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Elsewhere in this issue is an advertisement for PC T_EX that tells you how to order and how much it costs.

Future revisions will include a preview screen driver, and drivers for QMS, Imagen, Apple's Laser-Writer, and other popular output devices. We will also offer customized macro packages, written by Michael Spivak, each aimed at specific needs, such as publishing, business, and education.

If you have questions about PC T_EX, you can reach me weekdays from 9 a.m. until at least 6 p.m. (PST), or leave a message with my answering service.

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Macros

MACROS FOR TWO-COLUMN FORMAT

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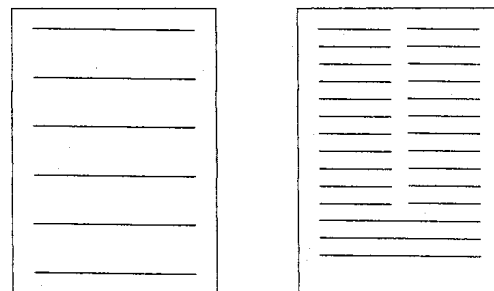
In Appendix E of the T_EXbook, Don Knuth presents the macros that were used for two-column formatting in Appendix I, the index. For their intended purposes they seem to have worked well enough, but there are a couple of circumstances under which they may fail. I discovered the first of these while trying to adapt the macros to another context, and in the process of working out a fix, Don came across the other.

The first problem can arise when switching from single-column to double-column mode near the end of a page, and then back to single-column mode "too soon" on the next page. Referring to page 417 of The T_EXbook, the `\begindoublecolumns` macro operates by first saving the current `\box255` in `\partialpage`, changing the output routine to `\doublecolumnout`, changing `\hsize` to `\colwidth`, and changing `\vsize` to `\bigcolheight`, which is a bit more than twice the original `\vsize`. This allows

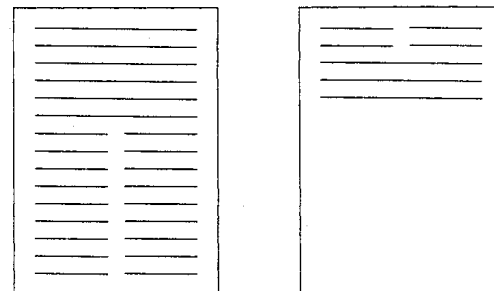
a very tall column to accumulate, after which, when `\doublecolumnout` is invoked, `\vsplit` is used to extract columns of the correct height.

When `\enddoublecolumns` occurs, the output routine `\balancecolumns` uses a `\loop` in an attempt to split the current `\box255` into two columns of equal height. Then `\pagesofar` packages these boxes side by side and contributes the result (along with the `\partialpage`, if any) to the current vertical list, and normal processing resumes.

The problem is that the alteration of `\vsize` by `\begindoublecolumns` doesn't take the height of `\partialpage` into account. This can allow `\box255` to grow too large, creating a situation that `\balancecolumns` can't handle. Consider a case where `\begindoublecolumns` has occurred on a given page and more than enough material has accumulated in the main vertical list to fill the remainder of the page, if split equally. Since `\begindoublecolumns` has set `\vsize` for a full double-column page, this might not be enough material to cause the output routine to be invoked. If `\enddoublecolumns` occurs at this point, `\balancecolumns` will split the *entire* `\box255` into two equal parts, and the resulting columns won't fit onto the page along with `\partialpage`. The result is that `\partialpage` gets put onto the current page as a badly underfull `\vbox`, and the two columns get held over for the next page. You get something like this:



instead of this:



Of course, this situation never occurs in Appendix I because before `\enddoublecolumns` finally occurs, several full-size double-column pages have intervened, so that `\partialpage` is empty.

The cure is to set a value of `\vsize` which ensures that the `\doublecolumnout` output routine gets "triggered" at the right time. In the modified versions of the macros below, the changes have been marked by `%%n` for easy reference. The `\savesize` register is used to hold the original `\vsize`, so it can be restored by `\enddoublecolumns`. In `\begindoublecolumns`, the new line `%%5` adjusts `\vsize` to compensate for `\partialpage`, and line `%%8` resets it to `\bigcolheight`, since a fresh page will start after `\doublecolumnout` operates.

A second problem with the macros in Appendix E is that under certain circumstances it is possible for `\balancecolumns` to be invoked twice in a row. Note that the final act of `\balancecolumns`, after splitting `\box255`, is to invoke `\pagesofar`,

which contributes its results to the current vertical list. It is possible for the resulting list to be big enough to trigger the output routine, which at this point is still `\balancecolumns`. Since `\box255` no longer contains a "column" to be split, the results will tend to be chaotic. In this kind of situation it is likely that the page *cannot* be properly balanced, so the best thing to do is warn the user and go on. This is accomplished by changing the output routine *inside* `\balancecolumns` to simply produce an error message. This happens in line `%%9`, and then line `%%6` is required to restore normal output in `\enddoublecolumns`.

Note that `\colwidth` and `\bigcolheight` here replace the T_EXbook values of 14pc and 89pc respectively, and that `\dimen0` replaces `\dimen@`.

```

\newdimen\colwidth \newdimen\bigcolheight          %%%1
\colwidth=14pc \bigcolheight=89pc                  %%%2
\output{\onepageout{\unvbox255}}
\newbox\partialpage
\newdimen\savesize                                  %%%3
\def\begindoublecolumns{\begingroup
  \savesize=\vsize                                  %%%4
  \output={\global\setbox\partialpage=\vbox{\unvbox255}}\eject
  \output={\doublecolumnout} \hsize=\colwidth \vsize=\bigcolheight
  \advance\vsize by -2\ht\partialpage}              %%%5
\def\enddoublecolumns{\output={\balancecolumns}\eject
  \global\output={\onepageout{\unvbox255}}          %%%6
  \global\vsize=\savesize                            %%%7
  \endgroup \pagegoal=\vsize}
\def\doublecolumnout{\dimen0=\pageheight
  \advance\dimen0 by-\ht\partialpage \splittopskip=\topskip
  \setbox0=\vsplit255 to\dimen0
  \setbox2=\vsplit255 to\dimen0
  \onepageout\pagesofar
  \global\vsize=\bigcolheight                        %%%8
  \unvbox255 \penalty\outputpenalty}
\def\pagesofar{\unvbox\partialpage
  \wd0=\hsize \wd2=\hsize \hbox to\pagewidth{\box0\hfil\box2}}
\def\balancecolumns{\setbox0=\vbox{\unvbox255} \dimen0=\ht0
  \advance\dimen0 by\topskip \advance\dimen0 by-\baselineskip
  \divide\dimen0 by2 \splittopskip=\topskip
  {\vbadness=10000 \loop \global\setbox3=\copy0
    \global\setbox1=\vsplit3 to\dimen0
    \ifdim\ht3>\dimen0 \global\advance\dimen0 by1pt \repeat}
  \setbox0=\vbox to\dimen0{\unvbox1}
  \setbox2=\vbox to\dimen0{\unvbox3}
  \global\output={\balancingerror}                  %%%9
  \pagesofar}
\newhelp\balerrhelp{Please change the page          %%%10
  into one that works.}                             %%%11
\def\balancingerror{\errhelp=\balerrhelp           %%%12
  \errmessage{Page can't be balanced}              %%%13
  \onepageout{\unvbox255}}                          %%%14

```