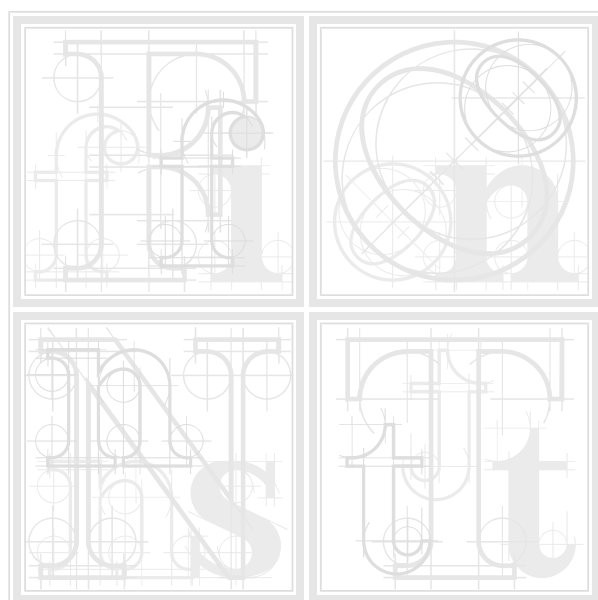


The Font Installation Guide

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*Using Postscript fonts to their full
potential with Latex*

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VERSION 1.23

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INTRODUCTION

This guide to setting up Postscript Type 1 fonts for use with Tex and Latex is not systematic but task-oriented. It will discuss the most common scenarios you are likely to encounter when installing Postscript fonts. The individual tutorials collected here are not self-contained, though: the second tutorial will presuppose that you have read the first one and so on. All the tools employed in the installation process are documented well, the actual difficulty most users are facing when trying to install new fonts is understanding how to put all the pieces together. This applies to fontinst, the Tex font installation tool, in particular. Controlled by Tex commands, fontinst is a powerful and extremely flexible tool. While its manual documents all available commands individually, you will most likely wonder how to actually employ them after reading the manual. This is what this guide is about. Because of its concept, you will need the following additional manuals when working with it:

THE FONTINST MANUAL – Shipping as `fontinst.dvi`, the fontinst manual is the most important piece of documentation you will need when working with this guide since most files required for proper Postscript font support are generated by fontinst. You do not need to work through the sections explaining all low-level commands in detail, but make sure that you have read the more general parts and that you have a basic understanding of what fontinst is and what it does. If this manual is not included in your distribution, get it from the Comprehensive Tex Archive Network (CTAN).¹

THE FONTNAME SCHEME – Fonts used with Tex are usually renamed according to a dedicated naming standard, the Fontname scheme by Karl Berry. Take a look at the outline of the scheme as given in `fontname.dvi` and make sure you have copies of the individual map files at hand. These lists define names for a large number of commercial Postscript fonts. You will need them while working with this guide. If the documentation of the Fontname scheme is not part of your distribution, you can read it online² or download the complete package from a CTAN FTP server.³

THE LATEX FONT SELECTION GUIDE – It might be a good idea to read the Latex font selection guide as well before proceeding with the first tutorial. It provides an overview of the New Font Selection Scheme (NFSS). This scheme is not used during font installation, but it will help you to understand certain aspects of the installation process. This guide ships with most Tex distributions as `fntguide.dvi` and is also available in PDF format from CTAN.⁴ Feel

¹ <http://www.ctan.org/tex-archive/fonts/utilities/fontinst/doc/manual/>

² <http://www.ctan.org/tex-archive/info/fontname/>

³ <ftp://tug.ctan.org/tex-archive/info/fontname.tar.gz>

⁴ <http://www.ctan.org/tex-archive/macros/latex/doc/fntguide.pdf>

free to skip the chapter about math fonts as we are only going to deal with text fonts. Setting up math fonts is a science in its own right.

Please note that this guide was written with version 1.8 of fontinst in mind. On July 14, 2003, Lars Hellström has released fontinst 1.9 to the public.¹ The recipes proposed here should still work with the latest version, but they do not exploit the new features of the new release. I will try to update this guide as my time permits. The latest release of this guide can always be found at CTAN.²

Acknowledgments

I am indebted to Timothy Eyre for taking the time to proofread and comment on an earlier revision of the entire guide. I would also like to thank William Adams, Adrian Heathcote, and Adrian Burd for pointing out spelling mistakes.

¹ <http://www.ctan.org/tex-archive/fonts/utilities/fontinst/>

² <http://www.ctan.org/tex-archive/info/Type1fonts/fontinstallationguide.pdf>

TUTORIAL I

THE BASICS

This introductory tutorial serves two purposes. It covers the most basic installation scenario by explaining how to use fontinst's `\latinfamily` macro to integrate a small font family into a Tex system. By providing step-by-step installation instructions, it will also discuss the installation procedure as a whole. The later tutorials will focus on the more advanced capabilities of fontinst. Before we begin, let's take a look at an overview of the installation procedure:

- STEP 1: RENAMING THE FONT FILES** – First of all, we copy all Type 1 fonts (extension `pfb`) and the corresponding Ascii metric files (`afm`) to a temporary directory and rename them according to the Fontname scheme.
- STEP 2: CREATING METRICS AND VIRTUAL FONTS** – We will use fontinst, a font installer that works with Adobe font metric files in Ascii format (`afm`), to generate metric files and virtual fonts. Fontinst is normally not used interactively but controlled by a Tex file. Since the fontinst file is specific to a given font family, we need to write a suitable file for our fonts first and run it through Tex afterwards.
- STEP 3: COMPILING METRICS AND VIRTUAL FONTS** – Fontinst will generate font metrics and virtual fonts in a human-readable format which need to be converted to a machine-readable form afterwards. Hence we run all property list files (`pl`) created by fontinst through `pltotf` to create Tex font metrics (`tfm`) and all virtual property list files (`vpl`) through `vptovf` to create virtual fonts (`vf`) and the corresponding Tex font metrics for them.
- STEP 4: INSTALLING THE FILES** – We install all font metrics (`afm`), Type 1 font outlines (`pfb`), Tex font metrics (`tfm`), virtual fonts (`vf`), and font definition files (`fd`) into the local Tex tree. The remaining files are not required anymore and may be deleted.
- STEP 5: CREATING MAP FILES** – The fonts are now set up for Tex and Latex, but not for DVI and PDF drivers, which are configured separately. We create map files for `dvips`, `pdftex`, and, if a version of `xdvi` with native support for Postscript fonts is available, for `xdvi`. We install the map files and add them to the applications' configuration files.
- STEP 6: UPDATING THE HASH TABLES** – Finally, we run `texhash` to update the file hash tables used by the `kpathsea` search library.

1.1 Renaming the files

Users unfamiliar with fontinst tend to moan when introduced to the Fontname scheme for the first time. This file naming standard, which is also known by the name of its creator as the Karl Berry scheme, is often regarded as overly

complicated, cumbersome, unclear, and unmanageable. And indeed, it will appear somewhat cumbersome to anyone working with an operating system that does not impose silly limits on the lengths of file names. All of that is not the fault of its creator, however, but an inevitable result of the historical need to encode a complete font designation in a string of eight characters in order to cope with the limitations of the DOS filesystem as well as the ISO-9660 filesystem used for data CD-ROMS. The most important asset of the Fontname scheme is that it is the only formalized naming system widely used within the Tex community. Given the large number of files required to integrate a given typeface into a Tex system, installations without formal file naming would quickly get out of control. So, if the next couple of paragraphs should sound a bit cumbersome to you, you are in good company. Rest assured that after installing a few font families and watching your installation grow, you will understand the benefits of this scheme.

In order to understand the basic principles of the Fontname scheme, see the file `fontname.dvi` for an overview as well as excerpts from various map files. Browse the map files of individual vendors for the complete listings. When using the `\latinfamily` macro, strict adherence to the scheme is required. If you write a custom fontinst file using lower-level commands, the naming is technically up to you. It is still a good idea to stick to the naming system where possible. If a given typeface is not included in the map file for the respective foundry, take the foundry code from `supplier.map` and the code of the typeface from `typeface.map`. If the typeface is not listed at all, you will need to create a new code. This should be an unused one if possible. Try handling weight, variant, and encoding codes as strictly as possible. Foundry and typeface codes may be handled more liberally.

For large text font families, most font vendors do not put all fonts in a single package. They usually offer a base package containing upright and italic/oblique fonts plus an advanced package complementing the former. The advanced package will usually contain one of the following additional font sets: a set of optical small caps¹ and hanging figures,² a set of expert fonts,³ additional weights, or a combination of these sets. This package has to be purchased sep-

- 1 'Optical' or 'real' small caps, as opposed to 'mechanical' or 'faked' ones, are special glyphs found in a dedicated small caps font. They are preferable to mechanical small caps since they were actually drawn by the font designer. Mechanical small caps are generated by taking the tall caps of the font and scaling them down.
- 2 While hanging or 'old style' figures have ascenders and descenders to blend in with lowercase and mixed case text, lining figures are aligned with the height of the capital letters (compare 1369 to 1369). Hanging figures are designed for use within mixed case text whereas lining figures are suitable for all uppercase text only. The latter also work well for applications like numbered lists and, since they are usually monospaced, for tabular settings.
- 3 'Expert' fonts are complements to be used in conjunction with regular text fonts. They usually contain optical small caps, additional sets of figures, ligatures as well as some other symbols. Please refer to tutorial v for further information.

arately and can normally not be used independently in a sensible way. We will use Sabon as an example in this tutorial. The Sabon family offered by Adobe is split up into two packages. The base package contains upright and italic fonts (with lining figures) in regular and bold weights, while the so-called `sc & osf` package provides optical small caps and hanging figures. Hanging figures are also known as “old style figures”, hence the name `sc & osf`. In the first and the second tutorial we will deal with the base package only. Adding the `sc & osf` package to the base install will be discussed in the third tutorial. As we receive the package from Adobe or from a vendor, it contains the following files:

```
sar____.afm   sai____.afm   sab____.afm   sabi____.afm
sar____.inf   sai____.inf   sab____.inf   sabi____.inf
sar____.pfb   sai____.pfb   sab____.pfb   sabi____.pfb
sar____.pfm   sai____.pfm   sab____.pfm   sabi____.pfm
```

Of those files, we only need two types: the font metrics in Ascii format (`afm`) and the binary font outlines (`pfb`). We copy these to our working directory to rename them. In this case, finding the proper names is simple because the typeface is listed explicitly in `adobe.map`:

```
psbr8a   Sabon-Roman           A   088   sar____
psbri8a  Sabon-Italic              A   088   sai____
psbb8a   Sabon-Bold                A   088   sab____
psbbi8a  Sabon-BoldItalic          A   088   sabi____
```

The first column indicates the Fontname name and the last column the original name of the files as shipped by the vendor.¹ After renaming, we find the following files in the working directory:

```
psbr8a.afm   psbri8a.afm   psbb8a.afm   psbbi8a.afm
psbr8a.pfb   psbri8a.pfb   psbb8a.pfb   psbbi8a.pfb
```

We can now begin with the installation process.

1.2 Using fontinst

Since writing a `fontinst` file can be quite a time-consuming thing to do, `fontinst` provides a special macro which is able to deal with standard scenarios like this one. You can look up the `\latinfamily` command in the `fontinst` manual to understand what it does in detail. For our situation, it will suffice to say that it is able to recognize the standard fonts we provide by their file name – hence the need for strict adherence to the Fontname scheme in this case. `Fontinst` will create all metric and auxiliary files required by `Latex` without further directions in the form of lower-level commands. Therefore our `fontinst` file is as simple as it can get:

¹ The fourth column may also prove helpful: it indicates the number of the Adobe font package to which this font belongs. This number will save you a lot of time if you are trying to locate updated metric files for a font on Adobe’s FTP server since the files are sorted by package number there.

```

1 \input fontinst.sty
2 \latinfamily{psb}{}
3 \bye

```

After loading `fontinst` (1) we simply call the `\latinfamily` macro with the base of the file names (the foundry code plus the typeface code) as the first argument (2). The second argument is code to be executed whenever this typeface is used. This is often employed to suppress hyphenation of fixed-width typefaces by setting the hyphenation character to a non-existing encoding position. If we wanted to suppress hyphenation for this font family, we would call the macro like this:

```
2 \latinfamily{psb}{\hyphenchar\font=-1}
```

We save the file as `drv-psb.tex`, for example, and run it through `tex`:

```
tex drv-psb.tex
```

The `\latinfamily` macro will create metric files, virtual fonts, and auxiliary files for four different encodings: Tex Base 1, `OT1`, `T1`, and `TS1`. While Tex Base 1 serves as the basis for virtual fonts using other encodings, it is usually not employed as such on the LaTeX level, although `\latinfamily` provides font definition files for the Tex Base 1 encoded fonts as well.

The `OT1` encoding is a 7-bit legacy encoding solely suitable for text using the English alphabet only because it requires the use of composite glyphs when typesetting accented letters. These glyphs are inferior to the native glyphs provided by Postscript fonts. When using `OT1` encoding and typesetting the letter *a* with a grave accent, for example, Tex does not use the real glyph *à* as provided by the font because `OT1` discards all accented letters. This amounts to almost half of the glyphs found in common Postscript fonts. Instead, Tex will use the stand-alone grave accent and move it over the lowercase letter *a* to form a composite glyph. Apart from their inferior typographic quality, composite letters break Tex's hyphenation algorithm so that words containing an accented letter are not hyphenated beyond this letter. Another problem with them is that they break searching for words containing accented letters in PDF files. In short, `OT1` should be considered obsolete unless you need the letters of the English alphabet only. But even in this case, `T1` encoding would be a sound choice.

`T1`, also known as Cork encoding, is a more recent text encoding suitable for a wide range of Latin scripts. Also known as Text Companion encoding, `TS1` complements `T1` by providing additional glyphs such as currency signs and other frequently used symbols like 'copyright' or 'registered'. `TS1` is never used as the main text encoding because it merely contains symbols. A user interface to the glyphs found in `TS1` is provided by the `textcomp` package.

When running the `fontinst` file through `tex`, `fontinst` will write a lot of messages to the terminal. These will include warnings about glyphs not being found, since a few glyphs defined in `OT1` and `T1` encoding are missing from the glyph set of our fonts:

```
(/usr/share/texmf/tex/fontinst/base/ot1.etx
Warning: missing glyph 'dotlessj'.
Warning: missing glyph 'lslashslash'.
```

```
(/usr/share/texmf/tex/fontinst/base/t1.etx
Warning: missing glyph 'perthousandzero'.
Warning: missing glyph 'dotlessj'.
Warning: missing glyph 'Eng'.
Warning: missing glyph 'eng'.
```

These warnings are normal, the missing glyphs are simply not provided by most Postscript fonts. In addition to that, you will most likely be lacking the ligatures ‘ff’, ‘ffi’, and ‘ffl’. This means that they will not be typeset as a single glyph but as a sequence of characters. There is no warning message in this case as fontinst will construct the ligatures using the single-letter glyphs at hand. You will usually find these ligatures in so-called expert fonts which complement the base fonts. Some foundries however, like FontFont, include them in the base fonts. Standard Postscript fonts should always provide the ligatures ‘fi’ and ‘fl’. The situation is worse for T₁ encoding since parts of it are rather exotic, defining glyphs not found in industry-standard fonts such as a ‘copyleft’ symbol, or glyphs which should rather go in a dedicated symbol font such as arrow symbols:

```
(/usr/share/texmf/tex/fontinst/base/ts1.etx
Warning: missing glyph 'arrowleft'.
Warning: missing glyph 'arrowright'.
Warning: missing glyph 'tieaccentlowercase'.
Warning: missing glyph 'tieaccentcapital'.
Warning: missing glyph 'newtieaccentlowercase'.
Warning: missing glyph 'newtieaccentcapital'.
Warning: missing glyph 'blank'.
Warning: missing glyph 'hyphendbl'.
Warning: missing glyph 'zerooldstyle'.
Warning: missing glyph 'oneoldstyle'.
Warning: missing glyph 'twooldstyle'.
Warning: missing glyph 'threeoldstyle'.
Warning: missing glyph 'fouroldstyle'.
Warning: missing glyph 'fiveoldstyle'.
Warning: missing glyph 'sixoldstyle'.
Warning: missing glyph 'sevenoldstyle'.
Warning: missing glyph 'eightoldstyle'.
Warning: missing glyph 'nineoldstyle'.
Warning: missing glyph 'angbracketleft'.
Warning: missing glyph 'angbracketright'.
Warning: missing glyph 'Omegainv'.
Warning: missing glyph 'bigcircle'.
Warning: missing glyph 'Omega'.
Warning: missing glyph 'arrowup'.
Warning: missing glyph 'arrowdown'.
Warning: missing glyph 'born'.
Warning: missing glyph 'divorced'.
Warning: missing glyph 'died'.
Warning: missing glyph 'leaf'.
Warning: missing glyph 'married'.
Warning: missing glyph 'musicalnote'.
```

```

Warning: missing glyph 'hyphendblchar'.
Warning: missing glyph 'dollaroldstyle'.
Warning: missing glyph 'centoldstyle'.
Warning: missing glyph 'colonmonetary'.
Warning: missing glyph 'won'.
Warning: missing glyph 'naira'.
Warning: missing glyph 'guarani'.
Warning: missing glyph 'peso'.
Warning: missing glyph 'lira'.
Warning: missing glyph 'recipe'.
Warning: missing glyph 'interrobang'.
Warning: missing glyph 'interrobangdown'.
Warning: missing glyph 'dong'.
Warning: missing glyph 'pertenthousand'.
Warning: missing glyph 'pilcrow'.
Warning: missing glyph 'baht'.
Warning: missing glyph 'numero'.
Warning: missing glyph 'discount'.
Warning: missing glyph 'estimated'.
Warning: missing glyph 'openbullet'.
Warning: missing glyph 'servicemark'.
Warning: missing glyph 'quillbracketleft'.
Warning: missing glyph 'quillbracketright'.
Warning: missing glyph 'copyleft'.
Warning: missing glyph 'circledP'.
Warning: missing glyph 'referencemark'.
Warning: missing glyph 'radical'.
Warning: missing glyph 'euro'.

```

While this may seem like a long list, it is not unusual when installing fonts not specifically designed for TeX. You will get the most common symbols such as currency signs and other frequently used symbols, and chances are that you are not going to miss the lacking ones. If you want to learn more about these encodings, simply run `fontinst's` encoding vectors through `latex` to get a DVI file containing a commented listing of all the glyphs:

```

latex 8r.etx
latex ot1.etx
latex t1.etx
latex ts1.etx

```

After `fontinst` is finished, we run all property list files (`p1`) through `pltotf` to create TeX font metric files (`tfm`) and all virtual property list files (`vp1`) files through `vptovf` to create virtual fonts (`vf`). When using the Bash shell, this can be done as follows:

```

for file in *.p1; do pltotf $file; done
for file in *.vp1; do vptovf $file; done

```

The generation of TeX font metrics, virtual fonts, and font definition files is now complete.

1.3 Installing the files

The TeX distribution supports a total of three TeX trees: a global one, a local one, and a user tree. The global tree is usually maintained by package man-

agement software. The local tree is for everything that is not part of the Tetex distribution but should be available system-wide. The user tree is for private files of individual users on the system.

Fonts and everything related to them should go in the local tree if you have administrative access on the system. Putting them in the global tree is a bad idea because they might get overwritten when you update Tetex; putting them in a private one will restrict access to them to a single user which is probably not what you want if you have administrative access. It is a good idea to define the variable `$TEXMF` (all trees) in a way that references `$TEXMFLOCAL` (the local tree) before `$TEXMFMAIN` (the global tree). This will allow you to install newer versions of selected packages in the local tree without updating the whole install. I recommend defining `$TEXMF` as follows in `texmf.cnf`:

```
TEXMF = {$HOMETEXMF,!!$TEXMFLOCAL,!!$TEXMFMAIN}
```

This will give you two levels on top of the global install: your local extensions will be preferred over files in the global tree and can in turn be overridden by individual users who put files in their private tree (`$HOMETEXMF`). These settings should go into the global configuration file for the `kpathsea` search library, `texmf.cfg`. For the rest of this section we will assume that we are installing the fonts in the local tree and that its top directory is `/usr/local/share/texmf`. The relevant branches of the local tree are as follows:

```
/usr/local/share/texmf/
/usr/local/share/texmf/dvips/
/usr/local/share/texmf/dvips/config/
/usr/local/share/texmf/fonts/
/usr/local/share/texmf/fonts/afm/
/usr/local/share/texmf/fonts/afm/adobe/
/usr/local/share/texmf/fonts/afm/adobe/sabon/
/usr/local/share/texmf/fonts/tfm/
/usr/local/share/texmf/fonts/tfm/adobe/
/usr/local/share/texmf/fonts/tfm/adobe/sabon/
/usr/local/share/texmf/fonts/type1/
/usr/local/share/texmf/fonts/type1/adobe/
/usr/local/share/texmf/fonts/type1/adobe/sabon/
/usr/local/share/texmf/fonts/vf/
/usr/local/share/texmf/fonts/vf/adobe/
/usr/local/share/texmf/fonts/vf/adobe/sabon/
/usr/local/share/texmf/pdftex/
/usr/local/share/texmf/pdftex/config/
/usr/local/share/texmf/tex/
/usr/local/share/texmf/tex/latex/
/usr/local/share/texmf/tex/latex/adobe/
/usr/local/share/texmf/tex/latex/adobe/sabon/
/usr/local/share/texmf/xdvi/
/usr/local/share/texmf/xdvi/config/
```

The main components of this directory structure are defined by the Tex Directory Structure (TDS),¹ another standard introduced to cope with the large

¹ <http://www.tug.org/tds/>

number of files that make up a typical TeX system. The appropriate locations for the different file types should be more or less obvious. The `fonts/` branch has subdirectories for Ascii font metrics (`afm/`), TeX font metrics (`tfm/`), Type 1 fonts (`type1/`), and virtual fonts (`vf/`). It is customary to create subdirectories for the foundry and for each font family. You can take the names of these subdirectories from the Fontname scheme as well, although this is not a requirement. The standard directory name for the foundry is given in the file `supplier.map`, the standard name for the typeface in `typeface.map`. Here are the relevant lines from both files for Sabon:

```
p adobe      @r{Adobe (@samp{p} for PostScript)}
sb sabon     Sabon b:ClassicalGaramondBT
```

The font description files (`fd`) for LaTeX go in a subdirectory of `tex/latex/`. The exact location is up to you but I recommend using the `foundry/typeface` scheme as well. We do not need the directories `dvips/`, `pdftex/`, and `xdvi/` at this point, but we are going to use them later. Now we create all directories and copy the files into the local tree as follows:

```
cp *.afm /usr/local/share/texmf/fonts/afm/adobe/sabon/
cp *.tfm /usr/local/share/texmf/fonts/tfm/adobe/sabon/
cp *.pfb /usr/local/share/texmf/fonts/type1/adobe/sabon/
cp *.vf  /usr/local/share/texmf/fonts/vf/adobe/sabon/
cp *.fd  /usr/local/share/texmf/tex/latex/adobe/sabon/
```

All files left in the working directory will not be used any more and may be deleted.

1.4 Creating map files

All the files that TeX and LaTeX need in order to use Sabon are now available. At this point we could create a perfectly valid `DVI` file with the right amount of blank space for every glyph – but we would not see a single glyph when looking at a `DVI` preview. Note that TeX itself is completely indifferent to the actual font files. It will only use the metrics in the `tfm` files without accessing the glyph outlines. Rendering or embedding fonts is at the responsibility of the application which displays the `DVI` file or processes it further in order to generate Postscript. `pdftex` is a special case because it combines the roles of TeX and of a PDF driver. All of these applications need to know which fonts to use. This information is provided in ‘map’ files which map font metrics to font outlines. We will deal with the three most popular applications, the Postscript driver `dvips`, the `DVI` viewer `xdvi`, and `pdftex`. All of them need to be provided with a suitable map file. For `dvips`, the syntax of this file is explained in detail in the `dvips` manual.¹ For `pdftex`, it is explained in the `pdftex` manual, and for `xdvi` in the documentation that comes with the source distribution. Fortunately, `xdvi` and `pdftex` are capable of reading `dvips`’s map files to a certain

¹ <http://www.radical-eye.com/dvipsman/>

extent. If written with a little bit of care, dvips, pdftex, and xdvi can share the same map file. This section will explain how to do that.

Let's take a look at the first line of what will become `psb.map`, our map file for Sabon. The first column indicates the name of the raw TeX font without any file extension:

```
psbr8r Sabon-Roman "TeXBase1Encoding ReEncodeFont" <8r.enc <psbr8a.pfb
```

Since the `\latinfamily` macro reencodes all regular text fonts from Adobe Standard encoding (Fontname code 8a) to TeX Base 1 (8r) when creating metric files for TeX, it corresponds to the name of the pfb file with encoding 8r instead of 8a. In this case, `psbr8a.pfb` becomes `psbr8r`.

```
psbr8r Sabon-Roman "TeXBase1Encoding ReEncodeFont" <8r.enc <psbr8a.pfb
```

The second column is the Postscript name of the font. Do not try to guess the right name or copy it from some map file you found somewhere on the web some time ago. If your font is included in one of the foundry-specific lists of the Fontname scheme, the Postscript name is given in the second column of the respective table. If it is not or if you are in doubt, the Postscript name should be taken from the header of the `afm` file for every font. Here are a few lines from `psbr8a.afm`:

```
StartFontMetrics 2.0
Comment Copyright (c) 1989 Adobe Systems Incorporated. All Rights Reserved.
Comment Creation Date:Fri Mar 10 16:47:51 PST 1989
FontName Sabon-Roman
FullName 12 Sabon* Roman 05232
FamilyName Sabon
EncodingScheme AdobeStandardEncoding
```

The relevant part is the line starting with “FontName” – the Postscript name of this font is “Sabon-Roman.” For each font, we copy this name verbatim to `psb.map`.

```
psbr8r Sabon-Roman "TeXBase1Encoding ReEncodeFont" <8r.enc <psbr8a.pfb
```

The third column of our map file is a reencoding instruction. As mentioned above, the `\latinfamily` macro reencodes all fonts from Adobe Standard encoding to TeX Base 1 when creating metric files for TeX. This affects the metrics only, which are defined in the `tfm` files generated by `fontinst`, while the glyph outlines as defined in the `pfb` file still use the font's native encoding. Therefore, we add a reencoding directive to the map file that will instruct all applications dealing with the actual glyph outlines to reencode them accordingly.

```
psbr8r Sabon-Roman "TeXBase1Encoding ReEncodeFont" <8r.enc <psbr8a.pfb
```

Finally, the last column contains a list of files that dvips will embed in the Postscript file. In this case, we need the Postscript encoding vector `8r.enc` for TeX Base 1 encoding and the `pfb` file, since we want the fonts to be embedded in the Postscript file. Now the map file for our basic Sabon set looks like this:

```
psbr8r Sabon-Roman "TeXBase1Encoding ReEncodeFont" <8r.enc <psbr8a.pfb
psbri8r Sabon-Italic "TeXBase1Encoding ReEncodeFont" <8r.enc <psbri8a.pfb
psbb8r Sabon-Bold "TeXBase1Encoding ReEncodeFont" <8r.enc <psbb8a.pfb
psbbi8r Sabon-BoldItalic "TeXBase1Encoding ReEncodeFont" <8r.enc <psbbi8a.pfb
```

In addition to that, we need to tell dvips about the slanted versions of all upright fonts which `\latinfamily` creates by default. We copy the lines for Sabon-Roman and Sabon-Bold and insert `o`, the Fontname code for slanted fonts, after the weight code of the Tex font name; `psbr8r` becomes `psbro8r` and `psbb8r` is changed to `psbbo8r`:

```
psbro8r Sabon-Roman "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbr8a.pfb
psbbo8r Sabon-Bold "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbb8a.pfb
```

Note that the name of the pfb file does *not* change. We also add a “SlantFont” instruction to the third column. By default, `\latinfamily` uses a slant factor of 0.167 when creating the modified metrics and our map file has to indicate this accordingly. Our complete map file looks like this:

```
psbr8r Sabon-Roman "TeXBase1Encoding ReEncodeFont" <8r.enc <psbr8a.pfb
psbri8r Sabon-Italic "TeXBase1Encoding ReEncodeFont" <8r.enc <psbri8a.pfb
psbb8r Sabon-Bold "TeXBase1Encoding ReEncodeFont" <8r.enc <psbb8a.pfb
psbbi8r Sabon-BoldItalic "TeXBase1Encoding ReEncodeFont" <8r.enc <psbbi8a.pfb
psbro8r Sabon-Roman "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbr8a.pfb
psbbo8r Sabon-Bold "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbb8a.pfb
```

The format suggested here is suitable for `xdvi`, `dvips`, and `pdftex`. We copy `psb.map` to the branch `dvips/config/` in the local Tex tree. In order to configure `dvips`, we locate the default configuration file of `dvips` (`config.ps`) in the main Tex tree and copy it to the same location. If the search order for all Tex trees is set up as suggested above, this local copy will now be picked up instead of the global one. We open this file in a text editor, locate the section for map files (lines defining map files begin with a lowercase “p”), and add the new map file so that the updated section looks as follows:

```
% Standard map file provided by default
p +psfonts.map
% New map file for Sabon
p +psb.map
```

The procedure for `pdftex` is similar: the configuration file is called `pdftex.cfg` and map files are marked with the string “map” at the beginning of the line. After copying the file to the branch `pdftex/config` of the local tree and updating it, the relevant section should look similar to the following example:

```
% Standard map file provided by default
map +pdftex.map
% New map file for Sabon
map +psb.map
```

We repeat this step one more time for `xdvi`. The configuration file for `xdvi` is called `xdvi.cfg`, the local branch is `xdvi/config` and lines indicating a map file begin with “`dvipsmap`”:

```
% Map files provided by default
dvipsmap ps2pk.map
dvipsmap ...
% New map file for Sabon
dvipsmap psb.map
```

In addition to that, we have to make sure that an encoding definition for TeX Base 1 encoding is provided as well. The configuration file for xdvi should contain the following line:

```
% Tag   Suffix  Encoding name      Encoding file
enc     8r      TeXBase1Encoding  8r.enc
```

The installation is now finished. Do not forget to update the file hash tables by running `texhash` or an equivalent command!

1.5 Using the fonts

Everything you need to know about using the fonts can be found in the LaTeX font selection guide.¹ The second chapter of this guide documents the standard NFSS commands used to switch fonts under LaTeX. Let's take a look at some examples. To select Sabon at any point in a LaTeX file, we use a command like:

```
\fontfamily{psb}\selectfont
```

Sabon provides two weights which are readily available using compact font selection macros like `\textbf` and `\bfseries`. Larger font families may offer more than two weights. To select a particular weight, we use the `\fontseries` command in conjunction with the NFSS series codes defined during the installation of the font family. Please refer to the code table on page 84 of this guide for a list of the most common NFSS codes. To select the semibold (sb) weight for example, we would use the following construct:

```
\fontseries{sb}\selectfont
```

Compact font switching macros such as `\mdseries` and `\bfseries` do not switch to a fixed NFSS font series, they use `\mddefault` and `\bfdefault` for the regular and bold weight respectively. If we want to use semibold as the default bold weight, for example, we simply redefine `\bfdefault` accordingly:

```
\renewcommand*{\bfdefault}{sb}
```

In order to use Sabon as the default roman typeface for the whole document, we redefine `\rmdefault` in the preamble:

```
\renewcommand*{\rmdefault}{psb}
```

It is much more convenient to put the initialization of the font family into a dedicated style file (sty), though. Our file `sabon.sty` might look like this:

```
1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{sabon}[2002/04/17 v1.0 Adobe Sabon]
```

¹ <http://www.ctan.org/tex-archive/macros/latex/doc/fntguide.pdf>

```

3 \RequirePackage[T1]{fontenc}
4 \RequirePackage{textcomp}
5 \renewcommand*{\rmdefault}{psb}
6 \endinput

```

Essentially, we redefine `\rmdefault` in order to use Sabon as the default roman typeface for the whole document. In addition to that, we load the `fontenc` package and switch to `T1` encoding, which is more appropriate for Postscript fonts than the `OT1` encoding used by default. We also load the `textcomp` package which provides a user interface for the symbols found in `TS1` encoding. This will allow us to access symbols such as ‘copyright’ or ‘registered’. If the `textcomp` package is used in conjunction with `inputenc`, it is even possible to enter most of these symbols directly in a Latex file.

There is one thing we have to keep in mind when switching to `T1` encoding. The default encoding is a global setting that applies to all text fonts used in a Latex file, unless the encoding is reset explicitly using the `NFSS` macro `\fontencoding`. It will affect the font family defined as `\rmdefault`, but also the families set up as `\sfdefault` and `\ttdefault`. By default, these are Computer Modern Sans Serif (`cmss`) and Computer Modern Typewriter (`cmtt`). Using these fonts in conjunction with `T1` encoding will pose some problems most European Tex users are already well familiar with. It is perfectly possible, provided that we use a suitable version of the Computer Modern fonts. Choosing a suitable version, however, can be quite difficult. We will discuss some typical issues related to that in the following section. Alternatively, we could use other `T1` encoded sans serif and typewriter typefaces available in Postscript format. For example, here is an enhanced version of `sabon.sty` using Helvetica (`phv`) and Courier (`pcr`):

```

1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{sabon}[2002/04/17 v1.0 Adobe Sabon with PS fonts]
3 \RequirePackage[T1]{fontenc}
4 \RequirePackage{textcomp}
5 \renewcommand*{\rmdefault}{psb}
6 \renewcommand*{\sfdefault}{phv}
7 \renewcommand*{\ttdefault}{pcr}
8 \endinput

```

This setup is certainly not the most fortunate one in terms of typography, but it should be safe from a technical perspective. Helvetica and Courier are part of the Postscript base fonts built into every Level 2 Postscript device. Most Tex distributions do not ship with the original versions of these fonts but they provide suitable replacements for them. For our setup of Sabon, the next section is only relevant if you want to use Computer Modern Sans Serif and Computer Modern Typewriter in conjunction with Sabon. If you deploy different `T1` encoded sans serif and typewriter typefaces, which are available in Postscript format, all you need to do is redefine `\sffamily` and `\ttfamily` in `sabon.sty` or in the preamble of the respective Latex file as shown above for Helvetica and Courier.

1.6 Computer Modern and T1 encoding

The Computer Modern fonts designed for T1 and TS1 encoding are called EC and TC fonts respectively, together known as European Computer Modern. When switching to T1 encoding, we implicitly switch to these fonts. Note that European Computer Modern, while being derived from Donald Knuth's original Computer Modern typefaces, is not simply a T1 encoded drop-in replacement. Over the years it has evolved into an independent typeface. The additional fonts created for the European Computer Modern family have been subject to debate based on their design. Some of them are considered to be typographically inferior to the original designs. From a technical perspective, the problem with the European Computer Modern fonts is that, historically, they have been available in Metafont format only. This implies that Postscript and PDF files will contain bitmap representations of these fonts when we switch to T1 encoding. Bitmap fonts, however, have a fixed resolution and so are not independent of the output device. They are not suitable for on-screen display and a major inconvenience for every print shop, if they are tolerated at all.

Donald Knuth had designed the Computer Modern fonts in Metafont format and with OT1 encoding in mind. Blue Sky Research and Y&Y developed Postscript versions of these fonts later, which were donated to the public in 1997 and have been shipping with most TeX distributions ever since. While these fonts work fine for Postscript and PDF files, they are not suitable for tasks requiring letters not found in the English alphabet because their glyph base is still restricted to OT1 encoding. Jörg Knappen's European Computer Modern fonts address this issue by providing a more comprehensive set of glyphs, but they have in turn been subject to the limitations of Metafont. In the following, I will briefly introduce several solutions which try to address these problems. Most of them are trade-offs in one way or another. Tables 1 and 2 try to provide an overview of the major design variations over the Computer Modern theme along with their implementations. The tables are by no means exhaustive, there are even more fonts derived from the original Computer Modern typefaces.

To work around the hyphenation problem of OT1 encoding while sticking to the original Computer Modern fonts, there is a choice of two packages on CTAN which provide T1 encoded virtual fonts based on the original Computer Modern family of fonts: the AE¹ and the ZE² fonts. The AE fonts are built on top of Computer Modern exclusively, but unfortunately they lack almost a dozen T1 characters including the French double and single guillemets, which makes their default setup unsuitable for all French and a lot of German texts. For Computer Modern Typewriter, the situation is even worse. There is a supplemental package called `aecompl` which adds Metafont versions of the missing characters, but that again brings up the problem we were trying to avoid in the first

1 <http://www.ctan.org/tex-archive/fonts/ae/>

2 <http://www.ctan.org/tex-archive/fonts/zefonts/>

TYPEFACE	FONTS	
	NAME	FORMAT
Computer Modern	CM	Metafont
	CM, Blue Sky	Postscript
	CM, Bakoma	Postscript
	AE	virtual fonts
	ZE	virtual fonts
European Computer Modern	EC & TC	Metafont
	EC & TC, Micropress	Postscript
	Tt2001	Postscript
	CM-super	Postscript
Latin Modern	LM	Postscript
European Modern	EM	Postscript

TABLE 1: Computer Modern, fonts and formats

place. A different complement called `aeguill`¹ at least adds Postscript versions of the guillemets. An enhanced version of `sabon.sty` might then look like this:

```

1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{sabon}[2002/04/17 v1.0 Adobe Sabon with AE]
3 \RequirePackage[T1]{fontenc}
4 \RequirePackage{textcomp}
5 \RequirePackage{ae}
6 \RequirePackage{aeguill}
7 \renewcommand*{\rmdefault}{psb}
8 \endinput

```

The ZE fonts take a different approach to work around this problem: the missing characters are taken from standard Postscript fonts such as Times and Helvetica. This means that there will be some typographical inconsistencies, but we are safe from a technical point of view. While the AE fonts and the corresponding supplemental packages ship with most Tex distributions, you might need to download the ZE fonts from CTAN. When using the ZE fonts, our enhanced version of `sabon.sty` would look like this:

```

1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{sabon}[2002/04/17 v1.0 Adobe Sabon with ZE]
3 \RequirePackage[T1]{fontenc}
4 \RequirePackage{textcomp}
5 \RequirePackage{zefonts}
6 \renewcommand*{\rmdefault}{psb}
7 \endinput

```

There is a more robust solution you might be interested in if you require T1 encoded Computer Modern fonts. Free Postscript versions of the European Computer Modern fonts have been made available, although they might not have made their way into every Tex distribution yet. As mentioned before, one prob-

¹ <http://www.ctan.org/tex-archive/macros/latex/contrib/supported/aeguill/>

FONTS	ENCODING	
	NATIVE	SUPPORTED
CM	OT1	OT1
CM, Blue Sky	OT1	OT1
CM, Bakoma	font specific	OT1
AE	OT1	T1, with composite glyphs
ZE	OT1	T1, with composite glyphs
EC, TC	T1, TS1	T1, TS1
CM-super	8a	T1, TS1, T2A, T2B, T2C, X2
LM	font specific	T1, TS1, LY1, QX1

TABLE 2: Computer Modern, fonts and encodings

lem with OT1 encoded fonts is that they rely on composite glyphs which break searching for words containing accented letters in PDF files. Both the AE and the ZE fonts, although they enable Tex to hyphenate words containing accented letters properly, still suffer from this particular problem as they are based on OT1 encoded fonts internally. It is highly advisable to switch to a real T1 version of the Computer Modern fonts in Postscript format. Such fonts are included in two independent packages: Péter Szabó's Tt2001¹ as well as Vladimir Volovich's more recent CM-super² package. Both packages include Postscript fonts which are traced and post-processed conversions of their Metafont counterparts.

Unless you know that a specific font you need is provided by the Tt2001 package only, go with the more advanced CM-super package which will bring you as close to a real solution as you can possibly get when using free versions of the European Computer Modern fonts. Note, however, that it is a rather large download. Since it includes a huge number of fonts, the compressed package is about 64 MB in size. The CM-super fonts use Adobe Standard as their native encoding, but the glyph set provided by these fonts includes Cyrillic letters as well. In addition to T1 and TS1, CM-super supports the Cyrillic encodings T2A, T2B, T2C, and X2. See the package documentation for installation instructions and answers to the most frequently asked questions. Here is a version of our style file for use in conjunction with CM-super:

```

1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{sabon}[2002/04/17 v1.0 Adobe Sabon with CM-Super]
3 \RequirePackage[T1]{fontenc}
4 \RequirePackage{textcomp}
5 \RequirePackage{typelec}
6 \renewcommand*\rmdefault{psb}
7 \endinput

```

Recently, yet another new implementation of Computer Modern has been re-

1 <http://www.ctan.org/tex-archive/fonts/ps-type1/ec/>
2 <http://www.ctan.org/tex-archive/fonts/ps-type1/cm-super/>

leased to the public, the promising Latin Modern fonts created by Bogusław Jackowski and Janusz M. Nowacki. Unlike Tt2001 and cm-super, Latin Modern is derived from the original Computer Modern designs and augmented with accented letters as well as other glyphs missing from the very restricted glyph base of the original fonts. While the Latin Modern fonts are younger than European Computer Modern, they are a parallel development from a systematic perspective. Consequently, they are not affected by the controversial design decisions underlying certain parts of the European Computer Modern family of fonts. They use a font specific encoding by default and feature a glyph base suitable for T1, TS1, LY1 as well as the Polish encoding QX1. Even though these fonts are still under development, they are already perfectly usable as of this writing. Here is yet another iteration of our style file for Sabon, combined with Latin Modern for the sans serif and typewriter families:

```
1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{sabon}[2003/07/27 v1.0 Adobe Sabon with LM]
3 \RequirePackage[T1]{fontenc}
4 \RequirePackage{textcomp}
5 \RequirePackage{lmodern}
6 \renewcommand*\rmdefault{psb}
7 \endinput
```

Apart from these free fonts, there are also commercial offerings from Y&Y¹ and Micropress.² Judging by the vendors' websites, Micropress offers Postscript versions of European Computer Modern while the European Modern fonts by Y&Y are augmented Postscript versions of the original Computer Modern typefaces. Please refer to the respective website for details and pricing. Since I have never used any of these fonts, I cannot comment on their quality or on any possible shortcomings.

1 <http://www.yandy.com/em.htm>

2 <http://www.micropress-inc.com/fonts/ecfonts/ecmain.htm>

TUTORIAL II

STANDARD FONT SETS

While the `\latinfamily` shorthand is very convenient, it is not capable of coping with complex installation scenarios. Sooner or later you will probably have more specific requirements or simply desire more control over the basics. This will require using lower-level fontinst commands in most cases.

II.1 The fontinst file

In this tutorial, we will essentially repeat the scenario discussed in the previous one. This time, however, we will employ lower-level commands. The verbose file introduced here will also serve as a template for subsequent tutorials.

```
1 \input fontinst.sty
2 \substitutesilent{bx}{b}
```

After loading fontinst we set up an alias that will suppress a warning when the respective font is substituted. Why would we want to set up this particular alias? Note that `bx` is the NFSS code of the ‘bold extended’ series. The LaTeX macros `\textbf` and `\bfseries` do not switch to a fixed series, they use `\bfdefault` instead which is set to `bx` by default. As long as you are using the Computer Modern fonts this is fine since they actually include bold extended fonts. For font families which do not, however, using these macros would result in a warning. To avoid that, you would need to redefine `\bfdefault` to a suitable weight. The problem here is that `\bfdefault` is a global setting applying to all of LaTeX’s font families (`\rmdefault`, `\sfdefault`, and `\ttdefault`), but it is not safe to assume that all of them will offer the same weights. To avoid any need to redefine `\bfdefault` unless we really want to, we set up an alias so that every request for ‘bold extended’ (`bx`) is substituted by ‘bold’ (`b`).¹ Unless bold extended fonts are available, simply think of `bx` as the default bold weight.

The standard weight is selected by LaTeX in a similar way. The relevant macro is called `\mddefault` and defaults to `m`. Make sure that the NFSS series `m` is always defined, either mapped to actual fonts or as a substitution. In this case our font family provides regular-weight fonts so we will simply use them for the `m` series. Some font families, however, are based on the main weights ‘light’ and ‘demibold’ instead of ‘regular’ and ‘bold’. In this case, we would either just map these weights to the `m` and `b` series directly or use the proper NFSS series codes (`l` and `db`) plus the following substitutions:

```
\substitutesilent{m}{l}
\substitutesilent{bx}{db}
```

¹ This is a default substitution that fontinst will always silently include. We could omit line 2 here, but if semibold fonts are available you might prefer using those as a substitute for `bx`.

Again, think of `m` as the default weight if regular-weight fonts are not available. Every font family should provide mappings for the NFSS series `m` and `bx` in the font definition file. If fonts matching these series exactly are not available, use substitutions to ensure that the defaults for `\mddefault` and `\bfdefault` will work without user intervention. Since `\mddefault` and `\bfdefault` are overall settings applying to all of LaTeX’s families, redefining them explicitly may cause problems. Doing so should be an option, not a requirement.

3 `\substitutesilent{sc}{n}`

We also add a substitution for the `sc` shape, which will in fact be used by the `TS1` encoded families only. Since `TS1` contains symbols and figures, we do not need an additional small caps font for this encoding as it would be identical to the upright variant anyway. However, to ensure that all text commands of the `textcomp` package will always work, even if the active NFSS shape is `sc`, we set up this shape substitution.

4 `\setint{smallcapsscale}{800}`

The basic Sabon set we are dealing with offers upright and italic fonts but no optical small caps. As a substitute, `fontinst` is capable of transparently generating so-called ‘mechanical’ or ‘faked’ small caps – as opposed to ‘optical’ or ‘real’ small caps which are actual glyphs found in a dedicated small caps font. Mechanical small caps are generated by taking the tall caps of the font and scaling them by a certain factor: 1000 means full size, 800 means 0.8. Since Type 1 fonts scale linearly, scaling down tall caps implies that they will appear lighter than the corresponding lowercase glyphs, thus disturbing the color of the page. However, if they are too tall they do not mix well with the lowercase alphabet.

Optical small caps match the ‘x-height’ of the font. This is the height of the lowercase alphabet without ascenders and descenders. They blend in seamlessly with lowercase and mixed case text. Depending on the typeface, this usually corresponds to a value in the range of 650–750. If you scale down tall caps so that they match the x-height of the font, they will appear too light in running text. Finding a suitable value for this is obviously a trade-off. We are going to use `fontinst`’s default setting of 800 here but you might want to experiment with a value in the range of 750–800. For serious applications of small caps we would need optical small caps, provided in a dedicated small caps or in an expert font. For details on small caps and expert sets, please refer to tutorial III and `v` respectively.

5 `\setint{slant}{167}`

The integer variable `smallcapsscale` is a predefined variable used by `fontinst`’s encoding vectors. We could use it in conjunction with `\latinfamily` as well. The variable `slant` is specific to our `fontinst` file. We define it for convenience so that we can set the slant factor for all subsequent font transformations globally. The slant factor defines how much the glyphs slope to the right. It is a real

number equivalent to the tangent of the slant angle. Fontinst represents this number as an integer though, so we have to multiply the tangent by 1000. The value 167 ($\sim 9.5^\circ$) is a reasonable default. Any value significantly greater than 176 ($\sim 10^\circ$) is usually too much.¹

```
6 \transformfont{psbr8r}{\reencodefont{8r}{\fromafm{psbr8a}}}
7 \transformfont{psbri8r}{\reencodefont{8r}{\fromafm{psbri8a}}}
8 \transformfont{psbb8r}{\reencodefont{8r}{\fromafm{psbb8a}}}
9 \transformfont{psbbi8r}{\reencodefont{8r}{\fromafm{psbbi8a}}}
```

We start off with some basic font transformations: all fonts are reencoded from Adobe Standard (Fontname code 8a) to Tex Base 1 encoding (8r). Please refer to the fontinst manual for an explanation of the syntax of the individual commands used here and in the following.

```
10 \transformfont{psbro8r}{\slantfont{\int{slant}}\reencodefont{8r}{\fromafm{psbr8a}}}
11 \transformfont{psbbo8r}{\slantfont{\int{slant}}\reencodefont{8r}{\fromafm{psbb8a}}}
```

Like the `\latinfamily` shorthand, our fontinst file should create slanted fonts as well. These need to be reencoded and, well, slanted. We are using the `slant` variable defined in line 5 to set the slant factor. The raw, Tex Base 1 encoded fonts are now prepared for the generation of virtual fonts.

```
12 \installfonts
13 \installfamily{T1}{psb}{}
14 \installfamily{TS1}{psb}{}

```

The installation of a font family is enclosed in an environment which we open in line 12 and close later in line 29. First of all, the font family we are about to install has to be declared: we have Adobe Sabon and we are going to install it in T1 encoding (Fontname code 8t) as well as in TS1 (8c). The third argument to `\installfamily` corresponds to the second one of the `\latinfamily` command: it is used to include code in the font definition file that will be read by LaTeX whenever the font is selected. T1 will serve as our base encoding in LaTeX's text mode later. It is complemented by TS1 which provides additional glyphs such as currency signs and other frequently used symbols. The `\latinfamily` command also provides OT1 (7t) and Tex Base 1 encoded fonts. We will omit both encodings here as we do not need them. While raw Tex Base 1 encoded fonts (8r) form the basis of all virtual fonts, they are usually not deployed as such on the Tex level, and the OT1 encoding is not suitable for Postscript fonts anyway. We will therefore deliberately ignore it and focus on T1 and TS1 exclusively.

```
15 \installfont{psbr8t}{psbr8r,latin}{t1}{T1}{psb}{m}{n}{}

```

¹ I suggest you do not bother trying to match the slope of the italic fonts when creating a slanted variant of a roman font. This will usually not work for typefaces with true italics because the latter are an independent design.

To create the individual virtual fonts, we use fontinst's `\installfont` command. The first argument to `\installfont` is the virtual font we are going to create, the second one is a list of files used to build this font. These can be `afm`, `mtx`, or `pl` files, their extension is omitted. If multiple fonts are provided, `\installfont` does not overwrite any encoding positions when reading in additional files, it simply fills vacant slots if it finds suitable glyphs in the next font. The metric file `latin.mtx` is an auxiliary file provided by fontinst which should always be read when creating OT1 or T1 encoded text fonts. The third argument is the file name of an encoding vector without the file extension, in this case `t1.etx`. The remaining arguments are written verbatim to the font definition file and declare the respective font in a format that the Latex font selection scheme (NFSS) can process: T1 encoding, Adobe Sabon¹, medium², normal (that is, upright or roman). The last argument is only relevant if fonts with different design sizes are available. It is empty for linearly scaled fonts.

```
16 \installfont{psbrc8t}{psbr8r,latin}{t1c}{T1}{psb}{m}{sc}{}

```

The small caps font is slightly different. Since we do not have any Type 1 font containing optical small caps we need to 'fake' them by scaling the uppercase alphabet and putting the scaled glyphs in the encoding positions of the lowercase alphabet. Fortunately, we do not have to deal with the actual low-level glyph scaling. We simply load `t1c.etx`, a special encoding vector which will take care of that, using the value of `smallcapsscale` as the scale factor.

```
17 \installfont{psbro8t}{psbro8r,latin}{t1}{T1}{psb}{m}{s1}{}
18 \installfont{psbri8t}{psbri8r,latin}{t1}{T1}{psb}{m}{it}{}

```

Since the slanting was already performed on the raw fonts, the virtual slanted and the italic fonts are handled just like the upright ones. Now all regular fonts are done and we can repeat this part (15–18) for the bold fonts:

```
19 \installfont{psbb8t}{psbb8r,latin}{t1}{T1}{psb}{b}{n}{}
20 \installfont{psbbc8t}{psbb8r,latin}{t1c}{T1}{psb}{b}{sc}{}
21 \installfont{psbbo8t}{psbbo8r,latin}{t1}{T1}{psb}{b}{s1}{}
22 \installfont{psbbi8t}{psbbi8r,latin}{t1}{T1}{psb}{b}{it}{}

```

After that, we add virtual fonts for TS1 encoding:

```
23 \installfont{psbr8c}{psbr8r,textcomp}{ts1}{TS1}{psb}{m}{n}{}

```

Like `latin.mtx`, `textcomp.mtx` is an auxiliary metric file provided by fontinst. It should always be added when creating TS1 encoded fonts for the `textcomp` package. The third argument, the encoding vector, refers to `ts1.etx` in this case. As TS1 encoding is for symbols only and we did set up a shape substitution, we do not need a TS1 encoded small caps font. Slanted and italic fonts are handled like the upright one:

- 1 Latex does not really care about the name of the font or the foundry. This argument simply defines the code that identifies the font within the NFSS.
- 2 In fact, the more appropriate name would be *regular* because *medium* is a moderate bold weight with the NFSS code `mb`.

```

24 \installfont{psbro8c}{psbro8r,textcomp}{ts1}{TS1}{psb}{m}{s1}{}
25 \installfont{psbri8c}{psbri8r,textcomp}{ts1}{TS1}{psb}{m}{it}{}

```

We repeat 23–25 for the bold fonts:

```

26 \installfont{psbb8c}{psbb8r,textcomp}{ts1}{TS1}{psb}{b}{n}{}
27 \installfont{psbbo8c}{psbbo8r,textcomp}{ts1}{TS1}{psb}{b}{s1}{}
28 \installfont{psbbi8c}{psbbi8r,textcomp}{ts1}{TS1}{psb}{b}{it}{}

```

Finally, we close the install environment and terminate:

```

29 \endinstallfonts
30 \bye

```

11.2 The *latinfamily* macro revisited

Note that our fontinst file is not strictly equivalent to the `\latinfamily` macro but rather stripped down to the most useful parts with respect to typical Postscript fonts. Essentially, we did not create any font description files for the raw Tex Base 1 encoded fonts and we dropped OT1 encoding. If you are curious, you should be able to reconstruct all the steps taken by `\latinfamily` when looking at the log file created by fontinst while keeping our file in mind. Here are the relevant lines from the log file after running `\latinfamily` on the basic Sabon set. Only lines beginning with “INFO> run” are relevant in this context as they indicate lower-level macros used by `\latinfamily`:

```

INFO> run \transformfont <psbr8r> from <psbr8a>
INFO> run \installrawfont <psbr8r><psbr8r,8r><8r><8r><psb><m><n>
INFO> run \installfont <psbr7t><psbr8r,latin><OT1><OT1><psb><m><n>
INFO> run \installfont <psbr8t><psbr8r,latin><T1><T1><psb><m><n>
INFO> run \installfont <psbr8c><psbr8r,textcomp><TS1><TS1><psb><m><n>
INFO> run \installfont <psbrc7t><psbr8r,latin><OT1c><OT1c><psb><m><sc>
INFO> run \installfont <psbrc8t><psbr8r,latin><T1c><T1c><psb><m><sc>
INFO> run \transformfont <psbro8r> from <psbr8r> (faking oblique)
INFO> run \installrawfont <psbro8r><psbro8r,8r><8r><8r><psb><m><s1>
INFO> run \installfont <psbro7t><psbro8r,latin><OT1><OT1><psb><m><s1>
INFO> run \installfont <psbro8t><psbro8r,latin><T1><T1><psb><m><s1>
INFO> run \installfont <psbro8c><psbro8r,textcomp><TS1><TS1><psb><m><s1>
INFO> run \transformfont <psbri8r> from <psbri8a>
INFO> run \installrawfont <psbri8r><psbri8r,8r><8r><8r><psb><m><it>
INFO> run \installfont <psbri7t><psbri8r,latin><OT1i><OT1i><psb><m><it>
INFO> run \installfont <psbri8t><psbri8r,latin><T1i><T1i><psb><m><it>
INFO> run \installfont <psbri8c><psbri8r,textcomp><TS1i><TS1i><psb><m><it>
INFO> run \transformfont <psbb8r> from <psbb8a>
INFO> run \installrawfont <psbb8r><psbb8r,8r><8r><8r><psb><b><n>
INFO> run \installfont <psbb7t><psbb8r,latin><OT1><OT1><psb><b><n>
INFO> run \installfont <psbb8t><psbb8r,latin><T1><T1><psb><b><n>
INFO> run \installfont <psbb8c><psbb8r,textcomp><TS1><TS1><psb><b><n>
INFO> run \installfont <psbbc7t><psbb8r,latin><OT1c><OT1c><psb><b><sc>
INFO> run \installfont <psbbc8t><psbb8r,latin><T1c><T1c><psb><b><sc>
INFO> run \transformfont <psbbo8r> from <psbb8r> (faking oblique)
INFO> run \installrawfont <psbbo8r><psbbo8r,8r><8r><8r><psb><b><s1>
INFO> run \installfont <psbbo7t><psbbo8r,latin><OT1><OT1><psb><b><s1>
INFO> run \installfont <psbbo8t><psbbo8r,latin><T1><T1><psb><b><s1>
INFO> run \installfont <psbbo8c><psbbo8r,textcomp><TS1><TS1><psb><b><s1>
INFO> run \transformfont <psbbi8r> from <psbbi8a>

```

```
INFO> run \installrawfont <psbbi8r><psbbi8r,8r><8r><8r><psb><b><it>
INFO> run \installfont <psbbi7t><psbbi8r,latin><OT1i><OT1><psb><b><it>
INFO> run \installfont <psbbi8t><psbbi8r,latin><T1i><T1><psb><b><it>
INFO> run \installfont <psbbi8c><psbbi8r,textcomp><TS1i><TS1><psb><b><it>
```

This listing is a complete summary of what the `\latinfamily` macro does in this case, broken down into lower-level commands. The order of the commands differs slightly from our file, because the `\transformfont` calls are not grouped at the beginning but rather used ‘on demand’ for each shape. This difference is irrelevant from a technical point of view. `\transformfont` must obviously be called before `\installfont` or `\installrawfont` tries to use the transformed fonts, but the exact location does not matter. Since we did not create any font description files for Tex Base 1 encoding, we did not use the `\installrawfont` macro in our fontinst file. This macro does not build a virtual font but rather sets up a raw, Tex Base 1 encoded font for use under Latex.

Here are some crucial points we would have to keep in mind when writing a fontinst file that does exactly what `\latinfamily` would do: the macro `\installrawfont` is used in conjunction with `8r.mtx` instead of `latin.mtx`, the encoding file is obviously `8r.etx` in this case. Creating OT1 encoded virtual fonts requires `latin.mtx` and `ot1.etx`. You will also notice that, in addition to `ot1c.etx` and `t1c.etx`, fontinst used encoding files like `ot1i.etx` and `t1i.etx` when creating italic virtual fonts. For T1 encoding, `t1.etx` and `t1i.etx` are equivalent because `t1i.etx` reads `t1.etx` internally, hence we did not use `t1i.etx` in our fontinst file. The situation is the same with `ts1.etx` and `ts1i.etx`. For OT1 encoding, however, the difference is crucial because this encoding differs depending on the shape: the upright shape features a dollar symbol while the italic shape puts an italic pound symbol in the slot of the dollar. This is yet another idiosyncrasy of OT1.

11.3 Map files revisited

With all of that in mind, let’s now go back to the dvips map file from the first tutorial and take another look at it. The meaning of the reencoding and slanting instructions should be much clearer now:

```
psbr8r Sabon-Roman "TeXBase1Encoding ReEncodeFont" <8r.enc <psbr8a.pfb
psbri8r Sabon-Italic "TeXBase1Encoding ReEncodeFont" <8r.enc <psbri8a.pfb
psbb8r Sabon-Bold "TeXBase1Encoding ReEncodeFont" <8r.enc <psbb8a.pfb
psbbi8r Sabon-BoldItalic "TeXBase1Encoding ReEncodeFont" <8r.enc <psbbi8a.pfb
psbro8r Sabon-Roman "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbr8a.pfb
psbbo8r Sabon-Bold "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbb8a.pfb
```

Note that the T1 and TS1 encodings are used for the virtual fonts only, they are what Tex will work with. A Postscript file created by dvips, however, does not contain any virtual fonts. They will have been resolved into the raw fonts they are based on by dvips. The raw fonts used to build virtual ones were reencoded to Tex Base 1 encoding during the installation. But this reencoding step affects the font metrics only while the pfb files embedded in the Postscript code still

use Adobe Standard as their native encoding. Therefore every application reading the final file has to repeat the reencoding step for the font outlines before rendering the fonts. This is what the “ReEncodeFont” instruction is all about. Since we cannot expect every application to know about Tex Base 1 encoding, we embed the respective encoding vector (8r.enc) along with the fonts. Compare the first `\transformfont` command in the fontinst file to the first line of the map file:

```
\transformfont{psbr8r}          {\reencodefont{8r}          {\fromafm{psbr8a}}}
                               psbr8r Sabon-Roman "TeXBase1Encoding ReEncodeFont" <8r.enc          <psbr8a.pfb
```

The situation is similar for the slanted fonts. The font files embedded in the Postscript file are not slanted, they are upright. Fontinst has performed the slanting for the font metrics only, it does not touch the font outlines at all. The slanting of the glyph outlines will be performed by a Postscript printer or an interpreter like Ghostscript. After resolving the virtual fonts, all that dvips does as far as the raw fonts are concerned is reading the files listed in `psb.map` and embedding them along with the “SlantFont” instruction. The transformation of the glyph outlines takes place when the Postscript code is rendered on screen or on paper. Both “ReEncodeFont” and “SlantFont” are instructions for the application finally performing the rendering. The value of the “SlantFont” instruction has to correspond to the slant factor used in the fontinst file. As mentioned above, fontinst’s representation of the slant factor is slightly different. The value used in the map file is a real number corresponding to fontinst’s (integer) slant factor divided by 1000. That’s why its precision is fixed to three decimal places. Let’s compare a line of the map file to the corresponding line of the fontinst file:

```
\transformfont{psbro8r}{\slantfont{167}\reencodefont{8r}{\fromafm{psbr8a}}}
psbro8r Sabon-Roman "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbr8a.pfb
```

Essentially, think of map files as a way of recording all encoding and shape modifications applied to the font metrics during the installation, so that they can be repeated for the font outlines when the final Postscript file is displayed or printed. This information is required for the raw fonts only because all the information concerning the virtual fonts is contained in the virtual font files. When using DVI or PDF as the final output format, the division of labor between the various tools involved differs since pdftex combines the roles of Tex and dvips, while DVI viewers deal with both the virtual fonts and the rendering of the font outlines on screen. The principle, however, remains the same. Therefore pdftex and xdvi require map files as well.

TUTORIAL III

OPTICAL SMALL CAPS AND HANGING FIGURES

When choosing a new typeface, bear in mind that optical small caps and hanging figures are not available for all commercial Postscript fonts. If they are available for a certain typeface, they are usually provided separately, either in a `sc & osf` or in an expert font package. We will deal with the former case in this tutorial, the latter will be discussed in tutorial v. Suppose we have acquired the Sabon `sc & osf` package to complement our base install of Sabon. This package provides four additional fonts: a regular `sc & osf`, an italic `osf`, a bold `osf`, and a bold italic `osf` font. These fonts will provide us with hanging figures for all shapes in both weights. Small caps are available for the regular weight only; we will still have to make do with mechanical small caps for the bold weight. Adobe does not include a separate regular-weight upright `osf` font. The respective figures are to be found in the small caps font instead. Our original file set looks like this:

```

sar____.afm   sai____.afm   sab____.afm   sabi____.afm
sar____.inf   sai____.inf   sab____.inf   sabi____.inf
sar____.pfb   sai____.pfb   sab____.pfb   sabi____.pfb
sar____.pfm   sai____.pfm   sab____.pfm   sabi____.pfm

sarsc__.afm   saiof__.afm   sabof__.afm   sabio__.afm
sarsc__.inf   saiof__.inf   sabof__.inf   sabio__.inf
sarsc__.pfb   saiof__.pfb   sabof__.pfb   sabio__.pfb
sarsc__.pfm   saiof__.pfm   sabof__.pfm   sabio__.pfm

```

After renaming and choosing the required files, we could start off with the following set of files:

```

psbr8a.afm   psbri8a.afm   psbb8a.afm   psbbi8a.afm
psbr8a.pfb   psbri8a.pfb   psbb8a.pfb   psbbi8a.pfb

psbrc8a.afm  psbrij8a.afm  psbbj8a.afm  psbbij8a.afm
psbrc8a.pfb  psbrij8a.pfb  psbbj8a.pfb  psbbij8a.pfb

```

But before we begin, let's take a closer look at the encoding of the fonts. We will have to deal with some peculiarities characteristic for typical `sc & osf` sets. Taking a look at `psbr8a.afm`, you will see that in Adobe Standard encoding, which is the native encoding of all fonts of the Sabon family, the figures are encoded as “zero”, “one”, “two” etc.:

```

C 48 ; WX 556 ; N zero ; B 52 -15 504 705 ;
C 49 ; WX 556 ; N one ; B 91 0 449 705 ;
C 50 ; WX 556 ; N two ; B 23 0 507 705 ;

```

Compare that to the glyph names of figures in an expert font:

```

C 48 ; WX 511 ; N zerooldstyle ; B 40 -14 480 436 ;
C 49 ; WX 328 ; N oneoldstyle ; B 35 -3 294 425 ;
C 50 ; WX 440 ; N twooldstyle ; B 44 -3 427 436 ;

```

The different glyph names are appropriate because regular Postscript fonts usually come with lining figures by default while expert fonts feature hanging (‘old style’) figures amongst other things. Now let’s take a look at `psbrc8a.afm`:

```
C 48 ; WX 556 ; N zero ; B 41 -15 515 457 ;
C 49 ; WX 556 ; N one ; B 108 0 448 442 ;
C 50 ; WX 556 ; N two ; B 72 0 512 457 ;
```

When comparing these glyph names to the actual outlines in `psbrc8a.pfb`,¹ we would see that this font in fact comes with hanging (‘old style’) figures even though the figures are labeled using the standard names. This is the case with all OSF fonts included in the `sc & OSF` package. The reason why this complicates the installation procedure will become clear when we take a look at the TeX side. In T1 encoding, for example, the figures are (essentially) encoded like this by default:

```
\setslot{zero}\endsetslot
\setslot{one}\endsetslot
\setslot{two}\endsetslot
```

While T1 encoding (essentially) references them as follows:

```
\setslot{zerooldstyle}\endsetslot
\setslot{oneoldstyle}\endsetslot
\setslot{twooldstyle}\endsetslot
```

We face a similar problem with small caps. The lowercase letters in `psbr8a.afm` are labeled like this:

```
C 97 ; WX 500 ; N a ; B 42 -15 465 457 ;
C 98 ; WX 556 ; N b ; B 46 -15 514 764 ;
C 99 ; WX 444 ; N c ; B 25 -15 419 457 ;
```

Expert fonts, which provide small caps as well but do not need to follow Adobe Standard encoding, encode small caps as follows:

```
C 97 ; WX 457 ; N Asmall ; B -15 -3 467 446 ;
C 98 ; WX 481 ; N Bsmall ; B 34 -3 437 437 ;
C 99 ; WX 501 ; N Csmall ; B 38 -14 477 448 ;
```

Our font `psbrc8a` features small caps in place of lowercase letters but it has to follow Adobe Standard encoding:

```
C 97 ; WX 556 ; N a ; B 10 0 546 509 ;
C 98 ; WX 556 ; N b ; B 49 0 497 490 ;
C 99 ; WX 556 ; N c ; B 49 -12 512 502 ;
```

This is one of the tricky parts when installing typical `sc & OSF` sets. Fontinst’s encoding vectors expect distinct names for distinct glyphs while the metric files of `sc & OSF` fonts do not provide unique names for optical small caps and hanging figures. The other idiosyncrasy of `sc & OSF` sets is specific to a few font foundries (including Adobe) only: there is no separate upright OSF font so we have to

¹ The correct name of this font is `psbrcj8a`, but we will stick to the naming proposed in `adobe.map` here.

take the upright hanging figures from the small caps font when building virtual fonts.

III.1 The fontinst file

For fontinst, we use the file introduced in the last tutorial as a template and add the features we need. We will create two Latex font families: `psb` and `psbj`. The former will provide lining figures while the latter will use the hanging figures of the `osf` fonts instead. Both families will incorporate optical small caps where available. In the following, all comments concerning the fontinst file will be restricted to those aspects diverging from our template. Please refer to the previous tutorial for a commentary on the original template.

```

1 \input fontinst.sty
2 \substitutesilent{bx}{b}
3 \substitutesilent{sc}{n}
4 \setint{smallcapsscale}{800}
5 \setint{slant}{167}
6 \transformfont{psbr8r}{\reencodefont{8r}{\fromafm{psbr8a}}}
7 \transformfont{psbri8r}{\reencodefont{8r}{\fromafm{psbri8a}}}
8 \transformfont{psbb8r}{\reencodefont{8r}{\fromafm{psbb8a}}}
9 \transformfont{psbbi8r}{\reencodefont{8r}{\fromafm{psbbi8a}}}
10 \transformfont{psbrc8r}{\reencodefont{8r}{\fromafm{psbrc8a}}}
11 \transformfont{psbrij8r}{\reencodefont{8r}{\fromafm{psbrij8a}}}
12 \transformfont{psbbj8r}{\reencodefont{8r}{\fromafm{psbbj8a}}}
13 \transformfont{psbbij8r}{\reencodefont{8r}{\fromafm{psbbij8a}}}

```

The first couple of lines of our template remain unchanged (1–9). After the reencodings inherited from our template, we insert the additional fonts since they need to be reencoded as well (10–13).

```

14 \transformfont{psbro8r}{\slantfont{\int{slant}}\reencodefont{8r}{\fromafm{psbr8a}}}
15 \transformfont{psbbo8r}{\slantfont{\int{slant}}\reencodefont{8r}{\fromafm{psbb8a}}}
16 \transformfont{psbrco8r}{\slantfont{\int{slant}}\reencodefont{8r}{\fromafm{psbrc8a}}}
17 \transformfont{psbboj8r}{\slantfont{\int{slant}}\reencodefont{8r}{\fromafm{psbbj8a}}}

```

In addition to that, we need slanted versions of the new fonts. Slanting the small caps font (16) may seem like a strange thing to do at first since we do not really want to create a slanted small caps shape. But since regular-weight hanging figures are found in the small caps font, we need a slanted version of that as well to provide matching figures for the slanted shape of the `psbj` family later.

```

18 \installfonts
19 \installfamily{T1}{psb}{}
20 \installfamily{TS1}{psb}{}
21 \installfont{psbr8t}{psbr8r,latin}{t1}{T1}{psb}{m}{n}{}
22 \installfont{psbrc8t}{psbrc8r,unsetnum,kernoff,psbr8r,kernon,latin}{t1}{T1}{psb}{m}{sc}{}

```

The file `psbrc8r` provides small caps and hanging figures, but we want `psb` to be a consistent family using lining figures throughout. Therefore, we read `psbrc8r` first and clear the encoding positions of all figures using commands from a separate metric file, `unsetnum.mtx`, right after that. This file is listed further down; all it does is clear all figure slots. When adding `psbr8r` after-

wards, the figure slots of the virtual font `psbrc8t` will be filled using the lining figures found in `psbr8r`. Note that `\installfont` does not overwrite any encoding slots when processing additional metric files, it simply fills vacant slots if it finds suitable glyphs in the next font. This allows us to insert the lining figures of `psbr8r` in the virtual font while the rest of the glyphs including the small caps is taken from `psbrc8r`. As to the encoding vector, we use the regular encoding file `t1.etx` in this case since `psbrc8r` uses standard glyph names for the small caps so that `t1c.etx` would be inappropriate.

There is one more thing we have to take into account: adding a metric file to the `\installfont` command also adds kerning information provided by that file. The problem here is that some of the glyph names in our raw fonts are not unique since the small caps in `psbrc8r` are encoded and labeled just like the lowercase letters in `psbr8r`. The kerning data in `psbr8r`, however, refers to ordinary lowercase letters. Under certain circumstances, misleading kerning data might thus be included in the virtual small caps font `psbrc8t`. To avoid that, we add two auxiliary files provided by `fontinst`, `kernon.mtx` and `kernoff.mtx`, which enable and disable `fontinst`'s `\setkern` command. When added to the input file list as shown above, this will effectively ignore the kerning data in `psbr8r`.

```

23 \installfont{psbro8t}{psbro8r,latin}{t1}{T1}{psb}{m}{s1}{}
24 \installfont{psbri8t}{psbri8r,latin}{t1}{T1}{psb}{m}{it}{}
25 \installfont{psbb8t}{psbb8r,latin}{t1}{T1}{psb}{b}{n}{}
26 \installfont{psbbc8t}{psbb8r,latin}{t1c}{T1}{psb}{b}{sc}{}

```

Optical small caps are available for the regular weight only. For the bold series we have to make do with ‘faked’ small caps, so we use the encoding file `t1c.etx` here (26). The remaining lines for `T1` encoding do not require any adjustments:

```

27 \installfont{psbbo8t}{psbbo8r,latin}{t1}{T1}{psb}{b}{s1}{}
28 \installfont{psbbi8t}{psbbi8r,latin}{t1}{T1}{psb}{b}{it}{}

```

That’s it for `T1` encoding. While `TS1` is primarily intended for symbols complementing `T1`, it includes hanging figures as well. Since the only way to use them is loading the `textcomp` package and typing rather cumbersome text commands like `\textzerooldstyle` it is not very useful to have them in `TS1`. Our `psbj` family will make them the default figures anyway so that they are readily available. But we are being picky. We have put down some hard, cold cash for the Sabon `sc & OSF` package and we want to make the most of it. Let’s see how we can put hanging figures in `TS1/psb` as well. As mentioned above, the problem here is that the `OSF` fonts use regular glyph names for the hanging figures while `fontinst`'s `TS1` encoding vector references them by `oldstyle` names. Hence we have to turn regular figures – which are in fact hanging figures not encoded as such – into hanging figures. To do that, we need an additional resource provided by `fontinst`, the metric file `resetosf.mtx`. With this in mind, let’s add a section for `TS1` encoding to our `fontinst` file:

```
29 \installfont{psbr8c}{psbr8r,unsetnum,kernoff,psbrc8r,kernon,resetof,textcomp}{ts1}%
30 {TS1}{psb}{m}{n}{}
```

For the upright fonts, the hanging figures are in fact in the small caps font which complicates the installation even more. But we have dealt with this problem before and the first steps should therefore look familiar: we read `psbr8r`, clear the standard figures using `unsetnum`, and read `psbrc8r`. Since we are dealing with `TS1` here, one additional step is required. We add `resetof.mtx` to the input file list of this `\installfont` command to rename the figures found in `psbrc8r` (the figures in `psbr8r` have already been discarded by `unsetnum`). `resetof` will rename the figures to “zerooldstyle” and so on. We also add `kernon.mtx` and `kernoff.mtx` to protect the kerning data. Typing `\textthreeoldstyle` in a Latex file when the `textcomp` package has been loaded would now typeset a proper hanging three.

```
31 \installfont{psbro8c}{psbro8r,unsetnum,kernoff,psbroc8r,kernon,resetof,textcomp}{ts1}%
32 {TS1}{psb}{m}{s1}{}
```

The slanted shape is handled in a similar way because it relies on the figures in the small caps font as well. For the remaining virtual fonts, the installation is simpler. Since the `OSF` fonts already provide hanging figures, all we need to do is rename them for `TS1` encoding by adding `resetof.mtx`:

```
33 \installfont{psbri8c}{psbrij8r,resetof,textcomp}{ts1}{TS1}{psb}{m}{it}{}
34 \installfont{psbb8c}{psbbj8r,resetof,textcomp}{ts1}{TS1}{psb}{b}{n}{}
35 \installfont{psbbo8c}{psbboj8r,resetof,textcomp}{ts1}{TS1}{psb}{b}{s1}{}
36 \installfont{psbbi8c}{psbbij8r,resetof,textcomp}{ts1}{TS1}{psb}{b}{it}{}
37 \endinstallfonts
```

This is the first half of our fontinst file which is dealing with the `psb` family. Compared to the template introduced in the previous tutorial it adds optical small caps to `T1` and hanging figures to `TS1` encoding. We will create an additional font family called `psbj` which we want to use hanging figures throughout.

```
38 \installfonts
39 \installfamily{T1}{psbj}{}
40 \installfont{psbrj8t}{psbr8r,unsetnum,kernoff,psbrc8r,kernon,latin}{t1}{T1}{psbj}{m}{n}{}
```

If we want the `psbj` family to incorporate hanging figures, we need to exchange the figure set of the virtual font like we did when creating the regular-weight small caps font above. But this time, we do it the other way around: we read `psbr8r` first, clear the encoding slots of all figures, and add `psbrc8r` afterwards to fill the figure slots using the hanging figures found in `psbrc8r`. Only the figures found in `psbrc8r` will be included in the virtual font as all other encoding slots were already filled by `psbr8r`. Again, care needs to be taken with the kerning data here. The kerning information in `psbrc8r` refers to small caps although the glyphs are encoded as ordinary lowercase letters. Hence we need to add `kernon.mtx` and `kernoff.mtx` to discard the kerning data in `psbrc8r`.

```
41 \installfont{psbrcj8t}{psbrc8r,latin}{t1}{T1}{psbj}{m}{sc}{}
```

The small caps font does not require any modifications this time. `psbrc8r` already contains hanging figures so we can use it as-is. Since `psbrc8r` uses standard glyph names for small caps and hanging figures, we use the regular encoding vector `t1.etx`.

```
42 \installfont{psbroj8t}{psbro8r,unsetnum,kernoff,psbrco8r,kernon,latin}{t1}{T1}{psbj}{m}{s1}{}

```

The slanted shape is straightforward to the upright one: we read `psbro8r`, clear the figures, and add the slanted hanging figures provided by `psbrco8r`. We also toggle fontinst's `\setkern` macro by adding `kernon` and `kernoff`.

```
43 \installfont{psbrij8t}{psbrij8r,latin}{t1}{T1}{psbj}{m}{it}{}

```

Building the italic virtual font is trivial because we have an italic OSF font with easily accessible hanging figures in the standard slots. Since there are OSF fonts for all bold shapes as well, they do not require any special modifications either. We simply use the appropriate OSF fonts instead of the fonts from the basic Sabon package:

```
44 \installfont{psbbj8t}{psbbj8r,latin}{t1}{T1}{psbj}{b}{n}{}
45 \installfont{psbbcj8t}{psbbj8r,latin}{t1c}{T1}{psbj}{b}{sc}{}

```

We create ‘faked’ bold small caps using the special `t1c.etx` encoding file because there is no bold small caps font.

```
46 \installfont{psbboj8t}{psbboj8r,latin}{t1}{T1}{psbj}{b}{s1}{}
47 \installfont{psbbij8t}{psbbij8r,latin}{t1}{T1}{psbj}{b}{it}{}
48 \endinstallfonts
49 \bye

```

This is the complete fontinst file for the NFSS font families `psb` and `psbj`. It requires the metric file `unsetnum.mtx` which is part of the fontinst package. Metric files always begin with `\relax` and enclose all commands in a `metrics` environment. Essentially, `unsetnum.mtx` consists of several `\unsetglyph` commands which clear all figure slots:

```
\relax
\metrics
\unsetglyph{zero}
\unsetglyph{one}
\unsetglyph{two}
\unsetglyph{three}
\unsetglyph{four}
\unsetglyph{five}
\unsetglyph{six}
\unsetglyph{seven}
\unsetglyph{eight}
\unsetglyph{nine}
\endmetrics

```

You probably will have noticed that we did not create TS1 encoded fonts for the `psbj` family. The reason is quite simple: since TS1 is not a regular text encoding TS1/`psbj` would be identical to TS1/`psb` anyway. To ensure that the `textcomp`

package works for the `psbj` family nonetheless, we need to set up some substitutions. Since `fontinst` does not support family substitutions we cannot create them automatically. We have to write a font definition file manually. The file `ts1psbj.fd` should like this:

```
\ProvidesFile{ts1psbj.fd}
\DeclareFontFamily{TS1}{psbj}{}
\DeclareFontShape{TS1}{psbj}{m}{n}{<-> ssub * psb/m/n}{}
\DeclareFontShape{TS1}{psbj}{m}{sc}{<-> ssub * psb/m/sc}{}
\DeclareFontShape{TS1}{psbj}{m}{sl}{<-> ssub * psb/m/sl}{}
\DeclareFontShape{TS1}{psbj}{m}{it}{<-> ssub * psb/m/it}{}
\DeclareFontShape{TS1}{psbj}{b}{n}{<-> ssub * psb/b/n}{}
\DeclareFontShape{TS1}{psbj}{b}{sc}{<-> ssub * psb/b/sc}{}
\DeclareFontShape{TS1}{psbj}{b}{sl}{<-> ssub * psb/b/sl}{}
\DeclareFontShape{TS1}{psbj}{b}{it}{<-> ssub * psb/b/it}{}
\DeclareFontShape{TS1}{psbj}{bx}{n}{<-> ssub * psb/b/n}{}
\DeclareFontShape{TS1}{psbj}{bx}{sc}{<-> ssub * psb/b/sc}{}
\DeclareFontShape{TS1}{psbj}{bx}{sl}{<-> ssub * psb/b/sl}{}
\DeclareFontShape{TS1}{psbj}{bx}{it}{<-> ssub * psb/b/it}{}
\endinput
```

The syntax of font definition files is explained in the *Latex font selection guide* and will not be discussed in detail here.¹ The main point of this file should be evident: for all series and shapes, we substitute `TS1/psb` for `TS1/psbj` because we did not create virtual fonts for `TS1/psbj`. The `ssub` directive is a silent substitution. For details, see chapter 4 of the *font selection guide*, section 4.4 in particular. With this additional font definition file we now have a fully functional setup for `psb` and `psbj` in `T1` and `TS1` encoding.

III.2 The map file

After running the `fontinst` file through `TeX` and installing the new fonts, we still need to update the map file `psb.map`. We add the following lines for the additional fonts found in the `sc & osf` package:

```
psbrc8r Sabon-RomanSC "TeXBase1Encoding ReEncodeFont" <8r.enc <psbrc8a.pfb
psbrij8r Sabon-Italic0sF "TeXBase1Encoding ReEncodeFont" <8r.enc <psbrij8a.pfb
psbbj8r Sabon-Bold0sF "TeXBase1Encoding ReEncodeFont" <8r.enc <psbbj8a.pfb
psbbij8r Sabon-BoldItalic0sF "TeXBase1Encoding ReEncodeFont" <8r.enc <psbbij8a.pfb
```

In addition to this, we need slanted versions of the new fonts. For the bold `osf` font this is obvious. Since regular-weight hanging figures are found in the small caps font, we need a slanted version of this font as well to provide matching figures for the slanted shape of the `psbj` family. This leads us to the slanted small caps variant:

```
psbrco8r Sabon-RomanSC "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbrco8a.pfb
psbboj8r Sabon-Bold0sF "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbboj8a.pfb
```

This is the complete map file:

```
psbr8r Sabon-Roman "TeXBase1Encoding ReEncodeFont" <8r.enc <psbr8a.pfb
```

¹ <http://www.ctan.org/tex-archive/macros/latex/doc/fntguide.pdf>

```

psbri8r Sabon-Italic "TeXBase1Encoding ReEncodeFont" <8r.enc <psbri8a.pfb
psbb8r Sabon-Bold "TeXBase1Encoding ReEncodeFont" <8r.enc <psbb8a.pfb
psbbi8r Sabon-BoldItalic "TeXBase1Encoding ReEncodeFont" <8r.enc <psbbi8a.pfb
psbrc8r Sabon-RomanSC "TeXBase1Encoding ReEncodeFont" <8r.enc <psbrc8a.pfb
psbrij8r Sabon-Italic0sF "TeXBase1Encoding ReEncodeFont" <8r.enc <psbrij8a.pfb
psbbj8r Sabon-Bold0sF "TeXBase1Encoding ReEncodeFont" <8r.enc <psbbj8a.pfb
psbbij8r Sabon-BoldItalic0sF "TeXBase1Encoding ReEncodeFont" <8r.enc <psbbij8a.pfb
psbro8r Sabon-Roman "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbro8a.pfb
psbbo8r Sabon-Bold "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbbo8a.pfb
psbrco8r Sabon-RomanSC "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbrco8a.pfb
psbboj8r Sabon-Bold0sF "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <psbboj8a.pfb

```

III.3 The style file

With two Sabon families at hand, we might want to update `sabon.sty` to make them readily available. We add the two options `oldstyle` and `lining` for the respective font families (6–7) and make hanging figures the default (8). Loading the package with the option `oldstyle` or without any option will set up `psbj` as the default roman family while using the `lining` option will make it select `psb` instead. It might also be handy to have dedicated text commands to switch between the two figure sets. Since such commands will need to work with all font families anyway, let's put them in a stand-alone style file, `nfssext.sty`, and load that in `sabon.sty` (5):

```

1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{sabon}[2002/05/12 v1.1 Adobe Sabon]
3 \RequirePackage[T1]{fontenc}
4 \RequirePackage{textcomp}
5 \RequirePackage{nfssext}
6 \DeclareOption{oldstyle}{\renewcommand*\rmdefault}{psbj}}
7 \DeclareOption{lining}{\renewcommand*\rmdefault}{psb}}
8 \ExecuteOptions{oldstyle}
9 \ProcessOptions
10 \endinput

```

The style file `nfssext.sty` might look like this:

```

1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{nfssext}[2003/03/14 v1.2 Experimental NFSS Extensions]
3 \newcommand*\exfs@tempa{}
4 \newcommand*\exfs@tempb{}
5 \newcommand*\exfs@try@family}[1]{%
6   \let\exfs@tempa\relax
7   \begingroup
8     \fontfamily{#1}\try@load@fontshape
9     \expandafter\ifx\csname\curr@fontshape\endcsname\relax
10      \PackageWarning{nfssext}{%
11        Font family '\f@encoding/#1' not available\MessageBreak
12        Ignoring font switch}%
13   \else
14     \gdef\exfs@tempa{\fontfamily{#1}\selectfont}%
15   \fi
16 \endgroup
17 \exfs@tempa}

```


This is an outline for a command that makes use of a few NFSS internals to switch to a specific family if and only if it is available. Essentially, we try to load the requested family in the current encoding (8). If this succeeds, we set up a macro (14) to be expanded later that will actually switch font families; if not, we print a warning message (10–12) and do nothing.

```

18 \def\exfs@get@base#1#2#3#4\@nil{#1#2#3}%
19 \DeclareRobustCommand{\lnstyle}{%
20   \not@math@alphabet\lnstyle\relax
21   \exfs@try@family{\expandafter\exfs@get@base\@family\@nil}}
22 \DeclareRobustCommand{\osstyle}{%
23   \not@math@alphabet\osstyle\relax
24   \exfs@try@family{\expandafter\exfs@get@base\@family\@nil j}}
```

The macros `\lnstyle` and `\osstyle` switch to lining and hanging (‘old style’) figures respectively. They are like `\bfseries` or `\itshape`. Internally, they will take the first three letters of the current NFSS font family name (18), append a letter to it where appropriate (none for lining figures, `j` for hanging figures), and call `\exfs@try@family`. Even though this mechanism is rather simple-minded, it should work just fine for all fonts set up properly according to the Fontname scheme.

```

25 \DeclareTextFontCommand{\textln}{\lnstyle}
26 \DeclareTextFontCommand{\textos}{\osstyle}
27 \endinput
```

The corresponding text commands, `\textln` and `\textos`, take one mandatory argument and can be employed like `\textbf` or `\textit`.

III.4 Fonts supplied with Tex

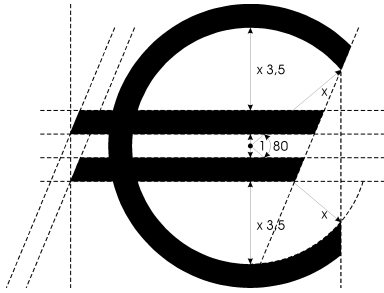
The standard Postscript fonts supplied with most Tex distributions do not include optical small caps, nor do they include hanging figures. The default typeface of both plain Tex and Latex however, Computer Modern Roman, does include such glyphs. Unfortunately, the design of the small caps is flawed. Their height corresponds to what you usually end up with when creating mechanical small caps. Being too tall, these small caps hardly blend in with lowercase text at all, even though their color matches that of the lowercase alphabet.

Hanging figures are included in Computer Modern as well, but they are hidden in some of the math fonts. The only way to use them with the default setup is rather cumbersome: the command `\oldstylenums{}` will take the numbers to be typeset as hanging figures as an argument. There is a set of virtual fonts for the European Computer Modern fonts which make these hanging figures the default in Tex’s text mode so that they are readily available. These fonts are provided in the `ECO` package available from CTAN.¹ Please refer to the package documentation for installation and usage instructions. Since this package essentially consists of a set of virtual fonts, it should also work in conjunction with the `CM-super` fonts mentioned in section 1.6.

¹ <http://www.ctan.org/tex-archive/fonts/eco/>

TUTORIAL IV

THE EURO CURRENCY SYMBOL



While the euro symbol has been supported by LaTeX for quite some time – it is included in `TS1` encoding and the `textcomp` package provides the corresponding text command `\texteuro` – the real problem is getting fonts that provide this glyph and setting them up accordingly. You might want to read this tutorial even if you are not affected by this particular issue, because it

deals with some generic encoding problems that you may encounter in a different context as well. There is a bit more to updating a font than drawing a euro symbol and putting it in the font. It has to be properly encoded as well. Since the euro symbol is not defined in Adobe Standard encoding, it can normally only be included as an uncoded glyph in regular Postscript text fonts. An uncoded glyph is only accessible after reencoding and assigning it to a valid encoding position. Some font foundries decided to follow this path in order to conform to Adobe Standard encoding. Others preferred to drop some supposedly rarely used glyph and put the euro symbol in its encoding position instead. While this violates the encoding standard, it can be more convenient under certain circumstances. In the following, we will explore ways to handle both situations cleanly. Finally, we will learn how to take the euro symbol from an external font if none is provided by the text font itself.

iv.1 Uncoded euro symbol

While Adobe used to be rather inattentive to the problem at first, the foundry is finally updating their typeface portfolio by gradually adding matching euro symbols to their fonts – a process that has been promoted by the introduction of the OpenType font format. Recent releases of Adobe Garamond, for example, already ship with matching euro symbols. A quick look at the `afm` file shows that in this case, the foundry decided to handle the encoding problem in a strict manner. The new symbol is correctly labeled as “Euro” but it is not encoded by default as that would violate Adobe Standard encoding. An encoding slot number of -1 tells us that the glyph was not assigned to any encoding position:

```
C -1 ; WX 572 ; N Euro ; B -13 -14 542 640 ;
```

In order to access it, we need to reencode the font and assign the glyph “Euro” to a valid encoding position. The standard procedure we have been pursuing in this guide involves reencoding all fonts to Tex Base 1 encoding anyway precisely

because of cases like this one. By reencoding all base fonts to Tex Base 1 encoding, we ensure that all glyphs our virtual fonts rely on are properly encoded in the raw fonts we use as their basis. But we have to keep in mind that older versions of Tex Base 1 encoding did not include the euro symbol either. The previous release of fontinst, version 1.8, came with an encoding vector that is not suitable for our situation for this very reason. You can verify that by running the file `8r.etx` through Latex to create a documented listing of the encoding vector as follows:

```
latex 8r.etx
```

Now take a look at the DVI file `8r.dvi`: if the version number of this file is 1.801 (dated June 29, 1998), it does not include the euro symbol. The best way to solve this problem is updating fontinst to the latest release which ships with an updated encoding vector.¹ After that, you can install the fonts as usual. Note, however, that you will need a matching version of `8r.enc` as well, so that `dvips` and `pdftex` can use the symbol. This file is distributed separately and not included in the fontinst release.² In the following, we will create our own updated versions of `8r.etx` and `8r.enc`. This is merely intended as an illustrating of how to deal with a typical encoding problem. If you simply want to get access to an uncoded euro glyph, upgrade to fontinst 1.9, update `8r.enc`, and install the fonts as usual. You might want to skip the next paragraphs and continue reading with section IV.2 on page 46 in this case. If you want to learn more about fontinst’s encoding vectors, read on.

First, we create a copy of the file `8r.etx` as provided by fontinst 1.8. The updated encoding vector of the new fontinst release puts the euro symbol in slot 128. We will do the same to ensure that our vector remains compatible with the official distribution. Let’s take a look at the relevant part of `8r.etx`:

```
624 \setslot{asciitilde}
625   \comment{The ASCII tilde '\textasciitilde'.
626     This is included for compatibility with typewriter fonts used
627     for computer listings.}
628 \endsetslot
629
630 \comment{The following 32 slots, 128--159, are based on Windows ANSI.}
631
632 \nextslot{130}
633 \setslot{quotesinglbase}
634   \comment{A German single quote mark '\quotesinglbase' similar to a comma,
635     but with different sidebearings.}
636 \endsetslot
```

Slot 126 defines “asciitilde”, slots 127–129 are empty, and slot 130 defines the lower single quotation mark “quotesinglbase”. The slot number is automatically incremented by one for each `\setslot` command, but if some slots are left

¹ <http://www.ctan.org/tex-archive/fonts/utilities/fontinst/>

² <http://www.ctan.org/tex-archive/info/fontname/8r.enc>

empty the slot has to be set explicitly with a `\nextslot` command. This is done for “quotesinglbase” above. We want to add the euro symbol in slot 128, so we add the following:

```
630 \comment{The following 32 slots, 128--159, are based on Windows ANSI.}
    \nextslot{128}
    \setslot{Euro}
        \comment{The euro currency symbol '\texteuro'.}
    \endsetslot
632 \nextslot{130}
633 \setslot{quotesinglbase}
634     \comment{A German single quote mark '\quotesinglbase' similar to a comma,
635         but with different sidebearings.}
636 \endsetslot
```

Since slot 127 is empty and the last slot defined was 126 we need to set the slot explicitly by adding `\nextslot` before actually defining the encoding position. When defining the slot, keep in mind that the glyph names are case sensitive; “euro” is not equivalent to “Euro”. We also add an explanation so that the commented listing of the encoding vector provides a meaningful explanation. This is all we need. It might be a good idea to update `\title` and `\date` at the beginning of the file to avoid any confusion. Finally, we install this file in the branch `tex/fontinst/base/` of the local Tex tree. If our system has been set up as recommended in the first tutorial, fontinst will now pick up our updated encoding vector. Now we need a version of `8r. enc` that matches our `8r. etx`. This is what the relevant part of `8r. enc` looks like:

```
71 % 0x70
72 /p /q /r /s /t /u /v /w
73 /x /y /z /braceleft /bar /braceright /asciitilde
74 /.notdef
75 % 0x80
76 /.notdef /.notdef /quotesinglbase /florin
77 /quotedblbase /ellipsis /dagger /daggerdbl
78 /circumflex /perthousand /Scaron /guilsinglleft
79 /OE /.notdef /.notdef /.notdef
```

Note that in Postscript encoding vectors empty slots are marked “notdef”. We can spot the same pattern: “asciitilde” in slot 126 is followed by three empty slots (127–129) and finally “quotesinglbase” in slot 130. We count the slots and add “Euro” in slot 128 (indicated in hexadecimal notation as ‘0x80’ here):

```
71 % 0x70
72 /p /q /r /s /t /u /v /w
73 /x /y /z /braceleft /bar /braceright /asciitilde
74 /.notdef
75 % 0x80
76 /Euro /.notdef /quotesinglbase /florin
77 /quotedblbase /ellipsis /dagger /daggerdbl
78 /circumflex /perthousand /Scaron /guilsinglleft
79 /OE /.notdef /.notdef /.notdef
```

After that, we move our modified `8r.enc` to `dvips/base/` in the local Tex tree and update the `kpathsea` file databases by running `texhash`. Our system is now ready for the euro. Since reencoding all text fonts to Tex Base 1 encoding is part of our regular installation routine anyway, the `fontinst` file does not need any adjustments. The reencoding is performed as usual:

```
\transformfont{padr8r}{\reencodefont{8r}{\fromafm{padr8a}}}
\transformfont{padri8r}{\reencodefont{8r}{\fromafm{padri8a}}}
\transformfont{padb8r}{\reencodefont{8r}{\fromafm{padb8a}}}
\transformfont{padbi8r}{\reencodefont{8r}{\fromafm{padbi8a}}}
```

The new `8r` encoding vector will ensure that the euro symbol is available in all Tex Base 1 encoded raw fonts, so we can simply use them to build `TS1` encoded virtual fonts:

```
\installfont{padr8c}{padr8r,textcomp}{ts1}{TS1}{pad}{m}{n}{}
\installfont{padri8c}{padri8r,textcomp}{ts1}{TS1}{pad}{m}{it}{}
\installfont{padb8c}{padb8r,textcomp}{ts1}{TS1}{pad}{b}{n}{}
\installfont{padbi8c}{padbi8r,textcomp}{ts1}{TS1}{pad}{b}{it}{}

```

After installing the fonts and creating a map file as usual, the euro symbol will be available as `\texteuro` when loading the `textcomp` package.

iv.2 Euro symbol encoded as currency symbol

Bitstream was one of the first type foundries to update their font collection and add a matching euro symbol to all fonts. When looking at the fonts, the first thing we notice is that the foundry decided to encode the euro symbol as the generic currency symbol ¤ . The reasoning behind this is that you can access the symbol without reencoding the font. Since the generic currency symbol is hardly ever used anyway, it is no surprise that this particular glyph was dropped. We could install Bitstream fonts as usual and use `\textcurrency` instead of `\texteuro` to access the euro symbol, but that would imply keeping the idiosyncrasies of a given font in mind while writing, and modifying the text when changing the typeface – not quite what one would expect when working with a high-level markup language like LaTeX. When taking a closer look at the `pfb` and `afm` files, we can see that the fonts in fact contain two euro symbols. One of them is uncoded (slot -1) and labeled as “Euro”:

```
C -1 ; WX 556 ; N Euro ; B 6 -12 513 697 ;
```

The other one is found in encoding slot 168, that is, it is encoded as the currency symbol and named accordingly. To verify that, we have to take a look at the `pfb` files in a font viewer or a font editor. Since the euro symbol is both encoded and labeled just like a currency symbol, there is no way to tell the difference by looking at the `afm` file only:

§ ₁₆₇	€ ₁₆₈	' ₁₆₉
• ₁₈₃	, ₁₈₄	” ₁₈₅
. ₁₉₉	.. ₂₀₀	

```
C 168 ; WX 556 ; N currency ; B 6 -12 513 697 ;
```

If we want a readily available euro symbol (and one that is available *as such*), we have two options in this case. Either we reencode the font and assign the uncoded euro symbol to a valid encoding position or we use the already encoded euro symbol found in the slot of the currency symbol and move it to the proper encoding position. The former case was already discussed above, let's now investigate the latter.

The best way to move the glyph to a different slot is resetting it when creating the TS1 encoded virtual font. We use an approach that is functionally equivalent to the way we have reset the hanging figures in the previous tutorial. The appropriate low-level commands that set the glyph go in a dedicated metric file, `reseteur.mtx`, which we have to create ourselves:

```
1 \relax
2 \metrics
3 \resetglyph{euro}
4   \glyph{currency}{1000}
5 \endsetglyph
6 \setleftkerning{euro}{currency}{1000}
7 \unsetglyph{currency}
8 \endmetrics
```

We reset the glyph “euro” based on the glyph “currency” scaled to its full size (3–5), adjust the kerning on either side of “euro” to match that of “currency” (6) and finally unset the glyph “currency” (7) because there is no such thing as a currency symbol in this font. In the `fontinst` file, we include the metric file `reseteur.mtx` in the file list of the respective `\installfont` command right after the metrics for this font have been read. This might look as follows:

```
\installfont{bsbr8c}{bsbr8r,reseteur,textcomp}{ts1}{TS1}{bsb}{m}{n}{}
```

We only need to do this for the TS1 encoded virtual fonts as T1 does not include the euro symbol. Apart from that, the `fontinst` file does not need any adjustments.

iv.3 Euro symbol taken from external symbol font

Let's go back to our install of Sabon to see if we can get euro support for Sabon as well. The font itself does not include a euro symbol at all so all we can do is take it from an external font. While some other font foundries at least provide special symbol fonts containing a collection of matching euro glyphs for all typefaces that have not been updated yet, Adobe merely offers a set of generic euro fonts containing glyphs that do not really match any typeface at all.¹ From a typographical perspective, this is a desperate workaround. However, lacking a matching euro symbol, we do not have a choice. The Adobe Euro fonts come in three flavors: serif (Euro Serif), sans serif (Euro Sans), and condensed sans serif (Euro Mono, intended for use with monospaced fonts). Each family consists of regular, regular italic, bold, and bold italic fonts. Instead of using a serif euro

¹ <http://www.adobe.com/type/eurofont.html>

that does not match our typeface we will use the sans serif design which has a more generic look that adheres to the shape of the reference design of the European Commission. Granted, this one does not match our typeface either – but at least it does not pretend to do so.

Now that we are aware of the most common encoding pitfalls, we inspect the afm files first before proceeding with the installation. The Euro fonts put the euro symbol in all encoding positions. When looking at the afm file, we can see that the fonts use a font specific encoding and that the glyphs are labeled as “Euro” with a consecutive number appended to the name:

```
C 33 ; WX 750 ; N Euro.001 ; B 10 -12 709 685 ;
C 34 ; WX 750 ; N Euro.002 ; B 10 -12 709 685 ;
C 35 ; WX 750 ; N Euro.003 ; B 10 -12 709 685 ;
C 36 ; WX 750 ; N Euro.004 ; B 10 -12 709 685 ;
C 37 ; WX 750 ; N Euro.005 ; B 10 -12 709 685 ;
C 38 ; WX 750 ; N Euro.006 ; B 10 -12 709 685 ;
C 39 ; WX 750 ; N Euro.007 ; B 10 -12 709 685 ;
C 40 ; WX 750 ; N Euro.008 ; B 10 -12 709 685 ;
C 41 ; WX 750 ; N Euro.009 ; B 10 -12 709 685 ;
```

On further inspection, we find two additional glyphs. There is a glyph labeled as “Euro” in slot 128 as well as an uncoded glyph labeled “uni20AC”:

```
C 128 ; WX 750 ; N Euro      ; B 10 -12 709 685 ;
C -1 ; WX 750 ; N uni20AC ; B 10 -12 709 685 ;
```

The number 20AC is 8364 in hexadecimal. This is the encoding position of the euro symbol in Unicode encoding, hence the string “uni20AC”. If nothing else, one thing is for sure: someone was trying to make sure that every application out there would be able to access that euro symbol. Fortunately, this covers our situation as well. We need a glyph that is both properly encoded and labeled as “Euro”; the encoding position does not matter since we will include it in a virtual font using a different encoding anyway. The one in slot 128 fits our needs perfectly. In practice, this means that we can simply add the file name to the input file list of an `\installfont` command when creating TS1 encoded virtual fonts with `fontinst`. This time no reencoding or renaming is required. The relevant section of our `fontinst` file for Sabon would look as follows:

```
\installfont{psbr8c}{psbr8r,zpeurs,textcomp}{ts1}{TS1}{psb}{m}{n}{}
\installfont{psbro8c}{psbro8r,zpeuros,textcomp}{ts1}{TS1}{psb}{m}{s1}{}
\installfont{psbri8c}{psbri8r,zpeuris,textcomp}{ts1}{TS1}{psb}{m}{it}{}
\installfont{psbb8c}{psbb8r,zpeubs,textcomp}{ts1}{TS1}{psb}{b}{n}{}
\installfont{psbbo8c}{psbbo8r,zpeubos,textcomp}{ts1}{TS1}{psb}{b}{s1}{}
\installfont{psbbi8c}{psbbi8r,zpeubis,textcomp}{ts1}{TS1}{psb}{b}{it}{}

```

Since the Adobe Euro fonts are non-standard, their naming is non-standard as well. We will discuss that in more detail below. Before running this file, we need to copy the properly named afm files of the Adobe Euro fonts to the working directory so that `fontinst` will find them. For the euro glyph to be available later, the Euro fonts need to be installed in the usual way so that `TeX` as well as `pdftex`, `dvips`, and `xdvi` are able to use them. Because the above `fontinst` file depends

on this installation, it makes sense to do it first. Since the installation of symbol fonts differs from that of regular text fonts, we will take a look at the required steps. The Euro font package¹ will provide us with the following set of files:

```
_1____.afm  _1i____.afm  _1b____.afm  _1bi____.afm
_1____.inf  _1i____.inf  _1b____.inf  _1bi____.inf
_1____.pfb  _1i____.pfb  _1b____.pfb  _1bi____.pfb
_1____.pfm  _1i____.pfm  _1b____.pfm  _1bi____.pfm

_2____.afm  _2i____.afm  _2b____.afm  _2bi____.afm
_2____.inf  _2i____.inf  _2b____.inf  _2bi____.inf
_2____.pfb  _2i____.pfb  _2b____.pfb  _2bi____.pfb
_2____.pfm  _2i____.pfm  _2b____.pfm  _2bi____.pfm

_3____.afm  _3i____.afm  _3b____.afm  _3bi____.afm
_3____.inf  _3i____.inf  _3b____.inf  _3bi____.inf
_3____.pfb  _3i____.pfb  _3b____.pfb  _3bi____.pfb
_3____.pfm  _3i____.pfm  _3b____.pfm  _3bi____.pfm
```

The Fontname map file `adobe.map` defines the following names for these fonts:

```
zpeur   EuroSerif-Regular      A   916   _3____
zpeub   EuroSerif-Bold          A   916   _3b____
zpeubi  EuroSerif-BoldItalic       A   916   _3bi____
zpeuri  EuroSerif-Italic           A   916   _3i____
zpeurs  EuroSans-Regular           A   916   _1____
zpeubs  EuroSans-Bold              A   916   _1b____
zpeubis EuroSans-BoldItalic       A   916   _1bi____
zpeuris EuroSans-Italic           A   916   _1i____
zpeurt  EuroMono-Regular          A   916   _2____
zpeubt  EuroMono-Bold              A   916   _2b____
zpeubit EuroMono-BoldItalic       A   916   _2bi____
zpeurit EuroMono-Italic           A   916   _2i____
```

We select all `.afm` and all `.pfb` files, rename them, and start off with the following file set:

```
zpeur.afm   zpeuri.afm   zpeub.afm   zpeubi.afm
zpeur.pfb   zpeuri.pfb   zpeub.pfb   zpeubi.pfb
zpeurs.afm  zpeuris.afm  zpeubs.afm  zpeubis.afm
zpeurs.pfb  zpeuris.pfb  zpeubs.pfb  zpeubis.pfb
zpeurt.afm  zpeurit.afm  zpeubt.afm  zpeubit.afm
zpeurt.pfb  zpeurit.pfb  zpeubt.pfb  zpeubit.pfb
```

As we do not really need `fontinst` when dealing with symbol fonts, we simply run `afm2tfm` on each `.afm` file to create a corresponding `.tfm` file for `TeX`:

```
afm2tfm zpeur.afm  zpeur.tfm
afm2tfm zpeuri.afm zpeuri.tfm
afm2tfm zpeub.afm  zpeub.tfm
afm2tfm zpeubi.afm zpeubi.tfm
afm2tfm zpeurs.afm zpeurs.tfm
afm2tfm zpeuris.afm zpeuris.tfm
afm2tfm zpeubs.afm zpeubs.tfm
afm2tfm zpeubis.afm zpeubis.tfm
afm2tfm zpeurt.afm zpeurt.tfm
afm2tfm zpeurit.afm zpeurit.tfm
```

¹ <http://www.adobe.com/type/eurofont.html>

```
afm2tfm zpeubt.afm zpeubt.tfm
afm2tfm zpeubit.afm zpeubit.tfm
```

We also need slanted versions of all upright fonts. As slant factor, we use the generic value 0.167:

```
afm2tfm zpeur.afm -s 0.167 zpeuro.tfm
afm2tfm zpeub.afm -s 0.167 zpeubo.tfm
afm2tfm zpeurs.afm -s 0.167 zpeuros.tfm
afm2tfm zpeubs.afm -s 0.167 zpeubos.tfm
afm2tfm zpeurt.afm -s 0.167 zpeurot.tfm
afm2tfm zpeubt.afm -s 0.167 zpeubot.tfm
```

In addition to that, we need a map file for dvips. Map files for symbol fonts are simpler than those for text fonts because the fonts are not reencoded. Therefore, there will be no “ReEncodeFont” instruction and no encoding vector. The first lines of `peu.map` look like this:

```
zpeur EuroSerif-Regular <zpeur.pfb
zpeuri EuroSerif-Italic <zpeuri.pfb
zpeub EuroSerif-Bold <zpeub.pfb
zpeubi EuroSerif-BoldItalic <zpeubi.pfb
zpeurs EuroSans-Regular <zpeurs.pfb
zpeuris EuroSans-Italic <zpeuris.pfb
zpeubs EuroSans-Bold <zpeubs.pfb
zpeubis EuroSans-BoldItalic <zpeubis.pfb
zpeurt EuroMono-Regular <zpeurt.pfb
zpeurit EuroMono-Italic <zpeurit.pfb
zpeubt EuroMono-Bold <zpeubt.pfb
zpeubit EuroMono-BoldItalic <zpeubit.pfb
```

We also need to add “SlantFont” instructions for all slanted shapes:

```
zpeuro EuroSerif-Regular "0.167 SlantFont" <zpeur.pfb
zpeubo EuroSerif-Bold "0.167 SlantFont" <zpeub.pfb
zpeuros EuroSans-Regular "0.167 SlantFont" <zpeurs.pfb
zpeubos EuroSans-Bold "0.167 SlantFont" <zpeubs.pfb
zpeurot EuroMono-Regular "0.167 SlantFont" <zpeurt.pfb
zpeubot EuroMono-Bold "0.167 SlantFont" <zpeubt.pfb
```

While we are at it, let’s also write some font definition files for Latex. These are not required if the fonts are only referenced by other virtual fonts, but they will allow us the access the Euro fonts directly in any Latex file. The syntax of the commands used in font definition files is explained in the Latex font selection guide mentioned in the introduction. Our font definition file for Euro Serif, `upeu.fd`, should look like this:

```
\ProvidesFile{upeu.fd}
\DeclareFontFamily{U}{peu}{}
\DeclareFontShape{U}{peu}{m}{n}{<->zpeur}{}
\DeclareFontShape{U}{peu}{m}{sc}{<->ssub *peu/m/n}{}
\DeclareFontShape{U}{peu}{m}{sl}{<->zpeuro}{}
\DeclareFontShape{U}{peu}{m}{it}{<->zpeuri}{}
\DeclareFontShape{U}{peu}{b}{n}{<->zpeub}{}
\DeclareFontShape{U}{peu}{b}{sc}{<->ssub *peu/b/n}{}
\DeclareFontShape{U}{peu}{b}{sl}{<->zpeubo}{}
\DeclareFontShape{U}{peu}{b}{it}{<->zpeubi}{}

```

```

\DeclareFontShape{U}{peu}{bx}{n}{<->ssub*peu/b/n}{}
\DeclareFontShape{U}{peu}{bx}{sc}{<->ssub*peu/b/n}{}
\DeclareFontShape{U}{peu}{bx}{sl}{<->ssub*peu/b/sl}{}
\DeclareFontShape{U}{peu}{bx}{it}{<->ssub*peu/b/it}{}
\endinput

```

For Euro Sans, `upeus.fd`:

```

\ProvidesFile{upeus.fd}
\DeclareFontFamily{U}{peus}{}
\DeclareFontShape{U}{peus}{m}{n}{<->zpeurs}{}
\DeclareFontShape{U}{peus}{m}{sc}{<->ssub*peus/m/n}{}
\DeclareFontShape{U}{peus}{m}{sl}{<->zpeuros}{}
\DeclareFontShape{U}{peus}{m}{it}{<->zpeuris}{}
\DeclareFontShape{U}{peus}{b}{n}{<->zpeubs}{}
\DeclareFontShape{U}{peus}{b}{sc}{<->ssub*peus/b/n}{}
\DeclareFontShape{U}{peus}{b}{sl}{<->zpeubos}{}
\DeclareFontShape{U}{peus}{b}{it}{<->zpeubis}{}
\DeclareFontShape{U}{peus}{bx}{n}{<->ssub*peus/b/n}{}
\DeclareFontShape{U}{peus}{bx}{sc}{<->ssub*peus/b/n}{}
\DeclareFontShape{U}{peus}{bx}{sl}{<->ssub*peus/b/sl}{}
\DeclareFontShape{U}{peus}{bx}{it}{<->ssub*peus/b/it}{}
\endinput

```

And for Euro Mono, `upeut.fd`:

```

\ProvidesFile{upeut.fd}
\DeclareFontFamily{U}{peut}{}
\DeclareFontShape{U}{peut}{m}{n}{<->zpeurt}{}
\DeclareFontShape{U}{peut}{m}{sc}{<->ssub*peut/m/n}{}
\DeclareFontShape{U}{peut}{m}{sl}{<->zpeurot}{}
\DeclareFontShape{U}{peut}{m}{it}{<->zpeurit}{}
\DeclareFontShape{U}{peut}{b}{n}{<->zpeubt}{}
\DeclareFontShape{U}{peut}{b}{sc}{<->ssub*peut/b/n}{}
\DeclareFontShape{U}{peut}{b}{sl}{<->zpeubot}{}
\DeclareFontShape{U}{peut}{b}{it}{<->zpeubit}{}
\DeclareFontShape{U}{peut}{bx}{n}{<->ssub*peut/b/n}{}
\DeclareFontShape{U}{peut}{bx}{sc}{<->ssub*peut/b/n}{}
\DeclareFontShape{U}{peut}{bx}{sl}{<->ssub*peut/b/sl}{}
\DeclareFontShape{U}{peut}{bx}{it}{<->ssub*peut/b/it}{}
\endinput

```

We install the map file `peu.map` as well as all `afm`, `tfm`, `pfb`, and `fd` files in the local TeX tree as explained in the first tutorial and add `peu.map` to the configuration files for `pdftex`, `dvips`, and `xdvi`. Finally, we run `texhash`. The euro symbol can now be used in virtual fonts. Since we have font definition files for LaTeX as well, we could also access it in any LaTeX file with a construct like this one:

```

{\fontencoding{U}\fontfamily{peu}\selectfont\char 128}

```

So let's make that a generic euro package, `peufonts.sty`, for use with all fonts that do not provide a native euro symbol:

```

1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{peufonts}[2002/10/25 v1.0 Adobe Euro Fonts]
3 \RequirePackage{textcomp}
4 \DeclareRobustCommand{\eurrm}{\%

```

```

5 \fontencoding{U}\fontfamily{peu}\selectfont\char 128}}
6 \DeclareRobustCommand{\eursf}{%
7 \fontencoding{U}\fontfamily{peus}\selectfont\char 128}}
8 \DeclareRobustCommand{\eurtt}{%
9 \fontencoding{U}\fontfamily{peut}\selectfont\char 128}}

```

We define three commands, `\eurrm`, `\eursf`, and `\eurtt`, which typeset a serif, sans serif, and monospaced euro symbol respectively. Note the additional braces to keep the font change local.

```

10 \DeclareOption{sans}{\def\eur\eursf}
11 \DeclareOption{serif}{\def\eur\eurrm}
12 \DeclareOption{mono}{\def\eur\eurtt}
13 \DeclareOption{textcomp}{%
14 \PackageInfo{peufonts}{Hijacking '\string\texteuro'}%
15 \def\texteuro{\eur}}
16 \ExecuteOptions{sans}
17 \ProcessOptions
18 \endinput

```

We also provide `\eur` along with three options controlling whether it uses the serif, sans serif, or monospaced euro symbol; `sans` is set up as the default in line 19. The option `textcomp` will hijack the text command `\texteuro` as provided by the `textcomp` package. This is very handy when using the `inputenc` package with Latin 9 (ISO8859-15) as input encoding and entering the euro symbol directly, as `inputenc` uses `\texteuro` internally. With this option, we may also type `\texteuro` or simply € in the input file to typeset a euro symbol. For this to work, `inputenc` has to be loaded before this package. Please keep in mind that this is a global redefinition affecting all text fonts. We do not activate it by default as some fonts may provide a native euro symbol. We also write a message to the log when redefining `\texteuro` and request `textcomp` in line 3 so that it is loaded before `peufonts`.

iv.4 Euro symbol taken from external text font

There is yet another way to get the euro symbol for a font that does not provide one by default. Suppose we have an external text font including a euro symbol that would go reasonably well with our copy of Sabon. If this euro symbol is uncoded but labeled correctly, we could simply add the text font to the input file list of the respective `\installfont` commands as shown in section iv.3 and then proceed as outlined in section iv.1. What if it is encoded as the currency symbol in the external text font? In this case, we take an approach that is based on section iv.2 with some minor adjustments. Let's assume we have a copy of Bitstream Classical Garamond. Since Classical Garamond is Bitstream's take on Sabon, the euro symbol of this typeface will obviously go quite well with our install of Sabon. The syntax of the `\installfont` commands will look like this:

```
\installfont{psbr8c}{psbr8r,unsetcur,bsbr8r,reseteur,psbr8r,textcomp}{ts1}{TS1}{bsb}{m}{n}{}
```

psb is Adobe Sabon, bsb is Bitstream Classical Garamond, and `reseteur.mtx` has been discussed in section IV.2. In this case, we need an additional metric file, called `unsetcur.mtx` here, that clears the currency slot before `bsbr8r.afm` is read. Without this additional step, the euro symbol found in the currency slot of `bsbr8r.afm` would be discarded as `psbr8r.afm` has already provided this symbol. `reseteur.mtx` would then move the currency symbol found in `psbr8r.afm` to the euro slot, which is obviously not what we want. We need to clear the currency slot using `unsetcur.mtx`, which is quite simple:

```
\relax
\metrics
\unsetglyph{currency}
\endmetrics
```

With this additional resource, what happens is this: `psbr8r.afm` is read and processed, the currency slot is cleared by `unsetcur.mtx`, then `bsbr8r.afm` is read, filling the currency slot with its euro glyph (which is encoded as the currency symbol in `bsbr8r.afm`). Our metric file `reseteur.mtx` will then move the euro symbol found in `bsbr8r.afm` to the euro slot and clear the currency slot. After that, we read `psbr8r.afm` again to get the original Adobe Sabon currency symbol of back. Our virtual font will now contain all glyphs found in Adobe Sabon plus the euro symbol of Bitstream Classical Garamond, all properly encoded. Note that, for this to work, we need a complete install of Bitstream Classical Garamond, including map files for `dvips` and `pdftex`, in addition to the steps outlined above.

TUTORIAL V

EXPERT FONT SETS, REGULAR SETUP

Expert fonts are complements to be used in conjunction with regular text fonts. They usually contain optical small caps, additional sets of figures – hanging, inferior, superior –, the f-ligatures ff, fi, fl, ffi, and ffl, plus a few text fractions and some other symbols. Since they are companion fonts only, which do not contain the regular uppercase and lowercase alphabet, they are not useful on their own. To employ them in a sensible way we need the basic text fonts as well. In this tutorial, we will install the complete Monotype Janson font set as provided by the base and the expert package offered by Agfa Monotype. The base package contains four text fonts (regular, regular italic, bold, bold italic):

```
jan____.afm   jani____.afm   janb____.afm   janbi____.afm
jan____.inf   jani____.inf   janb____.inf   janbi____.inf
jan____.pfb   jani____.pfb   janb____.pfb   janbi____.pfb
jan____.pfm   jani____.pfm   janb____.pfm   janbi____.pfm
```

The expert package adds the corresponding expert fonts:

```
jny____.afm   jnyi____.afm   jnyb____.afm   jnybi____.afm
jny____.inf   jnyi____.inf   jnyb____.inf   jnybi____.inf
jny____.pfb   jnyi____.pfb   jnyb____.pfb   jnybi____.pfb
jny____.pfm   jnyi____.pfm   jnyb____.pfm   jnybi____.pfm
```

When talking about “expert font sets” in this tutorial, we are referring to all of the above (base plus expert package). The proper file names for Monotype Janson are given in `monotype.map`. Expert fonts have essentially the same file name as the corresponding text fonts, but their encoding code is 8x instead of 8a for Adobe Standard encoding. After renaming the files, we start off with the following file set:

```
mjnr8a.afm   mjnr8a.afm   mjnr8a.afm   mjnr8a.afm
mjnr8a.pfb   mjnr8a.pfb   mjnr8a.pfb   mjnr8a.pfb

mjnr8x.afm   mjnr8x.afm   mjnr8x.afm   mjnr8x.afm
mjnr8x.pfb   mjnr8x.pfb   mjnr8x.pfb   mjnr8x.pfb
```

There are two ways to install an expert font set. Apart from writing a verbose fontinst file using low-level commands we may also use the `\latinfamily` macro. We will take a look at the latter case first and proceed with a verbose fontinst file afterwards.

v.1 Basic fontinst file

As usual, our file begins with a typical header setting up some common font substitutions (2–3). While the Janson expert package provides optical small caps for the regular weight, the bold expert fonts do not contain optical small

caps. For the bold series, we have to make do with mechanical small caps. The `\latinfamily` macro will take care of that automatically. All we need to do is define a scale factor of 0.72 (4):

```
1 \input fontinst.sty
2 \substitutesilent{bx}{b}
3 \substitutesilent{sc}{n}
4 \setint{smallcapsscale}{720}
```

In the third tutorial, we have incorporated lining and hanging figures by creating two font families: a family with the basic, three-character font family name (lining figures) and a second family featuring hanging figures, with the letter `j` appended to the font family name. The character `j` is the Fontname code for hanging figures. In this tutorial, we need an additional code: the letter `x`, indicating a font featuring expert glyphs. When installing expert sets with the `\latinfamily` macro we use these family names to instruct fontinst that we have an expert set at hand and that we want it to create a font family featuring expert glyphs with lining figures (5) plus a second family featuring expert glyphs with hanging figures (6):

```
5 \latinfamily{mjnx}{}
6 \latinfamily{mjnj}{}
7 \bye
```

Please note that appending `x` and `j` to the font family name works for expert font sets only. The `\latinfamily` macro is not capable of dealing with `sc` & `osf` font sets in the same way. These sets always require a fontinst file using low-level commands such as the one discussed in tutorial III.

v.2 Verbose fontinst file

While the `\latinfamily` macro incorporates the most fundamental features of expert sets, such as optical small caps and additional f-ligatures, it does not exploit all the glyphs found in expert fonts. To use them, you will need to use low-level fontinst commands, at least for parts of the fontinst file. But before we start with our verbose fontinst file, let's first take a look at some encoding issues specific to expert fonts. When dealing with `sc` & `osf` fonts in the third tutorial, we had to rename some glyphs or move them around because in `sc` & `osf` fonts, hanging figures and small caps are found in the standard slots for figures and the lowercase alphabet. With small caps and hanging figures provided by expert fonts the installation is in fact simpler since all glyph names are unique. To understand the difference, we will take a brief look at the glyph names in the respective `afm` files. Compare the names of lowercase glyphs as found in `mjnr8a.afm` to the small caps glyph names in `mjnr8x.afm`:

```
C 97 ; WX 427 ; N a ; B 59 -13 409 426 ;
C 98 ; WX 479 ; N b ; B 18 -13 442 692 ;
C 99 ; WX 427 ; N c ; B 44 -13 403 426 ;
```



```
C 97 ; WX 479 ; N Asmall ; B 19 -4 460 451 ;
C 98 ; WX 438 ; N Bsmall ; B 31 -4 395 434 ;
C 99 ; WX 500 ; N Csmall ; B 37 -12 459 443 ;
```

The situation is similar for lining and hanging (‘old style’) figures. The following lines are taken from `mjnr8a.afm` and `mjnr8x.afm` respectively:

```
C 48 ; WX 469 ; N zero ; B 37 -12 432 627 ;
C 49 ; WX 469 ; N one ; B 109 -5 356 625 ;
C 50 ; WX 469 ; N two ; B 44 0 397 627 ;

C 48 ; WX 469 ; N zerooldstyle ; B 39 0 431 387 ;
C 49 ; WX 271 ; N oneoldstyle ; B 44 -5 229 405 ;
C 50 ; WX 396 ; N twooldstyle ; B 37 0 356 415 ;
```

In practice, this means that adding expert fonts to the basic font set amounts to little more than adding them to the input file list of `\installfont` in most cases. Still, some additional steps are required. Fortunately, all we need to do in order to make optical small caps and hanging figures readily available is using dedicated encoding vectors provided by fontinst. These encoding vectors reference the glyphs by names corresponding to those found in expert fonts, thus allowing us to pick optical small caps and hanging figures at will. With that in mind, we can get down to business. Our fontinst file begins with a typical header (1–5):

```
1 \input fontinst.sty
2 \substitutesilent{bx}{b}
3 \substitutesilent{sc}{n}
4 \setint{smallcapsscale}{720}
5 \setint{slant}{167}
```

Unfortunately, Monotype Janson provides small caps for the regular weight only. Hence we have to make do with mechanical small caps for the bold series. We set a scale factor of 0.72 for that (4).

```
6 \transformfont{mjnr8r}{\reencodefont{8r}{\fromafm{mjnr8a}}}
7 \transformfont{mjnr8i}{\reencodefont{8r}{\fromafm{mjnr8a}}}
8 \transformfont{mjnb8r}{\reencodefont{8r}{\fromafm{mjnb8a}}}
9 \transformfont{mjnb8i}{\reencodefont{8r}{\fromafm{mjnb8a}}}
10 \transformfont{mjnr8r}{\slantfont{\int{slant}}\reencodefont{8r}{\fromafm{mjnr8a}}}
11 \transformfont{mjnb8r}{\slantfont{\int{slant}}\reencodefont{8r}{\fromafm{mjnb8a}}}
```

We reencode (6–9) and slant (10–11) the basic fonts as usual. Expert fonts do not require any reencoding, but we do need slanted variants of them as well:

```
12 \transformfont{mjnr8x}{\slantfont{\int{slant}}\fromafm{mjnr8x}}
13 \transformfont{mjnb8x}{\slantfont{\int{slant}}\fromafm{mjnb8x}}
```

We will create two font families: `mjnx`, featuring expert glyphs, optical small caps, and lining figures, plus `mjnj` incorporating hanging instead of lining figures. TS1 encoded virtual fonts will be generated for the `mjnx` family only.

```
14 \installfonts
15 \installfamily{T1}{mjnx}{}
16 \installfamily{TS1}{mjnx}{}
17 \installfont{mjnr9e}{mjnr8r,mjnr8x,latin}{t1}{T1}{mjnx}{m}{n}{}

```

As mentioned above, incorporating expert glyphs boils down to adding an additional file to the arguments of the `\installfont` command, in this case the file `mjnr8x.afm`. Note that we use the encoding suffix `9e` instead of `8t` for all T_1 encoded virtual fonts of the `mjnx` family to indicate that they feature expert glyphs. While the code `8t`, as defined by the Fontname scheme, is for T_1 (Cork) encoding, `9e` indicates T_1 plus expert glyphs. Please refer to section 2.4 of the Fontname scheme for a comprehensive list of these codes and the code tables on page 83 of this guide for additional hints.

```
18 \installfont{mjnr9e}{mjnr8r,mjnr8x,latin}{t1c}{T1}{mjnx}{m}{sc}{}

```

For the small caps font we use the encoding vector `t1c.etx` which will map the small caps in `mjnr8x.afm` to the encoding positions of the lowercase alphabet in our T_1 encoded virtual font. Instead of `latin.mtx` we use the special metric file `latinsc.mtx` in this case. The remaining virtual fonts of the `mjnx` family are built as expected:

```
19 \installfont{mjnr9e}{mjnr8r,mjnr8x,latin}{t1}{T1}{mjnx}{m}{sl}{}
20 \installfont{mjnr9e}{mjnr8r,mjnr8x,latin}{t1}{T1}{mjnx}{m}{it}{}
21 \installfont{mjnb9e}{mjnb8r,mjnb8x,latin}{t1}{T1}{mjnx}{b}{n}{}
22 \installfont{mjnb9e}{mjnb8r,mjnb8x,latin}{t1c}{T1}{mjnx}{b}{sc}{}

```

Since the bold expert font does not provide small caps, we create mechanical ones. The `t1c.etx` encoding vector will deal with that transparently, but we have to make sure that the regular `latin.mtx` metric file is read here since there are no optical small caps in the raw font.

```
23 \installfont{mjnb9e}{mjnb8r,mjnb8x,latin}{t1}{T1}{mjnx}{b}{sl}{}
24 \installfont{mjnb9e}{mjnb8r,mjnb8x,latin}{t1}{T1}{mjnx}{b}{it}{}

```

That's it for T_1 encoding. Creating TS_1 encoded virtual fonts featuring expert glyphs is pretty straightforward. We simply add the expert fonts to the input file list. Note the encoding suffix of the virtual fonts. We use `9c` instead of `8c` to indicate that the virtual fonts feature expert glyphs:

```
25 \installfont{mjnr9c}{mjnr8r,mjnr8x,textcomp}{ts1}{TS1}{mjnx}{m}{n}{}
26 \installfont{mjnr9c}{mjnr8r,mjnr8x,textcomp}{ts1}{TS1}{mjnx}{m}{sl}{}
27 \installfont{mjnr9c}{mjnr8r,mjnr8x,textcomp}{ts1}{TS1}{mjnx}{m}{it}{}
28 \installfont{mjnb9c}{mjnb8r,mjnb8x,textcomp}{ts1}{TS1}{mjnx}{b}{n}{}
29 \installfont{mjnb9c}{mjnb8r,mjnb8x,textcomp}{ts1}{TS1}{mjnx}{b}{sl}{}
30 \installfont{mjnb9c}{mjnb8r,mjnb8x,textcomp}{ts1}{TS1}{mjnx}{b}{it}{}
31 \endinstallfonts

```

The `mjnx` family including T_1 and TS_1 encoded fonts is now complete. We continue with the `mjnj` family which we want to feature hanging figures by default:

```
32 \installfonts
33 \installfamily{T1}{mjnj}{}
34 \installfont{mjnr9d}{mjnr8r,mjnr8x,latin}{t1j}{T1}{mjnj}{m}{n}{}

```

The encoding code `9d` indicates a T_1 encoded font with expert glyphs and hanging figures. We will use this code for all T_1 encoded virtual fonts of the `mjnj` family. This family is supposed to feature hanging figures in the standard en-

coding positions for figures. We have to keep in mind that the regular encoding vector for T1 encoding (`t1.etx`) references the figures as “zero,” “one,” “two” while the hanging (‘old style’) figures in the expert font (which we want to be available by default) are labeled “zerooldstyle,” “oneoldstyle” and so on. In order to arrange the glyphs according to our wishes, we could read the regular font, clear the figures, read the expert font and rename the ‘old style’ figures. In this case, however, there is a simpler way: we use the special encoding vector `t1j.etx` which is essentially equivalent to `t1.etx` but automatically appends the suffix “oldstyle” to all figures.

```
35 \installfont{mjnrc9d}{mjnr8r,mjnr8x,latin}{t1cj}{T1}{mjnj}{m}{sc}{}

```

We have regular optical small caps, so we use the metric file `latinsc.mtx` here. Instead of `t1c.etx` we use the encoding file `t1cj.etx` to make hanging figures the default. The remaining virtual fonts are built like the upright shape (34):

```
36 \installfont{mjnro9d}{mjnro8r,mjnro8x,latin}{t1j}{T1}{mjnj}{m}{s1}{}
37 \installfont{mjnri9d}{mjnri8r,mjnri8x,latin}{t1j}{T1}{mjnj}{m}{it}{}
38 \installfont{mjnb9d}{mjnb8r,mjnb8x,latin}{t1j}{T1}{mjnj}{b}{n}{}
39 \installfont{mjnbc9d}{mjnb8r,mjnb8x,latin}{t1cj}{T1}{mjnj}{b}{sc}{}

```

There are no optical small caps in the bold-weight expert fonts. Thus, when generating the bold small caps font, we use the metric file `latin.mtx` and the encoding file `t1cj.etx` to create mechanical small caps.

```
40 \installfont{mjnbo9d}{mjnbo8r,mjnbo8x,latin}{t1j}{T1}{mjnj}{b}{s1}{}
41 \installfont{mjnbi9d}{mjnbi8r,mjnbi8x,latin}{t1j}{T1}{mjnj}{b}{it}{}
42 \endinstallfonts

```

At this point, we have a comprehensive text setup featuring expert f-ligatures, optical small caps as well as a choice of readily available lining and hanging figures. However, there are some glyphs in expert fonts that we have not considered yet.

v.3 Inferior and superior figures

Expert fonts usually provide superior and inferior figures which can be combined with a dedicated fraction slash called ‘solidus’ to typeset arbitrary text fractions like $\frac{1}{2}$ or even $\frac{3}{127}$. Please note that these figures are not suitable for Tex’s math mode but they can be useful in text mode even if there is no need to typeset text fractions. For example, in this guide the footnote marks in the body text are typeset using superior figures and inferior figures are used for the line numbers of the code listings. Like hanging figures, we want inferior and superior figures to be readily available. Therefore, we will create two additional font families, `mjn0` and `mjn1`, which put inferior and superior figures in the standard encoding positions for figures just like our `mjnj` family does for hanging figures. We have been using the encoding vector `t1j.etx` to make hanging figures the default in this tutorial so let’s find out what `t1j.etx` does in detail and try to modify this approach according to our needs. This is `t1j.etx`:

```

\relax
\encoding
\setcommand\lc#1#2{#2}
\setcommand\uc#1#2{#1}
\setcommand\lctop#1#2{#2}
\setcommand\uctop#1#2{#1}
\setcommand\lclig#1#2{#2}
\setcommand\uclig#1#2{#1}
\setcommand\digit#1{#1oldstyle}
\inputetx{T1}
\endencoding

```

As you can see, `t1j.etx` is short. It does not define any encoding slots. All it does is predefine a few macros and use `\inputetx` to load `t1.etx` afterwards. The relevant part (and the only point at which it differs from what `t1.etx` does in this respect) is the line defining the `\digit` macro. To understand this mechanism, we need to take a look at how `t1.etx` defines the encoding slots for all figures:

```

\setslot{\digit{one}}\endsetslot
\setslot{\digit{two}}\endsetslot
\setslot{\digit{three}}\endsetslot

```

The glyph names of figures are not given verbatim, they are used as an argument to the `\digit` macro. The default definition of this macro as given in `t1.etx` looks like this:

```

\setcommand\digit#1{#1}

```

This means that the glyph labeled “one” in the `afm` file will end up in the encoding position for the numeral one in the virtual font – and so on. `t1j.etx` predefines the `\digit` macro as follows:

```

\setcommand\digit#1{#1oldstyle}

```

In this case the glyph labeled “oneoldstyle” in the `afm` file will end up in the encoding position for the numeral one in the `T1` encoded virtual font. When taking a look at the glyph names of hanging, inferior, and superior figures in the `afm` files of our expert fonts now, the approach we need to take in order to access them should be obvious:

```

C 48 ; WX 469 ; N zerooldstyle ; B 39 0 431 387 ;
C 49 ; WX 271 ; N oneoldstyle ; B 44 -5 229 405 ;
C 50 ; WX 396 ; N twooldstyle ; B 37 0 356 415 ;

C 210 ; WX 323 ; N zeroinferior ; B 27 -13 296 355 ;
C 211 ; WX 323 ; N oneinferior ; B 84 -5 240 357 ;
C 212 ; WX 323 ; N twoinferior ; B 27 0 288 358 ;

C 200 ; WX 323 ; N zerosuperior ; B 27 293 296 661 ;
C 201 ; WX 323 ; N onesuperior ; B 84 298 240 661 ;
C 202 ; WX 323 ; N twosuperior ; B 27 303 288 661 ;

```

Just like ‘old style’ figures, inferior and superior figures use suffixes to the respective glyph names in (properly encoded) expert fonts. This means that we

can modify `t1j.etx` accordingly to create encoding vectors incorporating inferior and superior figures. Hence our encoding vector for τ_1 encoded fonts featuring inferior figures (`t10.etx`, read: t-one-zero since 0 is the Fontname code for inferior figures) should look like this:

```
\relax
\encoding
\setcommand\lc#1#2{#2}
\setcommand\uc#1#2{#1}
\setcommand\lctop#1#2{#2}
\setcommand\uctop#1#2{#1}
\setcommand\lclig#1#2{#2}
\setcommand\uclig#1#2{#1}
\setcommand\digit#1{#1inferior}
\inputetx{t1}
\endencoding
```

All we need to do in `t10.etx` is use `\setcommand` to predefine the `\digit` macro as follows:

```
\setcommand\digit#1{#1inferior}
```

This will add the suffix “inferior” to all digits. For superior figures, the approach is similar. We create an encoding vector called `t11.etx` (read: t-one-one since 1 is the Fontname code for superior figures):

```
\relax
\encoding
\setcommand\lc#1#2{#2}
\setcommand\uc#1#2{#1}
\setcommand\lctop#1#2{#2}
\setcommand\uctop#1#2{#1}
\setcommand\lclig#1#2{#2}
\setcommand\uclig#1#2{#1}
\setcommand\digit#1{#1superior}
\inputetx{t1}
\endencoding
```

With `t10.etx` and `t11.etx` at hand, we may now create the font families `mjn0` and `mjn1` pretty much like we have generated `mjnj`. Let’s put the new encoding vectors in our working directory and go back to the `fontinst` file:

```
43 \installfonts
44 \installfamily{T1}{mjn0}{}
45 \installfont{mjnr09e}{mjnr8r,mjnr8x,latin}{t10}{T1}{mjn0}{m}{n}{}

```

We add the code 0 to the name of the virtual font (`mjnr09e` here), use the encoding vector `t10.etx`, and adapt the NFSS font declaration (in this case `T1/mjn0/m/n`) accordingly. Other than that, the virtual fonts of the `mjn0` family are generated in the usual way:

```
46 \installfont{mjnr09e}{mjnr08r,mjnr08x,latin}{t10}{T1}{mjn0}{m}{s1}{}
47 \installfont{mjnr09e}{mjnr08r,mjnr08x,latin}{t10}{T1}{mjn0}{m}{it}{}
48 \installfont{mjnb09e}{mjnb8r,mjnb8x,latin}{t10}{T1}{mjn0}{b}{n}{}
49 \installfont{mjnb09e}{mjnb08r,mjnb08x,latin}{t10}{T1}{mjn0}{b}{s1}{}
50 \installfont{mjnb09e}{mjnb08r,mjnb08x,latin}{t10}{T1}{mjn0}{b}{it}{}

```

51 \endinstallfonts

Our fontinst file will omit the small caps shape to save some disk space. We have included a global shape substitution for the `sc` shape in the header, so `mjn0/sc` will be substituted by `mjn0/n` via a silent substitution in the font definition file. Since the figures of upright and small caps shapes do not differ at all and since we need the `mjn0` family for figures only, we can safely omit the small caps shape. For the `mjn1` family, we adapt the names of the virtual fonts (adding the Fontname code 1 to indicate superior figures), the encoding vector (`t11.etx`), and the `NFSS` declaration in a similar way:

```
52 \installfonts
53 \installfamily{TS1}{mjn1}{}
54 \installfont{mjnr19e}{mjnr8r,mjnr8x,latin}{t11}{TS1}{mjn1}{m}{n}{}
55 \installfont{mjnro19e}{mjnro8r,mjnro8x,latin}{t11}{TS1}{mjn1}{m}{s1}{}
56 \installfont{mjnr19e}{mjnr8r,mjnr8x,latin}{t11}{TS1}{mjn1}{m}{it}{}
57 \installfont{mjnb19e}{mjnb8r,mjnb8x,latin}{t11}{TS1}{mjn1}{b}{n}{}
58 \installfont{mjnbo19e}{mjnbo8r,mjnbo8x,latin}{t11}{TS1}{mjn1}{b}{s1}{}
59 \installfont{mjnbi19e}{mjnbi8r,mjnbi8x,latin}{t11}{TS1}{mjn1}{b}{it}{}
60 \endinstallfonts
61 \bye
```

This is our complete fontinst file which will provide us with four font families: `mjnx`, `mjnj`, `mjn0`, and `mjn1`. Virtual fonts in `TS1` encoding are provided for all families, but `TS1` encoded ones for `mjnx` only since they would be identical for all of our four font families anyway. Thus, we can simply use substitutions instead of creating duplicate virtual fonts. As mentioned in the third tutorial, however, fontinst does not provide family substitutions. We have to write font definition files manually to ensure that the lacking `TS1` encoded fonts are substituted by their counterparts of the `mjnx` family so that the `textcomp` package will work with all of them. For the `mjnj` family, our font definition file for `TS1` encoding (`ts1mjnj.fd`) looks like this:

```
\ProvidesFile{ts1mjnj.fd}
\DeclareFontFamily{TS1}{mjnj}{}
\DeclareFontShape{TS1}{mjnj}{m}{n}{<-> ssub * mjnx/m/n} {}
\DeclareFontShape{TS1}{mjnj}{m}{sc}{<-> ssub * mjnx/m/n} {}
\DeclareFontShape{TS1}{mjnj}{m}{s1}{<-> ssub * mjnx/m/s1} {}
\DeclareFontShape{TS1}{mjnj}{m}{it}{<-> ssub * mjnx/m/it} {}
\DeclareFontShape{TS1}{mjnj}{b}{n}{<-> ssub * mjnx/b/n} {}
\DeclareFontShape{TS1}{mjnj}{b}{sc}{<-> ssub * mjnx/b/n} {}
\DeclareFontShape{TS1}{mjnj}{b}{s1}{<-> ssub * mjnx/b/s1} {}
\DeclareFontShape{TS1}{mjnj}{b}{it}{<-> ssub * mjnx/b/it} {}
\DeclareFontShape{TS1}{mjnj}{bx}{n}{<-> ssub * mjnx/b/n} {}
\DeclareFontShape{TS1}{mjnj}{bx}{sc}{<-> ssub * mjnx/b/n} {}
\DeclareFontShape{TS1}{mjnj}{bx}{s1}{<-> ssub * mjnx/b/s1} {}
\DeclareFontShape{TS1}{mjnj}{bx}{it}{<-> ssub * mjnx/b/it} {}
\endinput
```

This is the equivalent for `mjn0`, the file `ts1mjn0.fd`:

```
\ProvidesFile{ts1mjn0.fd}
\DeclareFontFamily{TS1}{mjn0}{}
\DeclareFontShape{TS1}{mjn0}{m}{n}{<-> ssub * mjnx/m/n} {}
```

```

\DeclareFontShape{TS1}{mjn0}{m}{sc}{<-> ssub * mjnx/m/n} {}
\DeclareFontShape{TS1}{mjn0}{m}{sl}{<-> ssub * mjnx/m/sl} {}
\DeclareFontShape{TS1}{mjn0}{m}{it}{<-> ssub * mjnx/m/it} {}
\DeclareFontShape{TS1}{mjn0}{b}{n}{<-> ssub * mjnx/b/n} {}
\DeclareFontShape{TS1}{mjn0}{b}{sc}{<-> ssub * mjnx/b/n} {}
\DeclareFontShape{TS1}{mjn0}{b}{sl}{<-> ssub * mjnx/b/sl} {}
\DeclareFontShape{TS1}{mjn0}{b}{it}{<-> ssub * mjnx/b/it} {}
\DeclareFontShape{TS1}{mjn0}{bx}{n}{<-> ssub * mjnx/b/n} {}
\DeclareFontShape{TS1}{mjn0}{bx}{sc}{<-> ssub * mjnx/b/n} {}
\DeclareFontShape{TS1}{mjn0}{bx}{sl}{<-> ssub * mjnx/b/sl} {}
\DeclareFontShape{TS1}{mjn0}{bx}{it}{<-> ssub * mjnx/b/it} {}
\endinput

```

And finally, `ts1mjn1.fd` for the `mjn1` family:

```

\ProvidesFile{ts1mjn1.fd}
\DeclareFontFamily{TS1}{mjn1}{}
\DeclareFontShape{TS1}{mjn1}{m}{n}{<-> ssub * mjnx/m/n} {}
\DeclareFontShape{TS1}{mjn1}{m}{sc}{<-> ssub * mjnx/m/n} {}
\DeclareFontShape{TS1}{mjn1}{m}{sl}{<-> ssub * mjnx/m/sl} {}
\DeclareFontShape{TS1}{mjn1}{m}{it}{<-> ssub * mjnx/m/it} {}
\DeclareFontShape{TS1}{mjn1}{b}{n}{<-> ssub * mjnx/b/n} {}
\DeclareFontShape{TS1}{mjn1}{b}{sc}{<-> ssub * mjnx/b/n} {}
\DeclareFontShape{TS1}{mjn1}{b}{sl}{<-> ssub * mjnx/b/sl} {}
\DeclareFontShape{TS1}{mjn1}{b}{it}{<-> ssub * mjnx/b/it} {}
\DeclareFontShape{TS1}{mjn1}{bx}{n}{<-> ssub * mjnx/b/n} {}
\DeclareFontShape{TS1}{mjn1}{bx}{sc}{<-> ssub * mjnx/b/n} {}
\DeclareFontShape{TS1}{mjn1}{bx}{sl}{<-> ssub * mjnx/b/sl} {}
\DeclareFontShape{TS1}{mjn1}{bx}{it}{<-> ssub * mjnx/b/it} {}
\endinput

```

As far as LaTeX is concerned, our setup is complete now. We still need a map file, though.

v.4 The map file

The syntax of map files has been discussed in detail before. The lines for the basic font set should therefore be obvious:

```

mjnr8r JansonMT "TeXBase1Encoding ReEncodeFont" <8r.enc <mjnr8a.pfb
mjnr18r JansonMT-Italic "TeXBase1Encoding ReEncodeFont" <8r.enc <mjnr18a.pfb
mjnb8r JansonMT-Bold "TeXBase1Encoding ReEncodeFont" <8r.enc <mjnb8a.pfb
mjnb18r JansonMT-BoldItalic "TeXBase1Encoding ReEncodeFont" <8r.enc <mjnb18a.pfb
mjnr08r JansonMT "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <mjnr8a.pfb
mjnb08r JansonMT-Bold "0.167 SlantFont TeXBase1Encoding ReEncodeFont" <8r.enc <mjnb8a.pfb

```

Mapping lines for expert fonts are simpler because there is no need for reencoding and no encoding vector will be included:

```

mjnr8x JansonExpertMT <mjnr8x.pfb
mjnr18x JansonExpertMT-Italic <mjnr18x.pfb
mjnb8x JansonExpertMT-Bold <mjnb8x.pfb
mjnb18x JansonExpertMT-BoldItalic <mjnb18x.pfb

```

We do need slanted expert fonts as well, though:

```

mjnr08x JansonExpertMT "0.167 SlantFont" <mjnr8x.pfb
mjnb08x JansonExpertMT-Bold "0.167 SlantFont" <mjnb8x.pfb

```

This is our complete map file for Monotype Janson, `mjn.map`.

v.5 The style file

Our style file for Janson, `janson.sty`, is based on the one suggested in section III.3. We simply adjust the package name and the names of the font families:

```

1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{janson}[2002/12/30 v1.0 Monotype Janson]
3 \RequirePackage[T1]{fontenc}
4 \RequirePackage{textcomp}
5 \RequirePackage{nfssex}
6 \DeclareOption{oldstyle}{\renewcommand*\rmdefault{mjnj}}
7 \DeclareOption{lining}{\renewcommand*\rmdefault{mjnx}}
8 \ExecuteOptions{oldstyle}
9 \ProcessOptions
10 \endinput

```

With an expert font set at hand, however, we have to extend `nfssex.sty` to support expert families:

```

1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{nfssex}[2003/03/14 v1.2 Experimental NFSS Extensions]
3 \newcommand*\exfs@tempa{}
4 \newcommand*\exfs@tempb{}
5 \newcommand*\exfs@try@family}[2] [] {%
6   \let\exfs@tempa\relax
7   \begingroup
8     \fontfamily{#2}\try@load@fontshape%
9     \expandafter\ifx\csname\curr@fontshape\endcsname\relax
10      \edef\exfs@tempa{#1}%
11      \ifx\exfs@tempa\@empty
12        \PackageWarning{nfssex}{%
13          Font family '\f@encoding/#2' not available\MessageBreak
14          Ignoring font switch}%
15      \else
16        \PackageInfo{nfssex}{%
17          Font family '\f@encoding/#2' not available\MessageBreak
18          Font family '\f@encoding/#1' tried instead}%
19        \exfs@try@family{#1}%
20      \fi
21    \else
22      \gdef\exfs@tempa{\fontfamily{#2}\selectfont}%
23    \fi
24  \endgroup
25  \exfs@tempa}

```

As soon as expert fonts come into play, the `\lnstyle` macro has to cater for two font families which, depending on the font, may contain lining figures: a basic font family with a three-character code or an expert family with a four-character code ending with the letter `x`. To make sure that `nfssex.sty` will work for fonts like Janson as well as fonts without an expert set, the first thing we need to do is extend our main font switching macro, enabling it to cope with both cases. To do so, we will introduce an optional argument. Essentially, we try to load the font family given by the mandatory argument first (8). If this family is not available, we do not quit with a warning but add a note to the log file (16–18) and try the family given by the optional argument next (19). If loading

the alternative family fails as well, we finally print a warning message (12–14). If the optional argument is not used, the second step will be omitted.

```
26 \def\exfs@get@base#1#2#3#4\@nil{#1#2#3}
27 \DeclareRobustCommand{\lnstyle}{%
28   \not@math@alphabet\lnstyle\relax
29   \exfs@try@family[\expandafter\exfs@get@base\@family\@nil]%
30   {\expandafter\exfs@get@base\@family\@nil x}}
```

After that, the `\lnstyle` macro needs to be adjusted in order to exploit the optional argument. It will try the expert family with a four-character code first (30) and make `\exfs@try@family` fall back to the basic font family with a three-character code (29) if the former is not available.

```
31 \DeclareRobustCommand{\osstyle}{%
32   \not@math@alphabet\osstyle\relax
33   \exfs@try@family{\expandafter\exfs@get@base\@family\@nil j}}
```

The availability of hanging figures is expressed by appending the letter `j` to the font family code for both basic and expert font sets, so `\osstyle` does not need any modification.

```
34 \DeclareRobustCommand{\instyle}{%
35   \not@math@alphabet\instyle\relax
36   \exfs@try@family{\expandafter\exfs@get@base\@family\@nil 0}}
37 \DeclareRobustCommand{\sustyle}{%
38   \not@math@alphabet\sustyle\relax
39   \exfs@try@family{\expandafter\exfs@get@base\@family\@nil 1}}
```

With inferior and superior figures implemented as two additional font families, `mjn0` and `mjn1`, we add two macros activating these families by adding 0 and 1 to the family name respectively.

```
40 \DeclareTextFontCommand{\textln}{\lnstyle}
41 \DeclareTextFontCommand{\textos}{\osstyle}
42 \DeclareTextFontCommand{\textin}{\instyle}
43 \DeclareTextFontCommand{\textsu}{\sustyle}
44 \endinput
```

We also add two text commands, `\textin` and `\textsu`, which activate these figures locally, similar to `\textit` or `\textbf`.

v.6 Using the fonts

Most features of expert font sets such as additional f-ligatures and optical small caps will be available automatically when selecting the new font families. Using them does not require any additional macros. Lining and hanging figures can be conveniently selected by activating the respective font family, in this case `mjnx` and `mjnj`, or by using the style file `janson.sty` suggested above. Since inferior and superior figures are not used as regular figures, they are treated differently. We will take a look at some possible applications. The inferior and superior figures found in expert fonts were originally intended for typesetting text fractions so let's write a simple macro for that. To typeset a fraction, we combine inferior

and superior figures with the `\textfractionsolidus` macro provided by the `textcomp` package. Accessing the figures implies switching font families locally. Note the additional set of braces which will keep the font change local:

```
\newcommand*\textfrac[2]{%
  {\fontfamily{mjn1}\selectfont #1}%
  \textfractionsolidus
  {\fontfamily{mjn0}\selectfont #2}}
```

Writing `\textfrac{1}{2}` in the input file will typeset the fraction $\frac{1}{2}$. When looking at an expert font in a font editor, you will see that expert fonts contain a fixed number of text fractions. Some of them are included in `TS1` encoding and supported by the `textcomp` package, but typing rather long commands such as `\textthreequarters` is not exactly convenient. Since there are only nine of them they are not very useful anyway. With a complete set of inferior and superior figures at our disposal, our macro will work for arbitrary fractions like $\frac{3}{7}$ or $\frac{13}{17}$. Instead of using ‘hard-wired’ fonts as shown above, it is even better to use the font switching macros provided by `nfssect.sty` instead since they will dynamically adjust to the active text font:

```
\newcommand*\textfrac[2]{%
  \textsu{#1}%
  \textfractionsolidus
  \textin{#2}}
```

What about using superior figures as footnote numbers? To do so, we need to redefine `\@makefnmark`. This is the default definition:

```
\def\@makefnmark{\hbox{\@textsuperscript{\normal font\@thefnmark}}}
```

In order to use optical superior figures instead of mechanical ones, we drop `\@textsuperscript` and switch font families instead:

```
\def\@makefnmark{\hbox{\fontfamily{mjn1}\selectfont\@thefnmark}}
```

We do not need to add additional braces in this case since `\hbox` will keep the font change local. Using our new font switching macros, this may also be accomplished like this:

```
\def\@makefnmark{\hbox{\sustyle\@thefnmark}}
```

Note that, if you want to put a definition of `\@makefnmark` in the preamble of a regular Latex input file (as opposed to a class or a style file), it has to be enclosed in `\makeatletter` and `\makeatother`:

```
\makeatletter
\def\@makefnmark{\hbox{\sustyle\@thefnmark}}
\makeatother
```

TUTORIAL VI

EXPERT FONT SETS, EXTENDED SETUP

In this tutorial we will combine what we have learned in tutorials III and V to install a very complete font set featuring expert fonts, small caps, and hanging figures. This tutorial will also add multiple weights, italic small caps, italic swashes and text ornaments to that. Our example is Adobe Minion, base plus expert packages:

pmnr8a	Minion-Regular	A	143	morg___
pmnr18a	Minion-Italic	A	143	moi___
pmns8a	Minion-Semibold	A	143	mosb___
pmnsi8a	Minion-SemiboldItalic	A	143	mosbi___
pmnb8a	Minion-Bold	A	143	mob___
pmnbi8a	Minion-BoldItalic	A	143	mobi___
pmnc8a	Minion-Black	A	143	mobl___
pmnrc8a	Minion-RegularSC	A	144	mosc___
pmnric8a	Minion-ItalicSC	A	144	moisc___
pmnrw7a	Minion-SwashItalic	A	144	moswi___
pmnsc8a	Minion-SemiboldSC	A	144	mosbs___
pmnsic8a	Minion-SemiboldItalicSC	A	144	mosic___
pmnsiw7a	Minion-SwashSemiboldItalic	A	144	mossb___
pmnbj8a	Minion-BoldOsF	A	144	mobos___
pmnbij8a	Minion-BoldItalicOsF	A	144	mobio___
pmncj8a	Minion-BlackOsF	A	144	mozof___
pmnr8x	MinionExp-Regular	A	144	mjrg___
pmnr18x	MinionExp-Italic	A	144	mji___
pmns8x	MinionExp-Semibold	A	144	mjsb___
pmnsi8x	MinionExp-SemiboldItalic	A	144	mjsbi___
pmnb8x	MinionExp-Bold	A	144	mjb___
pmnbi8x	MinionExp-BoldItalic	A	144	mjbi___
pmnc8x	MinionExp-Black	A	144	mjbl___
pmnrp	Minion-Ornaments	A	144	moor___

In addition to these fonts, the expert package includes a set of regular-weight display fonts intended for titling and display work at very large sizes. Generated from the same master sources by interpolation, the display fonts share the lettershapes of the text fonts while being based on a design size of 72 pt. Since they form a complete set including small caps and expert fonts, they are handled just like the Minion text set and we will not explicitly consider them here.

VI.1 The fontinst file

With a very comprehensive set of fonts at our disposal, we will be fastidious. There will be no computed glyph shapes – no mechanical small caps and no slanted fonts – thus making this setup suitable for professional typesetting. Note that the bold and black weights do not feature optical small caps. Even though there are expert fonts for these weights, they do not contain any small caps glyphs. The bold weight is merely intended for applications requiring a

very strong contrast, for example to highlight the keywords in a dictionary, while the black weight of a typeface like Minion is only relevant for certain types of display work. Without further ado, we start off as usual:

```
1 \nonstopmode
2 \input fontinst.sty
3 \substitutesilent{bx}{sb}
4 \substitutenoisy{sc}{n}
5 \substitutenoisy{si}{it}
```

When looking at our font set it is obvious that semibold should be used as the main bold weight, hence we make it the default by substituting `sb` for `bx`. Since the bold and black weights do not feature optical small caps, we add appropriate substitutions for the `sc` and `si` (italic small caps) shapes.

```
6 \transformfont{pmnr8r}{\reencodefont{8r}{\fromafm{pmnr8a}}}
7 \transformfont{pmnrc8r}{\reencodefont{8r}{\fromafm{pmnrc8a}}}
8 \transformfont{pmnri8r}{\reencodefont{8r}{\fromafm{pmnri8a}}}
9 \transformfont{pmnric8r}{\reencodefont{8r}{\fromafm{pmnric8a}}}
10 \transformfont{pmns8r}{\reencodefont{8r}{\fromafm{pmns8a}}}
11 \transformfont{pmnsc8r}{\reencodefont{8r}{\fromafm{pmnsc8a}}}
12 \transformfont{pmnsi8r}{\reencodefont{8r}{\fromafm{pmnsi8a}}}
13 \transformfont{pmnsic8r}{\reencodefont{8r}{\fromafm{pmnsic8a}}}
14 \transformfont{pmnb8r}{\reencodefont{8r}{\fromafm{pmnb8a}}}
15 \transformfont{pmnbi8r}{\reencodefont{8r}{\fromafm{pmnbi8a}}}
16 \transformfont{pmnc8r}{\reencodefont{8r}{\fromafm{pmnc8a}}}
```

Reencoding: you know the drill. We reencode all base fonts using Adobe Standard as their native encoding. While the swash fonts are based on Adobe Standard as well, they contain a special set of glyphs and are handled like expert fonts.

```
17 \installfonts
18 \installfamily{T1}{pmnx}{}
19 \installfamily{TS1}{pmnx}{}
20 \installfont{pmnr9e}{pmnr8r,pmnr8x,latin}{t1}{T1}{pmnx}{m}{n}{}
21 \installfont{pmnri9e}{pmnri8r,pmnri8x,latin}{t1}{T1}{pmnx}{m}{it}{}

```

The setup of the upright and italic shapes does not differ from tutorial v.

```
22 \installfont{pmnrc9e}%
23 {kernoff,pmnr8r,pmnr8x,kernon,glyphoff,pmnrc8r,glyphon,resetsc,latinsc}%
24 {t1c}{T1}{pmnx}{m}{sc}{}
25 \installfont{pmnric9e}%
26 {kernoff,pmnri8r,pmnri8x,kernon,glyphoff,pmnric8r,glyphon,resetsc,latinsc}%
27 {t1c}{T1}{pmnx}{m}{si}{}

```

There is one problem with taking optical small caps from an expert font as demonstrated in tutorial v: there are no kerning pairs between the uppercase alphabet and the small caps replacing the lowercase letters. Without dedicated small caps fonts there is nothing we can do about that. Now that we have both expert and small caps fonts, however, we could take an approach similar to the one outlined in tutorial III, adding the expert font on top of them to get the additional ligatures. We will use a different technique though, which extracts the more comprehensive kerning data from the small caps fonts while taking

the glyphs from the base and the expert fonts only. Apart from being conceptually cleaner, this approach has the additional benefit of not requiring the small caps fonts after the metrics and the virtual fonts have been generated, resulting in slightly smaller PDF and Postscript files if fonts are embedded. The input file list should be more or less self-explanatory: we use `kernoff.mtx` to ignore the kerning data while reading the respective base and expert fonts. Then we add `kernon.mtx` to re-activate the kerning commands and a special metric file called `glyphoff.mtx` to ignore the glyph data. After that, we read the corresponding small caps font and re-activate the glyph commands. Finally, we add `resetsc.mtx` as well as `latinsc.mtx`. Our encoding file is `t1c.etx`.

```

28 \installfont{pmns9e}{pmns8r,pmns8x,latin}{t1}{T1}{pmnx}{sb}{n}{}
29 \installfont{pmnsi9e}{pmnsi8r,pmnsi8x,latin}{t1}{T1}{pmnx}{sb}{it}{}
30 \installfont{pmnsc9e}%
31   {kernoff,pmns8r,pmns8x,kernon,glyphoff,pmnsc8r,glyphon,resetsc,latinsc}%
32   {t1c}{T1}{pmnx}{sb}{sc}{}
33 \installfont{pmnsic9e}%
34   {kernoff,pmnsi8r,pmnsi8x,kernon,glyphoff,pmnsic8r,glyphon,resetsc,latinsc}%
35   {t1c}{T1}{pmnx}{sb}{si}{}

```

We repeat these steps for the semibold weight.

```

36 \installfont{pmnb9e}{pmnb8r,pmnb8x,latin}{t1}{T1}{pmnx}{b}{n}{}
37 \installfont{pmnbi9e}{pmnbi8r,pmnbi8x,latin}{t1}{T1}{pmnx}{b}{it}{}
38 \installfont{pmnc9e}{pmnc8r,pmnc8x,latin}{t1}{T1}{pmnx}{eb}{n}{}

```

The bold and black weights are handled differently because there are no optical small caps. We will simply omit the respective shapes. The black weight will be mapped to the `eb` series of the NFSS. After finishing T1 encoding we continue with TS1. Our setup for TS1 encoding does not differ from tutorial v either:

```

39 \installfont{pmnr9c}{pmnr8r,pmnr8x,textcomp}{ts1}{TS1}{pmnx}{m}{n}{}
40 \installfont{pmnri9c}{pmnri8r,pmnri8x,textcomp}{ts1}{TS1}{pmnx}{m}{it}{}
41 \installfont{pmns9c}{pmns8r,pmns8x,textcomp}{ts1}{TS1}{pmnx}{sb}{n}{}
42 \installfont{pmnsi9c}{pmnsi8r,pmnsi8x,textcomp}{ts1}{TS1}{pmnx}{sb}{it}{}
43 \installfont{pmnb9c}{pmnb8r,pmnb8x,textcomp}{ts1}{TS1}{pmnx}{b}{n}{}
44 \installfont{pmnbi9c}{pmnbi8r,pmnbi8x,textcomp}{ts1}{TS1}{pmnx}{b}{it}{}
45 \installfont{pmnc9c}{pmnc8r,pmnc8x,textcomp}{ts1}{TS1}{pmnx}{eb}{n}{}
46 \endinstallfonts

```

The `pmnx` family is now complete. We continue with `pmnj` which will feature hanging figures by default:

```

47 \installfonts
48 \installfamily{T1}{pmnj}{}
49 \installfont{pmnr9d}{pmnr8r,pmnr8x,latin}{t1j}{T1}{pmnj}{m}{n}{}
50 \installfont{pmnri9d}{pmnri8r,pmnri8x,latin}{t1j}{T1}{pmnj}{m}{it}{}

```

To make hanging figures the default throughout the `pmnj` family we employ the encoding file `t1j.etx`. Other than that, the setup of the upright and italic shapes does not differ from `pmnx`.

```

51 \installfont{pmnrc9d}
52   {kernoff,pmnr8r,pmnr8x,kernon,glyphoff,pmnrc8r,glyphon,resetosf,resetsc,latinsc}%
53   {t1cj}{T1}{pmnj}{m}{sc}{}

```

```

54 \installfont{pmnric9d}
55   {kernoff,pmnri8r,pmnri8x,kernon,glyphoff,pmnric8r,glyphon,resetosf,resetsc,latinsc}%
56   {t1cj}{T1}{pmnj}{m}{si}{}

```

For the small caps shape of the pmnj family we essentially use the technique introduced above. Since this font family will feature hanging figures we use the encoding file t1cj.etx and add the metric file resetosf.mtx.

```

57 \installfont{pmns9d}{pmns8r,pmns8x,latin}{t1j}{T1}{pmnj}{sb}{n}{}
58 \installfont{pmnsi9d}{pmnsi8r,pmnsi8x,latin}{t1j}{T1}{pmnj}{sb}{it}{}
59 \installfont{pmnsc9d}
60   {kernoff,pmns8r,pmns8x,kernon,glyphoff,pmnsc8r,glyphon,resetosf,resetsc,latinsc}%
61   {t1cj}{T1}{pmnj}{sb}{sc}{}
62 \installfont{pmnsic9d}
63   {kernoff,pmnsi8r,pmnsi8x,kernon,glyphoff,pmnsic8r,glyphon,resetosf,resetsc,latinsc}%
64   {t1cj}{T1}{pmnj}{sb}{si}{}

```

Again, we repeat these steps for the semibold weight.

```

65 \installfont{pmnb9d}{pmnb8r,pmnb8x,latin}{t1j}{T1}{pmnj}{b}{n}{}
66 \installfont{pmnbi9d}{pmnbi8r,pmnbi8x,latin}{t1j}{T1}{pmnj}{b}{it}{}
67 \installfont{pmnc9d}{pmnc8r,pmnc8x,latin}{t1j}{T1}{pmnj}{eb}{n}{}
68 \endinstallfonts

```

The bold and black weights are essentially handled like those of the pmnx family, only differing in the choice of the encoding file.

```

69 \installfonts
70 \installfamily{T1}{pmn0}{}
71 \installfont{pmnr09e}{pmnr8r,pmnr8x,latin}{t10}{T1}{pmn0}{m}{n}{}
72 \installfont{pmnri09e}{pmnri8r,pmnri8x,latin}{t10}{T1}{pmn0}{m}{it}{}
73 \installfont{pmns09e}{pmns8r,pmns8x,latin}{t10}{T1}{pmn0}{sb}{n}{}
74 \installfont{pmnsi09e}{pmnsi8r,pmnsi8x,latin}{t10}{T1}{pmn0}{sb}{it}{}
75 \installfont{pmnb09e}{pmnb8r,pmnb8x,latin}{t10}{T1}{pmn0}{b}{n}{}
76 \installfont{pmnbi09e}{pmnbi8r,pmnbi8x,latin}{t10}{T1}{pmn0}{b}{it}{}
77 \installfont{pmnc09e}{pmnc8r,pmnc8x,latin}{t10}{T1}{pmn0}{eb}{n}{}
78 \endinstallfonts

```

In addition to pmnx and pmnj, we also add dedicated font families incorporating inferior and superior figures. Since inferior figures are found in the expert fonts, our approach here does not differ from the one introduced in section v.3.

```

79 \installfonts
80 \installfamily{T1}{pmn1}{}
81 \installfont{pmnr19e}{pmnr8r,pmnr8x,latin}{t11}{T1}{pmn1}{m}{n}{}
82 \installfont{pmnri19e}{pmnri8r,pmnri8x,latin}{t11}{T1}{pmn1}{m}{it}{}
83 \installfont{pmns19e}{pmns8r,pmns8x,latin}{t11}{T1}{pmn1}{sb}{n}{}
84 \installfont{pmnsi19e}{pmnsi8r,pmnsi8x,latin}{t11}{T1}{pmn1}{sb}{it}{}
85 \installfont{pmnb19e}{pmnb8r,pmnb8x,latin}{t11}{T1}{pmn1}{b}{n}{}
86 \installfont{pmnbi19e}{pmnbi8r,pmnbi8x,latin}{t11}{T1}{pmn1}{b}{it}{}
87 \installfont{pmnc19e}{pmnc8r,pmnc8x,latin}{t11}{T1}{pmn1}{eb}{n}{}
88 \endinstallfonts

```

The same holds true for superior figures.

```

89 \installfonts
90 \installfamily{T1}{pmnw}{}
91 \installfont{pmnriw9d}{pmnri8r,unsetcaps,pmnriw7a,pmnri8x,latin}{t1j}{T1}{pmnw}{m}{it}{}
92 \installfont{pmnsiw9d}{pmnsi8r,unsetcaps,pmnsiw7a,pmnsi8x,latin}{t1j}{T1}{pmnw}{sb}{it}{}

```

```
93 \endinstallfonts
94 \bye
```

In order to incorporate the italic swashes we create an additional font family called `pmnw`. We read the respective base font and clear the slots of the capital letters using the metric file `unsetcaps.mtx`. After that we add the respective swash font and finally the expert font as usual. We employ `t1j.etx` to get hanging figures by default. Our self-made metric file `unsetcaps.mtx` uses the `\unsetglyph` command as follows:

```
\relax
\metrics
\unsetglyph{A}
\unsetglyph{B}
\unsetglyph{C}
...
\unsetglyph{X}
\unsetglyph{Y}
\unsetglyph{Z}
\endmetrics
```

We are merely clearing the slots of capital letters found in the English here. Capital letters with an accent are not removed because the Minion swash set does not provide accented swash capitals anyway. This means that all accented capital letters will be taken from the ordinary italic font. In this particular case `OT1` encoding could be used as a workaround since this encoding constructs accented letters from the English alphabet as discussed in tutorial I. So here is the respective part of the file for `OT1` encoding:

```
\installfonts
\installfamily{OT1}{pmnw}{}
\installfont{pmnrw9o}{pmnr8r,unsetcaps,pmnrw7a,pmnr8x,latin}{ot1j}{OT1}{pmnw}{m}{it}{}
\installfont{pmnsw9o}{pmns8r,unsetcaps,pmnsw7a,pmns8x,latin}{ot1j}{OT1}{pmnw}{sb}{it}{}
\endinstallfonts
```

Note that using a setup including `OT1` encoding for one font family only will require switching the encoding explicitly when selecting the swash fonts:

```
\fontencoding{OT1}\fontfamily{pmnw}\selectfont
```

The `pmnw` family as generated by `fontinst` will only cover two shapes in either case. Since `fontinst` does not support family substitutions we cannot take the missing shapes from `pmnj` in the `fontinst` file. We have to edit the respective font definition file, `t1pmnw.fd`, after running `fontinst`. For `T1` encoding it should look as follows:

```
\ProvidesFile{t1pmnw.fd}
\DeclareFontFamily{T1}{pmnw}{}
\DeclareFontShape{T1}{pmnw}{m}{n}{<-> ssub * pmnj/m/n} {}
\DeclareFontShape{T1}{pmnw}{m}{sc}{<-> ssub * pmnj/m/sc} {}
\DeclareFontShape{T1}{pmnw}{m}{sl}{<-> ssub * pmnj/m/sl} {}
\DeclareFontShape{T1}{pmnw}{m}{it}{<-> pmnrw9d} {}
\DeclareFontShape{T1}{pmnw}{m}{si}{<-> ssub * pmnj/m/si} {}
\DeclareFontShape{T1}{pmnw}{sb}{n}{<-> ssub * pmnj/sb/n} {}
```

```

\DeclareFontShape{T1}{pmnw}{sb}{sc}{<-> ssub * pmnj/sb/sc}{}
\DeclareFontShape{T1}{pmnw}{sb}{sl}{<-> ssub * pmnj/sb/sl}{}
\DeclareFontShape{T1}{pmnw}{sb}{it}{<-> pmnsiw9d}{}
\DeclareFontShape{T1}{pmnw}{sb}{si}{<-> ssub * pmnj/sb/si}{}
\DeclareFontShape{T1}{pmnw}{b}{n}{<-> ssub * pmnj/b/n}{}
\DeclareFontShape{T1}{pmnw}{b}{sc}{<-> ssub * pmnj/b/sc}{}
\DeclareFontShape{T1}{pmnw}{b}{sl}{<-> ssub * pmnj/b/sl}{}
\DeclareFontShape{T1}{pmnw}{b}{it}{<-> ssub * pmnj/b/it}{}
\DeclareFontShape{T1}{pmnw}{b}{si}{<-> ssub * pmnj/b/si}{}
\DeclareFontShape{T1}{pmnw}{eb}{n}{<-> ssub * pmnj/eb/n}{}
\DeclareFontShape{T1}{pmnw}{eb}{sc}{<-> ssub * pmnj/eb/sc}{}
\DeclareFontShape{T1}{pmnw}{eb}{sl}{<-> ssub * pmnj/eb/sl}{}
\DeclareFontShape{T1}{pmnw}{eb}{it}{<-> ssub * pmnj/eb/it}{}
\DeclareFontShape{T1}{pmnw}{eb}{si}{<-> ssub * pmnj/eb/si}{}
\DeclareFontShape{T1}{pmnw}{bx}{n}{<-> ssub * pmnw/sb/n}{}
\DeclareFontShape{T1}{pmnw}{bx}{sc}{<-> ssub * pmnw/sb/sc}{}
\DeclareFontShape{T1}{pmnw}{bx}{sl}{<-> ssub * pmnw/sb/sl}{}
\DeclareFontShape{T1}{pmnw}{bx}{it}{<-> ssub * pmnw/sb/it}{}
\DeclareFontShape{T1}{pmnw}{bx}{si}{<-> ssub * pmnw/sb/si}{}
\endinput

```

Only the pmnx family offers TS1 encoded fonts as the glyphs found in this encoding are identical across all font families. To make sure that all font families work as expected, however, we need font definition files containing family substitutions which cannot be defined in a fontinst file. For the pmnj family:

```

\ProvidesFile{ts1pmnj.fd}
\DeclareFontFamily{TS1}{pmnj}{}
\DeclareFontShape{TS1}{pmnj}{m}{n}{<-> ssub * pmnx/m/n}{}
\DeclareFontShape{TS1}{pmnj}{m}{sc}{<-> ssub * pmnx/m/sc}{}
\DeclareFontShape{TS1}{pmnj}{m}{sl}{<-> ssub * pmnx/m/sl}{}
\DeclareFontShape{TS1}{pmnj}{m}{it}{<-> ssub * pmnx/m/it}{}
\DeclareFontShape{TS1}{pmnj}{sb}{n}{<-> ssub * pmnx/sb/n}{}
\DeclareFontShape{TS1}{pmnj}{sb}{sc}{<-> ssub * pmnx/sb/sc}{}
\DeclareFontShape{TS1}{pmnj}{sb}{sl}{<-> ssub * pmnx/sb/sl}{}
\DeclareFontShape{TS1}{pmnj}{sb}{it}{<-> ssub * pmnx/sb/it}{}
\DeclareFontShape{TS1}{pmnj}{b}{n}{<-> ssub * pmnx/b/n}{}
\DeclareFontShape{TS1}{pmnj}{b}{sc}{<-> ssub * pmnx/b/sc}{}
\DeclareFontShape{TS1}{pmnj}{b}{sl}{<-> ssub * pmnx/b/sl}{}
\DeclareFontShape{TS1}{pmnj}{b}{it}{<-> ssub * pmnx/b/it}{}
\DeclareFontShape{TS1}{pmnj}{eb}{n}{<-> ssub * pmnx/eb/n}{}
\DeclareFontShape{TS1}{pmnj}{eb}{sc}{<-> ssub * pmnx/eb/sc}{}
\DeclareFontShape{TS1}{pmnj}{eb}{sl}{<-> ssub * pmnx/eb/sl}{}
\DeclareFontShape{TS1}{pmnj}{eb}{it}{<-> ssub * pmnx/eb/it}{}
\DeclareFontShape{TS1}{pmnj}{bx}{n}{<-> ssub * pmnx/sb/n}{}
\DeclareFontShape{TS1}{pmnj}{bx}{sc}{<-> ssub * pmnx/sb/sc}{}
\DeclareFontShape{TS1}{pmnj}{bx}{sl}{<-> ssub * pmnx/sb/sl}{}
\DeclareFontShape{TS1}{pmnj}{bx}{it}{<-> ssub * pmnx/sb/it}{}
\endinput

```

For the pmnw family:

```

\ProvidesFile{ts1pmnw.fd}
\DeclareFontFamily{TS1}{pmnw}{}
\DeclareFontShape{TS1}{pmnw}{m}{n}{<-> ssub * pmnx/m/n}{}
\DeclareFontShape{TS1}{pmnw}{m}{sc}{<-> ssub * pmnx/m/sc}{}
\DeclareFontShape{TS1}{pmnw}{m}{sl}{<-> ssub * pmnx/m/sl}{}
\DeclareFontShape{TS1}{pmnw}{m}{it}{<-> ssub * pmnx/m/it}{}

```



```

\DeclareFontShape{TS1}{pmnw}{sb}{n}{<-> ssub * pmnx/sb/n} {}
\DeclareFontShape{TS1}{pmnw}{sb}{sc}{<-> ssub * pmnx/sb/n} {}
\DeclareFontShape{TS1}{pmnw}{sb}{sl}{<-> ssub * pmnx/sb/sl} {}
\DeclareFontShape{TS1}{pmnw}{sb}{it}{<-> ssub * pmnx/sb/it} {}
\DeclareFontShape{TS1}{pmnw}{b}{n}{<-> ssub * pmnx/b/n} {}
\DeclareFontShape{TS1}{pmnw}{b}{sc}{<-> ssub * pmnx/b/n} {}
\DeclareFontShape{TS1}{pmnw}{b}{sl}{<-> ssub * pmnx/b/sl} {}
\DeclareFontShape{TS1}{pmnw}{b}{it}{<-> ssub * pmnx/b/it} {}
\DeclareFontShape{TS1}{pmnw}{eb}{n}{<-> ssub * pmnx/eb/n} {}
\DeclareFontShape{TS1}{pmnw}{eb}{sc}{<-> ssub * pmnx/eb/n} {}
\DeclareFontShape{TS1}{pmnw}{eb}{sl}{<-> ssub * pmnx/eb/sl} {}
\DeclareFontShape{TS1}{pmnw}{eb}{it}{<-> ssub * pmnx/eb/it} {}
\DeclareFontShape{TS1}{pmnw}{bx}{n}{<-> ssub * pmnx/sb/n} {}
\DeclareFontShape{TS1}{pmnw}{bx}{sc}{<-> ssub * pmnx/sb/n} {}
\DeclareFontShape{TS1}{pmnw}{bx}{sl}{<-> ssub * pmnx/sb/sl} {}
\DeclareFontShape{TS1}{pmnw}{bx}{it}{<-> ssub * pmnx/sb/it} {}
\endinput

```

For the pmn0 family:

```

\ProvidesFile{ts1pmn0.fd}
\DeclareFontFamily{TS1}{pmn0}{}
\DeclareFontShape{TS1}{pmn0}{m}{n}{<-> ssub * pmnx/m/n} {}
\DeclareFontShape{TS1}{pmn0}{m}{sc}{<-> ssub * pmnx/m/n} {}
\DeclareFontShape{TS1}{pmn0}{m}{sl}{<-> ssub * pmnx/m/sl} {}
\DeclareFontShape{TS1}{pmn0}{m}{it}{<-> ssub * pmnx/m/it} {}
\DeclareFontShape{TS1}{pmn0}{sb}{n}{<-> ssub * pmnx/sb/n} {}
\DeclareFontShape{TS1}{pmn0}{sb}{sc}{<-> ssub * pmnx/sb/n} {}
\DeclareFontShape{TS1}{pmn0}{sb}{sl}{<-> ssub * pmnx/sb/sl} {}
\DeclareFontShape{TS1}{pmn0}{sb}{it}{<-> ssub * pmnx/sb/it} {}
\DeclareFontShape{TS1}{pmn0}{b}{n}{<-> ssub * pmnx/b/n} {}
\DeclareFontShape{TS1}{pmn0}{b}{sc}{<-> ssub * pmnx/b/n} {}
\DeclareFontShape{TS1}{pmn0}{b}{sl}{<-> ssub * pmnx/b/sl} {}
\DeclareFontShape{TS1}{pmn0}{b}{it}{<-> ssub * pmnx/b/it} {}
\DeclareFontShape{TS1}{pmn0}{eb}{n}{<-> ssub * pmnx/eb/n} {}
\DeclareFontShape{TS1}{pmn0}{eb}{sc}{<-> ssub * pmnx/eb/n} {}
\DeclareFontShape{TS1}{pmn0}{eb}{sl}{<-> ssub * pmnx/eb/sl} {}
\DeclareFontShape{TS1}{pmn0}{eb}{it}{<-> ssub * pmnx/eb/it} {}
\DeclareFontShape{TS1}{pmn0}{bx}{n}{<-> ssub * pmnx/sb/n} {}
\DeclareFontShape{TS1}{pmn0}{bx}{sc}{<-> ssub * pmnx/sb/n} {}
\DeclareFontShape{TS1}{pmn0}{bx}{sl}{<-> ssub * pmnx/sb/sl} {}
\DeclareFontShape{TS1}{pmn0}{bx}{it}{<-> ssub * pmnx/sb/it} {}
\endinput

```

For the pmn1 family:

```

\ProvidesFile{ts1pmn1.fd}
\DeclareFontFamily{TS1}{pmn1}{}
\DeclareFontShape{TS1}{pmn1}{m}{n}{<-> ssub * pmnx/m/n} {}
\DeclareFontShape{TS1}{pmn1}{m}{sc}{<-> ssub * pmnx/m/n} {}
\DeclareFontShape{TS1}{pmn1}{m}{sl}{<-> ssub * pmnx/m/sl} {}
\DeclareFontShape{TS1}{pmn1}{m}{it}{<-> ssub * pmnx/m/it} {}
\DeclareFontShape{TS1}{pmn1}{sb}{n}{<-> ssub * pmnx/sb/n} {}
\DeclareFontShape{TS1}{pmn1}{sb}{sc}{<-> ssub * pmnx/sb/n} {}
\DeclareFontShape{TS1}{pmn1}{sb}{sl}{<-> ssub * pmnx/sb/sl} {}
\DeclareFontShape{TS1}{pmn1}{sb}{it}{<-> ssub * pmnx/sb/it} {}
\DeclareFontShape{TS1}{pmn1}{b}{n}{<-> ssub * pmnx/b/n} {}
\DeclareFontShape{TS1}{pmn1}{b}{sc}{<-> ssub * pmnx/b/n} {}
\DeclareFontShape{TS1}{pmn1}{b}{sl}{<-> ssub * pmnx/b/sl} {}

```

```

\DeclareFontShape{TS1}{pmn1}{b}{it}{<-> ssub * pmnx/b/it} {}
\DeclareFontShape{TS1}{pmn1}{eb}{n} {<-> ssub * pmnx/eb/n} {}
\DeclareFontShape{TS1}{pmn1}{eb}{sc}{<-> ssub * pmnx/eb/n} {}
\DeclareFontShape{TS1}{pmn1}{eb}{sl}{<-> ssub * pmnx/eb/sl} {}
\DeclareFontShape{TS1}{pmn1}{eb}{it}{<-> ssub * pmnx/eb/it} {}
\DeclareFontShape{TS1}{pmn1}{bx}{n} {<-> ssub * pmnx/sb/n} {}
\DeclareFontShape{TS1}{pmn1}{bx}{sc}{<-> ssub * pmnx/sb/n} {}
\DeclareFontShape{TS1}{pmn1}{bx}{sl}{<-> ssub * pmnx/sb/sl} {}
\DeclareFontShape{TS1}{pmn1}{bx}{it}{<-> ssub * pmnx/sb/it} {}
\endinput

```

vi.2 Text ornaments

The Minion expert package includes a dedicated ornament font, `pmnrbp.pfb`. As discussed before in section iv.3, we do not really need `fontinst` when installing symbol fonts. Since no reencoding is required and there are no virtual fonts, `afm2tfm` is sufficient for the job:

```
afm2tfm pmnrbp.afm pmnrbp.tfm
```

Using the fonts with LaTeX requires a font definition file, though. Symbol fonts are not based on any particular encoding, so we use the encoding code U (uncoded, unknown) in this case. This is `upmnp.fd`:

```

\ProvidesFile{upmnp.fd}
\DeclareFontFamily{U}{pmnp}{}
\DeclareFontShape{U}{pmnp}{m}{n}{<-> pmnrbp}{}
\endinput

```

vi.3 The map file

The map file for Minion is longer than the one in the last tutorial, but conceptually similar. Note that the `sc` & `osf` fonts are not required. They are included here for reference only. The swash and ornament fonts were not reencoded, hence their mapping is similar to that of expert fonts:

<code>pmnr8r</code>	Minion-Regular	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmnr8a.pfb
<code>pmnr18r</code>	Minion-Italic	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmnr18a.pfb
<code>pmns8r</code>	Minion-Semibold	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmns8a.pfb
<code>pmns18r</code>	Minion-SemiboldItalic	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmns18a.pfb
<code>pmnb8r</code>	Minion-Bold	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmnb8a.pfb
<code>pmnb18r</code>	Minion-BoldItalic	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmnb18a.pfb
<code>pmnc8r</code>	Minion-Black	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmnc8a.pfb
<code>pmnrc8r</code>	Minion-RegularSC	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmnrc8a.pfb
<code>pmnric8r</code>	Minion-ItalicSC	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmnric8a.pfb
<code>pmnsc8r</code>	Minion-SemiboldSC	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmnsc8a.pfb
<code>pmnsic8r</code>	Minion-SemiboldItalicSC	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmnsic8a.pfb
<code>pmnbj8r</code>	Minion-BoldOsF	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmnbj8a.pfb
<code>pmnbj18r</code>	Minion-BoldItalicOsF	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmnbj18a.pfb
<code>pmncj8r</code>	Minion-BlackOsF	"TeXBase1Encoding ReEncodeFont"	<8r.enc <pmncj8a.pfb
<code>pmnr8x</code>	MinionExp-Regular		<pmnr8x.pfb
<code>pmnr18x</code>	MinionExp-Italic		<pmnr18x.pfb
<code>pmns8x</code>	MinionExp-Semibold		<pmns8x.pfb
<code>pmns18x</code>	MinionExp-SemiboldItalic		<pmns18x.pfb
<code>pmnb8x</code>	MinionExp-Bold		<pmnb8x.pfb

pmnbi8x	MinionExp-BoldItalic	<pmnbi8x.pfb
pmnc8x	MinionExp-Black	<pmnc8x.pfb
pmnrw7a	Minion-SwashItalic	<pmnrw7a.pfb
pmnsiw7a	Minion-SwashSemiboldItalic	<pmnsiw7a.pfb
pmnrrp	Minion-Ornaments	<pmnrrp.pfb

VI.4 Extending the user interface

Before creating a style file for Minion, we will update `nfssect.sty` one more time to support its additional features. Support for swashes is easily added since the framework is already in place. Therefore, the first part of the file does not require any changes, we simply add support for swashes by defining `\swstyle` in a similar vein (40–42):

```

1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{nfssect}[2003/03/14 v1.2 Experimental NFSS Extensions]
3 \newcommand*\exfs@tempa{}
4 \newcommand*\exfs@tempb{}
5 \newcommand*\exfs@try@family[2][ ]{%
6   \let\exfs@tempa\relax
7   \begingroup
8     \fontfamily{#2}\try@load@fontshape
9     \expandafter\ifx\csname\curr@fontshape\endcsname\relax
10      \edef\exfs@tempa{#1}%
11      \ifx\exfs@tempa\@empty
12        \PackageWarning{nfssect}{%
13          Font family '\f@encoding/#2' not available\MessageBreak
14          Ignoring font switch}%
15      \else
16        \PackageInfo{nfssect}{%
17          Font family '\f@encoding/#2' not available\MessageBreak
18          Font family '\f@encoding/#1' tried instead}%
19        \exfs@try@family{#1}%
20      \fi
21    \else
22      \gdef\exfs@tempa{\fontfamily{#2}\selectfont}%
23    \fi
24  \endgroup
25  \exfs@tempa}
26 \def\exfs@get@base#1#2#3#4\@nil{#1#2#3}
27 \DeclareRobustCommand{\lnstyle}{%
28   \not@math@alphabet\lnstyle\relax
29   \exfs@try@family[\expandafter\exfs@get@base\f@family\@nil]%
30   {\expandafter\exfs@get@base\f@family\@nil x}}
31 \DeclareRobustCommand{\osstyle}{%
32   \not@math@alphabet\osstyle\relax
33   \exfs@try@family{\expandafter\exfs@get@base\f@family\@nil j}}
34 \DeclareRobustCommand{\instyle}{%
35   \not@math@alphabet\instyle\relax
36   \exfs@try@family{\expandafter\exfs@get@base\f@family\@nil 0}}
37 \DeclareRobustCommand{\sustyle}{%
38   \not@math@alphabet\sustyle\relax
39   \exfs@try@family{\expandafter\exfs@get@base\f@family\@nil 1}}
40 \DeclareRobustCommand{\swstyle}{%
41   \not@math@alphabet\swstyle\relax
42   \exfs@try@family{\expandafter\exfs@get@base\f@family\@nil w}}

```

Adding thorough support for italic small caps is not quite as easy. The problem is that the creators of the NFSS apparently did not think of italic small caps when putting italics and small caps in the same category. Since both variants are on the shape axis of the NFSS they are mutually exclusive. While this will not keep us from using `\fontshape` to select italic small caps explicitly, nesting `\scshape` and `\itshape` does not have the desired effect. When nested, these macros simply override each other instead of switching to italic small caps. This problem is not as exotic as it may seem because italic small caps are hardly ever used explicitly. Typically, they come into play when small caps and italics are mixed on the same line. For example, think of a page header which is set in small caps, containing a highlighted word set in italics; or an italic section heading with an acronym set in small caps. To work around this problem, we will have to redefine a few NFSS macros. But first of all, we will add a macro for explicit switching to italic small caps.

```
43 \newcommand*{\sidefault}{si}
```

Note that the NFSS does not use fixed shape codes like `it` and `sc` for the italic and the small caps shape, but rather macros like `\itdefault` and `\scdefault`. We will handle italic small caps in a similar way by defining `\sidefault`, which defaults to `si`. Now let's define `\sishape` for explicit switching to italic small caps:

```
44 \DeclareRobustCommand{\sishape}{%
45   \not@math@alphabet\sishape\relax
46   \fontshape\sidefault\selectfont}
```

While we are able to typeset italic small caps by selecting them explicitly, macros like `\itshape` and `\scshape` will simply ignore the new shape. Let's redefine these macros to make them take advantage of italic small caps transparently. In order to do so, we need a macro that will merge properties of the shape axis, thereby allowing us to treat italics and small caps as if they were not on the same axis:

```
47 \newcommand*{\exfs@merge@shape}[3]{%
48   \edef\exfs@tempa{#1}%
49   \edef\exfs@tempb{#2}%
50   \ifx\fontshape\exfs@tempb
51     \expandafter\ifx\csname\fontencoding/\fontfamily/\fontseries/#3\endcsname\relax
52     \else
53       \edef\exfs@tempa{#3}%
54     \fi
55   \fi
56   \fontshape{\exfs@tempa}\selectfont}
```

This macro will switch to the font shape given as the first argument unless the current shape is identical to the one indicated by the second argument. In this case it will switch to the shape designated by the third argument instead, provided that it is available for the current font family. With this macro at hand we redefine `\itshape`:

```

57 \DeclareRobustCommand{\itshape}{%
58   \not@math@alphabet\itshape\mathit
59   \exfs@merge@shape{\itdefault}{\scdefault}{\sidefault}}

```

Essentially, `\itshape` will switch to the font shape `it` unless the current shape is `sc`, in which case it will switch to `si` instead, provided that `si` is available. `\scshape` does it the other way around:

```

60 \DeclareRobustCommand{\scshape}{%
61   \not@math@alphabet\scshape\relax
62   \exfs@merge@shape{\scdefault}{\itdefault}{\sidefault}}

```

We also redefine `\upshape` to make it switch to `sc` instead of `n` if the current shape is `si`:

```

63 \DeclareRobustCommand{\upshape}{%
64   \not@math@alphabet\upshape\relax
65   \exfs@merge@shape{\updefault}{\sidefault}{\scdefault}}

```

If no italic small caps are available, all of these macros will behave like they did before, making them suitable for global use. While we are at it, we also define a new macro, `\dfshape`, that will reset the current shape to the default (`n` unless `\shapedefault` has been redefined) regardless of the current shape:

```

66 \DeclareRobustCommand{\dfshape}{%
67   \not@math@alphabet\dfshape\relax
68   \fontshape\shapedefault\selectfont}

```

Before we add text commands for our new font switches, there is still one thing left to do. The macro `\swstyle`, which we have defined above (40–42), will switch to the the font family providing italic swashes (for example, `pmnw`). However, it will not activate the italic shape. It would be convenient to have a macro which takes care of all of that. We first create an auxiliary macro holding the shape which provides the actual swashes:

```

69 \newcommand*{\swshapedefault}{\itdefault}

```

Then we create a macro which will call `\swstyle` and select the shape providing the italic swashes in one shot:

```

70 \DeclareRobustCommand{\swshape}{%
71   \not@math@alphabet\swshape\relax
72   \swstyle\fontshape\swshapedefault\selectfont}

```

Finally, we add text commands for our new font switches:

```

73 \DeclareTextFontCommand{\textln}{\lnstyle}
74 \DeclareTextFontCommand{\textos}{\osstyle}
75 \DeclareTextFontCommand{\textin}{\instyle}
76 \DeclareTextFontCommand{\textsu}{\sustyle}
77 \DeclareTextFontCommand{\textsi}{\sishape}
78 \DeclareTextFontCommand{\textdf}{\dfshape}
79 \DeclareTextFontCommand{\textsw}{\swshape}

```

As far as text is concerned, all features of Minion are readily available at this point. Using the ornaments would still require low-level commands, though.

vi.5 A high-level interface for ornaments

Technically, ornament fonts are comparable to the euro fonts discussed in section iv.3. To typeset the first ornament of Minion, for example, we could use the following construct:

```
{\usefont{U}{pmpn}{m}{n}\char 97}
```

As this is rather awkward and requires looking at the afm file to find out the encoding slot of each ornament, we will implement a higher-level solution. The problem is that ornament fonts do not conform to any encoding, so there is no standard we could rely on as far as the order of the glyphs in the font is concerned. We have to provide this information explicitly in `minion.sty`. To facilitate this, we define the following macro:

```
80 \newcommand*\DeclareTextOrnament}[7]{%
81 \expandafter\def\csname#1orn@roman#2\endcsname{#3/#4/#5/#6/#7}}
```

To declare the first ornament of Minion, this macro would be employed as follows:

```
\DeclareTextOrnament{pmn}{1}{U}{pmpn}{m}{n}{97}
```

We use the first three letters of the font family name as an identifier (`pmn`) and assign a number (1 in this case) to the ornament defined by the remaining arguments. These arguments form a complete font declaration with a syntax similar to that of the NFSS macro `\DeclareFontShape`. The last argument is the encoding slot of the ornament (97 here) as given in the afm file. You might wonder why we use a complete font declaration here. Since all ornaments are located in the same font, using the same encoding, series, and shape, this seems to be redundant. In this case, this is actually true. The problem is that ornaments are not necessarily provided in dedicated fonts. Adobe Garamond, for example, comes with ornaments which are included in some of the alternate text fonts so we use a complete declaration for maximum flexibility. Internally, the ornaments are saved in a format modeled after the way the NFSS handles font shapes. When typesetting an ornament later, we need a macro to parse this font declaration:

```
82 \begingroup
83 \catcode'\/=12
84 \gdef\exfs@split@orndef#1/#2/#3/#4/#5@nil{%
85 \def\f@encoding{#1}%
86 \def\f@family{#2}%
87 \def\f@series{#3}%
88 \def\f@shape{#4}%
89 \def\exfs@tempa{#5}}
90 \endgroup
```

Since we use the base of the font family name as an identifier, we also need a macro that expands to the first three letters of the current font family:

```
91 \def\exfs@base@family{\expandafter\exfs@get@base\f@family@nil}
```

Now we can finally implement a user macro that actually typesets the ornament. We will simply call it `\ornament`:

```

92 \DeclareRobustCommand{\ornament}[1]{%
93   \expandafter\ifx\csname\exfs@base@family @orn@\roman#1\endcsname\relax
94     \PackageWarning{nfssex}{%
95       Ornament #1 undefined for font family '\exfs@base@family'\MessageBreak
96       Setting debug mark}%
97     \rule{1ex}{1ex}%
98   \else
99     \begingroup
100    \edef\exfs@tempb{\csname\exfs@base@family @orn@\roman#1\endcsname}%
101    \expandafter\expandafter\expandafter\exfs@split@orndef
102    \expandafter\string\exfs@tempb\@nil
103    \selectfont\char\exfs@tempa
104    \endgroup
105  \fi}
106 \endinput

```

First of all, we check if the desired ornament has been declared (93) and issue a warning if not (94–96). We also typeset a mark (97) to facilitate debugging in this case. If it has been declared, we expand and parse the declaration (100–102), switch fonts, and typeset the ornament (103). We use a group to keep the font change local.

vi.6 The style file

The style file for Minion is similar to the ones suggested in section III.3 and v.5. The only difference is the declaration of the text ornaments. This is the first part of `minion.sty`:

```

1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{minion}[2003/03/25 v1.0 Adobe Minion]
3 \RequirePackage[T1]{fontenc}
4 \RequirePackage{textcomp}
5 \RequirePackage{nfssex}
6 \DeclareOption{oldstyle}{\renewcommand*{\rmdefault}{pminj}}
7 \DeclareOption{lining}{\renewcommand*{\rmdefault}{pminx}}
8 \ExecuteOptions{oldstyle}
9 \ProcessOptions

```

When declaring the text ornaments, we take the encoding slot numbers from the respective afm file:

```

C 97 ; WX 885 ; N ornament1 ; B 50 -65 835 744 ;
C 98 ; WX 1036 ; N ornament2 ; B 50 4 986 672 ;
C 99 ; WX 1066 ; N ornament3 ; B 50 -106 1016 745 ;
C 100 ; WX 866 ; N ornament4 ; B 50 98 816 534 ;
C 101 ; WX 390 ; N ornament5 ; B 50 86 341 550 ;

```

We add a declaration for each ornament:

```

10 \DeclareTextOrnament{pmin}{1}{U}{pminp}{m}{n}{97}
11 \DeclareTextOrnament{pmin}{2}{U}{pminp}{m}{n}{98}
12 \DeclareTextOrnament{pmin}{3}{U}{pminp}{m}{n}{99}
13 \DeclareTextOrnament{pmin}{4}{U}{pminp}{m}{n}{100}
14 \DeclareTextOrnament{pmin}{5}{U}{pminp}{m}{n}{101}

```

```

15 \DeclareTextOrnament{pmn}{6}{U}{pmnp}{m}{n}{102}
16 \DeclareTextOrnament{pmn}{7}{U}{pmnp}{m}{n}{103}
17 \DeclareTextOrnament{pmn}{8}{U}{pmnp}{m}{n}{104}
18 \DeclareTextOrnament{pmn}{9}{U}{pmnp}{m}{n}{105}
19 \DeclareTextOrnament{pmn}{10}{U}{pmnp}{m}{n}{106}
20 \DeclareTextOrnament{pmn}{11}{U}{pmnp}{m}{n}{107}
21 \DeclareTextOrnament{pmn}{12}{U}{pmnp}{m}{n}{108}
22 \DeclareTextOrnament{pmn}{13}{U}{pmnp}{m}{n}{109}
23 \DeclareTextOrnament{pmn}{14}{U}{pmnp}{m}{n}{110}
24 \DeclareTextOrnament{pmn}{15}{U}{pmnp}{m}{n}{111}
25 \DeclareTextOrnament{pmn}{16}{U}{pmnp}{m}{n}{112}
26 \DeclareTextOrnament{pmn}{17}{U}{pmnp}{m}{n}{113}
27 \DeclareTextOrnament{pmn}{18}{U}{pmnp}{m}{n}{114}
28 \DeclareTextOrnament{pmn}{19}{U}{pmnp}{m}{n}{115}
29 \DeclareTextOrnament{pmn}{20}{U}{pmnp}{m}{n}{116}
30 \DeclareTextOrnament{pmn}{21}{U}{pmnp}{m}{n}{117}
31 \DeclareTextOrnament{pmn}{22}{U}{pmnp}{m}{n}{118}
32 \DeclareTextOrnament{pmn}{23}{U}{pmnp}{m}{n}{119}
33 \endinput



```

As mentioned before, Adobe Garamond features ornaments in the alternate text fonts, requiring a complete font declaration. In this case, the definitions would look as follows:

```

\DeclareTextOrnament{pad}{1}{U}{pada}{m}{n}{49}
\DeclareTextOrnament{pad}{2}{U}{pada}{m}{n}{50}
\DeclareTextOrnament{pad}{3}{U}{pada}{m}{it}{49}

```

Note that the ornament macro is deliberately designed to be sensitive to the active font family. When using Minion as text font, `\ornament{1}` will typeset the symbol . When using Adobe Garamond, the same command sequence will typeset  instead. If you would like to use these text ornaments in a font independent manner, simply switch font families explicitly, adding extra braces to keep the font change local:

```
{\fontfamily{pmnx}\selectfont\ornament{1}}
```

Which Minion font family you select (for example, `pmnx` or `pmnj`) does not matter, but it has to be a known one, that is, there has to be a font definition file corresponding to the active text encoding in addition to the one for the ornament font. Note that, since the ornament declarations are given in the style file, you also need to load the respective package in the document preamble. For example, if you would like to typeset a document in Sabon and make use of some Minion text ornaments, you might do the following:

```

\documentclass...
\usepackage{minion}
\usepackage{sabon}
...
\begin{document}
...
Text in Sabon
...
{\fontfamily{pmnx}\selectfont\ornament{1}}

```


Apart from that, you can always go back to lower-level commands which merely depend on a font definition file (`upmnp.fd` and `upada.fd` here) for the respective ornament font:

```
{\usefont{U}{pmp}{m}{n}\char 97}  
{\usefont{U}{pada}{m}{n}\char 49}
```


CODE TABLES

The tables on the following pages are intended to give an idea of how the codes of the Fontname scheme relate to those used by Latex's font selection scheme (NFSS). The Fontname codes are what we use when renaming the font files during the installation while the NFSS codes are what we need when selecting a certain font under Latex later. Sticking to the NFSS codes listed below is not a technical requirement for a functional font installation. When using the `\latinfamily` macro, fontinst will indeed use these NFSS codes. When employing low-level fontinst commands, however, the NFSS font declaration is controlled by the last five arguments of the `\installfont` command. In theory, we could use an arbitrary code and the NFSS would handle that just fine. It is still highly recommended to stick to these codes to avoid confusion and incompatibility. Two dashes in one of the table cells indicate that there is no customary code for this font property in the respective scheme whereas a blank cell means that the code is omitted. Properties which are not catered for by the `\latinfamily` macro are marked with an asterisk in the last column.

Please note that Fontname codes and NFSS codes cannot be mapped on a one-to-one basis in all cases since the two schemes are rather different in concept. Weights and widths, which are treated separately by the Fontname scheme, need to be concatenated and handled as a 'series' when using the NFSS since the latter does not have independent categories ('axes') for weight and width. The 'variant' category of the Fontname scheme on the other hand, which embraces several different properties including shapes like italics as well as special glyph sets such as small caps or alternative figures, does not correspond to a single NFSS axis. Some variants, like italics and small caps for example, are mapped to the 'shape' axis of the NFSS. Others, such as alternative figures, are handled in completely different ways. Table 5 lists variants corresponding to the most common NFSS shapes only. When looking at the documentation of the Fontname scheme, you will find a lot more variant codes not mentioned here. Although they are used for file naming, they do not, or, at least do not necessarily correspond to a customary NFSS shape. Hanging, inferior, and superior numbers (Fontname codes `j`, `0`, and `1`), for example, are treated as 'variants' by the Fontname scheme but they are usually implemented as independent font families on the level of the NFSS. For the encodings listed in table 6 the situation is similar. For example, a virtual font in T1 encoding featuring expert glyphs is indicated by adding `9e` to the file name. However, on the level of the NFSS the encoding code is T1 for all T1 encoded fonts and the fact that the font provides expert glyphs is expressed by adding the letter `x` to the font family name.

WEIGHT	FONTNAME CODE	NFSS SERIES
ultra light, thin, hairline	a	ul*
extra light	j	el*
light	l	l
book	k	m
regular	r	m
medium	m	mb
demibold	d	db
semibold	s	sb
bold	b	b
heavy	h	eb
black	c	eb
extra bold, extra black	x	eb
ultra bold, ultra black	u	ub
poster	p	--*

TABLE 3: Codes for font weights

WIDTH	FONTNAME CODE	NFSS SERIES
ultra compressed	u	uc*
ultra condensed	o	uc*
extra compressed, extra condensed	q	ec*
compressed	p	c*
condensed	c	c*
narrow	n	c
regular		
extended	x	x*
expanded	e	x*
extra expanded	v	ex*
ultra expanded	--	ux*
wide	w	--*

TABLE 4: Codes for font widths

VARIANT	FONTNAME CODE	NFSS SHAPE
normal, upright, roman		n
italic	i	it
oblique, slanted	o	sl
small caps	c	sc
italic small caps	ic	si*
upright italic	--	ui*
outline	l	ol*

TABLE 5: Codes for font variants

ENCODING	FONTNAME CODE	NFSS ENCODING
Adobe Standard	8a	8a
Expert	8x	8x
Tex Base 1	8r	8r
Tex Text	7t	OT1
Tex Tex with expert set	9t	OT1
Tex Text with expert set and osf	9o	OT1
Cork	8t	T1
Cork with expert set	9e	T1
Cork with expert set and osf	9d	T1
Text Companion	8c	TS1
Text Companion with expert set	9c	TS1

TABLE 6: Codes for font encodings

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REVISION HISTORY

- 1.23** 2003-08-31 Added tables 1 and 2 to section 1.6
Revised section 1.6, adding note about Latin Modern
Revised section 1.5
- 1.20** 2003-07-17 Added preliminary hints concerning fontinst 1.9 to section IV.1
Fixed problem with `nfssect.sty` (sections III.3, V.5, and VI.4)
Improved support for swashes in `nfssect.sty` (section VI.4)
Revised discussion of ornaments in section VI.6
Revised discussion of swashes in section VI.1
Added spelling corrections by William Adams
Added spelling corrections by Adrian Burd
- 1.10** 2003-03-27 Added GNU Free Documentation License to the appendix
Added explicit licensing clause
- 1.00** 2003-03-25 Final release for fontinst 1.8
Added tutorial VI
Updated notes on contributions
- 0.80** 2003-03-23 Added spelling corrections and suggestions by Timothy Eyre
Revised section 1.5, splitting off section 1.6
Added section III.4
Updated notes on contributions
- 0.68** 2003-02-09 Revised section IV.2
Updated notes on contributions
- 0.66** 2003-01-26 Added highlighting to code listings
- 0.65** 2003-01-19 Added spelling corrections by Adrian Heathcote
Added spelling corrections by William Adams
Added section II.2
Revised section II.3
Revised introduction
- 0.60** 2003-01-11 Revised tutorial III
Added discussion of kerning issues to section III.1
- 0.54** 2003-01-04 Revised discussion of OT1 encoding in tutorial I
Added minor changes to code tables
- 0.52** 2003-01-02 Added code table 4 to appendix
Revised note on code tables in appendix
- 0.50** 2002-12-30 Added tutorial V
Added code tables 3, 5, and 6 to appendix
Added revision history
- 0.43** 2002-10-25 First public pre-release featuring tutorials I–IV
Added installation instructions to section IV.3
Added section IV.4
- 0.40** 2002-08-11 Added tutorial IV
- 0.30** 2002-05-12 Added tutorial III
- 0.20** 2002-04-17 Unreleased draft including tutorials I and II