight
\@sourcewidth
\@sourceheight

Parameter registers.

```
64 \newdimen\@targetwidth
65 \newdimen\@targetheight
66 \newdimen\@sourcewidth
67 \newdimen\@sourceheight
68
```

\if@leftpage
\@leftpage
\@rightpage
\@physicalpage

Registers used by output routine.

```
69 \newif\if@leftpage
70   \@leftpagetrue
71 \newbox\@leftpage
72 \newbox\@rightpage
73 \newcount\@physicalpage
74
```

Since pages are both stored and shipped out half as often:

```
75 \multiply\maxdeadcycles by 40\relax
76
```

\bookletpage
\leftpagenumber
\rightpagenumber

Registers used only for booklet layout. These are specified directly as this is the only layout.

```
77 \newcount\bookletpage
78   \bookletpage=0
79 \newcount\leftpagenumber
80 \newcount\rightpagenumber
81
```

\twoupp@geboxes

I have added this macro so that only the boxes required for a signature are created. The original 2up code creates a new box for each output page.

```
82 \newcommand*{\twoupp@geboxes}{%
83   \advance\bookletpage\@ne
84   \expandafter\newbox\csname bookletbox\the\bookletpage\endcsname
85   \ifnum \bookletpage < \c@signature
86     \twoupp@geboxes
87   \fi}
88 \AtBeginDocument{\twoupp@geboxes\bookletpage=\z@}
89
```

\target
\inv@targetmag

\@targetwidth and \@targetheight are set to the *unmagnified* dimensions of the target page. \inv@targetmag is the inverse of the target magnification.

```
90 {\catcode`\p=12\catcode`\t=12\gdef\@@inv@@mag#1pt#2{\def#2{#1}}}
91 \def\target#1#2#3{%
92   \mag #1\relax
93   \@targetwidth=1000pt
94   \divide\@targetwidth by #1\relax
```

```
  \expandafter\@@inv@@mag\the\@targetwidth\inv@targetmag
  \@targetwidth=#2\relax
  \@targetwidth=\inv@targetmag\@targetwidth
  \@targetheight=#3\relax
  \@targetheight=\inv@targetmag\@targetheight}

```

`\source` Like `\target`, but for the source:

```
\def\source#1#2#3{%
  \@sourcewidth=1000pt
  \divide\@sourcewidth by #1\relax
  \expandafter\@@inv@@mag\the\@sourcewidth\inv@sourcemag
  \@sourcewidth=#2\relax
  \@sourcewidth=\inv@sourcemag\@sourcewidth
  \@sourceheight=#3\relax
  \@sourceheight=\inv@sourcemag\@sourceheight}

```

`\setpdftargetpages` This macro specifies the size of the target page for pdfLaTeX. It ensures that memoir's version (`\fixpdflayout`) does nothing.

```
\renewcommand*{\setpdftargetpages}{%
  \ifprintoption
    \setlength{\pdfpageheight}{\@targetheight}%
    \setlength{\pdfpagewidth}{\@targetwidth}%
    \let\fixpdflayout\relax
  \fi}
```

`\setdvipstargetpages` This macro specifies the size of the target page fow when dvips is used. It ensures that memoir's version (`\fixdvipslayout`) does nothing.

```
\renewcommand*{\setdvipstargetpages}{%
  \ifprintoption
    \AtBeginDvi{\special{papersize=\the\@targetwidth,\the\@targetheight}}%
    \let\fixdvipslayout\relax
  \fi}

```

`\targetBooklet` `\ship@@@leftpage` `\ship@@@rightpage` I only provide the original 2up Booklet, not booklet. For the booklet package the Booklet code can be processed immediately. The code in this chunk is equvalent to the original `\target@Booklet`.

```
\def\targetBooklet{%
  \def\ship@@@leftpage{\save@booklet\@leftpage}%
  \def\ship@@@rightpage{\save@booklet\@rightpage}%
  \@leftpagefalse}
\targetBooklet

```

`\targettopbottom` `\make@@halfpage` `\make@fullpage` I have renamed the original `\target@topbottom` to `\targettopbottom`

```
\def\targettopbottom{%
  \def\make@@halfpage{\make@@halftopbottom}%
```

```
\def\make@fullpage{\make@fulltopbottom}%
\sidebysidefalse}
```

Specify the options. There are new ones for signature sizes, and some of the original 2up source/targets are now treated as options.

```
\DeclareOption{four}{\setcounter{signature}{4}}
\DeclareOption{eight}{\setcounter{signature}{8}}
\DeclareOption{sixteen}{\setcounter{signature}{16}}
\DeclareOption{thirtytwo}{\setcounter{signature}{32}}
\DeclareOption{twouparticle}{\twouparticle}
\DeclareOption{landscape}{\twouplandscape}
\DeclareOption{largetypeblock}{\twoupplain}
\DeclareOption{1to1}{\twouponetoone}
```

`\shipout` TeX's `\shipout` primitive is saved as `\&normal@shipout`, and then `\shipout` is defined to save each page to `\@leftpage` or `\@rightpage` and to print out every two. There is no twosided layout in this version.

```
\expandafter\let\csname &normal@shipout\endcsname\shipout
\def\shipout{%
  \if@leftpage
    \global\@leftpagefalse
    \def\next{\afterassignment\ship@leftpage\global\setbox\@leftpage=}%
  \else
    \global\@leftpagetrue
    \def\next{\afterassignment\ship@rightpage\global\setbox\@rightpage=}%
  \fi
  \next}
```

`\ship@leftpage` `\ship@rightpage` The job of `\ship@leftpage` and `\ship@rightpage` is to invoke `\ship@@leftpage` or `\ship@@rightpage` at the right time. `\shipout` is followed either:

1. by an `\hbox`, `\vbox` or `\vtop`, in which case `\ship@leftpage` is invoked after the opening `{`; `\@leftpage` is void, and `\ship@leftpage` invokes `\ship@@leftpage` after the closing `}`: or

2. by a `\box` or `\copy`, in which case `\ship@leftpage` is invoked after the full assignment; `\@leftpage` is not void, and `\ship@leftpage` invokes `\ship@@leftpage` immediately.

```
\def\ship@leftpage{%
  \ifvoid\@leftpage\aftergroup\ship@@leftpage\else\ship@@leftpage\fi}
\def\ship@rightpage{%
  \ifvoid\@rightpage\aftergroup\ship@@rightpage\else\ship@@rightpage\fi}
```

\ship@@leftpage
\ship@@rightpage

\ship@@leftpage/\ship@@rightpage take the output box, and first make it into a fully-size source page (with \make@halfpage) and then this is centered horizontally and vertically in half of a target page (with \make@@halfpage). Then they are shipped individually or together.

```
\def\ship@@leftpage{\make@halfpage\@leftpage\ship@@@leftpage}
\def\ship@@rightpage{\make@halfpage\@rightpage\ship@@@rightpage}
```

\make@halfpage

```
\def\make@halfpage#1{%
  \dp#1=\z@
  \setbox#1=\vbox to\@sourceheight{%
    \vskip \inv@sourcemag in
    \vskip \voffset
    \hbox to\@sourcewidth{\hskip\inv@sourcemag in\hskip\hoffset\box#1\hss}%
    \vss}%
  \make@@halfpage#1}
```

\make@@halfsidebyside
\make@@halfpage

The definition of \make@@halfpage depends on the target layout.

```
\def\make@@halfsidebyside#1{%
  \global\setbox#1=\vbox to\@targetheight{\vss
    \hbox to.5\@targetwidth{\hss\box#1\hss}\vss}}
\def\make@@halfpage{\make@@halfsidebyside}
```

\make@@halftopbottom

```
\def\make@@halftopbottom#1{%
  \global\setbox#1=\vbox to.5\@targetheight{\vss
    \hbox to\@targetwidth{\hss\box#1\hss}\vss}}
```

\ship@twoup

The pages are generaly shipped in pairs:

```
\def\ship@twoup{%
  \begingroup
    \voffset=-\inv@targetmag in
    \hoffset=\voffset
    \global\advance\@physicalpage by 1
    \count\z@=\@physicalpage
    \csname &normal@shipout\endcsname\make@fullpage
  \endgroup}
```

\make@fullsidebyside
\make@fulltopbottom

```
\def\make@fullsidebyside{%
  \hbox{\box\@leftpage\pagesep@sidebyside\box\@rightpage}}
\def\make@fulltopbottom{%
  \vbox{\offinterlineskip\box\@leftpage\pagesep@topbottom\box\@rightpage}}
```

\make@fullpage The definition of \make@fullpage depends on the layout:

```
\def\make@fullpage{\make@fullsidebyside}
```

\pagesep@sidebyside \pagesep@topbottom A vertical or horizontal rule can be inserted. These can be redefined for other tricks:

```
\def\pagesep@sidebyside{%
  \begingroup
    \advance\pageseplength by \pagesepoffset
    \pagesepwidth=\inv@targetmag\pagesepwidth
    \kern -.5\pagesepwidth
    \vrule height \inv@targetmag\pageseplength
           depth -\inv@targetmag\pagesepoffset
           width \pagesepwidth
    \kern -.5\pagesepwidth
  \endgroup}
\def\pagesep@topbottom{%
  \begingroup
    \pagesepwidth=\inv@targetmag\pagesepwidth
    \vskip -.5\pagesepwidth
    \moveright\inv@targetmag\pagesepoffset\hbox{%
      \vrule height\pagesepwidth width\inv@targetmag\pageseplength}%
    \vskip -.5\pagesepwidth
  \endgroup}
```

For example it may be helpful to mark the positions of sewing holes along the spine of your booklet. For landscape this can be done by redefining \pagesep@topbottom and for the more typical portrait style booklet by changing \pagesep@sidebyside. The general technique is to use a zero-sized picture which LaTeX will think takes up no space. For instance, for letterpaper (11in by 8.5in) you can do something like this in your preamble:

```
\makeatletter
\renewcommand*{\pagesep@sidebyside}{%
  \begingroup
  \setlength{\unitlength}{1in}%      measurements in inches
  \begin{picture}(0,0)(0,-8.5)%      zero-sized picture, origin at page top
    \put(0,-1){\makebox(0,0){.}}%    mark 1in down from top
    \put(0,-4.25){\makebox(0,0){.}}% mark at page center
    \put(0,-7.5){\makebox(0,0){.}}%   mark 1in up from bottom
  \end{picture}%
  \endgroup}
\makeatother
```

\save@booklet With the Booklet layout, the pages are saved rather than shipped. I have added the signature code to the original macro. This outputs all the pages making

up a signature even if there are still more to come. The page boxes used in `\save@booklet` are assigned initially by `\twoupp@geboxes`.

```
\begingroup
\let\newbox\relax
\gdef\save@booklet#1{%
  \begingroup
    \globaldefs=1
    \ifnum\c@sigcount=\z@\bookletpage=0\fi
    \advance\bookletpage by 1
    \addtocounter{sigcount}{1}
%%%%    \expandafter\newbox\csname bookletbox\the\bookletpage\endcsname
    \expandafter\setbox\csname bookletbox\the\bookletpage\endcsname\box#1%
  \endgroup
  \ifnum\c@sigcount=\c@signature     %%% PW
    \twoup@eject%
    \setcounter{sigcount}{0}%
  \fi}
\endgroup

```

`\make@bookletpage` `\booklet@loop` `\Booklet@@loop`

The pages are then printed at the end with the following macros:

```
\def\make@bookletpage#1{%
  \setbox\ifodd#1\@rightpage\else\@leftpage\fi=%
    \expandafter\box\csname bookletbox\the#1\endcsname}

\def\booklet@loop{%
  \count\z@\rightpagenumber
  \make@bookletpage\leftpagenumber
  \make@bookletpage\rightpagenumber
  \ship@twoup
  \Booklet@@loop
}

\def\Booklet@@loop{%
  \advance\rightpagenumber by 1
  \advance\leftpagenumber by -1
  \ifnum\leftpagenumber<\rightpagenumber\else\expandafter\booklet@loop\fi}

```

`\twoupemptypage`

This one is easy:

```
\def\twoupemptypage{\shipout\hbox{}}

```

`\twoup@eject`

This clears a whole target page if there is a saved left page. Note that this does not invoke the output routine; i.e., it is not like `\clearpage` or `\supereject`. See `\twoupclearpage` below. (The booklet package doesn't need `\twoupeject` which is for non-LaTeX systems).

This is the definition of `\twoup@eject` with the Booklet layout.

```
\def\twoup@eject{
```

```
\leftpagenumber\bookletpage
\advance\leftpagenumber by 3
\divide\leftpagenumber by 4
\multiply\leftpagenumber by 4
\rightpagenumber=1
\ifnum\leftpagenumber>\bookletpage
  \setbox\@leftpage\hbox{}%
  \make@@halfpage\@leftpage
  \loop
    \setbox\@rightpage\copy\@leftpage
    \save@booklet\@rightpage
  \ifnum\leftpagenumber>\bookletpage
  \repeat
\fi
\booklet@loop}

```

`\twoupclearpage` This modification is needed for LaTeX in order to get the last page printed out if the final page is a left page (the catcode business is because `\enddocument` is `\let` to `\bye` in amstex):

```
\begingroup
\catcode`\>=9\relax
>>\gdef\twoupclearpage{\clearpage\twoup@eject}
>>\expandafter\@temptokena\expandafter{\enddocument}
>>\xdef\enddocument{\noexpand\twoupclearpage\the\@temptokena}
\endgroup

```

`\TwoupWrites` This is one workaround for the page cross-references problem

```
\def\TwoupWrites{%
  \let\TwoupSaved@write\write
  \let\TwoupSaved@read\read
  \let\TwoupSaved@openout\openout
  \let\TwoupSaved@closeout\closeout
  \def\write{\TwoupSaved@write-1{}\immediate\TwoupSaved@write}%
  \def\read{\TwoupSaved@write-1{}\immediate\TwoupSaved@read}%
  \def\openout{\TwoupSaved@write-1{}\immediate\TwoupSaved@openout}%
  \def\closeout{\TwoupSaved@write-1{}\immediate\TwoupSaved@closeout}%
  \let\TwoupWrites\relax}

```

`\twouparticle` `\twoupplain` `\twouplandscape` `\twouponetoone` The pre-defined layouts. I have taken advantage of LaTeX2e's paper size lengths to generalise.

```
\def\twouparticle{\target{\magstepminus1}{\paperheight}{\paperwidth}}
\def\twoupplain{\target{\magstepminus2}{\paperheight}{\paperwidth}}
\def\twouplandscape{\target{\magstepminus2}{\paperwidth}{\paperheight}%
  \targettopbottom}
\def\twouponetoone{\target{\magstep0}{\paperheight}{\paperwidth}}

```

Set the default for the source.

```
\source{\magstep0}{\paperwidth}{\paperheight}
```

Set the defaults for the rule.

```
\pagesepwidth 0pt
\pageseplength 6.5in
\pagesepoffset 1in
```

I also found that `\TwoupWrites` was really not optional.

```
\TwoupWrites

```

The default options are twouparticle and thirtytwo pages per signature.

```
\ExecuteOptions{twouparticle,thirtytwo}
\ProcessOptions

```

The end of this package.

```
⟨/prnt⟩
```

A The code for 2up

Following is a verbatim copy of Timothy Van Zandt's 2up code. I hope that by including this I have partly met his COPYING conditions.

```
%% BEGIN 2up.tex/2up.sty
%%
\def\fileversion{1.2}
\def\filedate{93/01/28}
%%
%% COPYRIGHT 1992, 1993 by Timothy Van Zandt, tvz@Princeton.EDU
%%
%% DESCRIPTION:
%%   2up.tex/2up.sty provides two-up printing for Generic TeX (e.g.,
%%   Plain, LaTeX, AmSTeX and AmS-LaTeX). It produces a standard dvi file,
%%   and does not involve an additional dvi or PostScript filter. It has a
%%   flexible interface for specifying paper size and layout.
%%
%% INSTALLATION:
%%   Put this file where your TeX looks for inputs, under the name 2up.tex.
%%   Name a copy 2up.sty to use as a LaTeX style option, or create a file
%%   2up.sty with the lines:
%%     \input 2up.tex
%%     \endinput
%%
%% DOCUMENTATION:
%%   Input 2up.tex, or include 2up as a LaTeX style option. There is a
%%   good chance you will get the desired layout. (But you will probably
%%   need to generate new font bitmaps to get high quality output.) See
```

```
%%   2up.doc, which might be appended to this file, for detailed
%%   documentation.
%%
%% COPYING:
%%   Copying of part or all of this file is allowed under the following
%%   conditions only:
%%   (1) You may freely distribute unchanged copies of the file. Please
%%       include the documentation when you do so.
%%   (2) You may modify a renamed copy of the file, but only for personal
%%       use or use within an organization.
%%   (3) You may copy fragments from the file, for personal use or for use
%%       in a macro package for distribution, as long as credit is given
%%       where credit is due.
%%
%%   You are NOT ALLOWED to take money for the distribution or use of
%%   this file or modified versions or fragments thereof, except for
%%   a nominal charge for copying etc.
%%
%% CODE:
%
\csname TwoUpLoaded\endcsname
\let\TwoUpLoaded\endinput
%
\edef\TheAtCode{\the\catcode`\@}
\catcode`\@=11\relax
\message{\space\space v\fileversion\space\space \filedate\space\space <tvz>}
%
% Parameter registers:
\newdimen\@targetwidth
\newdimen\@targetheight
\newdimen\@sourcewidth
\newdimen\@sourceheight
\newdimen\pageseplength
\newdimen\pagesepwidth
\newdimen\pagesepoffset
\newif\if@sidebyside
\@sidebysidetrue
\newif\if@twosided
%
% Registers used by output routine.
\newif\if@leftpage
\@leftpagetrue
\newbox\@leftpage
\newbox\@rightpage
\newcount\@physicalpage
%
% Since pages are shipped out half as often:
\multiply\maxdeadcycles by 2
%
% Registers used only for booklet layout:
```

```
\begingroup
  \let\newcount\relax
  \gdef\booklet@registers{%
    \newcount\bookletpage
    \bookletpage=0
    \newcount\leftpagenumber
    \newcount\rightpagenumber
    \multiply\maxdeadcycles by 20}
\endgroup
%
% A useful extension of the \magstep macro.
\def\magstepminus#1{%
  \ifcase#1 \@m\or 833\or 694\or 579\or 482\or 401\fi\relax}
%
% \@targetwidth and \@targetheight are set to the *unmagnified* dimensions
% of the target page. \inv@targetmag is the inverse of the target
% magnification.
{\catcode`\p=12\catcode`\t=12\gdef\@@inv@@mag#1pt#2{\def#2{#1}}}
\def\target#1#2#3{%
  \mag #1\relax
  \@targetwidth=1000pt
  \divide\@targetwidth by #1\relax
  \expandafter\@@inv@@mag\the\@targetwidth\inv@targetmag
  \@targetwidth=#2\relax
  \@targetwidth=\inv@targetmag\@targetwidth
  \@targetheight=#3\relax
  \@targetheight=\inv@targetmag\@targetheight}
%
% Like \target, but for the source:
\def\source#1#2#3{%
  \@sourcewidth=1000pt
  \divide\@sourcewidth by #1\relax
  \expandafter\@@inv@@mag\the\@sourcewidth\inv@sourcemag
  \@sourcewidth=#2\relax
  \@sourcewidth=\inv@sourcemag\@sourcewidth
  \@sourceheight=#3\relax
  \@sourceheight=\inv@sourcemag\@sourceheight}
%
% \targetlayout does a loop that reads the comma separated arguments.
% There can be no extraneous spaces.
\def\targetlayout#1{\process@targetlayout#1,stop,}
\def\process@targetlayout#1,{%
  \expandafter\let\expandafter\next\csname target@#1\endcsname
  \ifx\next\relax
    \begingroup
      \errhelp{Valid target layouts are "topbottom", "twosided",
        "booklet", "Booklet" and "dvidvi".}%
      \errmessage{`#1' is invalid 2up target layout - ignored.}%
    \endgroup
    \expandafter\process@targetlayout
```

```
  \else
    \next
  \fi}
\def\target@stop{}
\def\target@booklet{%
  \booklet@registers
  \def\ship@@@leftpage{\save@booklet\@leftpage}%
  \def\ship@@@rightpage{\save@booklet\@rightpage}%
  \@leftpagefalse
  \def\twoup@eject{\twoup@eject@booklet}%
  \expandafter\process@targetlayout}
\def\target@Booklet{%
  \def\booklet@@loop{\Booklet@@loop}%
  \target@booklet}
\def\target@twosided{%
  \@twosidedtrue
  \expandafter\process@targetlayout}
\def\target@topbottom{%
  \def\make@@halfpage{\make@@halftopbottom}%
  \def\make@fullpage{\make@fulltopbottom}%
  \@sidebysidefalse
  \expandafter\process@targetlayout}
\def\target@dvidvi{%
  \def\ship@@@leftpage{\ship@dvidvi\@leftpage}%
  \def\ship@@@rightpage{\ship@dvidvi\@rightpage}%
  \expandafter\process@targetlayout}
%
% TeX's \shipout primitive is saved as \&normal@shipout, and then \shipout
% is defined to save each page to \@leftpage or \@rightpage and to print out
% every two. With the twosided layout, filler pages are added when needed.
\expandafter\let\csname &normal@shipout\endcsname\shipout
\def\shipout{%
  \if@leftpage
    \global\@leftpagefalse
    \def\next{\afterassignment\ship@leftpage\global\setbox\@leftpage=}%
    \if@twosided
      \ifodd\count\z@
        \global\setbox\@leftpage=\hbox{}%
        \make@@halfpage\@leftpage\ship@@@leftpage
        \def\next{\shipout}%
      \fi
    \fi
  \else
    \global\@leftpagetrue
    \def\next{\afterassignment\ship@rightpage\global\setbox\@rightpage=}%
    \if@twosided
      \ifodd\count\z@
      \else
        \global\setbox\@rightpage=\hbox{}%
        \make@@halfpage\@rightpage\ship@@@rightpage
```

```
        \def\next{\shipout}%
      \fi
    \fi
  \fi
  \next}
%
% The job of \ship@leftpage and \ship@rightpage is to invoke \ship@@leftpage
% or \ship@@rightpage at the right time. \shipout is followed either
% (i) by an \hbox, \vbox or \vtop, in which case \ship@leftpage is invoked
% after the opening {. \@leftpage is void, and \ship@leftpage invokes
% \ship@@leftpage after the closing }, or
% (ii) by a \box or \copy, in which case \ship@leftpage is invoked after
% the full assignment. \@leftpage is not voide, and \ship@leftpage invokes
% \ship@@leftpage immediately.
\def\ship@leftpage{%
  \ifvoid\@leftpage\aftergroup\ship@@leftpage\else\ship@@leftpage\fi}
\def\ship@rightpage{%
  \ifvoid\@rightpage\aftergroup\ship@@rightpage\else\ship@@rightpage\fi}
%
% \ship@@leftpage/\ship@@rightpage take the output box, and first make it
% into a fully-size source page (with \make@halfpage) and then this is
% centered horizontally and vertically in half of a target page (with
% \make@@halfpage). Then they are shipped individually or together.
\def\ship@@leftpage{\make@halfpage\@leftpage\ship@@@leftpage}
\def\ship@@rightpage{\make@halfpage\@rightpage\ship@@@rightpage}
\def\make@halfpage#1{%
  \dp#1=\z@
  \setbox#1=\vbox to\@sourceheight{%
    \vskip \inv@sourcemag in
    \vskip \voffset
    \hbox to\@sourcewidth{\hskip\inv@sourcemag in\hskip\hoffset\box#1\hss}%
    \vss}%
  \make@@halfpage#1}
%
% The definition of \make@@halfpage depends on the target layout.
\def\make@@halfsidebyside#1{%
  \global\setbox#1=\vbox to\@targetheight{\vss
    \hbox to.5\@targetwidth{\hss\box#1\hss}\vss}}
\def\make@@halftopbottom#1{%
  \global\setbox#1=\vbox to.5\@targetheight{\vss
    \hbox to\@targetwidth{\hss\box#1\hss}\vss}}
\def\make@@halfpage{\make@@halfsidebyside}
%
% The pages are generaly shipped in pairs:
\def\ship@twoup{%
  \begingroup
    \voffset=-\inv@targetmag in
    \hoffset=\voffset
    \global\advance\@physicalpage by 1
    \count\z@=\@physicalpage
```

```
    \csname &normal@shipout\endcsname\make@fullpage
  \endgroup}
\let\ship@@@leftpage\relax
\def\ship@@@rightpage{\ship@twoup}
%
% The definition of \make@fullpage depends on the layout:
\def\make@fullsidebyside{%
  \hbox{\box\@leftpage\pagesep@sidebyside\box\@rightpage}}
\def\make@fulltopbottom{%
  \vbox{\offinterlineskip\box\@leftpage\pagesep@topbottom\box\@rightpage}}
\def\make@fullpage{\make@fullsidebyside}
%
% A vertical or horizontal rule can be inserted. These can be redefined
% for other tricks:
\def\pagesep@sidebyside{%
  \begingroup
    \advance\pageseplength by \pagesepoffset
    \pagesepwidth=\inv@targetmag\pagesepwidth
    \kern -.5\pagesepwidth
    \vrule height \inv@targetmag\pageseplength
           depth -\inv@targetmag\pagesepoffset
           width \pagesepwidth
    \kern -.5\pagesepwidth
  \endgroup}
\def\pagesep@topbottom{%
  \begingroup
    \pagesepwidth=\inv@targetmag\pagesepwidth
    \vskip -.5\pagesepwidth
    \moveright\inv@targetmag\pagesepoffset\hbox{%
      \vrule height\pagesepwidth width\inv@targetmag\pageseplength}%
    \vskip -.5\pagesepwidth
  \endgroup}
%
% With the dvidvi layout, the pages are shipped individually:
\def\ship@dvidvi#1{%
  \begingroup
    \voffset=-\inv@targetmag in
    \hoffset=\voffset
    \csname &normal@shipout\endcsname\box#1%
  \endgroup}
%
% With the booklet or Booklet layout, the pages are saved rather than
% shipped.
\begingroup
\let\newbox\relax
\gdef\save@booklet#1{%
  \begingroup
    \globaldefs=1
    \advance\bookletpage by 1
    \expandafter\newbox\csname bookletbox\the\bookletpage\endcsname
```

```
    \expandafter\setbox\csname bookletbox\the\bookletpage\endcsname\box#1%
  \endgroup}
\endgroup
%
% The pages are then printed at the end with the following macros:
\def\make@bookletpage#1{%
  \setbox\ifodd#1\@rightpage\else\@leftpage\fi=%
    \expandafter\box\csname bookletbox\the#1\endcsname}
\def\booklet@loop{%
  \count\z@\rightpagenumber
  \make@bookletpage\leftpagenumber
  \make@bookletpage\rightpagenumber
  \ship@twoup
  \booklet@@loop}
\def\booklet@@loop{%
  \advance\rightpagenumber by 2
  \advance\leftpagenumber by -2
  \ifnum\leftpagenumber<1\else\expandafter\booklet@loop\fi}
\def\Booklet@@loop{%
  \advance\rightpagenumber by 1
  \advance\leftpagenumber by -1
  \ifnum\leftpagenumber<\rightpagenumber\else\expandafter\booklet@loop\fi}
%
% This one is easy:
\def\twoupemptypage{\shipout\hbox{}}
%
% This clears a whole target page if there is a saved left page. Note that
% this does not invoke the output routine; i.e., it is not like \clearpage
% or \supereject. See \twoupclearpage and \twoupeject below.
\def\twoup@eject{%
  \if@leftpage\else
    \global\setbox\@rightpage\hbox{}%
    \make@@halfpage\@rightpage\ship@@@rightpage
    \global\@leftpagetrue
  \fi}
%
% This is the definition of \twoup@eject with the booklet option:
\def\twoup@eject@booklet{%
  \leftpagenumber\bookletpage
  \advance\leftpagenumber by 3
  \divide\leftpagenumber by 4
  \multiply\leftpagenumber by 4
  \rightpagenumber=1
  \ifnum\leftpagenumber>\bookletpage
    \setbox\@leftpage\hbox{}%
    \make@@halfpage\@leftpage
    \loop
      \setbox\@rightpage\copy\@leftpage
      \save@booklet\@rightpage
    \ifnum\leftpagenumber>\bookletpage
```

```
    \repeat
  \fi
  \booklet@loop}
%
% This modification is needed for \LaTeX in order to get the last page
% printed out if the final page is a left page (the catcode business is
% because \enddocument is \let to \bye in amstex):
\begingroup
\expandafter\ifx\csname @latexerr\endcsname\relax
  \catcode`\>=14\else\catcode`\>=9\fi\relax
>>\gdef\twoupclearpage{\clearpage\twoup@eject}
>>\expandafter\@temptokena\expandafter{\enddocument}
>>\xdef\enddocument{\noexpand\twoupclearpage\the\@temptokena}
\endgroup
%
% For most other macro packages we could just leave be and all pages would
% always be printed because of the way the \end primitive works (except that
% TeX will go bonkers with the booklet layout). However,
% sometimes a blank filler page would be printed *with* headings. We prefer
% the filler page to be truly blank. To achieve this,  we hack the definition
% of \end. This may cause problems with some macros.
\expandafter\ifx\csname @latexerr\endcsname\relax
  \let\twoup@@@end\end
  \def\end{\twoup@eject\twoup@@@end}
  \def\twoupeject{\par\vfil\supereject\twoup@eject}
\fi
%
% This is one workaround for the page cross-references problem
\def\TwoupWrites{%
  \let\TwoupSaved@write\write
  \let\TwoupSaved@read\read
  \let\TwoupSaved@openout\openout
  \let\TwoupSaved@closeout\closeout
  \def\write{\TwoupSaved@write-1{}\immediate\TwoupSaved@write}%
  \def\read{\TwoupSaved@write-1{}\immediate\TwoupSaved@read}%
  \def\openout{\TwoupSaved@write-1{}\immediate\TwoupSaved@openout}%
  \def\closeout{\TwoupSaved@write-1{}\immediate\TwoupSaved@closeout}%
  \let\TwoupWrites\relax}
%
%  Defaults:
\def\twouparticle{%
  \target{\magstepminus1}{11in}{8.5in}%
  \source{\magstep0}{8.5in}{11in}}
\def\twoupplain{%
  \target{\magstepminus2}{11in}{8.5in}%
  \source{\magstep0}{8.5in}{11in}}
\def\twouplegaltarget{%
  \target{\magstepminus1}{14in}{8.5in}%
  \source{\magstep0}{8.5in}{11in}}%
\def\twouplandscape{%
```

```
  \target{\magstepminus2}{8.5in}{11in}%
  \source{\magstep0}{11in}{8.5in}%
  \targetlayout{topbottom}}
\expandafter\ifx\csname @latexerr\endcsname\relax
  \twoupplain\else\twouparticle\fi
\pagesepwidth 0pt
\pageseplength 6.5in
\pagesepoffset 1in
%
\expandafter\catcode`\@=\TheAtCode\relax
\endinput
%% END 2up.tex/2up.sty
```

B The documentation for 2up

Following is an almost verbatim copy of the documentation for Timothy Van Zandt's 2up. I hope that by including this I have now completely met his COPYING conditions. The only change that I have made to the original is replacing every occurrence of '`{verbatim}`' by '`{verbtm}`', so LaTeX does not get confused when processing the current document.

```
%% BEGIN 2up.doc
%%
%% Documentation for 2up.tex/2up.sty.
%% Run through LaTeX, with or without the NFSS.
%%
%% See below if you want to try out two-up printing.
%%
%% LaTeX version of this documentation courtesy of
%%    H. David Todd <hdtodd@mockingbird.wesleyan.edu>
%%
%%
\documentstyle[12pt,twoside]{article}

\def\FileDate{January 28, 1993}
\def\FileVersion{1.2}

%% INSTRUCTIONS FOR TWO-UP PRINTING.
%% 1. Change \iffalse below to \iftrue.
%% 2. Uncomment \special{landscape} if using Rokicki's dvips, or otherwise
%%      remember to print the document out in landscape mode.
%% 3. Uncomment one of the booklet options, if desired.
%%
\iffalse
  \input 2up.tex
  \targetlayout{twosided}
```

```
  \TwoupWrites
  % \special{landscape}     %% This works with Rokicki's dvips
  % \targetlayout{Booklet}  %% Booklet printing with 2-sided printer/copier.
  % \targetlayout{booklet}  %% Booklet printing with 1-sided printer/copier.
\fi

\makeatletter

%% PAGE NUMBERING:
%% Adjust page numbering if using booklet layout option.
\setcounter{page}{0}
\def\next{\if@leftpage\else\stepcounter{page}\fi}
\@ifundefined{target@stop}{}{\next}

%% CONTENTS:
\def\tableofcontents{%
  \par\begin{center}
  \large\bf Contents
  \end{center}
  \begin{quote}\@starttoc{toc}\end{quote}}

%% PAGE PARAMETERS:
\setlength{\parindent}{0pt}          % paragraph indent
\setlength{\parskip}{4pt plus 1pt minus 1pt}
\setlength{\topmargin}{0pt}
\setlength{\headheight}{12pt}        % height of running head
\setlength{\headsep}{30pt}           % distance between header and text
\setlength{\textheight}{8.2in}        % height of text on page

%% DATES, VERSIONS AND TITLES:
\def\@maketitle{%
 \begin{center}
   {\Large\bf \@title \par}
   \vskip 1.2em {\lineskip .5em
   \begin{tabular}[t]{c}\@author\end{tabular}\par}
   \vskip .8em {\@date}%
  \end{center}
  \par
  \vskip .5em}

%% Page Style:
\pagestyle{myheadings}
\markboth{Two-Up Style Guide}{Version \FileVersion, \FileDate}

%% Special list:
\newcommand{\namelistlabel}[1]{\mbox{\bf #1}\hfil}
\newenvironment{namelist}[1]%
  {\begin{list}{}%
    {\let\makelabel\namelistlabel
    \settowidth{\labelwidth}{#1}
```

```
    \setlength{\leftmargin}{1.1\labelwidth}}}%
 {\end{list}}

%% VERBATIM:
%%
\begingroup
  \catcode`\{=12 \catcode`\}=12
  \catcode`\(=1 \catcode`\)=2
  \catcode`\+=0 \catcode`\\=12
  +gdef+|(\)          % \| = character \
  +gdef+{({)          % \{ = character {
  +gdef+}(})          % \} = character }
+endgroup
\def\Backslash{\protect\|}
%%
%% Define some functional font commands:
%%
\def\MainFont{\tt}      % For macro definitions.
\def\UsageFont{\tt}           % For in-line macro names.
\def\InlineFont{\tt}          % For other in-line snipets of code.
\def\MetaFont{\rm\it}            % For meta arguments.
%%
%% Short-cuts for font commands:
%%
\def\s#1{\string#1}
\def\t#1{{\InlineFont\string#1}}   % For other in-line code.
\def\m#1{{\MetaFont #1\/}}         % For just putting things in italics
\def\M#1{{\InlineFont\{\m{#1}\}}}  % Arg is in italic, enclosed in tt braces.
\let\N\t                           % For in-line macro names.
\catcode`\<=13 \def<#1>{\m{#1}}    % <meta>
\catcode`\"=13\def"{\verb"}        % Short verb
%%
%% This is for listing macro definitions in a quote-like environment.
%%
\begingroup
  \catcode`\[=1 \catcode`\]=2
  \catcode`\{=13 \catcode`\}=12
  \gdef\@MD[%
    \catcode`\{=13 \catcode`\}=12
    \def{##1}[\{[\MetaFont ##1]\}]]
\endgroup
\def\MD{%
  \quote
  \begingroup
    \@MD
    \def\end{\endgroup\end}%
    \def\\{\@centercr\s}%
    \MainFont
    \s}
\def\endMD{\endquote}
```

```
%%

%% End preamble.
\catcode`\@=12

\begin{document}

\title{Documentation for 2up.tex:\\
  Two-up printing for Generic TeX}
\author{Timothy Van Zandt\thanks{The documentation was put into
  \LaTeX\ format by David Todd.}\\ tvz@Princeton.EDU}
\date{Version \FileVersion\\[3pt] \FileDate}

\maketitle
\thispagestyle{empty}

  "2up.tex"/"2up.sty" allows one to print a document two-up, with
considerable flexibility as to paper size and layout. It produces a standard
dvi file, and does not involve an additional dvi or PostScript filter. It
should work with most \TeX\ macro packages.

  {\bf Usage:} Input "2up.tex", or include "2up" as a LaTeX style option.
There is a good chance you will get the desired layout. (But you will probably
need to generate new font bitmaps to get high quality output.) See the rest of
this documentation for detailed information on controlling 2up.tex.

\begingroup
\def\baselinestretch{.8}\large\normalsize
\tableofcontents
\endgroup
\clearpage

\section{Comparison with other methods}

There are other tools for two-up printing:
\begin{description}
\item[PostScript filters]
These work well as long as you only use PostScript fonts (as opposed to the
usual Metafont fonts). Otherwise, the PostScript filter scales bitmapped
fonts, and the quality is lower than with "2up.tex".

\item[Rokicki's dvidvi]
"dvidvi" is a versatil tool that does much more than
2up printing. However, if only rearranges the pages, and does not adjust the
magnification to ensure that the pages fit properly in a two-up format. It
also adds one more step to the \TeX-dvi-printer cycle. "2up.tex", on the other
hand, combines the changes to \TeX's magnification and page layout with the
rearranging of the pages, all with an easy-to-use interface and from within
your \TeX\ document. (See Section \ref{dvidvi} on using both "2up.tex" and
"dvidvi" together.)
```

```
\end{description}

\section{A warning about fonts}

Two-up printing generally involves reducing a document, and thus using fonts
sizes that are not typically found on your system. If you are using bitmapped
fonts (standard for \TeX\ users), and you do not have and cannot generate the
extra fonts bitmaps, you will find 2up.sty (and any other method of two-up
printing) to give very poor quality output.

If you are using a program like Rokicki's "dvips" that can generate extra font
bitmaps as needed, you will find that it takes a long time to print your 2up
document the first few times, as "dvips" is busy making the extra fonts. This
problem will go away. Be thankful you have such an easy way to get extra font
bitmaps.

\section{Usage}

Input "2up.tex". \LaTeX\ users can include "2up" as a style option.

Then set the target and source layout:
\begin{MD}
  \source{mag}{width}{height}\\
  \target{mag}{width}{height}
\end{MD}

\begin{itemize}
\item The ``source'' layout is the layout of your document
the way it is usually printed.  The ``target'' layout is the layout when it
is printed two-up.

\item <width> and <height> are the true width and height of the paper,
when looking at the output right-side-up.

\item <mag> refers to the source and target magnification. It should be an
integer, equal to 1000 times the magnification factor. There are also some
magic magnification numbers:
\begin{description}
\item[$\setminus$magstep<n>] for a magnification of 1.2$^n$ (n=0,...,5), or

\item[$\setminus$magstepminus<n>] for a magnification of 1.2$^{-n}$
(n=0,...,5).
\end{description}
Using these magnification values will make best use of the available fonts on
your system.
\end{itemize}

"2up.tex" takes each source page, and centers in half a target page. To get
the pages to fit, the magnification of the document typically has to be
reduced. If you find that the pages are too crowded, try reducing the target
```

```
magnification. If they are too lonely, try increasing the target
magnification.

If you want to adjust the positioning of the scaled pages, try changing the
values of "\hoffset" or "\voffset" with "\advance" or \LaTeX's "\addtolength".

Don't change the magnification of your document after using the "\target"
command, as you will override the settings made by 2up.tex.

You can also specify some options:
\begin{MD}
  \targetlayout{options}
\end{MD}
where <options> is a comma separated list with no spaces. Valid
options are:
\begin{namelist}{topbottomxxx}

\item [topbottom] The two source pages are printed one on top of the other.
\item [twosided]  Odd pages are always printed on the right or the bottom.
\item [booklet]   Pages are printed like a booklet. See Section \ref{booklet}.
\item [Booklet]   Like "booklet", but for two-sided printers/copiers.
\item [dvidvi]    For arranging in two-up layout with "dvidvi". See Section
\ref{dvidvi}.

\end{namelist}

The only other changes you might want to make to your document are the
following:
\begin{itemize}
\item You have to see to it that the target output is printed with the
correct orientation (landscape or portrait). See the documentation for your
dvi driver for details.

\item "2up.tex" will inserts a line between pages if you change the following
dimensions:
\begin{namelist}{pagesepwidthxxx}
\item [$\setminus$pagesepwidth]   Thickness of line. (Default 0pt)
\item [$\setminus$pageseplength]  Length of line. (Default 6.5in)
\item [$\setminus$pagesepoffset]  Distance from bottom of page to bottom of
line, or (with "topbottom" layout) from side of page to beginning of line.
(Default 1in)
\end{namelist}

\item You can, but do not need to, use the following commands:
\begin{namelist}{twoupemptypagexxx}

\item [$\setminus$twoupemptypage] inserts a completely blank half page
in the target.

\item [$\setminus$twoupclearpage] \LaTeX\ users: ejects a complete target
```

```
page.

\item [$\setminus$twoupeject] Plain \TeX users: ejects a complete target
page.

\end{namelist}
\end{itemize}

\section{Defaults}

  The following commands set the parameters for some common sources and
targets. The definitions of these commands are also useful examples.

  For A4 paper, just replace "8.5in" and "11in" in the definitions below by
the width and height of A4 paper.

\begin{description}

\item [$\setminus$twouparticle]

This is the default for \LaTeX.
\begin{namelist}{Sourcexx}

\item [Source:] A portrait document on 8.5x11 inch paper with wide margins as
used in \LaTeX's article style, and without marginal notes.

\item [Target:] A landscape document on the same size paper, with the source
pages printed side by side.

\item [Definition:]\hspace{1pt}
\begin{verbtm}
\target{\magstepminus1}{11in}{8.5in}
\source{\magstep0}{8.5in}{11in}}
\end{verbtm}
\end{namelist}

If you use narrower side margins, or if you use marginal notes, then you
will need to use "\twoupplain" or \\ "\twouplegaltarget", defined below.

\item [$\setminus$twoupplain]

This is the default for non-\LaTeX.

It is the same as "\twouparticle", but for source documents with narrower
margins.
\begin{namelist}{Sourcexxx}

\item [Definition:]\hspace{1pt}
\begin{verbtm}
\target{\magstepminus2}{11in}{8.5in}
```

```
\source{\magstep0}{8.5in}{11in}
\end{verbtm}
\end{namelist}

\item [$\setminus$twouplegaltarget]

\begin{namelist}{Sourcexxx}
\item [Source:] A portrait document on 8.5x11 inch paper with just about any
margins and perhaps with marginal notes.

\item [Target:] A landscape document on legal size paper (8.5x14 inches),
with the source pages printed side by side.

\item [Definition:]\hspace{1pt}
\begin{verbtm}
\target{\magstepminus1}{14in}{8.5in}
\source{\magstep0}{8.5in}{11in}\
end{verbtm}
\end{namelist}

\item [$\setminus$twouplandscape]\hspace{1pt}
\begin{namelist}{Sourcexxx}

\item [Source:] A landscape document on 8.5x11 inch paper with just about any
margins.

\item [Target:] A portrait document on the same size paper, with the
source pages stacked vertically.

\item [Definition:]\hspace{1pt}
\begin{verbtm}
\target{\magstepminus2}{8.5in}{11in}
\source{\magstep0}{11in}{8.5in}
\targetlayout{topbottom}
\end{verbtm}
\end{namelist}

\end{description}


\section{True Dimensions}

\TeX\ lets you use ‘true’ dimensions, as in
\begin{verbtm}
    \topmargin 1truein
    \setlength{\topmargin}{1truein}
\end{verbtm}
This sets the length to 1 inch
as it appears on the page, no matter what the magnification.
```

```
Once you use ‘true’ dimensions, it is impossible to change the
magnification of your document, and hence it is almost impossible
to use 2up.tex. You will get an error like:
\begin{verbtm}
    ! Incompatible magnification (833);
      the previous value will be retained (2000).
\end{verbtm}%

The use of ‘true’ dimensions might be hiding in macros or style files
you are using. For example, Plain \TeX’s "\magnification" command uses
true dimensions; use "\mag" instead, and then set "\hsize" and
"\vsize" appropriately scaled. If you can’t find the culprit ‘true’
dimension in your document or input files, try putting this on the
(very) first line of your document:
\begin{verbtm}
    \mag 143 \voffset 1truein \mag 1000
\end{verbtm}

You will get the error listed above wherever true dimensions are used
(and in some other places as well).


\section{Page Cross-References}

  Page cross-references (e.g., in an index or table of contents) will not be
accurate with "2up.tex", because finished pages are not immediately shipped
out. This can also cause problems with some special \LaTeX\ styles that have
multiple ".aux" files (e.g., for each chapter).

  To get better, but not perfect, page cross-references, try putting the
command
\begin{verbtm}
    \TwoupWrites
\end{verbtm}
at the beginning of your document, after inputting "2up.tex". This is good for
drafts, and may fix problems with \LaTeX\ styles that have multiple ".aux"
files. "\TwoupWrites" makes "\write" and "\read" "\immediate", if you know
what that means. It might cause problems of its own, but try it and see.

  To get accurate page cross-references:
\begin{enumerate}
\item Run the job without "2up.tex", until all cross-references
are properly resolved. Run any index utility at this point.

\item Run the job ONE MORE TIME with "2up.tex"; it will use the
correct cross-references from the previous runs. (In \LaTeX\ documents,
it is useful at this point to include the "\nofiles" command, so that
the correct cross-references are preserved.)
\end{enumerate}
```

```
\section{Booklets\label{booklet}}

Here are some special considerations for making booklets:

\begin{itemize}

\item  Use the "booklet" target layout if your printer or copier cannot print
two
sides directly. "2up.tex" prints out the ‘‘tops’’ of the pages, and then the
‘‘bottoms’’, so that you can copy or print on both sides by doing one side,
flipping the output over, and doing the other side.

\item Use "Booklet" if your printer or copier can print directly on two sides.

\item You must have enough memory and box registers to hold all the pages in
the document. A Big\TeX\ should be able to handle at least a 32-page booklet.

\item Sometimes booklet printing is part of the design of a document, rather
than an afterthought. In this case, you should set up the margins for the
target half-page rather than using "2up.tex" to scale the document. For
example, if using \LaTeX, 8.5x11 inch paper, \LaTeX's twoside style option,
and headings, try the following page parameter changes:
\begin{verbtm}
    \setlength{\oddsidemargin}{-0.2in}
    \setlength{\evensidemargin}{-0.5in}
    \setlength{\textwidth}{4.2in}
    \setlength{\textheight}{6.5in}
    \setlength{\topmargin}{-.4in}
\end{verbtm}
If you do this, "2up.tex" isn't adjusting margins or scaling the
document. You coould therefore get by without "2up.tex" by using "dvidvi".
\end{itemize}

\section{Using dvidvi\label{dvidvi}}

  With the "dvidvi" layout option, "2up.tex" takes care of adjusting the
margins, and you then use "dvidvi" to arrange the pages in a two-up
format. The advantage is that cross referencing comes out right.
The disadvantage is that it involves one more step.

Start by \TeX ing your document with "2up.tex" and the "dvidvi" layout option.
Then run the dvi file through "dvidvi". Specify the offsets for "dvidvi" at
the middle of the page. E.g., for
a side-by-side layout on 8.5x11in paper, use
\begin{verbtm}
    dvidvi '2:0,1(5.5in,0in)' foo bar
\end{verbtm}
For other paper sizes, replace "5.5in" by half the target paper width. For the
"topbottom" layout, reverse the dimensions, e.g.,
(0in,5.5in). For booklet printing, see the
```

```
the documentation for "dvidvi".


\section{Compatibility\label{compatibility}}

  These macros should work with most \TeX\ macro packages, except for
the following possible but unlikely compatibility problems:

\begin{itemize}

\item If you use a macro package other than \LaTeX\ that does unusual things
to end a document and/or that modifies the definition of "\end", you may
find that the last page is nor printed or that an extra page with headings
is inserted at the end of the document. This is fixable on a case-by-case
basis. See the redefinition of "\end" in "2up.tex".

\item "2up.tex" might not work if you meddle with \TeX's "\shipout" primitive
after loading "2up.tex".

\item If the first page of the source document is not on the first two-up
target
page (possible, for example, with two-sided printing and the "booklet"
option, but generally unlikely), "\special"'s that come at the beginning
of the document also do not get onto the first page of output. This can mess
up "\special"'s for landscape printing or
including a PostScript header file. In this case, you have to specify
these things as command line options when using your dvi driver.

\end{itemize}


\section{Changes}
\begin{namelist}{V0.9xxx}
\raggedright

\item [V0.9a] Everything redone. Too many differences to point out.

\item [V0.9b] Interface redone again. "booklet" option added.

\item [V0.9c] Pages ship out a little earlier. A few bugs fixed.

  Parameters "\pageseplength" and "\pagesepthickness" added.

\item [V0.9d] Fixed bug with "\twoupclearpage" and "\twoupeject".

\item [V0.9e] Made pages be counted (from dvi driver's viewpoint) by the
physical page number.

\item [V0.9f] Parameter "\pagesepoffset" added, and "\pagesepthickness"
changed to "\pagesepwidth".
```

```
\item [V1.0]  None. Just seemed seemed like it was time to call it 1.0

\item [V1.1] Added "Booklet" and "dvidvi" target layouts.

  "\hoffset" and "\voffset" in source document now have expected effect.

\item[V1.2] Fixed incompatibility problem with AmS-\TeX/AmS-\LaTeX.

  Added "\TwoupWrites" command.

\end{namelist}
\end{document}
% END 2up.doc
```

I used a slightly modified version of `2up.doc` as one of the test documents for the booklet package. First, to get a baseline, I followed the instructions in `2up.doc` and edited and printed it using `2up` to get a booklet.

I then copied `2up.doc` to `2updoc.tex` and then edited the new file so that the first part of the preamble became:

```
%% BEGIN 2updoc.tex
%% ....
\documentclass[12pt,twoside]{article}
\usepackage[print,four]{booklet}  % change options to suit
\usepackage{ifpdf}                % from CTAN

\ifpdf
  \pdfoutput=1
  \setpdftargetpages
\else
  \checkforlandscape
  \ifuselandscape
    \special{dvips}
    \ifprintoption
      \special{!TeXDict begin <</Duplex true /Tumble true>> setpagedevice end}
    \fi
  \fi
\fi

\def\FileDate....
...
\iffalse
  \input 2up.tex
  ...
   % \fi and \makeatletter were here
%% PAGE NUMBERING:
...
```

```
\@ifundefined{target@stop}...
\fi     % this \fi and \makeatletter moved down from before NUMBERING
\makeatletter

%% CONTENTS     % no changes after this
...
```

Processing, printing and folding this to make a booklet enabled me to determine if the package effectively produced the same final result as 2up.

References

[GMS94] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *The LaTeX Companion*. Addison-Wesley Publishing Company, 1994.

[Zan93] Timothy Van Zandt. *Two-up printing for Generic TeX*. January 1993. (Available from CTAN in macros/generic/2up)

Index

Numbers written in italic refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in roman refer to the code lines where the entry is used.