

## Fonts

### An exploration of the Latin Modern fonts

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#### Abstract

The Latin Modern fonts are a newly-created set of fonts with the principal aim of providing glyphs for as many languages as possible. There is a multitude of little-known font shapes in the package, however, and these will be explored here.

#### 1 Introduction

The Latin Modern family is a relatively recent collection of fonts authored by Bogusław Jackowski and Janusz M. Nowacki [1]. They are intended as the successors to Donald Knuth’s Computer Modern fonts for the Unicode age, to provide the means for typesetting as many languages as possible that use the Latin-based alphabet. The collection is vast: it contains 72 text fonts, each containing almost seven hundred glyphs, at time of writing, with more probable in the future. That’s some 50,000 glyphs in total! A very small number of the glyphs are shown in figure 1, chosen mostly at random for their interesting shapes. The maths fonts in the collection are not considered in this article, as they are equivalent to the Computer Modern fonts they are based on.

The Latin Modern fonts have been created with the MetaType1 system [2], whose programmatic nature makes the idea of dealing with such a huge number of glyphs even possible. The number of fonts in the collection is greater than the BlueSky Computer Modern Type 1 fonts [3] now used by default by all current L<sup>A</sup>T<sub>E</sub>X distributions, but fewer than in the enormous CM-Super collection (which also provides many glyphs for multilingual typesetting), whose fonts have been auto-traced from bitmaps and hence are of slightly inferior quality [4]. With the most recent releases, OpenType versions of the fonts have been made available for more general use. In this article, we shall look at the fonts the Latin Modern family provides and how they may be accessed in L<sup>A</sup>T<sub>E</sub>X.

#### 2 NFSS refresher

To provide context, some brief details of L<sup>A</sup>T<sub>E</sub>X’s font selection scheme are expounded here. Refer to the documentation [5] for further information.

Figure 1: Ten of the 50000-odd glyphs in the Latin Modern collection.

Three main families are defined for a document: the default roman, sans serif, and typewriter fonts. These are selected with the `\rmfamily`, `\sffamily`, and `\ttfamily` commands, respectively. Font families are requested with `\fontfamily{...}`; all such `\font...` commands (more to be seen) must be followed by `\selectfont`, if nothing else, to perform the actual font selection.

Variations along two other font axes (other than family) are possible: series and shape. The series axis is used to express weight and width, such as bold or condensed, and combinations thereof. We will be using the `\fontseries{...}` command later to look at various weights of the Latin Modern fonts. The shape axis is used to express italics and small caps, among other more esoteric options. We shall be content in the shape axis to use the commands `\itshape`, `\slshape`, and `\scshape`<sup>1</sup> to choose between the italic, oblique, and small caps shapes. Note that when only slanted shapes are available, `\itshape` will generally also select them.

How do we discover all the codes used to express the families, series and shapes for each font? These are all defined within font definition (`.fd`) files, which are supplied one per font encoding. The most common encoding is T1, which provides glyphs for many, but not all, European languages. To discover the font shapes available in the Latin Modern collection, then, these files must be located within the T<sub>E</sub>X distribution. They are found in the `texmf/tex/latex/lm` directory (where this is located will be system dependent), and investigation here will yield all of Latin Modern’s secrets.

The encodings currently supported by the Latin Modern fonts in L<sup>A</sup>T<sub>E</sub>X are: T1, for most European languages; TS1, a large collection of miscellaneous symbols to accompany T1. QX, a variant of T1 that is more suitable for Slavonic languages (also including the `fk` ligature, cf. `fk`); LY1, an alternative to T1 that supports a mixture of common symbols and accented letters; T5, for Vietnamese; OT1, for emulating T<sub>E</sub>X’s original ad-hoc font encoding; OT4, an obsolete encoding based on OT1 that supports Polish; IL2, a ‘nonstandard’ encoding suitable for Czech fonts; and, L7X, a ‘nonstandard’ encoding for Lithuanian.

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<sup>1</sup> Or `\textit{...}`, `\textsl{...}`, `\textsc{...}`, respectively, which change the font of their argument instead.

### 3 The same-old

Everyone is familiar with the default  $\TeX$  fonts. The Latin Modern fonts are selected with, in the preamble,<sup>2</sup>

```
\usepackage{lmodern}
\usepackage[T1]{fontenc}
```

which should make barely any visible changes to already existing documents; these fonts are an *extension* of Computer Modern, not a new design.

To begin, the three default families are shown, using common  $\LaTeX$  font selecting commands. In the examples shown in this article, indented entries indicate that the previous outdented command(s) are still active.

**Roman** Perhaps simply because he could, Knuth included a large amount of variation in the fonts he designed for  $\TeX$ . Certainly, no one since has really matched his efforts. The descendants of his fonts still bear this curious hallmark: the Latin Modern Roman family contains both slanted *and* italic shapes.

```
\rmdefault LM Roman
\itshape LM Roman Italic
\slshape LM Roman Oblique
\scshape LM ROMAN SMALL CAPS
\bfseries LM Roman Bold Extended
\itshape LM Roman Bold Italic Extended
\slshape LMR Bold Oblique Extended
```

**Sans serif** Variations here must wait until later; here are the ‘standard four’. Note that the sans serif family does not have a true italic, nor small caps.

```
\sffamily LM Sans
\slshape LM Sans Oblique
\bfseries LM Sans Bold
\slshape LM Sans Bold Oblique
```

**Typewriter** The italic shape here is perhaps a little unpleasant, and the fact that it has small caps is quite unusual considering that the sans serif family does not.

```
\ttfamily LM Typewriter
\itshape LM Typewriter Italic
\slshape LM Typewriter Oblique
\scshape LM TYPEWRITER SMALL CAPS
\bfseries LM Typewriter Dark
\slshape LM Typewriter Dark Oblique
```

The majority of the shapes demonstrated above are available in the Computer Modern fonts (that is, the current  $\LaTeX$  defaults). The bold (‘Dark’)

<sup>2</sup> Change T1 to another option (LY1, QX, T5, etc.), or combination thereof, depending on which glyphs you require/which language(s) you are typesetting.

typewriter fonts above, however, are completely new to Latin Modern. While the original METAFONT fonts are parameterised such that changes like this were easily possible, its bitmap output format is very outdated and rarely used these days.

### 4 Interlude — optical sizes

In the old days of printing, fonts were made of metal and were literally one to a size. The characters in a font for the body text of a book would look noticeably different to that same font at a larger size for titling. Nowadays, computer-based fonts can be scaled linearly to any size imaginable, but well designed fonts are still made available with variations based on the intended size of the output. In brief, the smaller a font is, the less fine its intricacies must be in order to survive the transfer from (possibly imperfect) printed page or low-resolution screen to eye. Conversely, a font designed to be large can be more delicately rendered.

For the original Computer Modern fonts, designed in METAFONT, the optical size could be chosen exactly for any size. Due to constraints on early computers, specific sizes were chosen as canonical, which were then inherited when they were converted to the PostScript Type 1 format. The Latin Modern fonts, in turn, also preserve these canonical sizes for all of the ‘major’ shapes, although such a profusion of optical sizes is almost certainly unnecessary, since there needn’t be such a great range of font sizes in a single document.

The set of optical sizes for Latin Modern Roman is shown in figure 2, the largest number for any of the Latin Modern families. The non-linear nature of the scaling is immediately apparent, and it is quite clear how the characteristics change from robust to delicate, most significantly in the widths and stroke thicknesses of the characters, as the design size increases.

The Latin Modern fonts with a range of optical sizes are: roman upright, italic, oblique, and bold

Latin Modern Roman, design size 5 pt  
 Latin Modern Roman, design size 6 pt  
 Latin Modern Roman, design size 7 pt  
 Latin Modern Roman, design size 8 pt  
 Latin Modern Roman, design size 9 pt  
 Latin Modern Roman, design size 10 pt  
 Latin Modern Roman, design size 12 pt  
 Latin Modern Roman, design size 17 pt

**Figure 2:** The optical size range of Latin Modern Roman, each font at 10 pt.

extended; sans upright and oblique; and typewriter upright. These optical size variations constitute 32 of 69 fonts in the collection.

## 5 Non-default weights

As previously mentioned, the Latin Modern collection shares with the Computer Modern fonts some shapes that are not often used in practice, probably due to the fact that they can't be accessed with the 'normal' NFSS commands such as `\emph` and `\textbf`.

### 5.1 Other bold shapes

A non-extended version of the roman bold exists. Unfortunately, it is available in but a single design size (unlike its extended counterpart), and lacks true italics.

```
\bfseries           LM Roman Bold Extended
\fontseries{b}\selectfont LM Roman Bold
\fontseries{b}\slshape LM Roman Bold Oblique
```

The sans serif family also has a 'secret' bold shape:

```
\sffamily
  \bfseries           LM Sans Bold
  \fontseries{sbcb}
  \selectfont        LM Sans Demi Condensed
  \slshape           LM Sans Demi Condensed Oblique
```

### 5.2 Italic small caps

The `slantsc` package allows `\slshape` and `\scshape` to be combined in order to select oblique small caps. (Or `\itshape` for truly italic small caps if they exist.) With `\usepackage{slantsc}`, it is possible to select

```
\scshape\slshape LM ROMAN OBLIQUE SMALL CAPS
\ttfamily\scshape\slshape
                  LM TYPEWRITER OBLIQUE SMALL CAPS
```

Oblique or italic small caps are scarce in traditional typesetting, but their use is becoming more popular in modern times.

### 5.3 The new typewriter shapes

Quite recently in the lifetime of the Latin Modern collection, the typewriter fonts have been supplemented with extra shapes, including the 'Typewriter Dark' fonts previously seen. Also present are light and condensed light shapes, the latter being a  $\frac{2}{3}$  reduction in width; that is, 120 characters in condensed light will fit in the space for 80 regular typewriter letters. Note that every character in every weight and shape of the typewriter fonts has the same width so that the letter grid remains constant when switching between styles.

```
\ttfamily
  \fontseries{b}
```

```
\DeclareFontFamily{T1}{lmtt}{}
\DeclareFontShape{T1}{lmtt}
  {m}{n}{<-> ec-lmtl10}{}
\DeclareFontShape{T1}{lmtt}
  {m}{\itdefault}{<-> ec-lmtlo10}{}
\DeclareFontShape{T1}{lmtt}
  {\bfdefault}{n}{<-> ec-lmtk10}{}
\DeclareFontShape{T1}{lmtt}
  {\bfdefault}{\itdefault}{<-> ec-lmtko10}{}

```

**Figure 3:** Code to select lightface typewriter by default. For the T1 encoding; adapt as required for the other encodings by looking in the `...lmtt.fd` files, as discussed in section 2.

```
\selectfont      LM Typewriter Dark
\slshape         LM Typewriter Dark Oblique
\fontseries{l}
  \selectfont    LM Typewriter Light
  \slshape      LM Typewriter Light Oblique
\fontseries{lc}
  \selectfont    LM Typewriter Light Condensed
  \slshape      LM Typewriter Light Condensed Oblique
```

One may wonder why the light weights were produced. As the medium typewriter face is relatively heavy, it does not have much contrast with the new dark weight; compare the example on page 3 with the one on the previous page. So, in situations in which the bold face is to be used, the light face should be selected as the 'normal' typewriter weight. See figure 3 for preamble code to effect this.

## 6 Other families

As well as the secret weights mentioned above, there are entire *families* in the Latin Modern collection of which many people may be unaware.

### 6.1 Sans extended

The family 'Latin Modern Sans Extended' (sometimes referred to as 'Sans Quotation' due to Knuth's original use for it) is an extended version of the default sans serif family, intended for use at small font sizes (its nominal design size is 8 pt).

```
\renewcommand\sfddefault{lmsq}
```

```
\sffamily       LM Sans Extended
  \slshape      LM Sans Extended
  \bfseries     LM Sans Extended
  \slshape      LM Sans Extended
```

The variation in sans bold is interesting with regard to the condensed sans shown in section 5.1, but the shapes aren't entirely suitable for combination since they have different x-heights arising from their different design sizes:

**Condensed Bold Extended**

```

\DeclareFontFamily{T1}{lmvtt}{
\DeclareFontShape{T1}{lmvtt}
  {m}{n}{<-> ec-lmvtl10}{
\DeclareFontShape{T1}{lmvtt}
  {m}{\itdefault}{<-> ec-lmvtlo10}{
\DeclareFontShape{T1}{lmvtt}
  {\bfdefault}{n}{<-> ec-lmvtk10}{
\DeclareFontShape{T1}{lmvtt}
  {\bfdefault}{\itdefault}{<-> ec-lmvtko10}{

```

**Figure 4:** Preamble code to select the lightface variable width typewriter by default.

## 6.2 Typewriter proportional

As the era of teletext computers becomes ever more distant, perhaps the idea of a fixed width font can be thought to be archaic. The Latin Modern Typewriter family has an accompanying variable width design, for those who wish to use it:

```

\renewcommand\ttdefault{lmvtt}
\ttfamily      LMTT Proportional
\slshape       LMTT Proportional Oblique
\fontseries{l}
  \selectfont  LMTT Proportional Light
  \slshape     LMTT Proportional Light Oblique
\fontseries{b}
  \selectfont  LMTT Proportional Dark
  \slshape     LMTT Proportional Dark Oblique

```

It can be seen that here, as in the fixed-width typewriter fonts, every alphabet has the same horizontal width. Again, if the bold face is to be used for contrast, better results will be achieved by selecting the light face as default. This can be effected in a similar manner as before (section 5.3, refer in this case to `t1lmvtt.fd`); see figure 4.

## 6.3 Odd shapes

These fonts exist as examples to demonstrate the ‘meta-ness’ of the Computer Modern family, in that obliqueness of the italics and the stem height of the roman, to name but two parameters in the design, may be varied orthogonally. Their use is not particularly widespread.

The Dunhill family is named after the cigarette, for obvious reasons:

```

\fontfamily{lmdh}\selectfont Latin Modern Dunhill
\fontfamily{lmdh}\slshape    LM Dunhill Slanted

```

There is also an ‘upright italic’ font, which I find quite unusual:<sup>3</sup>

```

\fontshape{ui}\selectfont
Latin Modern Unslanted italic

```

## 7 Conclusions

This concludes our tour of the different shapes of the Latin Modern font collection, which are the more multilingual replacements of the vector Computer Modern fonts. They have been exhibited in the belief that they are not as well known as they deserve, for much time and effort has been spent to supplement each of the fonts with hundreds of extra glyphs.

We have seen some shortfalls and awkwardness with L<sup>A</sup>T<sub>E</sub>X’s font selection scheme in being able to select, in a straightforward manner, the large variety of shapes and weights that the collection offers. Brief examples detailing how to overcome these problems have been given, but more work is required for a flexible generic solution. In the future, we look forward to the creation of a better user interface for this purpose, either specifically for these fonts, or in general with a ‘newer’ font selection scheme.

## Bibliography

- [1] Bogusław Jackowski and Janusz M. Nowacki. Latin Modern: Enhancing Computer Modern with accents, accents, accents. *TUGboat*, 24(1):64–74, 2003. <http://www.tug.org/TUGboat/Articles/tb24-1/jackowski.pdf>.
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- [5] L<sup>A</sup>T<sub>E</sub>X3 Project Team. *L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> font selection*. <http://www.latex-project.org/guides/fntguide.pdf>.

<sup>3</sup> This will work in the next release of the Latin Modern fonts; at time of writing the font exists but the font definition for L<sup>A</sup>T<sub>E</sub>X is missing.