

Acrobat PDF from T_EX



Y&Y, Inc.

From T_EX to Acrobat

T_EX — the typesetting language invented by Donald E. Knuth at Stanford — is widely used in the academic and research community for typesetting technical articles and books. T_EX is unsurpassed in its capabilities for typesetting complex math (see [sample at end of this article](#))[†] and is well known for its superb dynamic programming hyphenation/line-breaking search algorithm. Adobe Acrobat PDF is a powerful platform-independent technology for document interchange. It is natural to want to convert material typeset using T_EX to Acrobat PDF format.

It is easy to do this using a T_EX system designed from the ground up for scalable outline fonts such as ATM compatible fonts in Adobe Type 1 format (a.k.a. ‘PostScript fonts’ or ‘ATM fonts’). With the Y&Y T_EX system, for example, you simply typeset the material using T_EX, check the result using the DVIWindo previewer, then print to file using the special PS printer driver DVIPSONE (which can be called directly from the previewer). Acrobat Distiller processes the resulting PostScript file.

[And that is pretty much all there is to it!](#)

[†]Click on text in green to make hypertext jump.

Bitmapped Font Woes

So what *is* the problem with Acrobat PDF files made from T_EX output?

T_EX has traditionally been used with ‘Computer Modern’ fonts — also designed by Donald E. Knuth — in bitmapped form (PK font file format). Converting PostScript files containing bitmapped fonts to PDF format leads to unattractive (and slow) rendering in the Acrobat Reader, mostly because it is impossible to scale bitmapped fonts well.

The solution to this problem is to use scalable outline fonts in ATM compatible Adobe Type 1 format. The Computer Moderns fonts *are* available in Type 1 format — in both non-commercial form (on CTAN — the ‘Comprehensive T_EX Archive Network’) and commercial form (from Y&Y, Inc. or Blue Sky Research). For details [see end of this note](#) (note that both non-commercial and commercial forms have some restrictions on use).

Font Choices

Of course, once one uses a T_EX system that properly supports scalable outline fonts, there is no longer any necessity to stick with Computer Modern. Literally *thousands* of text fonts in Adobe Type 1 format can be used. When it comes to math fonts, however, the choices are much more limited, because of special demands made by T_EX on math fonts. There are presently the following possibilities:

- (1) Computer Modern (and extra L^AT_EX, SLI_T_EX and *AMS* fonts);
- (2) Lucida[®] Bright + Lucida New Math (and Lucida Bright Expert);
- (3) *MathTime* 1.1 (and *MathTime* Plus) + Times, Helvetica, & Courier;
- (4) Adobe Lucida, Lucida Sans, and Lucida Math.

The first three font sets are available in Type 1 format from **Y&Y, Inc.**, the last one from **Adobe Systems Inc.** T_EX macro packages are available to make it easy to switch to these fonts in (i) plain T_EX, (ii) L^AT_EX 2.09, and (iii) L^AT_EX 2_ε dialects of T_EX.

Some find Computer Modern a bit ‘thin’ and prefer a somewhat ‘heavier’ face for text, such as Lucida Bright or Times-Roman.

The generation of Acrobat PDF files is particularly simple when using a T_EX system designed from the ground up for use with scalable outline fonts. Such a system will produce PostScript files referring directly to the Type 1 fonts. This PS file can then be passed through the Acrobat Distiller. In this case, little preparation is needed, other than to first install the fonts using Adobe Type Manager (**ATM**),

Other T_EX systems require more work, including (i) multiple metric files, (ii) special configuration files that tell where the font files are, (iii) information on how to reencode the fonts, and (iv) what the relationship is between the name used for a font in T_EX, the PostScript Fontname, and the name of the font file(s). But this is just what it takes for such systems to use fonts in Type 1 format in the first place case when making PostScript files. There isn’t anything specific to preparing for Acrobat Distiller.

Some Practical Details

There are other issues that need to be addressed when creating PDF files:

- (1) Distiller should be set up to *always* subset fonts (i.e. use ‘partial font downloading’). This not only reduces the size of the PDF file, but is *required* by some font licensing agreements. You need to add a file to Distiller’s ‘startup’ directory/folder containing the line:

```
<</SubsetFonts true /MaxSubsetPct 99 >> setdistillerparams
```

Do *not* add this code to the existing ‘example.ps’ file, because the latter may be replaced — and hence your customization lost — when you upgrade. Also, be careful when editing this file, since the Distiller will read *all* files in the ‘startup’ directory, *including* any backup copies your editor may have created!

- (2) Check that Distiller has embedded all fonts, *and* that all embedded fonts are subsetted (partial). In Acrobat Reader 2.1 open the PDF file, select ‘File→Document Info→Fonts.’ Click on ‘List All Fonts.’ The ‘Original Names’ of all subsetted fonts have a six letter prefix followed by ‘+.’ Fonts listed *without* such a prefix are (i) not embedded at all, (ii) simulated using generic Multiple Master fonts, or (iii) are embedded as complete fonts.

The ‘Used Font’ column is important. It should say ‘Embedded’ if the font is embedded. If the font is installed on the system on which you are reading the PDF file, however, it will instead list the font name, indicating that the reader is using the locally installed font rather than the embedded one. By the way, this field will only be filled in if you have looked at a page in the document that uses this font. If it is blank, first page forward over the file to ‘touch’ all fonts.

In Acrobat Reader 3.0, the 6 letter prefix is not shown, instead check the ‘Used Font’ column for ‘Embedded Subset.’

If you notice that complete fonts are embedded, then you may not have the new file in the ‘startup’ directory set up properly. If fonts are not embedded, then the Acrobat Reader will try to simulate them using the generic Multiple Master fonts. In the case of output from

T_EX this is almost *never* what you want. You have to go back to the Distiller and tell it to always embed such fonts. Then run the PS file through Distiller again.

- (3) There may be difficulties when using fonts that use the ‘control character’ range (character code 0–31). This can be avoided by either using normal text fonts that do not use the control character range, or — when this is not possible (as with Computer Modern fonts) — use a printer driver that remaps such character codes to higher up.
- (4) To exploit fonts other than Computer Modern, use a T_EX system that can *fully reencode* the fonts to provide access to all characters. Otherwise you may have problems getting at some glyphs.

For example, out of 228 ‘standard’ characters found in most text fonts, 21 are not normally accessible on the Macintosh. In Windows, 15 are missing, including important glyphs such as ‘ı’ (dotlessi), ‘˙’ (dotaccent), and the ligatures ‘fi’ (fi) and ‘fl’ (fl).[†]

- (5) Different printer drivers produce very different PostScript code. PostScript code that works fine on a printer or image setter often is *not* set up to work optimally with Acrobat. Check, for example, that equal thickness rules render equally thick in the Acrobat Reader, independent of where on the page they lie.
- (6) Since Acrobat PDF format provides strong hypertext support, you may want to use a T_EX system that itself has hypertext support, and that *also* translates hypertext links to appropriate Acrobat ‘pdfmarks’ embedded in the PostScript file (see [Contact Information](#)).

[†]Ideally the system should also provide access to ‘ff’ ‘ffi’ ‘ffl’ ‘j.’

- (7) Before posting PDF files with embedded fonts on the InterNet, check with the font vendor whether any special licensing is required.

Legacy Documents

The above assumes that the T_EX source files are available. Often all that is left are PostScript files made some years ago. These typically will contain bitmapped fonts that lead to exactly the rendering problems described above. It is non-trivial to ‘reverse engineer’ one of these files, since there is no information in the file on what the fonts are called, and since the bitmaps for a given font are *not* fixed entities, depending on the printer resolution and the METAFONT ‘mode’ settings used when creating them.

Sample PDF Documents

Some samples typeset using T_EX and converted to Acrobat PDF format may be found at <http://www.YandY.com/yyfonts.htm>. There are PDF files illustrating the first three font choices discussed above:



CM,



LB+LNM,



MathTime.

Additional Information

For additional information on Distiller’s parameters, check the Distiller on-line help file; and page 127 in “*Acrobat 2.1: Your Personal Consultant*” by Roy Christmann, Ziff-Davis Press, Emeryville, California, 1995, ISBN 1-56276-336-9. Also see page 15 in Adobe’s Technical Note 5151 “*Acrobat Distiller Parameters*” available from

<http://www.adobe.com/supportservice/devrelations/devtechnotes.html>.

Contact Information

CTAN is the ‘Comprehensive T_EX Archive Network.’ The main servers are <ftp://tug2.cs.umb.edu> (USA), <ftp://ftp.tex.ac.uk> (United Kingdom), and <ftp://ftp.dante.de> (Germany). Look in ‘tex-archive.’

Blue Sky Research, makers of ‘Textures’ — an integrated T_EX system for the Macintosh — may be found at

<http://www.BlueSky.com>.

Y&Y, Inc. makers of the Y&Y T_EX system for Windows — may be found at

<http://www.YandY.com>.

Y&Y also specializes in ATM compatible Type 1 fonts for use with T_EX.

$$\begin{array}{ccccccc}
 & & & & & 0 & \\
 & & & & & \downarrow & \\
 0 & \longrightarrow & \mathcal{O}_C & \xrightarrow{\iota} & \mathcal{F} & \xrightarrow{\rho} & \mathcal{L} & \longrightarrow & 0 \\
 & & \parallel & & \downarrow \phi & & \downarrow \psi & & \\
 0 & \longrightarrow & \mathcal{O}_C & \longrightarrow & \pi_* \mathcal{O}_D & \xrightarrow{\delta} & R^1 f_* \mathcal{O}_V(-D) & \longrightarrow & 0 \\
 & & & & & & \downarrow \theta_i \otimes \gamma^{-1} & & \\
 & & & & & & R^1 f_* (\mathcal{O}_V(-iM)) \otimes \gamma^{-1} & & \\
 & & & & & & \downarrow & & \\
 & & & & & & 0 & &
 \end{array}$$

Try typesetting the above without using T_EX!

Colophon

- This document was typeset using the Y&Y T_EX System release 2.0 — translated to PostScript form by DVIPSONE — then to PDF form by Acrobat Distiller 3.0.1 for Windows.
- DocInfo pdfmark (check out ‘File→Document Info→General’ in Acrobat Reader) produced automatically by DVIPSONE. Keywords (in DocInfo pdfmark) supplied via `\special{...}`.
- CropBox pdfmark (which defines the area shown in Acrobat Reader) supplied via `\special{...}`.
- Hypertext links to ‘named destinations’ automatically translated by DVIPSONE to appropriate pdfmarks. Similarly, DVIPSONE translated hypertext links to URLs to standard /URI /Action annotations (these require the [\(Acrobat WebLink plug-in\)](#) for proper operation).
- TIFF image (the [Y&Y logo](#)) inserted via `\special{insertimage ...}`. Colored text produced via `\special{color rgb ...}`.
- Fonts used include several from the Lucida Bright + Lucida New Math super family, as well as a few Computer Modern fonts and *Times-Italic* (check out ‘File→Document Info→Fonts’ in Acrobat Reader).

Trademark Information

T_EX is a registered trademark of the American Mathematical Society ([AMS](#)), Lucida is a registered trademark of Bigelow & Holmes, Inc. Y&Y and the [Y&Y logo](#) are registered trademarks of Y&Y, Inc. DVIPSONE and DVIWindo are trademarks of Y&Y, Inc. PostScript, Acrobat, and Adobe Type Manager are registered trademarks of [Adobe Systems, Inc.](#), Windows is a registered trademark of [Microsoft, Inc.](#)

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