1 Typography

1.1 Introduction

Throughout the millennia humans have developed and adapted methods for storing facts and thoughts on a variety of different media. A very efficient way of doing this is using logograms, as the Chinese have done for ages. Another method is to represent each syllable in a word by a symbol, as the Japanese do when writing telegrams. However, the most common way of storing characters is by using a limited set of shapes representing basic sounds (a.k.a. phonemes). Such a collection is called an *alphabet*, and the shapes are called *letters*.

TEX is primarily meant for typesetting languages that use this third method. The other two methods can also be dealt with, but some extra effort is needed. In this chapter we will focus on languages that use alphabets, the other methods will be explained in later chapters.

The shapes representing the characters that make up an alphabet are more or less standardized, and thereby can be recognized by readers even if their details differ. A collection of pictures representing character shapes is called a *font*, and the pictures in a font are called *glyphs*.

The example below shows (from left to right) a Computer Modern font, a Helvetica lookalike, a Times Roman lookalike and the Antiqua Torunska font, all scaled to 48pt.

As you can see, quite some design variation is possible. It follows that when fonts from different sources (designers) are intermixed, the result is not always pleasing to look at. The term *font collection* refers to a set of fonts combined together in such a way that the overall appearance on a page looks good and reading is as comfortable as possible.

The next example shows an attempt at such a font collection: the fonts were picked such that the glyph sizes and the line thicknesses are roughly the same.

Fonts from a single source often already come in a few variations that are intended to be used together. Such a set of fonts with the same basic design is known as a *font family*. For example, Computer Modern is a font family, as is Lucida.

Within a font family there can be multiple *styles*. In the example below you see five font styles of the Latin Modern family: the Roman, Sans, Typewriter, Smallcaps and Variable Typewriter. (However, this manual will often continue to use the word *style in a more generic sense. Hopefully the context will make clear which sense is intended.)*

ok ok ok OK ok

Within a given style, there can be multiple alternatives of a font. The example below shows a normal, a bold, an italic, and a bold italic alternative.

lap **lap** *lap* ***lap***

The distance between the individual glyphs in a word and the actual glyphs that are used depends on the combinations of these glyphs. In the top line of the next sample, the gap between the b and the o as well as the distance between the o and the x is slightly altered. This is called kerning. Further, the separate glyphs for the f and the i have been combined into a single one. This is called ligaturing.

box file

box file

The font shown here is Computer Modern, the default TEX font. This font is designed by Donald Knuth. The Computer Modern has many kerning pairs, while the Palatino–like font that is used for most of the text in this manual has only a few, while both have essentially the same list of ligatures.

Micro–typography like kerning pairs and ligatures are not to be altered by the user, but are part of the font design and the required data is stored inside the font file, together with the drawing routines for the actual pictures. It is *possible for the user to alter fonts and interline spacing and some more aspects on the level of macro–typography. The choice of font is the main topic of this chapter.*

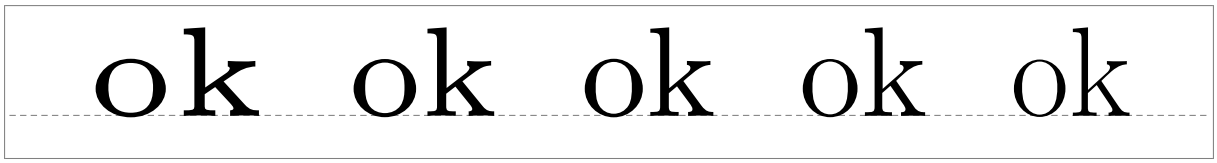
There are many different methods that can be used to classify fonts. There are classification systems based on the period in which the style was first developed; on the characteristics of the font; or the font application, like a newspaper or a book. Often, classification systems mix these characteristics to a certain point.

For example, the Computer Modern family can be classified as a 'modern' font. This is a classification that primarily indicates a period (late 18th century), but it also implies a particular shape: 'modern' fonts have a high contrast between thick and thin strokes, and their stress axis is perfectly vertical.

At the same time, specific fonts in the Computer Modern family can be classified as to their style: 'serif' (glyphs strokes have embellishments at the end), 'sans serif' (shapes end abruptly), or 'monospaced' (all glyphs have the same width).

The Computer Modern family is in fact inspired by one font in particular: 'Modern 8a' by the Monotype corporation. Knuth implemented Computer Modern in MetaFont using parameters so that he could generate a whole collection of fonts all closely matching each other in overall style (not necessarily in style*). In ConTEXt you will normally use a reimplementation of Computer Modern using a more modern file format (Type 1 or OpenType). This new version is called 'Latin Modern', and also features an extended glyph set making it usable for languages that could not be typeset with Knuth's original fonts.*

Computer Modern is one of the few font families that comes with dedicated design sizes. The example below shows the differences of a 5, 7, 9, 12 and 17 point design scaled up to 48 points. Such nuances in font size are seldom seen these days.



As explained earlier, the general appearance of a font style can be classified according to many schemes, and the exact terminology used depends on the background of the user. In table 1.1 you can see some examples of the terms that are used by various people to identify the three font styles that are most often found together within a single book design (such as for a software manual).

terms	***intended usage***
regular, serif, roman	main text
support, sans	section headings
teletype, mono, type	`code examples`

Table 1.1 Some ways of identifying the font styles in a document design.

Within the lists of terms, the earlier names are normally used by typographers and book designers, the later ones are commonly used in TEX. In ConTEXt all of these terms can be used intermixed because they are all remapped to the same set of internal commands. As will be explained later, the command `\rm` *is used to switch to the style used for the main text (this is usually a font style with serifs),* `\ss` *to switch to the support style (usually a style without serifs) and* `\tt` *to switch to the code example style (for which usually monospaced fonts are used).*

Text can be typeset in different font sizes. The unit `pt`*, short for 'printer's point', is normally used to specify the size of a font. There are a little over 72 points per inch (or a little under 2.85 points per millimeter, if you prefer metric units). Traditionally, font designers used to design a glyph collection for each point size, but nowadays most fonts have only a single design size of 10 points, or at most a small set of sizes with names indicating their proposed use, like* caption*,* text*, and* display*.*

The next sections will go into the details of switching of font styles and fonts in your documents. Be warned that the font switching mechanism is rather complex. This is due to the different modes like math mode and text mode in ConTEXt. If you want to understand the mechanism fully, you will have to acquaint yourself with the concept of encoding vectors and obtain some knowledge on fonts and their peculiarities. See the next chapter for more information.

1.2 The mechanism

Font switching is one of the oldest features of ConTEXt because font switching is indispensable in a macro package. During the years extensions to the font switching mechanism were inevitable. The following starting points have been chosen during the development of this mechanism:

- *It must be easy to change font* styles*, e.g., switching between roman (serif, regular), sans serif (support), teletype (monospaced) etc. (*`\rm`*,* `\ss`*,* `\tt` *etc.)*
- *More than one* alternative *set of glyphs shapes must be available like italic and bold (*`\it` *and* `\bf`*).*

- *Different font* families *like Latin Modern Roman and Lucida Bright must be supported.*
- *It must be possible to combine different families into font* collections.
- *Different sub– and super–scripts must be available. These script sizes have to be consistent across the switching of family, style and alternative.*
- *It should be possible to combine all of these requirements into a single definition unit called a* body font.
- *Changing the global font collection as well as the size must also be easy, and so sizes between 8pt and 14.4pt must be available by default.*

Before reading further, please stop for a moment to make sure you thoroughly comprehend the above paragraphs. ConTEXt's terminology probably differs from what you are accustomed to, especially if you were previously a LaTEX user.

1.3 Font switching

The mechanism to switch from one style to another is somewhat complex, not in the least because the terminology is a bit fuzzy. A quick recap: we call a set of fonts from the same source, with the same basic design, like Lucida or Computer Modern Roman, a family. *Within such a family, the members can be grouped according to characteristics such as the presence of serifs, or the variability of width. Such a group is called a* style. *Examples of styles within a family are: 'roman', 'sans serif' and 'teletype'. We saw already that there can be other classifications. Within a style there can be* alternatives, *like 'boldface' and 'italic'.*

There are different ways to change into a new a style or alternative. You can use `\ss` *to switch to a sans serif font style and* `\bf` *to get a bold alternative. When a different style is chosen, the alternatives adapt themselves to this style.*

Often a document will be mostly typeset using just one combination of family and style. This is called the bodyfont. Consistent use of alternative commands like `\bf` *and* `\it` *in the text will automatically result in the desired bold and italic alternatives when you change the family or style in the setup area of your input file, since these commands adapt to the specified family and style.*

1.3.1 Font style switching

Switching to another font style is done by one of five two-letter commands that are listed in table 1.2.

command	***keyword equivalents***
`\rm`	*serif, regular, roman, rm*
`\ss`	*sans, support, sansserif, ss*
`\tt`	*mono, type, teletype, tt*
`\hw`	*handwritten, hw*
`\cg`	*calligraphic, cg*
–	*mm*

Table 1.2 Font style switching commands and their keyword equivalents. For more on keywords, see subsection 1.3.3.

The 'handwritten' and 'calligraphic' font styles are sometimes useful when dealing with very elaborate document layout definitions. In the ConTEXt distribution only the Lucida font family uses these styles; in any other font set they are simply ignored. You could use them in your own font setups if you so desire. See the next chapter for font setup definitions.

There is a sixth internal style that is only ever referred to as 'mm'. This style handles math fonts. It does not make sense to use this style directly so there is no command attached to it, but it is quite important internally so it makes sense to introduce it right away.

1.3.2 Font alternative switching

The alternatives within a style are given in table 1.3. Not all fonts have both italic and slanted or the bold alternatives of each. Some other fonts do not have small caps or have only one set of digits. When an alternative is not known, ConTEXt will attempt to choose a suitable replacement automatically. For instance, the italic alternative may be used for if slanted is not available or vice versa.

command	***keyword equivalents***
`\bf`	*bold*
`\it`	*italic*
`\bi`	*bolditalic, italicbold*
`\sl`	*slanted*
`\bs`	*boldslanted, slantedbold*
`\sc`	*smallcaps*
`\os`	*mediaeval (from* oldstyle*)*
`\tf`	*normal (from* typeface*)*

Table 1.3 Font alternative switching commands and their keyword equivalents. With `\os` you tell ConTEXt that you prefer mediaeval or old–style numbers as in 139 over 139.

Note that, while these alternatives can sometimes seem to be 'combined,' as in `bolditalic`*, it is important to recognize that only one alternative can actually be active at a time. In this regard alternatives are like 'radio buttons.'* `bolditalic` *is in fact one predefined alternative, not a combination of two. Alternatives cannot be arbitrarily combined, or turned on and off independently of each other.*

Besides these two-letter commands, there is a series of font selector commands with a size suffix attached. Some examples of that are:

```
\tfx \bfx \slx \itx
\tfa \tfb \tfc \tfd \tfxx
```

The `a` *suffix selects a somewhat larger font size than the default. Each of the ordered alphabetic suffixes* `a`*,* `b`*, ... select a somewhat larger actual font than the previous suffix. The* `x` *and* `xx` *suffixes select smaller and yet smaller versions. Note that these commands select font sizes relative to the default, not relative to whatever font size is currently in effect.*

`\bfx`	*smallbold*
`\itx`	*smallitalic*
`\bix`	*smallbolditalic, smallitalicbold*
`\slx`	*smallslanted*
`\bsx`	*smallboldslanted, smallslantedbold*
`\tfx`	*small, smallnormal*

Table 1.4 Small alternative switching commands and their keyword equivalents.

The 'small' (single `x` suffix) switches mentioned in table 1.4, such as `\tfx`, are always available. The availability of other commands like `\ita`, `\bfxx`, `\bfc`, etc. depends on the completeness of the font definition files. For the core ConTEXt fonts, you can count on at least `\tfa`, `\tfb`, `\tfc`, `\tfd`, and `\tfxx` being defined. For the others, just try and see what happens.

When you have chosen a larger character size, for example `\tfb`, then `\tf` equals `\tfb`, `\bf` equals `\bfb`, etc. This behavior is almost always preferable over returning to the original character size, but it may catch you off-guard.

More generic font scaling commands are also available:

```
\tx \txx
\setsmallbodyfont \setbigbodyfont
```

The command `\tx` adapts itself to both the style and the alternative. This command is rather handy when one wants to write macros that act like a chameleon. Going one more step smaller, is possible too: `\txx`. Using `\tx` when `\tx` is already given, is equivalent to `\txx`.

The commands `\setsmallbodyfont` and `\setbigbodyfont` switch to the 'small' and 'big' body font sizes. These relative sizes are defined via the 'body font environment', see section 1.9.

The various commands will adapt themselves to the actual setup of font and size. For example:

```
{\rm test {\sl test} {\bf test} \tfc test {\tx test} {\bf test}}
{\ss test {\sl test \tx test} {\bf test \tx test}}
```

will result in:

*test test **test*** test test **test**
*test test test **test** **test***

When the `\rm` style is active, ConTEXt will interpret the command `\tfd` as if it was `\rmd`, when the style `\ss` is active, `\tfd` as is treated as `\ssd`. All default font setups use `tf`–setups so they will automatically adapt to the current font style.

The remainder of this section is for the sake of completeness. Use of the following commands in new documents is discouraged.

Frequent font switching leads to longer processing times. When no sub- or superscripts are used and you are very certain what font you want to use, you can perform fast font switches with: `\rmsl`, `\ssbf`, `\tttf`, etc.

The plain TEX compatible font switches `\vi`, `\vii`, `\viii`, `\ix`, `\x`, and `\xii` are also defined; these have local effects like `\tfx` and `\tfa`. ('Local' means that `\tfx` in running text will only change the font

in the running text, not in headers etc.; and will only change the font from that point, to the end of the enclosing group.)

1.3.3 Switc hing font styles in setup commands

A number of ConTEXt commands use the parameter `style` *to set the used font. The parameter mechanism is rather flexible so that within the parameter* `style` *you can use any of the font switching commands like* `\bf` *or* `bf` *or* `\switchtobodyfont`*, but also a number of keywords like*

```
normal bold italic bolditalic slanted boldslanted type
small smallbold smallitalic ... smallslanted ... smalltype
capital
```

Most of these keywords have already been listed in the tables 1.3 and 1.4, but a few predefined ones have not been mentioned yet. These are displayed in table 1.5, together with the commands they execute. As is normal in ConTEXt, you can extend the list of accepted keywords by defining your own. This will be explained in?? in the next chapter.

`\tt`	*type, mono*
`\ttx`	*smalltype*
`\ss`	*sans, sansserif*
`\ss\bf`	*sansbold*
`\setsmallbodyfont`	*smallbodyfont*
`\setbigbodyfont`	*bigbodyfont*
`\smallcapped`	*cap, capital*
`\WORD`	*WORD*

Table 1.5 Remaining font alternative keywords.

1.4 Emphasize

Within most macro–packages the command `\em` *is available. This command behaves like a chameleon which means that it will adapt to the actual typeface. In ConTEXt* `\em` *has the following characteristics:*

- *a switch to italic or slanted is possible*
- *a switch within* `\bf` *results in* ***bold italic*** *or* ***bold slanted*** *(when available)*
- *a so called* italic correction *is performed automatically (*`\/`*)*

The bold italic or bold slanted characters are supported only when `\bs` *and* `\bi` *are available.*

```
The mnemonic {\em em} means {\em emphasis}.
{\em The mnemonic {\em em} means {\em emphasis}.}
{\bf The mnemonic {\em em} means {\em emphasis}.}
{\em \bf The mnemonic {\em em} means {\em emphasis}.}
{\it The mnemonic em {\em means \bf emphasis}.}
{\sl The mnemonic em {\em means \bf emphasis}.}
```

This results in:

The mnemonic em *means* emphasis.

The mnemonic *em* means *emphasis*.
***The mnemonic* em *means* emphasis.**
The mnemonic *em* means *emphasis*.
The mnemonic em means **emphasis**.
The mnemonic em means **emphasis**.

The advantage of the use of `\em` *over* `\it` *and/or* `\sl` *is that consistent typesetting is enforced.*

By default emphasis is set at slanted*, but in this text it is set at* italic*. This setting is made via* `\setupbodyfontenvironment`*, see section 1.9 for more details:*

```
\setupbodyfontenvironment
   [default]
   [em=italic]
```

1.5 Line spacing

In TEX linespacing is determined by a number of variable dimensions like `\topskip`*,* `\parskip` *and* `\baselineskip`*. However, in ConTEXt these variables are related to the bodyfont size.*

A line has a height and a depth. The distance between two lines is normally equal to the sum of the maximum height and maximum depth:

This sum is in ConTEXt equal to 2.8ex, so almost three times the height of an x. This is about 1.2 *times the bodyfont height. The proportion between maximum height and depth is .72 : .28 by default. Linespacing alters when a new bodyfont is used or when linespacing is defined explicitly by* `\setupinterlinespace` *(which is explained later):*

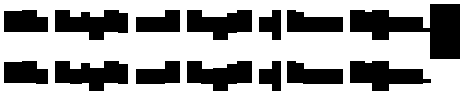
Sometimes a line does not have the maximum height or depth. The next example illustrates this:

It says:

The height and depth of lines differs.

When we put two of these lines above each other we will get:

You can see that the distance is somewhat bigger that the sum of the height and depth of each separate line. This distance is called the baseline distance (`\baselineskip`*) and is in this document 13.8292pt. If we add some extra height to the line we see this:*



To prevent the lines from touching TEX adds a `\lineskip`*, in our example 1.0pt. In a similar way TEX is taking care of the first line of a page to have at least a height of* `\topskip` *(here 11.0pt plus 55.0pt).*

Linespacing is set up by:

```
\setupinterlinespace [.*.]
                     OPTIONAL
*   reset small medium auto big on off
```

```
\setupinterlinespace [..,.*=.,..]

*   height  =  NUMBER
    depth   =  NUMBER
    line    =  DIMENSION
    top     =  NUMBER
    bottom  =  NUMBER
```

Linespacing adapts to the size of the actual bodyfont automatically. This means that the user can leave this command untouched, unless a different linespacing is wanted. Instead of a factor one of the predetermined values `small` *(1.0),* `medium` *(1.25) or* `big` *(1.5) can be given. Below an example is given of a text with a linespacing of 1.25:* `\setupinterlinespace[medium]`*.*

> *Whenever it comes to my mind that "everything that comes in quantities, will somehow survive", I also got the feeling that in a few hundred years people will draw the saddening conclusion that all those top–ten hits produced by computers represent the some of todays musical and instrumental abilities. Isn't it true that archaeologists can spend a lifetime on speculating about some old coins from the first century? On the other hand, the mere fact that one can have success with this type of non–music success of some top–hit musicians demonstrates both the listeners inability to rate the product and the lack of self criticism of the performers. In principle the future archaeologist will therefore draw the right conclusion.*

When you make a font switch the linespacing is adapted when you give the command `\setupinterlinespace` *without any setup parameters and also when you add the key* `reset`*, for example*

```
\setupinterlinespace[reset,medium]
```

The text below is typeset in the fontsize `\tfa`*, using the following input:*

```
\start \tfa \setupinterlinespace
In books meant for children we often find
a somewhat ... when needed. \par \stop
```

In this example the `\par` *is necessary because TEX operates on whole paragraphs. Within a group one has to close the paragraph explicitly with an empty line or* `\par` *otherwise TEX will have forgotten the linespacing before the paragraph is finished (as in that case, the paragraph is ended by the empty line after the* `\stop`*).*

The word `height` *is typeset inside a bare* `\tfd` *group, to illustrate why* `\setupinterlinespace` *is required.*

In books meant for children we often find a somewhat bigger typeface, for instance because we are convinced that this enables them to read the book themselves. On the other hand, I can also imagine that it is a cheap

way to increase the number of pages. Unfortunately scaling up will also uncover the lack of quality of the typesetting used and/or the lack of typographic knowledge of the user of such a system. The interline space sometimes differs on a line by line basis, and depends on the height of the current line. Therefore, when changing the style, something that should only be done on purpose, also change the baseline distance when needed.

Instead of a keyword, one can pass a key–value pair to define the characteristics of a line.

The default settings are:

```
\setupinterlinespace
  [height=.72,
   depth=.28,
   top=1.0,
   bottom=0.4,
   line=2.8ex]
```

The `height` *and* `depth` *determine the ratio between the height and depth of a line. The baseline distance is set to 2.8ex. The parameters* `top` *and* `bottom` *specify the relation between the bodyfont size and the height of the first line and the depth of the last line on a page. They are related to TEX's* `\topskip` *and* `\maxdepth`*.*

We will see later that instead of setting the spacing at the document level, i.e. for each font, you can set the spacing per body font environment:

```
\setupbodyfontenvironment
  [modern] [12pt]
  [interlinespace=14pt]
```

1.6 Capitals

Some words and abbreviations are typeset in capitals (uppercase). ConTEXt provides the following commands for changing both upper– and lowercase characters into capitals.

```
\cap {.*.}

*   CONTENT
```

```
\Cap {.*.}

*   CONTENT
```

```
\CAP {.*.}

*   CONTENT
```

```
\Caps {.. .*. ..}

*   WORD
```

The command `\cap` *converts all letters to capitals at the size of* `\tx`*. If you switch to italic (*`\it`*), bold (*`\bf`*), etc. the capital letter will also change. Since* `\cap` *has a specific meaning in math mode, the formal implementation is called* `\smallcapped`*. However in text mode one can use* `\cap`*.*

```
Capitals for \cap {UK} are \cap {OK} and capitals for \cap {USA} are
okay. But what about capitals in \cap {Y2K}.
```

this results in:

Capitals for UK *are* OK *and capitals for* USA *are okay. But what about capitals in* Y2K*.*

A `\cap` *within a* `\cap` *will not lead to any problems:*

```
\cap {People that have gathered their \cap {capital} at the cost of other
people are not seldom \nocap {decapitated} in revolutionary times.}
```

or:

PEOPLE THAT HAVE GATHERED THEIR CAPITAL *AT THE COST OF OTHER PEOPLE ARE NOT SELDOM decapitated IN REVOLUTIONARY TIMES.*

In this example you can see that `\cap` *can be temporarily revoked by* `\nocap`*.*

```
\nocap {.*.}

*   CONTENT
```

The command `\Cap` *changes the first character of a word into a capital and* `\CAP` *changes letters that are preceded by* `\\` *into capital letters. With* `\Caps` *you can change the first character of several words into a capital letter.*

```
\setupcapitals [..,.*=.,..]

*   title  =  yes no
    sc     =  yes no
```

With this command the capital mechanism can be set up. The key `sc=yes` *switches to real* Small Caps*. The key* `title` *determines whether capitals in titles are changed.*

Next to the former `\cap`*–commands there are also:*

```
\Word {.*.}

*   WORD
```

and

```
\Words {.. .*. ..}

*   WORD
```

These commands switch the first characters of a word or words into capitals. All characters in a word are changed with:

```
\WORD {.*.}

*   WORD
```

Let's end this section with real small capitals. When these are available the real small caps `\sc` *are preferred over the pseudo–capital in abbreviations and logos.*

```
In a manual on \TeX\ and Con\TeX t there is always the question whether
to type \cap{\TeX} and \cap{Con\TeX t} or {\sc \TeX} and {\sc Con\TeX t}.
Both are defined as a logo in the style definition so we type \type {\TEX}
and \type {\CONTEXT}, which come out as \TEX\ and \CONTEXT.
```

Results in:

In a manual on TEX and ConTEXt there is always the question whether to type TEX *and* CONTEXT *or* TEX *and* ConTEXt. *Both are defined as a logo in the style definition so we type* `\TEX` *and* `\CONTEXT`, *which come out as TEX and ConTEXt.*

It is always possible to typeset text in small capitals. However, realize that lower case characters discriminate more and make for an easier read.

An important difference between `\cap` *and* `\sc` *is that the latter command is used for a specific designed font type. The command* `\cap` *on the other hand adapts itself to the actual typeface:* KAP, **KAP**, ***KAP***, *etc.*

1.7 Character spacing

Some typesetting packages stretch words (inter character spacing) to reach an acceptable alignment. In ConTEXt this not supported. On purpose! Words in titles can be stretched by:

```
\stretched {.*.}

*   WORD
```

```
\hbox to \hsize {\stretched{there\\is\\much\\stretch\\in ...}}
\hbox to 20em   {\stretched{... and\\here\\somewhat\\less}}
```

With `\\` *you can enforce a space (*`{}` *is also allowed).*

t h e r e i s m u c h s t r e t c h i n ...
... a n d h e r e s o m e w h a t l e s s

These typographically non permitted actions are only allowed in heads. The macros that take care of stretching do this by processing the text character by character.

This chapter will not go into the details of underlining because using underlining for typographical purposes is a bad practice. Instead, the commands related to under- and over-lining are discussed in section ?? (“”).

1.8 Selecting bodyfonts

The bodyfont (main font), font style and size is set up with:

```
\setupbodyfont [...,*,...]

*   IDENTIFIER serif regular roman sans support sansserif mono type teletype handwritten
    calligraphic 5pt ... 12pt
```

In a running text a font switch is done with the command:

```
\switchtobodyfont [...,*,...]

*   IDENTIFIER serif regular roman sans support sansserif mono type teletype handwritten
    calligraphic 5pt ... 12pt small big
```

This command changes the bodyfont in the running text where it occurs, but not in headers and footers. With `small` *and* `big` *you switch to a smaller or larger font.*

In most cases, the command `\setupbodyfont` *is only used once: in the style definition, and font switching inside the document is done with* `\switchtobodyfont`*. Don't confuse these two because that may lead to some rather strange but legitimate effects.*

`\switchtobodyfont` *differs from the use of font selector commands like* `\ss`*,* `\it` *and* `\tfa` *in a few significant ways. For one,* `\switchtobodyfont` *is ``heavier'': it results in more thorough changes, for example, adjusting the interlinespace to suit the change (if the change lasts until the end of a paragraph). As such, switching the body font is slower. In general,* `\switchtobodyfont` *is intended for longer-lasting changes, e.g. at least a paragraph, whereas* `\it` *and the like are meant for changes of short duration, such as a phrase. Moreover, it's useful to know that* `\switchtobodyfont` *controls and changes the sizes for commands like* `\tfa`*.*

1.8.1 Body font sizes

Body font sizes actually consist of two components: the font size and a number of indirect parameters. Think of things like the font size used in headers, footers, footnotes, sub– and superscripts, as well as the interline space and a few others.

This is why in ConTEXt there is the concept of a body font environment *(expressed as a dimension), and that is what you pass as an argument to* `\setupbodyfont` *or* `\switchtobodyfont`*. The definitions as presented above indicate* `5pt ... 12pt` *for the body font environment, but actually any dimension is acceptable.*

The most frequently used sizes are predefined as body font environments: 4pt ... 12pt, 14.4pt, and 17.3pt. But when you use a different, not-yet-defined size specification —for example in a title page— ConTEXt will define a body font environment for that size automatically. While doing so, ConTEXt normally works with a precision of 1 decimal to prevent unnecessary loading of fontsizes with only small size differences.

Be warned that in this case, the results may be a less than ideal. The reason is that ConTEXt not just has to load the actual font, but it also has to guess at the various other settings like the relative font sizes and the interline space. It does so by using the values from the nearest smaller body font environment is that is already defined.

You can extend the list of predefined body font environments and even alter the precision in body font matching. See section 1.9 for detailed information about how to tweak or define your own body font sizes.

To end this section, the example below demonstrates how the interline space is adapted automatically, when changing the size of the bodyfont. Consider this input:

```
{\switchtobodyfont[14.4pt] with these commands \par}
{\switchtobodyfont[12pt]   for font switching  \par}
{\switchtobodyfont[10pt]   it is possible to   \par}
{\switchtobodyfont[8pt]    produce an eye test: \par}
{\switchtobodyfont[6pt]    a x c e u i w m q p \par}
```

The actual ConTEXt behaviour is shown below on the left. On the right you can see what would have happened if the interline space were not automatically adapted.

with these commands
for font switching
it is possible to
produce an eye test:
a x c e u i w m q p

with these commands
for font switching
it is possible to
produce an eye test:
a x c e u i w m q p

1.8.2 Body font identifiers

In the definition block of `setupbodyfont` *there was a list of words given besides the special marker* `IDENTIFIER`*. These words are the symbolic ConTEXt names for the font styles that we ran into earlier, with a few aliases so that you do not have to worry about the actual naming convention used. The symbolic names are mapped to two-letter internal style abbreviations that are used internally. See table 1.2 for an overview.*

Although the macro syntax does not say so, you can use two-letter internal style abbreviations (`ss`*,* `rm`*) as well as the longer names, if you prefer.*

We have seen already that there are other and easier ways to switch the font style, so if `\setupbodyfont` *could only be used for this purpose it would not be all that useful. But luckily there is more: the optional* `IDENTIFIER` *can be a 'body font name' (aka 'typeface'). Such names have to be predefined, perhaps in a font support file, or simply on earlier lines in the style definition.*

A 'typeface' is a symbolic name that links a single font style to actual font families. Such symbolic names are typically grouped together in a definition block that sets up values that link the four styles `\rm`*,* `\ss`*,* `\tt` *and* `\mm` *to fonts in a 'font collection', and such definition blocks are called 'typescripts'.*

ConTEXt expects you to define your own font setups, but there are quite a few examples predefined in various typescript files. Not all of those are perpetually loaded, so you usually have to execute a typescript explicitly to get the typeface names predefined. To this end, typescripts themselves *also have names.*

Executing a typescript is done by `\usetypescript`*. We will get back to* `\usetypescript` *later because it is in fact a very flexible command, but let's discuss simple usage first.*

```
\usetypescript [...,1...] [...,2...] [...,3...]
                           OPTIONAL      OPTIONAL
1   IDENTIFIER
2   IDENTIFIER
3   IDENTIFIER
```

A typical input sequence for selecting the predefined 'palatino' set of typefaces in MkII will look like this:

```
\usetypescript[palatino][ec]
\setupbodyfont[palatino,12pt]
```

In this example the typescript named `palatino` *is asked for in the* `ec` *font encoding, and that defines a set of typefaces under the name* `palatino`*. These are then used by* `\setupbodyfont` *and eventually this makes pdfTEX load the free Type 1 font URW Palladio in the correct encoding. URW Palladio is a font that looks a lot like the commercial font Linotype Palatino by Hermann Zapf, which explains the name of the typescript and typefaces.*

Font encodings will be handled fully in the section 1.15. For now, please take for granted the fact that pdfTEX needs a second argument to `\usetypescript` *that specifies an encoding name, and that there is a fixed set of acceptable names that depends on the typescript that is being requested.*

In XETEX and MkIV the situation is a little bit different because fonts are reencoded to match Unicode whenever that is possible. That in turn means that XETEX and MkIV prefer to use OpenType fonts over Type 1 fonts, so different typescript definitions are used behind the scenes, and the second argument to `\usetypescript` *becomes optional.*

For example,

```
\usetypescript[palatino]
\setupbodyfont[palatino,12pt]
```

will make XETEX and LuaTEX load the OpenType font Pagella. This is a free font from the TEX Gyre project, that also looks just like the commercial font Linotype Palatino. You may as well leave the second argument in place: while it will always be ignored by LuaTEX, XETEX will actually use that encoding if the typescript uses Type 1 fonts instead of the more modern OpenType or TrueType font formats.

All predefined typescripts attach meaning to (at least) the three basic text font styles(serif, sans, and mono), so you can e.g. do this:

```
\usetypescript[times][ec]
\setupbodyfont[times,sans,12pt]
```

and end up using the OpenType font TEX Gyre Heros or the Type 1 font URW Nimbus Sans L. Both fonts are very similar in appearance to Linotype Helvetica, by the way.

The typescripts that come with the ConTEXt distribution are placed in source files that have names that start with `type-`*. Some of these files are automatically loaded when needed, but most have to be loaded explicitly. There is a list in table 1.6*

Some of the internal building blocks for typescripts are themselves located in yet other files (font size and font map file information, for example). Normally, when ConTEXt has to load typescript information from files, it will try to save memory by only executing the typescript it needs at that moment and discarding all other information. If you have enough memory at your disposal, you can speed up typescript use considerably by adding

`\preloadtypescripts`

in your preamble or your `cont-usr.tex`*. This will make ConTEXt store all the typescript information in internal token registers the first (and therefore only) time it loads the actual files.*

File	*Loaded by pdfTEX*	*Loaded by XETEX*	*Loaded by MkIV*	*Description*
type-akb	*no*	*no*	*no*	*PostScript fonts using psnfss names (Type 1)*
type-buy	*no*	*no*	*no*	*Various commercial fonts (Type 1)*
type-cbg	*no*	*no*	*no*	*Greek free fonts (Type 1)*
type-cow	*no*	*no*	*no*	*The ConTEXt cow font (Type 1)*
type-exp	*no*	*no*	*no*	*Commercial Zapf fonts (OpenType)*
type-fsf	*no*	*no*	*no*	*Commercial Fontsite 500 fonts (Type 1)*
type-ghz	*no*	*no*	*no*	*Commercial Zapf fonts (Type 1)*
type-gyr	*no*	*no*	*no*	*The TEX Gyre project fonts (Type 1)*
type-hgz	*no*	*no*	*no*	*Commercial Zapf fonts (OpenType)*
type-msw	*no*	*no*	*no*	*Fonts that come with Microsoft Windows (Type 1)*
type-omg	*no*	*no*	*no*	*Omega free fonts (Type 1)*
type-one	*yes*	*no*	*no*	*Various free fonts (Type 1)*
type-otf	*no*	*yes*	*yes*	*Various free fonts (OpenType)*
type-xtx	*no*	*yes*	*no*	*Fonts that come with MacOSX (OpenType)*

Table 1.6 The typescript source files that are part of ConTEXt.

Explicit loading one of those files is done via the macro `\usetypescriptfile`*.*

The predefined typescripts, the typefaces they define, the files in which they are contained in the ConTEXt distribution, and the encodings they support in MkII mode are listed in table 1.7. In the following section there is a table (1.8) that explains what font set each typescript attaches to each of the font styles.

```
\usetypescriptfile [...,*,...]

*  FILE
```

For example, the following

```
\usetypescriptfile[type-buy]
\usetypescript[lucida][texnansi]
\setupbodyfont[lucida,12pt]
```

will make pdfTEX use the Lucida Bright font family. Because this is a commercial font, this only works correctly if you have actually bought and installed the fonts. This uses the `texnansi` *encoding because that is the preferred encoding of the actual fonts.*

This is a good moment to explain a little trick: because the various `type-xxx` *files define the building blocks for typescripts as well as the actual typescripts, it is sometimes possible to alter the effect of a typescript by loading an extra typescript file. For example,*

```
\usetypescriptfile[type-gyr]
\usetypescript[palatino][ec]
\setupbodyfont[palatino,12pt]
```

will result in pdfTEX using the Type 1 font Pagella from the TEX Gyre project instead of the older and less complete URW Palladio, because the definition of the building blocks for the `palatino` *typescript that is in the* `type-gyr` *file overwrites the preloaded definition from the* `type-one` *file.*

Typescript	*Typeface*	*File*	*Encodings*
antykwa-torunska	*antykwa*	*type-one, type-otf*	*texnansi,ec,8r,t2a*
fourier	*fourier*	*type-one*	*ec*
iwona	*iwona*	*type-one, type-otf*	*texnansi,ec,8r,t2a*
iwona-heavy	*iwona-heavy*	*type-one, type-otf*	*texnansi,ec,8r,t2a*
iwona-light	*iwona-light*	*type-one, type-otf*	*texnansi,ec,8r,t2a*
iwona-medium	*iwona-medium*	*type-one, type-otf*	*texnansi,ec,8r,t2a*
modern	*modern*	*type-one, type-otf*	*texnansi,ec,qx,t5,default*
modern-base	*modern*	*type-one, type-otf*	*texnansi,ec,qx,t5,default,t2a/b/c*
modernvariable	*modernvariable*	*type-one, type-otf*	*texnansi,ec,qx,8r,t5*
palatino	*palatino*	*type-one, type-otf*	*texnansi,ec,qx,8r,t5*
postscript	*postscript*	*type-one, type-otf*	*texnansi,ec,qx,8r,t5*
times	*times*	*type-one, type-otf*	*texnansi,ec,qx,8r,t5*
OmegaLGC	*omlgc*	*type-omg*	*(unspecified)*
cbgreek	*cbgreek*	*type-cbg*	*(unspecified)*
cbgreek-all	*cbgreek-all*	*type-cbg*	*(unspecified)*
cbgreek-medium	*cbgreek-medium*	*type-cbg*	*(unspecified)*
cow	*cow*	*type-cow*	*default*
sheep	*sheep*	*type-cow*	*default*
lucida	*lucida*	*type-buy*	*texnansi,ec,8r*
lucidabfm	*lucida*	*type-buy*	*texnansi,ec,8r*
lucidabfm	*lucidabfm*	*type-buy*	*texnansi,ec,8r*
lucidaboldmath	*lucida*	*type-buy*	*texnansi,ec,8r*
lucidaboldmath	*lucidaboldmath*	*type-buy*	*texnansi,ec,8r*
optima	*optima*	*type-one*	*texnansi,ec,qx*
optima	*optima*	*type-ghz*	*texnansi,ec,qx*
optima-nova	*optima*	*type-ghz, type-hgz*	*texnansi,ec*
optima-nova-os	*optima-os*	*type-ghz, type-hgz*	*texnansi,ec*
palatino	*palatino*	*type-hgz*	*(cannot be used in MkII)*
palatino-informal	*palatino-informal*	*type-hgz*	*(cannot be used in MkII)*
palatino-light	*palatino-light*	*type-exp*	*(cannot be used in MkII)*
palatino-medium	*palatino-medium*	*type-exp*	*(cannot be used in MkII)*
palatino-normal	*palatino-normal*	*type-exp*	*(cannot be used in MkII)*
palatino-nova	*palatino*	*type-hgz*	*(cannot be used in MkII)*
palatino-sans	*palatino*	*type-hgz*	*(cannot be used in MkII)*

Table 1.7 The typescripts. Typescripts that use commercial fonts are typeset in bold. Typescripts above the horizontal line are preloaded.

Two of the files in the ConTEXt distribution exist precisely for this reason:

`type-gyr.tex`
: *maps the typical PostScript font names for the free URW fonts to the TEX Gyre set;*

`type-akb.tex`
: *maps the same names to the commercial Adobe fonts.*

For the definitions in the second file to work, you also need to execute an extra typescript:

```
\usetypescriptfile [type-akb]
\usetypescript [adobekb] [ec]

\usetypescript [palatino] [ec]
\setupbodyfont[palatino,12pt]
```

1.8.3 Typeface definitions

Defining a typeface goes like this:

```
\starttypescript [palatino] [texnansi,ec,qx,t5,default]

\definetypeface[palatino] [rm] [serif][palatino] [default]
\definetypeface[palatino] [ss] [sans] [modern]   [default] [rscale=1.075]
\definetypeface[palatino] [tt] [mono] [modern]   [default] [rscale=1.075]
\definetypeface[palatino] [mm] [math] [palatino] [default]

\stoptypescript
```

This defines a typescript named `palatino` *in five different encodings. When this typescript is executed via* `\usetypescript`*, it will define four typefaces, one of each of the four basic styles* `rm`*,* `ss`*,* `tt`*, and* `mm`*.*

```
\definetypeface [.1.] [.2.] [.3.] [.4.] [.5.] [.6.]
                                        OPTIONAL OPTIONAL
1   TEXT

2   rm ss tt mm hw cg

3   IDENTIFIER

4   IDENTIFIER

5   IDENTIFIER

6   features  =  IDENTIFIER
    rscale    =  NUMBER
    encoding  =  IDENTIFIER
    text      =  IDENTIFIER
```

The third and fourth arguments to `\definetypeface` *are pointers to already declared font sets; these are defined elsewhere. Table 1.8 gives the full list of predefined typescripts (the first argument of* `\starttypescript`*) and font sets that are attached to the styles (the third and fourth argument of each* `\definetypeface`*).*

The names in the third argument (like `serif` *and* `sans`*) do* not *have the same meaning as the names used in* `\setupbodyfont`*. Inside* `\setupbodyfont`*, they were keywords that were internally remapped to one of the two-letter internal styles. Inside* `\definetypeface`*, they are nothing more than convenience names that are attached to a group of fonts by the person that wrote the font definition. They only reflect a grouping that the person believed that could be a single font style. Oftentimes, these names are identical to the official style keywords, just as the typescript and typeface names are often the same, but there can be (and sometimes are) different names altogether.*

How to define your own font sets will be explained in the next chapter, but there are quite a few predefined font sets that come with ConTEXt; these are all listed in the four tables 1.9, 1.10, 1.11, and 1.12.

For everything to work properly in MkII, the predefined font sets also have to have an encoding attached, you can look those up in the relevant tables as well.

The fifth argument to `\definetypeface` *specifies specific font size setups (if any), these will be covered in section* `??` *in the next chapter. Almost always, specifying* `default` *will suffice.*

The optional sixth argument is used for tweaking font settings like the specification of font features or adjusting parameters. In this case, the two `modern` *font sets are loaded with a small magnification, this evens out the visual heights of the font styles.*

Typescript	*Style rm*	*Style ss*	*Style tt*	*Style mm*
OmegaLGC	*omega*	–	*omega*	–
antykwa-torunska	*antykwa-torunska*	*modern*	*modern*	*antykwa-torunska*
cbgreek	*cbgreek*	*cbgreek*	*cbgreek*	–
cbgreek-all	*cbgreek*	*cbgreek*	*cbgreek*	–
cbgreek-medium	*cbgreek*	*cbgreek*	*cbgreek*	–
cow	*cow*	*cow serif*	*modern*	*cow*
fallback	*modern*	*modern*	*modern*	*modern*
fourier	*fourier*	*modern*	*modern*	*fourier*
iwona	*modern*	*iwona*	*modern*	*iwona*
iwona-heavy	*modern*	*iwona-heavy*	*modern*	*iwona-heavy*
iwona-light	*modern*	*iwona-light*	*modern*	*iwona-light*
iwona-medium	*modern*	*iwona-medium*	*modern*	*iwona-medium*
lucida	*lucida*	*lucida*	*lucida*	*lucida*
lucidabfm	*lucida*	*lucida*	*lucida*	*lucida bfmath*
lucidaboldmath	*lucida*	*lucida*	*lucida*	*lucida boldmath*
modern	*modern*	*modern*	*modern*	*modern*
modern-base	*(computer-)modern*	*(computer-)modern*	*(computer-)modern*	*(computer-)modern*
modernvariable	*simple*	*modern*	*modern*	*modern*
optima	*palatino*	*optima-nova*	*modern*	*palatino*
optima-nova	*optima-nova sans*	*optima-nova*	*latin-modern*	*latin-modern*
optima-nova-os	*optima-nova-os sans*	*optima-nova-os*	*latin-modern*	*latin-modern*
palatino	*palatino-nova*	*palatino-sans*	*latin-modern*	*latin-modern*
palatino	*palatino*	*modern*	*modern*	*palatino*
palatino-informal	*palatino-nova*	*palatino-informal*	*latin-modern*	*latin-modern*
palatino-light	*palatino-nova*	*palatino-sans-light*	*latin-modern*	*latin-modern*
palatino-medium	*palatino-nova*	*palatino-sans-medium*	*latin-modern*	*latin-modern*
palatino-normal	*palatino-nova*	*palatino-sans-normal*	*latin-modern*	*latin-modern*
palatino-nova	*palatino-nova*	*palatino-sans*	*latin-modern*	*latin-modern*
palatino-sans	*palatino-nova*	*palatino-sans*	*latin-modern*	*latin-modern*
postscript	*times*	*helvetica*	*courier*	*times*
sheep	*sheep*	*sheep serif*	*modern*	*sheep*
times	*times*	*helvetica*	*modern*	*times*

Table 1.8 The typescripts.
Unless stated otherwise, style **rm** uses a group named serif, style **ss** uses sans, style **tt** uses mono, and style **mm** uses math. A single dash in a cell means that the typescript does not define that style; you should refrain from using the style. The lucida, lucidabfm, and lucidaboldmath typescripts also define **hw** and **cg** as 'lucida handwring' and 'lucida calligraphy'. The modern-base typescript switches back to computer-modern for a few legacy encodings: t2a, t2b, and t2c.

A note for the lazy: if the sixth argument is not given and the fifth argument happens to be `default`*, then the fifth argument can be omitted as well.*

There are four possible keys in the sixth argument:

key	*default value*	*explanation*
`rscale`	*1*	*a scaling factor for this typescript relative to the selected body font size*
`encoding`	`\defaultencoding`	*the encoding for the typeface, normally inherited from the typescript automatically*

Identifier	*file*	*Encodings*	*Supported styles*
modern	*type-one*	*ec, qx, texnansi, t5*	*serif, sans, mono, math, boldmath, bfmath*
latin-modern	*type-one*	*ec, qx, texnansi, t5*	*serif, sans, mono, math, boldmath, bfmath*
computer-modern	*type-one*	*t2a/b/c*	*serif, sans, mono, math, boldmath, bfmath*
simple	*type-one*	*– synonyms only –*	*serif*
concrete	*type-one*	*– hardcoded –*	*serif*
euler	*type-one*	*– hardcoded –*	*math, boldmath, bfmath*
ams	*type-one*	*– hardcoded –*	*math*
fourier	*type-one*	*ec*	*math, serif*
courier	*type-one*	*8r, ec, qx, texnansi, t5*	*mono*
helvetica	*type-one*	*8r, ec, qx, texnansi, t5*	*sans*
times	*type-one*	*8r, ec, qx, texnansi, t5*	*serif, math*
palatino	*type-one*	*8r, ec, qx, texnansi, t5*	*serif, math*
bookman	*type-one*	*8r, ec, qx, texnansi, t5*	*serif*
schoolbook	*type-one*	*8r, ec, texnansi, t5*	*serif*
chancery	*type-one*	*8r, ec, qx, texnansi*	*calligraphy*
charter	*type-one*	*8r, ec, texnansi*	*serif*
utopia	*type-one*	*ec, texnansi*	*serif*
antykwa-torunska	*type-one*	*ec, qx, texnansi, t5, t2a/b/c, greek*	*serif, math*
antykwa-torunska-light	*type-one*	*ec, qx, texnansi, t5, t2a/b/c, greek*	*serif, math*
antykwa-torunska-cond	*type-one*	*ec, qx, texnansi, t5, t2a/b/c, greek*	*serif, math*
antykwa-torunska-lightcond	*type-one*	*ec, qx, texnansi, t5, t2a/b/c, greek*	*serif, math*
antykwa-poltawskiego	*type-one*	*8r, ec, texnansi*	*serif*
iwona	*type-one*	*ec, qx, texnansi, t5*	*sans, math*
iwona-light	*type-one*	*ec, qx, texnansi, t5*	*sans, math*
iwona-medium	*type-one*	*ec, qx, texnansi, t5*	*sans, math*
iwona-heavy	*type-one*	*ec, qx, texnansi, t5*	*sans, math*
iwona-cond	*type-one*	*ec, qx, texnansi, t5*	*sans*
iwona-light-cond	*type-one*	*ec, qx, texnansi, t5*	*sans*
iwona-medium-cond	*type-one*	*ec, qx, texnansi, t5*	*sans*
iwona-heavy-cond	*type-one*	*ec, qx, texnansi, t5*	*sans*
kurier	*type-one*	*ec, qx, texnansi, t5*	*sans, math*
kurier-light	*type-one*	*ec, qx, texnansi, t5*	*sans, math*
kurier-medium	*type-one*	*ec, qx, texnansi, t5*	*sans, math*
pagella	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*serif*
palatino	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*serif*
termes	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*serif*
times	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*serif*
bonum	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*serif*
bookman	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*serif*
schola	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*serif*
schoolbook	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*serif*
heros	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*sans*
helvetica	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*sans*
adventor	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*sans*
cursor	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*mono*
courier	*type-gyr*	*ec, qx, texnansi, t5, t2a/b/c*	*mono*
omega	*type-omg*	*– hardcoded –*	*naskh, serif, mono*
cbgreek	*type-cbg*	*– hardcoded –*	*serif, sans, mono*
cbgreek-medium	*type-cbg*	*– hardcoded –*	*serif, sans, mono*
cbgreek-all	*type-cbg*	*– hardcoded –*	*serif, sans, mono*
cow	*type-cow*	*– hardcoded –*	*math, serif*
sheep	*type-cow*	*– hardcoded –*	*math, serif*

Table 1.9 The predefined body font identifiers for free Type 1 and MetaFont fonts

Identifier	*file*	*Encodings*	*Supported styles*
lucida	*type-buy*	*8r, ec, texnansi*	*serif, sans, mono, handwriting, calligraphy, math, boldmath, bfmath, casual, fax*
informal	*type-buy*	*– hardcoded –*	*casual, math*
officina	*type-buy*	*8r, ec, texnansi*	*serif, sans*
meta	*type-buy*	*8r, ec, texnansi*	*serif, sans, expert*
meta-medium	*type-buy*	*8r, ec, texnansi*	*sans*
meta-lf	*type-buy*	*8r, ec, texnansi*	*sans*
meta-book	*type-buy*	*8r, ec, texnansi*	*sans*
meta-book-lf	*type-buy*	*8r, ec, texnansi*	*sans*
meta-bold	*type-buy*	*8r, ec, texnansi*	*sans*
meta-bold-lf	*type-buy*	*8r, ec, texnansi*	*sans*
meta-normal	*type-buy*	*8r, ec, texnansi*	*sans*
meta-normal-lf	*type-buy*	*8r, ec, texnansi*	*sans*
meta-medium	*type-buy*	*8r, ec, texnansi*	*sans*
meta-medium-lf	*type-buy*	*8r, ec, texnansi*	*sans*
meta-black	*type-buy*	*8r, ec, texnansi*	*sans*
meta-black-lf	*type-buy*	*8r, ec, texnansi*	*sans*
univers	*type-buy*	*8r, ec, texnansi*	*sans*
univers-light	*type-buy*	*8r, ec, texnansi*	*sans*
univers-black	*type-buy*	*8r, ec, texnansi*	*sans*
mendoza	*type-buy*	*8r, ec, texnansi*	*serif*
frutiger	*type-buy*	*8r, ec, texnansi*	*sans*
kabel	*type-buy*	*8r, ec, texnansi*	*sans*
thesans	*type-buy*	*8r, ec, texnansi*	*sans, mono, expert*
sabon	*type-buy*	*8r, ec, texnansi*	*serif*
stone	*type-buy*	*ec, texnansi*	*serif, sans*
stone-oldstyle	*type-buy*	*– synonyms only –*	*serif, sans*
industria	*type-buy*	*ec, texnansi*	*sans*
bauhaus	*type-buy*	*ec, texnansi*	*sans*
swift	*type-buy*	*ec, texnansi*	*serif*
swift-light	*type-buy*	*– synonyms only –*	*serif*
syntax	*type-buy*	*ec, texnansi*	*sans*
linoletter	*type-buy*	*ec, texnansi*	*serif*
zapfino	*type-ghz*	*8r, ec, texnansi*	*serif, handwriting*
palatino-sans-light	*type-exp*	*texnansi, ec*	*sans*
palatino-sans-normal	*type-exp*	*texnansi, ec*	*sans*
palatino-sans-medium	*type-exp*	*texnansi, ec*	*sans*
opus	*type-fsf*	*8r, ec, texnansi*	*sans*
typewriter	*type-fsf*	*8r, ec, texnansi*	*mono*
garamond	*type-fsf*	*8r, ec, texnansi*	*serif*
optima	*type-ghz*	*8r, ec, texnansi*	*sans*
optima-nova	*type-ghz*	*8r, ec, texnansi*	*sans*
optima-nova-os	*type-ghz*	*8r, ec, texnansi*	*sans*
optima-nova-light	*type-ghz*	*8r, ec, texnansi*	*sans*
optima-nova-medium	*type-ghz*	*8r, ec, texnansi*	*sans*
palatino	*type-ghz*	*8r, ec, texnansi*	*serif*
palatino-nova	*type-ghz*	*8r, ec, texnansi*	*serif*
palatino-nova-os	*type-ghz*	*8r, ec, texnansi*	*serif*
palatino-nova-light	*type-ghz*	*8r, ec, texnansi*	*serif*
palatino-nova-medium	*type-ghz*	*8r, ec, texnansi*	*serif*
aldus-nova	*type-ghz*	*8r, ec, texnansi*	*serif*
melior	*type-ghz*	*8r, ec, texnansi*	*serif*
verdana	*type-msw*	*texnansi*	*sans*
arial	*type-msw*	*texnansi*	*sans*

Table 1.10 The predefined body font identifiers for commercial Type 1 fonts

Identifier	*file*	*Supported styles*
modern	*type-otf*	*serif, sans, mono, math, boldmath, bf-math*
latin-modern	*type-otf*	*serif, sans, mono, math, boldmath, bf-math*
modern-vari	*type-otf*	*mono*
latin-modern-vari	*type-otf*	*mono*
modern-cond	*type-otf*	*mono*
latin-modern-cond	*type-otf*	*mono*
computer-modern	*type-otf*	*serif, sans, mono, math, boldmath, bf-math*
concrete	*type-otf*	*serif*
euler	*type-otf*	*math, boldmath, bf-math*
ams	*type-otf*	*math*
pagella	*type-otf*	*serif*
termes	*type-otf*	*serif*
bonum	*type-otf*	*serif*
schola	*type-otf*	*serif*
chorus	*type-otf*	*serif*
heros	*type-otf*	*sans*
adventor	*type-otf*	*sans*
cursor	*type-otf*	*sans*
palatino	*type-otf*	*serif, math*
times	*type-otf*	*serif, math*
bookman	*type-otf*	*serif*
schoolbook	*type-otf*	*serif*
chancery	*type-otf*	*calligraphy*
helvetica	*type-otf*	*sans*
courier	*type-otf*	*mono*
antykwa-torunska	*type-otf*	*serif, math*
antykwa-torunska-light	*type-otf*	*serif, math*
antykwa-torunska-cond	*type-otf*	*serif, math*
antykwa-torunska-lightcond	*type-otf*	*serif, math*
antykwa-poltawskiego	*type-otf*	*serif*
iwona-light	*type-otf*	*sans, math*
iwona	*type-otf*	*sans, math*
iwona-medium	*type-otf*	*sans, math*
iwona-heavy	*type-otf*	*sans, math*
iwona-cond	*type-otf*	*sans*
iwona-light-cond	*type-otf*	*sans*
iwona-medium-cond	*type-otf*	*sans*
iwona-heavy-cond	*type-otf*	*sans*
kurier	*type-otf*	*sans, math*
kurier-light	*type-otf*	*sans, math*
kurier-medium	*type-otf*	*sans, math*
charter	*type-otf*	*serif*
gentium	*type-xtx*	*serif*

Table 1.11 The predefined body font identifiers for free Opentype fonts

Identifier	*file*	*Supported styles*
zapfino	*type-hgz*	*serif, handwriting*
optima-nova	*type-hgz*	*sans*
optima-nova-os	*type-hgz*	*sans*
optima-nova-light	*type-hgz*	*sans*
optima-nova-medium	*type-hgz*	*sans*
palatino-nova	*type-hgz*	*serif*
palatino-nova-os	*type-hgz*	*serif*
palatino-nova-light	*type-hgz*	*serif*
palatino-nova-medium	*type-hgz*	*serif*
palatino-sans	*type-hgz*	*sans*
palatino-informal	*type-hgz*	*sans*
melior	*type-hgz*	*serif*
– all four-variant fonts –	*type-xtx*	*Xserif*
– all four-variant fonts –	*type-xtx*	*Xsans*
– all four-variant fonts –	*type-xtx*	*Xmono*
times	*type-xtx*	*serif*
palatino	*type-xtx*	*serif*
helvetica	*type-xtx*	*sans*
courier	*type-xtx*	*mono*
hoefler	*type-xtx*	*serif*
lucidagrande	*type-xtx*	*sans*
optima	*type-xtx*	*sans*
gillsans	*type-xtx*	*sans*
gillsanslt	*type-xtx*	*sans*
zapfino	*type-xtx*	*handwriting, serif*
applechancery	*type-xtx*	*calligraphy, serif*
timesnewroman	*type-xtx*	*serif*
arial	*type-xtx*	*sans*
lucida	*type-xtx*	*serif, sans, mono, handwriting, fax, calligraphy*

Table 1.12 The predefined body font identifiers for commercial Opentype fonts

`features`	*this applies a predefined font feature set (see section 1.10)*
`text`	*sets up the forced math text style*

If you look closely, in table 1.12 you will notice three very special items: `Xserif`*,* `Xsans` *and* `Xmono`*. These belong to a special XeTeX-only trick called 'wildcard typescripts'.*

XeTeX offers some nice features in terms of automatically finding related fonts in a family, namely the italic, bold, and bolditalic alternatives. To take advantage of that, there's a set of wildcard typescripts that take an arbitrary Macintosh font name as input, and provide as many of the alternatives it can find. To set these typescripts (and the calling conventions) apart from the familiar ones, the typescripts are identified with `Xserif`*,* `Xsans`*, and* `Xmono`*.*

To call these special typescripts, it's most convenient to define a typeface that uses these features. The named font slot should contain the display name of the Regular alternative (not the family name) of the font in question. For example, you could have the following mix:

```
\starttypescript[myface]
\definetypeface[myface][rm][Xserif][Baskerville]    [default]
\definetypeface[myface][tt][Xmono] [Courier]        [default][rscale=.87]
\definetypeface[myface][ss][Xsans] [Optima Regular][default]
\stoptypescript
```

As you can see, you can activate relative scaling of face sizes. The above definitions look very much like any other typeface definition, except that the serif/sans/mono identifier is preceded with X, and that there is no underlying "Optima Regular" defined anywhere. Those missing bits of the definitions are handled by typescript and XeTeX magic.

1.9 Body font environments

Earlier we saw that within a single body font there are in fact different font sizes such as super- and subscripts. The relations between these sizes are defined by body font environments*.*

For all regular font sizes, environments are predefined that fulfill their purpose adequately. However when you want to do some extra defining yourself there is:

```
\definebodyfontenvironment [.1.] [.2.] [..,.3.,..]
                            OPTIONAL    OPTIONAL
1   IDENTIFIER

2   5pt ... 12pt default

3   text            =  DIMENSION
    script          =  DIMENSION
    scriptscript    =  DIMENSION
    x               =  DIMENSION
    xx              =  DIMENSION
    a               =  DIMENSION
    b               =  DIMENSION
    c               =  DIMENSION
    d               =  DIMENSION
    small           =  DIMENSION
    big             =  DIMENSION
    interlinespace  =  DIMENSION
    em              =  normal bold slanted boldslanted type cap small... COMMAND
```

The first argument is optional, and specifier the typeface identifier that this particular body font environment setup is for. It defaults to the current typeface.

The second argument is the size of the body font environment that is being defined. This argument is not really optional, the macro syntax description is a little misleading.

The third argument once again is optional, and contains the actual settings as key-value pairs. If it is missing, defaults will be guessed at by ConTEXt itself. Although the macro syntax says the type is DIMENSION, floating point numbers are also acceptable. Such numbers are multipliers that are applied to the font size when the body font environment is applied.

`text`	*Math text size or multiplier (default is 1.0)*
`script`	*Math script size (default is 0.7)*
`scriptscript`	*Math scriptscript size (default is 0.5)*
`x`	*The size used for commands like* `\tfx` *(default is 0.8)*
`xx`	*The size used for the* `\tfxx` *command (default is 0.6)*
`a`	*The size for commands like* `\tfa` *(default is 1.200)*
`b`	*The size for commands like* `\tfb` *(default is 1.440)*
`c`	*The size for commands like* `\tfa` *(default is 1.728)*
`d`	*The size for commands like* `\tfd` *(default is 2.074)*
`big`	*The 'larger' font size (default is 1.2)*
`small`	*The 'smaller' font size (default is 0.8)*
`interlinespace`	*Distance between lines in a paragraph (default is 2.8ex)*
`em`	*The style to use for emphasis (default is* `slanted`*)*

So, when you want to have a somewhat bigger fontsize for just a few words (e.g. for a book title) you can type:

```
\definebodyfontenvironment [24pt]
\switchtobodyfont[24pt]
```

For longer stretches of text you will probably want to set up most of the values explicitly, using something like this

```
\definebodyfontenvironment
  [22pt]
  [        text=22pt,
         script=17.3pt,
    scriptscript=14.4pt,
               x=17.3pt,
              xx=14.4pt,
             big=28pt,
           small=17.3pt]
```

To tweak already defined sizes, there is an accompanying setup command with the same parameter conventions:

```
\setupbodyfontenvironment [.1.] [.2.] [..,.3.,..]
                                OPTIONAL      OPTIONAL
1   inherits from \definebodyfontenvironment
2   inherits from \definebodyfontenvironment
3   inherits from \definebodyfontenvironment
```

1.10 Font feature sets

As mentioned already, some fonts contain extra information besides the actual glyph shapes. In traditional TEX fonts, the extra information is roughly limited to kerning pairs and ligature information, and both of these 'features' are automatically applied to the text that is being typeset. In the odd case where one of the two needs to be suppressed, a little bit of macro trickery can do the job without too many complicating factors.

But with the new OpenType font format that is used by XETEX and LuaTEX, the list of possible features has increased enormously. OpenType fonts have not just kerning information and ligature information, but there can also be other features like optional oldstyle figures, caps and smallcaps glyphs, decorative swashes, etc. all inside a single font file.

Not only that, but some of these features are not even supposed to be active all the time. Certain features should only be activated if the user asks for it, while other features depend on the script and language that is in use for the text that is being typeset.

This is a big step forward in that there are now far fewer fonts needed to achieve the same level of quality than before, all that extra font information also poses a big challenge for macro writers. And add to that the fact that at the core, the two engines (XETEX and LuaTEX) handle OpenType fonts completely different from each other.

ConTEXt has a new subsystem called 'font features' to create order in this forest of features. The most important command is `\definefontfeature`*. This command can be used to group various font features under a single symbolic name, that can then be used as e.g. the argument to the* `features` *key of* `\definetypeface`*.*

```
\definefontfeature [.1.] [.2.] [.3.]
                           OPTIONAL
1   TEXT

2   IDENTIFIER

3   compose   =  no yes
    mode      =  node base
    tlig      =  no yes
    trep      =  no yes
    script    =  IDENTIFIER
    language  =  IDENTIFIER
    ..tag..   =  no yes
```

```
\definefontfeature
   [default-base]
   [script=latn,language=dflt,liga=yes,kern=yes,tlig=yes,trep=yes]
```

As you can probably guess, the first argument is the symbolic name that is being defined. The second argument is a mix of a-hoc settings and OpenType font features.

`compose`	*Use fallback composition in MkIV (experimental, undocumented)*
`protrusion`	*Character protrusion in MkIV (see section 1.14)*
`expansion`	*Character expansion in MkIV (see section 1.14)*
`script`	*An OpenType script identifier*
`language`	*An OpenType script language identifier*

`tlig`	*A virtual feature for legacy (TEX-style) automatic ligatures (for compatibility, there is an alias for this key called* `texligatures`*)*
`trep`	*A virtual feature for legacy (TEX-style) automatic ligatures (for compatibility, there is an alias for this key called* `texquotes`*) (only works in MkIV)*
`mode`	*Processing mode for MkIV.* `node` *and* `base` *allowed,* `base` *is default*
`<tag>`	*Any OpenType feature tag is acceptable, but in MkIV only a 'known' subset actually has any effect, and then only in* `node` *mode. This list is given in table 1.13. In XETEX, processing depends on the internal subengine that is used by XETEX, and that is outside of ConTEXt's control.*

A few fontfeatures are predefined by context:

`default`	`liga=yes,kern=yes,tlig=yes,trep=yes`
`smallcaps`	`liga=yes,kern=yes,tlig=yes,trep=yes,smcp=yes`
`oldstyle`	`liga=yes,kern=yes,tlig=yes,trep=yes,onum=yes`

At the moment, `smallcaps` *and* `oldstyle` *only work in XETEX (in MkIV, it would need an extra* `mode=node` *pair).*

1.11 Displaying the current font setup

With the command `\showbodyfont` *an overview is generated of the available characters, and an overview of the different fontsizes within a family can be summoned with* `\showbodyfontenvironment`*.*

```
\showbodyfont [...,*,...]
                  OPTIONAL
*   inherits from \setupbodyfont
```

```
\showbodyfontenvironment [...,*,...]
                               OPTIONAL
*   inherits from \setupbodyfont
```

Specifying actual `IDENTIFIER`*s to these commands is currently unreliable because they internally are still counting on an older system of body font definitions, but you can safely use a size argument to get the information for the current font set.*

Below an example of the possible output is shown, for `\showbodyfont[12pt]`

[palatino] [12pt]													\mr : *Ag*
	`\tf`	`\sc`	`\sl`	`\it`	`\bf`	`\bs`	`\bi`	`\tfx`	`\tfxx`	`\tfa`	`\tfb`	`\tfc`	`\tfd`
`\rm`	Ag	Ag	*Ag*	*Ag*	**Ag**	**Ag**	**Ag**	Ag	Ag	Ag	Ag	Ag	Ag
`\ss`	Ag	Ag	*Ag*	*Ag*	**Ag**	**Ag**	**Ag**	Ag	Ag	Ag	Ag	Ag	Ag
`\tt`	Ag	Ag	*Ag*	*Ag*	**Ag**	**Ag**	**Ag**	Ag	Ag	Ag	Ag	Ag	Ag

aalt	*Access All Alternates*
abvf	*Above-Base Forms*
abvm	*Above-Base Mark Positioning*
abvs	*Above-Base Substitutions*
afrc	*Alternative Fractions*
akhn	*Akhands*
blwf	*Below-Base Forms*
blwm	*Below-Base Mark Positioning*
blws	*Below-Base Substitutions*
c2pc	*Petite Capitals From Capitals*
c2sc	*Small Capitals From Capitals*
calt	*Contextual Alternates*
case	*Case-Sensitive Forms*
ccmp	*Glyph Composition/Decomposition*
cjct	*Conjunct Forms*
clig	*Contextual Ligatures*
cpsp	*Capital Spacing*
cswh	*Contextual Swash*
curs	*Cursive Positioning*
dflt	*Default Processing*
dist	*Distances*
dlig	*Discretionary Ligatures*
dnom	*Denominators*
expt	*Expert Forms*
falt	*Final glyph Alternates*
fina	*Terminal Forms*
fin2	*Terminal Forms #2*
fin3	*Terminal Forms #3*
frac	*Fractions*
fwid	*Full Width*
half	*Half Forms*
haln	*Halant Forms*
halt	*Alternate Half Width*
hist	*Historical Forms*
hkna	*Horizontal Kana Alternates*
hlig	*Historical Ligatures*
hngl	*Hangul*
hojo	*Hojo Kanji Forms*
hwid	*Half Width*
init	*Initial Forms*
isol	*Isolated Forms*
ital	*Italics*
jalt	*Justification Alternatives*
jp04	*JIS2004 Forms*
jp78	*JIS78 Forms*
jp83	*JIS83 Forms*
jp90	*JIS90 Forms*
kern	*Kerning*
lfbd	*Left Bounds*
liga	*Standard Ligatures*
ljmo	*Leading Jamo Forms*
lnum	*Lining Figures*
locl	*Localized Forms*
mark	*Mark Positioning*
medi	*Medial Forms*
med2	*Medial Forms #2*
mgrk	*Mathematical Greek*
mkmk	*Mark to Mark Positioning*
mset	*Mark Positioning via Substitution*
nalt	*Alternate Annotation Forms*
nlck	*NLC Kanji Forms*
nukt	*Nukta Forms*
numr	*Numerators*
onum	*Old Style Figures*
opbd	*Optical Bounds*
ordn	*Ordinals*
ornm	*Ornaments*
palt	*Proportional Alternate Width*
pcap	*Petite Capitals*
pnum	*Proportional Figures*
pref	*Pre-base Forms*
pres	*Pre-base Substitutions*
pstf	*Post-base Forms*
psts	*Post-base Substitutions*
pwid	*Proportional Widths*
qwid	*Quarter Widths*
rand	*Randomize*
rkrf	*Rakar Forms*
rlig	*Required Ligatures*
rphf	*Reph Form*
rtbd	*Right Bounds*
rtla	*Right-To-Left Alternates*
ruby	*Ruby Notation Forms*
salt	*Stylistic Alternates*
sinf	*Scientific Inferiors*
size	*Optical Size*
smcp	*Small Capitals*
smpl	*Simplified Forms*
ss01	*Stylistic Set 1*
ss02	*Stylistic Set 2*
ss03	*Stylistic Set 3*
ss04	*Stylistic Set 4*
ss05	*Stylistic Set 5*
ss06	*Stylistic Set 6*
ss07	*Stylistic Set 7*
ss08	*Stylistic Set 8*
ss09	*Stylistic Set 9*
ss10	*Stylistic Set 10*
ss11	*Stylistic Set 11*
ss12	*Stylistic Set 12*
ss13	*Stylistic Set 13*
ss14	*Stylistic Set 14*
ss15	*Stylistic Set 15*
ss16	*Stylistic Set 16*
ss17	*Stylistic Set 17*
ss18	*Stylistic Set 18*
ss19	*Stylistic Set 19*
ss20	*Stylistic Set 20*
subs	*Subscript*
sups	*Superscript*
swsh	*Swash*
titl	*Titling*
tjmo	*Trailing Jamo Forms*
tnam	*Traditional Name Forms*
tnum	*Tabular Figures*
trad	*Traditional Forms*
twid	*Third Widths*
unic	*Unicase*
valt	*Alternate Vertical Metrics*
vatu	*Vattu Variants*
vert	*Vertical Writing*
vhal	*Alternate Vertical Half Metrics*
vjmo	*Vowel Jamo Forms*
vkna	*Vertical Kana Alternates*
vkrn	*Vertical Kerning*
vpal	*Proportional Alternate Vertical Metrics*
vrt2	*Vertical Rotation*
zero	*Slashed Zero*

Table 1.13 The OpenType features that are understood by MkIV in `mode=node` processing mode

And the output of `\showbodyfontenvironment[12pt]` *is:*

[palatino] [12pt]							
text	script	scriptscript	x	xx	small	big	interlinespace
20.7pt	14.4pt	12pt	17.3pt	14.4pt	17.3pt	20.7pt	
17.3pt	12pt	10pt	14.4pt	12pt	14.4pt	20.7pt	
14.4pt	11pt	9pt	12pt	10pt	12pt	17.3pt	
12pt	9pt	7pt	10pt	8pt	10pt	14.4pt	
11pt	8pt	6pt	9pt	7pt	9pt	12pt	
10pt	7pt	5pt	8pt	6pt	8pt	12pt	
9pt	7pt	5pt	7pt	5pt	7pt	11pt	
8pt	6pt	5pt	6pt	5pt	6pt	10pt	
7pt	6pt	5pt	6pt	5pt	5pt	9pt	
6pt	5pt	5pt	5pt	5pt	5pt	8pt	
5pt	5pt	5pt	5pt	5pt	5pt	7pt	
4pt	4pt	4pt	4pt	4pt	4pt	6pt	

1.12 Math fonts

There are only a few font families in existence that can handle math properly because such fonts have to carry a complete set of characters and symbols for mathematical typesetting. Among these, the Computer Modern Roman distinguishes itself by its many design sizes; that really pays off when typesetting complicated math formulas.

Many TEX users have chosen TEX for its superb math typesetting.

This chapter will not go into any details but in math mode, the central concept is the math family *(not to be confused with the* font families *discussed earlier). There are math families for* `\bf`*,* `\it`*, etc. as well as for the special math symbols. Within each family, there are always exactly three member fonts:* `text`*,* `script` *and* `scriptscript`*, or a normal, smaller and smallest font. The normal font size is used for running text and the smaller ones for sub and superscripts. The next example will show what the members of a math family can do.*

```
$\tf x^2+\bf x^2+\sl x^2+\it x^2+\bs x^2+ \bi x^2 =\rm 6x^2$
$\tf x^2+\bf x^2+\sl x^2+\it x^2+\bs x^2+ \bi x^2 =\tf 6x^2$
$\tf x^2+\bf x^2+\sl x^2+\it x^2+\bs x^2+ \bi x^2 =\bf 6x^2$
$\tf x^2+\bf x^2+\sl x^2+\it x^2+\bs x^2+ \bi x^2 =\sl 6x^2$
```

When this is typeset you see this:

$x^2 + \boldsymbol{x^2} + x^2 + x^2 + \boldsymbol{x^2} + \boldsymbol{x^2} = 6x^2$
$x^2 + \boldsymbol{x^2} + x^2 + x^2 + \boldsymbol{x^2} + \boldsymbol{x^2} = 6x^2$
$x^2 + \boldsymbol{x^2} + x^2 + x^2 + \boldsymbol{x^2} + \boldsymbol{x^2} = \boldsymbol{6x^2}$
$x^2 + \boldsymbol{x^2} + x^2 + x^2 + \boldsymbol{x^2} + \boldsymbol{x^2} = 6x^2$

As you can see, the alphabetic characters adapt to the selected font family but the symbols are all typeset in the same font regardless. Technically this means that the symbols are set in the fixed font family 0 whereas the alphabetic characters are typeset using variable family numbers.

Typesetting math formulas can also be done somewhat differently, as we will see in the next example.

```
$\tf\mf x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2$
$\bf\mf x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2$
$\sl\mf x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2$
$\bs\mf x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2$
$\it\mf x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2$
$\bi\mf x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2$
```

A new command is used: `\mf`*, which stands for* math font*. This command takes care of the symbols in such a way that they are also set in the actually selected font, just like the characters.*

$x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2$
$x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2$
$x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2$
$x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2$
$x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2$
$x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2$

You should take into account that TEX typesets a formula as a whole. In some cases this means that setups at the end of the formula have an effect that starts already at the beginning of the formula.

For example, the exact location of `\mf` *is not that important. We also could have typed:*

```
$\bf x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = \mf 6x^2$
```

There is much more to be said about math, but it is better to do that in chapter ??*, about math.*

1.13 Em and Ex

In specifying dimensions we can distinguish physical units like `pt` *and* `cm` *and internal units like* `em` *and* `ex`*. These last units are related to the actual fontsize. When you use these internal units in specifying for example horizontal and vertical spacing you don't have to do any recalculating when fonts are switched in the style definition.*

Some insight in these units does not hurt. The width of an `em` *is not the with of an M, but that of an — (an em–dash). When this glyph is not available in the font another value is used. Table 1.14 shows some examples. We see that the width of a digit is about* `.5em`*. In Computer Modern Roman a digit is exactly half an em wide.*

`\tf`	`\bf`	`\sl`	`\tt`	`\ss`	`\tfx`
12	**12**	*12*	12	*12*	12
M	**M**	*M*	M	*M*	M

Table 1.14 The width of an `em`.

In most cases we use `em` *for specifying width and* `ex` *for height. An* `ex` *equals the height of a lowercase x. Table 1.15 shows some examples.*

\tf	\bf	\sl	\tt	\ss	\tfx
x	**x**	*x*	*x*	*x*	x

Table 1.15 The height of an ex.

1.14 Font handling

Almost all users of typesetting systems based on TEX do so because of the quality of the output it produces. pdfTEX (and through inheritance LuaTEX as well) contains a few extensions to the typesetting engine that make the output even better than the results achieved by Knuth's original TEX. Although the extensions are made available by pdfTEX, they are not limited to the pdf output, they will work with the dvi backend just as well. And when the extensions are defined but not enabled, then the typeset output is 100% identical to when the feature is not present at all.

1.14.1 Character protrusion

In the following fake paragraph, you can see a hyphenation point, a secondary sentence, separated by a comma, and a last sentence, ending with a period. Miraculously, this paragraph fits into lines. Although exaggerated, these lines demonstrate that visually the hyphen and punctuation characters make the margin look ragged.

Before computers started to take over the traditional typesetter's job, it was common practice to move hyphens and punctuation into the margin, like in:

In this alternative, the margin looks less ragged, and this becomes more noticeable once you get aware of this phenomenon.

Sometimes, shifting the characters completely into the margin is too much for the sensitive eye, for instance with an italic font, where the characters already hang to the right. In such cases, we need to compromise.

pdfTEX (and LuaTEX, that has inherited this feature) has provisions to move characters into the margin when they end up at the end of a line. Such characters are called protruding characters. pdfTEX takes protruding into account when breaking a paragraph.

We will demonstrate protruding using a quote from Hermann Zapf's article "About micro–typography and the hz–program" in Electronic Publishing, vol 6 (3), 1993.

After TEX has typeset this paragraph (using a specific font size and line width) it may have constructed the following lines.

Coming back to the use of typefaces in electronic publishing: many of the new typographers receive their knowledge and information about the rules of typography from books, from computer magazines or the instruction manuals which they get with the purchase of a PC or software. There is not so much basic instruction, as of now, as there was in the old days, showing the differences between good and bad typographic design. Many people are just fascinated by their PC's tricks, and think that a widely–praised program, called up on the screen, will make everything automatic from now on.

As you can see, the height and depth of the lines depend on the characters, but their width equals what TEX calls `\hsize`*. However, the natural width of the lines may differ from* `\hsize`*.*

Coming back to the use of typefaces in electronic publishing: many of the new typographers receive their knowledge and information about the rules of typography from books, from computer magazines or the instruction manuals which they get with the purchase of a PC or software. There is not so much basic instruction, as of now, as there was in the old days, showing the differences between good and bad typographic design. Many people are just fascinated by their PC's tricks, and think that a widely–praised program, called up on the screen, will make everything automatic from now on.

Here the inter–word space is fixed to what TEX considers to be a space. This example also demonstrates that TEX does not have spaces, but stretches the white area between words to suit its demands. When breaking lines, TEX's mind is occupied by boxes, glue and penalties, or in more common language: (parts of) words, stretchable white space, and more or less preferred breakpoints.

Coming back to the use of typefaces in electronic publishing: many of the new typographers receive their knowledge and information about the rules of typography from books, from computer magazines or the instruction manuals which they get with the purchase of a PC or software. There is not so much basic instruction, as of now, as there was in the old days, showing the differences between good and bad typographic design. Many people are just fascinated by their PC's tricks, and think that a widely–praised program, called up on the screen, will make everything automatic from now on.

This time we have enabled pdfTEX's protruding mechanism. The characters that stick into the margin are taken into account when breaking the paragraph into lines, but in the final result, they do not count in the width. Here we used an ugly three column layout so that we got a few more hyphens to illustrate the principle.

When that same text is typeset in the traditional way in two columns, it looks like this:

Coming back to the use of typefaces in electronic publishing: many of the new typographers receive their knowledge and information about the rules of typography from books, from computer magazines or the instruction manuals which they get with the purchase of a PC or software. There is not so much basic instruction, as of now, as there was in the old days, showing the differences between good and bad typographic design. Many people are just fascinated by their PC's tricks, and think that a widely–praised program, called up on the screen, will make everything automatic from now on.

As you can see, the hyphens and punctuation fit snugly into the line and as a result the line endings look a bit ragged. With protrusion turned on, it looks like this:

Coming back to the use of typefaces in electronic publishing: many of the new typographers receive their knowledge and information about the rules of typography from books, from computer magazines or the instruction manuals which they get with the purchase of a PC or software. There is not so much basic instruction, as of now, as there was in the old days, showing the differences between good and bad typographic design. Many people are just fascinated by their PC's tricks, and think that a widely–praised program, called up on the screen, will make everything automatic from now on.

Now the punctuation protrudes a little into the margin. Although the margin is now geometrically uneven it looks straighter to the human eye because not so much whitespace 'pushes into' the text.

1.14.2 Font expansion

In typesetting the two characters hz are tightly connected to Hermann Zapf and the next couple of pages we will discuss a method for optimizing the look and feel of a paragraph using a mechanism that is inspired by his work. Although official qualified in pdfTEX as font adjusting, we will use the short qualification hz since this is how it is called in the pdfTEX community.

First, here is again the same example text that was used in the previous section, typeset using normal TEX–comptibale font settings:

Coming back to the use of typefaces in electronic publishing: many of the new typographers receive their knowledge and information about the rules of typography from books, from computer magazines or the instruction manuals which they get with the purchase of a PC or software. There is not so much basic instruction, as of now, as there was in the old days, showing the differences between good and bad typographic design. Many people are just fascinated by their PC's tricks, and think that a widely–praised program, called up on the screen, will make everything automatic from now on.

The example below shows hz in action. This paragraph is typeset with hz enabled and has a more even spacing than the text above.

Coming back to the use of typefaces in electronic publishing: many of the new typographers receive their knowledge and information about the rules of typography from books, from computer magazines or the instruction manuals which they get with the purchase of a PC or software. There is not so much basic instruction, as of now, as there was in the old days, showing the differences between good and bad typographic design. Many people are just fascinated by their PC's tricks, and think that a widely–praised program, called up on the screen, will make everything automatic from now on.

The average reader will not notice the trick, but those sensitive to character shapes will see that some glyphs are widened slightly and others are narrowed slightly. Ideally the programs that built the glyph should be defined in such a way that this goes unnoticed, but in practice glyph programs are not that clever and so a brute force horizontal scaling is applied. As long as the used percentage is small, the distortion will go unnoticed and the paragraph will look slightly better because the whitespace distribution is more even.

1.14.3 Other font handlings

In addition to the two handlings documented in the previous paragraphs (protruding and hz), ConTEXt also provides the `noligs` *handling (handy when one processes xml),* `flexspacing` *and* `prespacing`

(meant for languages like French that need spacing around for instance : and ;). These handlings are experimental.

1.14.4 How to use font handlings

Before we go into the details of the actual extensions, let's see what is provided by ConTEXt as the user–level interface. The ConTEXt interface to those new features is through a subsystem called 'font handling', and at the top that subsystem is seamlessly integrated into the normal alignment macros.

For example, assuming the system is set up already to support protrusion, you can simply say

```
\setupalign[hanging]
```

to turn protrusion on. However, this will only work correctly if a number of special setups have taken place internally. The command `\setupalign` *only toggles a switch, and the required setups have to be done elsewhere.*

The list of font handling–related keys for `\setupalign` *is:*

`hanging`	*turns on character protrusion*
`nohanging`	*turns off character protrusion*
`hz`	*turns on font expansion*
`nohz`	*turns off font expansion*
`spacing`	*turns on special spacing rules*
`nospacing`	*turns off special spacing*

Largely because of the tight connection with the font itself, the method of defining and setting font handling is a little different between pdfTEX and MkIV.

1.14.5 Setting up font handlings in MkII

Now, let's move on to how to set up the system for font handling properly. Most of the underlying features of pdfTEX cannot be turned merely *on or off, it is possible to tweak the machinery on the font as well as on the individual glyph level. You can define those settings all on your own, but ConTEXt comes with a handy set of predefined values.*

name	`\setupalign`	***description***
`pure`	`hanging`	*full protrusion of only selected punctuation*
`normal`	`hanging`	*partial protrusion of punctuation and some asymmetrical letters*
`hz`	`hz`	*variable correction of character widths*
`quality`	`hanging,hz`	*combination of hz and pure*
`highquality`	`hanging,hz`	*combination of hz and normal*
`flexspacing`	`spacing`	*automatic extra spacing around various punctuation characters*
`prespacing`	`spacing`	*like flexspacing, but ignoring . and , and with smaller effects*
`noligs`	`--`	*suppresses ligatures; because this is irreversible it is not controlled via* `\setupalign`

You need to be aware of the fact that at the moment that you actually define a font, you need to tell what handling you want to apply.

Note: setting up font handling involves a few low-level font definition commands, so you may want to read the chapter about font definitions first.

Say that we want to hang only the serif fonts and say that we use Palatino as main typeface.

```
\setupfontsynonym [Serif] [handling=pure]
\definetypeface [palatino] [rm] [serif] [palatino] [default]
```

In the above example, the font loader is instructed to treat fonts with the virtual name `Serif` *in a special way by applying the font handling named* `pure`*. After that, the typeface collection* `palatino` *is (re)defined and by that process the font tagged as* `Serif` *will get the 'hanging' settings attached it.*

Now enable this typeface collection can be enabled by:

```
\setupbodyfont [palatino]
```

and finally, don't forget to turn on hanging by:

```
\setupalign [hanging]
```

However, this only takes care of the `Serif` *font. Normally, that is the virtual name for the combination* `\rm\tf`*. If you also want the bold variants to hang, you have to add an extra line:*

```
\setupfontsynonym [SerifBold] [handling=pure]
```

And so on for all the alternatives. This is tedious, so ConTEXt provides a shortcut. If you want to set all serif weights at once, you can call on a predefined typescript component before defining the typeface:

```
\usetypescript [serif] [handling] [pure]
```

for hanging punctuation, or for all characters:

```
\usetypescript [serif] [handling] [normal]
```

The full example then becomes:

```
\usetypescript [serif] [handling] [pure]
\definetypeface [palatino] [rm] [serif] [palatino] [default]
\setupbodyfont [palatino]
\setupalign [hanging]
```

The first argument can be one of three named typescript groups: `serif` *(for the virtual font synonyms whose names begin with* `Serif`*),* `sans` *(for* `Sans`*), or* `mono` *(for* `Mono`*). The second argument should always be* `handling`*. The third argument has to be one of named font handlings that are listed in the table at the start of this section.*

The typescripts that are used in these examples work by altering the font synonyms for virtual symbolic font names like `Serif` *and* `SerifBold` *en bloc. They will even work with your own typescripts if (but only if) these typescripts use the same font naming conventions as the ConTEXt core.*

The definition of font handlings is actually a two-step process. A named font handling consists of one or more handling vectors that have to be defined first, those are then combined under a single name.

This is not the right place to describe how to define the low-level vector definitions in detail, for that you are referred to the documented source of the main handling definition file `hand-def.tex`*. But to give you an idea of what it looks like, here is a small excerpt of that file. The* `pure` *handling vector is defined as:*

```
\startfonthandling [pure]

  \defineprotrudefactor , 0 1
  \defineprotrudefactor . 0 1
  \defineprotrudefactor : 0 1
```

```
\defineprotrudefactor ; 0 1
\defineprotrudefactor - 0 1

\defineprotrudefactor hyphen 0 1
\defineprotrudefactor endash 0 .5
\defineprotrudefactor emdash 0 .33 % .5

\stopfonthandling
```

The `pure` *font handling itself is then defined as follows:*

```
\definefonthandling [pure] [pure] [type=hanging]
```

The `hz` *setup runs along the same lines. First here is a vector:*

```
\startfonthandling [hz]

  \defineadjustfactor A .5
  \defineadjustfactor B .7
  \defineadjustfactor C .7
  ...

\stopfonthandling
```

And then the definition of the hz handling is as follows:

```
\definefonthandling [hz] [hz,extended] [type=hz]
```

To wrap this up, here is the macro syntax for the font handling definition and setup.

```
\definefonthandling [.¹.] [...,²,...] [.³.]

1   IDENTIFIER

2   IDENTIFIER

3   type    =  hanging hz spacing tag
    right   =  NUMBER
    left    =  NUMBER
    factor  =  NUMBER
    min     =  NUMBER
    max     =  NUMBER
    step    =  NUMBER
```

As you can see, the `\definefonthandling` *command accepts three arguments. The first is the handling to be defined, the second is a list of handling vectors to be used, and the third sets up a number of settings.*

`type`	*the type of this font handling feature, for use by* `\setupalign`
`right`	*used by* `type=hanging`*, default 1*
`left`	*used by* `type=hanging`*, default 1*
`factor`	*used by* `type=spacing`*, default 1*
`min`	*used by* `type=hz`*, default 20*
`max`	*used by* `type=hz`*, default 20*
`step`	*used by* `type=hz`*, default 5*

On top of the list at the beginning of this paragraph, a few more elaborate font handlings are also predefined:

```
\definefonthandling [purebold]        [pure] [type=hanging]
\definefonthandling [pureitalic]      [pure] [type=hanging,right=1.5]
\definefonthandling [pureslanted]     [pure] [type=hanging,right=1.5]
\definefonthandling [pureboldditalic] [pure] [type=hanging,right=1.5]
\definefonthandling [pureboldslanted] [pure] [type=hanging,right=1.5]
```

The `right` *parameter (there is also* `left`*) is a multiplication factor that is applied to the values in the associated vector. Such definitions can be more extensive, like:*

```
\definefonthandling
  [normalitalic]
  [punctuation,alpha,extended]
  [type=hanging,right=1.5]
```

Here we have combined three vectors into one handling. For these extended font handlings, there are no predefined typescripts, so you either have to use the font synonyms directly, or define your own typescripts. Now, if you think this is overly complicated, you are probably right. Normally you will just invoke protruding handlings defined previously, but the mechanisms are there to fine–tune the handlings to your precise wishes.

In case you want to alter some of the settings of an already defined font handling, there is

```
\setupfonthandling [.⋮.] [.≝.]

1   IDENTIFIER
2   inherits from \definefonthandling
```

The first argument is the handling to be altered, the second sets up the settings.

1.14.6 Setting up font handlings in MkIV

In MkIV, font handling is merged with the font features (because these already have a low-level connection to the font), so you can set up the font-side of things with the sixth argument of `\definetypeface`*, like so:*

```
\definefontfeature
    [hz] [default]
    [protrusion=pure, mode=node, script=latn]
\definetypeface [palatino] [rm] [serif] [palatino] [default] [features=hz]
\setupbodyfont [palatino]
\setupalign [hanging]
```

or by redefining the feature set that is used by the typescript you are using and then (re-)executing the typescript, like so:

```
\definefontfeature
    [default] [default]
    [protrusion=pure, expansion=quality, mode=node, script=latn]
\usetypescript[palatino]
\setupbodyfont [palatino]
\setupalign [hanging]
```

There is a list of predefined font handling feature values that you can use:

For protrusion, there is:

name	\setupalign	*description*
pure	hanging	*full protrusion of only selected punctuation*
punctuation	hanging	*partial protrusion of punctuation*
alpha	hanging	*partial of some asymmetrical letters*
quality	hanging	*the combination of* punctuation *and* alpha

For expansion, there is:

name	\setupalign	*description*
quality	hz	*variable correction of character widths*

These are defined in the file font-ext.lua*. The low–level definitions look like*

```
fonts.protrusions.vectors['pure'] = {
    [0x002C] = { 0, 1    }, -- comma
    [0x002E] = { 0, 1    }, -- period
    [0x003A] = { 0, 1    }, -- colon
    [0x003B] = { 0, 1    }, -- semicolon
    [0x002D] = { 0, 1    }, -- hyphen
    [0x2013] = { 0, 0.50 }, -- endash
    [0x2014] = { 0, 0.33 }, -- emdash
}
fonts.protrusions.classes['pure'] = {
    vector = 'pure', factor = 1
}
```

That was the complete definition of protrusion=pure*. The key* classes *has the same function as the macro call* \definefonthandling *in MkII. It references the named vector* pure *and sets up a parameter.*

For protrusion*, there is only the one parameter* factor*, but for* expansion *there are a few more:*

```
\startLUA
fonts.expansions.classes['quality'] = {
    stretch = 2, shrink = 2, step = .5, vector = 'default', factor = 1
}
fonts.expansions.vectors['default'] = {
    [byte('A')] = 0.5,
    [byte('B')] = 0.7,
    ... -- many more characters follow
}
\stopLUA
```

As you can see, the definition order of vector vs. class is not important, and the format of the vector is a little different. The use of byte() *is just so that that keying in hex numbers can be avoided. The values are bare numbers instead of hashes because there is only one per-character parameter involved with character expansion.*

Also note that the values for the parameters stretch*,* shrink *and* step *are divided by a factor 10 compared to the MkII definition.*

In MkIV, there is no support for the `spacing` *key to* `\setupalign` *yet. That is because the low–level features in pdfTEX are not present in LuaTEX, and there is no replacement yet. The font handling* `noligs` *is, of course, replaced by the OpenType font feature tags for ligatures: simply leave all of the relevant font features turned off.*

1.15 Encodings and mappings

This section only applies to pdfTEX. If you are exclusively using XETEX or MkIV, you can safely ignore the following text.

Not every language uses the (western) Latin alphabet. Although in most languages the basic 26 characters are somehow used, they can be combined with a broad range of accents placed in any place.

In order to get a character representation, also called glyph, in the resulting output, you have to encode it in the input. This is no problem for `a..z`*, but other characters are accessed by name, for instance* `\eacute`*. The glyph é can be present in the font but when it's not there, TEX has to compose the character from a letter e and an accent ´.*

In practice this means that the meaning of `\eacute` *depends on the font and font encoding used. There are many such encodings, each suited for a subset of languages.*

encoding	*usage*	*status*
`8r`	*a (strange) mixture of encodings*	*useless*
`default`	*the 7 bit ascii encoding as used by plain TEX*	*obsolete*
`ec`	*the prefered encoding of TEX distributions*	*okay*
`greek`	*an encoding for modern greek*	*okay*
`qx`	*an encoding that covers most eastern european languages*	*okay*
`t2a`	*a cyrillic TEX font encoding*	*?*
`t2b`	*another cyrillic TEX font encoding*	*?*
`t2c`	*another another cyrillic TEX font encoding*	*?*
`t5`	*an encoding dedicated to vietnamese (many (double) accents)*	*okay*
`texnansi`	*a combination of TEX and Adobe standard encoding*	*okay*

These encodings are font related as is demonstrated in figure 1.1, 1.2, 1.3, and 1.4. Here we used the `\showfont` *command.*

The situation is even more complicated than it looks, since the font may be virtual, that is, built from several fonts.

The advantage of using specific encodings is that you can let TEX hyphenate words in the appropriate way. The hyphenation patterns are applied to the internal data structures that represent the sequence of glyphs. In spite of what you may expect, they are font–dependent! Even more confusing: they not only depend on the font encoding, but also on the mapping from lower to uppercase characters, or more precise, on the existence of such a mapping.

Unless you want to play with these encodings and mappings, in most cases you can forget their details and rely on what other TEX experts tell you to do. Normally switching from one to another encoding and/or mapping takes place with the change in fonts or when some special output encoding is needed, for instance in pdf annotations and/or unicode vectors that enable searching in documents. So, to summarize this:

encodings and mappings depend on the fonts used as well have consequences for the language specific hyphenation patterns. Fortunately ConTEXt handles this for you automatically.

Figure 1.1 The Latin Modern Roman font in ec encoding.

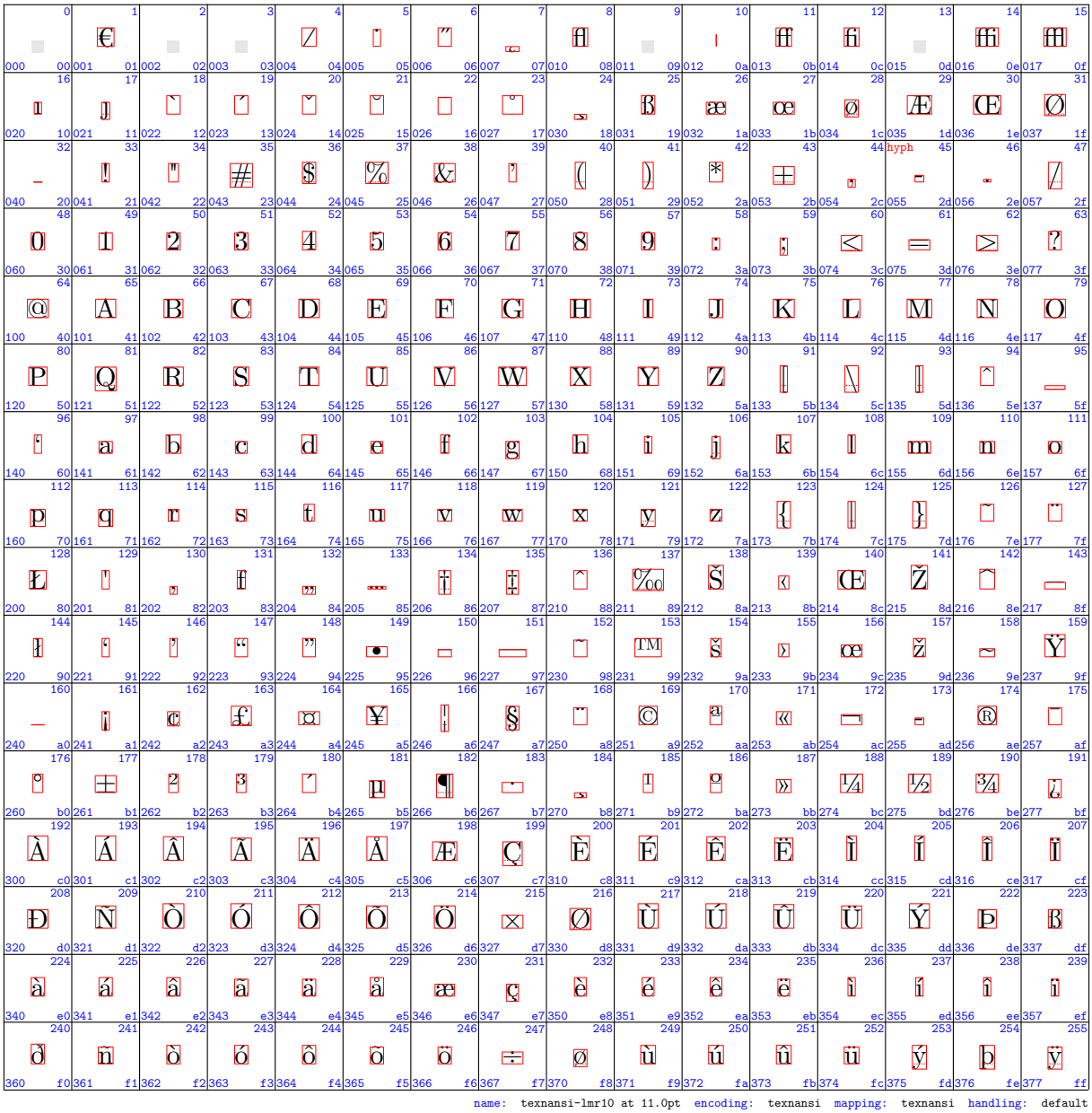


Figure 1.2 The Latin Modern Roman font in texnansi encoding.

Figure 1.3 The Latin Modern Roman font in qx encoding.

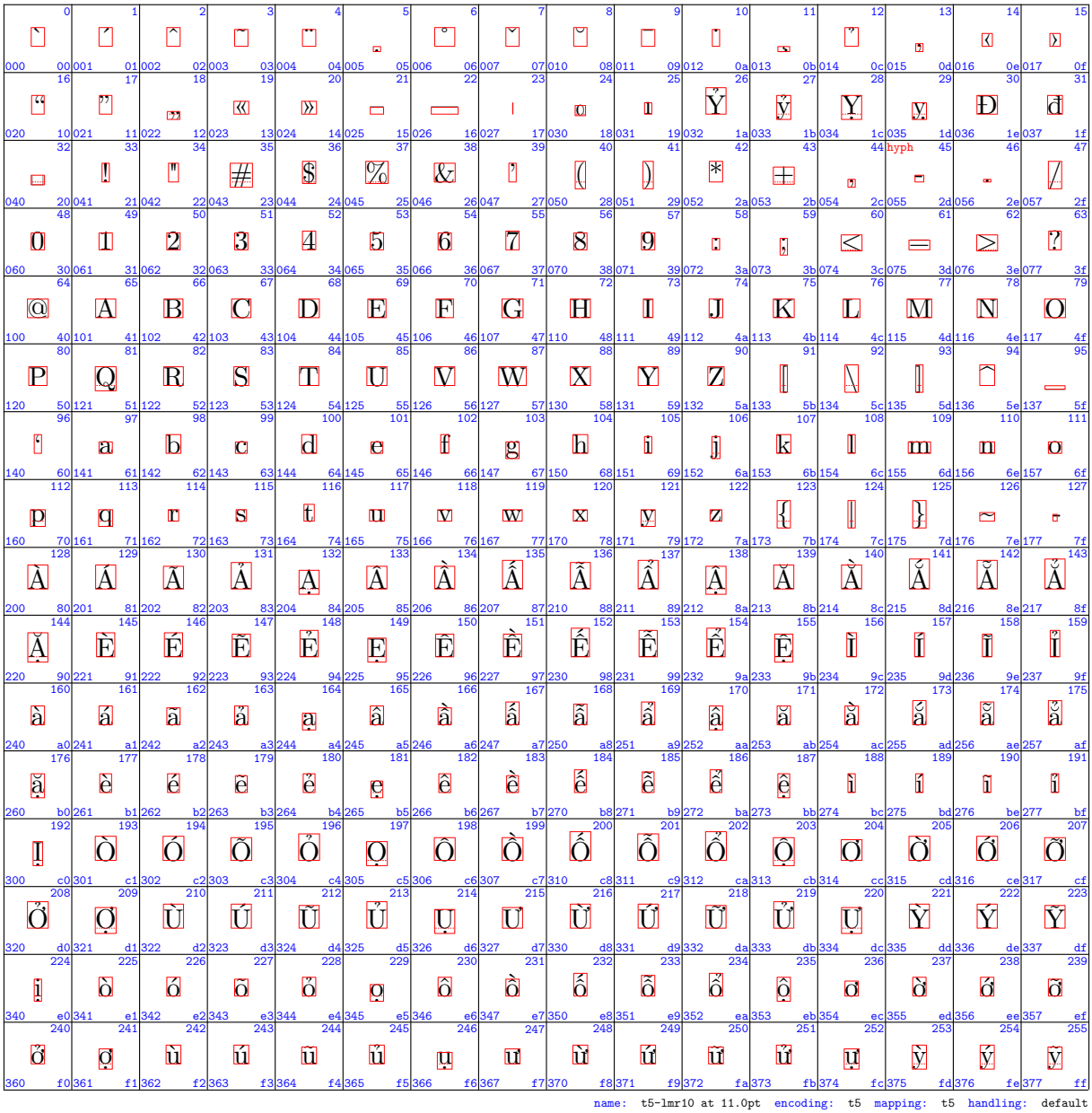


Figure 1.4 The Latin Modern Roman font in t5 encoding.

If you want to know to what extent a font is complete and characters need to be composed on the fly, you can typeset a a couple of tables. The (current) composition is shown by `\showaccents`*, as shown in figure 1.5*

ec ec-uplr8a at 11.0pt: composed bottom char raw

\'	á	ḃ	ć	ḋ	é	ḟ	ǵ	ḣ	í	j́	ḱ	ĺ	ḿ	ń	ó	ṕ	q́	ŕ	ś	ẗ	ú	v́	ẃ	x́	ý	ź
	Á	Ḃ	Ć	Ḋ	É	Ḟ	Ǵ	Ḣ	Í	J́	Ḱ	Ĺ	Ḿ	Ń	Ó	Ṕ	Q́	Ŕ	Ś	T̈	Ú	V́	Ẃ	X́	Ý	Ź
\`	à	ḃ	c̀	ḋ	è	ḟ	ǵ	ḣ	ì	j̀	ḱ	l̀	m̀	ǹ	ò	ṕ	q̀	r̀	s̀	ẗ	ù	v̀	ẁ	x̀	ỳ	ż
	À	Ḃ	C̀	Ḋ	È	Ḟ	Ǵ	Ḣ	Ì	J̀	Ḱ	L̀	M̀	Ǹ	Ò	Ṕ	Q̀	R̀	S̀	T̈	Ù	V̀	Ẁ	X̀	Ỳ	Ż
\^	â	ḃ	ĉ	ḋ	ê	ḟ	ĝ	ḣ	î	̂	ḱ	l̂	m̂	n̂	ô	ṕ	q̂	r̂	ŝ	ẗ	û	v̂	ŵ	x̂	ŷ	ẑ
	Â	Ḃ	Ĉ	Ḋ	Ê	Ḟ	Ĝ	Ḣ	Î	J̀	Ḱ	L̂	M̂	N̂	Ô	Ṕ	Q̂	R̂	Ŝ	T̂	Û	V̂	Ŵ	X̂	Ŷ	Ẑ
\~	ã	ḃ	c̃	ḋ	ẽ	ḟ	g̃	ḣ	ĩ	j̃	ḱ	l̃	m̃	ñ	õ	ṕ	q̃	r̃	s̃	ẗ	ũ	ṽ	w̃	x̃	ỹ	ž
	Ã	Ḃ	C̃	Ḋ	Ẽ	Ḟ	G̃	Ḣ	Ĩ	J̃	Ḱ	L̃	M̃	Ñ	Õ	Ṕ	Q̃	R̃	S̃	T̃	Ũ	Ṽ	W̃	X̃	Ỹ	Ž
\"	ä	ḃ	c̈	ḋ	ë	ḟ	g̈	ḣ	ï	j̈	ḱ	l̈	m̈	n̈	ö	ṕ	q̈	r̈	s̈	ẗ	ü	v̈	ẅ	ẍ		ż
	Ä	Ḃ	C̈	Ḋ	Ë	Ḟ	G̈	Ḣ	Ï	J̈	Ḱ	L̈	M̈	N̈	Ö	Ṕ	Q̈	R̈	S̈	T̈	Ü	V̈	Ẅ	Ẍ	Ÿ	Ż
\H	ő	b̋	c̋	d̋	ő	f̋	g̋	h̋	ő	j̋	k̋	l̋	m̋	n̋	ő	p̋	q̋	r̋	s̋	t̋	ű	v̋	ẅ	x̋	ÿ	z̋
	Ő	B̋	C̋	D̋	Ő	F̋	G̋	H̋	Ő	J̋	K̋	L̋	M̋	N̋	Ő	P̋	Q̋	R̋	S̋	T̋	Ű	V̋	Ẅ	X̋	Ÿ	Z̋
\r	å	ḃ	c̊	ḋ	e̊	ḟ	g̊	ḣ	i̊	j̊	k̊	l̊	m̊	n̊	o̊	p̊	q̊	r̊	s̊	ẗ	ů	v̊	ẘ	x̊	ẙ	ż
	Å	Ḃ	C̊	Ḋ	E̊	Ḟ	G̊	Ḣ	Å	J̊	K̊	L̊	M̊	N̊	O̊	P̊	Q̊	R̊	S̊	T̊	Ů	V̊	W̊	X̊	Y̊	Ż
\v	ǎ	ḃ	č	ḋ	ě	ḟ	ǧ	ȟ	ǐ	ǰ	ǩ	ľ	m̌	ň	ǒ	p̌	q̌	ř	š	ẗ	ǔ	v̌	ẅ	x̌	ǰ	ž
	Ǎ	Ḃ	Č	Ḋ	Ě	Ḟ	Ǧ	Ȟ	Ǐ	J̌	Ǩ	Ľ	M̌	Ň	Ǒ	P̌	Q̌	Ř	Š	T̈	Ǔ	V̌	Ẅ	X̌	Y̌	Ž
\u	ă	ḃ	č	ḋ	ĕ	ḟ	ğ	ȟ	ĭ	ǰ	ǩ	ľ	m̆	ň	ŏ	p̌	q̌	ř	š	ẗ	ŭ	v̌	ẅ	x̌	ǰ	ž
	Ă	Ḃ	Č	Ḋ	Ĕ	Ḟ	Ğ	Ȟ	Ĭ	J̌	Ǩ	Ľ	M̆	Ň	Ŏ	P̌	Q̌	Ř	Š	T̈	Ŭ	V̌	Ẅ	X̌	Y̌	Ž
\=	ā	ḃ	c̄	ḋ	ē	ḟ	ḡ	ẖ	ī	j̄	k̄	l̄	m̄	n̄	ō	p̄	q̄	r̄	s̄	ẗ	ū	v̄	w̄	x̄	ȳ	z̄
	Ā	Ḃ	C̄	Ḋ	Ē	Ḟ	Ḡ	H̱	Ī	J̄	K̄	L̄	M̄	N̄	Ō	P̄	Q̄	R̄	S̄	T̄	Ū	V̄	W̄	X̄	Ȳ	Z̄
\.	ȧ	ḃ	ċ	ḋ	ė	ḟ	ġ	ḣ	i	j̇	k̇	l̇	ṁ	ṅ	ȯ	ṗ	q̇	ṙ	ṡ	ṫ	u̇	v̇	ẇ	ẋ	ẏ	ż
	Ȧ	Ḃ	Ċ	Ḋ	Ė	Ḟ	Ġ	Ḣ	İ	J̇	K̇	L̇	Ṁ	Ṅ	Ȯ	Ṗ	Q̇	Ṙ	Ṡ	Ṫ	U̇	V̇	Ẇ	Ẋ	Ẏ	Ż
\b	a̲	b̲	c̲	d̲	e̲	f̲	g̲	h̲	i̲	j̲	k̲	l̲	m̲	n̲	o̲	p̲	q̲	r̲	s̲	t̲	u̲	v̲	w̲	x̲	y̲	z̲
	A̲	B̲	C̲	D̲	E̲	F̲	G̲	H̲	I̲	J̲	K̲	L̲	M̲	N̲	O̲	P̲	Q̲	R̲	S̲	T̲	U̲	V̲	W̲	X̲	Y̲	Z̲
\d	ạ	ḅ	c̣	ḍ	ẹ	ḟ	ġ	ḥ	ị	j̣	ḳ	ḷ	ṃ	ṇ	ọ	ṗ	q̣	ṛ	ṣ	ṭ	ụ	ṿ	ẉ	ẋ	ỵ	ẓ
	Ạ	Ḅ	C̣	Ḍ	Ẹ	Ḟ	Ġ	Ḥ	Ị	J̣	Ḳ	Ḷ	Ṃ	Ṇ	Ọ	Ṗ	Q̣	Ṛ	Ṣ	Ṭ	Ụ	Ṿ	Ẉ	Ẋ	Ỵ	Ẓ
\k	ą	ḅ	c̨	ḍ	ę	f̨	g̨	h̨	į	j̨	k̨	l̨	m̨	n̨	ǫ	p̨	q̨	r̨	s̨	t̨	u̧	v̨	w̨	x̨	y̨	z̨
	Ą	Ḅ	C̨	Ḍ	Ę	F̨	G̨	H̨	Į	J̨	K̨	L̨	M̨	N̨	Ǫ	P̨	Q̨	R̨	S̨	T̨	U̧	V̨	W̨	X̨	Y̨	Z̨
\c	a̧	ḅ	ç	ḍ	ȩ	f̧	g̨	h̨	i̧	j̨	k̨	l̨	m̨	n̨	o̧	p̨	q̨	r̨	s̨		u̧	v̨	w̨	x̨	y̨	z̨
	A̧	Ḅ	Ç	Ḍ	Ȩ	F̨	G̨	H̨	I̧	J̨	K̨	L̨	M̨	N̨	O̧	P̨	Q̨	R̨	S̨		U̧	V̨	W̨	X̨	Y̨	Z̨

Figure 1.5 Output of `\showaccents` for the current (palatino) font in pdfTEX