The microtype package

Subliminal refinements towards typographical perfection

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The microtype package provides a LaTeX interface to the micro-typographic extensions that were introduced by pdfTeX and have since also propagated to LuaTeX and XeTeX: most prominently, character protrusion and font expansion, furthermore the adjustment of interword spacing and additional kerning, as well as hyphenatable letterspacing (tracking) and the possibility to disable all or selected ligatures. These features may be applied to customisable sets of fonts, and all micro-typographic aspects of the fonts can be configured in a straight-forward and flexible way. Settings for various fonts are provided.

Note that character protrusion requires pdfTeX (version 0.14f or later), LuaTeX, or XeTeX (at least version 0.9997). Font expansion works with pdfTeX (version 1.20 for automatic expansion) or LuaTeX. The package will by default enable protrusion and expansion if they can safely be assumed to work. Disabling ligatures requires pdfTeX ($\geq$ 1.30) or LuaTeX, while the adjustment of interword spacing and of kerning only works with pdfTeX ($\geq$ 1.40). Letterspacing is available with pdfTeX ($\geq$ 1.40) or LuaTeX ($\geq$ 0.62).

The alternative package letterspace, which also works with plain TeX, provides the user commands for letterspacing only, omitting support for all other extensions (see section 7).

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1 Micro-typography with TeX

Micro-typography is the art of enhancing the appearance and readability of a document while exhibiting a minimum degree of visual obtrusion. It is concerned with what happens between or at the margins of characters, words or lines. Whereas the macro-typographical aspects of a document (i.e., its layout) are clearly visible even to the untrained eye, micro-typographical refinements should ideally not even be recognisable. That is, you may think that a document looks beautiful, but you might not be able to tell exactly why: good micro-typographic practice tries to reduce all potential irritations that might disturb a reader.

Some essential micro-typographical aspects are already taken care of by TeX out of the box – and in an outstanding manner – namely, hyphenation and justification, as well as kerning and ligatures. Other aspects are in the user's scope of responsibilities, e.g., to specify the right amounts of spacing around punctuation characters, numbers, or quotation marks. On top of this, a number of long-standing micro-typographic techniques have been introduced to the TeX world relatively recently with pdfTeX, and have since also propagated to LuaTeX and XƎTeX. These features make them the tool of choice not only for the creation of electronic documents but also of works of outstanding time-honoured typography: most prominently, *character protrusion* (also known as margin kerning) and *font expansion*. Quoting Hàn Thế Thành, the author of pdfTeX, who writes in his thesis:

After you have read the text on the right, you can view the effect of the features it describes by clicking on the links:

Protrusion	*off*
Expansion	*off*

Both features are enabled throughout this document.

> 'Margin kerning is the adjustments of the characters at the margins of a typeset text. A simplified employment of margin kerning is hanging punctuation. Margin kerning is needed for optical alignment of the margins of a typeset text, because mechanical justification of the margins makes them look rather ragged. Some characters can make a line appear shorter to the human eye than others. Shifting such characters by an appropriate amount into the margins would greatly improve the appearance of a typeset text.
>
> Composing with font expansion is the method to use a wider or narrower variant of a font to make interword spacing more even. A font in a loose line can be substituted by a wider variant so the interword spaces are stretched by a smaller amount. Similarly, a font in a tight line can be replaced by a narrower variant to reduce the amount that the interword spaces are shrunk by. There is certainly a potential danger of font distortion when using such manipulations, thus they must be used with extreme care. The potentiality to adjust a line width by font expansion can be taken into consideration while a paragraph is being broken into lines, in order to choose better breakpoints.' [Thành 2000, p. 323]

Another micro-typographic technique, which has always been extremely difficult to achieve in TeX, is robust and hyphenatable *letterspacing (tracking)*.[1] Whereas letterspacing can easily be, and often is, abused when applying it to lowercase letters, readability may be increased by slightly letterspacing (small) capitals or by decreasing the tracking of very large uppercase type.

Setting *additional kerning* for individual characters is especially (but not only) useful for languages whose typographical tradition requires certain characters to be separated by a space. For example, it is customary in French typography to add a small space before question mark, exclamation mark and semi-colon, and a bigger space before the colon and the guillemets. Until now, this could only be achieved

[1] The `soul` package undertakes great efforts, but may still fail in certain circumstances; even to systematically adjust the tracking of a font throughout the document remains impossible.

by making these characters active (as is done, for example, by the `babel` package), which may not always be a robust solution. In contrast to the standard kerning built into the fonts (which will of course apply as usual), this additional kerning relates to single characters, not to character pairs.

Adjustment of interword spacing is based upon the idea that in order to achieve a uniform greyness of the text, the space between words should also depend on the surrounding characters. For example, if a word ends with an ‘r’, the following space should be a tiny bit smaller than that following, say, an ‘m’. You can think of this concept as an extension to TeX’s ‘space factors’. This feature may enhance the appearance of paragraphs even more. Emphasis in the last sentence is on the word ‘may’: this extension is still highly experimental – in particular, only ending characters will currently influence the interword space. Also, the settings shipped with `microtype` are but a first approximation, and I would highly welcome corrections and improvements. I suggest reading the reasoning behind the settings in section 15.9.

The possibility, finally, to *disable all or selected ligatures* is particularly useful for typewriter fonts.

The `microtype` package provides an interface to all these micro-typographic extensions. All micro-typographic aspects may be customised to your taste and needs in a straight-forward and systematic manner. The next chapters present a survey of all options and customisation possibilities. Should the micro-typographic extension discussed in a section work only with certain TeX engines, this requirement is marked inside a grey text box on the right.

2 Getting started

There is nothing surprising in loading this package:

```
\usepackage{microtype}
```

This will be sufficient in most cases, and if you are not interested in fine-tuning the micro-typographic appearance of your document (however unlikely this would seem, since using this package is proof of your interest in typographic issues), you may actually skip the rest of this document. If this, on the other hand, does not satisfy you – be it for theoretical or practical reasons – this manual will guide you on the path to the desired results along the following milestones:

- Enable the desired micro-typographic features, either via the respective package option or with the `\microtypesetup` command (section 3).
- Select the fonts to which this feature should be applied by declaring and activating ‘sets of fonts’. A number of sets are predefined, which may be activated directly in the package options (section 4).
- Fine-tune the micro-typographic settings of the fonts or sets of fonts (section 5).
- If you’re of the kind who always wants to march on, you will certainly be interested in the possibility of context-sensitive setup (section 6).
- You are even countenanced to leave the path of typographic virtue and steal some sheep (section 7) or trespass in other ways (section 8).
- Should you encounter any obstacles, follow the hints and caveats (section 9).

3 Options

Like many other LaTeX packages, the `microtype` package accepts options in the well-known `key=value` syntax. In the following, you will find a description of all `keys` and their possible `values` (‘`true`’ may be omitted; multiple values, where allowed, must be enclosed in braces; the default value is shown on the right – if preceded by an asterisk, this default only applies when running an up-to-date pdfTeX in PDF mode).

3.1 Enabling the micro-typographic features

`protrusion` `true`, `false`, `compatibility`, `nocompatibility`, ⟨*font set name*⟩ * `true`

`expansion` These are the main options to control the level of micro-typographic refinement which the fonts in your document should gain. By default, the package is moderately greedy: character protrusion will always be enabled, font expansion will only be disabled when the fonts cannot be expanded automatically, that is, with pdfTeX versions older than 1.20 or in DVI output mode (see section 3.5), or with XeTeX. In other words, `microtype` will try to apply as much micro-typography as can safely be expected to work under the respective conditions (hence, it is usually not necessary to load the package with different options, e.g., for PDF resp. DVI mode).

`activate` Protrusion and expansion may be enabled or disabled independently from each other by setting the respective key to `true` resp. `false`. The `activate` option is a shortcut for setting both options at the same time. Therefore, the following lines all have the same effect (when creating PDF files with a recent version of pdfTeX):

```
\usepackage[protrusion=true,expansion]{microtype}
```

```
\usepackage[activate={true,nocompatibility}]{microtype}
```

```
\usepackage{microtype}
```

With activated font expansion and/or character protrusion, line breaks (and consequently, page breaks) may turn out differently. If this is not desired – because you are re-typesetting a book whose pagination must not change – you may pass the value `compatibility` to the `protrusion` and/or `expansion` options. Typographically, however, the results will be suboptimal, hence the default value is `nocompatibility`.

Finally, you may also specify the name of a font set to which character protrusion and/or font expansion should be restricted. See section 4 for a detailed discussion. Specifying a font set for a feature implicitly activates this feature.

`tracking` `true`, `false`, ⟨*font set name*⟩ `false`

This option will systematically change the tracking of the fonts specified in the active font set (by default, all small capitals). It is not available with XeTeX (you may use the ‘`LetterSpace`’ option of the `fontspec` package instead). With pdfTeX, it is only available in PDF mode.

`kerning` `true`, `false`, ⟨*font set name*⟩ `false`

`spacing` These features do not unconditionally improve the quality of the typeset text: the `spacing` feature is still considered experimental, while the `kerning` feature only makes sense in special cases. Therefore, neither feature is enabled by default. They are not available with XeTeX or LuaTeX.

Table 1: Availability of micro-typographic features

TEX engine			Micro-typographic features					
Engine	Version	Output	Protrusion	Expansion		Tracking	Kerning	Spacing
				manual	automatic			
pdfTEX	< 0.14f	DVI/PDF	∅	∅	∅	∅	∅	∅
	≥ 0.14f	DVI/PDF	★	⊠	∅	∅	∅	∅
	≥ 1.20	DVI	★	⊠	∅	∅	∅	∅
		PDF	★	⊠	★	∅	∅	∅
	≥ 1.40	DVI	★	⊠	∅	∅	⊠	⊠
		PDF	★	⊠	★	⊠	⊠	⊠
LuaTEX	≥ 0.30	DVI	★	⊠	∅	∅	∅	∅
		PDF	★	⊠	★	∅	∅	∅
	≥ 0.62	DVI	★	∅	(⊠)[a]	⊠	∅	∅
		PDF	★	∅	★	⊠	∅	∅
XƎTEX	≥ 0.9997	PDF	★	∅	∅	∅	∅	∅

★ = enabled ⊠ = not enabled ∅ = not available *a* by means of variable tracking

Table 1 presents an overview of which micro-typographic features are available and enabled by default for the relevant TEX versions and output modes.

Whether ligatures should be disabled cannot be controlled via a package option but by using the `\DisableLigatures` command, which is explained in section 8.

3.2 Character protrusion

pdfTEX 0.14f | LuaTEX 0.30 | XƎTEX 0.9997

`factor` ⟨*integer*⟩ 1000

Using this option, you can globally increase or decrease the amount by which the characters will be protruded. While a value of 1000 means that the full protrusion as specified in the configuration (see section 5.1) will be used, a value of 500 would result in halving all protrusion factors of the configuration. This might be useful if you are generally satisfied with the settings but prefer the margin kerning to be less or more visible (e.g., if you are so proud of being able to use this feature that you want everybody to see it, or – to mention a motivation more in compliance with typographical correctness – if you are using a large font that calls for more modest protrusion).

`unit` `character`, ⟨*dimension*⟩ `character`

This option is described in section 5.1, apropos the command `\SetProtrusion`. Use with care.

3.3 Font expansion

pdfTEX 0.14f | LuaTEX 0.30

`auto` `true`, `false` * `true`

Beginning with pdfTEX version 1.20 (inherited by LuaTEX), the expanded instances of the fonts may be calculated automatically and at run-time instead of the user having to prepare them in advance. This option is true by default provided that you are using a TEX engine with this capability and the output mode is PDF.[2] If `auto` is set to false, the font instances for all expansion steps must exist (with files called ⟨*font name*⟩±⟨*expansion value*⟩, e.g., `cmr12+10`, as described in the pdfTEX manual). With recent versions of LuaTEX, expansion is always automatic.

When generating DVI files, font expansion has to be enabled explicitly. With pdfTEX, *automatic* font expansion will not work because the postprocessing drivers (`dvips`, `dvipdfm`, etc.) resp. the DVI viewer are not able to generate the fonts on the fly. With LuaTEX, on the other hand, expansion in DVI mode is realised by modifying the inter-letter spacing (tracking) instead of the glyphs themselves, which may or may not be desired.

`stretch` ⟨*integer*⟩ 20

`shrink` You may specify the stretchability and shrinkability of a font, i.e., the maximum amount that a font may be stretched or shrunk. The numbers will be divided by 1000, so that a stretch limit of 10 means that the font may be expanded by up to 1%. The default stretch limit is 20. The shrink limit will by default be the same as the stretch limit.

`step` ⟨*integer*⟩ * 1

Fonts are not expanded by arbitrary amounts but only by certain discrete steps within the expansion limits. With recent versions of pdfTEX (1.40 or newer) or LuaTEX, this option is by default set to 1, in order to allow trying the maximum number of font instances, and hence to guarantee the best possible output.[3] Older pdfTEX versions, however, had to include every font instance in the PDF file, which may increase the file size quite dramatically. Therefore, in case you are using a pre-1.40 pdfTEX version, `step` is by default set to one fifth of the smaller value of `stretch` and `shrink`.

`selected` `true`, `false` `false`

When applying font expansion, it is possible to restrict the expansion of some characters that are more sensitive to deformation than others (e.g., the ‘O’, in contrast to the ‘I’). This is called *selected expansion*, and its usage allows increasing the stretch and shrink limits (to, say, 30 instead of 20); however, the gain is limited since at the same time the average stretch variance will be decreased. Therefore, this option is by default set to `false`, so that all characters will be expanded by the same amount. See section 5.2 for a more detailed discussion.

3.4 Tracking

pdfTEX 1.40 | LuaTEX 0.62

`letterspace` ⟨*integer*⟩ 100

This option changes the default amount for tracking (see section 5.3) resp. letterspacing (see section 7). The amount is specified in thousandths of 1 em; admissible values are in the range of −1000 to +1000.

[2] With pdfTEX, automatic font expansion does not work with bitmap fonts. Therefore, if you are using the Computer Modern Roman fonts in `T1` encoding, you should either install the `cm-super` package or use the Latin Modern fonts (package `lmodern`).

[3] The downside with this default is that pdfTEX may run out of memory with huge documents; in this case, read about the error messages in the ‘Hints and caveats’ section (9), or try with a larger `step`.

3.5 Miscellaneous options

draft true, false false

final If the draft option is passed to the package, *all micro-typographic extensions will be disabled*, which may lead to different line, and hence page, breaks. The draft and final options may also be inherited from the class options; of course, you can override them in the package options. E.g., if you are using the class option draft to show any overfull boxes, you should load microtype with the final option.

verbose true, false, errors, silent false

Information on the settings used for each font will be written into the log file if you enable the verbose option. When microtype encounters a problem that is not fatal (e.g., an unknown character in the settings, or non-existent settings), it will by default only issue a warning and try to continue. Loading the package with verbose=errors will turn all warnings into errors, so that you can be sure that no problem will go unnoticed. If on the other hand you have investigated all warnings and decide to ignore them, you may silence microtype with verbose=silent.

babel true, false false

Loading the package with the babel option will adjust the typesetting according to the respective selected language. Read section 6 for further information.

config ⟨*file name*⟩ microtype

Various settings for this package will be loaded from a main configuration file, by default microtype.cfg (see section 5.7). You can have a different configuration file loaded instead by specifying its name *without the extension*, e.g., config=mycrotype.

DVIoutput true, false * false

pdfTEX and LuaTEX are not only able to generate PDF output but can also spit out DVI files. In fact, all recent TEX systems are using pdfTEX as the default engine also for DVI output, and LuaTEX too can be called in DVI mode. However, since changing the output mode inside the document may have undesired effects, this option should be considered deprecated; instead, it is recommended to just call the respective program (latex resp. dvilualatex). For XƎTEX, this option is not applicable.

3.6 Changing options later

\microtypesetup { ⟨*key = value list*⟩ }

Inside the preamble, this command accepts all package options described above (except for config). In the document body, this command may be used to change the general settings of the micro-typographic extensions. It then accepts all options from section 3.1: expansion, protrusion and activate, which in turn may receive the values true, false, compatibility or nocompatibility, and tracking, kerning and spacing with the admissible values true or false. Passing the name of a font set is not allowed. Using this command, you could for instance temporarily disable font expansion by saying:

```
\microtypesetup{expansion=false}
```

4 Selecting fonts for micro-typography

By default, character protrusion will be applied to all text fonts used in the document, and a basic set of fonts will be subject to font expansion. You may want to customise which fonts should get the benefit of micro-typographic treatment. This can be achieved by declaring and activating ‘font sets’; these font sets are specified via font attributes that have to match.

`\DeclareMicrotypeSet` [⟨*features*⟩] {⟨*set name*⟩} {⟨*set of fonts*⟩}
`\DeclareMicrotypeSet*` This command declares a new set of fonts to which the micro-typographic extensions should be applied. The optional argument may contain a comma-separated list of features to which this set should be restricted. The starred version of the command declares *and* activates the font set at the same time.

The set of fonts is specified by assigning values to the NFSS font attributes: encoding, family, series, shape and size (cf. LaTeX 2ε font selection). Let’s start with an example. In the main configuration file `microtype.cfg`, a font set called ‘`basictext`’ is defined as follows:

```
\DeclareMicrotypeSet{basictext}
   { encoding = {OT1,T1,T2A,LY1,OT4,QX,T5,EU1,EU2,TU},
     family   = {rm*,sf*},
     series   = {md*},
     size     = {normalsize,footnotesize,small,large}
   }
```

If you now call

```
\UseMicrotypeSet[protrusion]{basictext}
```

in the document’s preamble, only fonts in the text encodings, roman or sans serif families, normal (or ‘medium’) series, and in sizes called by `\normalsize`, `\footnotesize`, `\small` or `\large`, will be protruded. Math fonts, on the other hand, will not, since they are in another encoding. Neither will fonts in bold face, or huge fonts. Etc.

If an attribute list is empty or missing – like the ‘shape’ attribute in the above example – it does not constitute a restriction. In other words, this is equivalent to specifying *all* possible values for that attribute. Therefore, the predefined set ‘`alltext`’, which is declared as:

```
\DeclareMicrotypeSet{alltext}
   { encoding = {OT1,T1,T2A,LY1,OT4,QX,T5,TS1,EU1,EU2,TU} }
```

is far less restrictive. The only condition here is that the encoding must match.

If a value is followed by an asterisk (like ‘`rm*`’ and ‘`sf*`’ in the first example), it does not designate an NFSS code, but will be translated into the document’s `\`⟨*value*⟩`default`, e.g., `\rmdefault`.[4] A single asterisk means `\`⟨*attribute*⟩`default`, e.g., `\encodingdefault`, respectively `\normalsize` for the size axis. Sizes may either be specified as a dimension (‘`10`’ or ‘`10pt`’), or as a size selection command *without* the backslash. You may also specify ranges (e.g., ‘`small-Large`’); while the lower

[4] These translations will take place `\AtBeginDocument`, which means that changes to the defaults inside the preamble will also be taken into account. Only in cases where you change font defaults `\AtBeginDocument` yourself, you need to load `microtype` after these changes.

Table 2: Predefined font sets

Set name	Font attributes				
	Encoding	Family	Series	Shape	Size
all	∅	∅	∅	∅	∅
alltext (allmath)	Text encodings, TS1 (OML, OMS, U)	∅	∅	∅	∅
alltext-nott (allmath-nott)	Text encodings, TS1 (OML, OMS, U)	\rm*, \sf*	∅	∅	∅
basictext (basicmath)	Text encodings (OML, OMS)	\rm*, \sf*	\md*	∅	\normalsize, \footnotesize, \small, \large
smallcaps	Text encodings	∅	∅	\sc*,si,scit	∅
footnotesize	Text encodings, TS1	∅	∅	∅	-\small
scriptsize	Text encodings, TS1	∅	∅	∅	-\footnotesize
normalfont	\encoding*	\family*	\series*	\shape*	\normalsize

‘Text encodings’ = OT1, T1, T2A, LY1, OT4, QX, T5, EU1, EU2, TU ‘\...*’ = ‘\...default’

boundary is included in the range, the upper boundary is not. Thus, ‘12-16’ would match 12 pt, 13.5 pt and 15.999 pt, for example, but not 16 pt. You are allowed to omit the lower or upper bound (‘-10’, ‘large-’).

Additionally to this declaration scheme, you can add single fonts to a set using the ‘font’ key, which expects the concatenation of all font attributes, separated by forward slashes, i.e., ‘font = ⟨*encoding*⟩/⟨*family*⟩/⟨*series*⟩/⟨*shape*⟩/⟨*size*⟩’. This allows you to add fonts to the set that are otherwise disjunct from it. For instance, if you wanted to have the roman family in all sizes protruded, but only the normal sized, possibly italic, typewriter font (in contrast to, say, the small one), this is how you could declare the set:

```
\DeclareMicrotypeSet[protrusion]
   { myset }
   { encoding = T1,
     family   = rm*,
     font     = {T1/tt*/m/n/*,
                 T1/tt*/m/it/*} }
```

As you can tell from the example, the asterisk notation is also permitted for the font key. A single asterisk is equivalent to ‘*/*/*/*/*’, i.e., the normal font. Size selection commands are possible, too, however, ranges are not allowed.

Table 2 lists the eleven predefined font sets. They may also be activated by passing their name to the feature options protrusion, expansion, tracking, kerning and spacing when loading the package, for example:

```
\usepackage[protrusion=allmath,tracking=smallcaps]{microtype}
```

`\UseMicrotypeSet` [⟨*features*⟩] {⟨*set name*⟩}

This command activates a font set previously declared by `\DeclareMicrotypeSet`. Using the optional argument, you can limit the application of the set to one or more features. This command only has an effect if the feature was activated in the package options.

`\DeclareMicrotypeSetDefault` [⟨*features*⟩] {⟨*set name*⟩}

If a feature is enabled but no font set has been chosen explicitly, the sets declared by this command will be activated. By default, the '`alltext`' font set will be activated for character protrusion and additional kerning, the '`alltext-nott`' set for font expansion and interword spacing, and the '`smallcaps`' set for tracking.

These commands may only be used in the preamble or in the main configuration file. Their scope is global to the document. Only one set per feature may be activated.

5 Micro fine tuning

Every character asks for a particular protrusion, kerning or spacing amount. It may also be desirable to restrict the maximum expansion of certain characters. Furthermore, since every font looks different, settings have to be specific to a font or set of fonts. This package offers flexible and straight-forward methods of customising these finer aspects of micro-typography.

All fine-tuning commands follow basically the same syntax: they all take three arguments; the first one is optional and may contain additional options; in the second argument, you specify the set of fonts to which the settings should apply; the third argument contains the actual settings. Here, as in all configuration commands, all spaces are ignored.

The set of fonts to which the settings should apply is declared using the same syntax of ⟨*font axis*⟩ = ⟨*value list*⟩ pairs as for the command `\DeclareMicrotypeSet` (see section 4), with the only difference that values including asterisks (which, as you may recall, stand for the respective default) will be translated immediately instead of at the end of the preamble. To find the matching settings for a given font the package will try all combinations of font encoding, family, series, shape and size, with decreasing significance in this order. For instance, if settings exist for both the current family (say, `T1/cmr///`) and for italic fonts in the normal weight (`T1//m/it/`), the settings for the `cmr` family would apply. The encoding must always match.

The characters may be specified either as a single letter (`A`), as a text symbol command (`\textquoteleft`), or as a slot number (resp. Unicode number for LuaTeX or XeTeX): three or more digits for decimal notation, prefixed with `"` for hexadecimal, with `'` for octal numerals (e.g., the 'fl' ligature in `T1` encoding: `029`, `"1D`, `'35`). 8-bit (and even UTF-8) characters may be entered directly or in LaTeX's traditional 7-bit notation: both `\"A` and `Ä` are valid, provided the character is actually declared in both the input and the font encoding. With LuaTeX or XeTeX, you may additionally specify a (font-specific) glyph name, prefixed with '/' (e.g., the 'fl' ligature as `/f_l`). Note that you also have the possibility to declare lists of characters that should inherit settings (see section 5.6).

5.1 Character protrusion

pdfTEX 0.14f | LuaTEX 0.30 | XƎTEX 0.9997

\SetProtrusion [⟨*options*⟩] {⟨*set of fonts*⟩} {⟨*protrusion settings*⟩}

Using this command, you can set the protrusion factors for each character of a font or a set of fonts. A very incomplete example would be the following:

```
\SetProtrusion
   { encoding = T1,
     family   = cmr }
   { A              = {50,50},
     \textquoteleft = {700, } }
```

which would result in the character 'A' being protruded by 5% of its width on both sides, and the left quote character by 70% of its width into the left margin. This would apply to all font shapes, series and sizes of the T1 encoded Computer Modern Roman family.

The protrusion settings consist of ⟨*character*⟩ = ⟨*protrusion factors*⟩ pairs. The protrusion factors designate the amount that a character should be protruded into the left margin (first value) respectively into the right margin (second value). By default, the values are relative to the character widths, so that a value of 1000 means that the character should be shifted fully into the margin, while, for example, with a value of 50 it would be protruded by 5% of its width. Negative values are admitted, as well as numbers larger than 1000 (but effectively not more than 1 em of the font). You may omit either number if the character should not be protruded on that side, but must not drop the separating comma.

Options:

`name` You may assign a name to the protrusion settings, so that you are able to load it by another list.

`load` You can load another list (provided, you assigned a name to it) before the current list will be loaded, so that the fonts will inherit the values from the loaded list.

In this way, the configuration may be simplified considerably. You can for instance create a default list for a font; settings for other shapes or series can then load these settings, and extend or overwrite them (since the value that comes last will take precedence). Font settings will be loaded recursively. The following options will affect all loaded lists, in other words, any options from the loaded lists will be ignored:

`factor` This option can be used to influence all protrusion factors of the list, overriding any global `factor` setting (see section 3.2). For instance, if you want fonts in larger sizes to be protruded less, you could load the normal lists, just with a different factor applied to them:

```
\SetProtrusion
   [ factor   = 700,
     load     = cmr-T1 ]
   { encoding = T1,
     family   = cmr,
     size     = large- }
   { }
```

`unit` By default, the protrusion factors are relative to the respective character's width. The `unit` option may be used to override this and make `microtype` regard all values in the list as thousandths of the specified width. Issuing, for instance, '`unit=1em`' would have the effect that a value of, say, 50 now results in the character being protruded by 5% of an em of the font (thus simulating the internal measuring of pdfTEX's `\lpcode` and `\rpcode` primitives). The default behaviour can be restored with `unit=character`.[5]

`preset` Presets the protrusion codes of all characters to the specified values (`={`⟨*left*⟩`,`⟨*right*⟩`}`), possibly scaled by a `factor`. A `unit` setting will only be taken into account if it is not `=character`.

`inputenc` Selects an input encoding that should apply to this list, regardless of what the document's input encoding is. You may specify any encoding that can be loaded via the `inputenc` package, e.g., `ansinew`, `koi8-r`, `utf8`.

`context` The scope of the list may be limited to a certain context. For further details, see section 6.

5.2 Font expansion

pdfTEX 0.14f | LuaTEX 0.30

`\SetExpansion` [⟨*options*⟩] {⟨*set of fonts*⟩} {⟨*expansion settings*⟩}

By default, all characters of a font are allowed to be stretched or shrunk by the same amount. However, it is also possible to limit the expansion of certain characters if they are more sensitive to deformation. This is the purpose of the `\SetExpansion` command. Note that it will only have an effect if the package has been loaded with the `selected` option (cf. section 3.3). Otherwise, the expansion settings will be ignored – unlike the options in the optional first argument, which will still be evaluated. If the `selected` option has been set to true, and settings for a font don't exist, font expansion will not be applied to this font at all. Should the extraordinary situation arise that you want to employ selected expansion in general but for a particular font (set) all characters should be expanded or shrunk by the same amount, you would have to declare an empty list for these fonts.

The expansion settings consist of ⟨*character*⟩ = ⟨*expansion factor*⟩ pairs. You may specify one number for each character, which determines the amount that a character may be expanded. The numbers denominate thousandths of the full expansion. For example, if you set the expansion factor for the character 'O' to 500, it will only be expanded or shrunk by one half of the amount that the rest of the characters will be expanded or shrunk. While the default value for character protrusion is 0 – that is, if you didn't specify any characters, none would be protruded – the default value for expansion is 1000, which means that all characters would be expanded by the same amount.

Options:

`name`, `load`, `preset`, `inputenc`, `context` Analogous to `\SetProtrusion`, the optional argument may be used to assign a name to the list, to load another list, to preset

[5] The `unit` option can even be passed globally to the package (cf. section 3.2). However, all provided settings are created under the assumption that the values are relative to the character width. Therefore, you should only change it if you are certain that the default settings will not be used in your document.

all expansion factors, to set the input encoding, or to determine the context of the list (expansion contexts are only possible with pdfTEX version 1.40.4 or newer).

`auto`, `stretch`, `shrink`, `step` These keys can be used to override the global settings from the package options (see section 3.3). If you don't specify either one of `stretch`, `shrink` and `step`, their respective global value will be used (that is, no calculation will take place).

As a practical example, suppose you have a paragraph containing a widow that could be avoided by shrinking the font a bit more. In conjunction with the `context` option (see section 6 for further details), you could thus allow for more expansion in this particular paragraph:

```
\SetExpansion
   [ context = sloppy,
     stretch = 30,
     shrink  = 60,
     step    =  5  ]
   { encoding = {OT1,T1,TS1} }
   { }
% ... END PREAMBLE
{\microtypecontext{expansion=sloppy}%
 This paragraph contains a `fussy' widow.}
```

This method of employing contexts to temporarily apply different expansion parameters only works with pdfTEX version 1.40.4 or later,[6] or with LuaTEX. Also note that both pdfTEX and LuaTEX prohibit the use of fonts with different expansion limits or steps (even of different fonts) within one paragraph, hence the `sloppy` context would have to be applied to complete paragraphs.

`factor` This option provides a different method to alter expansion settings for certain fonts, working around the restriction just mentioned. The `factor` option influences the expansion factors of all characters (in contrast to the overall stretchability) of the font. For instance, if you want the italic shape to be expanded less, you could declare:

```
\SetExpansion
   [ factor   = 500 ]
   { encoding = *,
     shape    = it }
   { }
```

The `factor` option can only be used to *decrease* the stretchability of the characters, that is, it may only receive values smaller than 1000. Also, it can only be used for single fonts or font sets; setting it globally in the package options wouldn't make much sense – to this end, you use the package's `stretch` and `shrink` options.

5.3 Tracking

pdfTEX 1.40 | LuaTEX 0.62

`\SetTracking` [⟨*options*⟩] {⟨*set of fonts*⟩} {⟨*tracking amount*⟩}

An important typographic technique – which was missing in TEX for a long time – is the adjustment of tracking, i.e., the uniform addition or subtraction of letter space

[6] For older versions, a dirty trick is laid out in section 14.2 on page 59.

to/from all the characters in a font. For example, it is good typographic practice to slightly space out text set in all capitals or small capitals (as in this document). Legibility may also be improved by minimally increasing the tracking of smaller and decreasing that of larger type.[7] The `\SetTracking` command allows specifying the tracking amount for different fonts or font sets. It will also be evaluated by the `\textls` command, which may be used for letterspacing shorter pieces of text (see section 7).

The tracking amount is specified in thousandths of 1 em (or the given unit); negative values are allowed, too.

Options:

`name`, `unit`, `context` These options serve the same functions as in the previous configuration commands. The unit may be any dimension, default is 1 em.

`spacing` When the inter-*letter* spacing is altered, the inter-*word* spacing probably also needs to be adjusted. This option expects three numbers for interword space, stretch and shrink respectively, which are given in thousandths of 1 em (or of the current `unit`). If a value is followed by an asterisk, it denotes thousandths of the respective font dimension which will be added to it. For instance, with

```
\SetTracking[ spacing = {25*,166, } ]{ encoding = *, shape = sc }{ 25 }
```

the interword space will be increased by 2.5%, the stretch amount will be set to 0.166 em, while the shrink amount will be left untouched. If you don't specify the `spacing` option, the interword space will be scaled by the current letterspace amount (as in the above example), while stretch and shrink will not be changed.

`outer spacing` If an interword space immediately precedes or follows letterspaced text, it will by default be equal to that within the text. With this option, which accepts the same values as `spacing`, it may be adjusted independently.

`outer kerning` If, on the other hand, no interword space precedes or follows, you may still want to slightly set off the first and last letter from adjoining letters. This option expects the kerning amounts for left and right hand side, separated by a comma, in thousandths of 1 em (or the current `unit`). If a value is followed by an asterisk, it denotes thousandths of the current letterspacing amount. A single asterisk means '`500*`'; this is also the default, i.e., the sum of the outer kerns is by default equal to the current letterspace amount. To remove kerning on both sides, you would write '`outer kerning={0,0}`'.

`no ligatures` By default, ligatures in letterspaced fonts will be constructed as usual, which may be advisable when changing the tracking by only a small amount. For larger letterspacing amounts, on the other hand, the normal letter space within ligatures would have displeasing effects. This key expects a comma-separated list of characters for which ligatures should be disabled; only the character that begins a ligature must be specified. If the key is given without a value, *all* ligatures of the font will be disabled. With pdfTEX, this is not recommended, however, since it entails that kerning will be switched off, too. With LuaTEX, there is no such limitation. The default settings disable ligatures for the character 'f' only, i.e., 'ff',

[7] With full-featured fonts like Computer Modern, this is usually not necessary, though, since they come in optical sizes, and the tracking of the small-capitals font is already adjusted.

'fi', ffi', etc.[8] In exceptional situations, you can manually break up a ligature by inserting '{\kern0pt}' resp. babel's "| shortcut, or protect it by enclosing it in \lslig (see section 7).

Since a picture is worth a thousand words, probably even more if, in our case, it depicts a couple of letterspaced words, let's bring one to sum up these somewhat confusing options. Suppose you had the following settings (which are in no way recommended; they only serve illustrative purposes):

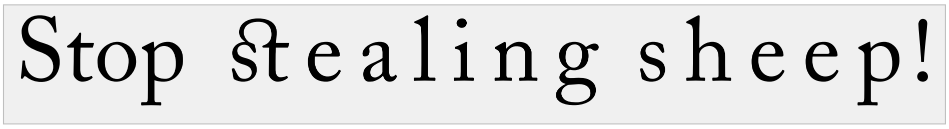
```
\SetTracking
  [ no ligatures  = {f},
    spacing       = {600*,-100*, },
    outer spacing = {450,250,150},
    outer kerning = {*,*} ]
  { encoding = * }
  { 160 }
```

and then write:

```
Stop \textls{stealing sheep}!
```

this would be the (typographically dubious) outcome:

Click on the image to show the kerns and spacings involved. Click on emphasised words in the text below to reveal the relation of image and code.



Stop stealing sheep!

While the word 'Stop' is not letterspaced, the space between the letters in the other two words is expanded by the *tracking amount* of 160/1000 em = 0.16 em. The *inner space* within the letterspaced text is increased by 60%, while its *stretch* amount is decreased by 10% and the *shrink* amount is left untouched. The *outer space* (of 0.45 em) immediately before the piece of text may *stretch* by 0.25 em and *shrink* by 0.15 em. Note that there is no outer space after the text, since the exclamation mark immediately follows; instead, the default *outer kern* of half the letterspace amount (0.08 em) is added. Furthermore, one *ligature* wasn't broken up, because we neglected to specify the 's' in the no ligatures key.

As another, more realistic example, suppose you want to space out all small capitals by 50/1000 em, fonts smaller than \small by 0.02 em, and to decrease the tracking of large type by 0.02 em. This could be achieved with the following settings:

```
\usepackage[tracking=true]{microtype}
\DeclareMicrotypeSet*[tracking]{my}
   { encoding = *,
     size     = {-small,Large-},
     font     = */*/*/sc/* }
\SetTracking[ no ligatures = f ]{ encoding = *, shape = sc}{ 50 }
\SetTracking{ encoding = *, size = -small }{  20 }
\SetTracking{ encoding = *, size = Large- }{ -20 }
```

Letterspaced fonts for which settings don't exist will be spaced out by the default of 0.1 em (adjustable with the package option letterspace, see section 3.5). Suppose

[8] With pdfTEX versions older than 1.40.4, *all* ligatures, and hence all kerning, will be disabled. It is therefore recommended to use at least version 1.40.4.

your editor wants you to shorten your 1000-pages chef-d'œuvre by a handful of pages, you could load `microtype` with (fingers crossed):

```
\usepackage[tracking=alltext,letterspace=-40]{microtype}
```

5.4 Additional kerning

pdfTeX 1.40

`\SetExtraKerning` [⟨*options*⟩] {⟨*set of fonts*⟩} {⟨*kerning settings*⟩}

With this command, you can fine tune the extra kerning. In contrast to standard kerning, which is always associated with a *pair* of characters, and to tracking, which specifies the space between *all* characters of a font, the extra kerning relates to single characters, that is, whenever a particular character appears in the text, the specified kerning will be inserted, regardless of which character precedes resp. follows it. (Put differently, this feature allows modifying the left or right *sidebearings* of specific glyphs.)

It should not be neglected to mention a limitation of this feature: words *immediately following* such a kern (not separated by a space) will not be hyphenated, unless you insert the breakpoints manually, e.g., for kerning after the apostrophe, '`l'apos\-trophe`'. Furthermore, additional kerning will not be applied in math mode. These restrictions of pdfTeX will hopefully be lifted some time.

The kerning settings are specified as pairs of ⟨*character*⟩ = ⟨*kerning values*⟩, where the latter consist of two values: the kerning added before the character, and the kerning appended after the respective character. Once again, either value may be omitted, but not the separating comma.

Options:

`name`, `load`, `factor`, `preset`, `inputenc` These options serve the same function as in the previous configuration commands.

`unit` Admissible values are: `space`, `character` and a ⟨*dimension*⟩. By default, the values denote thousandths of 1 em.

`context` When it comes to kerning settings, this option is especially useful, since it allows applying settings depending on the current language.

For example, you can find the following settings, intended to be used for documents written in French, in the main configuration file:

```
\SetExtraKerning
   [ name     = french-default,
     context  = french,
     unit     = space    ]
   { encoding = {OT1,T1,LY1} }
   {
     :  = {1000,}, % = \fontdimen2
     ;  = {500, }, % ~ \thinspace
     !  = {500, },
     ?  = {500, }
   }
```

What is the result of these settings ? If they are active, like in the current paragraph, a thin space will be inserted in front of each question mark, exclamation mark and semicolon ; a normal space in front of the colon. Read section 6 to learn how to activate these settings ! This paragraph was input like this :

```
\begin{microtypecontext}{kerning=french}
 What is the result of these settings? If they are active, like in the
 current paragraph, a thin space will be inserted in front of each
 question mark, exclamation mark and semicolon; a normal space in front
 of the colon. Read section~\ref{sec:context} to learn how to activate
 these settings! This paragraph was input like this:
\end{microtypecontext}
```

5.5 Interword spacing

pdfTEX 1.40

`\SetExtraSpacing` [⟨*options*⟩] { ⟨*set of fonts*⟩ } { ⟨*spacing settings*⟩ }

This command allows you to fine tune the interword spacing (also known as glue). A preliminary remark on what a 'space' is may be in order: between two words, TEX will insert a so called glue, which is characterised by three parameters – the normal distance between two words, the maximum amount of space that may be added to it, and the maximum amount that may be subtracted. The latter two parameters come into effect whenever TEX tries to break a paragraph into lines and does not succeed; it can then stretch or shrink the spaces between words. These three parameters are specific to each font.

On top of these glue dimensions, TEX has the concept of 'space factors'. They may be used to increase the space after certain characters, most prominently the punctuation characters. pdfTEX's additional spacing adjustment may be considered as an extension to space factors with much finer control: while space factors will influence all three parameters of interword space (or glue) by the same amount – the kerning, the maximum amount that the space may be stretched and the maximum amount that it may be shrunk – you may modify these parameters independently from one another. Furthermore, the values may be set differently for each font. And, probably most importantly, the parameters may not only be increased but also decreased. Note that when interword spacing adjustment is in effect, space factors are ignored.

The spacing settings are declared as pairs of ⟨*character*⟩ = ⟨*spacing factors*⟩, where the latter consist of three numbers: first, the additional kern inserted after this character if it appears before an interword space, second, the additional stretch amount, and third, the additional shrink amount. All values may also be negative, in which case the dimensions will be decreased. Not all values have to be specified, but the settings must always contain the two separating commas.

Options:

`name`, `load`, `factor`, `preset`, `inputenc`, `context` These options serve the same function as in the previous configuration commands.

`unit` You can specify the unit by which the specified numbers are measured. Possible values are: `character`, a ⟨*dimension*⟩ and, additionally, `space`. The latter will measure the values in thousandths of the respective space dimension set by the font. By default, the unit is measured by the space dimensions. For example, with the following (nonsensical) settings:

```
\SetExtraSpacing
   [ unit = space  ] % default
   { font = */*/*/*/* }
   {
       .  = {1000,1000,1000},
   }
```

the space inserted after a full stop would be doubled (technically speaking: 2 × \fontdimen 2), as would the maximum stretch and shrink amounts of the interword space (\fontdimen 3 and 4). Conversely, setting all three values to −1000 would completely cancel a space after the respective character.

5.6 Character inheritance

\DeclareCharacterInheritance [⟨*features*⟩] {⟨*set of fonts*⟩} {⟨*inheritance lists*⟩}

In most cases, accented characters should inherit the settings from the respective base character. For example, all of the characters À, Á, Â, Ã, Ä, Å and Ă should probably be protruded by the same (absolute) amount as the character A. Using the command \DeclareCharacterInheritance, you may declare such classes of characters, so that you then only have to set up the respective base character. With the optional argument, which may contain a comma-separated list of features, you can confine the scope of the list. Additionally, it accepts the inputenc key to set the input encoding for this list. The font set can be declared in the usual way. The inheritance lists are declared as pairs of ⟨*base character*⟩ = ⟨*list of inheriting characters*⟩. Unless you are using a different encoding or a very peculiarly shaped font, there should be no need to change the default character inheritance settings.

The situation is different with LuaTeX and XeTeX, however: the default inheritance settings only contain those glyhps that can safely be assumed to exist in any font; but since OpenType fonts may contain many more glyphs for different scripts (languages), it is quite probable that font-specific settings are necessary, which should be specified in the font's configuration file (see next section).

5.7 Configuration files

The default configuration, consisting of inheritance settings, declarations of font sets and alias fonts, and generic protrusion, expansion, spacing and kerning settings, will be loaded from the file microtype.cfg. You may extend this file with custom settings (or load a different configuration file with the 'config' option, see section 3.5).

If you embark on creating new settings for a font family, you should put them into a separate file, whose name must be: 'mt-⟨*font family*⟩.cfg' (e.g., 'mt-cmr.cfg'; any spaces in the font name should be removed, e.g., 'mt-MinionPro.cfg'), and may contain all commands described in the current section 5. These files will be loaded automatically if you are actually using the respective fonts. This package ships with configuration files for a number of font families. Table 3 lists them all.

\DeclareMicrotypeVariants {⟨*list of suffixes*⟩}

\DeclareMicrotypeVariants*

On its search for a configuration file, the package will also try to remove from the font name a suffix of one or more letters that denotes a 'variant' of the base font (cf. Karl Berry's Fontname). It is thus possible to put settings for, e.g., the fonts pplx (expert set), pplj (oldstyle numerals) and ppl (plain) into one and the

Table 3:

Fonts with tailored protrusion settings

Font family (NFSS code)	Features	
Type 1 fonts	Encodings	Shapes
Generic	OT1, T1, T2A, LY1, QX, (TS1)[a]	n, (it, sl, sc)[a]
Computer Modern Roman (`cmr`)[b]	OT1, OT4, T1, T2A, T5, LY1, TS1	n, it, sl, sc
Bitstream Charter (`bch`)[c]	OT1, T1, T5, LY1, TS1	n, it, (sl)[d], sc
EB Garamond[e]	OT1, T1, LY1, TS1	n, it, (sl)[d], sc
URW Garamond (`ugm`)[f]	OT1, T1, TS1	n, it
Bitstream Letter Gothic (`blg`)[g]	OT1, T1, TS1	n, it
Adobe Minion (`pmnx`, `pmnj`)	OT1, T1, T2A, LY1, TS1	n, it, (sl)[d], sc, si
Palatino (`ppl`, `pplx`, `pplj`)[h]	OT1, OT4, T1, LY1, (TS1)[a]	n, it, (sl)[d], sc
Times (`ptm`, `ptmx`, `ptmj`)[i]	OT1, OT4, T1, LY1, QX, (TS1)[a]	n, it, (sl)[d], sc
Computer Modern math (`cmsy`, `cmm`)[j]	OML/OMS	n/it
AMS symbols (`msa`, `msb`)	U	n
Euler (`eur`, `eus`, `euf`)[k]	U	n
Euro symbols (Adobe, ITC, `marvosym`)	U/OT1	n, it
OpenType fonts	Scripts	Shapes
Generic	Latin	n, (it, sl, sc)[a]
Latin Modern Roman[l]	Latin, Greek	n, it, (sl)[d]
Charis SIL	Latin, Cyrillic, Greek	n, it, sc
Palatino[m]	Latin	n, it, sc

a Incomplete
b Aliases: Latin Modern Roman (`lmr`), `ae` (`aer`), `zefonts` (`zer`), `eco` (`cmor`), `hfoldsty` (`hfor`), `mlmodern` (`mlmr`)
c Aliases: `mathdesign`/Charter (`mdbch`), MicroPress's `chmath` (`chr`), `XCharter`
d Settings inherited from italic shape
e Alias: Adobe Garamond (`pad`, `padx`, `padj`)
f Aliases: `mathdesign`/URW Garamond (`mdugm`), `garamondx` (`zgmx`, `zgmj`)
g Alias: `ulgothic` (`ulg`)
h Aliases: `pxfonts` (`pxr`), `qfonts`/QuasiPalatino, TeX Gyre Pagella (`qpl`), `newpx`, FPL Neu (`fp9x`, `fp9j`), `domitian`
i Aliases: `txfonts` (`txr`), `qfonts`/QuasiTimes, TeX Gyre Termes (`qtm`), `newtx`, `tempora`, `step`, `stix`/`stix2`
j Aliases: Latin Modern (`lmsy`, `lmm`), `mlmodern` (`mlmsy`, `mlmm`)
k Alias: `eulervm` (`zeur`, `zeus`)
l Alias: New Computer Modern
m Aliases: Palatino Linotype, Palatino LT Std, TeX Gyre Pagella, Domitian

same file `mt-ppl.cfg`. This command expects a comma-separated list of variant suffixes. The starred version appends the suffix(es) to the existing list. The default declaration in `microtype.cfg` is:

```
\DeclareMicrotypeVariants{x,j,w,a,d,0,1,-LF,-TLF,-OsF,-TOsF}
```

`\DeclareMicrotypeAlias` {⟨*font name*⟩} {⟨*alias font*⟩}

This command may be used for fonts that are very similar, or actually the same (for instance if you did not stick to the Berry naming scheme when installing a font). An example would be the Latin Modern fonts, which are derived from Computer Modern, so that it is not necessary to create new settings for them – you could say:

```
\DeclareMicrotypeAlias{lmr}{cmr}
```

which would make the package, whenever it encounters the font `lmr` and does not find settings for it, also try the font `cmr`. In fact, you will find this very line, along with some others, in the default configuration file.

`\LoadMicrotypeFile` {⟨*font name*⟩}

In rare cases, it might be necessary to load a font configuration file manually, for instance, from within another configuration file, or to be able to extend settings defined in a file that would otherwise not be loaded automatically, or would be loaded too late.[9] This command will load the file '`mt-`⟨*font name*⟩`.cfg`'.

6 Context-sensitive setup

The `microtype` package also allows applying different micro-typographic settings to the fonts depending on the context in which they occur. This opens up the space for infinite possibilities of tweaking the document's appearance.

`\microtypecontext` {⟨*context assignments*⟩}

This command may be used anywhere in the document (also in the preamble) to change the micro-typographic context in the current group. To each feature (`protrusion`, `expansion`, (or `activate` as a shortcut for both), `tracking`, `spacing` and `kerning`), one context may be assigned. Consequently, only settings with the corresponding '`context`' keyword will be applied.

`\begin{microtypecontext}` {⟨*context assignments*⟩}
`\end{microtypecontext}` Like many LaTeX commands, it is also available in the form of an environment.

`\textmicrotypecontext` {⟨*context assignments*⟩} {⟨*general text*⟩}

As another possibility, the command `\textmicrotypecontext` sets the context(s) for the text given in the second argument.

Suppose you want the footnote markers in the text to be protruded by a larger amount. You could define settings for the numbers:

```
\SetProtrusion
   [ context = footnote ]
   { font    = */*/*/*/scriptsize } % adapt if necessary
   { 1 = { ,650}, 2 = { ,400}, 3 = { ,400}, 4 = { ,400}, 5 = { ,400},
     6 = { ,400}, 7 = { ,500}, 8 = { ,400}, 9 = { ,400}, 0 = { ,400} }
```

and have the context changed in the footnote marker command. This command differs among the various classes; for the base classes, e.g., `article`, it would be:

```
\newcommand*\new@makefnmark{\hbox{\@textsuperscript{\normalfont
   \microtypecontext{protrusion=footnote}\@thefnmark}}}
\renewcommand*\@footnotemark{%
   \leavevmode \ifhmode\edef\@x@sf{\the\spacefactor}\nobreak\fi
   \new@makefnmark \ifhmode\spacefactor\@x@sf\fi \relax}
```

[9] Font package authors might also want to have a look at the hook `\Microtype@Hook`, described in the implementation part, section 14.4.4.

For the `memoir` class, you would additionally have to disable auto-detection of multiple footnotes, which prevents protrusion:

```
\renewcommand*\@makefnmark{\hbox{\@textsuperscript{\normalfont
   \microtypecontext{protrusion=footnote}\@thefnmark}}}
\let\m@mmf@prepare\relax
\let\m@mmf@check\relax
```

Another possibility would be to employ contexts for a language-dependent setup. For instance, if you are writing a text in French, you could add:

```
\microtypecontext{kerning=french}
```

to the preamble. This would have the effect that kerning settings for the French context would be applied to the document. Should parts of the document be in English, you could write:

```
\textmicrotypecontext{kerning=}{English text!}
```

to reset the context, so that the punctuation characters in these parts will not receive any extra kerning.

Instead of adding these commands manually to your document, you may also load `microtype` with the `babel` option (see section 3.5). The current language will then be automatically detected and the contexts set accordingly.

`\DeclareMicrotypeBabelHook` {⟨*list of* `babel` *languages*⟩} {⟨*context list*⟩}

Naturally, `microtype` does not know about the typographic specialties of every language. This command is a means of teaching it how to adjust the context when a particular language is selected. The main configuration file contains among others the following declaration:

```
\DeclareMicrotypeBabelHook
   {french,francais,acadian,canadien}
   {kerning=french, spacing=}
```

Consequently, whenever you switch to the French language, the kerning context will be changed to '`french`' and the spacing context will be reset. This hook only has an effect if the package was loaded with the `babel` option. Currently, `microtype` supports French and Turkish kerning and English spacing (aka. `\nonfrenchspacing`). For unknown languages, all contexts will be reset.

7 Letterspacing revisited

pdfTEX 1.40 | LuaTEX 0.62

`\textls` [⟨*amount*⟩] {⟨*general text*⟩}

While the `tracking` feature, described in section 5.3, will apply to sets of fonts, you may also want to letterspace shorter pieces of text, regardless of the font in which they are typeset.[10] For such ad-hoc letterspacing, `microtype` introduces two commands that can be used (independently of whether the `tracking` option is enabled) in the same way as LATEX's text commands: `\textls` – which also works in math mode – expects the text in the mandatory argument, while `\lsstyle` will

`\lsstyle`

[10] Letterspacing should be used cautiously; in particular, letterspacing lowercase text is held in abhorrence by honourable typographers. Unless you know what you are doing, you should probably only letterspace capitals or small capitals. Another just cause may be emphasis in texts typeset in Fraktur fonts.

switch on letterspacing for all subsequent fonts until the end of the current group.

\textls*

The starred version of \textls does not add any extra kerning before or after the text, which may be useful, e.g., for section titles. By default, each character will be spaced out by 100/1000 em = 0.1 em; this amount may be altered in the optional argument to \textls, using the \SetTracking command, or globally with the letterspace package option, with decreasing significance in this order.

\lslig {⟨*ligature*⟩}

Since the commands \textls and \lsstyle will also evaluate the 'no ligatures' key for the respective font, you need not worry about protecting or breaking ligatures with most fonts. However, in certain situations, there may be a conflict of ligatures beginning with the same letter, where some of them should be inhibited, while others should not. When letterspacing text typeset in Fraktur fonts, for example, the ligatures 'ch', 'ck', 'tz' and 'sz' ('ß') should never be broken up; you also usually see the 'st' ('ſt') ligature in letterspaced text. Furthermore, at least the yfonts package realises the short s ('s') as the ligature 's:'. On the other hand, the 'ct' ligature and the other 'long s' ligatures often found in Fraktur fonts should be suppressed. There are two ways of solving this problem: either don't disable the 's' and/or 'c' ligatures and break those that need to be broken up by inserting '{\kern0pt}' or babel's "| shortcut; or disable them and protect those ligatures that need to be protected by enclosing them in the \lslig command. So, the following two solutions have the same result (namely, 'Ausſichtsloſigkeit', with ligatures shown in green, inhibited ligatures in red).

```
\SetTracking[no ligatures={f}]{encoding = LY, family = yfrak}{120}
\textfrak{\lsstyle Aus:s{\kern0pt}ichts:los{\kern0pt}igkeit}
```

```
\SetTracking[no ligatures={f,s,c}]{encoding = LY, family = yfrak}{120}
\textfrak{\lsstyle Au\lslig{s:}si\lslig{ch}t\lslig{s:}losigkeit}
```

letterspace.sty

These three commands (plus the letterspace option, described in section 3.4) are also available with the alternative letterspace package, which is in fact a much stripped-down version of microtype, omitting support for all the other extensions (and also omitting the possibilities of the \SetTracking command – all 'f' ligatures will be disabled, inner and outer spacing and outer kerning will be set to the default values described in section 5.3). If you prefer to forgo microtype's specialties, you may load the letterspace package instead. Both packages should not be used at the same time.

In contrast to microtype, which requires LaTeX, the letterspace package also works with eplain or even only miniltx: for use with eplain, load the package with \usepackage inside the \beginpackages ... \endpackages environment; with miniltx (which does not support package options) simply \input letterspace.sty.

8 Disabling ligatures

pdfTEX 1.30 | LuaTEX 0.30

\DisableLigatures [⟨*characters*⟩] {⟨*set of fonts*⟩}

While completely disabling all ligatures of a font (which will also switch off kerning for this font), purposely *lowers* the micro-typographic quality instead of raising it, it is especially useful for typewriter fonts, so that, e.g., in a T1 encoded font, ‘`\texttt{--}`’ will indeed be printed as ‘`--`’, not as ‘-’. `\DisableLigatures` may be used to specify, in the usual way, a set of fonts for which ligatures should be disabled, for example, of the typewriter font in T1 encoding:

```
\DisableLigatures{encoding = T1, family = tt* }
```

It is also possible to disable selected ligatures only. The optional argument may contain a comma-separated list of characters for which the ligature mechanism should be inhibited:

```
\DisableLigatures[?,!]{encoding = T1} % inhibit ?‘ and !‘, but not fi, –, », etc.
```

Only the character that begins the ligature(s) should be specified. This command may only be used in the preamble, and only once.[11]

9 Hints and caveats

Use settings that match your font. Although the default settings should give reasonable results for most fonts, the particular font you happen to be using may have different character shapes that necessitate more or less protrusion. In particular, italic letter shapes may differ wildly in different fonts, hence I have decided against providing default protrusion settings for them. The file `test-microtype.tex` might be of some help when adjusting the protrusion settings for a font.

Don’t use too large a value for expansion. Font expansion is a feature that is supposed to enhance the typographic quality of your document by producing a more uniform greyness of the text block (and potentially reducing the number of necessary hyphenations). When expanding or shrinking a font too much, the effect will be turned into the opposite. Expanding the fonts by more than 2%, i.e., setting a `stretch` limit of more than 20, should be justified by a typographically trained eye. If you are so lucky as to be in the possession of multiple instances of a Multiple Master font, you may set expansion limits to up to 4%.

Don’t use font expansion for web documents (with older pdfTeX versions). With pdfTeX versions older than 1.40, each expanded instance of the font will be embedded in the PDF file, hence the file size may increase by quite a large factor (depending on expansion limits and step). Therefore, courtesy and thriftiness of bandwidth command it not to enable font expansion when creating files to be distributed electronically. With pdfTeX 1.40 and LuaTeX, which use a different technique of expansion, the increase of file size can be neglected.

You might want to disable protrusion in the Table of Contents. In unfortunate situations, enabled protrusion might internally alter the line length in the TOC and similar lists in such a way that an excess leader dot will fit in. The solution is to temporarily disable protrusion for the TOC:

```
\microtypesetup{protrusion=false}
\tableofcontents
\microtypesetup{protrusion=true}
```

[11] With LuaTeX, you have to load the fonts with the `fontspec` option ‘`Renderer=Basic`’.

You might want to disable protrusion in `verbatim` environments. As you know by now, `microtype` will by default activate character protrusion for all fonts contained in the font set '`alltext`'. This also includes the typewriter font. Although it does make sense to protrude the typewriter font if it appears in running text (like, for example, in this manual), this is probably not desirable inside the `verbatim` environment. However, `microtype` has no knowledge about the context that a font appears in but will solely decide by examining its attributes. Therefore, you have to take care of disabling protrusion in `verbatim` environments for yourself (that is, if you don't want to disable protrusion for the typewriter font altogether, by activating, say, the font set '`alltext-nott`'). While the `\microtypesetup` command has of course been designed for cases like this, you may find it tiresome to repeat it every time if you are using the `verbatim` environment frequently. The following line (which requires the `etoolbox` package), added to the document's preamble, would serve the same purpose:

```
\AtBeginEnvironment{verbatim}{\microtypesetup{activate=false}}
```

If you are using the `fancyvrb` or the `listings` package, this is not necessary, since their implementation of the corresponding environments will inhibit protrusion anyway.

Settings for Greek/Thai/Armenian etc. encodings are not yet included. The default sets of fonts for which the micro-typographic features will be enabled (see table 2) only contain those encodings for which configurations exist. Therefore, if you are using any other encoding (e.g., LGR, T2B, etc.), `microtype` will not apply to these fonts. You have to define and activate a new font set including the encoding(s) you are using (for details, see section 4). For protrusion at least, you would also have to create settings for the fonts in question (see section 5.1). It goes without saying that contributions for these encodings are more than welcome.

Only employ kerning adjustment if it is customary in the language's typographic tradition. In contrast to protrusion and expansion, additional kerning does not unconditionally improve the micro-typographical quality of your document. You should only switch it on if you are writing a document in a language whose typographic tradition warrants such kerning. If you are, for example, writing an English text, your readers would probably be rather confused by additional spaces before the punctuation characters.

Adjustment of interword spacing is still experimental. The implementation of this feature in pdfTeX is not complete, and may not yield the positive effects on the typographical quality you might expect – in certain situations, there may even be undesired side effects, in particular, when used together with the `ragged2e` package. Therefore, the `spacing` option should not be chosen blindly; it is also recommended to experiment with the settings in order to understand the workings of this feature.

Compatibility and interaction with other packages: The `microtype` package is supposed to work happily together with all other LaTeX packages (except for `pdfcprot`). However, life isn't perfect, so problems are to be expected. Currently, I am aware of the following issues:

- Even though all configuration files are still provided in legacy (7-bit) format, using multi-byte (Unicode) characters in the settings should run smoothly with an up-to-date LaTeX system. For older systems or documents in legacy encodings, in contrast, this requires loading the `inputenc` package first. Furthermore, when using multiple input encodings in a document, 8-bit characters in the settings will only work reliably if you specify the `inputenc` key.

- When loading the package with the `babel` option, you must load the `babel` package before `microtype`.
- Before this package was fully compatible with LuaTeX, the following method of enabling expansion and protrusion with the `fontspec` package was most often found to be recommended:

  ```
  \newfontfeature{Microtype}{protrusion=default;expansion=default}
  \defaultfontfeatures{Microtype}
  ```

  This code should *not* be used with this package, as it will basically override all of the settings made by `microtype` – despite the naming, the above lines have nothing to do with this package.[12]
- With pdfTeX, it is currently not possible to create character-specific settings for Chinese/Japanese/Korean fonts. Therefore, the only micro-typographic extension that can be made to work with `CJK` fonts is (non-selected) font expansion.
- When used with the `xeCJK` package or the `luatexja` package, text commands (e.g., `\'A`, `\textless`) in the configuration will not be understood. You therefore have to ensure that `microtype` will encounter none of them. This requires, firstly, that the glyphs be specified only as single (possibly Unicode) characters, as numbers, or as glyph names (cf. section 5); and secondly, if you are using a font for which pre-defined settings do not exist, that you create these settings yourself (because otherwise, the default settings will be loaded, which do contain text commands). Furthermore, you should load `microtype` late.

Possible error messages and how to get rid of them (specs may differ):

- `! Font csnameendcsname=cmr10+20 at 10.0pt not loadable: Metric (TFM) file not found.`

  This error message will occur if you are trying to employ font expansion while creating DVI output. Remember that *automatic* font expansion only works when running pdfTeX or LuaTeX in PDF mode. Although expansion is also possible in DVI mode with pdfTeX, it requires that all instances of the expanded fonts exist on your TeX system.
- `! pdfTeX error (font expansion): auto expansion is only possible with scalable fonts.`

  Automatic font expansion has been improved in pdfTeX 1.40, in that it now not only works with Type 1 fonts but also with TrueType, OpenType and even non-embedded fonts. The above error message indicates either that you are trying to apply expansion to a bitmap (pk) font, which is still not possible, or that the font isn't found at all, e.g., because of missing map entries.
- `Warning: pdflatex: font ptmr8r cannot be expanded (not an included Type1 font)`

  and the PDF viewer complains about a missing font, e.g., Adobe Reader thusly:

  `Could not find a font in the Resources dictionary - using Helvetica instead.`

  With pdfTeX versions older than 1.40, font expansion can only be applied if the font is actually embedded in the PDF file. If you get the above error message, your

[12] They make use of features provided by `luaotfload` (via `fontspec`).

TeX system is not set up to embed (or 'download') the base PostScript fonts (e.g., Times, Helvetica, Courier). In most TeX distributions, this can be changed in the file `updmap.cfg` by setting `pdftexDownloadBase14` to `true`.

- `Warning: pdflatex (file ecrm1000+20): Font ecrm1000+20 at 1200 not found`

  Furthermore, pdfTeX versions older than 1.40 require Type 1 fonts for automatic font expansion. When you receive a message like the above, you are probably trying to apply font expansion to a bitmap or TrueType font. With older pdfTeX versions, this is only possible if you manually create expanded instances of the fonts.

- `! Font T1/cmr/m/n/10=ecrm1000 at 10.0pt not loaded: Not enough room left.`

  Memory parameter '`font_mem_size`' too small.

- `! TeX capacity exceeded, sorry [maximum internal font number (font_max)=2000].`

  Memory parameter '`font_max`' too small.

- `! TeX capacity exceeded, sorry [PDF memory size (pdf_mem_size)=65536].`

  Memory parameter '`pdf_mem_size`' too small (pdfTeX versions older than 1.30).

  When applying micro-typographic enhancement to a large document with a lot of fonts, pdfTeX may be running out of some kind of memory. It can be increased by setting the respective parameter to a larger value. For web2c-based systems, e.g., TeX Live, change the settings in `texmf.cnf`, for MiKTeX, in the file `miktex.ini` (2.4 or older) resp. `pdflatex.ini` (2.5 or newer).

- `pdfTeX warning (font expansion): font should be expanded before its first use`

  This warning will occur with pdfTeX versions older than 1.40.4, if tracking *and* expansion is applied to a font. It is harmless and can be ignored.

The source code of this document is freely available. If you wonder how this document was created, just have a look at the source code in `microtype.dtx`, which is either already included in your TeX distribution, or else can be downloaded from CTAN. For the source code of the logo on the title page and of the letterspacing sample from section 5.3, see the appendices A and B. If you want to re-typeset the documentation, read the comments at the end of `microtype.dtx`.

10 Contributions

I would be glad to include configuration files for more fonts. Preparing such configurations is quite a time-consuming task and requires a lot of patience. To alleviate this process, this package also includes a test file that can be used to check at least the protrusion settings (`test-microtype.tex`). If you have created a configuration file for another font, or if you have any suggestions for enhancements in the default configuration files, I would gratefully accept them: `w.m.l@gmx.net`.

11 Acknowledgments

This package would be pointless if *Hàn Thế Thành* hadn't created the pdfTeX programme in the first place, which introduced the micro-typographic extensions and made them available to the TeX world. Furthermore, I thank him for helping me to improve this package, and not least for promoting it in Thành 2004, Thành 2008 and elsewhere. I also thank him and the rest of the pdfTEX team, and more recently also the LuaTEX and XƎTEX teams, for refuting the idea that TEX is dead, and for fixing the bugs I find.

Harald Harders has contributed protrusion settings for Adobe Minion. I would also like to thank him for a number of bug reports and suggestions he had to make. *Andreas Bühmann* has suggested the possibility to specify ranges of font sizes, and resourcefully assisted in implementing this. He also came up with some good ideas for the management of complex configurations. *Ulrich Dirr* has made numerous suggestion, especially concerning the new extensions of interword spacing adjustment and additional character kerning. *Georg Duffner* has patiently tested `microtype` under XƎTEX and LuaTEX with his beautiful OpenType font EB Garamond[13]. My thanks also go to *Maciej Eder* for contributing settings for the QX encoding, as well as to *Karl Karlsson* for providing settings for the Cyrillic T2A encoding, and to *Hendrik Vogt*, who made substantial improvements to the Computer Modern Roman italic settings. I thank *Loren B. Davis* for providing protrusion settings for OpenType versions of Palatino Linotype. I am also very much indebted to *Élie Roux*, who not only contributed the `lua` module in the first place, but also, together with *Philipp Gesang*, took care of updating it for the developments in LuaTEX land.

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[13] Available from CTAN at `pkg/ebgaramond`, including configuration files for `microtype`.

12 References

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13 Short history

The comprehensive list of changes can be found in appendix C. The following is a list of all changes relevant in the user land; bug and compatibility fixes are swept under the rug. Numbers in brackets indicate the relevant section in this manual.

2.8 (2020/12/07)

- New default font sets for expansion and spacing: ‘`alltext-nott`’ [4, table 2]

2.7 (2017/07/07)

- Allow automatic expansion and letterspacing with LuaTEX in DVI mode (aka. `dvilualatex`) [3.1, 3.3, table 1]
- Compatibility with LATEX 2017/01/01 (fix warnings)

2.6 (2016/05/01)

- Support for LuaTEX $\geq$ 0.85
- Improvements for tracking/letterspacing with LuaTEX (`Renderer=Basic` no longer required)

- New font sets: ‘alltext-nott’, ‘allmath-nott’ [4, table 2]

2.5 (2013/03/13)

- Support for the fontspec package, viz. for OpenType fonts with LuaTEX and XƎTEX
- Support for protrusion with XƎTEX ≥ 0.9997
- Support for tracking/letterspacing with LuaTEX ≥ 0.62
- Allow context-sensitive setup with LuaTEX
- Info if protrusion settings are generic
- Protrusion settings for Latin Modern Roman (OpenType)
- Protrusion settings for Charis SIL (OpenType)
- Protrusion settings for Palatino Linotype (OpenType)

2.4 (2010/01/10)

- Protrusion settings for T2A encoded Minion

2.3e (2009/11/09)

- Support for the Cyrillic T2A encoding (protrusion, expansion, spacing)

2.3d (2009/03/27)

- New default for expansion option ‘step’: 1, if pdfTEX ≥ 1.40 [3.3]

2.3c (2008/11/11)

- Support for LuaTEX enabled by default

2.3 (2007/12/23)

- New key ‘outer kerning’ for \SetTracking to customise outer kerning [5.3]
- Adjust protrusion settings for tracking even if protrusion is not enabled
- New option ‘verbose=silent’ to turn all warnings into mere messages [3.5]
- The letterspace package also works with eplain or miniltx [7]

2.2 (2007/07/14)

- Improvements to tracking/letterspacing: retain kerning (pdfTEX ≥ 1.40.4); automatically adjust protrusion settings
- New key ‘no ligatures’ for \SetTracking to disable selected or all ligatures (pdfTEX ≥ 1.40.4) [5.3]
- New keys ‘spacing’ and ‘outer spacing’ for \SetTracking to customise interword spacing [5.3]
- Possibility to expand a font with different parameters (pdfTEX ≥ 1.40.4) [5.2]
- New optional argument for \DisableLigatures to disable selected ligatures [8]
- New command \DeclareMicrotypeVariants to specify variant suffixes [5.7]
- New command \textmicrotypecontext as a wrapper for \microtypecontext [6]
- Protrusion settings for Bitstream Letter Gothic

2.1 (2007/01/21)

- New command \lslig to protect ligatures in letterspaced text [7]

2.0 (2007/01/14)

- Support for the new extensions of pdfTEX ≥ 1.40: tracking/letterspacing, additional kerning, and adjustment of interword spacing (glue) (new commands \SetTracking, \SetExtraKerning, \SetExtraSpacing; new options ‘tracking’, ‘kerning’, ‘spacing’) [5.3, 5.4, 5.5]

- New commands `\textls` and `\lsstyle` for letterspacing, new option '`letterspace`' [3.4, 7]
- New option '`babel`' for automatic micro-typographic adjustment to the selected language [3.5, 6]
- New font sets: '`smallcaps`', '`footnotesize`', '`scriptsize`' [4, table 2]
- New package '`letterspace`' providing the commands for robust and hyphenatable letterspacing [7]

1.9e (2006/07/28)

- New key '`inputenc`' to specify the lists' input encodings [5]
- Protrusion settings for Euler math fonts

1.9d (2006/05/05)

- Support for the Central European QX encoding (protrusion, inheritance)
- Protrusion settings for various Euro symbol fonts (Adobe, ITC, `marvosym`)
- Support for Unicode input in the configuration (`inputenc/utf8`)

1.9c (2006/02/02)

- Protrusion settings for URW Garamond

1.9a (2005/12/05)

- Defer setup until the end of the preamble
- Inside the preamble, `\microtypesetup` accepts all package options [3.6]
- Protrusion settings for T5 encoded Charter

1.9 (2005/10/28)

- New command `\DisableLigatures` to disable ligatures (pdfTeX ≥ 1.30) [8]
- New command `\microtypecontext` to change the configuration context; new key '`context`' for the configuration commands [6]
- New key '`font`' to add single fonts to the font sets [4]
- New key '`preset`' to set all characters to the specified value before loading the lists
- Value '`relative`' renamed to '`character`' for '`unit`' keys
- Support for the Polish OT4 encoding (protrusion, expansion, inheritance)
- Support for the Vietnamese T5 encoding (protrusion, expansion, inheritance)

1.8 (2005/06/23)

- New command `\DeclareMicrotypeSetDefault` to declare the default font sets [4]
- New option '`config`' to load a different configuration file [3.5]
- New option '`unit`' to measure protrusion factors relative to a dimension instead of the character width [5.1]
- Renamed commands from `\..MicroType..` to `\..Microtype..`
- Protrusion settings for AMS math fonts
- Protrusion settings for Times in LY1 encoding completed
- The '`allmath`' font set also includes U encoding
- Support for protrusion with the `ledmac` package (pdfTeX ≥ 1.30)

1.7 (2005/03/23)

- Possibility to specify ranges of font sizes in the set declarations [4, 5]
- New command `\LoadMicrotypeFile` to load a configuration file manually [5.7]
- New command `\Microtype@Hook` for font package authors [14.4.4]
- New option '`verbose=errors`' to turn all warnings into errors

- Warning when running in draft mode

1.6 (2005/01/24)

- New option '`factor`' to influence protrusion resp. expansion of all characters of a font or font set [3.2, 5]
- When pdfTEX is too old to expand fonts automatically, expansion has to be enabled explicitly, automatic expansion will be disabled [3.1]
- Use e-TEX extensions, if available

1.5 (2004/12/15)

- When output mode is DVI, font expansion has to be enabled explicitly, automatic expansion will be disabled [3.1]
- New option '`selected`' to enable selected expansion, default: `false` [3.3, 5.2]
- New default for expansion option '`step`': 4 (min(`stretch`,`shrink`)/5) [3.3]
- Protrusion settings for Bitstream Charter

1.4 (2004/11/12)

- Set up fonts independently from LATEX font loading
- New option: '`final`' [3.5]

1.2 (2004/10/03)

- New font sets: '`allmath`' and '`basicmath`' [4, table 2]
- Protrusion settings for Computer Modern Roman math symbols
- Protrusion settings for TS1 encoding completed for Computer Modern Roman and Adobe Garamond

1.1 (2004/09/21)

- Protrusion settings for Adobe Minion
- New command: `\DeclareCharacterInheritance` [5.6]
- Characters may also be specified as octal or hexadecimal numbers [5]

1.0 (2004/09/11)

- First CTAN release

14 Implementation

The docstrip modules in this file are:

- driver: The documentation driver, only visible in the dtx file.
- package: The code for the microtype package (microtype.sty).
- pdftex-def: Definitions specific to pdfTeX (microtype-pdftex.def).
- xetex-def: Definitions specific to XeTeX (microtype-xetex.def).
- luatex-def: Definitions specific to LuaTeX (microtype-luatex.def).
- letterspace: The code for the letterspace package (letterspace.sty).
  - plain: Code for eplain, miniltx (letterspace only).
- debug: Code for additional output in the log file.
  Used for – surprise! – debugging purposes.
- luafile: Lua functions (microtype.lua).
- config: Surrounds all configuration modules.
  - cfg-t: Surrounds (Latin) text configurations.
    - m-t: The main configuration file (microtype.cfg).
    - bch: Settings for Bitstream Charter (mt-bch.cfg).
    - blg: Settings for Bitstream Letter Gothic (mt-blg.cfg).
    - cmr: Settings for Computer Modern Roman (mt-cmr.cfg).
    - ebg: Settings for EB Garamond (mt-EBGaramond.cfg).
    - ppl: Settings for Palatino (mt-ppl.cfg).
    - ptm: Settings for Times (mt-ptm.cfg).
    - pmn: Settings for Adobe Minion (mt-pmn.cfg).
      Contributed by *Harald Harders*.
    - ugm: Settings for URW Garamond (mt-ugm.cfg).
  - cfg-u: Surrounds non-text configurations (U encoding).
    - msa: Settings for AMS ‘a’ symbol font (mt-msa.cfg).
    - msb: Settings for AMS ‘b’ symbol font (mt-msb.cfg).
    - euf: Settings for Euler Fraktur font (mt-euf.cfg).
    - eur: Settings for Euler Roman font (mt-eur.cfg).
    - eus: Settings for Euler Script font (mt-eus.cfg).
  - cfg-e: Surrounds Euro symbol configurations.
    - zpeu: Settings for Adobe Euro symbol fonts (mt-zpeu.cfg).
    - mvs: Settings for marvosym Euro symbol (mt-mvs.cfg).
- test: A helper file that may be used to create and test protrusion settings (test-microtype.tex).

And now for something completely different.

```
⟨*package|letterspace⟩
```

14.1 Preliminaries

\MT@MT This is us.

```
\def\MT@MT
⟨package⟩  {microtype}
⟨letterspace⟩  {letterspace}
```

\MT@fix@catcode \MT@restore@catcodes We have to make sure that the category codes of some characters are correct (the german package, for instance, makes " active). Probably overly cautious. Ceterum censeo: it should be forbidden for packages to change catcodes within the preamble. Polite as we are, we'll restore them afterwards.

```
\let\MT@restore@catcodes\@empty
```

```
\def\MT@fix@catcode#1#2{%
  \edef\MT@restore@catcodes{%
    \MT@restore@catcodes
    \catcode#1=\the\catcode#1\relax
  }%
  \catcode#1=#2\relax
}
\MT@fix@catcode{17}{14}% ^^Q (comment)
\MT@fix@catcode{24} {9}% ^^X (ignore)
⟨package⟩\MT@fix@catcode{33}{12}% !
⟨package⟩\MT@fix@catcode{34}{12}% "
\MT@fix@catcode{36} {3}% $ (math shift)
\MT@fix@catcode{39}{12}% '
\MT@fix@catcode{42}{12}% *
\MT@fix@catcode{43}{12}% +
\MT@fix@catcode{44}{12}% ,
\MT@fix@catcode{45}{12}% -
\MT@fix@catcode{58}{12}% :
\MT@fix@catcode{60}{12}% <
\MT@fix@catcode{61}{12}% =
\MT@fix@catcode{62}{12}% >
⟨package⟩\MT@fix@catcode{63}{12}% ?
\MT@fix@catcode{94} {7}% ^ (superscript)
\MT@fix@catcode{96}{12}% `
⟨package⟩\MT@fix@catcode{124}{12}% |
```

These are all commands for the outside world. We define them here as blank commands, so that they won't generate an error if we are not running pdfTEX.

```
⟨*package⟩
\newcommand*\DeclareMicrotypeSet[3][]{}
\newcommand*\UseMicrotypeSet[2][]{}
\newcommand*\DeclareMicrotypeSetDefault[2][]{}
\newcommand*\SetProtrusion[3][]{}
\newcommand*\SetExpansion[3][]{}
\newcommand*\SetTracking[3][]{}
\newcommand*\SetExtraKerning[3][]{}
\newcommand*\SetExtraSpacing[3][]{}
\newcommand*\DisableLigatures[2][]{}
\newcommand*\DeclareCharacterInheritance[3][]{}
\newcommand*\DeclareMicrotypeVariants[1]{}
\newcommand*\DeclareMicrotypeAlias[2]{}
\newcommand*\LoadMicrotypeFile[1]{}
\newcommand*\DeclareMicrotypeBabelHook[2]{}
\newcommand*\microtypesetup[1]{}
\newcommand*\microtypecontext[1]{}
\newcommand*\textmicrotypecontext[2]{#2}
\@ifpackageloaded{letterspace}{\let\MT@textls\relax}{%
⟨/package⟩
\newcommand*\lsstyle{}
\newcommand\textls[2][]{}
\def\textls#1#{}
\newcommand*\lslig[1]{#1}
⟨*package⟩
}
```

These commands also have a starred version.

```
\def\DeclareMicrotypeSet#1#{\@gobbletwo}
\def\DeclareMicrotypeVariants#1#{\@gobble}
```

Set declarations are only allowed in the preamble (resp. the main configuration file). The configuration commands, on the other hand, must be allowed in the document, too, since they may be called inside font configuration files, which, in principle, may be loaded at any time.

```
\@onlypreamble\DeclareMicrotypeSet
\@onlypreamble\UseMicrotypeSet
\@onlypreamble\DeclareMicrotypeSetDefault
\@onlypreamble\DisableLigatures
\@onlypreamble\DeclareMicrotypeVariants
\@onlypreamble\DeclareMicrotypeBabelHook
```

Don't load `letterspace`.

```
\expandafter\let\csname ver@letterspace.sty\endcsname\@empty
```

\MT@old@cmd

The old command names had one more hunch.

```
\def\MT@old@cmd#1#2{%
  \newcommand*#1{\MT@warning{%
    \string#1 is deprecated. Please use\MessageBreak
    \string#2 instead}%
    \let #1#2#2}}
```

```
\MT@old@cmd\DeclareMicroTypeAlias\DeclareMicrotypeAlias
\MT@old@cmd\DeclareMicroTypeSet  \DeclareMicrotypeSet
\MT@old@cmd\UseMicroTypeSet      \UseMicrotypeSet
\MT@old@cmd\LoadMicroTypeFile    \LoadMicrotypeFile
⟨/package⟩
```

\MT@warning
\MT@warning@nl
\MT@info
\MT@info@nl
\MT@vinfo
\MT@error
\MT@warn@err

Communicate.

```
\def\MT@warning{\PackageWarning\MT@MT}
\def\MT@warning@nl#1{\MT@warning{#1\@gobble}}
⟨*package⟩
\def\MT@info{\PackageInfo\MT@MT}
\def\MT@info@nl#1{\MT@info{#1\@gobble}}
\let\MT@vinfo\@gobble
\def\MT@error{\PackageError\MT@MT}
\def\MT@warn@err#1{\MT@error{#1}{%
  This error message appears because you loaded the `\MT@MT'\MessageBreak
  package with the option `verbose=errors'. Consult the documentation\MessageBreak
  in \MT@MT.pdf to find out what went wrong.}}
```

14.1.1 Debugging

\tracingmicrotype
\MT@dinfo
\MT@dinfo@nl

Cases for `\tracingmicrotype`:

0: almost none

1: + sets & lists

2: + heirs

3: + slots

4: + factors

```
⟨*debug⟩
\MT@warning@nl{This is the debug version}
\newcount\tracingmicrotype
```

```
\tracingmicrotype=2
\def\MT@info#1{\PackageInfo\MT@MT{#1}\MT@addto@annot{#1}}
\def\MT@info@nl#1{\PackageInfo\MT@MT{#1\@gobble}\MT@addto@annot{#1}}
\let\MT@vinfo\MT@info@nl
\def\MT@warning#1{\PackageWarning\MT@MT{#1}\MT@addto@annot{Warning: #1}}
\def\MT@warning@nl#1{\PackageWarning\MT@MT{#1\@gobble}\MT@addto@annot{Warning: #1}}
\def\MT@dinfo#1#2{\ifnum\tracingmicrotype<#1 \else\MT@info{#2}\fi}
\def\MT@dinfo@nl#1#2{\ifnum\tracingmicrotype<#1 \else\MT@info@nl{#2}\fi}
```

\tracingmicrotypeinpdf

Another debug method: font switches can be marked in the PDF file with a small caret, an accompanying popup text box displaying all debug messages.

Cases for \tracingmicrotypeinpdf:

1: show new fonts

2: + show known fonts

```
\newcount\tracingmicrotypeinpdf
```

Let's see how it works ... (if you don't see anything special on this page, your PDF viewer doesn't support annotations).

```
\tracingmicrotypeinpdf=2
```

\MT@pdf@annot
\MT@addto@annot
\ifMT@inannot

During font setup, we save the text for the popup in \MT@pdf@annot. (This requires pdfTEX ≥ 1.30.) The pdftexcmds package provides pdfTEX's utility commands in LuaTEX, too.

```
\RequirePackage{pdftexcmds}
\newif\ifMT@inannot \MT@inannottrue
\let\MT@pdf@annot\@empty
\def\MT@addto@annot#1{\ifnum\tracingmicrotypeinpdf>\z@ \ifMT@inannot
  {\def\MessageBreak{^^J\@spaces}%
   \MT@xadd\MT@pdf@annot{\pdf@escapestring{#1^^J}}}\fi\fi}
```

\iftracingmicrotypeinpdfall

With \tracingmicrotypeinpdfallfalse, the PDF output is (hopefully) identical, but some font switches will not be displayed; otherwise the output is affected, but *all* font switches are visible. In the latter case, we also insert a small kern so that multiple font switches are discernable.

```
\newif\iftracingmicrotypeinpdfall
```

\MT@show@pdfannot

A red caret is shown for fonts which are actually set up by *Microtype*, a green one marks fonts that we have already seen. The /Caret annotation requires a viewer for PDF version 1.5 (you could use /Text if you're using an older PDF viewer).

```
\def\MT@show@pdfannot#1{%
  \ifnum\tracingmicrotypeinpdf<#1 \else
    \iftracingmicrotypeinpdfall\leavevmode\fi
    \pdfannot height 4pt width 4pt depth 2pt {%
      /Subtype/Caret
      /T(\expandafter\string\font@name)
      \ifcase#1\or
      /Subj(New font)/C[1 0 0]
      \else
      /Subj(Known font)/C[0 1 0]
      \fi
      /Contents(\MT@pdf@annot)
    }%
    \iftracingmicrotypeinpdfall\kern1pt \fi
    \global\MT@inannotfalse
  \fi
}
⟨/debug⟩
⟨/package⟩
```

14.1.2 Requirements

\MT@plain

The letterspace package works with:

0: miniltx

1: eplain

2: LaTeX

For plain usage, we have to copy some commands from latex.ltx.

```
⟨*plain⟩
\def\MT@plain{2}
\ifx\documentclass\@undefined
  \def\MT@plain{1}
  \def\hmode@bgroup{\leavevmode\bgroup}
  \def\nfss@text#1{{\mbox{#1}}}
  \let\@typeset@protect\relax
  \ifx\eplain\@undefined
    \def\MT@plain{0}
    \def\PackageWarning#1#2{%
      \begingroup
        \newlinechar=10 %
        \def\MessageBreak{^^J(#1)\@spaces\@spaces\@spaces\@spaces}%
        \immediate\write16{^^JPackage #1 Warning: #2\on@line.^^J}%
      \endgroup
    }
    \def\on@line{ on input line \the\inputlineno}
    \def\@spaces{\space\space\space\space}
  \fi
\fi
```

\MT@requires@latex

Better use groups than plain ifs.

```
\def\MT@requires@latex#1{%
  \ifnum\MT@plain<#1 \expandafter\@secondoftwo\else\expandafter\@firstoftwo\fi
}
⟨/plain⟩
```

For definitions that depend on e-TeX features.

```
\ifcase 0%
  \ifx\eTeXversion\@undefined 1\else
    \ifx\eTeXversion\relax    1\else
      \ifcase\eTeXversion     1\fi
    \fi
  \fi
\else
  \catcode`\^^Q=9 \catcode`\^^X=14
\fi
⟨letterspace⟩^^Q\MT@warning@nl{This package requires the etex extensions.
⟨letterspace⟩^^Q               \MessageBreak Exiting}\MT@restore@catcodes\endinput
⟨debug⟩\MT@dinfo@nl{0}{this is
⟨debug⟩^^Q not
⟨debug⟩  etex}
```

We check whether we are running pdfTeX, XeTeX, or LuaTeX, and load the appropriate definition file.

\MT@clear@options

If we are using neither of these engines, we disable everything and exit.

```
\def\MT@clear@options{%
⟨plain⟩  \MT@requires@latex1{%
  \AtEndOfPackage{\let\@unprocessedoptions\relax\MT@restore@catcodes}%
  \let\CurrentOption\@empty
⟨package⟩  \let\MT@endinput\endinput
⟨plain⟩  }\relax
}
```

A hack circumventing the TEX Live 2004 hack which undefines the pdfTEX primitives in the format in order to hide the fact that pdfTEX is being run from the user. This has been *fixed* in TEX Live 2005.

```
\ifx\normalpdftexversion\@undefined \else
  \let\pdftexversion \normalpdftexversion
  \let\pdftexrevision\normalpdftexrevision
  \let\pdfoutput     \normalpdfoutput
\fi
```

\MT@engine
\MT@engine@tooold

Old packages might have let `\pdftexversion` to `\relax`.

```
\let\MT@engine\relax
⟨letterspace⟩\def\MT@engine@tooold{0}
\ifx\pdftexversion\@undefined \else
  \ifx\pdftexversion\relax \else
    \def\MT@engine{pdf}
⟨letterspace⟩    \let\MT@pdf@or@lua\@firstoftwo
⟨letterspace⟩    \ifnum\pdftexversion > 139 \def\MT@engine@tooold{1}\fi
  \fi
\fi
\ifx\directlua\@undefined \else
  \ifx\directlua\relax \else
    \def\MT@engine{lua}
```

Since approx. LuaTEX 0.80, `\pdftexversion` is let to `\luatexversion`, so that we would be fooled to think that pdfTEX is too old.

```
⟨*letterspace⟩
    \let\MT@pdf@or@lua\@secondoftwo
    \ifnum\luatexversion < 62 \def\MT@engine@tooold{0}
    \else
      \def\MT@engine@tooold{1}
      \let\MT@lua\directlua
      \ifnum\luatexversion > 84
        \let\pdfoutput\outputmode
        \let\pdfprotrudechars\protrudechars
        \let\pdfadjustspacing\adjustspacing
      \fi
    \fi
⟨/letterspace⟩
  \fi
\fi
⟨*package⟩
\ifx\MT@engine\relax
  \ifx\XeTeXversion\@undefined \else
    \ifx\XeTeXversion\relax \else
      \def\MT@engine{xe}
    \fi
  \fi
\fi
⟨/package⟩
⟨/package|letterspace⟩
```

\MT@pdftex@no

pdfTEX's features for which we provide an interface here haven't always been available, and some specifics have changed over time. Therefore, we have to test which pdfTEX we're using, if any. `\MT@pdftex@no` will be used throughout the package to respectively do the right thing.

Currently, we have to distinguish seven cases for pdfTEX:

0: not running pdfTEX

1: pdfTEX ($<$ 0.14f)

2: + micro-typographic extensions (0.14f,g)

3: + protrusion relative to 1 em ($\geq$ 0.14h)

4: + automatic font expansion; protrusion no longer has to be set up first; scale factor fixed to 1000; default \efcode = 1000 (≥ 1.20)

5: + \(left,right)marginkern; \pdfnoligatures; \pdfstrcmp; \pdfescapestring (≥ 1.30)

6: + adjustment of interword spacing; extra kerning; \letterspacefont; \pdfmatch[14]; \pdftracingfonts; always e-TeX (≥ 1.40)

7: + \letterspacefont doesn't disable ligatures and kerns; \pdfcopyfont (≥ 1.40.4)

```
⟨*pdftex-def⟩
⟨debug⟩\MT@dinfo@nl{0}{this is pdftex \the\pdftexversion(\pdftexrevision)}
\def\MT@pdftex@no{7}
\ifnum\pdftexversion = 140
  \ifnum\pdftexrevision < 4
    \def\MT@pdftex@no{6}
  \fi
\else
  \ifnum\pdftexversion < 140
    \def\MT@pdftex@no{5}
    \ifnum\pdftexversion < 130
      \def\MT@pdftex@no{4}
      \ifnum\pdftexversion < 120
        \def\MT@pdftex@no{3}
        \ifnum\pdftexversion = 14
          \ifnum \expandafter`\pdftexrevision < `h
            \def\MT@pdftex@no{2}
            \ifnum \expandafter`\pdftexrevision < `f
              \def\MT@pdftex@no{1}
            \fi
          \fi
        \else
          \ifnum\pdftexversion < 14
            \def\MT@pdftex@no{1}
          \fi
        \fi
      \fi
    \fi
  \fi
\fi
⟨debug⟩\MT@dinfo@nl{0}{pdftex no.: \MT@pdftex@no}
⟨/pdftex-def⟩
```

\MT@xetex@no

XƎTeX supports character protrusion since version 0.9997.

```
⟨*xetex-def⟩
⟨debug⟩\MT@dinfo@nl{0}{this is xetex (\the\XeTeXversion\XeTeXrevision)}
\ifdim 0\XeTeXrevision pt < 0.9997pt
  \def\MT@xetex@no{1}
\else
  \def\MT@xetex@no{2}
\fi
⟨debug⟩\MT@dinfo@nl{0}{xetex no.: \MT@xetex@no}
⟨/xetex-def⟩
```

\MT@luatex@no

Cases for LuaTeX (\luatexversion ought to have been enabled by the format):

0: N/A

1: LuaTeX (< 0.36)

2: + \directlua without state number (≥ 0.36)

[14] This command was actually introduced in 1.30, but failed on strings longer than 1023 bytes.

3: + `\letterspacefont`; non-automatic expansion doesn't work anymore, and automatic expansion in DVI mode is realised by modifying the tracking, not the glyphs[15] (≥ 0.62)

4: + almost all of the pdfTEX primitives have been renamed (≥ 0.85)

5: + default `\efcode` = 1000; `\protrusionboundary` [not yet supported] (≥ 0.90)

6: + `\glet`(≥ 1.10)

Also, sometime between 1.0.4 and 1.0.7, the function `font.setexpansion` has been introduced (but we're not using it for now).

```
⟨*luatex-def⟩
⟨debug⟩\MT@dinfo@nl0{this is luatex (\the\luatexversion)}
```

`\MT@lua` Communicate with `lua`. Beginning with LuaTEX 0.36, `\directlua` no longer requires a state number.

```
\let\MT@lua\directlua
\def\MT@luatex@no{6}
\ifnum\luatexversion<110
  \def\MT@luatex@no{5}
  \ifnum\luatexversion<90
    \def\MT@luatex@no{4}
    \ifnum\luatexversion<85
      \def\MT@luatex@no{3}
      \ifnum\luatexversion<62
        \def\MT@luatex@no{2}
        \ifnum\luatexversion<36
          \def\MT@lua{\directlua0}
          \def\MT@luatex@no{1}
        \fi
      \fi
    \fi
  \fi
\fi
```

```
⟨debug⟩\MT@dinfo@nl{0}{luatex no.: \MT@luatex@no}
⟨/luatex-def⟩
```

```
⟨*pdftex-def|xetex-def|letterspace⟩
\ifnum
⟨pdftex-def|xetex-def⟩  \csname MT@\MT@engine tex@no\endcsname < 2
⟨letterspace⟩  \MT@engine@tooold=\z@
  \MT@warning@nl{You
⟨*letterspace⟩
    \ifx\MT@engine\relax
      don't seem to be using pdftex or luatex.\MessageBreak
      Try running `pdftex' or `luatex' instead of\MessageBreak
        `\ifx\XeTeXversion\@undefined\else xe\fi tex'%
    \else
⟨/letterspace⟩
      are using a \MT@engine tex version older than
⟨pdftex-def⟩      0.14f%
⟨xetex-def⟩      0.9997%
⟨letterspace⟩        \MT@pdf@or@lua{1.40}{0.62}%
      .\MessageBreak
      `\MT@MT' does not work with this version.\MessageBreak
      Please install a newer version of \MT@engine tex%
⟨letterspace⟩    \fi
      .\MessageBreak I will quit now}
  \MT@clear@options
\endinput\fi
⟨/pdftex-def|xetex-def|letterspace⟩
```

[15] This may have been changed earlier, but I'm no longer able to find out when (the last version that actually works for me is 0.40).

Still there? Then we can begin: We need the keyval package, including the 'new' \KV@@sp@def implementation.

```
⟨*package|letterspace⟩
\RequirePackage{keyval}[1997/11/10]
⟨*package⟩
```

\MT@toks

We need a token register.

```
\newtoks\MT@toks
```

\ifMT@if@

A scratch if.

```
\newif\ifMT@if@
```

14.1.3 Declarations

\ifMT@protrusion
\ifMT@expansion
\ifMT@auto
\ifMT@selected
\ifMT@noligatures
\ifMT@draft
\ifMT@spacing
\ifMT@kerning
\ifMT@tracking
\ifMT@babel

These are the global switches . . .

```
\newif\ifMT@protrusion
\newif\ifMT@expansion
\newif\ifMT@auto
\newif\ifMT@selected
\newif\ifMT@noligatures
\newif\ifMT@draft
\newif\ifMT@spacing
\newif\ifMT@kerning
\newif\ifMT@tracking
\newif\ifMT@babel
```

[This line intentionally left blank.]

\MT@pr@level
\MT@ex@level
\MT@pr@factor
\MT@ex@factor
\MT@sp@factor
\MT@kn@factor

. . . and numbers.

```
\let\MT@pr@level\tw@
\let\MT@ex@level\tw@
\let\MT@pr@factor\@m
\let\MT@ex@factor\@m
\let\MT@sp@factor\@m
\let\MT@kn@factor\@m
```

\MT@pr@unit
\MT@sp@unit
\MT@kn@unit

Default unit for protrusion settings is character width, for spacing space, for kerning (and tracking) 1 em.

```
\let\MT@pr@unit\@empty
\let\MT@sp@unit\m@ne
\def\MT@kn@unit{1em}
```

\MT@stretch
\MT@shrink
\MT@step

Expansion settings.

```
\let\MT@stretch\m@ne
\let\MT@shrink \m@ne
\let\MT@step   \m@ne
```

\MT@pr@min
\MT@pr@max
\MT@ex@min
\MT@ex@max
\MT@sp@min
\MT@sp@max
\MT@kn@min
\MT@kn@max
\MT@tr@min
\MT@tr@max

Minimum and maximum values allowed by pdfTEX.

```
\def\MT@pr@min{-\@m}
\let\MT@pr@max\@m
\let\MT@ex@min\z@
\let\MT@ex@max\@m
\def\MT@sp@min{-\@m}
\let\MT@sp@max\@m
\def\MT@kn@min{-\@m}
\let\MT@kn@max\@m
⟨/package⟩
\def\MT@tr@min{-\@m}
\let\MT@tr@max\@m
⟨*package⟩
```

\MT@factor@default

Default factor.

```
\def\MT@factor@default{1000 }
```

\MT@stretch@default
\MT@shrink@default

Default values for expansion.

```
\def\MT@stretch@default{20 }
\def\MT@shrink@default{20 }
```

\MT@letterspace
\MT@letterspace@default

Default value for letterspacing (in thousandths of 1 em).

```
⟨/package⟩
\let\MT@letterspace\m@ne
\def\MT@letterspace@default{100}
⟨*package⟩
```

\ifMT@document

Our private test whether we're still in the preamble.

```
\newif\ifMT@document
⟨/package⟩
⟨/package|letterspace⟩
```

14.1.4 Auxiliary macros

\MT@requires@pdftex
\MT@requires@luatex

For definitions that depend on a particular pdfTEX resp. LuaTEX version.

```
⟨*pdftex-def|luatex-def⟩
\def
⟨pdftex-def⟩  \MT@requires@pdftex%
⟨luatex-def⟩  \MT@requires@luatex%
  #1{\ifnum
⟨pdftex-def⟩  \MT@pdftex@no
⟨luatex-def⟩  \MT@luatex@no
    <#1 \expandafter\@secondoftwo\else\expandafter\@firstoftwo\fi}
⟨luatex-def&debug⟩\MT@requires@luatex4{\MT@lua{tex.enableprimitives('pdf',{'tracingfonts'})}}\relax
⟨pdftex-def&debug⟩\MT@requires@pdftex6{
⟨debug⟩\pdftracingfonts=1
⟨pdftex-def&debug⟩}\relax
⟨/pdftex-def|luatex-def⟩
```

Some functions are loaded from a dedicated lua file. This avoids character escaping problems and incompatibilities between versions of LuaTEX. Unless running a recent LATEX, we load the luatexbase package.

```
⟨*luatex-def⟩
\@ifl@t@r\fmtversion{2016/01/01}\relax{\RequirePackage{luatexbase}}
```

We load luaotfload, because some of its functions are required in microtype.lua. This eliminates the need for the user to load fontspec before microtype. There will hardly be any LuaTEX documents that don't load this package, anyway. Since 2017/01/01, it is already loaded in the format.

```
\@ifl@t@r\fmtversion{2017/01/01}\relax{\RequirePackage{luaotfload}}
\MT@lua{require("microtype")}
⟨/luatex-def⟩
```

Here it begins. The module was contributed by Élie Roux.

```
⟨*luafile⟩

function microtype.info(...)
  luatexbase.module_info("microtype",...)
end

local find       = string.find
local match      = string.match
local tex_write  = tex.write

local catpackage
if luatexbase.registernumber then
  catpackage = luatexbase.registernumber("catcodetable@atletter") -- LaTeX
else
```

```
  catpackage = luatexbase.catcodetables.CatcodeTableLaTeXAtLetter -- luatexbase
end
function microtype.sprint (...)
  tex.sprint(catpackage, ...)
end

⟨/luafile⟩
```

To be continued, but first back to primitives.

\MT@glet

Here's the forgotten one (finally implemented in LuaTEX).

```
⟨luatex-def⟩\MT@requires@luatex6{\let\MT@glet\glet}\relax
⟨*package|letterspace⟩
\def\MT@glet{\global\let}
```

\MT@exp@cs
\MT@exp@gcs

Commands to create command sequences. Those that are going to be defined globally should be created inside a group so that the save stack won't explode.

```
\def\MT@exp@cs#1#2{\expandafter#1\csname#2\endcsname}
⟨*package⟩
\def\MT@exp@gcs#1#2{\begingroup\expandafter\endgroup\expandafter#1\csname#2\endcsname}
```

\MT@def@n
\MT@gdef@n

This is \@namedef and global.

```
\def\MT@def@n{\MT@exp@cs\def}
\def\MT@gdef@n{\MT@exp@gcs\gdef}
```

\MT@edef@n
\MT@xdef@n

Its expanding versions.

```
⟨/package⟩
\def\MT@edef@n{\MT@exp@cs\edef}
⟨*package⟩
\def\MT@xdef@n{\MT@exp@gcs\xdef}
```

\MT@let@nc
\MT@glet@nc

\let a \csname sequence to a command.

```
\def\MT@let@nc{\MT@exp@cs\let}
\def\MT@glet@nc{\MT@exp@gcs\MT@glet}
```

\MT@let@cn

\let a command to a \csname sequence.

```
⟨/package⟩
\def\MT@let@cn#1#2{\expandafter\let\expandafter#1\csname #2\endcsname}
⟨*package⟩
```

\MT@let@nn
\MT@glet@nn

\let a \csname sequence to a \csname sequence.

```
\def\MT@let@nn{\MT@exp@cs\MT@let@cn}
\def\MT@glet@nn{\MT@exp@gcs{\global\expandafter\MT@let@cn}}
```

\MT@@font

Remove trailing space from the font name.

```
\def\MT@@font{\expandafter\string\MT@font}
```

\MT@exp@one@n

Expand the second token once and enclose it in braces.

```
⟨/package⟩
\def\MT@exp@one@n#1#2{\expandafter#1\expandafter{#2}}
```

\MT@exp@two@c

Expand the next two tokens after ⟨*#1*⟩ once.

```
\def\MT@exp@two@c#1{\expandafter\expandafter\expandafter#1\expandafter}
⟨*package⟩
```

\MT@exp@two@n

Expand the next two tokens after ⟨*#1*⟩ once and enclose them in braces.

```
\def\MT@exp@two@n#1#2#3{%
  \expandafter\expandafter\expandafter
    #1\expandafter\expandafter\expandafter
      {\expandafter#2\expandafter}\expandafter{#3}}
```

You do not wonder why \MT@exp@one@c doesn't exist, do you?

\MT@ifdefined@c@T
\MT@ifdefined@c@TF
\MT@ifdefined@n@T
\MT@ifdefined@n@TF

Wrapper for testing whether command resp. \csname sequence is defined. If we are running e-TEX, we will use its primitives \ifdefined and \ifcsname, which decreases memory use substantially.

```
\def\MT@ifdefined@c@T#1{%
^^X  \ifdefined#1\expandafter\@firstofone\else\expandafter\@gobble\fi
^^Q  \ifx#1\@undefined\expandafter\@gobble\else\expandafter\@firstofone\fi
}
⟨/package⟩
\def\MT@ifdefined@c@TF#1{%
^^X  \ifdefined#1\expandafter\@firstoftwo\else\expandafter\@secondoftwo\fi
⟨package⟩^^Q  \ifx#1\@undefined
⟨package⟩^^Q    \expandafter\@secondoftwo\else\expandafter\@firstoftwo\fi
}
\def\MT@ifdefined@n@T#1{%
^^X  \ifcsname#1\endcsname\expandafter\@firstofone\else\expandafter\@gobble\fi
⟨package⟩^^Q  \begingroup\MT@exp@two@c\endgroup\ifx\csname #1\endcsname\relax
⟨package⟩^^Q    \expandafter\@gobble\else\expandafter\@firstofone\fi
}
\def\MT@ifdefined@n@TF#1{%
^^X  \ifcsname#1\endcsname\expandafter\@firstoftwo\else\expandafter\@secondoftwo\fi
⟨package⟩^^Q  \begingroup\MT@exp@two@c\endgroup\ifx\csname #1\endcsname\relax
⟨package⟩^^Q    \expandafter\@secondoftwo\else\expandafter\@firstoftwo\fi
}
⟨*package⟩
```

\MT@detokenize@n
\MT@detokenize@c
\MT@rem@last@space

Translate a macro into a token list. With e-TEX, we can use \detokenize. We also need to remove the last trailing space; and only the last one – therefore the fiddling (and the \string isn't perfect, of course).

```
\def\MT@detokenize@n#1{%
^^X  \expandafter\MT@rem@last@space\detokenize{#1} \@nil
^^Q  \string#1%
}
\def\MT@detokenize@c#1{%
^^X  \MT@exp@one@n\MT@detokenize@n#1%
^^Q  \MT@exp@two@c\MT@rem@last@space\strip@prefix\meaning#1 \@nil
}
\def\MT@rem@last@space#1 #2{#1%
  \ifx\@nil#2\else \space
  \expandafter\MT@rem@last@space\expandafter#2\fi
}
```

\MT@ifempty

Test whether argument is empty.

```
⟨/package⟩
\begingroup
\catcode`\%=12
\catcode`\&=14
\gdef\MT@ifempty#1{&
  \if %#1%&
    \expandafter\@firstoftwo
  \else
    \expandafter\@secondoftwo
  \fi
}
\endgroup
⟨*package⟩
```

\MT@ifint

Test whether argument is an integer, using an old trick by Mr. Arseneau, or the latest and greatest from pdfTEX or LuaTEX (which also allows negative numbers, as required by the letterspace option).

```
⟨/package⟩
⟨/package|letterspace⟩
⟨pdftex-def⟩\MT@requires@pdftex6{
⟨letterspace⟩\MT@pdf@or@lua{
```

```
⟨*pdftex-def|letterspace⟩
\def\MT@ifint#1{%
  \ifcase\pdfmatch{^-*[0-9]+ *$}{#1}\relax
    \expandafter\@secondoftwo
  \else
    \expandafter\@firstoftwo
  \fi
}
}{
⟨/pdftex-def|letterspace⟩
⟨*pdftex-def|xetex-def|letterspace⟩
\def\MT@ifint#1{%
  \if!\ifnum9<1#1!\else?\fi
    \expandafter\@firstoftwo
  \else
    \expandafter\@secondoftwo
  \fi
}
⟨/pdftex-def|xetex-def|letterspace⟩
⟨pdftex-def|letterspace⟩}
⟨luatex-def⟩\def\MT@ifint#1{\csname\MT@lua{microtype.if_int([[#1]])}\endcsname}
⟨*luafile⟩
local function if_int(s)
  if find(s,"^-*[0-9]+ *$") then
    tex_write("@firstoftwo")
  else
    tex_write("@secondoftwo")
  end
end
microtype.if_int = if_int

⟨/luafile⟩
```

\MT@ifdimen

Test whether argument is dimension (or number). (nd and nc are new Didot resp. Cicero, added in pdfTEX 1.30; px is a pixel.)

```
⟨*pdftex-def⟩
\MT@requires@pdftex6{
\def\MT@ifdimen#1{%
  \ifcase\pdfmatch{^([0-9]+([.,][0-9]+)?|[.,][0-9]+)%
                    (em|ex|cm|mm|in|pc|pt|dd|cc|bp|sp|nd|nc|px)? *$}{#1}\relax
    \expandafter\@secondoftwo
  \else
    \expandafter\@firstoftwo
  \fi
}
}{
⟨/pdftex-def⟩
⟨*pdftex-def|xetex-def⟩
\def\MT@ifdimen#1{%
  \setbox\z@=\hbox{%
    \MT@count=1#1\relax
    \ifnum\MT@count=\@ne
      \aftergroup\@secondoftwo
    \else
      \aftergroup\@firstoftwo
    \fi
  }%
}
⟨/pdftex-def|xetex-def⟩
⟨pdftex-def⟩}
⟨luatex-def⟩\def\MT@ifdimen#1{\csname\MT@lua{microtype.if_dimen([[#1]])}\endcsname}
⟨*luafile⟩
local function if_dimen(s)
  if (find(s, "^-*[0-9]+(%a*) *$") or
      find(s, "^-*[0-9]*[.,][0-9]+(%a*) *$")) then
    tex_write("@firstoftwo")
  else
    tex_write("@secondoftwo")
  end
end
microtype.if_dimen = if_dimen

⟨/luafile⟩
```

\MT@ifdim Compare floating point numbers.

```
⟨*package⟩
\def\MT@ifdim#1#2#3{%
  \ifdim #1\p@ #2 #3\p@
    \expandafter\@firstoftwo
  \else
    \expandafter\@secondoftwo
  \fi
}
⟨/package⟩
```

\MT@ifstreq Test whether two strings (fully expanded) are equal.

```
⟨*pdftex-def|xetex-def⟩
⟨pdftex-def⟩\MT@requires@pdftex5{
\def\MT@ifstreq#1#2{%
⟨pdftex-def⟩  \ifnum\pdfstrcmp{#1}{#2}=\z@
⟨xetex-def⟩  \ifnum\strcmp{#1}{#2}=\z@
    \expandafter\@firstoftwo
  \else
    \expandafter\@secondoftwo
  \fi
}
⟨/pdftex-def|xetex-def⟩
⟨*pdftex-def⟩
}{
\def\MT@ifstreq#1#2{%
  \edef\MT@res@a{#1}%
  \edef\MT@res@b{#2}%
  \ifx\MT@res@a\MT@res@b
    \expandafter\@firstoftwo
  \else
    \expandafter\@secondoftwo
  \fi
}
}
⟨/pdftex-def⟩
⟨luatex-def⟩\def\MT@ifstreq#1#2{\csname\MT@lua{microtype.if_str_eq([[#1]],[[#2]])}\endcsname}
⟨*luafile⟩
local function if_str_eq(s1, s2)
  if s1 == s2 then
    tex_write("@firstoftwo")
  else
    tex_write("@secondoftwo")
  end
end
microtype.if_str_eq = if_str_eq

⟨/luafile⟩
```

\MT@xadd Add item to a list.

```
⟨*package⟩
\def\MT@xadd#1#2{%
  \ifx#1\relax
    \xdef#1{#2}%
  \else
    \xdef#1{#1#2}%
  \fi
}
```

\MT@xaddb

Add item to the beginning.

```
\def\MT@xaddb#1#2{%
  \ifx#1\relax
    \xdef#1{#2}%
  \else
    \xdef#1{#2#1}%
  \fi
}
⟨/package⟩
```

\MT@map@clist@n
\MT@map@clist@c
\MT@map@clist@
\MT@clist@function
\MT@clist@break

Run ⟨*#2*⟩ on all elements of the comma list ⟨*#1*⟩. This and the following is modelled after LaTeX3 commands.

```
⟨*package|letterspace⟩
\def\MT@map@clist@n#1#2{%
  \ifx\@empty#1\else
    \def\MT@clist@function##1{#2}%
    \MT@map@clist@#1,\@nil,\@nnil
  \fi
}

\def\MT@map@clist@c#1{\MT@exp@one@n\MT@map@clist@n#1}
\def\MT@map@clist@#1,{%
  \ifx\@nil#1%
    \expandafter\MT@clist@break
  \fi
  \MT@clist@function{#1}%
  \MT@map@clist@
}
\let\MT@clist@function\@gobble
\def\MT@clist@break#1\@nnil{}
⟨*package⟩
```

\MT@map@tlist@n
\MT@map@tlist@c
\MT@map@tlist@
\MT@tlist@break

Execute ⟨*#2*⟩ on all elements of the token list ⟨*#1*⟩. `\MT@tlist@break` can be used to jump out of the loop.

```
\def\MT@map@tlist@n#1#2{\MT@map@tlist@#2#1\@nnil}
\def\MT@map@tlist@c#1#2{\expandafter\MT@map@tlist@\expandafter#2#1\@nnil}
\def\MT@map@tlist@#1#2{%
  \ifx\@nnil#2\else
    #1{#2}%
    \expandafter\MT@map@tlist@
    \expandafter#1%
  \fi
}
\def\MT@tlist@break#1\@nnil{\fi}
```

\ifMT@inlist@
\MT@in@clist

Test whether item ⟨*#1*⟩ is in comma list ⟨*#2*⟩. Using `\pdfmatch` would be slower.

```
\newif\ifMT@inlist@
\def\MT@in@clist#1#2{%
  \def\MT@res@a##1,#1,##2##3\@nnil{%
    \ifx##2\@empty
      \MT@inlist@false
    \else
      \MT@inlist@true
    \fi
  }%
  \expandafter\MT@res@a\expandafter,#2,#1,\@empty\@nnil
}
```

\MT@rem@from@clist

Remove item ⟨*#1*⟩ from comma list ⟨*#2*⟩. This is basically `\@removeelement` from `ltcntrl.dtx`. Using `\pdfmatch` and `\pdflastmatch` here would be really slow!

```
\def\MT@rem@from@clist#1#2{%
```

```
  \def\MT@res@a##1,#1,##2\MT@res@a{##1,##2\MT@res@b}%
  \def\MT@res@b##1,\MT@res@b##2\MT@res@b{\ifx,##1\@empty\else##1\fi}%
  \xdef#2{\MT@exp@two@c\MT@res@b\MT@res@a\expandafter,#2,\MT@res@b,#1,\MT@res@a}%
}
```

\MT@in@tlist
\MT@in@tlist@

Test whether item is in token list. Since this isn't too elegant, I thought that at least here, \pdfmatch would be more efficient – however, it turned out to be even slower than this solution.

```
\def\MT@in@tlist#1#2{%
  \MT@inlist@false
  \def\MT@res@a{#1}%
  \MT@map@tlist@c#2\MT@in@tlist@
}
\def\MT@in@tlist@#1{%
  \edef\MT@res@b{#1}%
  \ifx\MT@res@a\MT@res@b
    \MT@inlist@true
    \expandafter\MT@tlist@break
  \fi
}
```

\MT@in@rlist
\MT@in@rlist@
\MT@in@rlist@@
\MT@size@name

Test whether size \MT@size is in a list of ranges. Store the name of the list in \MT@size@name

```
\def\MT@in@rlist#1{%
  \MT@inlist@false
  \MT@map@tlist@c#1\MT@in@rlist@
}
\def\MT@in@rlist@#1{\expandafter\MT@in@rlist@@#1}
\def\MT@in@rlist@@#1#2#3{%
  \MT@ifdim{#2}=\m@ne{%
    \MT@ifdim{#1}=\MT@size
      \MT@inlist@true
      \relax
  }{%
    \MT@ifdim\MT@size<{#1}\relax{%
      \MT@ifdim\MT@size<{#2}%
        \MT@inlist@true
        \relax
    }%
  }%
  \ifMT@inlist@
    \def\MT@size@name{#3}%
    \expandafter\MT@tlist@break
  \fi
}
```

\MT@loop
\MT@iterate
\MT@repeat

This is the same as LaTeX's \loop, which we mustn't use, since this could confuse an outer \loop in the document.

```
⟨/package⟩
\def\MT@loop#1\MT@repeat{%
  \def\MT@iterate{#1\relax\expandafter\MT@iterate\fi}%
  \MT@iterate \let\MT@iterate\relax
}
\let\MT@repeat\fi
```

\MT@while@num

Execute ⟨*#3*⟩ from ⟨*#1*⟩ up to (excluding) ⟨*#2*⟩ (much faster than LaTeX's \@whilenum).

```
\def\MT@while@num#1#2#3{%
  \@tempcnta#1\relax
  \MT@loop #3%
    \advance\@tempcnta \@ne
    \ifnum\@tempcnta < #2\MT@repeat
}
⟨/package|letterspace⟩
```

\MT@if@luaotf@font For fonts loaded by `luaotfload` we query the font's table.

```
⟨letterspace⟩\MT@pdf@or@lua{\let\MT@if@luaotf@font\@secondoftwo}{
⟨luatex-def|letterspace⟩\def\MT@if@luaotf@font{\csname\MT@lua{%
⟨luatex-def⟩  microtype.if_luaotf_font()
⟨*luafile|letterspace⟩
⟨luafile⟩local function if_luaotf_font()
  local thefont = font.getfont(font.current())
  if thefont and ( thefont.format == "opentype" or thefont.format == "truetype" )
    then tex.write("@firstoftwo")
    else tex.write("@secondoftwo")
  end
⟨luafile⟩end
⟨luafile⟩microtype.if_luaotf_font = if_luaotf_font
⟨luafile⟩
⟨/luafile|letterspace⟩
⟨luatex-def|letterspace⟩ }\endcsname
⟨luatex-def|letterspace⟩}
⟨letterspace⟩}
```

\MT@do@font Execute ⟨*#1*⟩ 256 times,

```
⟨pdftex-def|letterspace⟩\def\MT@do@font{\MT@while@num\z@\@cclvi}
```

resp. for the whole font for LuaTeX, if it's a Unicode font.

```
⟨*luatex-def⟩
\def\MT@do@font#1{%
  \MT@if@luaotf@font{%
    \def\MT@dofont@function{#1}%
    \MT@lua{microtype.do_font()}%
  }{\MT@while@num\z@\@cclvi{#1}}%
}
⟨/luatex-def⟩
```

This is the `lua` function, which is much faster than looping through all glyphs in TeX. Legacy fonts (which this function should never work on) don't contain a `v.index` field.

```
⟨*luafile⟩
local function do_font()
  local thefont = font.getfont(font.current())
  if thefont then
    for i,v in next,thefont.characters do
      if v.index == nil or v.index > 0 then
        microtype.sprint([[\@tempcnta=]]..i..[[\relax\MT@dofont@function]])
      end
    end
  end
end
microtype.do_font = do_font

⟨/luafile⟩
```

The XeTeX variant (it's slow . . . !).

```
⟨*xetex-def⟩
\def\MT@do@font#1{%
  \@tempcnta=\z@
  \MT@loop
    \iffontchar\MT@font\@tempcnta #1\fi
    \advance\@tempcnta\@ne
    \ifnum\@tempcnta < \XeTeXlastfontchar\MT@font \MT@repeat
}
⟨/xetex-def⟩
⟨*package⟩
```

\MT@count
\MT@increment Increment macro ⟨*#1*⟩ by one. Saves using up too many counters. The e-TeX way is

slightly faster.

```
\newcount\MT@count
\def\MT@increment#1{%
^^X  \edef#1{\number\numexpr #1 + 1\relax}%
^^Q  \MT@count=#1\relax
^^Q  \advance\MT@count \@ne
^^Q  \edef#1{\number\MT@count}%
}
```

\MT@scale

Multiply and divide a counter. If we are using e-TEX, we will use its `\numexpr` primitive. This has the advantage that it is less likely to run into arithmetic overflow. The result of the division will be rounded instead of truncated. Therefore, we'll get a different (more accurate) result in about half of the cases.

```
\def\MT@scale#1#2#3{%
^^Q  \multiply #1 #2\relax
  \ifnum #3 = \z@
^^X    #1=\numexpr #1 * #2\relax
  \else
^^X    #1=\numexpr #1 * #2 / #3\relax
^^Q    \divide #1 #3\relax
  \fi
}
```

\MT@abbr@pr
\MT@abbr@ex
\MT@abbr@pr@c
\MT@abbr@ex@c
\MT@abbr@pr@inh
\MT@abbr@ex@inh
\MT@abbr@nl
\MT@abbr@sp
\MT@abbr@sp@c
\MT@abbr@sp@inh
\MT@abbr@kn
\MT@abbr@kn@c
\MT@abbr@kn@inh
\MT@abbr@tr
\MT@abbr@tr@c

Some abbreviations. Thus, we can have short command names but full-length log output.

```
\def\MT@abbr@pr{protrusion}
\def\MT@abbr@ex{expansion}
\def\MT@abbr@pr@c{protrusion codes}
\def\MT@abbr@ex@c{expansion codes}
\def\MT@abbr@pr@inh{protrusion inheritance}
\def\MT@abbr@ex@inh{expansion inheritance}
\def\MT@abbr@nl{noligatures}
\def\MT@abbr@sp{spacing}
\def\MT@abbr@sp@c{interword spacing codes}
\def\MT@abbr@sp@inh{interword spacing inheritance}
\def\MT@abbr@kn{kerning}
\def\MT@abbr@kn@c{kerning codes}
\def\MT@abbr@kn@inh{kerning inheritance}
\def\MT@abbr@tr{tracking}
\def\MT@abbr@tr@c{tracking amount}
```

\MT@rbba@protrusion
\MT@rbba@expansion
\MT@rbba@spacing
\MT@rbba@kerning
\MT@rbba@tracking

These we also need the other way round.

```
\def\MT@rbba@protrusion{pr}
\def\MT@rbba@expansion{ex}
\def\MT@rbba@spacing{sp}
\def\MT@rbba@kerning{kn}
\def\MT@rbba@tracking{tr}
```

\MT@features
\MT@features@long

We can work on these lists to save some guards in the `dtx` file.

```
\def\MT@features{pr,ex,sp,kn,tr}
\def\MT@features@long{protrusion,expansion,spacing,kerning,tracking}
```

\MT@is@feature

Whenever an optional argument accepts a list of features, we can use this command to check whether a feature exists in order to prevent a rather confusing '`Missing \endcsname inserted`' error message. The feature (long form) must be in ⟨*#1*⟩, the type of list to ignore in ⟨*#2*⟩, then comes the action.

```
\def\MT@is@feature#1#2{%
  \MT@in@clist{#1}\MT@features@long
  \ifMT@inlist@
    \expandafter\@firstofone
  \else
    \MT@error{`#1' is not an available micro-typographic\MessageBreak
```

```
      feature. Ignoring #2}{Available features are: `\MT@features@long'.}%
    \expandafter\@gobble
  \fi
}
```

14.1.5 Compatibility

For the record, the following LaTeX kernel commands will be modified by microtype:

- \pickup@font
- \do@subst@correction
- \add@accent (all in section 14.2.9)
- \showhyphens (in section 14.4.6)

The wordcount package redefines the font-switching commands, which will break microtype. Since microtype doesn't have an effect on the number of words in the document anyway, we will simply disable ourselves.

```
\@ifl@aded{tex}{wordcount}{%
  \MT@warning@nl{Detected the `wordcount' utility.\MessageBreak
    Disabling `\MT@MT', since it wouldn't work}%
  \MT@clear@options\endinput}\relax
```

The minimal class doesn't define any size commands other than \normalsize, which will result in lots of warnings. Therefore we issue a warning about the warnings.

```
\@ifclassloaded{minimal}{%
  \MT@warning@nl{Detected the `minimal' class.\MessageBreak
    Expect lots of warnings and some malfunctions.\MessageBreak
    You might want to use a proper class instead}%
}\relax
```

\MT@setup@

The setup is deferred until the end of the preamble. This has a couple of advantages: \microtypesetup can be used to change options later on in the preamble, and fonts don't have to be set up before microtype.

```
⟨/package⟩
⟨*package|letterspace⟩
⟨plain⟩\MT@requires@latex1{
\let\MT@setup@\@empty
```

\MT@addto@setup

We use our private hook to have better control over the timing. This will also work with eplain, but not with miniltx alone.

```
\def\MT@addto@setup{\g@addto@macro\MT@setup@}
```

Don't hesitate with miniltx.

```
⟨plain⟩}{\let\MT@addto@setup\@firstofone}
```

\MT@with@package@T

We almost never do anything if a package is not loaded.

```
\def\MT@with@package@T#1{\@ifpackageloaded{#1}\@firstofone\@gobble}
⟨/package|letterspace⟩
⟨*package⟩
```

\MT@with@babel@and@T

LaTeX's \@ifpackagewith ignores the class options.

```
\def\MT@with@babel@and@T#1{%
  \MT@ifdefined@n@T{opt@babel.\@pkgextension}{%
    \@expandtwoargs\MT@in@clist{#1}
      {\csname opt@babel.\@pkgextension\endcsname,\@classoptionslist}%
    \ifMT@inlist@\expandafter\@gobble\fi
  }\@gobble
}
```

\MT@ledmac@setup

The ledmac package first saves each paragraph in a box, from which it then splits off the lines one by one. This will destroy character protrusion. (There aren't any problems with the lineno package, since it takes a different approach.) — . . . — After much to and fro, the situation has finally settled and there is a fix. Beginning with pdfTEX version 1.21b together with ledpatch.sty as of 2005/06/02 (v0.4), character protrusion will work at last.

Peter Wilson was so kind to provide the \l@dunhbox@line hook in ledmac to allow for protrusion. \leftmarginkern and \rightmarginkern are new primitives of pdfTEX 1.21b (aka. 1.30.0). They are also part of recent XƎTEX. The successor packages eledmac and reledmac are also supported.

```
⟨/package⟩
⟨pdftex-def⟩\MT@requires@pdftex5{
⟨*pdftex-def|luatex-def|xetex-def⟩
  \def\MT@ledmac@setup{%
    \ifMT@protrusion
      \MT@ifdefined@c@TF\l@dunhbox@line{%
```

\MT@led@unhbox@line

Hook.

```
        \MT@info@nl{Patching ((r)e)ledmac to enable character protrusion}%
        \let\MT@led@unhbox@line\l@dunhbox@line
        \renewcommand*{\l@dunhbox@line}[1]{%
          \ifhbox##1%
            \kern\leftmarginkern##1%
            \expandafter\MT@led@unhbox@line\expandafter##1\expandafter
            \kern\rightmarginkern##1%
          \fi
        }%

      }{%
        \MT@warning@nl{%
          Character protrusion in paragraphs with line\MessageBreak
          numbering will only work if you update ledmac,\MessageBreak
          or use one of its successors, eledmac or reledmac}%
      }%
    \fi
  }
⟨/pdftex-def|luatex-def|xetex-def⟩
⟨*pdftex-def⟩
}{
  \def\MT@ledmac@setup{%
    \ifMT@protrusion
      \MT@warning@nl{%
        The pdftex version you are using does not allow\MessageBreak
        character protrusion in paragraphs with line\MessageBreak
        numbering by the `((r)e)ledmac' package.\MessageBreak
        Upgrade pdftex to version 1.30 or later}%
    \fi
  }
}
⟨/pdftex-def⟩
```

The shapepar package (v2.2) fixes this in a similar manner by itself, so we don't have to bother.

\MT@restore@p@h

Restore meaning of \% and \#.

```
⟨*package|letterspace⟩
⟨*package⟩
\def\MT@restore@p@h{\chardef\%`\% \chardef\#`\# }
```

\ifMT@fontspec
\ifMT@xunicode

Two new conditionals for use with XƎTEX or LuaTEX.

```
\newif\ifMT@fontspec
\MT@with@package@T{fontspec}\MT@fontspectrue
```

```
\newif\ifMT@xunicode
\MT@with@package@T{xunicode}\MT@xunicodetrue
```

We need the correct value of the former for configuration commands inside the preamble (to get the default families right).

```
\@ifl@t@r\fmtversion{2020/10/01}
  {\AddToHook{package/after/fontspec}{\MT@fontspectrue}}\relax
```

\MT@maybe@gobble@with@tikz
\MT@tikz@setup

If \tikz@expandcount is greater than zero, we're inside or at the end of a tikz node, where we don't want to adjust spacing after letterspacing, lest we disturb tikz. This is used in \MT@afteraftergroup, and we don't need it for letterspace.

```
\let\MT@maybe@gobble@with@tikz\@firstofone
\def\MT@tikz@setup{%
  \def\MT@maybe@gobble@with@tikz{%
    \ifnum\tikz@expandcount>\z@
      \expandafter\@gobble
    \else
      \expandafter\@firstofone
    \fi}}
```

\MT@setupfont@hook

This hook will be executed every time a font is set up (inside a group).

In the preamble, we check for the packages each time a font is set up. Thus, it will work regardless when the packages are loaded.

Even for packages that don't activate any characters in the preamble (like babel and csquotes), we have to check here, too, in case they were loaded before microtype, and a font is loaded \AtBeginDocument, before microtype. (This is no longer needed, since the complete setup is now deferred until the end of the preamble. However, it is still necessary for defersetup=false.)

```
\def\MT@setupfont@hook{%
```

Spanish (as well as Galician and Mexican) babel modify \%, storing the original meaning in \percentsign.

```
  \MT@if@false
  \MT@with@babel@and@T{spanish} \MT@if@true
  \MT@with@babel@and@T{galician}\MT@if@true
  \MT@with@babel@and@T{mexican} \MT@if@true
  \ifMT@if@\MT@ifdefined@c@T\percentsign{\let\%\percentsign}\fi
```

Using \@disablequotes, we can restore the original meaning of all characters made active by csquotes. (It would be doable for older versions, too, but we won't bother.)

```
  \MT@with@package@T{csquotes}{%
    \@ifpackagelater{csquotes}{2005/05/11}\@disablequotes\relax}%
```

hyperref redefines \% and \# inside a \url. We restore the original meanings (which we can only hope are correct). Same for tex4ht and mathastext.

```
  \MT@if@false
  \MT@with@package@T{hyperref}  \MT@if@true
  \MT@with@package@T{tex4ht}    \MT@if@true
  \MT@with@package@T{mathastext}\MT@if@true
  \ifMT@if@\MT@restore@p@h\fi
  \MT@with@package@T{tikz}\MT@tikz@setup
}
```

Check again at the end of the preamble.

```
⟨/package⟩
\MT@addto@setup{%
⟨*package⟩
```

Our competitor, the pdfcprot package, must not be tolerated!

```
  \MT@with@package@T{pdfcprot}{%
    \MT@error{Detected the `pdfcprot' package!\MessageBreak
              `\MT@MT' and `pdfcprot' may not be used together}{%
The `pdfcprot' package provides an interface to character protrusion.\MessageBreak
So does the `\MT@MT' package. Using both packages at the same\MessageBreak
time will almost certainly lead to undesired results. Have your choice!}%
  }%
  \MT@with@package@T  {ledmac}\MT@ledmac@setup
  \MT@with@package@T {eledmac}\MT@ledmac@setup
  \MT@with@package@T{reledmac}\MT@ledmac@setup
  \MT@with@package@T{xunicode}\MT@xunicodetrue
  \MT@with@package@T{fontspec}\MT@fontspectrue
```

We can clean up `\MT@setupfont@hook` now.

```
  \MT@glet\MT@setupfont@hook\@empty
  \MT@if@false
  \MT@with@babel@and@T{spanish} \MT@if@true
  \MT@with@babel@and@T{galician}\MT@if@true
  \MT@with@babel@and@T{mexican} \MT@if@true
  \ifMT@if@
    \g@addto@macro\MT@setupfont@hook{%
      \MT@ifdefined@c@T\percentsign{\let\%\percentsign}}%
  \fi
  \MT@with@package@T{csquotes}{%
    \@ifpackagelater{csquotes}{2005/05/11}{%
      \g@addto@macro\MT@setupfont@hook\@disablequotes
    }{%
      \MT@warning@nl{%
        Should you receive warnings about unknown slot\MessageBreak
        numbers, try upgrading the `csquotes' package}%
    }%
  }%
```

We disable `microtype`'s additions inside `hyperref`'s `\pdfstringdef`, which redefines lots of commands. `hyperref` doesn't work with plain TEX, so in that case we don't bother.

```
  \MT@if@false
⟨/package⟩
⟨plain⟩  \MT@requires@latex2{
  \MT@with@package@T{hyperref}{%
    \pdfstringdefDisableCommands{%
⟨*package⟩
      \MT@ltx@pickupfont
      \let\textmicrotypecontext\@secondoftwo
      \let\microtypecontext\@gobble
⟨/package⟩
      \def\lsstyle{\pdfstringdefWarn\lsstyle}%
      \def\textls#1#{\pdfstringdefWarn\textls}%
    }%
⟨package⟩    \MT@if@true
  }%
⟨plain⟩  }\relax
⟨*package⟩
  \MT@with@package@T{tex4ht}\MT@if@true
  \MT@with@package@T{mathastext}\MT@if@true
  \ifMT@if@\g@addto@macro\MT@setupfont@hook\MT@restore@p@h\fi
```

The `listings` package makes numbers and letters active,

```
  \MT@with@package@T{listings}{%
    \g@addto@macro\MT@cfg@catcodes{%
      \MT@while@num{"30}{"3A}{\catcode\@tempcnta=12\relax}%
      \MT@while@num{"41}{"5B}{\catcode\@tempcnta=11\relax}%
      \MT@while@num{"61}{"7B}{\catcode\@tempcnta=11\relax}%
    }%
```

… and the backslash (which would lead to problems in \MT@get@slot).

```
    \g@addto@macro\MT@setupfont@hook{%
      \catcode`\\=\z@
```

Inside a listing, \space is redefined.

```
      \def\space{ }%
```

When loaded with the extendedchar option, listings will also redefine 8-bit active characters (inputenc). Luckily, this simple redefinition will make them expand to their original definition, so that they could be used in the configuration.

```
      \let\lst@ProcessLetter\@empty
    }%
  }%
```

Of course, using both soul's and microtype's letterspacing mechanisms at the same time doesn't make much sense. But soul can do more, e.g., underlining. The optional argument to \textls may not be used. Also, we have to disable expansion within soul's trial run. Under plain TeX, soul doesn't register itself the LaTeX way, so we just test for its main command.

```
⟨/package⟩
  \ifx\SOUL@\@undefined\else
    \soulregister\lsstyle 0%
    \soulregister\textls  1%
    \ifx\XeTeXrevision\@undefined
      \let\MT@SOUL@doword\SOUL@doword
      \def\SOUL@doword{\pdfadjustspacing=\z@ \MT@SOUL@doword}%
    \fi
  \fi
⟨*package⟩
  \MT@with@package@T{tikz}\MT@tikz@setup
```

Compatibility with the pinyin package (from CJK): disable microtype in \py@macron, which loads a different font for the accent. In older versions of pinyin (pre-4.6.0), \py@macron had only one argument.

```
  \MT@with@package@T{pinyin}{%
    \let\MT@orig@py@macron\py@macron
    \@ifpackagelater{pinyin}{2005/08/11}{% 4.6.0
      \def\py@macron#1#2{%
        \MT@ltx@pickupfont
        \MT@orig@py@macron{#1}{#2}%
        \MT@MT@pickupfont}%
    }{%
      \def\py@macron#1{%
        \MT@ltx@pickupfont
        \MT@orig@py@macron{#1}%
        \MT@MT@pickupfont}%
    }%
  }%
⟨/package⟩
}
⟨/package|letterspace⟩
```

We need a font (the minimal class doesn't load one).

```
⟨package⟩\expandafter\ifx\the\font\nullfont\normalfont\fi
```

14.2 Font setup

\MT@setupfont

Setting up a font entails checking for each feature whether it should be applied to the current font (\MT@font).

```
⟨*pdftex-def|xetex-def|luatex-def⟩
\def\MT@setupfont{%
```

With XƎTEX and LuaTEX the font may not be actually loaded, hence we might see a wrong font (in `\MT@get@slot`). Therefore, we first load the current font.

```
⟨xetex-def|luatex-def⟩  \MT@font
```

We might have to disable stuff when used together with adventurous packages.

```
  \MT@setupfont@hook}
```

This will use a copy of the font (allowing for expansion parameter variation and the use of more than one set of protrusion factors for a font within one paragraph).

```
⟨pdftex-def⟩\MT@requires@pdftex7{
⟨pdftex-def|luatex-def⟩\g@addto@macro\MT@setupfont\MT@copy@font
⟨pdftex-def⟩}\relax
```

The font properties must be extracted from `\MT@font`, since the current value of `\f@encoding` and friends may be wrong!

```
\g@addto@macro\MT@setupfont{%
  \MT@exp@two@c\MT@split@name\string\MT@font/\@nil
```

Try to find a configuration file for the current font family.

```
  \MT@exp@one@n\MT@find@file\MT@family
  \ifx\MT@familyalias\@empty \else
    \MT@exp@one@n\MT@find@file\MT@familyalias\fi
```

We have to make sure that `\cf@encoding` expands to the correct value (for later, in `\MT@get@slot`), which isn't the case when `\selectfont` chooses a new encoding (this would be done a second later in `\selectfont`, anyway – three lines, to be exact). (I think, I do not need this anymore – however, I'm too afraid to remove it. . . . Oops, I did it. Let's see whether anybody complains.)

```
% \ifx\f@encoding\cf@encoding\else\@@enc@update\fi
}
```

Tracking has to come first, since it means actually loading a different font.

```
⟨pdftex-def⟩\MT@requires@pdftex6
⟨luatex-def⟩\MT@requires@luatex3
⟨pdftex-def|luatex-def⟩  {\g@addto@macro\MT@setupfont\MT@tracking}\relax
\g@addto@macro\MT@setupfont{%
  \MT@check@font
  \ifMT@inlist@
⟨debug⟩\MT@show@pdfannot2%
  \else
    \MT@vinfo{Setting up font `\MT@@font'\on@line}%
    \MT@info@notracking
```

Now we can begin setting up the font for all features that the current pdfTEX provides. The following commands are `\let` to `\relax` if the respective feature is disabled via package options.

For versions older than 1.20, protrusion has to be set up first, beginning with 1.20, the order doesn't matter.

```
  \MT@protrusion
⟨pdftex-def|luatex-def⟩  \MT@expansion
}
```

Interword spacing and kerning (pdfTEX 1.40).

```
⟨*pdftex-def⟩
\MT@requires@pdftex6{
\g@addto@macro\MT@setupfont{\MT@spacing\MT@kerning}
}\relax
⟨/pdftex-def⟩
```

Disable ligatures (pdfTEX 1.30).

```
⟨pdftex-def⟩\MT@requires@pdftex5{
```

```
⟨pdftex-def|luatex-def⟩\g@addto@macro\MT@setupfont\MT@noligatures
⟨pdftex-def⟩}\relax
\g@addto@macro\MT@setupfont{%
```

Debugging.

```
⟨debug⟩\MT@show@pdfannot1%
```

Finally, register the font so that we don't set it up anew each time.

```
    \MT@register@font
  \fi
}
⟨/pdftex-def|xetex-def|luatex-def⟩
```

\MT@copy@font
\MT@copy@font@

The new (1.40.4) \pdfcopyfont command allows expanding a font with different parameters, or to use more than one set of protrusion factors for a given font within one paragraph. It will be used when we find a context for \SetProtrusion or \SetExpansion in the preamble, or when the package has been loaded with the copyfonts option.

```
⟨*pdftex-def|luatex-def⟩
\let\MT@copy@font\relax
⟨pdftex-def⟩\MT@requires@pdftex7{
\def\MT@copy@font@{%
```

\MT@font@copy

For every new protrusion and expansion context, we create a new copy.

```
  \xdef\MT@font@copy{\csname\MT@@font/\MT@pr@context/\MT@ex@context\endcsname}%
  \expandafter\ifx\MT@font@copy\relax
```

\MT@font@orig

pdfTEX doesn't allow copying a font that has already been copied and expanded/ letterspaced. Hence, we have to get the original.

```
    \edef\MT@font@orig{\csname\expandafter\string\font@name @orig\endcsname}%
    \expandafter\ifx\MT@font@orig\relax
      \MT@exp@two@c\MT@glet\MT@font@orig\font@name
    \else
      \MT@exp@two@c\let\font@name\MT@font@orig
    \fi
⟨pdftex-def⟩      \global\MT@exp@two@c\pdfcopyfont\MT@font@copy\font@name
```

Even though LuaTEX also provides the primitive from pdfTEX (even renamed to \copyfont, that is, 'promoted' as per the LuaTEX manual), it is seriously crippled in that OpenType features will be lost. Therefore, we do not copy the font but load it anew.

```
⟨luatex-def⟩      \MT@exp@two@c\MT@lua@copyfont\meaning\font@name\@nil
⟨debug⟩\MT@dinfo1{creating new copy: \MT@font@copy}%
```

Since it's a new font, we have to remove it from the context lists.

```
    \MT@map@clist@c\MT@active@features{%
      \MT@exp@cs\ifx{MT@\@nameuse{MT@abbr@##1}}\relax\else
        \def\@tempa{##1}%
        \MT@exp@cs\MT@map@tlist@c{MT@##1@doc@contexts}\MT@rem@from@list
      \fi
    }%
  \fi
  \MT@exp@two@c\let\MT@font\MT@font@copy
```

We only need the font identifier for letterspacing.

```
  \let\font@name\MT@font@copy
```

But we have to properly substitute the font after we're done.

```
  \aftergroup\let\aftergroup\font@name\aftergroup\MT@font@copy
}
```

\MT@rem@from@list

```
\def\MT@rem@from@list#1{%
  \MT@exp@cs\ifx{MT@\@tempa @#1font@list}\relax\else
    \expandafter\MT@exp@one@n\expandafter\MT@rem@from@clist\expandafter
       \MT@font \csname MT@\@tempa @#1font@list\endcsname
  \fi
}
⟨pdftex-def⟩}\relax
```

\MT@lua@copy@font

⟨*#1*⟩ and ⟨*#2*⟩ are 'select' and 'font', respectively, ⟨*#3*⟩ is the font spec.

```
⟨luatex-def⟩\def\MT@lua@copyfont #1 #2 #3\@nil{%
⟨luatex-def⟩  \global\expandafter\font\MT@font@copy=#3\relax}
⟨/pdftex-def|luatex-def⟩
```

Here's the promised dirty trick for users of older pdfTEX versions, which works around the problem that the use of the same font with different expansion parameters is prohibited. If you do not want to create a clone of the font setup (this would require duplicating the tfm/vf files under a new name, and writing new fd files and map entries), you can load a minimally larger font for the paragraph in question. E.g., for a document typeset in 10 pt:

```
\SetExpansion
   [ stretch = 30,
     shrink  = 60,
     step    =  5 ]
   { encoding = *,
     size = 10.001 }
   { }
\newcommand{\expandpar}[1]{{%
   \fontsize{10.001}{\baselineskip}\selectfont #1\par}}
% ...
\expandpar{This paragraph contains an `unnecessary' widow.}
```

Note that the \expandpar command can only be applied to complete paragraphs. If you are using Computer Modern Roman, you have to load the fix-cm package to be able to select fonts in arbitrary sizes. Finally, the reason I suggest to use a larger font, and not a smaller one, is to prevent a different design size being selected.

\MT@fix@fontdimen@six
\MT@dimen@six

If \fontdimen 6 is zero, character protrusion, spacing, kerning and tracking won't work, and we could skip the settings (for example, the dsfont fonts don't specify this dimension; this is probably a bug – the fourier and newpx/newtx packages have been fixed in the meantime). However, we can fix it ourselves – only tracking still doesn't work (it seems that \letterspacefont uses the \fontdimen 6 from the original font). XƎTEX doesn't provide an equivalent to \pdffontsize, so we use the nominal size instead.

```
⟨*pdftex-def|luatex-def|xetex-def⟩
\def\MT@fix@fontdimen@six{%
  \ifnum\fontdimen6\MT@font=\z@
    \fontdimen6\MT@font=%
⟨pdftex-def⟩      \pdffontsize\MT@font
⟨luatex-def⟩      \MT@requires@luatex4{\pdffeedback fontsize}{\pdffontsize}\MT@font
⟨xetex-def⟩      \MT@size pt
    \MT@info{Fixing zero \string\fontdimen 6 for font `\MT@@font'\MessageBreak
             (new value: \the\fontdimen6\MT@font)}%
    \MT@glet@nc{\MT@@font-fake6}\@empty
  \fi
  \edef\MT@dimen@six{\number\fontdimen6\MT@font}%
}
⟨/pdftex-def|luatex-def|xetex-def⟩
```

\MT@split@name
\MT@encoding
\MT@family
\MT@series
\MT@shape
\MT@size

Split up the font name (⟨#6⟩ may be a protrusion/expansion context and/or a letterspacing amount). With fontspec we also need to remove its internal instance counter.

```
⟨*package⟩
\def\MT@split@name#1/#2/#3/#4/#5/#6\@nil{%
  \def\MT@encoding{#1}%
  \ifMT@fontspec
    \edef\MT@family{\MT@scrubfeature#2()\relax}%
  \else
    \def\MT@family{#2}%
  \fi
  \def\MT@series  {#3}%
  \def\MT@shape   {#4}%
  \def\MT@size    {#5}%
  \MT@fix@fontdimen@six
```

\MT@familyalias

Alias family?

```
  \MT@ifdefined@n@TF{MT@\MT@family @alias}%
    {\MT@let@cn\MT@familyalias{MT@\MT@family @alias}}%
    {\let\MT@familyalias\@empty}%
}
```

\MT@scrubfeature
\MT@scrubfeatures

Remove one resp. all feature counters (fontspec).

```
\def\MT@scrubfeature#1(#2)#3\relax{#1}
\def\MT@scrubfeatures#1(#2)#3\relax{%
  #1%
  \ifx\relax#3\relax\else
    \MT@scrubfeatures#3\relax
  \fi
}
```

\ifMT@do
\MT@feat
\MT@maybe@do

We check all features of the current font against the lists of the currently active font set, and set \ifMT@do accordingly.

```
\newif\ifMT@do
\def\MT@maybe@do#1{%
```

(but only if the feature isn’t globally set to false)

```
  \csname ifMT@\csname MT@abbr@#1\endcsname\endcsname
```

Begin with setting micro-typography to true for this font. The \MT@checklist@... tests will set it to false if the property is not in the list. The first non-empty list that does not contain a match will stop us (except for font).

```
    \MT@dotrue
    \edef\@tempa{\csname MT@#1@setname\endcsname}%
    \MT@map@clist@n{font,encoding,family,series,shape,size}{%
      \MT@ifdefined@n@TF{MT@checklist@##1}%
        {\csname MT@checklist@##1\endcsname}%
        {\MT@checklist@{##1}}%
      {#1}%
    }%
  \else
    \MT@dofalse
  \fi
  \ifMT@do
```

\MT@feat stores the current feature.

```
    \def\MT@feat{#1}%
    \csname MT@set@#1@codes\endcsname
  \else
    \MT@ifstreq{#1}{tr}%
      {\let\MT@info@notracking\MT@info@notracking@}%
      {\MT@vinfo{... No \@nameuse{MT@abbr@#1}}}%
  \fi
```

```
}
```

\MT@info@notracking
\MT@info@notracking@

To defer the message to after the font has actually been logged.

```
\let\MT@info@notracking\relax
\def\MT@info@notracking@{\MT@vinfo{... No tracking}}
```

\MT@dinfo@list

```
⟨debug⟩\def\MT@dinfo@list#1#2#3{\MT@dinfo@nl{1}{\@nameuse{MT@abbr@#1}: #2
⟨debug⟩  \ifx\\#3\\list empty\else `\@nameuse{MT@#2}' #3 list\fi}}
```

\MT@checklist@

The generic test (⟨*#1*⟩ is the axis, ⟨*#2*⟩ the feature, `\@tempa` contains the set name).

```
\def\MT@checklist@#1#2{%
⟨!debug⟩  \MT@ifdefined@n@T
⟨debug⟩  \MT@ifdefined@n@TF
      {MT@#2list@#1@\@tempa}{%
```

Begin a (neatly masqueraded) `\expandafter` orgy to test whether the font attribute is in the list.

```
    \expandafter\MT@exp@one@n\expandafter\MT@in@clist
      \csname MT@#1\expandafter\endcsname
      \csname MT@#2list@#1@\@tempa\endcsname
    \ifMT@inlist@
⟨debug⟩\MT@dinfo@list{#2}{#1}{in}%
      \MT@dotrue
    \else
⟨debug⟩\MT@dinfo@list{#2}{#1}{not in}%
      \MT@dofalse
      \expandafter\MT@clist@break
    \fi
  }%
```

If no limitations have been specified, i.e., the list for a font attribute has not been defined at all, the font should be set up.

```
⟨debug⟩  {\MT@dinfo@list{#2}{#1}{}}%
}
```

\MT@checklist@family

Also test for the alias font, if the original font is not in the list.

```
\def\MT@checklist@family#1{%
⟨!debug⟩  \MT@ifdefined@n@T
⟨debug⟩  \MT@ifdefined@n@TF
      {MT@#1list@family@\@tempa}{%
    \MT@exp@two@n\MT@in@clist
        \MT@family{\csname MT@#1list@family@\@tempa\endcsname}%
    \ifMT@inlist@
⟨debug⟩\MT@dinfo@list{#1}{family}{in}%
      \MT@dotrue
    \else
⟨debug⟩\MT@dinfo@list{#1}{family}{not in}%
      \MT@dofalse
      \ifx\MT@familyalias\@empty \else
        \MT@exp@two@n\MT@in@clist
            \MT@familyalias{\csname MT@#1list@family@\@tempa\endcsname}%
        \ifMT@inlist@
⟨debug⟩  \MT@dinfo@list{#1}{family alias}{in}%
          \MT@dotrue
⟨debug⟩\else\MT@dinfo@list{#1}{family alias}{not in}%
        \fi
      \fi
    \fi
    \ifMT@do \else
      \expandafter\MT@clist@break
    \fi
  }%
⟨debug⟩  {\MT@dinfo@list{#1}{family}{}}%
}
```

\MT@checklist@size

Test whether font size is in list of size ranges.

```
\def\MT@checklist@size#1{%
⟨!debug⟩  \MT@ifdefined@n@T
⟨debug⟩  \MT@ifdefined@n@TF
      {MT@#1list@size@\@tempa}{%
    \MT@exp@cs\MT@in@rlist{MT@#1list@size@\@tempa}%
    \ifMT@inlist@
⟨debug⟩\MT@dinfo@list{#1}{size}{in}%
      \MT@dotrue
    \else
⟨debug⟩\MT@dinfo@list{#1}{size}{not in}%
      \MT@dofalse
      \expandafter\MT@clist@break
    \fi
  }%
⟨debug⟩  {\MT@dinfo@list{#1}{size}{}}%
}
```

\MT@checklist@font

If the font matches, we skip the rest of the test.

```
\def\MT@checklist@font#1{%
⟨!debug⟩  \MT@ifdefined@n@T
⟨debug⟩  \MT@ifdefined@n@TF
      {MT@#1list@font@\@tempa}{%
```

Since \MT@font may be appended with context and/or letterspacing specs, we construct the name from the font characteristics.

```
    \edef\@tempb{\MT@encoding/\MT@family/\MT@series/\MT@shape/\MT@size}%
    \expandafter\MT@exp@one@n\expandafter\MT@in@clist\expandafter
      \@tempb \csname MT@#1list@font@\@tempa\endcsname
    \ifMT@inlist@
⟨debug⟩\MT@dinfo@list{#1}{font}{in}%
      \expandafter\MT@clist@break
    \else
⟨debug⟩\MT@dinfo@list{#1}{font}{not in}%
      \MT@dofalse
    \fi
  }%
⟨debug⟩  {\MT@dinfo@list{#1}{font}{}}%
}
```

14.2.1 Protrusion

\ifMT@nofamily

Info for settings that are not family-specific. (Warnings seem to be too irritating.) The switch is set in \MT@next@listname.

```
\newif\ifMT@nofamily
⟨/package⟩
```

\MT@protrusion

Set up for protrusion?

```
⟨*pdftex-def|xetex-def|luatex-def⟩
\def\MT@protrusion{\MT@maybe@do{pr}}
```

\MT@set@pr@codes

This macro is called by \MT@setupfont, and does all the work for setting up a font for protrusion.

```
\def\MT@set@pr@codes{%
  \MT@nofamilyfalse
```

Check whether and if, which list should be applied to the current font. If family-specific settings don't exist, we write it to the log (for each encoding).

```
  \MT@if@list@exists{%
    \ifMT@nofamily
```

```
      \MT@ifdefined@n@TF{\MT@encoding-\MT@family-settings}\relax{%
        \MT@info@nl{Loading generic protrusion settings for font family\MessageBreak
                    `\MT@family' (encoding: \MT@encoding).\MessageBreak
                    For optimal results, create family-specific settings.\MessageBreak
                    See the microtype manual for details}%
        \MT@glet@nc{\MT@encoding-\MT@family-settings}\@empty
      }%
    \fi
    \MT@get@opt
    \MT@reset@pr@codes
```

Get the name of the inheritance list and parse it.

```
    \MT@get@inh@list
```

Set an input encoding?

```
    \MT@set@inputenc{c}%
```

Load additional lists?

```
    \MT@load@list\MT@pr@c@name
    \MT@set@listname
```

Load the main list.

```
    \MT@let@cn\@tempc{MT@pr@c@\MT@pr@c@name}%
    \expandafter\MT@set@codes\@tempc,\relax,%
  }\MT@reset@pr@codes
}
```

\MT@set@all@pr

Set all protrusion codes of the font.

```
\def\MT@set@all@pr#1#2{%
⟨debug⟩\MT@dinfo@nl{3}{-- lp/rp: setting all to #1/#2}%
  \let\MT@temp\@empty
  \MT@ifempty{#1}\relax{\g@addto@macro\MT@temp{\lpcode\MT@font\@tempcnta=#1}}%
  \MT@ifempty{#2}\relax{\g@addto@macro\MT@temp{\rpcode\MT@font\@tempcnta=#2}}%
  \MT@do@font\MT@temp
}
```

\MT@reset@pr@codes@
\MT@reset@pr@codes

All protrusion codes are zero for new fonts. However, if we have to reload the font due to different contexts, we have to reset them. This command will be changed by `\microtypecontext` if necessary.

```
\def\MT@reset@pr@codes@{\MT@set@all@pr\z@\z@}
\let\MT@reset@pr@codes\relax
```

\MT@the@pr@code
\MT@the@pr@code@tr

If the font is letterspaced, we have to add half the letterspacing amount to the margin kerns. This will be activated in `\MT@set@tr@codes`.

```
\def\MT@the@pr@code{\@tempcntb}
⟨*pdftex-def|luatex-def⟩
⟨pdftex-def⟩\MT@requires@pdftex6
⟨luatex-def⟩\MT@requires@luatex3
  {\def\MT@the@pr@code@tr{%
    \numexpr\@tempcntb+\MT@letterspace@/2\relax
  }
}\relax
⟨/pdftex-def|luatex-def⟩
```

\MT@set@codes

Split up the values and set the codes.

```
\def\MT@set@codes#1,{%
  \ifx\relax#1\@empty\else
    \MT@split@codes #1==\relax
    \expandafter\MT@set@codes
  \fi
}
```

\MT@split@codes

The `keyval` package would remove spaces here, which we needn't do since `\SetProtrusion` ignores spaces in the protrusion list anyway. `\MT@get@char@unit` may mean different things.

```
\def\MT@split@codes#1=#2=#3\relax{%
  \def\@tempa{#1}%
  \ifx\@tempa\@empty \else
    \MT@get@slot
⟨pdftex-def|luatex-def⟩    \ifnum\MT@char > \m@ne
⟨xetex-def⟩    \ifx\MT@char\@empty \else
      \MT@get@char@unit
      \csname MT@\MT@feat @split@val\endcsname#2\relax
    \fi
  \fi
}
```

\MT@pr@split@val

```
\def\MT@pr@split@val#1,#2\relax{%
  \def\@tempb{#1}%
  \MT@ifempty\@tempb\relax{%
    \MT@scale@to@em
    \lpcode\MT@font\MT@char=\MT@the@pr@code
⟨debug⟩\MT@dinfo@nl{4}{;;; lp (\MT@char): \number\lpcode\MT@font\MT@char\space: [#1]}%
  }%
  \def\@tempb{#2}%
  \MT@ifempty\@tempb\relax{%
    \MT@scale@to@em
    \rpcode\MT@font\MT@char=\MT@the@pr@code
⟨debug⟩\MT@dinfo@nl{4}{;;; rp (\MT@char): \number\rpcode\MT@font\MT@char\space: [#2]}%
  }%
```

Now we can set the values for the inheriting characters. Their slot numbers are saved in the macro `\MT@inh@`⟨*list name*⟩`@`⟨*slot number*⟩`@`.

```
  \MT@ifdefined@c@T\MT@pr@inh@name{%
    \MT@ifdefined@n@T{MT@inh@\MT@pr@inh@name @\MT@char @}{%
      \MT@exp@cs\MT@map@tlist@c
        {MT@inh@\MT@pr@inh@name @\MT@char @}%
        \MT@set@pr@heirs
    }%
  }%
}
```

\MT@scale@to@em

Since pdfTEX version 0.14h, we have to adjust the protrusion factors (i.e., convert numbers from thousandths of character width to thousandths of an em of the font). We have to do this *before* setting the inheriting characters, so that the latter inherit the absolute value, not the relative one if they have a differing width (e.g., the 'ff' ligature). Unlike `protcode.tex` and `pdfcprot`, we do not calculate with `\lpcode` resp. `\rpcode`, since this would disallow protrusion factors larger than the character width (since `\[lr]pcode`'s limit is 1000). Now, the maximum protrusion is 1 em of the font.

The unit is in `\MT@count`, the desired factor in `\@tempb`, and the result will be returned in `\@tempcntb`.

```
⟨pdftex-def⟩\MT@requires@pdftex3{
\def\MT@scale@to@em{%
  \@tempcntb=\MT@count\relax
```

For really huge fonts (100 pt or so), an arithmetic overflow could occur with vanilla TEX. Using e-TEX, this can't happen, since the intermediate value is 64 bit, which could only be reached with a character width larger than `\maxdimen`.

```
  \MT@scale\@tempcntb \@tempb \MT@dimen@six
  \ifnum\@tempcntb=\z@ \else
    \MT@scale@factor
  \fi
}
```

\MT@get@charwd

Get the width of the character. When using e-TeX, we can employ \fontcharwd instead of building scratch boxes.

```
\def\MT@get@charwd{%
⟨*pdftex-def⟩
^^X  \MT@count=\fontcharwd\MT@font\MT@char\relax
^^Q  \setbox\z@=\hbox{\MT@font \char\MT@char}%
^^Q  \MT@count=\wd\z@
⟨/pdftex-def⟩
⟨luatex-def⟩  \MT@count=\fontcharwd\MT@font\MT@char\relax
```

\MT@char contains a slot number (legacy fonts), a Unicode number, or a glyph name (if \MT@char@ is negative).

```
⟨*xetex-def⟩
  \ifnum\MT@char@<\z@
    \setbox\z@=\hbox{\MT@font \XeTeXglyph-\MT@char@}%
    \MT@count=\wd\z@
  \else
    \MT@count=\fontcharwd\MT@font\MT@char@\relax
  \fi
⟨/xetex-def⟩
  \ifnum\MT@count=\z@ \MT@info@missing@char \fi
}
```

For letterspaced fonts, we have to subtract the letterspacing amount from the characters' widths. The protrusion amounts will be adjusted in \MT@set@pr@codes. The letterspaced font is already loaded so that 1 em = \fontdimen 6.

```
⟨*pdftex-def⟩
\MT@requires@pdftex6{
  \g@addto@macro\MT@get@charwd{%
    \MT@ifdefined@c@T\MT@letterspace@
      {\advance\MT@count -\dimexpr\MT@letterspace@ sp *\dimexpr 1em/1000\relax}%
  }
}\relax
}{
```

No adjustment with versions 0.14f and 0.14g.

```
\def\MT@scale@to@em{%
  \MT@count=\@tempb\relax
  \ifnum\MT@count=\z@ \else
    \MT@scale@factor
  \fi
}
```

We need this in \MT@warn@code@too@large (neutralised).

```
\def\MT@get@charwd{\MT@count=\MT@dimen@six}
}
⟨/pdftex-def⟩
⟨/pdftex-def|xetex-def|luatex-def⟩
```

\MT@get@font@dimen

For the space unit.

```
⟨*package⟩
\def\MT@get@font@dimen#1{%
  \ifnum\fontdimen#1\MT@font=\z@
    \MT@warning@nl{Font `\MT@@font' does not specify its\MessageBreak
      \@backslashchar fontdimen #1 (it's zero)!\MessageBreak
      You should use a different `unit' for \MT@curr@list@name}%
  \else
    \MT@count=\fontdimen#1\MT@font
  \fi
}
```

\MT@info@missing@char

Info about missing characters, or characters with zero width.

```
\def\MT@info@missing@char{%
```

```
  \MT@info@nl{Character `\the\MT@toks'
^^X   \ifnum\MT@char@<\z@ is missing\else
^^X     \iffontchar\MT@font\MT@char@
              has a width of 0pt
^^X      \else is missing\fi\fi
^^Q    \MessageBreak (it's probably missing)
    \MessageBreak in font `\MT@@font'.\MessageBreak
    Ignoring protrusion settings for this character}%
}
```

\MT@scale@factor

Furthermore, we might have to multiply with a factor.

```
\def\MT@scale@factor{%
  \ifnum\csname MT@\MT@feat @factor@\endcsname=\@m \else
    \expandafter\MT@scale\expandafter \@tempcntb
      \csname MT@\MT@feat @factor@\endcsname \@m
  \fi
  \ifnum\@tempcntb>\csname MT@\MT@feat @max\endcsname\relax
    \MT@exp@cs\MT@warn@code@too@large{MT@\MT@feat @max}%
  \else
    \ifnum\@tempcntb<\csname MT@\MT@feat @min\endcsname\relax
      \MT@exp@cs\MT@warn@code@too@large{MT@\MT@feat @min}%
    \fi
  \fi
}
```

\MT@warn@code@too@large

Type out a warning if a chosen protrusion factor is too large after the conversion. As a special service, we also type out the maximum amount that may be specified in the configuration.

```
\def\MT@warn@code@too@large#1{%
  \@tempcnta=#1\relax
  \ifnum\csname MT@\MT@feat @factor@\endcsname=\@m \else
    \expandafter\MT@scale\expandafter\@tempcnta\expandafter
      \@m \csname MT@\MT@feat @factor@\endcsname
  \fi
  \MT@scale\@tempcnta \MT@dimen@six \MT@count
  \MT@warning@nl{The \@nameuse{MT@abbr@\MT@feat} code \@tempb\space
    is too large for character\MessageBreak
    `\the\MT@toks' in \MT@curr@list@name.\MessageBreak
    Setting it to the maximum of \number\@tempcnta}%
  \@tempcntb=#1\relax
}
```

\MT@get@opt

The optional argument to the configuration commands (except for `\SetExpansion` and `\SetTracking`, which are being dealt with in `\MT@get@ex@opt` and `\MT@get@tr@opt`, resp.).

```
\def\MT@get@opt{%
  \MT@set@listname
```

\MT@pr@factor@
\MT@sp@factor@
\MT@kn@factor@

Apply a factor?

```
  \MT@ifdefined@n@TF{MT@\MT@feat @c@\csname MT@\MT@feat @c@name\endcsname @factor}{%
    \MT@let@nn{MT@\MT@feat @factor@}
        {MT@\MT@feat @c@\csname MT@\MT@feat @c@name\endcsname @factor}%
    \MT@vinfo{... : Multiplying \@nameuse{MT@abbr@\MT@feat} codes by
                    \number\csname MT@\MT@feat @factor@\endcsname/1000}%
  }{%
    \MT@let@nn{MT@\MT@feat @factor@}{MT@\MT@feat @factor}%
  }%
```

\MT@pr@unit@
\MT@sp@unit@
\MT@kn@unit@

The `unit` can only be evaluated here, since it might be font-specific. If it's `\@empty`, it's relative to character widths, if it's -1, relative to space dimensions.

```
  \MT@ifdefined@n@TF{MT@\MT@feat @c@\csname MT@\MT@feat @c@name\endcsname @unit}{%
    \MT@let@nn{MT@\MT@feat @unit@}%
        {MT@\MT@feat @c@\csname MT@\MT@feat @c@name\endcsname @unit}%
    \MT@exp@cs\ifx{MT@\MT@feat @unit@}\@empty
      \MT@vinfo{... : Setting \@nameuse{MT@abbr@\MT@feat} codes
                      relative to character widths}%
    \else
      \MT@exp@cs\ifx{MT@\MT@feat @unit@}\m@ne
        \MT@vinfo{... : Setting \@nameuse{MT@abbr@\MT@feat} codes
                        relative to width of space}%
      \fi
    \fi
  }{%
    \MT@let@nn{MT@\MT@feat @unit@}{MT@\MT@feat @unit}%
  }%
```

\MT@get@space@unit
\MT@get@char@unit

The codes are either relative to character widths, or to a fixed width. For spacing and kerning lists, they may also be relative to the width of the interword glue. Only the setting from the top list will be taken into account.

```
  \let\MT@get@char@unit\relax
  \let\MT@get@space@unit\@gobble
  \MT@exp@cs\ifx{MT@\MT@feat @unit@}\@empty
    \let\MT@get@char@unit\MT@get@charwd
  \else
    \MT@exp@cs\ifx{MT@\MT@feat @unit@}\m@ne
      \let\MT@get@space@unit\MT@get@font@dimen
    \else
      \MT@exp@cs\MT@get@unit{MT@\MT@feat @unit@}%
    \fi
  \fi
```

Preset all characters? If so, we surely don't need to reset, too.

```
  \MT@ifdefined@n@T{MT@\MT@feat @c@\csname MT@\MT@feat @c@name\endcsname @preset}{%
    \csname MT@preset@\MT@feat\endcsname
    \MT@let@nc{MT@reset@\MT@feat @codes}\relax
  }%
}
```

\MT@get@unit
\MT@get@unit@

If `unit` contains an em or ex, we use the corresponding `\fontdimen` to obtain the real size. Simply converting the em into points might give a wrong result, since the font probably isn't set up yet, so that these dimensions haven't been updated, either.

```
\def\MT@get@unit#1{%
  \expandafter\MT@get@unit@#1 e!\@nil
  \ifx\x\@empty\else\let#1\x\fi
  \@defaultunits\@tempdima#1 pt\relax\@nnil
  \ifdim\@tempdima=\z@
    \MT@warning@nl{%
      Cannot set \@nameuse{MT@abbr@\MT@feat} factors relative to zero\MessageBreak
      width. Setting factors of list `\@nameuse{MT@\MT@feat @c@name}'\MessageBreak
      relative to character widths instead}%
    \let#1\@empty
    \let\MT@get@char@unit\MT@get@charwd
  \else
    \MT@vinfo{... : Setting \@nameuse{MT@abbr@\MT@feat} factors relative
                    to \the\@tempdima}%
    \MT@count=\@tempdima\relax
  \fi
}
\def\MT@get@unit@#1e#2#3\@nil{%
  \ifx\\#3\\\let\x\@empty \else
    \if m#2%
      \edef\x{#1\fontdimen6\MT@font}%
    \else
      \if x#2%
        \edef\x{#1\fontdimen5\MT@font}%
      \fi
    \fi
  \fi
}
```

\MT@set@inputenc

The configurations may be under the regime of an input encoding.

```
\def\MT@set@inputenc#1{%
```

\MT@cat

We remember the current category (c or inh), in case of warnings later.

```
  \def\MT@cat{#1}%
```

```
  \edef\@tempa{MT@\MT@feat @#1@\csname MT@\MT@feat @#1@name\endcsname @inputenc}%
  \MT@ifdefined@n@T\@tempa\MT@set@inputenc@
}
```

\MT@set@inputenc@

More recent versions of inputenc remember the current encoding, so that we can test whether we really have to load the encoding file.

```
\MT@addto@setup{%
  \@ifpackageloaded{inputenc}{%
    \@ifpackagelater{inputenc}{2006/02/22}{%
      \def\MT@set@inputenc@{%
        \MT@ifstreq\inputencodingname{\csname\@tempa\endcsname}\relax
          \MT@load@inputenc
      }%
    }{%
      \let\MT@set@inputenc@\MT@load@inputenc
    }%
  }{%
    \def\MT@set@inputenc@{%
      \MT@warning@nl{Key `inputenc' used in \MT@curr@list@name, but the `inputenc'
          \MessageBreak package isn't loaded. Ignoring input encoding}%
    }%
  }%
}
```

\MT@load@inputenc

Set up normal catcodes, since, e.g., listings would otherwise want to actually typeset the inputenc file when it is being loaded inside a listing.

```
\def\MT@load@inputenc{%
  \MT@cfg@catcodes
⟨debug⟩\MT@dinfo@nl{1}{loading input encoding: \@nameuse{\@tempa}}%
  \inputencoding{\@nameuse{\@tempa}}%
}
⟨/package⟩
```

\MT@set@pr@heirs

Set the inheriting characters.

```
⟨*pdftex-def|xetex-def|luatex-def⟩
\def\MT@set@pr@heirs#1{%
  \lpcode\MT@font #1=\lpcode\MT@font\MT@char\relax
  \rpcode\MT@font #1=\rpcode\MT@font\MT@char\relax
⟨debug⟩\MT@dinfo@nl{2}{-- heir of \MT@char: #1}%
⟨debug⟩\MT@dinfo@nl{4}{;;; lp/rp (#1): \number\lpcode\MT@font\MT@char\space/%
⟨debug⟩                                 \number\rpcode\MT@font\MT@char\space}%
}
```

\MT@preset@pr

Preset characters. Presetting them relative to their widths is not allowed.

\MT@preset@pr@

```
\def\MT@preset@pr{%
  \expandafter\expandafter\expandafter\MT@preset@pr@
    \csname MT@pr@c@\MT@pr@c@name @preset\endcsname\@nil
}
\def\MT@preset@pr@#1,#2\@nil{%
  \ifx\MT@pr@unit@\@empty
    \MT@warn@preset@towidth{pr}%
    \let\MT@preset@aux\MT@preset@aux@factor
  \else
    \def\MT@preset@aux{\MT@preset@aux@space2}%
  \fi
  \MT@ifempty{#1}{\let\@tempa\@empty}{\MT@preset@aux{#1}\@tempa}%
  \MT@ifempty{#2}{\let\@tempb\@empty}{\MT@preset@aux{#2}\@tempb}%
  \MT@set@all@pr\@tempa\@tempb
}
```

\MT@preset@aux

Auxiliary macro for presetting. Store value ⟨*#1*⟩ in macro ⟨*#2*⟩.

\MT@preset@aux@factor
\MT@preset@aux@space

```
\def\MT@preset@aux@factor#1#2{%
  \@tempcntb=#1\relax
  \MT@scale@factor
  \edef#2{\number\@tempcntb}%
}
\def\MT@preset@aux@space#1#2#3{%
  \def\@tempb{#2}%
  \MT@get@space@unit#1%
  \MT@scale@to@em
  \edef#3{\number\@tempcntb}%
}
```

\MT@warn@preset@towidth

```
\def\MT@warn@preset@towidth#1{%
  \MT@warning@nl{%
    Cannot preset characters relative to their widths\MessageBreak
    for \@nameuse{MT@abbr@#1} list `\@nameuse{MT@#1@c@name}'. Presetting them%
    \MessageBreak relative to 1em instead}%
}
⟨/pdftex-def|xetex-def|luatex-def⟩
```

14.2.2 Expansion

\MT@expansion

Set up for expansion?

```
⟨*pdftex-def|luatex-def⟩
\def\MT@expansion{\MT@maybe@do{ex}}
```

\MT@set@ex@codes@s

Setting up font expansion is a bit different because of the `selected` option. There are two versions of this macro.

If `selected=true`, we only apply font expansion to those fonts for which a list has been declared (i.e., like for protrusion).

```
\def\MT@set@ex@codes@s{%
  \MT@if@list@exists{%
    \MT@get@ex@opt
    \let\MT@get@char@unit\relax
    \MT@reset@ef@codes
    \MT@get@inh@list
    \MT@set@inputenc{c}%
    \MT@load@list\MT@ex@c@name
    \MT@set@listname
    \MT@let@cn\@tempc{MT@ex@c@\MT@ex@c@name}%
    \expandafter\MT@set@codes\@tempc,\relax,%
    \MT@expandfont
  }\relax
}
⟨/pdftex-def|luatex-def⟩
```

\MT@set@ex@codes@n

If, on the other hand, all characters should be expanded by the same amount, we only take the first optional argument to `\SetExpansion` into account.

\ifMT@nonselected

We need this boolean in `\MT@if@list@exists` so that no warning for missing lists will be issued.

```
⟨package⟩\newif\ifMT@nonselected
```

```
⟨*pdftex-def|luatex-def⟩
\def\MT@set@ex@codes@n{%
  \MT@nonselectedtrue
  \MT@if@list@exists
    \MT@get@ex@opt
  {%
    \let\MT@stretch@  \MT@stretch
    \let\MT@shrink@   \MT@shrink
    \let\MT@step@     \MT@step
    \let\MT@auto@     \MT@auto
    \let\MT@ex@factor@\MT@ex@factor
  }%
  \MT@reset@ef@codes
  \MT@expandfont
  \MT@nonselectedfalse
}
```

\MT@set@ex@codes

Default is non-selected. It can be changed in the package options.

```
\let\MT@set@ex@codes\MT@set@ex@codes@n
```

\MT@expandfont

Expand the font. For some reason, older LuaTeX versions freeze if the `autoexpand` modifier is missing. Can't be bothered to find out why. For newer versions, we could also use the function `font.setexpansion`, or, in the future, `luaotfload`'s expansion font feature.

```
⟨*luatex-def⟩
\MT@requires@luatex3{
\MT@requires@luatex4{\let\pdffontexpand\expandglyphsinfont}\relax
\ifnum\luatexversion<79
\def\MT@expandfont{%
  \pdffontexpand\MT@font \MT@stretch@ \MT@shrink@ \MT@step@ autoexpand\relax
}
\else
\def\MT@expandfont{%
  \pdffontexpand\MT@font \MT@stretch@ \MT@shrink@ \MT@step@\relax
}
\fi
}{
⟨/luatex-def⟩
\def\MT@expandfont{%
  \pdffontexpand\MT@font \MT@stretch@ \MT@shrink@ \MT@step@ \MT@auto@\relax
}
⟨luatex-def⟩}
```

\MT@set@all@ex
\MT@reset@ef@codes@

At first, all expansion factors for the characters will be set to 1000 (respectively the `factor` of this font).

```
\def\MT@set@all@ex#1{%
⟨debug⟩\MT@dinfo@nl{3}{-- ex: setting all to \number#1}%
  \MT@do@font{\efcode\MT@font\@tempcnta=#1\relax}%
}
\def\MT@reset@ef@codes@{\MT@set@all@ex\MT@ex@factor@}
```

\MT@reset@ef@codes

However, this is only necessary for pdfTeX versions prior to 1.20, or LuaTeX < 0.90 (actually, I think, 0.87).

```
⟨pdftex-def⟩\MT@requires@pdftex4
⟨luatex-def⟩\MT@requires@luatex5
{
  \def\MT@reset@ef@codes{%
    \ifnum\MT@ex@factor@=\@m \else
      \MT@reset@ef@codes@
    \fi
  }
}{
  \let\MT@reset@ef@codes\MT@reset@ef@codes@
}
```

\MT@ex@split@val

There's only one number per character.

```
\def\MT@ex@split@val#1\relax{%
  \@tempcntb=#1\relax
```

Take an optional factor into account.

```
  \ifnum\MT@ex@factor@=\@m \else
    \MT@scale\@tempcntb \MT@ex@factor@ \@m
  \fi
  \ifnum\@tempcntb > \MT@ex@max
    \MT@warn@ex@too@large\MT@ex@max
  \else
    \ifnum\@tempcntb < \MT@ex@min
      \MT@warn@ex@too@large\MT@ex@min
    \fi
  \fi
  \efcode\MT@font\MT@char=\@tempcntb
⟨debug⟩\MT@dinfo@nl{4}{::: ef (\MT@char): \number\efcode\MT@font\MT@char: [#1]}%
```

Heirs, heirs, I love thy heirs.

```
  \MT@ifdefined@c@T\MT@ex@inh@name{%
    \MT@ifdefined@n@T{MT@inh@\MT@ex@inh@name @\MT@char @}{%
      \MT@exp@cs\MT@map@tlist@c{MT@inh@\MT@ex@inh@name @\MT@char @}\MT@set@ex@heirs
    }%
  }%
}
```

\MT@warn@ex@too@large

```
\def\MT@warn@ex@too@large#1{%
  \MT@warning@nl{Expansion factor \number\@tempcntb\space too large for
    character\MessageBreak `\the\MT@toks' in \MT@curr@list@name.\MessageBreak
    Setting it to the maximum of \number#1}%
  \@tempcntb=#1\relax
}
```

\MT@get@ex@opt
\MT@ex@factor@
\MT@stretch@
\MT@shrink@
\MT@step@
\MT@auto@

Apply different values to this font?

```
\def\MT@get@ex@opt{%
  \MT@set@listname
  \MT@ifdefined@n@TF{MT@ex@c@\MT@ex@c@name @factor}{%
    \MT@let@cn\MT@ex@factor@{MT@ex@c@\MT@ex@c@name @factor}%
    \MT@vinfo{... : Multiplying expansion factors by \number\MT@ex@factor@/1000}%
  }{%
    \let\MT@ex@factor@\MT@ex@factor
  }%
  \MT@get@ex@opt@{stretch}{Setting stretch limit to \number\MT@stretch@}%
  \MT@get@ex@opt@{shrink} {Setting shrink limit to \number\MT@shrink@}%
  \MT@get@ex@opt@{step}   {Setting expansion step to \number\MT@step@}%
⟨luatex-def⟩  \MT@requires@luatex3\relax{%
  \MT@get@ex@opt@{auto}{\MT@ifstreq{\MT@auto@}{autoexpand}{En}{Dis}abling automatic expansion}%
⟨luatex-def⟩  }%
  \MT@ifdefined@n@T{MT@ex@c@\MT@ex@c@name @preset}{%
    \MT@preset@ex
    \let\MT@reset@ef@codes\relax
  }%
}
```

\MT@get@ex@opt@

```
\def\MT@get@ex@opt@#1#2{%
  \MT@ifdefined@n@TF{MT@ex@c@\MT@ex@c@name @#1}{%
    \MT@let@nn{MT@#1@}{MT@ex@c@\MT@ex@c@name @#1}%
    \MT@vinfo{... : #2}%
  }{%
    \MT@let@nn{MT@#1@}{MT@#1}%
  }%
}
```

\MT@set@ex@heirs

```
\def\MT@set@ex@heirs#1{%
  \efcode\MT@font#1=\efcode\MT@font\MT@char
⟨debug⟩\MT@dinfo@nl{2}{-- heir of \MT@char: #1}%
⟨debug⟩\MT@dinfo@nl{4}{::: ef (#1) \number\efcode\MT@font\MT@char}%
}
```

\MT@preset@ex

```
\def\MT@preset@ex{%
  \@tempcntb=\csname MT@ex@c@\MT@ex@c@name @preset\endcsname\relax
  \MT@scale@factor
  \MT@set@all@ex\@tempcntb
}
⟨/pdftex-def|luatex-def⟩
```

14.2.3 Interword spacing (glue)

\MT@spacing

Adjustment of interword spacing? Only works with pdfTEX.

```
⟨*pdftex-def⟩
\MT@requires@pdftex6{
\def\MT@spacing{\MT@maybe@do{sp}}
```

\MT@set@sp@codes

This is all the same.

```
\def\MT@set@sp@codes{%
  \MT@if@list@exists{%
    \MT@get@opt
    \MT@reset@sp@codes
    \MT@get@inh@list
    \MT@set@inputenc{c}%
    \MT@load@list\MT@sp@c@name
    \MT@set@listname
    \MT@let@cn\@tempc{MT@sp@c@\MT@sp@c@name}%
    \expandafter\MT@set@codes\@tempc,\relax,%
  }\MT@reset@sp@codes
}
```

\MT@sp@split@val

If unit=space, \MT@get@space@unit will be defined to fetch the corresponding fontdimen (2 for the first, 3 for the second and 4 for the third argument).

```
\def\MT@sp@split@val#1,#2,#3\relax{%
  \def\@tempb{#1}%
  \MT@ifempty\@tempb\relax{%
    \MT@get@space@unit2%
    \MT@scale@to@em
    \knbscode\MT@font\MT@char=\@tempcntb
⟨debug⟩\MT@dinfo@nl{4}{;;; knbs (\MT@char): \number\knbscode\MT@font\MT@char: [#1]}%
  }%
  \def\@tempb{#2}%
  \MT@ifempty\@tempb\relax{%
    \MT@get@space@unit3%
    \MT@scale@to@em
    \stbscode\MT@font\MT@char=\@tempcntb
⟨debug⟩\MT@dinfo@nl{4}{;;; stbs (\MT@char): \number\stbscode\MT@font\MT@char: [#2]}%
  }%
  \def\@tempb{#3}%
  \MT@ifempty\@tempb\relax{%
    \MT@get@space@unit4%
    \MT@scale@to@em
    \shbscode\MT@font\MT@char=\@tempcntb
⟨debug⟩\MT@dinfo@nl{4}{;;; shbs (\MT@char): \number\shbscode\MT@font\MT@char: [#3]}%
  }%
  \MT@ifdefined@c@T\MT@sp@inh@name{%
    \MT@ifdefined@n@T{MT@inh@\MT@sp@inh@name @\MT@char @}{%
      \MT@exp@cs\MT@map@tlist@c{MT@inh@\MT@sp@inh@name @\MT@char @}\MT@set@sp@heirs
    }%
  }%
}
```

\MT@set@sp@heirs

```
\def\MT@set@sp@heirs#1{%
  \knbscode\MT@font#1=\knbscode\MT@font\MT@char
  \stbscode\MT@font#1=\stbscode\MT@font\MT@char
  \shbscode\MT@font#1=\shbscode\MT@font\MT@char
⟨debug⟩\MT@dinfo@nl{2}{-- heir of \MT@char: #1}%
⟨debug⟩\MT@dinfo@nl{4}{;;; knbs/stbs/shbs (#1): \number\knbscode\MT@font\MT@char/%
⟨debug⟩        \number\stbscode\MT@font\MT@char/\number\shbscode\MT@font\MT@char}%
}
```

\MT@set@all@sp
\MT@reset@sp@codes
\MT@reset@sp@codes@

```
\def\MT@set@all@sp#1#2#3{%
⟨debug⟩\MT@dinfo@nl{3}{-- knbs/stbs/shbs: setting all to #1/#2/#3}%
  \let\MT@temp\@empty
  \MT@ifempty{#1}\relax{\g@addto@macro\MT@temp{\knbscode\MT@font\@tempcnta=#1\relax}}%
  \MT@ifempty{#2}\relax{\g@addto@macro\MT@temp{\stbscode\MT@font\@tempcnta=#2\relax}}%
  \MT@ifempty{#3}\relax{\g@addto@macro\MT@temp{\shbscode\MT@font\@tempcnta=#3\relax}}%
  \MT@do@font\MT@temp
}
\def\MT@reset@sp@codes@{\MT@set@all@sp\z@\z@\z@}
\let\MT@reset@sp@codes\relax
```

\MT@preset@sp
\MT@preset@sp@

```
\def\MT@preset@sp{%
  \expandafter\expandafter\expandafter\MT@preset@sp@
    \csname MT@sp@c@\MT@sp@c@name @preset\endcsname\@nil
}
\def\MT@preset@sp@#1,#2,#3\@nil{%
  \ifx\MT@sp@unit@\@empty
    \MT@warn@preset@towidth{sp}%
    \MT@ifempty{#1}{\let\@tempa\@empty}{\MT@preset@aux@factor{#1}\@tempa}%
    \MT@ifempty{#2}{\let\@tempc\@empty}{\MT@preset@aux@factor{#2}\@tempc}%
    \MT@ifempty{#3}{\let\@tempb\@empty}{\MT@preset@aux@factor{#3}\@tempb}%
  \else
    \MT@ifempty{#1}{\let\@tempa\@empty}{\MT@preset@aux@space2{#1}\@tempa}%
    \MT@ifempty{#2}{\let\@tempc\@empty}{\MT@preset@aux@space3{#2}\@tempc}%
    \MT@ifempty{#3}{\let\@tempb\@empty}{\MT@preset@aux@space4{#3}\@tempb}%
  \fi
  \MT@set@all@sp\@tempa\@tempc\@tempb
}
}\relax
```

14.2.4 Additional kerning

\MT@kerning

Again, only check for additional kerning for new versions of pdfTEX.

```
\MT@requires@pdftex6{
\def\MT@kerning{\MT@maybe@do{kn}}
```

\MT@set@kn@codes

It's getting boring, I know.

```
\def\MT@set@kn@codes{%
  \MT@if@list@exists{%
    \MT@get@opt
    \MT@reset@kn@codes
    \MT@get@inh@list
    \MT@set@inputenc{c}%
    \MT@load@list\MT@kn@c@name
    \MT@set@listname
    \MT@let@cn\@tempc{MT@kn@c@\MT@kn@c@name}%
    \expandafter\MT@set@codes\@tempc,\relax,%
  }\MT@reset@kn@codes
}
```

\MT@kn@split@val

Again, the unit may be measured in the space dimension; this time only `\fontdimen` 2.

```
\def\MT@kn@split@val#1,#2\relax{%
  \def\@tempb{#1}%
  \MT@ifempty\@tempb\relax{%
    \MT@get@space@unit2%
    \MT@scale@to@em
    \knbccode\MT@font\MT@char=\@tempcntb
⟨debug⟩\MT@dinfo@nl{4}{;;; knbc (\MT@char): \number\knbccode\MT@font\MT@char: [#1]}%
  }%
  \def\@tempb{#2}%
  \MT@ifempty\@tempb\relax{%
    \MT@get@space@unit2%
    \MT@scale@to@em
    \knaccode\MT@font\MT@char=\@tempcntb
⟨debug⟩\MT@dinfo@nl{4}{;;; knac (\MT@char): \number\knaccode\MT@font\MT@char: [#2]}%
  }%
  \MT@ifdefined@c@T\MT@kn@inh@name{%
    \MT@ifdefined@n@T{MT@inh@\MT@kn@inh@name @\MT@char @}{%
      \MT@exp@cs\MT@map@tlist@c{MT@inh@\MT@kn@inh@name @\MT@char @}\MT@set@kn@heirs
    }%
  }%
}
```

\MT@set@kn@heirs

```
\def\MT@set@kn@heirs#1{%
  \knbccode\MT@font#1=\knbccode\MT@font\MT@char
  \knaccode\MT@font#1=\knaccode\MT@font\MT@char
⟨debug⟩\MT@dinfo@nl{2}{-- heir of \MT@char: #1}%
⟨debug⟩\MT@dinfo@nl{4}{;;; knbc (#1): \number\knbccode\MT@font\MT@char/%
⟨debug⟩                                      \number\knaccode\MT@font\MT@char}%
}
```

\MT@set@all@kn
\MT@reset@kn@codes
\MT@reset@kn@codes@

```
\def\MT@set@all@kn#1#2{%
⟨debug⟩\MT@dinfo@nl{3}{-- knac/knbc: setting all to #1/#2}%
  \let\MT@temp\@empty
  \MT@ifempty{#1}\relax{\g@addto@macro\MT@temp{\knbccode\MT@font\@tempcnta=#1\relax}}%
  \MT@ifempty{#2}\relax{\g@addto@macro\MT@temp{\knaccode\MT@font\@tempcnta=#2\relax}}%
  \MT@do@font\MT@temp
}
\def\MT@reset@kn@codes@{\MT@set@all@kn\z@\z@}
\let\MT@reset@kn@codes\relax
```

\MT@preset@kn
\MT@preset@kn@

```
\def\MT@preset@kn{%
  \expandafter\expandafter\expandafter\MT@preset@kn@
    \csname MT@kn@c@\MT@kn@c@name @preset\endcsname\@nil
}
\def\MT@preset@kn@#1,#2\@nil{%
  \ifx\MT@kn@unit@\@empty
    \MT@warn@preset@towidth{kn}%
    \let\MT@preset@aux\MT@preset@aux@factor
  \else
    \def\MT@preset@aux{\MT@preset@aux@space2}%
  \fi
  \MT@ifempty{#1}{\let\@tempa\@empty}{\MT@preset@aux{#1}\@tempa}%
  \MT@ifempty{#2}{\let\@tempb\@empty}{\MT@preset@aux{#2}\@tempb}%
  \MT@set@all@kn\@tempa\@tempb
}
}\relax
⟨/pdftex-def⟩
```

14.2.5 Tracking

This only works with pdfTEX 1.40 or LuaTEX 0.62.

```
⟨*pdftex-def|luatex-def⟩
⟨pdftex-def⟩\MT@requires@pdftex6
⟨luatex-def⟩\MT@requires@luatex3
{
```

\MT@tracking
\MT@tracking@

We only check whether a font should not be letterspaced at all, not whether we've already done that (because we have to do it again).

\MT@tr@font@list

```
\let\MT@tr@font@list\@empty
\def\MT@tracking@{%
  \MT@exp@one@n\MT@in@clist\MT@font\MT@tr@font@list
  \ifMT@inlist@\else
    \MT@maybe@do{tr}%
    \ifMT@do\else
      \xdef\MT@tr@font@list{\MT@tr@font@list\MT@font,}%
    \fi
  \fi
}
⟨/pdftex-def|luatex-def⟩
⟨pdftex-def|luatex-def|letterspace⟩\let\MT@tracking
⟨pdftex-def|luatex-def⟩  \MT@tracking@
⟨letterspace⟩  \relax
```

\MT@set@tr@codes

The tracking amount is determined by the optional argument to \textls, settings from \SetTracking, or the global letterspace option, in this order.

Tracking won't work if the original font's \fontdimen 6 is zero, in which case we issue a warning (once for every font).

```
⟨*pdftex-def|luatex-def|letterspace⟩
\def\MT@set@tr@codes{%
⟨*pdftex-def|luatex-def⟩
  \MT@vinfo{Tracking font `\MT@@font'\on@line}%
  \MT@ifdefined@n@TF{\MT@@font-fake6}{%
    \expandafter\ifx\csname\MT@@font-fake6\endcsname\@empty
      \MT@warning@nl{%
        Font `\MT@@font' does not specify its\MessageBreak
        \@backslashchar fontdimen 6 (width of an `em')! Therefore,\MessageBreak
        \@nameuse{MT@abbr@\MT@feat} will not work with this font}%
      \MT@glet@nc{\MT@@font-fake6}\relax
    \fi
  }{%
  \MT@if@list@exists
    \MT@get@tr@opt
    \relax
⟨/pdftex-def|luatex-def⟩
  \MT@ifdefined@c@TF\MT@letterspace@\relax{\let\MT@letterspace@\MT@letterspace}%
  \ifnum\MT@letterspace@=\z@
```

Zero tracking requires special treatment.

```
    \MT@set@tr@zero
  \else
⟨pdftex-def|luatex-def⟩    \MT@vinfo{... Tracking by \number\MT@letterspace@}%
```

Letterspacing only works in PDF mode.

```
    \MT@warn@tracking@DVI
```

\MT@lsfont

The letterspaced font instances are saved in macros \\⟨*font name*⟩/⟨*letterspacing amount*⟩ls.

In contrast to \MT@font, which may reflect the font characteristics more accurately (taking substitutions into account), \font@name is guaranteed to correspond to an actual font identifier.

```
    \xdef\MT@lsfont{\csname\expandafter\string\font@name
                           /\number\MT@letterspace@ ls\endcsname}%
    \expandafter\ifx\MT@lsfont\relax
⟨debug⟩\MT@dinfo@nl{1}{... new letterspacing instance}%
```

In case of nested letterspacing with different amounts, we have to extract the base font again.

```
      \MT@get@ls@basefont
```

`luaotfload` provides the faux font feature `kernfactor`, which we will use when dealing with non-legacy fonts, as it is less problematic and faster than the pdfTEX primitive `\letterspacefont`.

```
⟨*luatex-def|letterspace⟩
      \MT@if@luaotf@font{%
⟨luatex-def&debug⟩\MT@dinfo@nl{1}{... luaotf font: \MessageBreak
⟨luatex-def&debug⟩         \expandafter\fontname\font@name}%
        \ifnum\MT@letterspace@<\z@\def\MT@minus{-}\else\let\MT@minus\@empty\fi
        \global\expandafter\font\MT@lsfont=%
          \expandafter\MT@exp@two@c\expandafter\MT@ls@fontspec@font
            \expandafter\fontname\expandafter\font@name\space \@nil
      }{%
⟨/luatex-def|letterspace⟩
⟨luatex-def&debug⟩\MT@dinfo@nl{1}{... legacy font}%
      \global\expandafter\letterspacefont\MT@lsfont\font@name\MT@letterspace@
⟨luatex-def|letterspace⟩      }%
```

Scale interword spacing (not configurable in `letterspace`).

```
⟨*pdftex-def|luatex-def⟩
      \MT@ifdefined@c@TF\MT@tr@ispace
        {\let\@tempa\MT@tr@ispace}%
        {\edef\@tempa{\MT@letterspace@*,,}}%
      \MT@ifdefined@c@TF\MT@tr@ospace
        {\edef\@tempa{\@tempa,\MT@tr@ospace}}%
        {\edef\@tempa{\@tempa,,,}}%
      \expandafter\MT@tr@set@space\@tempa,%
⟨/pdftex-def|luatex-def⟩
⟨*letterspace⟩
      % spacing = {<letterspace amount>*,,}
      \fontdimen2\MT@lsfont=\dimexpr\numexpr 1000+\MT@letterspace@\relax sp
                                            * \fontdimen2\MT@lsfont/1000\relax
⟨/letterspace⟩
```

Adjust outer kerning (`microtype` only).

```
⟨*pdftex-def|luatex-def⟩
      \MT@ifdefined@c@TF\MT@tr@okern{\let\@tempa\MT@tr@okern}{\def\@tempa{*,*}}%
      \expandafter\MT@tr@set@okern\@tempa,%
```

Disable ligatures (not configurable in `letterspace`).

```
      \MT@ifdefined@c@T\MT@tr@ligatures\MT@tr@noligatures
⟨/pdftex-def|luatex-def⟩
⟨*letterspace⟩
      % no ligatures = {f}
      \tagcode\MT@lsfont`f=\m@ne
⟨/letterspace⟩
```

Adjust protrusion values now, and maybe later (in `\MT@pr@split@val`) (not for LuaTEX, though, where letterspacing does not interfere with protrusion).

```
⟨luatex-def|letterspace⟩      \MT@if@luaotf@font\relax{%
⟨debug⟩\MT@dinfo@nl{2}{... compensating for tracking (\number\MT@letterspace@)}%
      \MT@do@font{\lpcode\MT@lsfont\@tempcnta=\numexpr\MT@letterspace@/2\relax
                  \rpcode\MT@lsfont\@tempcnta=\numexpr\MT@letterspace@/2\relax}%
      \let\MT@the@pr@code\MT@the@pr@code@tr
⟨luatex-def|letterspace⟩     }%
    \fi
```

Finally, let the letterspaced font propagate. With LuaTEX, we also need to load.

```
    \aftergroup\MT@set@lsfont
⟨pdftex-def|luatex-def⟩    \let\MT@font\MT@lsfont
⟨luatex-def⟩    \MT@if@luaotf@font\MT@font\relax
```

\MT@set@curr@ls

We need to remember the current letterspacing amount (for \lslig).

\MT@curr@ls

```
    \xdef\MT@set@curr@ls{\def\noexpand\MT@curr@ls{\MT@letterspace@}}%
    \aftergroup\MT@set@curr@ls
```

Adjust surrounding spacing and kerning.

\MT@set@curr@os

We get the current outer spacing and adjust it, then, after the end of the current outer group, set the current outer spacing, again, and adjust.

```
⟨*pdftex-def|luatex-def⟩
    \MT@outer@space=\csname MT@outer@space\expandafter\string\font@name\endcsname\relax
    \xdef\MT@set@curr@os{\MT@outer@space=\the\MT@outer@space\relax}%
    \MT@tr@outer@l
⟨/pdftex-def|luatex-def⟩
```

If \MT@ls@adjust is empty, it's the starred version of \textls. Use scaling to avoid a 'Dimension too large'.

```
    \ifx\MT@ls@adjust\@empty
⟨letterspace⟩      % \textls : outer kerning = {*,*} ; \textls* : outer kerning = {0,0}
      \MT@outer@kern=-\dimexpr\MT@letterspace@ sp * \fontdimen6\font@name/2000\relax
      \MT@ls@outer@k
```

Otherwise, get the current outer kerning and adjust it, for left and right side (microtype only).

```
⟨*pdftex-def|luatex-def⟩
    \else
      \MT@outer@kern=\expandafter\expandafter\expandafter\@firstoftwo
                      \csname MT@outer@kern\expandafter\string\font@name\endcsname\relax
      \ifdim\MT@outer@kern=\z@\else \MT@ls@outer@k \fi
      \MT@outer@kern=\expandafter\expandafter\expandafter\@secondoftwo
                      \csname MT@outer@kern\expandafter\string\font@name\endcsname\relax
⟨/pdftex-def|luatex-def⟩
⟨*letterspace⟩
      \xdef\MT@set@curr@ok{\MT@outer@kern=\the\MT@outer@kern\relax}%
      \MT@afteraftergroup{%
        \MT@set@curr@ok
        \noexpand\MT@ls@outer@k
      }%
⟨/letterspace⟩
    \fi
⟨*pdftex-def|luatex-def⟩
```

\MT@set@curr@ok

Carry the outer kerning amount to outside the next group, then set outer spacing (which will set kerning, if no space follows).

```
    \xdef\MT@set@curr@ok{\MT@outer@kern=\the\MT@outer@kern\relax}%
```

Stuff to be done after the letterspace group. The letterspace package only adjusts the kerning.

```
    \MT@afteraftergroup{%
      \MT@set@curr@os
      \MT@set@curr@ok
      \noexpand\MT@tr@outer@r
    }%
⟨/pdftex-def|luatex-def⟩
  \fi
⟨pdftex-def|luatex-def⟩  }%
}
```

\MT@afteraftergroup

This helper macro carries stuff outside of the current group to the end of the next group, but will then respect grouping, which is crucial for nested letterspacing.

(Following an idea of Will Robertson.)

```
\def\MT@afteraftergroup#1{%
⟨!letterspace⟩  \MT@maybe@gobble@with@tikz{%
    \MT@ifdefined@n@TF{MT@aftergroup@\number\currentgrouplevel}\relax{%
      \MT@exp@cs\xdef{MT@aftergroup@\number\currentgrouplevel}%
        {\MT@exp@cs\MT@glet{MT@aftergroup@\number\currentgrouplevel}\noexpand\@undefined#1}%
      \expandafter\aftergroup\expandafter\aftergroup\MT@exp@cs\aftergroup
        {MT@aftergroup@\number\currentgrouplevel}%
    }%
⟨!letterspace⟩  }%
}
⟨/pdftex-def|luatex-def|letterspace⟩
```

\MT@ls@fontspec@colon
\MT@ls@fontspec@font

Add the kernfactor feature to a font loaded by fontspec (we might have to add the colon ourselves).

```
⟨*luatex-def|letterspace⟩
\def\MT@ls@fontspec@colon#1:#2:#3:#4\@nil{\ifx\\#3\\#1:#2\else#1:#2:#3\fi}
\def\MT@ls@fontspec@font#1 #2\@nil{%
  "\MT@ls@fontspec@colon#1:::\relax\@nil
    kernfactor=\MT@minus \ifnum\MT@letterspace@=1000 1\else 0.%
         \ifnum\MT@minus\MT@letterspace@<100 0\fi
         \ifnum\MT@minus\MT@letterspace@<10  0\fi
        \number\MT@minus\MT@letterspace@ \fi;"
  \ifx\\#2\\ at \f@size pt\else#2\fi\relax
}
⟨/luatex-def|letterspace⟩
```

\MT@get@tr@opt

Various settings (only for the microtype version).

```
⟨*pdftex-def|luatex-def⟩
\def\MT@get@tr@opt{%
  \MT@set@listname
  \let\MT@tr@factor@\@m
```

\MT@tr@unit@

Different unit (for letterspace and/or (outer)spacing)?

```
  \MT@ifdefined@n@T{MT@tr@c@\MT@tr@c@name @unit}{%
    \MT@let@cn\MT@tr@unit@{MT@tr@c@\MT@tr@c@name @unit}%
    \ifdim\MT@tr@unit@=1em
      \let\MT@tr@unit@\@undefined
    \else
      \MT@get@unit\MT@tr@unit@
    \fi
  }%
  \MT@ifdefined@n@T{MT@tr@c@\MT@tr@c@name}{%
    \MT@let@cn\MT@letterspace{MT@tr@c@\MT@tr@c@name}%
    \MT@ifdefined@c@T\MT@tr@unit@{%
      \let\@tempb\MT@letterspace
      \MT@scale@to@em
      \edef\MT@letterspace{\number\@tempcntb}%
    }%
  }%
```

\MT@tr@ispace
\MT@tr@ospace

Adjust interword spacing.

```
  \MT@get@tr@opt@{spacing}     {ispace}%
  \MT@get@tr@opt@{outerspacing}{ospace}%
```

\MT@tr@okern

Adjust outer kerning.

```
  \MT@get@tr@opt@{outerkerning}{okern}%
```

\MT@tr@ligatures

Which ligatures should we disable (empty means all, undefined none)?

```
  \MT@get@tr@opt@{noligatures} {ligatures}%
}
```

\MT@get@tr@opt@

```
\def\MT@get@tr@opt@#1#2{%
```

```
  \MT@ifdefined@n@T{MT@tr@c@\MT@tr@c@name @#1}%
    {\MT@let@nn{MT@tr@#2}{MT@tr@c@\MT@tr@c@name @#1}}%
}
⟨/pdftex-def|luatex-def⟩
```

\MT@set@lsfont Redefine \font@name, which will be called a second later (in \selectfont).

```
⟨*pdftex-def|luatex-def|letterspace⟩
⟨plain⟩\MT@requires@latex2{
\def\MT@set@lsfont{\MT@exp@two@c\let\font@name\MT@lsfont}
```

\lsstyle Disable the tests whether the font should be letterspaced, then trigger the setup. Only \textls can be used in math mode (\lsstyle may be used inside another text switch, of course). Still, we have to ensure that math fonts are set up again. Setting \glb@currsize globally to \@empty (our previous solution) could throw us into an infinite loop (e.g., with the psnfss packages, via \every@math@size), so we issue \glb@settings instead. However, in certain situations, we may still miss some math fonts, so let's try to also enforce it by emptying \glb@currsize, fingers crossed. The overhead seems small.

```
\DeclareRobustCommand\lsstyle{%
  \not@math@alphabet\lsstyle\textls
  \let\glb@currsize\@empty
⟨pdftex-def|luatex-def⟩  \MT@maybe@gobble@with@tikz{\aftergroup\glb@settings}%
⟨pdftex-def|luatex-def⟩  \def\MT@feat{tr}%
  \let\MT@tracking\MT@set@tr@codes
  \selectfont
}
```

Now the definitions for the letterspace package with plain TEX.

```
⟨*plain⟩
}{
\def\MT@set@lsfont{\MT@lsfont}
\def\lsstyle{%
  \begingroup
  \escapechar\m@ne
  \xdef\font@name{\csname\expandafter\string\the\font\endcsname}%
  \MT@set@tr@codes
  \endgroup
}
\let\textls\@undefined
\let\lslig\@undefined
}
⟨/plain⟩
```

\lslig For Fraktur fonts, some ligatures shouldn't be broken up. This command will temporarily select the base font and insert the correct kerning.

```
\DeclareRobustCommand\lslig[1]{%
  {\MT@ifdefined@c@TF\MT@curr@ls{%
     \escapechar\m@ne
     \MT@get@ls@basefont
     \MT@outer@kern=\dimexpr\MT@curr@ls sp * \fontdimen6\font@name/2000\relax
     \kern\MT@outer@kern
     \font@name #1%
     \kern\MT@outer@kern
  }{#1}}%
}
```

\MT@ls@basefont
\MT@get@ls@basefont pdfTEX cannot letterspace fonts that already are letterspaced. Therefore, we have to save the base font in \⟨*font name*⟩@base.

The previous solution (checking the macro's meaning with \pdfmatch), where we were loading the base font via the \font primitive again, would destroy all previously set up micro-typographic features of the font.

```
\def\MT@get@ls@basefont{%
  \xdef\MT@ls@basefont{\csname\expandafter\string\font@name @base\endcsname}%
  \expandafter\ifx\MT@ls@basefont\relax
    \MT@exp@two@c\MT@glet\MT@ls@basefont\font@name
  \else
⟨debug⟩\MT@dinfo@nl{1}{... fixing base font}%
    \MT@exp@two@c\let\font@name\MT@ls@basefont
  \fi
}
```

\MT@set@lsbasefont
\MT@set@tr@zero

If tracking is switched off in the middle of the document, or if `\textls` is called with a zero letterspacing amount, we have to retrieve the base font and select it.

```
\def\MT@set@lsbasefont{\MT@exp@two@c\let\font@name\MT@ls@basefont}
\def\MT@set@tr@zero{%
⟨debug⟩\MT@dinfo@nl{1}{... zero tracking}%
  \xdef\MT@ls@basefont{\csname\expandafter\string\font@name @base\endcsname}%
  \expandafter\ifx\MT@ls@basefont\relax \else
⟨debug⟩\MT@dinfo@nl{1}{... fixing base font}%
    \aftergroup\MT@set@lsbasefont
  \fi
}
⟨/pdftex-def|luatex-def|letterspace⟩
```

\MT@tr@noligatures

pdfTEX 1.40.0–1.40.3 disabled all ligatures in letterspaced fonts.

```
⟨*pdftex-def|luatex-def⟩
⟨pdftex-def⟩\MT@requires@pdftex7{
  \def\MT@tr@noligatures{%
    \ifx\MT@tr@ligatures\@empty
      \MT@noligatures@\MT@lsfont\@undefined
    \else
      \MT@noligatures@\MT@lsfont\MT@tr@ligatures
    \fi
  }
⟨*pdftex-def⟩
}{
  \def\MT@tr@noligatures{%
    \MT@warning@nl{%
      Disabling selected ligatures is only possible since\MessageBreak
      pdftex 1.40.4. Disabling all ligatures instead}%
    \MT@glet\MT@tr@noligatures\relax
  }
}
⟨/pdftex-def⟩
```

\MT@outer@space

A new skip for outer spacing.

```
\newskip\MT@outer@space
```

\MT@tr@set@space

Adjust interword spacing (`\fontdimen` 2,3,4) for inner and outer space. For inner spacing, the font dimensions will be adjusted, the settings for outer spacing will be remembered in a macro.

```
\def\MT@tr@set@space#1,#2,#3,#4,#5,#6,{%
⟨debug⟩\MT@dinfo@nl2{... orig. space: \the\fontdimen2\MT@lsfont,
⟨debug⟩    \the\fontdimen3\MT@lsfont, \the\fontdimen4\MT@lsfont
⟨debug⟩    \MessageBreak... (#1,#2,#3) (#4,#5,#6)}%
  \let\MT@temp\@empty
  \MT@tr@set@space@{#1}{#4}{2}\@empty
  \MT@tr@set@space@{#2}{#5}{3}\@plus
  \MT@tr@set@space@{#3}{#6}{4}\@minus
  \MT@glet@nc{MT@outer@space\expandafter\string\font@name}\MT@temp
⟨debug⟩\MT@dinfo@nl2{... inner space: \the\fontdimen2\MT@lsfont,
⟨debug⟩    \the\fontdimen3\MT@lsfont, \the\fontdimen4\MT@lsfont}%
⟨debug⟩\MT@dinfo@nl2{... outer space: \MT@temp}%
}
```

\MT@tr@set@space@

If settings for outer spacing ⟨#2⟩ don't exist, they will be inherited from the inner spacing settings ⟨#1⟩.

```
\def\MT@tr@set@space@#1#2#3#4{%
  \MT@ifempty{#2}{%
    \MT@ifempty{#1}\relax{%
      \MT@tr@set@space@@{#1}{#3}{1000}%
      \fontdimen#3\MT@lsfont=\@tempdima
    }%
    \edef\MT@temp{\MT@temp#4\the\fontdimen#3\MT@lsfont}%
  }{%
    \MT@tr@set@space@@{#2}{#3}{2000}%
    \edef\MT@temp{\MT@temp#4\the\@tempdima}%
    \MT@ifempty{#1}\relax{%
      \MT@tr@set@space@@{#1}{#3}{1000}%
      \fontdimen#3\MT@lsfont=\@tempdima
    }%
  }%
}
```

\MT@tr@set@space@@

If the value is followed by an asterisk, the fontdimen will be scaled by the respective amount, otherwise the value denotes the desired dimension in the respective unit.

```
\def\MT@tr@set@space@@#1#2#3{%
  \MT@test@ast#1*\@nil{%
    \MT@ifdefined@c@TF\MT@tr@unit@
      {\edef\@tempb{#1}\MT@scale@to@em}
      {\@tempcntb=#1\relax}%
    \@tempdima=\dimexpr\@tempcntb sp*\MT@dimen@six/1000\relax
```

For \fontdimen 2, we also have to subtract the kerning that letterspacing adds to each side of the characters (only half if it's for outer spacing).

```
    \ifnum#2=\tw@
      \advance\@tempdima -\dimexpr\MT@letterspace@ sp*\MT@dimen@six/#3\relax
    \fi
  }{%
    \MT@ifempty\@tempa{\let\@tempa\MT@letterspace@}\relax
    \@tempdima=\dimexpr \numexpr1000+\@tempa sp *\fontdimen#2\MT@lsfont/1000\relax
  }%
⟨debug⟩\MT@dinfo@nl3{... : font dimen #2 (#1): \the\@tempdima}%
}
```

\MT@tr@outer@l

Recall the last skip (must really be an interword space, not just a marker, nor a 'hard' space, i.e., one that doesn't contain stretch or shrink parts).

```
\def\MT@tr@outer@l{%
  \ifhmode
    \ifdim\lastskip>5sp
      \edef\x{\the\lastskip minus 0pt}%
      \setbox\z@\hbox{\MT@outer@space=\x}%
      \ifdim\wd\z@>\z@
⟨debug⟩\MT@dinfo2{[[[ adjusting pre space: \the\MT@outer@space}%
        \unskip \hskip\MT@outer@space\relax
```

Disable left outer kerning.

```
        \let\MT@ls@outer@k\relax
      \else
```

The ragged2e package sets \spaceskip without glue.

```
        \ifdim\lastskip=%
            \ifnum\spacefactor<2000
              \spaceskip
            \else
              \ifdim\xspaceskip=\z@
                \dimexpr\spaceskip+\fontdimen7\font@name\relax
              \else
                \xspaceskip
              \fi
            \fi
⟨debug⟩\MT@dinfo2{[[[ adjusting pre space (skip): \the\MT@outer@space}%
          \unskip \hskip\MT@outer@space\relax
          \let\MT@ls@outer@k\relax
        \fi
      \fi
    \fi
  \fi
}
```

\MT@tr@outer@next
\MT@tr@outer@r

microtype also adjusts spacing. The following is borrowed from soul. I've added the cases for italic correction, since tracking may also be triggered by text commands (e.g., \textsc).

```
\def\MT@tr@outer@r{%
  \futurelet\MT@tr@outer@next\MT@tr@outer@r@
}
```

\MT@if@outer@next

We avoid using \ifx tests, in case \MT@tr@outer@next is \let to \fi etc.

```
\def\MT@if@outer@next#1{%
  \ifx\MT@tr@outer@next#1\expandafter\@firstoftwo\else\expandafter\@secondoftwo\fi
}
```

\MT@tr@outer@r@

```
\def\MT@tr@outer@r@{%
  \def\MT@temp*{}%
```

Don't adjust in math mode. There was a tricky bug when \textls was the last command in a \mathchoice group.

```
  \ifmmode \else
```

A similar bug occurred when adjustment would happen inside a discretionary group, which we prevent here. This only works with e-TEX (which we know is available).

```
    \ifnum\currentgrouptype=10 \else
      \def\MT@temp*##1{\ifhmode\hskip\MT@outer@space
⟨debug⟩\MT@dinfo2{]]] adjusting post space (1): \the\MT@outer@space}%
        \fi}%
      \expandafter\ifcat\expandafter\noexpand\csname MT@tr@outer@next\endcsname\egroup
        \ifhmode\unkern\fi\egroup
        \MT@set@curr@ok \MT@set@curr@os
        \def\MT@temp*{\afterassignment\MT@tr@outer@r\let\MT@temp=}%
      \else
```

If the next token is \maybe@ic (from an enclosing text command), we gobble it, read the next one, feed it to \maybe@ic@ (via \MT@tr@outer@icr) and then call ourselves again.

```
        \MT@if@outer@next\maybe@ic{%
          \MT@set@curr@ok \MT@set@curr@os
          \def\MT@temp*{\afterassignment\MT@tr@outer@icr\let\MT@temp=}%
        }{%
```

If the next token is \check@icr (from an inner text command), we insert ourselves just before it. This will then call \maybe@ic again the next round (which however will always insert an italic correction, since it doesn't read beyond our group).

```
          \MT@if@outer@next\check@icr{%
            \def\MT@temp*{\aftergroup\MT@tr@outer@r\check@icr\let\MT@temp=}%
          }{%
            \MT@if@outer@next\@sptoken{%
              \def\MT@temp* {\ifhmode\hskip\MT@outer@space
⟨debug⟩\MT@dinfo2{]]] adjusting post space (2): \the\MT@outer@space}%
```

```
                \fi}%
            }{%
              \MT@if@outer@next~{%
                \def\MT@temp*~{\nobreak\hskip\MT@outer@space
⟨debug⟩\MT@dinfo2{]]] adjusting post space (3): \the\MT@outer@space}%
                  }%
              }{%
                \MT@if@outer@next\ \relax{%
                  \MT@if@outer@next\space\relax{%
                    \MT@if@outer@next\@xobeysp\relax{%
```

xspace requires special treatment.

```
                      \MT@if@outer@next\xspace{%
                        \def\MT@temp*\xspace{\MT@xspace}%
                      }{%
```

If there's no outer spacing, there may be outer kerning.

```
                        \def\MT@temp*{\ifdim\MT@outer@kern=\z@\else\MT@ls@outer@k
⟨debug⟩\MT@dinfo2{--- adjusting post kern: \the\MT@outer@kern}%
                          \fi}%
                        \MT@let@nc{MT@tr@outer@next}\relax
      }}}}}}}}\fi
  \fi\fi
  \MT@temp*%
}
```

\MT@tr@outer@icr
\MT@tr@outer@icr@

Helper macros for the italic correction mess.

```
\def\MT@tr@outer@icr{\afterassignment\MT@tr@outer@icr@\MT@tr@outer@r}
\def\MT@tr@outer@icr@{%
  \let\@let@token= \MT@tr@outer@next
  \maybe@ic@
}
```

\MT@xspace
\MT@xspace@

If the group is followed by \xspace, we first feed \xspace with the next token, then check whether it has inserted a space. \@let@token might be something evil, so it should be encapsulated here.

```
\def\MT@xspace{\futurelet\@let@token\MT@xspace@}
\def\MT@xspace@{\@xspace@firsttrue\@xspace
  \ifdim\lastskip>5sp
    \unskip \hskip\MT@outer@space
  \else
    \ifdim\MT@outer@kern=\z@\else\MT@ls@outer@k \fi
  \fi
}
```

For older pdfTEX versions and LuaTEX, throw an error.

```
}{
  \DeclareRobustCommand\lsstyle{%
    \MT@error{Letterspacing only works with \MT@engine tex version
⟨pdftex-def⟩      1.40%
⟨luatex-def⟩      0.62%
      \MessageBreak or newer}
      {Upgrade \MT@engine tex, or try the `soul' package instead.}%
    \MT@glet\lsstyle\relax
  }
}
```

And for XƎTEX, too.

```
⟨/pdftex-def|luatex-def⟩
⟨*xetex-def⟩
\DeclareRobustCommand\lsstyle{%
  \MT@error{Letterspacing currently doesn't work with xetex}
           {Run pdftex or luatex, or use the `soul' package instead.}%
  \MT@glet\lsstyle\relax
}
```

```
⟨/xetex-def⟩
```

\textls
\MT@ls@adjust@

This command may be used like the other text commands. The starred version removes kerning on the sides. The optional argument changes the letterspacing factor.

```
⟨*package|letterspace⟩
\DeclareRobustCommand\textls{%
  \@ifstar{\let\MT@ls@adjust@\MT@ls@adjust@empty\MT@textls}%
          {\let\MT@ls@adjust@\MT@ls@adjust@relax\MT@textls}%
}
```

\MT@textls
\MT@letterspace@

This is now almost LaTeX's \DeclareTextFontCommand, with the difference that we adjust the outer spacing and kerning also for \lsstyle, while LaTeX's text *switches* don't bother about italic correction.

```
\newcommand\MT@textls[2][]{%
  \ifmmode
    \nfss@text{\MT@ls@set@ls{#1}\lsstyle#2}%
  \else
    \hmode@bgroup
      \MT@ls@set@ls{#1}%
      \lsstyle #2%
      \expandafter
    \egroup
  \fi
}
```

\MT@ls@adjust
\MT@ls@adjust@empty
\MT@ls@adjust@relax
\MT@ls@set@ls

Set current letterspacing amount and outer kerning. This has to be done inside the same group as the letterspacing command.

```
\def\MT@ls@adjust@empty{\let\MT@ls@adjust\@empty}
\def\MT@ls@adjust@relax{\let\MT@ls@adjust\relax}
\def\MT@ls@set@ls#1{%
  \MT@ifempty{#1}%
    {\let\MT@letterspace@\@undefined}%
    {\KV@@sp@def\MT@letterspace@{#1}%
     \edef\MT@letterspace@{\number\MT@letterspace@}%
     \MT@ls@too@large\MT@letterspace@}%
  \MT@ls@adjust@
}
```

\MT@ls@too@large

Test whether letterspacing amount is too large.

```
\def\MT@ls@too@large#1{%
  \ifnum#1>\MT@tr@max
    \MT@warning{Maximum for option `letterspace' is \number\MT@tr@max}%
    \let#1\MT@tr@max
  \else
    \ifnum#1<\MT@tr@min
      \MT@warning{Minimum for option `letterspace' is \number\MT@tr@min}%
      \let#1\MT@tr@min
    \fi
  \fi
}
```

\MT@outer@kern
\MT@tr@set@okern

This dimen is used for the starred version of \textls, for \lslig and for adjusted outer kerning.

```
\newdimen\MT@outer@kern
⟨/package|letterspace⟩
⟨*pdftex-def|luatex-def⟩
\def\MT@tr@set@okern#1,#2,{%
  \let\MT@temp\@empty
  \MT@ifempty{#1}{\MT@tr@set@okern@{*}}{\MT@tr@set@okern@{#1}}%
  \MT@ifempty{#2}{\MT@tr@set@okern@{*}}{\MT@tr@set@okern@{#2}}%
  \MT@glet@nc{MT@outer@kern\expandafter\string\font@name}\MT@temp
⟨debug⟩\MT@dinfo@nl2{... outer kerning: (#1,#2)
⟨debug⟩                = \@nameuse{MT@outer@kern\expandafter\string\font@name}}%
}
```

\MT@tr@set@okern@

```
\def\MT@tr@set@okern@#1{%
  \MT@test@ast#1*\@nil{%
    \MT@ifdefined@c@TF\MT@tr@unit@
      {\edef\@tempb{#1}\MT@scale@to@em}
      {\@tempcntb=#1\relax}%
    \@tempdima=\dimexpr \@tempcntb sp * \MT@dimen@six/1000\relax
  }{%
    \MT@ifempty\@tempa{\let\@tempa\@m}\relax
    \@tempdima=\dimexpr \numexpr\@tempa*\MT@letterspace@/1000\relax sp
                     * \fontdimen6\MT@lsfont/2000\relax
  }%
  \advance\@tempdima -\dimexpr \MT@letterspace@ sp
                            * \fontdimen6\MT@lsfont/2000\relax
  \edef\MT@temp{\MT@temp{\the\@tempdima}}%
}
⟨/pdftex-def|luatex-def⟩
```

\MT@ls@outer@k

Adjust outer kerning. We additionally add a marker (\kern3sp\kern-3sp) for cases of nested letterspacing without anything actually printed.

```
⟨*pdftex-def|luatex-def|letterspace⟩
\def\MT@ls@outer@k{%
  \ifhmode
    \ifdim\lastkern=-3sp \unkern
      \ifdim\lastkern=3sp \kern-3sp
        \expandafter\expandafter\expandafter\@gobble
      \else \unkern
        \expandafter\expandafter\expandafter\@firstofone
      \fi
    \else
      \expandafter\@firstofone
    \fi
    {\kern\MT@outer@kern\kern3sp\kern-3sp\relax}%
  \fi
}
⟨/pdftex-def|luatex-def|letterspace⟩
```

14.2.6 Disabling ligatures

\MT@noligatures

The possibility to disable ligatures is a new features of pdfTEX 1.30, and also works with LuaTEX.

```
⟨*pdftex-def|luatex-def⟩
⟨pdftex-def⟩\MT@requires@pdftex5{
\def\MT@noligatures{%
  \MT@dotrue
  \let\@tempa\MT@nl@setname
  \MT@map@clist@n{font,encoding,family,series,shape,size}{%
    \MT@ifdefined@n@TF{MT@checklist@##1}%
      {\csname MT@checklist@##1\endcsname}%
      {\MT@checklist@{##1}}%
    {nl}%
  }%
  \ifMT@do
    \MT@noligatures@\MT@font\MT@nl@ligatures
  \fi
}
```

\MT@noligatures@

This is also used by \MT@set@tr@codes.

```
⟨luatex-def⟩\MT@requires@luatex4{\let\pdfnoligatures\ignoreligaturesinfont}\relax
\def\MT@noligatures@#1#2{%
```

```
  \MT@ifdefined@c@TF#2{%
```

Early MiKTEX versions (before 2.5.2579) didn't know `\tagcode`.

```
    \MT@ifdefined@c@TF\tagcode{%
```

No '`inputenc`' key.

```
      \let\MT@warn@maybe@inputenc\@empty
      \def\MT@curr@list@name{\@backslashchar DisableLigatures}%
      \MT@map@clist@c#2{%
        \KV@@sp@def\@tempa{##1}\MT@get@slot
        \ifnum\MT@char>\m@ne
          \tagcode#1\MT@char=\m@ne
```

With LuaTEX, we additionally register the ligatures that should be inhibited in a table (used by the `luaotfload` function `keepligature`).

```
⟨luatex-def⟩          \MT@if@luaotf@font
⟨luatex-def⟩             {\MT@lua{microtype.noligatures([[#1]],[[\MT@char]])}}\relax
        \fi
      }%
      \MT@vinfo{... Disabling ligatures for characters: #2}%
    }{%
      \pdfnoligatures#1%
      \MT@warning{Cannot disable selected ligatures (pdftex doesn't\MessageBreak
          know \@backslashchar tagcode). Disabling all ligatures of\MessageBreak
          the font instead}%
    }%
  }{%
    \pdfnoligatures#1%
⟨luatex-def⟩    \MT@if@luaotf@font
⟨luatex-def⟩        {\MT@lua{microtype.noligatures([[#1]],"_all_")}}\relax
    \MT@vinfo{... Disabling all ligatures}%
  }%
}
⟨pdftex-def⟩}\relax
⟨/pdftex-def|luatex-def⟩
```

For each potential ligature, `luaotfload` will call the `keepligature` function, which expects the first node of the ligature, to check whether they should be kept or inhibited. Here's our concoction of this function. The table `microtype.ligs` will be populated in `\MT@noligatures@`.

```
⟨*luafile⟩
microtype.ligs = microtype.ligs or { }

local function noligatures(fontcs,liga)
  local fontcs = match(fontcs,"([^ ]+)")
  microtype.ligs[fontcs] = microtype.ligs[fontcs] or { }
  table.insert(microtype.ligs[fontcs],liga)
end
microtype.noligatures = noligatures

local function keepligature(c)
  local nodedirect = node.direct
  local getfield   = nodedirect.getfield
  local getfont    = nodedirect.getfont
  local f,ch
  if type(c) == "userdata" then -- in older luaotfload versions, c was a node
    f  = c.font
    ch = c.components.char
  else                          -- since 2.6, c is a (direct node) number
    f  = getfont(c)
    ch = getfield(getfield(c,"components"),"char")
  end
--  if ch then -- should always be true
  local ligs = microtype.ligs[match(tex.fontidentifier(f),"\\([^ ]+)")]
  if ligs then
    for _,lig in pairs(ligs) do
      if lig == "_all_" or tonumber(lig) == ch then
        return false
      end
    end
  end
  return true
--  end
end

if luaotfload and luaotfload.letterspace then
  if luaotfload.letterspace.keepligature then
    microtype.info("overwriting function `keepligature'")
  end
  luaotfload.letterspace.keepligature = keepligature
end

⟨/luafile⟩
```

14.2.7 Loading the configuration

\MT@load@list

Recurse through the lists to be loaded.

```
⟨*package⟩
\def\MT@load@list#1{%
  \edef\@tempa{#1}%
  \MT@let@cn\@tempb{MT@\MT@feat @c@\@tempa @load}%
  \MT@ifstreq\@tempa\@tempb{%
    \MT@error{\@nameuse{MT@abbr@\MT@feat} list `\@tempa' cannot load itself}{}%
  }{%
    \ifx\@tempb\relax \else
      \MT@ifdefined@n@TF{MT@\MT@feat @c@\@tempb}{%
        \MT@vinfo{... : First loading \@nameuse{MT@abbr@\MT@feat} list `\@tempb'}%
        \begingroup
          \MT@load@list\@tempb
        \endgroup
        \edef\MT@curr@list@name{\@nameuse{MT@abbr@\MT@feat} list
          \noexpand\MessageBreak`\@tempb'}%
        \MT@let@cn\@tempc{MT@\MT@feat @c@\@tempb}%
        \expandafter\MT@set@codes\@tempc,\relax,%
      }{%
        \MT@error{\@nameuse{MT@abbr@\MT@feat} list `\@tempb' undefined.\MessageBreak
                    Cannot load it from list `\@tempa'}{}%
      }%
    \fi
  }%
}
```

\MT@find@file
\MT@file@list

Micro-typographic settings may be written into a file mt-⟨*font family*⟩.cfg. We must also record whether we've already loaded the file.

```
\let\MT@file@list\@empty
\def\MT@find@file#1{%
```

Check for existence of the file only once.

```
  \MT@in@clist{#1}\MT@file@list
  \ifMT@inlist@ \else
```

Don't forget that because reading the files takes place inside a group, all commands that may be used there have to be defined globally.

```
    \MT@begin@catcodes
      \let\MT@begin@catcodes\relax
      \let\MT@end@catcodes\relax
      \InputIfFileExists{mt-#1.cfg}{%
```

```
        \edef\MT@curr@file{mt-#1.cfg}%
        \MT@vinfo{... Loading configuration file \MT@curr@file}%
        \MT@xadd\MT@file@list{#1,}%
      }{%
        \MT@get@basefamily#1\@empty\@empty\@empty\@nil
        \MT@exp@one@n\MT@in@clist\@tempa\MT@file@list
        \ifMT@inlist@
          \MT@xadd\MT@file@list{#1,}%
        \else
          \InputIfFileExists{mt-\@tempa.cfg}{%
            \edef\MT@curr@file{mt-\@tempa.cfg}%
            \MT@vinfo{... Loading configuration file \MT@curr@file}%
            \MT@xadd\MT@file@list{\@tempa,#1,}%
          }{%
            \MT@vinfo{... No configuration file mt-#1.cfg}%
            \MT@xadd\MT@file@list{#1,}%
          }%
        \fi
      }%
    \endgroup
  \fi
}
```

\MT@cfg@catcodes

We have to make sure that all characters have the correct category code. Especially, new lines and spaces should be ignored, since files might be loaded in the middle of the document. This is basically \nfss@catcodes (from the LaTeX kernel). I've added: & (in tabulars), !, ?, ;, : (french), ,, $, _, ~, and = (Turkish babel).

OK, now all printable characters up to 127 are 'other'. We hope that letters are always letters and numbers other. (listings makes them active, see section 14.1.5.)

We leave ^ at catcode 7, so that stuff like '^^ff' remains possible.

```
\def\MT@cfg@catcodes{%
  \makeatletter
  \catcode`\^7%
  \catcode`\ 9%
  \catcode`\^^I9%
  \catcode`\^^M9%
  \catcode`\\\z@
  \catcode`\{\@ne
  \catcode`\}\tw@
  \catcode`\#6%
  \catcode`\%14%
  \MT@map@tlist@n
    {\!\"\$\&\'\(\)\*\+\,\-\.\/\:\;\<\=\>\?\[\]\_\`\|\~}%
    \@makeother
}
```

\MT@begin@catcodes

This will be used before reading the files as well as in all configuration commands, so that catcodes are also harmless when these commands are used outside the configuration files.

```
\def\MT@begin@catcodes{%
  \begingroup
  \MT@cfg@catcodes
}
```

\MT@end@catcodes

End group if outside configuration file (otherwise relax).

```
\let\MT@end@catcodes\endgroup
```

\MT@get@basefamily

The family name might have a suffix e.g., for expert set (x), old style numbers (j) swash capitals (w) etc. We mustn't simply remove the last letter, as this would make for instance cms out of cmss *and* cmsy (OK, cmex will still become cme ...).

We only work on the font name if it is longer than three characters.

Table 4:

Order for matching font attributes

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
Encoding	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Family	●	●	●	●	●	●	●	●	-	-	-	-	-	-	-	-
Series	●	●	●	●	-	-	-	-	●	●	●	●	-	-	-	-
Shape	●	●	-	-	●	●	-	-	●	●	-	-	●	●	-	-
Size	●	-	●	-	●	-	●	-	●	-	●	-	●	-	●	-

```
\def\MT@get@basefamily#1#2#3#4\@nil{%
  \ifx\@empty#4%
    \def\@tempa{#1#2#3}%
  \else
    \let\@tempa\@empty
    \edef\@tempb{#1#2#3#4}%
    \expandafter\MT@get@basefamily@\@tempb\@nil
  \fi
}
```

\MT@get@basefamily@

This will only remove one suffix (the longest match), so that *combinations* of suffixes would have be to added manually (e.g., \DeclareMicrotypeVariants*{aw}). But otherwise, something like 'pplx' would be truncated to 'p'.

```
\def\MT@get@basefamily@#1#2\@nil{%
  \edef\@tempa{\@tempa#1}%
  \ifx\\#2\\\expandafter\@gobble\else\expandafter\@firstofone\fi
  {\MT@in@tlist{#2}\MT@variants
   \ifMT@inlist@\else\MT@get@basefamily@#2\@nil\fi}%
}
```

\MT@listname
\MT@get@listname
\MT@get@listname@

Try all combinations of font family, series, shape and size to get a list for the current font.

```
\def\MT@get@listname#1{%
⟨debug⟩\MT@dinfo@nl{1}{trying to find \@nameuse{MT@abbr@#1} list for font `\MT@@font'}%
  \let\MT@listname\@undefined
  \def\@tempb{#1}%
  \MT@map@tlist@c\MT@try@order\MT@get@listname@
}
\def\MT@get@listname@#1{%
  \expandafter\MT@next@listname#1%
  \ifx\MT@listname\@undefined \else
    \expandafter\MT@tlist@break
  \fi
}
```

\MT@try@order

Beginning with version 1.7, we always check for the font size. Since the matching order has become more logical now, it can be described in words, so that we don't need table 4 in the documentation part any longer and can cast it off here.

```
\def\MT@try@order{%
  {1111}{1110}{1101}{1100}{1011}{1010}{1001}{1000}%
  {0111}{0110}{0101}{0100}{0011}{0010}{0001}{0000}%
}
```

\MT@next@listname

The current context is added to the font attributes. That is, the context must match.

```
\def\MT@next@listname#1#2#3#4{%
  \ifnum#1=\z@\MT@nofamilytrue\fi
  \edef\@tempa{\MT@encoding
/\ifnum#1=\@ne \MT@family  \fi
/\ifnum#2=\@ne \MT@series  \fi
/\ifnum#3=\@ne \MT@shape   \fi
/\ifnum#4=\@ne *\fi
               \MT@context}%
```

```
⟨debug⟩\MT@dinfo@nl{1}{trying \@tempa}%
  \MT@ifdefined@n@TF{MT@\@tempb @\@tempa}{%
    \MT@next@listname@#4%
  }{%
```

Also try with an alias family.

```
    \ifnum#1=\@ne
      \ifx\MT@familyalias\@empty \else
        \edef\@tempa{\MT@encoding
                    /\MT@familyalias
      /\ifnum#2=\@ne \MT@series\fi
      /\ifnum#3=\@ne \MT@shape\fi
      /\ifnum#4=\@ne *\fi
                     \MT@context}%
⟨debug⟩\MT@dinfo@nl{1}{(alias) \@tempa}%
        \MT@ifdefined@n@T{MT@\@tempb @\@tempa}{%
          \MT@next@listname@#4%
        }%
      \fi
    \fi
  }%
}
```

\MT@next@listname@

If size is to be evaluated, do that, otherwise use the current list.

```
\def\MT@next@listname@#1{%
  \ifnum#1=\@ne
    \MT@exp@cs\MT@in@rlist{MT@\@tempb @\@tempa @sizes}%
    \ifMT@inlist@
      \let\MT@listname\MT@size@name
    \fi
  \else
    \MT@let@cn\MT@listname{MT@\@tempb @\@tempa}%
  \fi
}
```

\MT@if@list@exists

\MT@context

```
\def\MT@if@list@exists{%
  \MT@let@cn\MT@context{MT@\MT@feat @context}%
  \MT@ifstreq{@}\MT@context{\let\MT@context\@empty}\relax
  \MT@get@listname{\MT@feat @c}%
  \MT@ifdefined@c@TF\MT@listname{%
    \MT@edef@n{MT@\MT@feat @c@name}{\MT@listname}%
    \ifMT@nonselected
      \MT@vinfo{... Applying non-selected expansion (list `\MT@listname')}%
    \else
      \MT@vinfo{... Loading \@nameuse{MT@abbr@\MT@feat} list `\MT@listname'}%
    \fi
    \@firstoftwo
  }{%
```

Since the name cannot be `\@empty`, this is a sound proof that no matching list exists.

```
    \MT@let@nc{MT@\MT@feat @c@name}\@empty
```

Don’t warn if `selected=false`.

```
    \ifMT@nonselected
      \MT@vinfo{... Applying non-selected expansion (no list)}%
    \else
```

Tracking doesn’t require a list, either.

```
      \MT@ifstreq\MT@feat{tr}\relax{%
        \MT@warning{I cannot find a \@nameuse{MT@abbr@\MT@feat} list
          for font\MessageBreak`\MT@@font'%
            \ifx\MT@context\@empty\else\space(context: `\MT@context')\fi.
          Switching off\MessageBreak\@nameuse{MT@abbr@\MT@feat} for this font}%
      }%
    \fi
    \@secondoftwo
  }%
}
```

\MT@get@inh@list

\MT@context

The inheritance lists are global (no context).

```
\def\MT@get@inh@list{%
  \let\MT@context\@empty
  \MT@get@listname{\MT@feat @inh}%
  \MT@ifdefined@c@TF\MT@listname{%
    \MT@edef@n{MT@\MT@feat @inh@name}{\MT@listname}%
⟨debug⟩\MT@dinfo@nl{1}{... Using \@nameuse{MT@abbr@\MT@feat} inheritance list
⟨debug⟩                `\MT@listname'}%
    \MT@let@cn\@tempc{MT@\MT@feat @inh@\MT@listname}%
```

If the list is \@empty, it has already been parsed.

```
    \ifx\@tempc\@empty \else
⟨debug⟩\MT@dinfo@nl{1}{parsing inheritance list ...}%
```

The group is only required in case an input encoding is given.

```
      \begingroup
      \edef\MT@curr@list@name{inheritance list\noexpand\MessageBreak`\MT@listname'}%
      \MT@set@inputenc{inh}%
      \expandafter\MT@inh@do\@tempc,\relax,%
      \MT@glet@nc{MT@\MT@feat @inh@\MT@listname}\@empty
      \endgroup
    \fi
  }{%
    \MT@let@nc{MT@\MT@feat @inh@name}\@undefined
  }%
}
```

14.2.8 Translating characters into slots

Get the slot number of the character in the current encoding.

\MT@get@slot

There are lots of possibilities how a character may be specified in the configuration files, which makes translating them into slot numbers quite expensive. Also, we want to have this as robust as possible, so that the user does not have to solve a sphinx's riddle if anything goes wrong.

\MT@char

\MT@char@

The character is in \@tempa, we want its slot number in \MT@char.

```
\def\MT@get@slot{%
  \escapechar`\\
  \let\MT@char@\m@ne
  \MT@noresttrue
```

Save unexpanded string in case we need to issue a warning message.

```
  \MT@toks=\expandafter{\@tempa}%
```

It might be an active character, i.e., an 8-bit character defined by inputenc. If so, we will expand it here to its LICR form.

```
  \MT@exp@two@c\MT@is@active\string\@tempa\@nil
```

Now, let's walk through (hopefully) all possible cases.

- It's a letter, a character or a number.

```
  \expandafter\MT@is@letter\@tempa\relax\relax
  \ifnum\MT@char@ < \z@
```

- OK, so it must be a macro. We do not allow random commands but only those defined in LaTeX's idiosyncratic font encoding scheme:

  If \⟨*encoding*⟩\⟨*command*⟩ (that's *one* command) is defined, we try to extract the slot number.

  We must be cautious not to stumble over accented characters consisting of two commands, like `\'\i` or `\U\CYRI`, hence, `\string` wouldn't be safe enough.

```
    \MT@ifdefined@n@TF{\MT@encoding\MT@detokenize@c\@tempa}%
      \MT@is@symbol
```

- Now, we'll catch the rest, which hopefully is an accented character (e.g. `\"a`).

```
      {\expandafter\MT@is@composite\@tempa\relax\relax}%
    \ifnum\MT@char@ < \z@
```

- It could also be a `\chardefed` command (e.g., the percent character). This seems the least likely case, so it's last.

```
      \expandafter\MT@exp@two@c\expandafter\MT@is@char\expandafter
          \meaning\expandafter\@tempa\MT@charstring\relax\relax\relax
    \fi
  \fi

  \let\MT@char\MT@char@
  \MT@get@slot@
  \escapechar\m@ne
}
⟨/package⟩
```

\MT@get@slot@

```
⟨*pdftex-def|luatex-def|xetex-def⟩
\def\MT@get@slot@{%
```

If it's a legacy (i.e., TFM) font, proceed as usual.

```
⟨xetex-def⟩  \ifnum\XeTeXfonttype\MT@font=\z@
  \ifnum\MT@char > \m@ne
```

In LuaTeX, it may also be a glyph name, prefixed with '/'.

```
⟨*luatex-def⟩
    \ifnum\MT@char=47\relax
      \ifMT@norest \else
        \@tempcnta=\MT@lua{
           local glyph = microtype.name_to_slot([[\expandafter\@gobble\@tempa]],true)
           if glyph then tex.write(glyph)
           else tex.write(-1)
           end
        }\relax
        \ifnum\@tempcnta<\z@
          \MT@warn@unknown
          \let\MT@char\m@ne
        \else
          \edef\MT@char{\the\@tempcnta}%
⟨debug⟩\MT@dinfo@nl{3}{> `\the\MT@toks' is a glyph name (\the\@tempcnta)}%
        \fi
      \fi
    \else
⟨/luatex-def⟩
```

If the user has specified something like '`fi`', or wanted to define a number but forgot to use three digits, we'll have something left of the string. In this case, we issue a warning and forget the complete string.

```
    \ifMT@norest \else
```

```
      \MT@warn@rest
⟨pdftex-def|luatex-def⟩      \let\MT@char\m@ne
⟨xetex-def⟩      \let\MT@char\@empty
    \fi
⟨luatex-def⟩    \fi
  \else
    \MT@warn@unknown
⟨xetex-def⟩    \let\MT@char\@empty
  \fi
⟨*xetex-def⟩
  \else
```

There are more possibilities for XƎTEX: It may also be a glyph name (prefixed with '/'). We indicate this to `\MT@get@charwd` by reversing the sign of `\MT@char@`.

```
    \ifnum\MT@char=47\relax
      \ifMT@norest \edef\MT@char{U47}%
      \else
        \@tempcnta=\XeTeXglyphindex"\expandafter\@gobble\@tempa"\relax
        \ifnum\@tempcnta=\z@
          \MT@warn@unknown
          \let\MT@char\@empty
        \else
          \edef\MT@char{\@tempa\space}%
          \edef\MT@char@{-\the\@tempcnta}%
⟨debug⟩\MT@dinfo@nl{3}{> `\the\MT@toks' is a glyph name (\the\@tempcnta)}%
        \fi
      \fi
    \else
      \ifnum\MT@char > \m@ne
        \ifMT@norest
```

Or, it's a Unicode number, which we mustn't translate into a glyph number, since the latter is font-specific.

```
          \@tempcnta=\XeTeXcharglyph\MT@char\relax
          \ifnum\@tempcnta=\z@
            \MT@info@missing@char
            \let\MT@char\@empty
          \else
⟨debug⟩\MT@dinfo@nl{3}{> (glyph number: \the\@tempcnta,
⟨debug⟩                   glyph name:   \XeTeXglyphname\MT@font\@tempcnta)}%
            \edef\MT@char{U\MT@char}%
          \fi
        \else
          \MT@warn@rest
          \let\MT@char\@empty
        \fi
      \else
        \MT@warn@unknown
        \let\MT@char\@empty
      \fi
    \fi
  \fi
⟨/xetex-def⟩
}
⟨/pdftex-def|luatex-def|xetex-def⟩
```

This is the lua function to translate glyph name into slot number. Beginning with v2.2, `luaotfload` provides this function in an API, which we use if available, but (for now, at least) keep the old code for backward compatibility.

```
⟨*luafile⟩
if luaotfload and luaotfload.aux and luaotfload.aux.slot_of_name then
  local slot_of_name = luaotfload.aux.slot_of_name
  microtype.name_to_slot = function(name, unsafe)
    return slot_of_name(font.current(), name, unsafe)
  end
else
  -- we dig into internal structure (should be avoided)
  local function name_to_slot(name, unsafe)
    if fonts then
      local unicodes
      if fonts.ids then       -- legacy luaotfload
        local tfmdata = fonts.ids[font.current()]
        if not tfmdata then return end
        unicodes = tfmdata.shared.otfdata.luatex.unicodes
      else                    -- new location
        local tfmdata = fonts.hashes.identifiers[font.current()]
        if not tfmdata then return end
        unicodes = tfmdata.resources.unicodes
      end
      local unicode = unicodes[name]
      if unicode then -- does the 'or' branch actually exist?
        return type(unicode) == "number" and unicode or unicode[1]
      end
    end
  end
  microtype.name_to_slot = name_to_slot
end

⟨/luafile⟩
```

\MT@is@letter Input is a letter, a character or a number.

\MT@max@char Warning if resulting character or slot number is too large.

\MT@max@slot

```
⟨*pdftex-def|luatex-def|xetex-def⟩
\def\MT@max@char
⟨pdftex-def⟩  {127 }
⟨luatex-def|xetex-def⟩  {1114111 }
\def\MT@max@slot
⟨pdftex-def⟩  {255 }
⟨luatex-def|xetex-def⟩  {1114111 }
⟨/pdftex-def|luatex-def|xetex-def⟩
```

\ifMT@norest Test whether all of the string has been used up.

```
⟨*package⟩
\newif\ifMT@norest
```

```
\def\MT@is@letter#1#2\relax{%
  \ifcat a\noexpand#1\relax
    \edef\MT@char@{\number`#1}%
    \ifx\\#2\\%
⟨debug⟩\MT@dinfo@nl{3}{> `\the\MT@toks' is a letter (\MT@char@)}%
    \else
      \MT@norestfalse
    \fi
  \else
    \ifcat !\noexpand#1\relax
      \edef\MT@char@{\number`#1}%
⟨debug⟩\MT@dinfo@nl{3}{> `\the\MT@toks' is a character (\MT@char@)}%
      \ifx\\#2\\%
        \ifnum\MT@char@ > \MT@max@char \MT@warn@ascii \fi
      \else
        \MT@norestfalse
        \expandafter\MT@is@number#1#2\relax\relax
      \fi
    \fi
  \fi
}
```

\MT@is@number Numbers may be specified as a three-digit decimal number (029), as a hexadecimal number (prefixed with ": "1D) or as a octal number (prefixed with ': '35). They must consist of at least three characters (including the prefix), that is, "F is not permitted.

```
\def\MT@is@number#1#2#3\relax{%
  \ifx\relax#3\relax \else
    \ifx\relax#2\relax \else
      \MT@noresttrue
      \if#1"\relax
        \def\x{\uppercase{\edef\MT@char@{\number#1#2#3}}}\x
⟨debug⟩\MT@dinfo@nl{3}{> ... a hexadecimal number: \MT@char@}%
      \else
        \if#1'\relax
          \def\MT@char@{\number#1#2#3}%
⟨debug⟩\MT@dinfo@nl{3}{> ... an octal number: \MT@char@}%
        \else
          \MT@ifint{#1#2#3}{%
            \def\MT@char@{\number#1#2#3}%
⟨debug⟩\MT@dinfo@nl{3}{> ... a decimal number: \MT@char@}%
          }\MT@norestfalse
        \fi
      \fi
      \ifnum\MT@char@ > \MT@max@slot
        \MT@warn@number@too@large{\noexpand#1\noexpand#2\noexpand#3}%
        \let\MT@char@\m@ne
      \fi
    \fi
  \fi
}
```

\MT@is@active

Expand an active character. (This was completely broken in v1.7, and only worked by chance before.) We \set@display@protect to translate, e.g., Ä into \"A, that is to whatever it is defined in the inputenc encoding file.

Unfortunately, the (older) inputenc definitions prefer the protected/generic variants (e.g., \copyright instead of \textcopyright), which our parser won't be able to understand. (I'm fed up now, so you have to complain if you really, really want to be able to write '©' instead of \textcopyright, thus rendering your configuration files unportable.)

Unicode characters (inputenc/utf8,utf8x) are also supported.

```
\def\MT@is@active#1#2\@nil{%
  \ifnum\catcode`#1 = \active
    \begingroup
      \set@display@protect
      \let\IeC\@firstofone
      \let\@inpenc@undefined@\MT@undefined@char
```

Unicode handling has changed again with LaTeX 2019/10/01.

```
      \let\UTF@two@octets@noexpand\@empty
      \let\UTF@three@octets@noexpand\@empty
      \let\UTF@four@octets@noexpand\@empty
```

We refrain from checking whether there is a sufficient number of octets.

```
      \def\UTFviii@defined##1{\ifx ##1\relax
        \MT@undefined@char{utf8}\else\expandafter ##1\fi}%
```

For ucs (utf8x). Let's call it experimental ...

```
      \MT@ifdefined@c@T\PrerenderUnicode
        {\PrerenderUnicode{\@tempa}\let\unicode@charfilter\@firstofone}%
```

The \expandafter hocus-pocus should please newunicodechar.

```
      \edef\x{\endgroup
        \def\noexpand\@tempa{\expandafter\expandafter\expandafter\@empty\@tempa}%
```

Append what we think the translation is to the token register we use for the log.

```
        \MT@toks={\the\MT@toks\space(=
                  \expandafter\expandafter\expandafter\@empty\@tempa)}%
      }%
    \x
  \fi
}
```

\MT@undefined@char

For characters not defined in the current input encoding.

```
\def\MT@undefined@char#1{undefined in input encoding ``#1''}
```

\MT@is@symbol

The symbol commands might expand to funny stuff, depending on context. Instead of simply expanding \⟨*command*⟩, we construct the command \⟨*encoding*⟩\⟨*command*⟩ and see whether its meaning is `\char"`⟨*hex number*⟩, which is the case for everything that has been defined with `\DeclareTextSymbol` in the encoding definition files.

```
\def\MT@is@symbol{%
  \expandafter\def\expandafter\MT@char\expandafter
      {\csname\MT@encoding\MT@detokenize@c\@tempa\endcsname}%
```

Since recently, some glyphs are defined optionally in LaTeX by checking if the glyph actually exists in the font (e.g., `\textasteriskcentered`).

```
  \expandafter\expandafter\expandafter
    \MT@is@opt@char\MT@char\iffontchar\char\else\fi\relax
  \expandafter\MT@exp@two@c\expandafter\MT@is@char\expandafter
    \meaning\expandafter\MT@char\MT@charstring\relax\relax\relax
  \ifnum\MT@char@ < \z@
```

In TU encoding, some commands (currently, `\textquotesingle`, `\textasciigrave` and `\textquotedbl`) are defined by means of the auxiliary macro `\remove@tlig`, which we take care of here.

```
    \expandafter\expandafter\expandafter\MT@is@tlig\MT@char\relax\relax
    \ifnum\MT@char@ < \z@
```

Finally, if it hasn't been defined by `\DeclareTextSymbol`, it could be a letter (e.g., `\i`, when using `frenchpro`).

```
      \expandafter\expandafter\expandafter\MT@is@letter\MT@char\relax\relax
    \fi
  \fi
}
```

\MT@is@opt@char

This seems adventurous, but we're only redefining the text command within the scope of our setup.

```
\def\MT@is@opt@char#1\iffontchar#2\char#3\else#4\fi\relax{%
  \ifx\\#1\\%
    \iffontchar#2%
      \expandafter\chardef
        \csname\MT@encoding\MT@detokenize@c\@tempa\endcsname=#3\relax
    \fi
  \fi
}
```

\MT@is@char

A helper macro that inspects the `\meaning` of its argument.

\MT@charstring

```
\begingroup
  \catcode`\/=\z@
  /MT@map@tlist@n{/\CHARLEX}/@makeother
  /lowercase{%
    /def/x{/endgroup
      /def/MT@charstring{\CHAR"}%
      /def/MT@is@char##1\CHAR"##2##3##4/relax{%
        /ifx/relax##4/relax
          /ifMT@xunicode
            /expandafter/MT@is@charx/MT@strip@prefix##1>/relax\CHAR "%
              /relax/relax/relax/relax/relax
          /fi
        /else
          /ifx/relax##1/relax
            /if##3\/relax
              /edef/MT@char@{/number"##2}%
              /MT@ifstreq/MT@charstring{##3##4}/relax/MT@norestfalse
            /else
              /edef/MT@char@{/number"##2##3}%
              /MT@ifstreq/MT@charstring{##4}/relax
                {/MT@is@xchar##2##3|##4\CHAR"/relax}%
            /fi
⟨debug⟩    /MT@dinfo@nl{3}{> `/the/MT@toks' is a \char (/MT@char@)}%
          /fi
        /fi
      }%
```

\MT@is@xchar

With fontspec's TU encoding, glyph numbers may be up to four digits.

```
      /def/MT@is@xchar##1|##2\CHAR"##3##4/relax{%
        /MT@ifstreq/MT@charstring{##3##4}%
          {/edef/MT@char@{/number"##1##2}}/MT@norestfalse
      }%
```

\MT@charxstring
\MT@strip@prefix
\MT@is@charx

For xunicode, which doesn't \countdef, but rather \defs the chars.

```
      /def/MT@charxstring{\CHAR "}%
      /def/MT@strip@prefix##1>##2/relax{##2}%
      /def/MT@is@charx##1\CHAR "##2##3##4##5##6/relax{%
        /ifx/relax##1/relax
          /ifx/relax##6/relax/else
            /edef/MT@char@{/number"##2##3##4##5}%
            /MT@ifstreq{\RELAX >\CHAR "}{##6}/relax/MT@norestfalse
⟨debug⟩    /MT@dinfo@nl{3}{> `/the/MT@toks' is a xunicode \char (/MT@char@)}%
          /fi
        /fi
      }%
    }%
  }
/x
```

\MT@is@tlig

This might have to change again with the next LaTeX release, . . . or so I feared, but it still seems to be fine.

```
\def\MT@is@tlig#1#2\relax{%
  \ifx\remove@tlig#1%
⟨debug⟩    \MT@dinfo@nl{3}{> `\the\MT@toks' (removing remove@tlig)}%
    \MT@remove@tlig
  \fi
}
```

\MT@remove@tlig

We remove the \remove@tlig command and only pass on the number.

```
\def\MT@remove@tlig{%
  \expandafter\MT@exp@two@c\expandafter\MT@is@number
  \expandafter\@secondoftwo\MT@char\relax\relax
}
```

\MT@is@composite

Here, we are dealing with accented characters, specified as two tokens.

```
\def\MT@is@composite#1#2\relax{%
  \ifx\\#2\\\else
```

Again, we construct a control sequence, this time of the form: \\⟨*encoding*⟩ \⟨*accent*⟩-⟨*character*⟩, e.g., \\T1\"-a, which we then expand once to see if it is a letter (if it has been defined by \DeclareTextComposite). This should be robust, finally, especially, since we also \detokenize the input instead of only \stringifying it. Thus, we will die gracefully even on wrong Unicode input without utf8.

```
    \expandafter\def\expandafter\MT@char\expandafter{\csname\expandafter
```

```
          \string\csname\MT@encoding\endcsname
          \MT@detokenize@n{#1}-\MT@detokenize@n{#2}\endcsname}%
```

In 2017, LaTeX introduced a new way of declaring accented Unicode commands (\DeclareUnicodeComposite), which we take care of here (\UnicodeEncodingName has been introduced at the same time):

```
  \ifx\UnicodeEncodingName\@undefined\else
   \expandafter\expandafter\expandafter
    \MT@is@uni@comp\MT@char\iffontchar\else\fi\relax
  \fi
  \expandafter\expandafter\expandafter\MT@is@letter\MT@char\relax\relax
```

Again, xunicode.

```
  \ifnum\MT@char@ < \z@
   \ifMT@xunicode
    \edef\MT@char{\MT@exp@two@c\MT@strip@prefix\meaning\MT@char>\relax}%
    \expandafter\MT@exp@two@c\expandafter\MT@is@charx\expandafter
      \MT@char\MT@charxstring\relax\relax\relax\relax\relax
   \fi
  \fi
 \fi
}
```

\MT@is@uni@comp

Helper for \DeclareUnicodeComposite.

```
\def\MT@is@uni@comp#1\iffontchar#2\else#3\fi\relax{%
 \ifx\\#1\\\edef\MT@char{\iffontchar#2\fi}\fi
}
```

[What about math? Well, for a moment the following looked like a solution, with \mt@is@mathchar defined accordingly, analogous to \MT@is@char above, to pick up the last two tokens (the \meaning of a \mathchardef'ed command expands to its hexadecimal notation):

```
\def\MT@is@mathchar#1{%
 \if\relax\noexpand#1% it's a macro
  \let\x#1%
 \else % it's a character
  \mathchardef\x=\mathcode`#1\relax
 \fi
 \expandafter\MT@exp@two@c\expandafter\mt@is@mathchar\expandafter
  \meaning\expandafter\x\mt@mathcharstring\relax\relax\relax
}
```

However, the problem is that \mathcodes and \mathchardefs have global scope. Therefore, if they are changed by a package that loads different math fonts, there is no guarantee whatsoever that things will still be correct (e.g., the minus in cmsy when the euler package is loaded). So, no way to go, unfortunately.]

Some warning messages, for performance reasons separated here.

\MT@curr@list@name

The type and name of the current list, defined at various places.

\MT@set@listname

```
\def\MT@set@listname{%
 \edef\MT@curr@list@name{\@nameuse{MT@abbr@\MT@feat} list\noexpand\MessageBreak
  `\@nameuse{MT@\MT@feat @c@name}'}%
}
```

\MT@warn@ascii

For 'other' characters > 127, we issue a warning (inputenc probably hasn't been loaded), since correspondence with the slot numbers would be purely coincidental.

```
\def\MT@warn@ascii{%
 \MT@warning@nl{Character `\the\MT@toks' (= \MT@char@)
  is outside of ASCII range.\MessageBreak
  You must load the `inputenc' package before using\MessageBreak
  8-bit characters in \MT@curr@list@name}%
}
```

\MT@warn@number@too@large Number too large.

```
\def\MT@warn@number@too@large#1{%
  \MT@warning@nl{%
    Number #1 in encoding `\MT@encoding' too large!\MessageBreak
    Ignoring it in \MT@curr@list@name}%
}
```

\MT@warn@rest Not all of the string has been parsed.

```
\def\MT@warn@rest{%
  \MT@warning@nl{%
    Unknown slot number of character\MessageBreak`\the\MT@toks'%
    \MT@warn@maybe@inputenc\MessageBreak
    in font encoding `\MT@encoding'.\MessageBreak
    Make sure it's a single character\MessageBreak
    (or a number) in \MT@curr@list@name}%
}
```

\MT@warn@unknown No idea what went wrong.

```
\def\MT@warn@unknown{%
  \MT@warning@nl{%
    Unknown slot number of character\MessageBreak`\the\MT@toks'%
    \MT@warn@maybe@inputenc\MessageBreak
    in font encoding `\MT@encoding' in \MT@curr@list@name}%
}
```

\MT@warn@maybe@inputenc In case an input encoding had been requested.

```
\def\MT@warn@maybe@inputenc{%
  \MT@ifdefined@n@T
     {MT@\MT@feat @\MT@cat @\csname MT@\MT@feat @\MT@cat @name\endcsname @inputenc}%
    { (input encoding `\@nameuse
     {MT@\MT@feat @\MT@cat @\csname MT@\MT@feat @\MT@cat @name\endcsname @inputenc}')}%
}
```

14.2.9 Hook into LaTeX's font selection

We append \MT@setupfont to \pickup@font, which is called by LaTeX every time a font is selected. We then check whether we've already seen this font, and if not, set it up for micro-typography. This ensures that we will catch all fonts, and that we will not set up fonts more than once. The whole package really hangs on this command.

In contrast to the pdfcprot package, it is not necessary to declare in advance which fonts should benefit from micro-typographic treatment. Also, only those fonts that are actually being used will be set up.

For my reference:

- \pickup@font is called by \selectfont, \wrong@fontshape, or \getanddefine@fonts (for math).
- \pickup@font calls \define@newfont.
- \define@newfont may call (inside a group!)
  - \wrong@fontshape, which in turn will call \pickup@font, and thus \define@newfont again, or
  - \extract@font.
- \get@external@font is called by \extract@font, by itself, and by the substitution macros.

Up to version 1.3 of this package, we were using `\define@newfont` as the hook, which is only called for *new* fonts, and therefore seemed the natural choice. However, this meant that we had to take special care to catch all fonts: we additionally had to set up the default font, the error font (if it wasn't the default font), we had to check for some packages that might have been loaded before `microtype` and were loading fonts, e.g., `jurabib`, `ledmac`, `pifont` (loaded by `hyperref`), `tipa`, and probably many more. Furthermore, we had to include a hack for the `IEEEtran` class which loads all fonts in the class file itself (to fine tune inter-word spacing), and the `memoir` class, too. To cut this short: it seemed to get out of hand, and I decided that it would be better to use `\pickup@font` and decide for ourselves whether we've already seen that font. I hope the overhead isn't too large.

`\MT@font@list` We use a comma separated list.

`\MT@font`

```
\let\MT@font@list\@empty
\let\MT@font\@empty
```

All this is done at the beginning of the document. It doesn't work for plain, of course, which doesn't have `\pickup@font`.

```
⟨/package⟩
⟨*package|letterspace⟩
⟨plain⟩\MT@requires@latex2{
\MT@addto@setup{%
```

`\MT@orig@pickupfont` The `luatexja` package redefines `\char`, which will upset our parsing of text symbols and commands; instead of fixing this, we won't bother, at least for the moment, but simply issue a warning and disable all further warnings. The fix is left to the user by not specifying any text commands but only (Unicode) letters. The `xeCJK` package, or rather its `xunicode-addon`, also modifies the way text symbols are defined (like `luatexja` but in a different way). Again, we only issue a warning.

```
⟨package⟩  \MT@with@package@T{luatexja}{\MT@warn@unknown@once{luatexja}}%
⟨package⟩  \MT@with@package@T{xeCJK}   {\MT@warn@unknown@once{xeCJK}}%
```

`microtype` also works with `CJK` in the sense that nothing will break when both packages are used at the same time. However, since `CJK` has its own way of encoding, it is currently not possible to create character-specific settings. That is, the only feature available with `CJK` fonts is (non-selected) expansion. (Tracking doesn't really work for other reasons.) Like us, `CJK` redefines `\pickup@font`.

```
  \@ifpackageloaded{CJK}{%
```

The `xeCJK` package in turn pretends that `CJK` was loaded, but does not change the definition of `\pickup@font`. With `xeCJK`, protrusion should be possible also for C/J/K characters; I haven't tried it, though.

```
    \@ifpackageloaded{xeCJK}{\@firstofone}{%
      \@ifpackagelater{CJK}{2006/10/17}% 4.7.0
        {\def\MT@orig@pickupfont{\CJK@ifundefined\CJK@plane}}%
        {\def\MT@orig@pickupfont{\@ifundefined{CJK@plane}}}%
      \g@addto@macro\MT@orig@pickupfont
        {{\expandafter\ifx\font@name\relax\define@newfont\fi}}%
```

`CJKutf8` redefines `\pickup@font` once more (recent versions, in PDF mode, as determined by `ifpdf`, which `CJKutf8` loads).

```
      \@ifpackageloaded{CJKutf8}%
        {\@ifpackagelater{CJKutf8}{2008/05/22}% 4.8.0
          {\ifpdf\expandafter\@secondoftwo\else\expandafter\@firstoftwo\fi}%
          {\@firstoftwo}}%
        {\@firstoftwo}%
      {\g@addto@macro\MT@orig@pickupfont{%
        {\expandafter\ifx\csname\curr@fontshape/\f@size/\CJK@plane\endcsname\relax
```

```
           \define@newfont\else\xdef\font@name{%
             \csname \curr@fontshape/\f@size/\CJK@plane\endcsname}\fi}}}%
      {\g@addto@macro\MT@orig@pickupfont{%
        {\expandafter\ifx\csname \curr@fontshape/\f@size/\CJK@plane\endcsname\relax
           \define@newfont\def\CJK@temp{v}%
           \ifx\CJK@temp\CJK@plane
             \expandafter\ifx\csname CJK@cmap@\f@family\CJK@plane\endcsname\relax
             \else\csname CJK@cmap@\f@family\CJK@plane\endcsname\fi
           \else \CJK@addcmap\CJK@plane \fi
         \else\xdef\font@name{%
           \csname \curr@fontshape/\f@size/\CJK@plane\endcsname}\fi}}}%
      \@gobble
    }%
  }{\@firstofone}%
```

This is the normal LaTeX definition.

```
  {\def\MT@orig@pickupfont{\expandafter\ifx\font@name\relax\define@newfont\fi}}%
```

Check whether `\pickup@font` is defined as expected. The warning issued by `\CheckCommand*` would be a bit too generic.

```
  \ifx\pickup@font\MT@orig@pickupfont \else
    \MT@warning@nl{%
      Command \string\pickup@font\space is not defined as expected.%
      \MessageBreak Patching it anyway. Some things may break%
⟨*package⟩
     .\MessageBreak Double-check whether micro-typography is indeed%
      \MessageBreak applied to the document.%
      \MessageBreak (Hint: Turn on `verbose' mode)%
⟨/package⟩
    }%
  \fi
```

`\pickup@font`

Then we append our stuff. Everything is done inside a group.

```
  \g@addto@macro\pickup@font{\begingroup}%
```

If the `trace` package is loaded, we turn off tracing of `microtype`'s setup, which is extremely noisy.

```
  \MT@with@package@T{trace}{\g@addto@macro\pickup@font{\conditionally@traceoff}}%
  \g@addto@macro\pickup@font{%
      \escapechar\m@ne
⟨*package⟩
⟨debug⟩     \global\MT@inannottrue
⟨debug⟩     \MT@glet\MT@pdf@annot\@empty
⟨debug⟩     \MT@addto@annot{(line \number\inputlineno)}%
```

If `\MT@font` is empty, no substitution has taken place, hence `\font@name` is correct. Otherwise, if they are different, `\font@name` does not describe the font actually used. This test will catch first order substitutions, like `bx` to `b`, but it will still fail if the substituting font is itself substituted.

```
      \MT@let@cn\MT@font{MT@subst@\expandafter\string\font@name}%
      \ifx\MT@font\relax
        \let\MT@font\font@name
      \else
        \ifx\MT@font\font@name \else
⟨debug⟩ \MT@addto@annot{= substituted with \MT@@font}%
          \MT@register@subst@font
        \fi
      \fi
      \MT@setupfont
⟨/package⟩
⟨letterspace⟩     \MT@tracking
    \endgroup
  }%
⟨*package⟩
```

\MT@pickupfont
\MT@MT@pickupfont
\MT@ltx@pickupfont

Remember the patched command, because we may have to disable ourselves in certain situations.

```
  \let\MT@pickupfont\pickup@font
  \def\MT@MT@pickupfont {\let\pickup@font\MT@pickupfont}%
  \def\MT@ltx@pickupfont{\let\pickup@font\MT@orig@pickupfont}%
```

\do@subst@correction

Additionally, we hook into `\do@subst@correction`, which is called if a substitution has taken place, to record the name of the ersatz font. Unfortunately, this will only work for one-level substitutions. We have to remember the substitute for the rest of the document, not just for the first time it is called, since we need it every time a font is letterspaced.

```
  \g@addto@macro\do@subst@correction
    {\edef\MT@font{\csname\curr@fontshape/\f@size\endcsname}%
     \MT@glet@nc{MT@subst@\expandafter\string\font@name}\MT@font}%
```

\add@accent
\MT@orig@add@accent

Inside `\add@accent`, we have to disable `microtype`'s setup, since the grouping in the patched `\pickup@font` would break the accent if different fonts are used for the base character and the accent. Fortunately, LaTeX takes care that the fonts used for the `\accent` are already set up, so that we cannot be overlooking them.

```
  \let\MT@orig@add@accent\add@accent
  \def\add@accent#1#2{%
    \MT@ltx@pickupfont
    \MT@orig@add@accent{#1}{#2}%
    \MT@MT@pickupfont
  }%
⟨/package⟩
}
⟨plain⟩}\relax
⟨*package⟩
```

Consequently (if all goes well), we are the last ones to change these commands, therefore there is no need to check whether our definition has survived.

\MT@check@font

Check whether we've already seen the current font.

```
\def\MT@check@font{\MT@exp@one@n\MT@in@clist\MT@font\MT@font@list}
```

\MT@register@font

Register the current font.

```
\def\MT@register@font{\xdef\MT@font@list{\MT@font@list\MT@font,}}
```

\MT@register@subst@font

Register the substituted font (only if it isn't registered already). Additionally, we have to remove the substitute font from the list of fonts, so that we set it up again.

```
\def\MT@register@subst@font{%
  \MT@exp@one@n\MT@in@clist\font@name\MT@font@list
  \ifMT@inlist@\else
    \xdef\MT@font@list{\MT@font@list\font@name,}%
    \expandafter\MT@rem@from@clist\MT@font\MT@font@list
  \fi
}
```

14.2.10 Context-sensitive setup

Here are the variants for context-sensitive setup.

\MT@active@features

The activated features are stored in this command.

```
\let\MT@active@features\@empty
```

\MT@check@font@cx

Every feature has its own list of fonts that have already been dealt with. If the font needn't be set up for a feature, we temporarily disable the corresponding setup command. This should be more efficient than book-keeping the fonts in lists associated with the combination of contexts, as we've done it before.

```
\def\MT@check@font@cx{%
  \MT@if@true
  \MT@map@clist@c\MT@active@features{%
    \expandafter\MT@exp@one@n\expandafter\MT@in@clist\expandafter\MT@font
      \csname MT@##1@\csname MT@##1@context\endcsname font@list\endcsname
    \ifMT@inlist@
      \MT@let@nc{MT@\@nameuse{MT@abbr@##1}}\relax
    \else
      \MT@if@false
    \fi
  }%
  \ifMT@if@ \MT@inlist@true \else \MT@inlist@false \fi
}
```

\MT@register@subst@font@cx

Add the substituted font to each feature list and possibly remove substitute font.

```
\def\MT@register@subst@font@cx{%
  \MT@map@clist@c\MT@active@features{%
    \expandafter\MT@exp@one@n\expandafter\MT@in@clist\expandafter\font@name
      \csname MT@##1@\csname MT@##1@context\endcsname font@list\endcsname
    \ifMT@inlist@ \else
      \MT@exp@cs\MT@xadd
        {MT@##1@\csname MT@##1@context\endcsname font@list}%
        {\font@name,}%
      \expandafter\MT@exp@one@n\expandafter\MT@rem@from@clist\expandafter\MT@font
         \csname MT@##1@\csname MT@##1@context\endcsname font@list\endcsname
    \fi
  }%
}
```

\MT@register@font@cx

For each feature, add the current font to the list, unless we didn’t set it up.

```
\def\MT@register@font@cx{%
  \MT@map@clist@c\MT@active@features{%
    \MT@exp@cs\ifx{MT@\@nameuse{MT@abbr@##1}}\relax\else
      \MT@exp@cs\MT@xadd
        {MT@##1@\csname MT@##1@context\endcsname font@list}%
        {\MT@font,}%
      \def\@tempa{##1}%
      \MT@exp@cs\MT@map@tlist@c{MT@##1@doc@contexts}\MT@maybe@rem@from@list
    \fi
  }%
}
```

\MT@maybe@rem@from@list

Recurse through all context font lists of the document and remove the font, unless it’s the current context.

```
\def\MT@maybe@rem@from@list#1{%
  \MT@ifstreq{\@tempa/#1}{\@tempa/\csname MT@\@tempa @context\endcsname}\relax{%
    \expandafter\MT@exp@one@n\expandafter\MT@rem@from@clist\expandafter
       \MT@font \csname MT@\@tempa @#1font@list\endcsname
  }%
}
```

\microtypecontext
\MT@microtypecontext

The user may change the context, so that different setups are possible. This is especially useful for multi-lingual documents.

Inside the preamble, this command shouldn’t actually do anything but remember itself for later.

```
\def\microtypecontext{\MT@begin@catcodes\MT@microtypecontext}
\def\MT@microtypecontext#1{\MT@end@catcodes\MT@addto@setup{\microtypecontext{#1}}}
\MT@addto@setup{%
  \DeclareRobustCommand\microtypecontext{%
    \MT@begin@catcodes
    \MT@microtypecontext
  }%
  \def\MT@microtypecontext#1{%
    \MT@end@catcodes
    \MT@setup@contexts
    \let\MT@reset@context\relax
```

We need to ensure that math fonts are set up anew.

```
    \MT@glet\glb@currsize\@empty
    \setkeys{MTC}{#1}%
    \selectfont
    \MT@reset@context
  }%
}
```

\textmicrotypecontext
\MT@textmicrotypecontext
\MT@text@microtypecontext

This is just a wrapper around \microtypecontext.

```
\DeclareRobustCommand\textmicrotypecontext{\MT@begin@catcodes\MT@textmicrotypecontext}
\def\MT@textmicrotypecontext#1{\MT@end@catcodes\MT@text@microtypecontext{#1}}
\def\MT@text@microtypecontext#1#2{{\microtypecontext{#1}#2}}
```

\MT@reset@context
\MT@reset@context@

We have to reset the font at the end of the group, provided there actually was a change.

```
\def\MT@reset@context@{%
  \MT@vinfo{<<< Resetting contexts\on@line
⟨debug⟩  \MessageBreak= \MT@pr@context/\MT@ex@context
⟨debug⟩                 /\MT@tr@context/\MT@kn@context/\MT@sp@context
  }%
  \selectfont
}
```

\MT@setup@contexts

The first time \microtypecontext is called, we initialise the context lists and redefine the commands used in \pickup@font.

```
\def\MT@setup@contexts{%
  \MT@map@clist@c\MT@active@features
    {\MT@glet@nc{MT@##1@@font@list}\MT@font@list}%
  \MT@glet\MT@check@font\MT@check@font@cx
  \MT@glet\MT@register@font\MT@register@font@cx
  \MT@glet\MT@register@subst@font\MT@register@subst@font@cx
  \MT@glet\MT@setup@contexts\relax
}
```

Define context keys.

```
\MT@map@clist@c\MT@features@long{%
  \define@key{MTC}{#1}[]{%
    \edef\@tempb{\@nameuse{MT@rbba@#1}}%
    \MT@exp@one@n\MT@in@clist\@tempb\MT@active@features
    \ifMT@inlist@
```

Using an empty context is only asking for trouble, therefore we choose the '@' instead (hoping for the LaTeX users' natural awe of this character).

```
      \MT@ifempty{##1}{\def\MT@val{@}}{\def\MT@val{##1}}%
      \MT@exp@cs\ifx{MT@\@tempb @context}\MT@val
⟨debug⟩\MT@dinfo{1}{>>> no change of #1 context: `\MT@val'}%
      \else
        \MT@vinfo{>>> Changing #1 context to `\MT@val'\MessageBreak\on@line
⟨debug⟩           \space(previous: `\@nameuse{MT@\@tempb @context}')%
           }%
        \def\MT@reset@context{\aftergroup\MT@reset@context@}%
```

The next time we see the font, we have to reset *all* factors.

```
        \MT@glet@nn{MT@reset@\@tempb @codes}{MT@reset@\@tempb @codes@}%
```

We must also keep track of all contexts in the document.

```
        \expandafter\MT@exp@one@n\expandafter\MT@in@tlist\expandafter
          \MT@val \csname MT@\@tempb @doc@contexts\endcsname
        \ifMT@inlist@ \else
          \MT@exp@cs\MT@xadd{MT@\@tempb @doc@contexts}{{\MT@val}}%
⟨debug⟩  \MT@dinfo{1}{||| added #1 context: \@nameuse{MT@\@tempb @doc@contexts}}%
```

```
        \fi
        \MT@edef@n{MT@\@tempb @context}{\MT@val}%
      \fi
    \fi
  }%
}
```

We also allow the `activate` shortcut.

```
\define@key{MTC}{activate}[]{%
  \setkeys{MTC}{protrusion={#1}}%
  \setkeys{MTC}{expansion={#1}}%
}
```

\MT@pr@context
\MT@ex@context
\MT@tr@context
\MT@sp@context
\MT@kn@context
\MT@pr@doc@contexts
\MT@ex@doc@contexts
\MT@tr@doc@contexts
\MT@sp@doc@contexts
\MT@kn@doc@contexts
\MT@extra@context

Initialise the contexts.

```
\MT@exp@one@n\MT@map@clist@n{\MT@features,nl}{%
  \MT@def@n{MT@#1@context}{@}%
  \MT@def@n{MT@#1@doc@contexts}{{@}}%
}
\let\MT@extra@context\@empty
```

14.3 Configuration

14.3.1 Font sets

\DeclareMicrotypeSet
\DeclareMicrotypeSet*

Calling this macro will create a comma list for every font attribute of the form: `\MT`⟨*feature*⟩`list@`⟨*attribute*⟩`@`⟨*set name*⟩. If the optional argument is empty, lists for all available features will be created.

The third argument must be a list of `key=value` pairs. If a font attribute is not specified, we define the corresponding list to `\relax`, so that it does not constitute a constraint.

```
\def\DeclareMicrotypeSet{%
  \MT@begin@catcodes
  \@ifstar
    \MT@DeclareSetAndUseIt
    \MT@DeclareSet
}
```

\MT@DeclareSet

```
\newcommand\MT@DeclareSet[3][]{%
  \MT@ifempty{#1}{%
    \MT@map@clist@c\MT@features{{\MT@declare@sets{##1}{#2}{#3}}}%
  }{%
    \MT@map@clist@n{#1}{{%
      \MT@ifempty{##1}\relax{%
        \MT@is@feature{##1}{set declaration `#2'}{%
          \MT@exp@one@n\MT@declare@sets
            {\csname MT@rbba@##1\endcsname}{#2}{#3}%
        }%
      }%
    }}%
  }%
  \MT@end@catcodes
}
```

\MT@DeclareSetAndUseIt

```
\newcommand\MT@DeclareSetAndUseIt[3][]{%
  \MT@DeclareSet[#1]{#2}{#3}%
  \UseMicrotypeSet[#1]{#2}%
}
```

\MT@curr@set@name

We need to remember the name of the set currently being declared.

```
\let\MT@curr@set@name\@empty
```

\MT@declare@sets

Define the current set name and parse the keys.

```
\def\MT@declare@sets#1#2#3{%
  \def\MT@curr@set@name{#2}%
  \MT@ifdefined@n@T{MT@#1@set@@\MT@curr@set@name}{%
    \MT@warning{Redefining \@nameuse{MT@abbr@#1} set `\MT@curr@set@name'}%
    \MT@map@clist@n{font,encoding,family,series,shape,size}{%
      \MT@glet@nc{MT@#1list@##1@\MT@curr@set@name}\@undefined
    }%
  }%
  \MT@glet@nc{MT@#1@set@@\MT@curr@set@name}\@empty
⟨debug⟩\MT@dinfo{1}{declaring \@nameuse{MT@abbr@#1} set `\MT@curr@set@name'}%
  \setkeys{MT@#1@set}{#3}%
}
```

\MT@define@set@key@

⟨*#1*⟩ = font axis, ⟨*#2*⟩ = feature.

```
\def\MT@define@set@key@#1#2{%
  \define@key{MT@#2@set}{#1}[]{%
    \MT@glet@nc{MT@#2list@#1@\MT@curr@set@name}\@empty
    \MT@map@clist@n{##1}{%
      \KV@@sp@def\MT@val{####1}%
      \MT@get@highlevel{#1}%
```

We do not add the expanded value to the list . . .

```
      \MT@exp@two@n\g@addto@macro
        {\csname MT@#2list@#1@\MT@curr@set@name\expandafter\endcsname}%
        {\MT@val,}%
    }%
```

. . . but keep in mind that the list has to be expanded at the end of the preamble.

```
    \expandafter\g@addto@macro\expandafter\MT@font@sets
      \csname MT@#2list@#1@\MT@curr@set@name\endcsname
⟨debug⟩\MT@dinfo@nl{1}{-- #1: \@nameuse{MT@#2list@#1@\MT@curr@set@name}}%
  }%
}
```

\MT@get@highlevel

Saying, for instance, '`family=rm*`' or '`shape=bf*`' will expand to `\rmdefault` resp. `\bfdefault`.

```
\def\MT@get@highlevel#1{%
  \expandafter\MT@test@ast\MT@val*\@nil\relax{%
```

And '`family = *`' will become `\familydefault`.

```
    \MT@ifempty\@tempa{\def\@tempa{#1}}\relax
```

Test whether the command is actually defined.

```
    \MT@ifdefined@n@TF{\@tempa default}%
      {\edef\MT@val{\expandafter\noexpand\csname \@tempa default\endcsname}}%
      {\MT@warning{`\@backslashchar\@tempa default' is not a defined command.\MessageBreak
                   Ignoring `#1 = {\@tempa*}' in font set\MessageBreak`\MT@curr@set@name'}%
       \let\MT@val\@empty}%
```

In contrast to earlier versions, these values will not be expanded immediately, but at the end of the preamble.

```
  }%
}
```

\MT@test@ast

It the last character is an asterisk, execute the second argument, otherwise the first one.

```
\def\MT@test@ast#1*#2\@nil{%
  \def\@tempa{#1}%
  \MT@ifempty{#2}%
}
```

\MT@font@sets
\MT@fix@font@set

Fully expand the font specification and fix catcodes for all font sets. Also remove fontspec's counters.

```
\let\MT@font@sets\@empty
\def\MT@fix@font@set#1{%
  \MT@ifdefined@c@T{#1}{%
    \xdef#1{#1}%
    \ifMT@fontspec
      \xdef#1{\expandafter\MT@scrubfeatures#1()\relax}%
    \fi
    \global\@onelevel@sanitize#1%
  }%
}
```

\MT@define@set@key@size

size requires special treatment.

```
\def\MT@define@set@key@size#1{%
  \define@key{MT@#1@set}{size}[]{%
    \MT@map@clist@n{##1}{%
      \def\MT@val{####1}%
      \expandafter\MT@get@range\MT@val--\@nil
      \ifx\MT@val\relax \else
        \MT@exp@cs\MT@xadd
          {MT@#1list@size@\MT@curr@set@name}%
          {{{\MT@lower}{\MT@upper}\relax}}%
      \fi
    }%
⟨debug⟩\MT@dinfo@nl{1}{-- size: \@nameuse{MT@#1list@size@\MT@curr@set@name}}%
  }%
}
```

Font sizes may also be specified as ranges. This has been requested by Andreas Bühmann, who has also offered valuable help in implementing this. Now, it is for instance possible to set up different lists for fonts with optical sizes. (The MinionPro project does this for the OpenType version of Adobe's Minion. (Available from CTAN at pkg/minionpro))

\MT@get@range
\MT@upper
\MT@lower

Ranges will be stored as triplets of {⟨*lower bound*⟩}{⟨*upper bound*⟩}{⟨*list name*⟩}. For simple sizes, the upper boundary is -1.

```
\def\MT@get@range#1-#2-#3\@nil{%
  \MT@ifempty{#1}{%
    \MT@ifempty{#2}{%
      \let\MT@val\relax
    }{%
      \def\MT@lower{0}%
      \def\MT@val{#2}%
      \MT@get@size
      \edef\MT@upper{\MT@val}%
    }%
  }{%
    \def\MT@val{#1}%
    \MT@get@size
    \ifx\MT@val\relax \else
      \edef\MT@lower{\MT@val}%
      \MT@ifempty{#2}{%
        \MT@ifempty{#3}%
          {\def\MT@upper{-1}}%
```

2048 pt is TEX's maximum font size.

```
          {\def\MT@upper{2048}}%
      }{%
        \def\MT@val{#2}%
        \MT@get@size
        \ifx\MT@val\relax \else
          \MT@ifdim\MT@lower>\MT@val{%
            \MT@error{%
              Invalid size range (\MT@lower\space > \MT@val) in font set
              `\MT@curr@set@name'.\MessageBreak Swapping sizes}{}%
            \edef\MT@upper{\MT@lower}%
            \edef\MT@lower{\MT@val}%
          }{%
            \edef\MT@upper{\MT@val}%
          }%
          \MT@ifdim\MT@lower=\MT@upper
            {\def\MT@upper{-1}}%
            \relax
        \fi
      }%
    \fi
  }%
}
```

\MT@get@size

Translate a size selection command and normalise it.

```
\def\MT@get@size{%
```

A single star would mean `\sizedefault`, which doesn't exist, so we define it to be `\normalsize`.

```
  \if*\MT@val\relax
    \def\@tempa{\normalsize}%
  \else
    \MT@let@cn\@tempa{\MT@val}%
  \fi
  \ifx\@tempa\relax\else
    \MT@get@size@
  \fi
```

Test whether we finally got a number or dimension so that we can strip the 'pt' (`\@defaultunits` and `\strip@pt` are kernel macros).

```
  \MT@ifdimen\MT@val{%
    \@defaultunits\@tempdima\MT@val pt\relax\@nnil
    \edef\MT@val{\strip@pt\@tempdima}%
  }{%
    \MT@warning{Could not parse font size `\MT@val'\MessageBreak
                in font set `\MT@curr@set@name'}%
    \let\MT@val\relax
  }%
}
```

\MT@get@size@
\MT@get@size@@

The `relsize` solution of parsing `\@setfontsize` does not work with the AMS classes, among others. I hope my hijacking doesn't do any harm. We redefine `\set@fontsize` instead of `\@setfontsize` because some classes might define the size selection commands by simply using `\fontsize` (e.g., the `a0poster` class).

```
\def\MT@get@size@@{%
  \begingroup
    \def\set@fontsize##1##2##3##4\@nil{\endgroup\def\MT@val{##2}}%
    \@tempa\@nil
}
```

The `svjour3` class defines the size commands using conditionals; using e-TeX primitives, we close any leftovers here.

```
^^X\@ifclassloaded{svjour3}{%
^^X  \def\MT@get@size@{%
^^X    \@tempcnta=\currentiflevel
^^X    \MT@get@size@@
^^X    \MT@loop
^^X      \ifnum\numexpr\currentiflevel-1>\@tempcnta
^^X      \csname fi\endcsname
^^X    \MT@repeat
^^X  }%
^^X}{%
```

```
  \let\MT@get@size@\MT@get@size@@
^^X}
```

\MT@define@set@key@font

```
\def\MT@define@set@key@font#1{%
  \define@key{MT@#1@set}{font}[]{%
    \MT@glet@nc{MT@#1list@font@\MT@curr@set@name}\@empty
    \MT@map@clist@n{##1}{%
      \def\MT@val{####1}%
      \MT@ifstreq\MT@val*{\def\MT@val{*/*/*/*/*}}\relax
      \expandafter\MT@get@font\MT@val/////\@nil
      \MT@exp@two@n\g@addto@macro
        {\csname MT@#1list@font@\MT@curr@set@name\expandafter\endcsname}%
        {\MT@val,}%
    }%
    \expandafter\g@addto@macro\expandafter\MT@font@sets
      \csname MT@#1list@font@\MT@curr@set@name\endcsname
⟨debug⟩\MT@dinfo@nl{1}{-- font: \@nameuse{MT@#1list@font@\MT@curr@set@name}}%
  }%
}
```

\MT@get@font Translate any asterisks.

```
\def\MT@get@font#1/#2/#3/#4/#5/#6\@nil{%
  \MT@get@font@{#1}{#2}{#3}{#4}{#5}{0}%
  \ifx\MT@val\relax\def\MT@val{0}\fi
  \expandafter\g@addto@macro\expandafter\@tempb\expandafter{\MT@val}%
  \let\MT@val\@tempb
}
```

\MT@get@font@ Helper macro, also used by \MT@get@font@and@size.

```
\def\MT@get@font@#1#2#3#4#5#6{%
  \let\@tempb\@empty
  \def\MT@temp{#1/#2/#3/#4/#5}%
  \MT@get@axis{encoding}{#1}%
  \MT@get@axis{family}  {#2}%
  \MT@get@axis{series}  {#3}%
  \MT@get@axis{shape}   {#4}%
  \ifnum#6>\z@\edef\@tempb{\@tempb*}\fi
  \MT@ifempty{#5}{%
    \MT@warn@axis@empty{size}{\string\normalsize}%
    \def\MT@val{*}%
  }{%
    \def\MT@val{#5}%
  }%
  \MT@get@size
}
```

\MT@get@axis

```
\def\MT@get@axis#1#2{%
  \def\MT@val{#2}%
  \MT@get@highlevel{#1}%
  \MT@ifempty\MT@val{%
    \MT@warn@axis@empty{#1}{\csname #1default\endcsname}%
    \expandafter\def\expandafter\MT@val\expandafter{\csname #1default\endcsname}%
  }\relax
  \expandafter\g@addto@macro\expandafter\@tempb\expandafter{\MT@val/}%
}
```

\MT@warn@axis@empty

```
\def\MT@warn@axis@empty#1#2{%
  \MT@warning{#1 axis is empty in font specification\MessageBreak
    `\MT@temp'. Using `#2' instead}%
}
```

We can finally assemble all pieces to define \DeclareMicrotypeSet's keys. They are also used for \DisableLigatures.

```
\MT@exp@one@n\MT@map@clist@n{\MT@features,nl}{%
  \MT@define@set@key@{encoding}{#1}%
  \MT@define@set@key@{family}  {#1}%
  \MT@define@set@key@{series}  {#1}%
  \MT@define@set@key@{shape}   {#1}%
  \MT@define@set@key@size      {#1}%
  \MT@define@set@key@font      {#1}%
}
```

\UseMicrotypeSet

To use a particular set we simply redefine MT@⟨*feature*⟩@setname. If the optional argument is empty, set names for all features will be redefined.

```
\def\UseMicrotypeSet{%
  \MT@begin@catcodes
  \MT@UseMicrotypeSet
}
```

\MT@UseMicrotypeSet

```
\newcommand*\MT@UseMicrotypeSet[2][]{%
  \MT@ifempty{#1}{%
    \MT@map@clist@c\MT@features{{\MT@use@set{##1}{#2}}}%
  }{%
    \MT@map@clist@n{#1}{{%
      \MT@ifempty{##1}\relax{%
        \MT@is@feature{##1}{activation of set `#2'}{%
          \MT@exp@one@n\MT@use@set
            {\csname MT@rbba@##1\endcsname}{#2}%
        }%
      }%
    }}%
  }%
  \MT@end@catcodes
}
```

\MT@pr@setname
\MT@ex@setname
\MT@tr@setname
\MT@sp@setname
\MT@kn@setname
\MT@use@set

Only use sets that have been declared.

```
\def\MT@use@set#1#2{%
  \MT@ifdefined@n@TF{MT@#1@set@@#2}{%
    \MT@xdef@n{MT@#1@setname}{#2}%
  }{%
    \MT@ifdefined@n@TF{MT@#1@setname}\relax{%
      \MT@xdef@n{MT@#1@setname}{\@nameuse{MT@default@#1@set}}%
    }%
    \MT@error{%
      The \@nameuse{MT@abbr@#1} set `#2' is undeclared.\MessageBreak
      Using set `\@nameuse{MT@#1@setname}' instead}{}%
  }%
}
```

\DeclareMicrotypeSetDefault

This command can be used in the main configuration file to declare the default font set, in case no set is specified in the package options.

```
\def\DeclareMicrotypeSetDefault{%
  \MT@begin@catcodes
  \MT@DeclareMicrotypeSetDefault
}
```

\MT@DeclareMicrotypeSetDefault

```
\newcommand*\MT@DeclareMicrotypeSetDefault[2][]{%
  \MT@ifempty{#1}{%
    \MT@map@clist@c\MT@features{{\MT@set@default@set{##1}{#2}}}%
  }{%
    \MT@map@clist@n{#1}{{%
      \MT@ifempty{##1}\relax{%
        \MT@is@feature{##1}{declaration of default set `#2'}{%
          \MT@exp@one@n\MT@set@default@set
```

```
            {\csname MT@rbba@##1\endcsname}{#2}%
        }%
      }%
    }}%
  }%
  \MT@end@catcodes
}
```

\MT@default@pr@set
\MT@default@ex@set
\MT@default@tr@set
\MT@default@sp@set
\MT@default@kn@set
\MT@set@default@set

```
\def\MT@set@default@set#1#2{%
  \MT@ifdefined@n@TF{MT@#1@set@@#2}{%
⟨debug⟩\MT@dinfo{1}{declaring default \@nameuse{MT@abbr@#1} set `#2'}%
    \MT@xdef@n{MT@default@#1@set}{#2}%
  }{%
    \MT@error{%
      The \@nameuse{MT@abbr@#1} set `#2' is not declared.\MessageBreak
      Cannot make it the default set. Using set\MessageBreak `all' instead}{}%
    \MT@xdef@n{MT@default@#1@set}{all}%
  }%
}
```

14.3.2 Variants and aliases

\DeclareMicrotypeVariants
\MT@variants

Specify suffixes for variants (see fontname/variants.map). The starred version appends to the list.

```
\let\MT@variants\@empty
\def\DeclareMicrotypeVariants{%
  \MT@begin@catcodes
  \@ifstar
    \MT@DeclareVariants
    {\let\MT@variants\@empty\MT@DeclareVariants}%
}
```

\MT@DeclareVariants

```
\def\MT@DeclareVariants#1{%
  \MT@map@clist@n{#1}{%
    \def\@tempa{##1}%
    \@onelevel@sanitize\@tempa
    \xdef\MT@variants{\MT@variants{\@tempa}}%
  }%
  \MT@end@catcodes
}
```

\DeclareMicrotypeAlias

This can be used to set an alias name for a font, so that the file and the settings for the aliased font will be loaded.

```
\def\DeclareMicrotypeAlias{%
  \MT@begin@catcodes
  \MT@DeclareMicrotypeAlias
}
```

\MT@DeclareMicrotypeAlias

```
\newcommand*\MT@DeclareMicrotypeAlias[2]{%
  \def\@tempb{#2}%
  \@onelevel@sanitize\@tempb
  \MT@ifdefined@n@T{MT@#1@alias}{%
    \MT@warning{Alias font family `\@tempb' will override
      alias `\@nameuse{MT@#1@alias}'\MessageBreak
      for font family `#1'}}%
  \MT@xdef@n{MT@#1@alias}{\@tempb}%
```

If we encounter this command while a font is being set up, we also set the alias for the current font so that if \DeclareMicrotypeAlias has been issued inside a configuration file, the configuration file for the alias font will be loaded, too.

```
  \MT@ifdefined@c@T\MT@family{%
⟨debug⟩\MT@dinfo{1}{Activating alias font `\@tempb' for `\MT@family'}%
    \MT@glet\MT@familyalias\@tempb
  }%
  \MT@end@catcodes
}
```

\LoadMicrotypeFile

May be used to load a configuration file manually.

```
\def\LoadMicrotypeFile#1{%
  \edef\@tempa{\zap@space#1 \@empty}%
  \@onelevel@sanitize\@tempa
  \MT@exp@one@n\MT@in@clist\@tempa\MT@file@list
  \ifMT@inlist@
    \MT@vinfo{... Configuration file mt-\@tempa.cfg already loaded}%
  \else
    \MT@xadd\MT@file@list{\@tempa,}%
    \MT@begin@catcodes
    \InputIfFileExists{mt-\@tempa.cfg}{%
      \edef\MT@curr@file{mt-\@tempa.cfg}%
      \MT@vinfo{... Loading configuration file \MT@curr@file}%
    }{%
      \MT@warning{Configuration file mt-\@tempa.cfg\MessageBreak
                  does not exist}%
    }%
    \MT@end@catcodes
  \fi
}
⟨/package⟩
⟨/package|letterspace⟩
```

14.3.3 Disabling ligatures

\DisableLigatures
\MT@DisableLigatures
\MT@nl@setname
\MT@nl@ligatures

This is really simple now: we can re-use the set definitions of \DeclareMicrotypeSet; there can only be one set, which we'll call 'no ligatures'.

The optional argument may be used to disable selected ligatures only.

```
⟨*pdftex-def|luatex-def⟩
⟨pdftex-def⟩\MT@requires@pdftex5{
\def\DisableLigatures{%
  \MT@begin@catcodes
  \MT@DisableLigatures
}
\newcommand*\MT@DisableLigatures[2][]{%
  \MT@ifempty{#1}\relax{\gdef\MT@nl@ligatures{#1}}%
  \xdef\MT@active@features{\MT@active@features,nl}%
  \global\MT@noligaturestrue
  \MT@declare@sets{nl}{no ligatures}{#2}%
  \gdef\MT@nl@setname{no ligatures}%
  \MT@end@catcodes
}
⟨pdftex-def⟩}{
⟨/pdftex-def|luatex-def⟩
```

If pdfTeX is too old, we throw an error.

```
⟨*pdftex-def|xetex-def⟩
\renewcommand*\DisableLigatures[2][]{%
  \MT@error{Disabling ligatures of a font is only possible\MessageBreak
    with pdftex version 1.30 or newer.\MessageBreak
    Ignoring \string\DisableLigatures}{%
⟨pdftex-def⟩    Upgrade
⟨xetex-def⟩    Use
    pdftex.}%
}
```

```
⟨pdftex-def⟩}
⟨/pdftex-def|xetex-def⟩
```

14.3.4 Interaction with babel

\DeclareMicrotypeBabelHook

Declare the context that should be loaded when a babel language is selected. The command will not check whether a previous declaration will be overwritten.

```
⟨*package⟩
\def\DeclareMicrotypeBabelHook#1#2{%
  \MT@map@clist@n{#1}{%
    \KV@@sp@def\@tempa{##1}%
    \MT@gdef@n{MT@babel@\@tempa}{#2}%
  }%
}
⟨/package⟩
```

14.3.5 Fine tuning

The commands \SetExpansion and \SetProtrusion provide an interface for setting the character protrusion resp. expansion factors for a set of fonts.

\SetProtrusion

This macro accepts three arguments: [options,] set of font attributes and list of character protrusion factors.

A new macro called \MT@pr@c@⟨*name*⟩ will be defined to be ⟨*#3*⟩ (i.e., the list of characters, not expanded).

```
⟨*pdftex-def|xetex-def|luatex-def⟩
\def\SetProtrusion{%
  \MT@begin@catcodes
  \MT@SetProtrusion
}
```

\MT@SetProtrusion
\MT@pr@c@name
\MT@extra@context
\MT@permutelist

We want the catcodes to be correct even if this is called in the preamble.

```
\newcommand*\MT@SetProtrusion[3][]{%
  \let\MT@extra@context\@empty
```

Parse the optional first argument. We first have to know the name before we can deal with the extra options.

```
  \MT@set@named@keys{MT@pr@c}{#1}%
⟨debug⟩\MT@dinfo{1}{creating protrusion list `\MT@pr@c@name'}%
  \def\MT@permutelist{pr@c}%
  \setkeys{MT@cfg}{#2}%
```

We have parsed the second argument, and can now define macros for all permutations of the font attributes to point to \MT@pr@c@⟨*name*⟩, . . .

```
  \MT@permute
```

. . . which we can now define to be ⟨*#3*⟩. Here, as elsewhere, we have to make the definitions global, since they will occur inside a group.

```
  \MT@gdef@n{MT@pr@c@\MT@pr@c@name}{#3}%
  \MT@end@catcodes
}
⟨/pdftex-def|xetex-def|luatex-def⟩
```

\SetExpansion

\SetExpansion only differs in that it allows some extra options (stretch, shrink, step, auto).

```
⟨*pdftex-def|luatex-def⟩
\def\SetExpansion{%
  \MT@begin@catcodes
  \MT@SetExpansion
}
```

\MT@SetExpansion

\MT@ex@c@name

\MT@extra@context

\MT@permutelist

```
\newcommand*\MT@SetExpansion[3][]{%
  \let\MT@extra@context\@empty
  \MT@set@named@keys{MT@ex@c}{#1}%
  \MT@ifdefined@n@T{MT@ex@c@\MT@ex@c@name @factor}{%
    \ifnum\csname MT@ex@c@\MT@ex@c@name @factor\endcsname > \@m
      \MT@warning@nl{Expansion factor \number\@nameuse{MT@ex@c@\MT@ex@c@name @factor}
        too large in list\MessageBreak `\MT@ex@c@name'. Setting it to the
        maximum of 1000}%
      \MT@glet@nc{MT@ex@c@\MT@ex@c@name @factor}\@m
    \fi
  }%
⟨debug⟩\MT@dinfo{1}{creating expansion list `\MT@ex@c@name'}%
  \def\MT@permutelist{ex@c}%
  \setkeys{MT@cfg}{#2}%
  \MT@permute
  \MT@gdef@n{MT@ex@c@\MT@ex@c@name}{#3}%
  \MT@end@catcodes
}
```

\SetTracking

```
\def\SetTracking{%
  \MT@begin@catcodes
  \MT@SetTracking
}
```

\MT@SetTracking

Third argument may be empty.

```
\newcommand*\MT@SetTracking[3][]{%
  \let\MT@extra@context\@empty
  \MT@set@named@keys{MT@tr@c}{#1}%
⟨debug⟩\MT@dinfo{1}{creating tracking list `\MT@tr@c@name'}%
  \def\MT@permutelist{tr@c}%
  \setkeys{MT@cfg}{#2}%
  \MT@permute
  \KV@@sp@def\@tempa{#3}%
  \MT@ifempty\@tempa\relax{%
    \MT@ifint\@tempa
      {\MT@xdef@n{MT@tr@c@\MT@tr@c@name}{\@tempa}}%
      {\MT@warning{Value `\@tempa' is not a number in\MessageBreak
                   tracking set `\MT@curr@set@name'}}}%
  \MT@end@catcodes
}
⟨/pdftex-def|luatex-def⟩
```

\SetExtraSpacing

```
⟨*pdftex-def⟩
\def\SetExtraSpacing{%
  \MT@begin@catcodes
  \MT@SetExtraSpacing
}
```

\MT@SetExtraSpacing

\MT@sp@c@name

\MT@extra@context

\MT@permutelist

```
\newcommand*\MT@SetExtraSpacing[3][]{%
  \let\MT@extra@context\@empty
  \MT@set@named@keys{MT@sp@c}{#1}%
⟨debug⟩\MT@dinfo{1}{creating spacing list `\MT@sp@c@name'}%
  \def\MT@permutelist{sp@c}%
  \setkeys{MT@cfg}{#2}%
  \MT@permute
  \MT@gdef@n{MT@sp@c@\MT@sp@c@name}{#3}%
  \MT@end@catcodes
}
```

\SetExtraKerning

```
\def\SetExtraKerning{%
  \MT@begin@catcodes
  \MT@SetExtraKerning
}
```

\MT@SetExtraKerning
\MT@kn@c@name
\MT@extra@context
\MT@permutelist

```
\newcommand*\MT@SetExtraKerning[3][]{%
  \let\MT@extra@context\@empty
  \MT@set@named@keys{MT@kn@c}{#1}%
⟨debug⟩\MT@dinfo{1}{creating kerning list `\MT@kn@c@name'}%
  \def\MT@permutelist{kn@c}%
  \setkeys{MT@cfg}{#2}%
  \MT@permute
  \MT@gdef@n{MT@kn@c@\MT@kn@c@name}{#3}%
  \MT@end@catcodes
}
⟨/pdftex-def⟩
```

\MT@set@named@keys
\MT@options

We first set the name (if specified), then remove it from the list, and set the remaining keys.

```
⟨*package⟩
\def\MT@set@named@keys#1#2{%
  \def\x##1name=##2,##3\@nil{%
    \setkeys{#1}{name=##2}%
    \gdef\MT@options{##1##3}%
    \MT@rem@from@clist{name=}\MT@options
  }%
  \x#2,name=,\@nil
  \@expandtwoargs\setkeys{#1}\MT@options
}
```

\MT@define@code@key

Define the keys for the configuration lists (which are setting the codes, in pdfTEX speak).

```
\def\MT@define@code@key#1#2{%
  \define@key{MT@#2}{#1}[]{%
    \@tempcnta=\@ne
    \MT@map@clist@n{##1}{%
      \KV@@sp@def\MT@val{####1}%
```

Here, too, we allow for something like ‘bf*’. It will be expanded immediately.

```
      \MT@get@highlevel{#1}%
      \MT@edef@n{MT@temp#1\the\@tempcnta}{\MT@val}%
      \advance\@tempcnta \@ne
    }%
  }%
}
```

\MT@define@code@key@family

Remove fontspec’s internal feature counter.

```
\def\MT@define@code@key@family#1{%
  \define@key{MT@#1}{family}[]{%
    \@tempcnta=\@ne
    \MT@map@clist@n{##1}{%
      \KV@@sp@def\MT@val{####1}%
      \MT@get@highlevel{family}%
      \ifMT@fontspec
        \edef\x{\edef\noexpand\MT@val{\noexpand\MT@scrubfeature\MT@val()\relax}}\x
      \fi
      \MT@edef@n{MT@tempfamily\the\@tempcnta}{\MT@val}%
      \advance\@tempcnta \@ne
    }%
  }%
}
```

\MT@define@code@key@size

\MT@tempsize must be in a \csname, so that it is at least \relax, not undefined.

```
\def\MT@define@code@key@size#1{%
  \define@key{MT@#1}{size}[]{%
    \MT@map@clist@n{##1}{%
      \KV@@sp@def\MT@val{####1}%
      \expandafter\MT@get@range\MT@val--\@nil
      \ifx\MT@val\relax \else
        \MT@exp@cs\MT@xadd{MT@tempsize}%
           {{{\MT@lower}{\MT@upper}{\MT@curr@set@name}}}%
      \fi
    }%
  }%
}
```

\MT@define@code@key@font

```
\def\MT@define@code@key@font#1{%
  \define@key{MT@#1}{font}[]{%
    \MT@map@clist@n{##1}{%
      \KV@@sp@def\MT@val{####1}%
      \MT@ifstreq\MT@val*{\def\MT@val{*/*/*/*/*}}\relax
      \expandafter\MT@get@font@and@size\MT@val/////\@nil
      \ifMT@fontspec
        \edef\@tempb{\expandafter\MT@scrubfeatures\@tempb()\relax}%
      \fi
      \MT@xdef@n{MT@\MT@permutelist @\@tempb\MT@extra@context}%
        {\csname MT@\MT@permutelist @name\endcsname}%
⟨debug⟩\MT@dinfo@nl{1}{initialising: use list for font \@tempb=\MT@val
⟨debug⟩                 \ifx\MT@extra@context\@empty\else\MessageBreak
⟨debug⟩                   (context: \MT@extra@context)\fi}%
      \MT@exp@cs\MT@xaddb
        {MT@\MT@permutelist @\@tempb\MT@extra@context @sizes}%
        {{{\MT@val}{\m@ne}{\MT@curr@set@name}}}%
    }%
  }%
}
```

\MT@get@font@and@size

Translate any asterisks and split off the size.

```
\def\MT@get@font@and@size#1/#2/#3/#4/#5/#6\@nil{%
  \MT@get@font@{#1}{#2}{#3}{#4}{#5}{1}%
}
```

```
\MT@define@code@key{encoding}{cfg}
\MT@define@code@key@family   {cfg}
\MT@define@code@key{series}  {cfg}
\MT@define@code@key{shape}   {cfg}
\MT@define@code@key@size     {cfg}
\MT@define@code@key@font     {cfg}
```

\MT@define@opt@key

```
\def\MT@define@opt@key#1#2{%
  \define@key{MT@#1@c}{#2}[]{\MT@ifempty{##1}\relax{%
    \MT@xdef@n{MT@#1@c@\MT@curr@set@name @#2}{##1}}}%
}
```

\MT@listname@count

The options in the optional first argument.

```
\newcount\MT@listname@count
\MT@map@clist@c\MT@features{%
```

Use file name and line number as the list name if the user didn't bother to invent one – also check whether the name already exists (in case more than one unnamed list is loaded in the same line, for example \AtBeginDocument).

```
  \define@key{MT@#1@c}{name}[]{%
    \MT@ifempty{##1}{%
      \MT@ifdefined@n@TF{MT@#1@c@\MT@curr@file/\the\inputlineno}{%
        \global\advance\MT@listname@count\@ne
        \MT@edef@n{MT@#1@c@name}{\MT@curr@file/\the\inputlineno
```

```
                                 (\number\MT@listname@count)}%
      }{%
        \MT@edef@n{MT@#1@c@name}{\MT@curr@file/\the\inputlineno}%
      }%
    }{%
      \MT@edef@n{MT@#1@c@name}{##1}%
      \MT@ifdefined@n@T{MT@#1@c@\csname MT@#1@c@name\endcsname}{%
        \MT@warning{Redefining \@nameuse{MT@abbr@#1} list `\@nameuse{MT@#1@c@name}'}%
      }%
    }%
    \MT@let@cn\MT@curr@set@name{MT@#1@c@name}%
  }%
  \MT@define@opt@key{#1}{load}%
  \MT@define@opt@key{#1}{factor}%
  \MT@define@opt@key{#1}{preset}%
  \MT@define@opt@key{#1}{inputenc}%
```

Only one context is allowed. This might change in the future.

```
  \define@key{MT@#1@c}{context}[]{\MT@ifempty{##1}\relax{\def\MT@extra@context{##1}}}%
}
⟨/package⟩
```

Automatically enable font copying if we find a protrusion or expansion context. After the preamble, check whether font copying is enabled. For older pdfTEX versions, disallow. It also works with LuaTEX 0.30 or newer.

```
⟨*pdftex-def|luatex-def⟩
⟨pdftex-def⟩\MT@requires@pdftex7{
  \define@key{MT@ex@c}{context}[]{%
    \MT@ifempty{#1}\relax{%
      \MT@glet\MT@copy@font\MT@copy@font@
      \def\MT@extra@context{#1}%
    }%
  }
  \MT@addto@setup{%
    \define@key{MT@ex@c}{context}[]{%
      \ifx\MT@copy@font\MT@copy@font@
        \MT@ifempty{#1}\relax{\def\MT@extra@context{#1}}%
      \else
        \MT@error{\MT@MT\space isn't set up for expansion contexts.\MessageBreak
           Ignoring `context' key\on@line}%
          {Either move the settings inside the preamble,\MessageBreak
           or load the package with the `copyfonts' option.}%
      \fi
    }%
  }
```

Protrusion contexts *might* also work without copying the font, so we don't issue an error but only a warning. The problem is that pdfTEX only allows one set of protrusion factors for a given font within one paragraph (those that are in effect at the end of the paragraph will be in effect for the whole paragraph). When different fonts are loaded – like in the example with the footnote markers – we don't need to copy the fonts.

```
  \define@key{MT@pr@c}{context}[]{%
    \MT@ifempty{#1}\relax{%
      \MT@glet\MT@copy@font\MT@copy@font@
      \def\MT@extra@context{#1}%
    }%
  }
  \MT@addto@setup{%
    \define@key{MT@pr@c}{context}[]{%
      \MT@ifempty{#1}\relax{\def\MT@extra@context{#1}}%
      \ifx\MT@copy@font\MT@copy@font@\else
        \MT@warning@nl{If protrusion contexts don't work as expected,
          \MessageBreak load the package with the `copyfonts' option}%
      \fi
    }%
  }
⟨/pdftex-def|luatex-def⟩
⟨*pdftex-def⟩
}{
  \define@key{MT@ex@c}{context}[]{%
    \MT@error{Expansion contexts only work with pdftex 1.40.4\MessageBreak
        or later. Ignoring `context' key\on@line}%
      {Upgrade pdftex.}%
  }
⟨/pdftex-def⟩
⟨*pdftex-def|xetex-def⟩
  \define@key{MT@pr@c}{context}[]{%
    \MT@error{Protrusion contexts only work with pdftex
⟨pdftex-def⟩        1.40.4\MessageBreak or later.
⟨xetex-def⟩        \MessageBreak or luatex.
        Ignoring `context' key\on@line}%
⟨pdftex-def⟩      {Upgrade pdftex.}%
⟨xetex-def⟩      {Use pdftex or luatex.}%
  }
⟨/pdftex-def|xetex-def⟩
⟨pdftex-def⟩}
```

\MT@warn@nodim

```
⟨*package⟩
\def\MT@warn@nodim#1{%
  \MT@warning{`\@tempa' is not a dimension.\MessageBreak
              Ignoring it and setting values relative to\MessageBreak #1}%
}
⟨/package⟩
```

Protrusion codes may be relative to character width, or to any dimension.

```
⟨*pdftex-def|xetex-def|luatex-def⟩
\define@key{MT@pr@c}{unit}[character]{%
  \MT@glet@nc{MT@pr@c@\MT@curr@set@name @unit}\@empty
  \def\@tempa{#1}%
  \MT@ifstreq\@tempa{character}\relax{%
```

Test whether it's a dimension, but do not translate it into its final form here, since it may be font-specific.

```
    \MT@ifdimen\@tempa
      {\MT@glet@nc{MT@pr@c@\MT@curr@set@name @unit}\@tempa}%
      {\MT@warn@nodim{character widths}}%
  }%
}
⟨/pdftex-def|xetex-def|luatex-def⟩
```

Tracking may only be relative to a dimension.

```
⟨*pdftex-def|luatex-def⟩
\define@key{MT@tr@c}{unit}[1em]{%
  \MT@glet@nc{MT@tr@c@\MT@curr@set@name @unit}\@empty
  \def\@tempa{#1}%
  \MT@ifdimen\@tempa
    {\MT@glet@nc{MT@tr@c@\MT@curr@set@name @unit}\@tempa}%
    {\MT@warn@nodim{1em}%
     \MT@gdef@n{MT@tr@c@\MT@curr@set@name @unit}{1em}}%
}
⟨/pdftex-def|luatex-def⟩
```

Spacing and kerning codes may additionally be relative to space dimensions.

```
⟨*pdftex-def⟩
\MT@map@clist@n{sp,kn}{%
  \define@key{MT@#1@c}{unit}[space]{%
```

```
    \MT@glet@nc{MT@#1@c@\MT@curr@set@name @unit}\@empty
    \def\@tempa{##1}%
    \MT@ifstreq\@tempa{character}\relax{%
      \MT@glet@nc{MT@#1@c@\MT@curr@set@name @unit}\m@ne
      \MT@ifstreq\@tempa{space}\relax{%
        \MT@ifdimen\@tempa
          {\MT@glet@nc{MT@#1@c@\MT@curr@set@name @unit}\@tempa}%
          {\MT@warn@nodim{width of space}}%
      }%
    }%
  }%
}
⟨/pdftex-def⟩
```

The first argument to `\SetExpansion` accepts some more options.

```
⟨*pdftex-def|luatex-def⟩
\MT@map@clist@n{stretch,shrink,step}{%
  \define@key{MT@ex@c}{#1}[]{%
    \MT@ifempty{##1}\relax{%
      \MT@ifint{##1}{%
```

A space terminates the number.

```
        \MT@gdef@n{MT@ex@c@\MT@curr@set@name @#1}{##1 }%
      }{%
        \MT@warning{%
          Value `##1' for option `#1' is not a number.\MessageBreak
          Ignoring it}%
      }%
    }%
  }%
}
\define@key{MT@ex@c}{auto}[true]{%
  \def\@tempa{#1}%
  \csname if\@tempa\endcsname
```

Don’t use `autoexpand` for pdfTEX version older than 1.20.

```
⟨pdftex-def⟩    \MT@requires@pdftex4%
⟨luatex-def⟩    \MT@requires@luatex3\relax
      {\MT@gdef@n{MT@ex@c@\MT@curr@set@name @auto}{autoexpand}}%
⟨pdftex-def⟩      {\MT@warning{pdftex too old for automatic font expansion}}%
  \else
⟨pdftex-def⟩    \MT@requires@pdftex4%
⟨*luatex-def⟩
    \MT@requires@luatex3{%
      \MT@warning{Non-automatic font expansion doesn't work with\MessageBreak
                  luatex}}%
⟨/luatex-def⟩
      {\MT@glet@nc{MT@ex@c@\MT@curr@set@name @auto}\@empty}%
⟨pdftex-def⟩      \relax
  \fi
}
```

Tracking: Interword spacing and outer kerning. The variant with space just in case `\SetTracking` is called inside an argument (e.g., to `\IfFileExists`).

```
\MT@define@opt@key{tr}{spacing}
\MT@define@opt@key{tr}{outerspacing}
\MT@define@opt@key{tr}{outerkerning}
```

Which ligatures should be disabled?

```
\define@key{MT@tr@c}{noligatures}[]%
  {\MT@xdef@n{MT@tr@c@\MT@curr@set@name @noligatures}{#1}}
\define@key{MT@tr@c}{outer spacing}[]{\setkeys{MT@tr@c}{outerspacing={#1}}}
\define@key{MT@tr@c}{outer kerning}[]{\setkeys{MT@tr@c}{outerkerning={#1}}}
\define@key{MT@tr@c}{no ligatures}[]{\setkeys{MT@tr@c}{noligatures={#1}}}
⟨/pdftex-def|luatex-def⟩
```

14.3.6 Character inheritance

\DeclareCharacterInheritance This macro may be used in the configuration files to declare characters that should inherit protrusion resp. expansion values from other characters. Thus, there is no need to define all accented characters (e.g., \'a, \'a, \^a, \~a, \"a, \r{a}, \k{a}, \u{a}), which will make the configuration files look much nicer and easier to maintain. If a single character of an inheritance list should have a different value, one can simply override it.

\MT@inh@feat \MT@extra@inputenc The optional argument may be used to restrict the list to some features, and to specify an input encoding.

```
⟨*package⟩
\renewcommand*\DeclareCharacterInheritance[1][]{%
  \let\MT@extra@context\@empty
  \let\MT@extra@inputenc\@undefined
  \let\MT@inh@feat\@empty
  \setkeys{MT@inh@}{#1}%
  \MT@begin@catcodes
  \MT@set@inh@list
}
```

\MT@set@inh@list No need to create an inheritance list for tracking.

```
\def\MT@set@inh@list#1#2{%
  \MT@ifempty\MT@inh@feat{%
    \MT@map@clist@c\MT@features{{%
      \MT@ifstreq{##1}{tr}\relax{\MT@declare@char@inh{##1}{#1}{#2}}%
    }}%
  }{%
    \MT@map@clist@c\MT@inh@feat{{%
      \KV@@sp@def\@tempa{##1}%
      \MT@ifempty\@tempa\relax{%
        \edef\@tempa{\csname MT@rbba@\@tempa\endcsname}%
        \MT@ifstreq\@tempa{tr}\relax{%
          \MT@exp@one@n\MT@declare@char@inh{\@tempa}{#1}{#2}}}%
    }}%
  }%
  \MT@end@catcodes
}
```

The keys for the optional argument.

```
\MT@map@clist@c\MT@features@long{%
  \define@key{MT@inh@}{#1}[]{\edef\MT@inh@feat{\MT@inh@feat#1,}}}
\define@key{MT@inh@}{inputenc}{\def\MT@extra@inputenc{#1}}
```

\MT@declare@char@inh The lists cannot be given a name by the user.

```
\def\MT@declare@char@inh#1#2#3{%
  \MT@edef@n{MT@#1@inh@name}%
    {\MT@curr@file/\the\inputlineno (\@nameuse{MT@abbr@#1})}%
  \MT@let@cn\MT@curr@set@name{MT@#1@inh@name}%
  \MT@ifdefined@c@T\MT@extra@inputenc{%
    \MT@xdef@n{MT@#1@inh@\MT@curr@set@name @inputenc}{\MT@extra@inputenc}}%
⟨debug⟩\MT@dinfo{1}{creating inheritance list `\@nameuse{MT@#1@inh@name}'}%
  \MT@gdef@n{MT@#1@inh@\csname MT@#1@inh@name\endcsname}{#3}%
  \def\MT@permutelist{#1@inh}%
  \setkeys{MT@inh}{#2}%
  \MT@permute
}
```

Parse the second argument. \DeclareCharacterInheritance may also be set up for various combinations. We can reuse the key setup from the configuration lists (\Set...).

```
\MT@define@code@key{encoding}{inh}
```

```
\MT@define@code@key@family   {inh}
\MT@define@code@key{series}  {inh}
\MT@define@code@key{shape}   {inh}
\MT@define@code@key@size     {inh}
\MT@define@code@key@font     {inh}
```

\MT@inh@do Now parse the third argument, the inheritance lists. We define the commands \MT@inh@⟨*name*⟩@⟨*slot*⟩@, containing the inheriting characters. They will also be translated to slot numbers here, to save some time. The following will be executed only once, namely the first time this inheritance list is encountered (in \MT@set@⟨*feature*⟩@codes).

```
\def\MT@inh@do#1,{%
  \ifx\relax#1\@empty \else
    \MT@inh@split #1==\relax
    \expandafter\MT@inh@do
  \fi
}
```

\MT@inh@split Only gather the inheriting characters here. Their codes will actually be set in \MT@set@⟨*feature*⟩@codes.

```
⟨/package⟩
⟨*pdftex-def|xetex-def|luatex-def⟩
\def\MT@inh@split#1=#2=#3\relax{%
  \def\@tempa{#1}%
  \ifx\@tempa\@empty \else
    \MT@get@slot
⟨pdftex-def|luatex-def⟩    \ifnum\MT@char > \m@ne
⟨xetex-def⟩    \ifx\MT@char\@empty\else
      \let\MT@val\MT@char
      \MT@map@clist@n{#2}{%
        \def\@tempa{##1}%
        \ifx\@tempa\@empty \else
          \MT@get@slot
⟨pdftex-def|luatex-def⟩          \ifnum\MT@char > \m@ne
⟨xetex-def⟩          \ifx\MT@char\@empty\else
            \MT@exp@cs\MT@xadd{MT@inh@\MT@listname @\MT@val @}{{\MT@char}}%
          \fi
        \fi
      }%
⟨debug⟩\MT@dinfo@nl{2}{children of #1 (\MT@val):
⟨debug⟩                \@nameuse{MT@inh@\MT@listname @\MT@val @}}%
    \fi
  \fi
}
⟨/pdftex-def|xetex-def|luatex-def⟩
```

14.3.7 Permutation

\MT@permute \MT@permute@ \MT@permute@@ \MT@permute@@@ \MT@permute@@@@ Calling \MT@permute will define commands for all permutations of the specified font attributes of the form \MT@⟨*list type*⟩@/⟨*encoding*⟩/⟨*family*⟩/⟨*series*⟩/⟨*shape*⟩/⟨|*⟩ to be the expansion of \MT@⟨*list type*⟩@name, i.e., the name of the currently defined list. Size ranges are held in a separate macro called \MT@⟨*list type*⟩@/⟨*font axes*⟩@sizes, which in turn contains the respective ⟨*list name*⟩s attached to the ranges. So that,

```
\SetProtrusion
   { encoding = U,
     family   = {euroitc,euroitcs} }
   { E = {100,50} }
\SetProtrusion
   { encoding = U,
     family   = {euroitc,euroitcs},
     shape    = it* }
   { E = {100,} }
```

would yield the following assignments:

```
⟨*package⟩
\MT@gdef@n{MT@pr@c@U/euroitc///}{euroitc}
\MT@gdef@n{MT@pr@c@U/euroitcs///}{euroitc}
\MT@gdef@n{MT@pr@c@U/euroitc//it/}{euroitci}
\MT@gdef@n{MT@pr@c@U/euroitcs//it/}{euroitci}
\MT@gdef@n{MT@pr@c@euroitc}{E={100,50}}
\MT@gdef@n{MT@pr@c@euroitci}{E={100,}}
\def\MT@permute{%
  \let\MT@cnt@encoding\@ne
  \MT@permute@
```

Undefine commands for the next round.

```
  \MT@map@tlist@n{{encoding}{family}{series}{shape}}\MT@permute@reset
  \MT@glet\MT@tempsize\@undefined
}
\def\MT@permute@{%
  \let\MT@cnt@family\@ne
  \MT@permute@@
  \MT@increment\MT@cnt@encoding
  \MT@ifdefined@n@T{MT@tempencoding\MT@cnt@encoding}%
    \MT@permute@
}
\def\MT@permute@@{%
  \let\MT@cnt@series\@ne
  \MT@permute@@@
  \MT@increment\MT@cnt@family
  \MT@ifdefined@n@T{MT@tempfamily\MT@cnt@family}%
    \MT@permute@@
}
\def\MT@permute@@@{%
  \let\MT@cnt@shape\@ne
  \MT@permute@@@@
  \MT@increment\MT@cnt@series
  \MT@ifdefined@n@T{MT@tempseries\MT@cnt@series}%
    \MT@permute@@@
}
\def\MT@permute@@@@{%
  \MT@permute@@@@@
  \MT@increment\MT@cnt@shape
  \MT@ifdefined@n@T{MT@tempshape\MT@cnt@shape}%
    \MT@permute@@@@
}
```

\MT@permute@@@@@ In order to save some memory, we can ignore unused encodings (inside the document).

```
\def\MT@permute@@@@@{%
  \MT@permute@define{encoding}%
  \ifMT@document
    \ifx\MT@tempencoding\@empty \else
      \MT@ifdefined@n@TF{T@\MT@tempencoding}\relax
        {\expandafter\expandafter\expandafter\@gobble}%
    \fi
  \fi
  \MT@permute@@@@@@
}
```

\MT@permute@@@@@@

```
\def\MT@permute@@@@@@{%
  \MT@permute@define{family}%
  \MT@permute@define{series}%
  \MT@permute@define{shape}%
  \edef\@tempa{\MT@tempencoding
```

```
              /\MT@tempfamily
              /\MT@tempseries
              /\MT@tempshape
              /\MT@ifdefined@c@T\MT@tempsize *}%
```

Some sanity checks: an encoding must be specified (unless nothing else is).

```
  \MT@ifstreq\@tempa{////}\relax{%
    \ifx\MT@tempencoding\@empty
      \MT@warning{%
        You have to specify an encoding for\MessageBreak
        \@nameuse{MT@abbr@\MT@permutelist} list
        `\@nameuse{MT@\MT@permutelist @name}'.\MessageBreak
        Ignoring it}%
    \else
      \MT@ifdefined@c@TF\MT@tempsize{%
```

Add the list of ranges to the beginning of the current combination, after checking for conflicts.

```
        \MT@ifdefined@n@T{MT@\MT@permutelist @\@tempa\MT@extra@context @sizes}{%
          \MT@map@tlist@c\MT@tempsize\MT@check@rlist
        }%
        \MT@exp@cs\MT@xaddb
          {MT@\MT@permutelist @\@tempa\MT@extra@context @sizes}%
          \MT@tempsize
⟨debug⟩\MT@dinfo@nl{1}{initialising: use list for font \@tempa,\MessageBreak
⟨debug⟩         sizes: \csname MT@\MT@permutelist @\@tempa\MT@extra@context
⟨debug⟩                         @sizes\endcsname}%
      }{%
```

Only one list can apply to a given combination. But we don't warn if the overridden list is to be loaded by the current one.

```
        \MT@ifdefined@n@T{MT@\MT@permutelist @\@tempa\MT@extra@context}{%
          \MT@ifstreq{\csname MT@\MT@permutelist @\@tempa\MT@extra@context\endcsname}%
             {\csname MT@\MT@permutelist @\csname MT@\MT@permutelist @name\endcsname @load\endcsname}%
              \relax{%
            \MT@warning{\@nameuse{MT@abbr@\MT@permutelist} list
              `\@nameuse{MT@\MT@permutelist @name}' will\MessageBreak override
              list `\@nameuse{MT@\MT@permutelist @\@tempa\MT@extra@context}'
              for \MessageBreak font `\@tempa'}%
          }%
        }%
⟨debug⟩\MT@dinfo@nl{1}{initialising: use list for font \@tempa
⟨debug⟩                \ifx\MT@extra@context\@empty\else\MessageBreak
⟨debug⟩                  (context: \MT@extra@context)\fi}%
      }%
      \MT@xdef@n{MT@\MT@permutelist @\@tempa\MT@extra@context}%
          {\csname MT@\MT@permutelist @name\endcsname}%
    \fi
  }%
}
```

\MT@permute@define

Define the commands.

```
\def\MT@permute@define#1{%
  \@tempcnta=\csname MT@cnt@#1\endcsname\relax
  \MT@ifdefined@n@TF{MT@temp#1\the\@tempcnta}%
    {\MT@edef@n{MT@temp#1}{\csname MT@temp#1\the\@tempcnta\endcsname}}%
    {\MT@let@nc{MT@temp#1}\@empty}%
}
```

\MT@permute@reset

Reset the commands.

```
\def\MT@permute@reset#1{%
  \@tempcnta=\@ne
  \MT@loop
    \MT@let@nc{MT@temp#1\the\@tempcnta}\@undefined
    \advance\@tempcnta\@ne
    \MT@ifdefined@n@TF{MT@temp#1\the\@tempcnta}%
      \iftrue
      \iffalse
  \MT@repeat
}
```

\MT@check@rlist For every new range item in `\MT@tempsize`, check whether it overlaps with ranges in the existing list.

```
\def\MT@check@rlist#1{\expandafter\MT@check@rlist@ #1}
```

\MT@check@rlist@ Define the current new range and . . .

```
\def\MT@check@rlist@#1#2#3{%
  \def\@tempb{#1}%
  \def\@tempc{#2}%
  \MT@if@false
  \MT@exp@cs\MT@map@tlist@c
    {MT@\MT@permutelist @\@tempa\MT@extra@context @sizes}%
    \MT@check@range
}
```

\MT@check@range . . . recurse through the list of existing ranges.

```
\def\MT@check@range#1{\expandafter\MT@check@range@ #1}
```

\MT@check@range@ `\@tempb` and `\@tempc` are lower resp. upper bound of the new range, ⟨*#1*⟩ and ⟨*#2*⟩ those of the existing range. ⟨*#3*⟩ is the list name.

```
\def\MT@check@range@#1#2#3{%
  \MT@ifdim{#2}=\m@ne{%
    \MT@ifdim\@tempc=\m@ne{%
```

- Both items are simple sizes.

```
      \MT@ifdim\@tempb={#1}\MT@if@true\relax
    }{%
```

- Item in list is a simple size, new item is a range.

```
      \MT@ifdim\@tempb>{#1}\relax{%
        \MT@ifdim\@tempc>{#1}{%
          \MT@if@true
          \edef\@tempb{#1 (with range: \@tempb\space to \@tempc)}%
        }\relax
      }%
    }%
  }{%
    \MT@ifdim\@tempc=\m@ne{%
```

- Item in list is a range, new item is a simple size.

```
      \MT@ifdim\@tempb<{#2}{%
        \MT@ifdim\@tempb<{#1}\relax\MT@if@true
      }\relax
    }{%
```

- Both items are ranges.

```
      \MT@ifdim\@tempb<{#2}{%
        \MT@ifdim\@tempc>{#1}{%
          \MT@if@true
          \edef\@tempb{#1 to #2 (with range: \@tempb\space to \@tempc)}%
        }\relax
      }\relax
    }%
  }%
  \ifMT@if@
```

```
    \MT@ifstreq{#3}%
        {\csname MT@\MT@permutelist @\csname MT@\MT@permutelist @name\endcsname @load\endcsname}%
        \relax{%
      \MT@warning{\@nameuse{MT@abbr@\MT@permutelist} list
        `\@nameuse{MT@\MT@permutelist @name}' will override\MessageBreak
        list `#3' for font \@tempa,\MessageBreak size \@tempb}%
    }%
```

If we've already found a conflict with this item, we can skip the rest of the list.

```
    \expandafter\MT@tlist@break
  \fi
}
```

14.4 Package options

14.4.1 Declaring the options

\ifMT@opt@expansion
\ifMT@opt@auto
\ifMT@opt@DVI

Keep track of whether the user explicitly set these options.

```
\newif\ifMT@opt@expansion
\newif\ifMT@opt@auto
\newif\ifMT@opt@DVI
```

\MT@optwarn@admissible

Some warnings.

```
\def\MT@optwarn@admissible#1#2{%
  \MT@warning@nl{`#1' is not an admissible value for option\MessageBreak
                 `#2'. Assuming `false'}%
}
```

\MT@optwarn@nan

```
⟨/package⟩
⟨*package|letterspace⟩
⟨plain⟩\MT@requires@latex1{
\def\MT@optwarn@nan#1#2{%
  \MT@warning@nl{Value `#1' for option `#2' is not a\MessageBreak number.
                 Using default value of \number\@nameuse{MT@#2@default}}%
}
⟨plain⟩}\relax
⟨/package|letterspace⟩
⟨*package⟩
```

\MT@opt@def@set

```
\def\MT@opt@def@set#1{%
  \MT@ifdefined@n@TF{MT@\@tempb @set@@\MT@val}{%
    \MT@xdef@n{MT@\@tempb @setname}{\MT@val}%
  }{%
    \MT@xdef@n{MT@\@tempb @setname}{\@nameuse{MT@default@\@tempb @set}}%
    \MT@warning@nl{The #1 set `\MT@val' is undeclared.\MessageBreak
                   Using set `\@nameuse{MT@\@tempb @setname}' instead}%
  }%
}
```

`expansion` and `protrusion` may be `true`, `false`, `compatibility`, `nocompatibility` and/or a ⟨*set name*⟩.

```
\MT@map@clist@n{protrusion,expansion}{%
  \define@key{MT}{#1}[true]{%
    \csname MT@opt@#1true\endcsname
    \MT@map@clist@n{##1}{%
      \KV@@sp@def\MT@val{####1}%
      \MT@ifempty\MT@val\relax{%
        \csname MT@#1true\endcsname
        \edef\@tempb{\csname MT@rbba@#1\endcsname}%
        \MT@ifstreq\MT@val{true}\relax
        {%
          \MT@ifstreq\MT@val{false}{%
            \csname MT@#1false\endcsname
          }{%
            \MT@ifstreq\MT@val{compatibility}{%
              \MT@let@nc{MT@\@tempb @level}\@ne
            }{%
              \MT@ifstreq\MT@val{nocompatibility}{%
                \MT@let@nc{MT@\@tempb @level}\tw@
              }{%
```

If everything failed, it should be a set name.

```
                \MT@opt@def@set{#1}%
              }%
            }%
          }%
        }%
      }%
    }%
  }%
}
```

activate is a shortcut for protrusion and expansion.

```
\define@key{MT}{activate}[true]{%
  \setkeys{MT}{protrusion={#1}}%
  \setkeys{MT}{expansion={#1}}%
}
```

spacing, kerning and tracking do not have a compatibility level.

```
\MT@map@clist@n{spacing,kerning,tracking}{%
  \define@key{MT}{#1}[true]{%
    \MT@map@clist@n{##1}{%
      \KV@@sp@def\MT@val{####1}%
      \MT@ifempty\MT@val\relax{%
        \csname MT@#1true\endcsname
        \MT@ifstreq\MT@val{true}\relax
        {%
          \MT@ifstreq\MT@val{false}{%
            \csname MT@#1false\endcsname
          }{%
            \edef\@tempb{\csname MT@rbba@#1\endcsname}%
            \MT@opt@def@set{#1}%
          }%
        }%
      }%
    }%
  }%
}
```

\MT@def@bool@opt

The true/false options: draft, final (may be inherited from the class options), auto, selected, babel, DVIoutput, defersetup, copyfonts.

```
\def\MT@def@bool@opt#1#2{%
  \define@key{MT}{#1}[true]{%
    \def\@tempa{##1}%
    \MT@ifstreq\@tempa{true}\relax{%
      \MT@ifstreq\@tempa{false}\relax{%
        \MT@optwarn@admissible{##1}{#1}%
        \def\@tempa{false}%
      }%
    }%
    #2%
  }%
}
```

Boolean options that only set the switch.

```
\MT@map@clist@n{draft,selected,babel}{%
  \MT@def@bool@opt{#1}{\csname MT@#1\@tempa\endcsname}}
\MT@def@bool@opt{auto}{\csname MT@auto\@tempa\endcsname \MT@opt@autotrue}
```

The DVIoutput option will change \pdfoutput immediately to minimise the risk of confusing other packages.

```
⟨/package⟩
⟨*pdftex-def|luatex-def|xetex-def⟩
⟨luatex-def⟩\MT@requires@luatex4{\let\pdfoutput\outputmode}\relax
\MT@def@bool@opt{DVIoutput}{%
  \csname if\@tempa\endcsname
⟨*pdftex-def|luatex-def⟩
    \ifnum\pdfoutput>\z@ \MT@opt@DVItrue \fi
    \pdfoutput\z@
  \else
    \ifnum\pdfoutput<\@ne \MT@opt@DVItrue \fi
    \pdfoutput\@ne
⟨/pdftex-def|luatex-def⟩
⟨xetex-def⟩    \MT@warning@nl{Ignoring `DVIoutput' option}%
  \fi
}
⟨/pdftex-def|luatex-def|xetex-def⟩
```

Setting the defersetup option to false will restore the old behaviour, where the setup took place at the time when the package was loaded. This is *undocumented*, since I would like to learn about the cases where this is necessary.

The only problem with the new deferred setup I can think of is when a box is being constructed inside the preamble and this box contains a font that is not loaded before the box is being used.

```
⟨*package⟩
\MT@def@bool@opt{defersetup}{%
  \csname if\@tempa\endcsname \else
    \AtEndOfPackage{%
      \MT@setup@
      \let\MT@setup@\@empty
      \let\MT@addto@setup\@firstofone
    }%
  \fi
}
⟨/package⟩
```

copyfonts will copy all fonts before setting them up. This allows protrusion and expansion with different parameters. This options is also *undocumented* in the hope that we can always find out automatically whether it's required. It also works with LuaTEX 0.30 or newer.

```
⟨*pdftex-def|luatex-def⟩
⟨pdftex-def⟩\MT@requires@pdftex7{
  \MT@def@bool@opt{copyfonts}{%
    \csname if\@tempa\endcsname
      \MT@glet\MT@copy@font\MT@copy@font@
    \else
      \MT@glet\MT@copy@font\relax
    \fi
  }
⟨pdftex-def⟩}{
⟨/pdftex-def|luatex-def⟩
⟨*pdftex-def|xetex-def⟩
  \MT@def@bool@opt{copyfonts}{%
    \csname if\@tempa\endcsname
      \MT@error
⟨pdftex-def⟩        {The pdftex version you are using is too old\MessageBreak
⟨pdftex-def⟩        to use the `copyfonts' option}{Upgrade pdftex.}%
⟨xetex-def⟩        {The `copyfonts' option does not work with xetex}
⟨xetex-def⟩        {Use pdftex or luatex instead.}%
    \fi
  }
⟨pdftex-def⟩}
⟨/pdftex-def|xetex-def⟩
```

final is the opposite to draft.

```
⟨*package⟩
\MT@def@bool@opt{final}{%
  \csname if\@tempa\endcsname
    \MT@draftfalse
  \else
    \MT@drafttrue
  \fi
}
```

For verbose output, we redefine \MT@vinfo.

```
\define@key{MT}{verbose}[true]{%
  \let\MT@vinfo\MT@info@nl
  \def\@tempa{#1}%
  \MT@ifstreq\@tempa{true}\relax{%
```

Take problems seriously.

```
    \MT@ifstreq\@tempa{errors}{%
      \let\MT@warning   \MT@warn@err
      \let\MT@warning@nl\MT@warn@err
    }{%
      \let\MT@vinfo\@gobble
```

Cast warnings to the winds.

```
      \MT@ifstreq\@tempa{silent}{%
        \let\MT@warning   \MT@info
        \let\MT@warning@nl\MT@info@nl
      }{%
        \MT@ifstreq\@tempa{false}\relax{\MT@optwarn@admissible{#1}{verbose}}%
      }%
    }%
  }%
}
⟨/package⟩
```

Options with numerical keys: factor, stretch, shrink, step, letterspace.

```
⟨*package|letterspace⟩
⟨plain⟩\MT@requires@latex1{
\MT@map@clist@n{%
⟨package⟩    stretch,shrink,step,%
    letterspace}{%
  \define@key{MT}{#1}[\csname MT@#1@default\endcsname]{%
    \def\@tempa{##1 }%
```

No nonsense in \MT@factor et al.? A space terminates the number.

```
    \MT@ifint\@tempa
      {\MT@edef@n{MT@#1}{\@tempa}}%
      {\MT@optwarn@nan{##1}{#1}}%
  }%
}
⟨plain⟩}\relax
⟨/package|letterspace⟩
```

factor will define the protrusion factor only.

```
⟨*package⟩
\define@key{MT}{factor}[\MT@factor@default]{%
  \def\@tempa{#1 }%
  \MT@ifint\@tempa
```

```
    {\edef\MT@pr@factor{\@tempa}}
    {\MT@optwarn@nan{#1}{factor}}%
}
```

Unit for protrusion codes.

```
\define@key{MT}{unit}[character]{%
  \def\@tempa{#1}%
  \MT@ifstreq\@tempa{character}\relax{%
    \MT@ifdimen\@tempa
      {\let\MT@pr@unit\@tempa}%
      {\MT@warning@nl{`\@tempa' is not a dimension.\MessageBreak
              Ignoring it and setting values relative to\MessageBreak
              character widths}}%
  }%
}
```

14.4.2 Loading the definition file

\MT@endinput

Abort if no capable engine found.

```
\let\MT@endinput\relax
```

```
\ifx\MT@engine\relax
  \MT@warning@nl{You don't seem to be using pdftex, luatex or xetex.\MessageBreak
    `\MT@MT' only works with these engines.\MessageBreak
    I will quit now}
  \MT@clear@options
\else
```

Otherwise load the engine-specific code (as strewn across this file).

```
  \input{microtype-\MT@engine tex.def}
\fi
\MT@endinput
```

14.4.3 Reading the configuration file

The package should just work if called without any options. Therefore, expansion will be switched off by default if output is DVI, since it isn't likely that expanded fonts are available. (This grows more important as modern TEX systems have switched to the pdfTEX engine even for DVI output, so that the user might not even be aware of the fact that she's running pdfTEX.)

```
\MT@protrusiontrue
⟨/package⟩
⟨*pdftex-def|luatex-def⟩
\ifnum\pdfoutput<\@ne \else
```

Also, we only enable expansion by default if pdfTEX can expand the fonts automatically.

```
⟨pdftex-def⟩  \MT@requires@pdftex4{
    \MT@expansiontrue
⟨pdftex-def⟩    \MT@autotrue
⟨pdftex-def⟩  }\relax
\fi
⟨luatex-def⟩\MT@autotrue
⟨/pdftex-def|luatex-def⟩
```

\MT@config@file
\MT@get@config

The main configuration file will be loaded before processing the package options. However, the config option must of course be evaluated beforehand. We also have to define a no-op for the regular option processing later.

```
⟨*package⟩
\define@key{MT}{config}[]{\relax}
\def\MT@get@config#1config=#2,#3\@nil{%
```

```
  \MT@ifempty{#2}%
    {\def\MT@config@file{\MT@MT.cfg}}%
    {\def\MT@config@file{#2.cfg}}%
}
\expandafter\expandafter\expandafter\MT@get@config
  \csname opt@\@currname.\@currext\endcsname,config=,\@nil
```

Load the file.

```
\IfFileExists{\MT@config@file}{%
  \MT@info@nl{Loading configuration file \MT@config@file}%
  \MT@begin@catcodes
    \let\MT@begin@catcodes\relax
    \let\MT@end@catcodes\relax
    \let\MT@curr@file\MT@config@file
    \input{\MT@config@file}%
  \endgroup
}{\MT@warning@nl{%
    Could not find configuration file `\MT@config@file'!\MessageBreak
    This will almost certainly cause undesired results.\MessageBreak
    Please fix your installation}%
}
```

\MT@check@active@set

We have to make sure that font sets are active. If the user didn't activate any, we use those sets declared by \DeclareMicrotypeSetDefault (this is done at the end of the preamble).

```
\def\MT@check@active@set#1{%
  \MT@ifdefined@n@TF{MT@#1@setname}{%
    \MT@info@nl{Using \@nameuse{MT@abbr@#1} set `\@nameuse{MT@#1@setname}'}%
  }{%
    \MT@ifdefined@n@TF{MT@default@#1@set}{%
      \MT@glet@nn{MT@#1@setname}{MT@default@#1@set}%
      \MT@info@nl{Using default \@nameuse{MT@abbr@#1} set `\@nameuse{MT@#1@setname}'}%
    }{%
```

If no default font set has been declared in the main configuration file, we use the (empty, non-existent) set '@', and issue a warning.

```
      \MT@gdef@n{MT@#1@setname}{@}%
      \MT@warning@nl{No \@nameuse{MT@abbr@#1} set chosen, no default set declared.
                     \MessageBreak Using empty set}%
    }%
  }%
}
```

14.4.4 Hook for other packages

\Microtype@Hook

This hook may be used by font package authors, e.g., to declare alias fonts. If it is defined, it will be executed here, i.e., after the main configuration file has been loaded, and before the package options are evaluated.

This hook was needed in versions prior to 1.9a to overcome the situation that (1) the microtype package should be loaded after all font defaults have been set up (hence, using \@ifpackageloaded in the font package was not viable), and (2) checking \AtBeginDocument could be too late, since fonts might already have been loaded, and consequently set up, in the preamble. With the new deferred setup, one could live without this command, however, it remains here since it's simpler than testing whether the package was loaded both in the preamble as well as at the beginning of the document (which is what one would have to do).

Package authors should check whether the command is already defined so that existing definitions by other packages aren't overwritten. Example:

```
\def\MinionPro@MT@Hook{\DeclareMicrotypeAlias{MinionPro-LF}{MinionPro}}
\@ifpackageloaded{microtype}
 \MinionPro@MT@Hook
 {\@ifundefined{Microtype@Hook}
  {\let\Microtype@Hook\MinionPro@MT@Hook}
  {\g@addto@macro\Microtype@Hook{\MinionPro@MT@Hook}}}
```

\MicroType@Hook with a capital T (which only existed in version 1.7) is provided for compatibility reasons. At some point in the future, it will no longer be available, hence it should not be used.

```
\MT@ifdefined@c@T\MicroType@Hook{\MT@warning{%
 Command \string\MicroType@Hook\space is deprecated.\MessageBreak
   Use \string\Microtype@Hook\space instead}\MicroType@Hook}
\MT@ifdefined@c@T\Microtype@Hook\Microtype@Hook
```

14.4.5 Changing options later

\microtypesetup
\MT@define@optionX

Inside the preamble, \microtypesetup accepts the same options as the package (unless defersetup=false). In the document body, it accepts the options: protrusion, expansion, activate, tracking, spacing and kerning. Specifying font sets is not allowed.

```
\def\microtypesetup{\setkeys{MT}}
\MT@addto@setup{\def\microtypesetup#1{\setkeys{MTX}{#1}\selectfont}}
⟨/package⟩
⟨*pdftex-def|luatex-def|xetex-def⟩
\def\MT@define@optionX#1#2{%
 \define@key{MTX}{#1}[true]{%
  \edef\@tempb{\csname MT@rbba@#1\endcsname}%
  \MT@map@clist@n{##1}{%
   \KV@@sp@def\MT@val{####1}%
   \MT@ifempty\MT@val\relax{%
    \@tempcnta=\m@ne
    \MT@ifstreq\MT@val{true}{%
```

Enabling micro-typography in the middle of the document is not allowed if it has been disabled in the package options since fonts might already have been loaded and hence wouldn’t be set up.

```
     \MT@checksetup{#1}{%
      \@tempcnta=\csname MT@\@tempb @level\endcsname
      \MT@vinfo{Enabling #1
          (level \number\csname MT@\@tempb @level\endcsname)\on@line}%
     }%
    }{%
     \MT@ifstreq\MT@val{false}{%
      \@tempcnta=\z@
      \MT@vinfo{Disabling #1\on@line}%
     }{%
      \MT@ifstreq\MT@val{compatibility}{%
       \MT@checksetup{#1}{%
        \@tempcnta=\@ne
        \MT@let@nc{MT@\@tempb @level}\@ne
        \MT@vinfo{Setting #1 to level 1\on@line}%
       }%
      }{%
       \MT@ifstreq\MT@val{nocompatibility}{%
        \MT@checksetup{#1}{%
         \@tempcnta=\tw@
         \MT@let@nc{MT@\@tempb @level}\tw@
         \MT@vinfo{Setting #1 to level 2\on@line}%
        }%
       }{\MT@error{Value `\MT@val' for key `#1' not recognised}
```

```
                         {Use any of `true', `false', `compatibility' or
                          `nocompatibility'.}%
              }%
            }%
          }%
        }%
        \ifnum\@tempcnta>\m@ne
          #2\@tempcnta\relax
        \fi
      }%
    }%
  }%
}
```

\MT@checksetup

Test whether the feature wasn't disabled in the package options.

```
\def\MT@checksetup#1{%
  \csname ifMT@#1\endcsname
    \expandafter\@firstofone
  \else
    \MT@error{You cannot enable #1 if it was disabled\MessageBreak
              in the package options}{Load microtype with #1 enabled.}%
    \expandafter\@gobble
  \fi
}
```

```
\MT@define@optionX{protrusion}\MT@protrudechars
⟨/pdftex-def|luatex-def|xetex-def⟩
⟨*pdftex-def|luatex-def⟩
\MT@define@optionX{expansion}\MT@adjustspacing
```

\MT@protrudechars
\MT@adjustspacing

```
⟨*luatex-def⟩
\MT@requires@luatex4{
  \let\pdfprotrudechars\protrudechars
  \let\pdfadjustspacing\adjustspacing
}\relax
⟨/luatex-def⟩
\let\MT@protrudechars\pdfprotrudechars
\let\MT@adjustspacing\pdfadjustspacing
⟨/pdftex-def|luatex-def⟩
⟨*xetex-def⟩
\let\MT@protrudechars\XeTeXprotrudechars
\define@key{MTX}{expansion}[true]{\MT@warning{Ignoring expansion setup}}
⟨/xetex-def⟩
```

\MT@define@optionX@

The same for `tracking`, `spacing` and `kerning`, which do not have a `compatibility` level.

```
⟨*pdftex-def|luatex-def⟩
⟨pdftex-def⟩\MT@requires@pdftex6{
⟨luatex-def⟩\MT@requires@luatex3{
  \def\MT@define@optionX@#1#2{%
    \define@key{MTX}{#1}[true]{%
      \MT@map@clist@n{##1}{%
        \KV@@sp@def\MT@val{####1}%
        \MT@ifempty\MT@val\relax{%
          \@tempcnta=\m@ne
          \MT@ifstreq\MT@val{true}{%
            \MT@checksetup{#1}{%
              \@tempcnta=\@ne
              \MT@vinfo{Enabling #1\on@line}%
            }%
          }{%
            \MT@ifstreq\MT@val{false}{%
              \@tempcnta=\z@
              \MT@vinfo{Disabling #1\on@line}%
      }{\MT@error{Value `\MT@val' for key `#1' not recognised}
           {Use either `true' or `false'}%
      }%
     }%
     \ifnum\@tempcnta>\m@ne
      #2\relax
     \fi
    }%
   }%
  }%
 }
```

We cannot simply let `\MT@tracking` relax, since this may select the already letterspaced font instance.

```
 \MT@define@optionX@{tracking}{\ifnum\@tempcnta=\z@ \let\MT@tracking\MT@set@tr@zero
                \else \let\MT@tracking\MT@tracking@ \fi}
⟨pdftex-def⟩  \MT@define@optionX@{spacing}{\pdfadjustinterwordglue\@tempcnta}
⟨pdftex-def⟩  \MT@define@optionX@{kerning}{\pdfprependkern\@tempcnta
⟨pdftex-def⟩                               \pdfappendkern\@tempcnta}
}{
⟨/pdftex-def|luatex-def⟩
⟨*pdftex-def|luatex-def|xetex-def⟩
```

Disable for older pdfTeX versions and for XeTeX and LuaTeX.

```
\define@key{MTX}{tracking}[true]{\MT@warning{Ignoring tracking setup}}
⟨luatex-def⟩}
\define@key{MTX}{kerning}[true]{\MT@warning{Ignoring kerning setup}}
\define@key{MTX}{spacing}[true]{\MT@warning{Ignoring spacing setup}}
⟨pdftex-def⟩}
\define@key{MTX}{activate}[true]{%
 \setkeys{MTX}{protrusion={#1}}%
⟨pdftex-def|luatex-def⟩  \setkeys{MTX}{expansion={#1}}%
}
⟨/pdftex-def|luatex-def|xetex-def⟩
```

\MT@saved@setupfont

Disable everything – may be used as a temporary work-around in case setting up fonts doesn't work under certain circumstances, but only until that specific problem is fixed. This is *undocumented*, as it completely deprives us of the possibility to act – we're blind and paralysed.

```
⟨*package⟩
\let\MT@saved@setupfont\MT@setupfont

\define@key{MTX}{disable}[]{%
 \MT@info{Inactivate `\MT@MT' package}%
 \let\MT@setupfont\relax
}
\define@key{MTX}{enable}[]{%
 \MT@info{Reactivate `\MT@MT' package}%
 \let\MT@setupfont\MT@saved@setupfont
}
⟨/package⟩
```

14.4.6 Processing the options

\MT@ProcessOptionsWithKV

Parse options.

```
⟨*package|letterspace⟩
⟨plain⟩\MT@requires@latex1{
\def\MT@ProcessOptionsWithKV#1{%
 \let\@tempc\relax
 \let\MT@temp\@empty
⟨plain⟩  \MT@requires@latex2{
  \MT@map@clist@c\@classoptionslist{%
   \def\CurrentOption{##1}%
```

```
      \MT@ifdefined@n@T{KV@#1@\expandafter\MT@getkey\CurrentOption=\@nil}{%
        \edef\MT@temp{\MT@temp,\CurrentOption,}%
        \@expandtwoargs\@removeelement\CurrentOption
          \@unusedoptionlist\@unusedoptionlist
      }%
    }%
    \edef\MT@temp{\noexpand\setkeys{#1}%
                    {\MT@temp\@ptionlist{\@currname.\@currext}}}%
```

eplain can handle package options.

```
⟨*plain⟩
  }{\edef\MT@temp{\noexpand\setkeys{#1}%
                    {\csname usepkg@options@\usepkg@pkg\endcsname}}}
⟨/plain⟩
  \MT@temp
  \MT@clear@options
}
```

\MT@getkey

For key=val in class options.

```
\def\MT@getkey#1=#2\@nil{#1}
```

```
\MT@ProcessOptionsWithKV{MT}
⟨plain⟩}\relax
⟨/package|letterspace⟩
⟨*package⟩
```

Now we can take the appropriate actions. We also tell the log file which options the user has chosen (in case it's interested).

```
\MT@addto@setup{%
\ifMT@draft
```

We disable most of what we've just defined in the 4462 lines above if we are running in draft mode.

```
  \MT@warning@nl{`draft' option active.\MessageBreak
                 Disabling all micro-typographic extensions.\MessageBreak
                 This might lead to different line and page breaks}%
  \let\MT@setupfont\relax
  \renewcommand*\LoadMicrotypeFile[1]{}%
  \renewcommand*\microtypesetup[1]{}%
  \renewcommand*\microtypecontext[1]{}%
  \renewcommand*\lsstyle{}%
\else
  \MT@setup@PDF
  \MT@setup@copies
```

Fix the font sets.

```
  \MT@map@tlist@c\MT@font@sets\MT@fix@font@set
  \MT@setup@protrusion
  \MT@setup@expansion
  \MT@setup@tracking
  \MT@setup@warntracking
  \MT@setup@spacing
  \MT@setup@kerning
  \MT@setup@noligatures
}
⟨/package⟩
```

\MT@setup@PDF

pdfTEX can create DVI output, too. However, both the DVI viewer and dvips need to find actual fonts. Therefore, expansion will only work if the fonts for different degrees of expansion are readily available.

Some packages depend on the value of \pdfoutput and will get confused if it is changed after they have been loaded. These packages are, among others: color, graphics, hyperref, crop, contour, pstricks and, as a matter of course, ifpdf.

Instead of testing for each package (that's not our job), we only say that it was microtype that changed it. This must be sufficient!

```
⟨*pdftex-def|luatex-def⟩
\def\MT@setup@PDF{%
  \MT@info@nl{Generating \ifnum\pdfoutput<\@ne DVI \else PDF \fi output%
              \ifMT@opt@DVI\space (changed by \MT@MT)\fi}%
}
```

\MT@setup@copies

Working on font copies?

```
\def\MT@setup@copies{%
  \ifx\MT@copy@font\relax\else \MT@info@nl{Using font copies for contexts}\fi
}
⟨/pdftex-def|luatex-def⟩
⟨*xetex-def⟩
\let\MT@setup@PDF\relax
\let\MT@setup@copies\relax
⟨/xetex-def⟩
```

\MT@setup@protrusion

Protrusion.

```
⟨*pdftex-def|xetex-def|luatex-def⟩
\def\MT@setup@protrusion{%
  \ifMT@protrusion
    \edef\MT@active@features{\MT@active@features,pr}%
    \MT@protrudechars\MT@pr@level
    \MT@info@nl{Character protrusion enabled (level \number\MT@pr@level)%
      \ifnum\MT@pr@factor=\MT@factor@default \else,\MessageBreak
        factor: \number\MT@pr@factor\fi
      \ifx\MT@pr@unit\@empty \else,\MessageBreak unit: \MT@pr@unit\fi}%
    \MT@check@active@set{pr}%
  \else
    \let\MT@protrusion\relax
    \MT@info@nl{No character protrusion}%
  \fi
}
⟨/pdftex-def|xetex-def|luatex-def⟩
```

\MT@setup@expansion

For DVI output, the user must have explicitly passed the expansion option to the package. Under LuaTeX, expansion works quite differently: the glyphs will be positioned as if they were transformed, without actually being transformed. Since this could still be considered a viable option, we don't disable the feature completely, but issue a warning.

```
⟨*pdftex-def|luatex-def⟩
\def\MT@setup@expansion{%
  \ifnum\pdfoutput<\@ne
    \ifMT@opt@expansion
⟨*luatex-def⟩
      \ifMT@expansion
        \MT@requires@luatex3{%
          \MT@warning@nl{Font expansion doesn't work properly with luatex in\MessageBreak
             DVI mode: the glyphs won't be actually transformed,\MessageBreak
             but will only be shifted. You might want to use\MessageBreak
             pdflatex instead. I'll continue anyway ..}%
          %\MT@expansionfalse
        }\relax
      \fi
⟨/luatex-def⟩
    \else
      \MT@expansionfalse
    \fi
  \fi
  \ifMT@expansion
```

Set up the values for font expansion: if stretch has not been specified, we take the default value of 20.

```
    \ifnum\MT@stretch=\m@ne
      \let\MT@stretch\MT@stretch@default
    \fi
```

If shrink has not been specified, it will inherit the value from stretch.

```
    \ifnum\MT@shrink=\m@ne
      \let\MT@shrink\MT@stretch
    \fi
```

If step has not been specified, we will just set it to 1 for recent pdfTEX versions. My tests did not show much difference neither in compilation time (within the margin of error) nor in file size (less than 1% difference for microtype.pdf with step=1 compared to step=5). With older versions, we set it to min(stretch,shrink)/5, rounded off, minimum value 1.

```
    \ifnum\MT@step=\m@ne
⟨pdftex-def⟩    \MT@requires@pdftex6{%
      \def\MT@step{1 }%
⟨*pdftex-def⟩
    }{%
      \ifnum\MT@stretch>\MT@shrink
        \ifnum\MT@shrink=\z@
          \@tempcnta=\MT@stretch
        \else
          \@tempcnta=\MT@shrink
        \fi
      \else
        \ifnum\MT@stretch=\z@
          \@tempcnta=\MT@shrink
        \else
          \@tempcnta=\MT@stretch
        \fi
      \fi
      \divide\@tempcnta 5\relax
      \ifnum\@tempcnta=\z@ \@tempcnta=\@ne \fi
      \edef\MT@step{\number\@tempcnta\space}%
    }%
⟨/pdftex-def⟩
    \fi
    \ifnum\MT@step=\z@
      \MT@warning@nl{The expansion step cannot be set to zero.\MessageBreak
          Setting it to one}%
      \def\MT@step{1 }%
    \fi
```

\MT@auto

Automatic expansion of the font? This new feature of pdfTEX 1.20 makes the *hz* programme really usable. It must be either 'autoexpand' or empty (or '1000' for older versions of pdfTEX). With LuaTEX, we just leave it empty, as there's actually no difference – non-automatic font expansion doesn't work anymore. In LuaTEX 1.0.6, the 'autoexpand' option seems to have been removed altogether and would trigger a warning.

```
    \let\MT@auto\@empty
    \ifMT@auto
```

We turn off automatic expansion if output mode is DVI.

```
⟨*pdftex-def⟩
      \MT@requires@pdftex4{%
        \ifnum\pdfoutput<\@ne
          \ifMT@opt@auto
            \MT@error{%
              Automatic font expansion only works for PDF output.\MessageBreak
              However, you are creating a DVI file}
```

```
             {If you have created expanded fonts instances, remove `auto' from%
              \MessageBreak the package options. Otherwise, you have to switch
              off expansion\MessageBreak completely.}%
          \fi
          \MT@autofalse
        \else
          \def\MT@auto{autoexpand}%
        \fi
```

Also, if pdfTEX is too old.

```
      }{%
        \MT@error{%
          The pdftex version you are using is too old for\MessageBreak
          automatic font expansion}%
         {If you have created expanded fonts instances, remove `auto' from\MessageBreak
          the package options. Otherwise, you have to switch off expansion\MessageBreak
          completely, or upgrade pdftex to version 1.20 or newer.}%
        \MT@autofalse
        \def\MT@auto{1000 }%
      }%
⟨/pdftex-def⟩
⟨luatex-def⟩      \MT@requires@luatex3\relax{\def\MT@auto{autoexpand}}%
    \else
⟨*pdftex-def⟩
```

No automatic expansion.

```
      \MT@requires@pdftex4\relax{%
        \def\MT@auto{1000 }%
      }%
⟨/pdftex-def⟩
⟨*luatex-def⟩
      \MT@requires@luatex3{%
        \ifMT@opt@auto
          \MT@error{Non-automatic font expansion does not work with\MessageBreak
                    luatex}{Remove `auto=false' from the package options, or use pdftex.}%
          \MT@autotrue
        \fi
      }\relax
⟨/luatex-def⟩
    \fi
```

Choose the appropriate macro for selected expansion.

```
    \ifMT@selected
      \let\MT@set@ex@codes\MT@set@ex@codes@s
    \else
      \let\MT@set@ex@codes\MT@set@ex@codes@n
    \fi
```

Filter out `stretch=0,shrink=0`, since it would result in a pdfTEX error.

```
    \ifnum\MT@stretch=\z@
      \ifnum\MT@shrink=\z@
        \MT@warning@nl{%
          Both the stretch and shrink limit are set to zero.\MessageBreak
          Disabling font expansion}%
        \MT@expansionfalse
      \fi
    \fi
  \fi
  \ifMT@expansion
    \edef\MT@active@features{\MT@active@features,ex}%
    \MT@adjustspacing\MT@ex@level
    \MT@info@nl{\ifMT@auto A\else Non-a\fi utomatic font expansion enabled
                (level \number\MT@ex@level),\MessageBreak
                stretch: \number\MT@stretch, shrink: \number\MT@shrink,
                step: \number\MT@step, \ifMT@selected\else non-\fi selected}%
```

\MT@check@step Check whether stretch and shrink are multiples of step.

```
    \def\MT@check@step##1{%
      \@tempcnta=\csname MT@##1\endcsname
      \divide\@tempcnta \MT@step
      \multiply\@tempcnta \MT@step
      \ifnum\@tempcnta=\csname MT@##1\endcsname\else
        \MT@warning@nl{The ##1 amount is not a multiple of step.\MessageBreak
                       The effective maximum ##1 is \the\@tempcnta\space
                       (step \number\MT@step)}%
      \fi
    }%
    \MT@check@step{stretch}%
    \MT@check@step{shrink}%
    \MT@check@active@set{ex}%
```

\showhyphens Inside \showhyphens, font expansion should be disabled. (Since 2017/01/10, the LaTeX format contains a different version for XeTeX, but since expansion doesn't work with XeTeX, we don't have to bother.) Since 2019/10/01, the command is robust.

```
    \MT@ifdefined@n@TF{showhyphens }{%
      \def\MT@temp##1##2{%
        \expandafter\CheckCommand\csname showhyphens \endcsname[1]{##1}%
        \DeclareRobustCommand\showhyphens[1]{##2}}%
    }{%
      \def\MT@temp##1##2{%
        \CheckCommand*\showhyphens[1]{##1}%
        \gdef\showhyphens####1{##2}}%
    }%
    \MT@temp
       {\setbox0\vbox{\color@begingroup
        \everypar{}\parfillskip\z@skip
        \hsize\maxdimen\normalfont\pretolerance\m@ne\tolerance\m@ne
        \hbadness\z@\showboxdepth\z@\ ##1\color@endgroup}}
       {\setbox0\vbox{\color@begingroup\pdfadjustspacing\z@
        \everypar{}\parfillskip\z@skip
        \hsize\maxdimen\normalfont\pretolerance\m@ne\tolerance\m@ne
        \hbadness\z@\showboxdepth\z@\ ##1\color@endgroup}}%

  \else
    \let\MT@expansion\relax
    \MT@info@nl{No font expansion}%
  \fi
}
⟨/pdftex-def|luatex-def⟩
⟨*xetex-def⟩
\def\MT@setup@expansion{%
  \ifMT@expansion
    \ifMT@opt@expansion
      \MT@error{Font expansion does not work with xetex}
               {Use pdftex or luatex instead.}%
    \fi
  \fi
}
⟨/xetex-def⟩
```

\MT@setup@tracking Tracking, spacing and kerning.

```
⟨*pdftex-def|luatex-def⟩
⟨pdftex-def⟩\MT@requires@pdftex6{%
⟨luatex-def⟩\MT@requires@luatex3{%
  \def\MT@setup@tracking{%
    \ifMT@tracking
      \edef\MT@active@features{\MT@active@features,tr}%
      \MT@info@nl{Tracking enabled}%
      \MT@check@active@set{tr}%
```

Enable protrusion for compensation at the line edges.

```
      \ifMT@protrusion\else\MT@protrudechars\@ne\fi
    \else
      \let\MT@tracking\relax
      \MT@info@nl{No adjustment of tracking}%
    \fi
  }
⟨/pdftex-def|luatex-def⟩
```

\MT@setup@spacing

```
⟨*pdftex-def⟩
  \def\MT@setup@spacing{%
    \ifMT@spacing
      \edef\MT@active@features{\MT@active@features,sp}%
      \pdfadjustinterwordglue\@ne
      \MT@info@nl{Adjustment of interword spacing enabled}%
```

The ragged2e package sets interword spaces to a fixed value without glue. microtype's modifications can therefore have undesired effects. Therefore, we issue a warning.

```
      \MT@with@package@T{ragged2e}{%
        \MT@warning@nl{You are using the `ragged2e' package.\MessageBreak
          Adjustment of interword spacing may lead to\MessageBreak
          undesired results when used with `ragged2e'.\MessageBreak
          In this case, disable the `spacing' option}%
      }%
      \MT@check@active@set{sp}%
    \else
      \let\MT@spacing\relax
      \MT@info@nl{No adjustment of interword spacing}%
    \fi
  }
```

\MT@setup@spacing@check

Warning if \nonfrenchspacing is active, since space factors will be ignored with \pdfadjustinterwordglue > 0. Why 1500? Because some packages redefine \frenchspacing.[16]

```
  \def\MT@setup@spacing@check{%
    \ifMT@spacing
      \ifMT@babel \else
        \ifnum\sfcode`\. > 1500
          \MT@ifstreq\MT@sp@context{nonfrench}\relax{%
            \MT@warning@nl{%
              \string\nonfrenchspacing\space is active. Adjustment of\MessageBreak
              interword spacing will disable it. You might want\MessageBreak
              to add `\@backslashchar\MT@MT context{spacing=nonfrench}'\MessageBreak
              to your preamble}%
          }%
        \fi
      \fi
    \fi
  }
```

\MT@setup@kerning

```
  \def\MT@setup@kerning{%
    \ifMT@kerning
      \edef\MT@active@features{\MT@active@features,kn}%
      \pdfprependkern\@ne
      \pdfappendkern\@ne
      \MT@info@nl{Adjustment of character kerning enabled}%
      \MT@check@active@set{kn}%
    \else
      \let\MT@kerning\relax
```

[16] Cf. the c.t.t. thread '\frenchspacing with AMS packages and babel', started by Philipp Lehman on 16 August 2005, MID: ddtbaj$rob$1@online.de

```
      \MT@info@nl{No adjustment of character kerning}%
    \fi
  }
⟨/pdftex-def⟩
```

\MT@error@doesnt@work

If pdfTEX is too old, we disable tracking, spacing and kerning, and throw an error message. We also switch the features off for LuaTEX and XƎTEX.

```
⟨pdftex-def|luatex-def⟩}{
⟨*luatex-def⟩
  \def\MT@setup@tracking{%
    \ifMT@tracking
      \MT@error{The tracking feature only works with luatex 0.62\MessageBreak
        or newer. Switching it off}{Upgrade luatex.}%
      \MT@trackingfalse
      \MT@let@nc{MT@tracking}\relax
    \else
      \MT@info@nl{No adjustment of tracking (luatex too old)}%
    \fi
  }
}
⟨/luatex-def⟩
⟨*pdftex-def|xetex-def|luatex-def⟩
  \def\MT@error@doesnt@work#1{%
    \csname ifMT@#1\endcsname
      \MT@error{The #1 feature only works with pdftex 1.40\MessageBreak
        or newer. Switching it off}
⟨pdftex-def⟩        {Upgrade pdftex.}%
⟨luatex-def|xetex-def⟩        {Use pdftex instead.}%
      \csname MT@#1false\endcsname
      \MT@let@nc{MT@#1}\relax
    \else
      \MT@info@nl{No adjustment of #1%
⟨pdftex-def⟩      \space(pdftex too old)%
      }%
    \fi
  }
⟨pdftex-def|xetex-def⟩  \def\MT@setup@tracking{\MT@error@doesnt@work{tracking}}
  \def\MT@setup@kerning {\MT@error@doesnt@work{kerning}}
  \def\MT@setup@spacing {\MT@error@doesnt@work{spacing}}
⟨pdftex-def⟩}
⟨/pdftex-def|xetex-def|luatex-def⟩
```

\MT@setup@warntracking

```
⟨letterspace⟩\MT@addto@setup
⟨pdftex-def|luatex-def⟩\def\MT@setup@warntracking
```

\MT@warn@tracking@DVI

With pdfTEX, we issue a warning, when letterspacing in DVI mode, since it will probably not work. We also switch on protrusion if it isn't already, to compensate for the letterspacing kerns.

```
⟨*pdftex-def|luatex-def|letterspace⟩
{%
⟨*pdftex-def|letterspace⟩
  \ifnum\pdfoutput<\@ne
    \def\MT@warn@tracking@DVI{%
⟨letterspace⟩      \MT@pdf@or@lua{%
      \MT@warning@nl{%
          You are using tracking/letterspacing in DVI mode.\MessageBreak
          This will probably not work, unless the post-\MessageBreak
          processing program (dvips, dvipdfm(x), ...) is\MessageBreak
          able to create the virtual fonts on the fly}%
⟨letterspace⟩      }\relax
      \MT@glet\MT@warn@tracking@DVI\relax
    }%
  \else
⟨/pdftex-def|letterspace⟩
    \def\MT@warn@tracking@DVI{%
      \ifnum\pdfprotrudechars<\@ne \global\pdfprotrudechars\@ne \fi
      \MT@glet\MT@warn@tracking@DVI\relax
    }%
⟨pdftex-def|letterspace⟩  \fi
  \ifnum\MT@letterspace=\m@ne
    \let\MT@letterspace\MT@letterspace@default
  \else
    \MT@ls@too@large\MT@letterspace
  \fi
}
⟨/pdftex-def|luatex-def|letterspace⟩
⟨xetex-def⟩\let\MT@setup@warntracking\relax
```

\MT@setup@noligatures

\DisableLigatures is only admissible in the preamble, therefore we can now disable the corresponding macro, if it was never called.

```
⟨*pdftex-def|luatex-def⟩
\def\MT@setup@noligatures{%
⟨pdftex-def⟩  \MT@requires@pdftex5{%
    \ifMT@noligatures \else
      \let\MT@noligatures\relax
    \fi
⟨pdftex-def⟩  }\relax
}
⟨/pdftex-def|luatex-def⟩
⟨xetex-def⟩\let\MT@setup@noligatures\relax
```

Remove the leading comma in \MT@active@features, and set the document switch to true.

```
⟨*package⟩
\MT@addto@setup{%
  \ifx\MT@active@features\@empty \else
    \edef\MT@active@features{\expandafter\@gobble\MT@active@features}%
  \fi
  \MT@documenttrue
}
```

\MT@set@babel@context

Interaction with babel.

```
\def\MT@set@babel@context#1{%
  \MT@ifdefined@n@TF{MT@babel@#1}{%
    \MT@vinfo{*** Changing to language context `#1'\MessageBreak\on@line}%
    \expandafter\MT@exp@one@n\expandafter\microtypecontext
      \csname MT@babel@#1\endcsname
  }{%
    \microtypecontext{protrusion=,expansion=,spacing=,kerning=}%
  }%
}
```

\MT@shorthandoff

Active characters can only be switched off if babel isn't loaded after microtype.

```
\@ifpackageloaded{babel}{
  \def\MT@shorthandoff#1#2{%
    \MT@info@nl{Switching off #1 babel's active characters (#2)}%
    \shorthandoff{#2}}
}{
  \def\MT@shorthandoff#1#2{%
    \MT@error{You must load `babel' before `\MT@MT'}
             {Otherwise, `\MT@MT' cannot switch off #1 babel's\MessageBreak
              active characters.}}
}
```

We patch the language switching commands to enable language-dependent setup.

```
\MT@addto@setup{%
  \ifMT@babel
```

```
    \@ifpackageloaded{babel}{%
      \MT@info@nl{Redefining babel's language switching commands}%
      \let\MT@orig@select@language\select@language
      \def\select@language#1{%
        \MT@orig@select@language{#1}%
        \MT@set@babel@context{#1}%
      }%
      \let\MT@orig@foreign@language\foreign@language
      \def\foreign@language#1{%
        \MT@orig@foreign@language{#1}%
        \MT@set@babel@context{#1}%
      }%
      \ifMT@kerning
```

Disable French babel's active characters.

```
        \MT@if@false
        \MT@with@babel@and@T{french}  \MT@if@true
        \MT@with@babel@and@T{frenchb} \MT@if@true
        \MT@with@babel@and@T{francais}\MT@if@true
        \MT@with@babel@and@T{canadien}\MT@if@true
        \MT@with@babel@and@T{acadian} \MT@if@true
        \ifMT@if@\MT@shorthandoff{French}{:;!?}\fi
```

Disable Turkish babel's active characters.

```
        \MT@if@false
        \MT@with@babel@and@T{turkish} \MT@if@true
        \ifMT@if@\MT@shorthandoff{Turkish}{:!=}\fi
      \fi
```

In case babel was loaded before microtype:

```
      \MT@set@babel@context\languagename
    }{%
      \MT@warning@nl{You did not load the babel package.\MessageBreak
        The `babel' option won't have any effect}%
    }%
  \fi
}
```

Now we close the \fi from \ifMT@draft.

```
\MT@addto@setup{\fi
```

Set up the current font, most likely the normal font. This has to come after all of the setup (including anything from the preamble) has been dealt with.

```
  \selectfont}
```

\MT@curr@file

This is the current file (hopefully with the correct extension).

```
\edef\MT@curr@file{\jobname.tex}
⟨/package⟩
```

Finally, execute the setup macro at the end of the preamble, and empty it (the combine class calls it repeatedly).

```
⟨*package|letterspace⟩
⟨plain⟩\MT@requires@latex1{
\AtBeginDocument{\MT@setup@ \MT@glet\MT@setup@\@empty}
⟨plain⟩}\relax
⟨/package|letterspace⟩
```

Must come at the very, very end.

```
⟨package⟩\MT@ifdefined@c@T\MT@setup@spacing@check
⟨package⟩  {\AtBeginDocument{\MT@setup@spacing@check}}
```

Restore catcodes.

```
⟨package|letterspace⟩\MT@restore@catcodes
```

That was that.

15 Configuration files

Let’s now write the font configuration files.

```
⟨*config⟩

```

15.1 Font sets

We first declare some sets in the main configuration file.

```
⟨*m-t⟩
%%% -----------------------------------------------------------------------
%%% FONT SETS

\DeclareMicrotypeSet{all}
   { }

\DeclareMicrotypeSet{allmath}
   { encoding = {OT1,T1,T2A,LY1,OT4,QX,T5,EU1,EU2,TU,TS1,OML,OMS,U} }

\DeclareMicrotypeSet{alltext}
   { encoding = {OT1,T1,T2A,LY1,OT4,QX,T5,TS1,EU1,EU2,TU} }

\DeclareMicrotypeSet{allmath-nott}
   { encoding = {OT1,T1,T2A,LY1,OT4,QX,T5,EU1,EU2,TU,TS1,OML,OMS,U},
     family   = {rm*,sf*}
   }

\DeclareMicrotypeSet{alltext-nott}
   { encoding = {OT1,T1,T2A,LY1,OT4,QX,T5,TS1,EU1,EU2,TU},
     family   = {rm*,sf*}
   }

\DeclareMicrotypeSet{basicmath}
   { encoding = {OT1,T1,T2A,LY1,OT4,QX,T5,EU1,EU2,TU,OML,OMS},
     family   = {rm*,sf*},
     series   = {md*},
     size     = {normalsize,footnotesize,small,large}
   }

\DeclareMicrotypeSet{basictext}
   { encoding = {OT1,T1,T2A,LY1,OT4,QX,T5,EU1,EU2,TU},
     family   = {rm*,sf*},
     series   = {md*},
     size     = {normalsize,footnotesize,small,large}
   }

\DeclareMicrotypeSet{smallcaps}
   { encoding = {OT1,T1,T2A,LY1,OT4,QX,T5,TS1,EU1,EU2,TU},
     shape    = {sc*,si,scit}
   }

\DeclareMicrotypeSet{footnotesize}
   { encoding = {OT1,T1,T2A,LY1,OT4,QX,T5,TS1,EU1,EU2,TU},
     size     = {-small}
   }

\DeclareMicrotypeSet{scriptsize}
   { encoding = {OT1,T1,T2A,LY1,OT4,QX,T5,TS1,EU1,EU2,TU},
     size     = {-footnotesize}
   }

\DeclareMicrotypeSet{normalfont}
   { font = */*/*/*/* }

```

The default sets.

```
%%% ----------------------------------------------------------------------
%%% DEFAULT SETS

\DeclareMicrotypeSetDefault[protrusion]{alltext}
\DeclareMicrotypeSetDefault[expansion] {alltext-nott}
\DeclareMicrotypeSetDefault[spacing]   {alltext-nott}
\DeclareMicrotypeSetDefault[kerning]   {alltext}
\DeclareMicrotypeSetDefault[tracking]  {smallcaps}

```

15.2 Font variants and aliases

These are the variants I happen to be using (expert encoding, oldstyle numerals, swashes, alternative, display, inferior and superior numerals): Additionally, we add the now common variants for Lining, Tabular, Oldstyle, and Tabular Oldstyle numbers.

```
%%% ----------------------------------------------------------------------
%%% FONT VARIANTS AND ALIASES

\DeclareMicrotypeVariants{x,j,w,a,d,0,1,-LF,-TLF,-OsF,-TOsF}
```

Other candidates: 2 (proportional digits), e (engraved), f (Fraktur), g (small text), h (shadow), l (outline), n (informal), p (ornaments), r (roman), s (sans serif), t (typewriter). I've omitted them since they seem hardly be used and/or they are actually more than just a variant, i.e., they shouldn't share a file.

Fonts that are 'the same': The fontspec package will set lmr as the default font, whose declarations for EU1/EU2/TU encoding are in mt-LatinModernRoman.cfg. Since 2016/12/03, the default encoding with XƎTeX and LuaTeX in the LaTeX format is TU, even if fontspec is not loaded.

```

\MT@if@false
\ifx\UnicodeEncodingName\@undefined\else
  \MT@ifstreq{\encodingdefault}{\UnicodeEncodingName}\MT@if@true\relax
\fi
\ifMT@fontspec\MT@if@true\fi
\ifMT@if@
%% -- Computer/Latin Modern Roman
\DeclareMicrotypeAlias{lmr}{Latin Modern Roman}
  \else
\DeclareMicrotypeAlias{lmr}{cmr}           % lmodern
\fi
```

The Latin Modern fonts, the virtual fonts from the ae and zefonts and the eco and hfoldsty packages (oldstyle numerals), as well as mlmodern, all inherit the (basic) settings from Computer Modern Roman. Some of them are in part overwritten later. We mustn't forget the Latin Modern math fonts.

```
\DeclareMicrotypeAlias{lmsy}{cmsy}         %   "
\DeclareMicrotypeAlias{lmm} {cmm}          %   "
\DeclareMicrotypeAlias{aer} {cmr}          % ae
\DeclareMicrotypeAlias{zer} {cmr}          % zefonts
```

```
\DeclareMicrotypeAlias{cmor}{cmr}          % eco
\DeclareMicrotypeAlias{hfor}{cmr}          % hfoldsty
\DeclareMicrotypeAlias{mlmr}{cmr}          % mlmodern
\DeclareMicrotypeAlias{mlmsy}{cmsy}        %   "
\DeclareMicrotypeAlias{mlmm} {cmm}         %   "
```

Another, new Computer Modern extension. The newcomputermodern package loads it by file name.

```
\DeclareMicrotypeAlias{New Computer Modern}{Latin Modern Roman}
\DeclareMicrotypeAlias{NewCM10-Book.otf}   {Latin Modern Roman}
\DeclareMicrotypeAlias{NewCM10-Regular.otf}{Latin Modern Roman}
```

The packages pxfonts and txfonts fonts inherit Palatino and Times settings respectively, also the TeX Gyre fonts Pagella and Termes (formerly: qfonts).

```
%% -- Palatino
\DeclareMicrotypeAlias{pxr} {ppl}          % pxfonts
\DeclareMicrotypeAlias{qpl} {ppl}          % TeX Gyre Pagella (formerly: qfonts/QuasiPalatino)
```

The ‘FPL Neu’ fonts, a ‘re-implementation’ of Palatino.

```
\DeclareMicrotypeAlias{fp9x}{pplx}         % FPL Neu
\DeclareMicrotypeAlias{fp9j}{pplj}         %    "
```

The newpx package, a replacement for pxfonts.

```
\DeclareMicrotypeAlias{zpllf}{pplx}        % newpxtext
\DeclareMicrotypeAlias{zplosf}{pplj}       %    "
\DeclareMicrotypeAlias{zpltlf}{pplx}       %    "
\DeclareMicrotypeAlias{zpltosf}{pplj}      %    "
```

The domitian package.

```
\DeclareMicrotypeAlias{Domitian-TLF} {pplx}% domitian
\DeclareMicrotypeAlias{Domitian-TOsF}{pplj}%    "
```

The OpenType versions:

```
\DeclareMicrotypeAlias{Palatino Linotype}{Palatino}
\DeclareMicrotypeAlias{Palatino LT Std}  {Palatino}
\DeclareMicrotypeAlias{TeX Gyre Pagella} {Palatino}
\DeclareMicrotypeAlias{Domitian}         {Palatino}
\DeclareMicrotypeAlias{Asana Math}       {Palatino}
%% -- Times New Roman
\DeclareMicrotypeAlias{txr}{ptm}           % txfonts
```

The newtx package, a replacement for txfonts.

```
\DeclareMicrotypeAlias{ntxlf}{ptmx}        % newtxtext
\DeclareMicrotypeAlias{ntxosf}{ptmj}       %    "
\DeclareMicrotypeAlias{ntxtlf}{ptmx}       %    "
\DeclareMicrotypeAlias{ntxtosf}{ptmj}      %    "
```

The tempora package.

```
\DeclareMicrotypeAlias{Tempora-TLF} {ptmx} % tempora
\DeclareMicrotypeAlias{Tempora-TOsF}{ptmj} %    "
\DeclareMicrotypeAlias{qtm}{ptm}           % TeX Gyre Termes (formerly: qfonts/QuasiTimes)
```

The step package.

```
\DeclareMicrotypeAlias{STEP-TLF} {ptmx}    % step
\DeclareMicrotypeAlias{STEP-TOsF}{ptmj}    %   "
```

The stix and stix2 packages (the latter has departed a bit from being a Times clone, but still seems close enough).

```
\DeclareMicrotypeAlias{stix} {ptm}         % stix
\DeclareMicrotypeAlias{stix2}{ptm}         % stix2
```

More Times variants, to be checked: pns, mns (TimesNewRomanPS); mnt (TimesNewRomanMT, TimesNRSevenMT), mtm (TimesSmallTextMT); pte (TimesEuropa); ptt (TimesTen); TimesEighteen; TimesModernEF.

MicroPress's Charter version (chmath).

```
%% -- Charter
\DeclareMicrotypeAlias{chr}{bch}           % CH Math
```

The XCharter package extends the Charter fonts.

```
\DeclareMicrotypeAlias{XCharter-TLF} {bch} % XCharter
\DeclareMicrotypeAlias{XCharter-TOsF}{bch} %    "
```

The mathdesign package provides math fonts matching Bitstream Charter and URW Garamond.

```
\DeclareMicrotypeAlias{mdbch}{bch}         % mathdesign/Charter
%% -- Garamond
\DeclareMicrotypeAlias{mdugm}{ugm}         % mathdesign/URW Garamond
```

The garamondx package, an extension of URW Garamond, providing small caps and oldstyle figures.

```
\DeclareMicrotypeAlias{zgmx}{ugm}          % garamondx
\DeclareMicrotypeAlias{zgmj}{ugm}          %    "
\DeclareMicrotypeAlias{zgmI}{ugm}          %    "
\DeclareMicrotypeAlias{zgmq}{ugm}          %    "
```

Because a configuration file for Adobe Garamond wouldn't be permitted for TEX Live distribution, we use EB Garamond as the base font.

```
\DeclareMicrotypeAlias{pad} {EBGaramond-LF}% Adobe Garamond
\DeclareMicrotypeAlias{padx}{EBGaramond-TLF}%   "
\DeclareMicrotypeAlias{padj}{EBGaramond-TOsF}%  "
%% --
```

URW Letter Gothic is similar enough to Bitstream Letter Gothic to share the configuration.

```
\DeclareMicrotypeAlias{ulg}{blg}           % URW LetterGothic -> Bitstream LetterGothic12Pitch
```

The eulervm package virtually extends the Euler fonts.

```
\DeclareMicrotypeAlias{zeur}{eur}          % Euler VM
\DeclareMicrotypeAlias{zeus}{eus}          %    "
```

Euro symbol fonts, to save some files.

```
\DeclareMicrotypeAlias{zpeus}   {zpeu}     % Adobe Euro sans -> serif
\DeclareMicrotypeAlias{eurosans}{zpeu}     % Adobe Euro sans -> serif

```

15.3 Interaction with babel

Contexts that are to be set when switching to a language.

```
%%% ----------------------------------------------------------------------
%%% INTERACTION WITH THE `babel' PACKAGE

\DeclareMicrotypeBabelHook
   {english,UKenglish,british,USenglish,american}
   {kerning=, spacing=nonfrench}

\DeclareMicrotypeBabelHook
   {french,francais,acadian,canadien}
   {kerning=french, spacing=}

\DeclareMicrotypeBabelHook
   {turkish}
   {kerning=turkish, spacing=}

```

15.4 Note on admissible characters

All printable ASCII characters are allowed in the settings, with the following exceptions (on the left hand side, the replacements on the right):

`\`	:	`\textbackslash`
`{`	:	`\textbraceleft`
`}`	:	`\textbraceright`
`^`	:	`\textasciicircum`
`%`	:	`\%`
`#`	:	`\#`

Comma and equal sign must be guarded with braces (‘`{,}`’, ‘`{=}`’) to keep `keyval` happy.

Character commands are allowed as far as they have been defined in the proper LaTeX way, that is, when they have been assigned a slot in the font encoding with `\DeclareTextSymbol` or `\DeclareTextComposite`. Characters defined via `\chardef` are also possible.

Ligatures and `\mathchardef`’ed symbols have to be specified numerically. Of course, numerical identification is possible in any other case, too.

8-bit characters are also admissible, provided they have been declared in the input encoding file. They should, however, only be used in private configuration files, where the proper input encoding is guaranteed, or else in combination with the ‘`inputenc`’ key.

With XeTeX or LuaTeX, in contrast, it is advisable to use the proper Unicode characters, or the font-specific glyph names prefixed with ‘/’ (cf. section 16).

15.5 Character inheritance

First the lists of inheriting characters. We only declare those characters that are the same on *both* sides, i.e., not Œ for O.

```
⟨/m-t⟩
⟨*m-t|zpeu|mvs⟩
%%% -----------------------------------------------------------------------
%%% CHARACTER INHERITANCE

⟨/m-t|zpeu|mvs⟩
⟨*m-t⟩
```

15.5.1 OT1

Glyphs that should possibly inherit settings on one side only: 012 (‘fi’ ligature), 013 (‘fl’), 014 (‘ffi’), 015 (‘ffl’), Æ, æ, Œ, œ.

```
\DeclareCharacterInheritance
   { encoding = OT1 }
   { f = {011}, % ff
     i = {\i},
     j = {\j},
     O = {\O},
     o = {\o}
   }

```

15.5.2 T1

Candidates here: 028 (‘fi’), 029 (‘fl’), 030 (‘ffi’), 031 (‘ffl’), 156 (‘IJ’ ligature, since LaTeX 2005/12/01 accessible as \IJ), 188 (‘ij’, \ij), Æ, æ, Œ, œ.

```
\DeclareCharacterInheritance
  { encoding = T1 }
  { A = {\`A,\'A,\^A,\~A,\"A,\r A,\k A,\u A},
    a = {\`a,\'a,\^a,\~a,\"a,\r a,\k a,\u a},
    C = {\'C,\c C,\v C},
    c = {\'c,\c c,\v c},
    D = {\v D,\DH},
    d = {\v d,\dj},
    E = {\`E,\'E,\^E,\"E,\k E,\v E},
    e = {\`e,\'e,\^e,\"e,\k e,\v e},
    f = {027}, % ff
    G = {\u G},
    g = {\u g},
    I = {\`I,\'I,\^I,\"I,\.I},
    i = {\`i,\'i,\^i,\"i,\i},
    j = {\j},
    L = {\L,\'L,\v L},
    l = {\l,\'l,\v l},
    N = {\'N,\~N,\v N},
    n = {\'n,\~n,\v n},
    O = {\O,\`O,\'O,\^O,\~O,\"O,\H O},
    o = {\o,\`o,\'o,\^o,\~o,\"o,\H o},
    R = {\'R,\v R},
    r = {\'r,\v r},
    S = {\'S,\c S,\v S,\SS},
    s = {\'s,\c s,\v s},
    T = {\c T,\v T},
    t = {\c t,\v t},
    U = {\`U,\'U,\^U,\"U,\H U,\r U},
    u = {\`u,\'u,\^u,\"u,\H u,\r u},
    Y = {\'Y,\"Y},
    y = {\'y,\"y},
    Z = {\'Z,\.Z,\v Z},
    z = {\'z,\.z,\v z}
```

The ‘soft hyphen’ often has reduced right side bearing so that it may already be protruded, hence no inheritance.

```
%    - = {127},
  }

```

15.5.3 LY1

More characters: 008 (‘fl’), 012 (‘fi’), 014 (‘ffi’), 015 (‘ffl’), Æ, æ, Œ, œ.

```
\DeclareCharacterInheritance
  { encoding = LY1 }
  { A = {\`A,\'A,\^A,\~A,\"A,\r A},
    a = {\`a,\'a,\^a,\~a,\"a,\r a},
    C = {\c C},
    c = {\c c},
    D = {\DH},
    E = {\`E,\'E,\^E,\"E},
    e = {\`e,\'e,\^e,\"e},
    f = {011}, % ff
    I = {\`I,\'I,\^I,\"I},
    i = {\`i,\'i,\^i,\"i,\i},
    L = {\L},
    l = {\l},
    N = {\~N},
    n = {\~n},
    O = {\`O,\'O,\^O,\~O,\"O,\O},
    o = {\`o,\'o,\^o,\~o,\"o,\o},
    S = {\v S},
    s = {\v s},
    U = {\`U,\'U,\^U,\"U},
    u = {\`u,\'u,\^u,\"u},
    Y = {\'Y,\"Y},
    y = {\'y,\"y},
    Z = {\v Z},
    z = {\v z}
  }

```

15.5.4 OT4

The Polish OT1 extension. More interesting characters here: 009 (‘fk’), 012 (‘fi’), 013 (‘fl’), 014 (‘ffi’), 015 (‘ffl’), Æ, æ, Œ, œ.

```
\DeclareCharacterInheritance
  { encoding = OT4 }
  { A = {\k A},
    a = {\k a},
    C = {\'C},
    c = {\'c},
    E = {\k E},
    e = {\k e},
    f = {011}, % ff
    i = {\i},
    j = {\j},
    L = {\L},
    l = {\l},
    N = {\'N},
    n = {\'n},
    O = {\O,\'O},
    o = {\o,\'o},
    S = {\'S},
    s = {\'s},
    Z = {\'Z,\.Z},
    z = {\'z,\.z},
    \textquotedblleft = "FF
  }

```

15.5.5 QX

The Central European QX encoding.[17] Ligatures: 009 (‘fk’), 012 (‘fi’), 013 (‘fl’), 014 (‘ffi’), 015 (‘ffl’), Æ, æ, Œ, œ.

```
\DeclareCharacterInheritance
  { encoding = QX }
  { A = {\`A,\'A,\^A,\~A,\"A,\k A,\AA},
    a = {\`a,\'a,\^a,\~a,\"a,\k a,\aa},
    C = {\'C,\c C},
    c = {\'c,\c c},
    D = {\DH},
    E = {\`E,\'E,\^E,\"E,\k E},
    e = {\`e,\'e,\^e,\"e,\k e},
    f = {011}, % ff
    I = {\`I,\'I,\^I,\"I,\k I},
    i = {\`i,\'i,\^i,\"i,\k i,\i},
    j = {\j},
```

[17] Contributed by *Maciej Eder*.

```
     L = {\L},
     l = {\l},
     N = {\'N,\~N},
     n = {\'n,\~n},
     O = {\O,\`O,\'O,\^O,\~O,\"O},
     o = {\o,\`o,\'o,\^o,\~o,\"o},
```

The Romanian `\textcommabelow` accents are actually replacements for the `\c` variants, which had previously (and erroneously[18]) been included in QX encoding. They are still kept for backwards compatibility.

```
     S = {\'S,\c S,\textcommabelow S,\v S},
     s = {\'s,\c s,\textcommabelow s,\v s},
     T = {\c T,\textcommabelow T},
     t = {\c t,\textcommabelow t},
     U = {\`U,\'U,\^U,\"U,\k U},
     u = {\`u,\'u,\^u,\"u,\k u},
     Y = {\'Y,\"Y},
     y = {\'y,\"y},
     Z = {\'Z,\.Z,\v Z},
     z = {\'z,\.z,\v z},
     . = \textellipsis
   }

```

15.5.6 T5

The Vietnamese encoding `T5`. It is so crowded with accented and double-accented characters that there is no room for any ligatures.

```
\DeclareCharacterInheritance
   { encoding = T5 }
   { A = {\`A,\'A,\~A,\h A,\d A,\^A,\u A,
          \`\Acircumflex,\'\Acircumflex,\~\Acircumflex,\h\Acircumflex,\d\Acircumflex,
          \`\Abreve,\'\Abreve,\~\Abreve,\h\Abreve,\d\Abreve},
     a = {\`a,\'a,\~a,\h a,\d a,\^a,\u a,
          \`\acircumflex,\'\acircumflex,\~\acircumflex,\h\acircumflex,\d\acircumflex,
          \`\abreve,\'\abreve,\~\abreve,\h\abreve,\d\abreve},
     D = {\DJ},
     d = {\dj},
     E = {\`E,\'E,\~E,\h E,\d E,\^E,
          \`\Ecircumflex,\'\Ecircumflex,\~\Ecircumflex,\h\Ecircumflex,\d\Ecircumflex},
     e = {\`e,\'e,\~e,\h e,\d e,\^e,
          \`\ecircumflex,\'\ecircumflex,\~\ecircumflex,\h\ecircumflex,\d\ecircumflex},
     I = {\`I,\'I,\~I,\h I,\d I},
     i = {\`i,\'i,\~i,\h i,\d i,\i},
     O = {\`O,\'O,\~O,\h O,\d O,\^O,\horn O,
          \`\Ocircumflex,\'\Ocircumflex,\~\Ocircumflex,\h\Ocircumflex,\d\Ocircumflex,
          \`\Ohorn,\'\Ohorn,\~\Ohorn,\h\Ohorn,\d\Ohorn},
     o = {\`o,\'o,\~o,\h o,\d o,\^o,\horn o,
          \`\ocircumflex,\'\ocircumflex,\~\ocircumflex,\h\ocircumflex,\d\ocircumflex,
          \`\ohorn,\'\ohorn,\~\ohorn,\h\ohorn,\d\ohorn},
     U = {\`U,\'U,\~U,\h U,\d U,\horn U,
          \`\Uhorn,\'\Uhorn,\~\Uhorn,\h\Uhorn,\d\Uhorn},
     u = {\`u,\'u,\~u,\h u,\d u,\horn u,
          \`\uhorn,\'\uhorn,\~\uhorn,\h\uhorn,\d\uhorn},
     Y = {\`Y,\'Y,\~Y,\h Y,\d Y},
     y = {\`y,\'y,\~y,\h y,\d y}
   }

```

[18] Cf. http://tug.org/pipermail/tex-live/2008-August/017204.html

15.5.7 EU1, EU2, TU

The EU1 (XeTeX), EU2 (LuaTeX), and, since fontspec version 2.5, TU encodings are not well-defined in the sense that they don't contain a fixed number of glyphs, all of which must be present. OpenType fonts may contain thousands of glyphs, but we only define those that should be present in every font (basically T1). This inheritance list should be overridden by font-specific ones.

```
\DeclareCharacterInheritance
  { encoding = {TU,EU1,EU2} }
  { A = {\`A,\'A,\^A,\~A,\"A,\r A,\k A,\u A},
    a = {\`a,\'a,\^a,\~a,\"a,\r a,\k a,\u a},
    C = {\'C,\c C,\v C},
    c = {\'c,\c c,\v c},
    D = {\v D,\DH},
    d = {\v d,\dj},
    E = {\`E,\'E,\^E,\"E,\k E,\v E},
    e = {\`e,\'e,\^e,\"e,\k e,\v e},
%     f = {/f_f}, % sometimes /f_f, sometimes /ff
    G = {\u G},
    g = {\u g},
    I = {\`I,\'I,\^I,\"I,\.I},
    i = {\`i,\'i,\^i,\"i,\i},
%     j = {\j},
    L = {\L,\'L,\v L},
    l = {\l,\'l,\v l},
    N = {\'N,\~N,\v N},
    n = {\'n,\~n,\v n},
    O = {\O,\`O,\'O,\^O,\~O,\"O,\H O},
    o = {\o,\`o,\'o,\^o,\~o,\"o,\H o},
    R = {\'R,\v R},
    r = {\'r,\v r},
    S = {\'S,\c S,\v S}, % \SS
    s = {\'s,\c s,\v s},
    T = {\c T,\v T},
    t = {\c t,\v t},
    U = {\`U,\'U,\^U,\"U,\H U,\r U},
    u = {\`u,\'u,\^u,\"u,\H u,\r u},
    Y = {\'Y,\"Y},
    y = {\'y,\"y},
    Z = {\'Z,\.Z,\v Z},
    z = {\'z,\.z,\v z}
  }

⟨/m-t⟩
```

15.5.8 Euro symbols

Make Euro symbols settings simpler.

```
⟨*zpeu⟩
\DeclareCharacterInheritance
  { encoding = U,
    family   = {zpeu,zpeus,eurosans} }
  { E = 128 }

⟨/zpeu⟩
⟨*mvs⟩
```

Since 2006/05/11 (that is, one week after I've added these settings, after the package had been dormant for six years!), marvosym's encoding is (correctly) U instead of OT1.

```
\DeclareCharacterInheritance
  { encoding = {OT1,U},
     family   = mvs }
   { 164 = {099,100,101} } % \EURhv,\EURcr,\EURtm

⟨/mvs⟩
```

15.6 Tracking

By default, we only disable the 'f*' ligatures, for those fonts that have any. Thus, ligatures and especially kerning for all other characters will be retained.

```
⟨*m-t⟩
%%% -----------------------------------------------------------------------
%%% TRACKING/LETTERSPACING

\SetTracking
  [ name         = default,
    no ligatures = {f} ]
  { encoding     = {OT1,T1,T2A,LY1,OT4,QX,EU2,TU} }
  { }

```

15.7 Font expansion

These are Hàn Thế Thành's original expansion settings. They are used for all fonts (until somebody shows mercy and creates font-specific settings).

```
%%% -----------------------------------------------------------------------
%%% EXPANSION

\SetExpansion
   [ name     = default      ]
   { encoding = {OT1,OT4,QX,T1,LY1} }
   {
     A = 500,     a = 700,
   \AE = 500,   \ae = 700,
     B = 700,     b = 700,
     C = 700,     c = 700,
     D = 500,     d = 700,
     E = 700,     e = 700,
     F = 700,
     G = 500,     g = 700,
     H = 700,     h = 700,
     K = 700,     k = 700,
     M = 700,     m = 700,
     N = 700,     n = 700,
     O = 500,     o = 700,
   \OE = 500,   \oe = 700,
     P = 700,     p = 700,
     Q = 500,     q = 700,
     R = 700,
     S = 700,     s = 700,
     U = 700,     u = 700,
     W = 700,     w = 700,
     Z = 700,     z = 700,
     2 = 700,
     3 = 700,
     6 = 700,
     8 = 700,
     9 = 700
   }

```

Settings for Cyrillic T2A encoding.[19]

```
\SetExpansion
  [ name     = T2A ]
  { encoding = T2A }
  {
    A = 500,      a = 700,
    B = 700,      b = 700,
    C = 700,      c = 700,
    D = 500,      d = 700,
    E = 700,      e = 700,
    F = 700,
    G = 500,      g = 700,
    H = 700,      h = 700,
    K = 700,      k = 700,
    M = 700,      m = 700,
    N = 700,      n = 700,
    O = 500,      o = 700,
    P = 700,      p = 700,
    Q = 500,      q = 700,
    R = 700,
    S = 700,      s = 700,
    U = 700,      u = 700,
    W = 700,      w = 700,
    Z = 700,      z = 700,
    2 = 700,
    3 = 700,
    6 = 700,
    8 = 700,
    9 = 700,
    \CYRA = 500,     \cyra = 700,
    \CYRB = 700,     \cyrb = 700,
    \CYRV = 700,     \cyrv = 700,
    \CYRG = 700,     \cyrg = 700,
    \CYRD = 700,     \cyrd = 700,
    \CYRE = 700,     \cyre = 700,
    \CYRZH = 700,    \cyrzh = 700,
    \CYRZ = 700,     \cyrz = 700,
    \CYRI = 700,     \cyri = 700,
    \CYRISHRT = 700, \cyrishrt = 700,
    \CYRK = 700,     \cyrk = 700,
    \CYRL = 700,     \cyrl = 700,
    \CYRM = 700,     \cyrm = 700,
    \CYRN = 700,     \cyrn = 700,
    \CYRO = 500,     \cyro = 700,
    \CYRP = 700,     \cyrp = 700,
    \CYRR = 700,     \cyrr = 700,
    \CYRS = 700,     \cyrs = 700,
    \CYRT = 700,     \cyrt = 700,
    \CYRU = 700,     \cyru = 700,
    \CYRF = 700,     \cyrf = 700,
    \CYRH = 700,     \cyrh = 700,
    \CYRC = 700,     \cyrc = 700,
    \CYRCH = 700,    \cyrch = 700,
    \CYRSH = 700,    \cyrsh = 700,
    \CYRSHCH = 700,  \cyrshch = 700,
    \CYRHRDSN = 700, \cyrhrdsn = 700,
    \CYRERY = 700,   \cyrery = 700,
    \CYRSFTSN = 700, \cyrsftsn = 700,
    \CYREREV = 700,  \cyrerev = 700,
    \CYRYU = 700,    \cyryu = 700,
    \CYRYA = 700,    \cyrya = 700
  }

```

[19] Contributed by *Karl Karlsson*.

T5 encoding does not contain `\AE`, `\ae`, `\OE` and `\oe`.

```
\SetExpansion
   [ name     = T5 ]
   { encoding = T5 }
   {
     A = 500,     a = 700,
     B = 700,     b = 700,
     C = 700,     c = 700,
     D = 500,     d = 700,
     E = 700,     e = 700,
     F = 700,
     G = 500,     g = 700,
     H = 700,     h = 700,
     K = 700,     k = 700,
     M = 700,     m = 700,
     N = 700,     n = 700,
     O = 500,     o = 700,
     P = 700,     p = 700,
     Q = 500,     q = 700,
     R = 700,
     S = 700,     s = 700,
     U = 700,     u = 700,
     W = 700,     w = 700,
     Z = 700,     z = 700,
     2 = 700,
     3 = 700,
     6 = 700,
     8 = 700,
     9 = 700
   }

⟨/m-t⟩
```

15.8 Character protrusion

```
%%% -----------------------------------------------------------------------
%%% PROTRUSION

```

For future historians, Hàn Thế Thành’s original settings (from `protcode.tex`, converted to `microtype` notation).

```
\SetProtrusion
   [ name     = thanh ]
   { encoding = OT1 }
   {
     A = {50,50},
     F = {  ,50},
     J = {50,  },
     K = {  ,50},
     L = {  ,50},
     T = {50,50},
     V = {50,50},
     W = {50,50},
     X = {50,50},
     Y = {50,50},
     k = {  ,50},
     r = {  ,50},
     t = {  ,50},
     v = {50,50},
     w = {50,50},
     x = {50,50},
     y = {50,50},
     . = { ,700},    {,}= { ,700},
     : = { ,500},     ; = { ,500},
     ! = { ,200},     ? = { ,200},
     ( = {50,  },     ) = {  ,50},
     - = { ,700},
     \textendash        = { ,300},     \textemdash        = { ,200},
     \textquoteleft     = {700, },     \textquoteright    = { ,700},
     \textquotedblleft  = {500, },     \textquotedblright = { ,500}
   }
```

15.8.1 Normal

The default settings always use the most moderate value.

```
⟨*cfg-t⟩
\SetProtrusion
⟨m-t⟩    [ name     = default ]
```

We also create configuration files for the fonts

- Bitstream Charter (NFSS code bch)

```
⟨bch⟩    [ name     = bch-default ]
```

- Bitstream Letter Gothic (blg)

```
⟨blg⟩    [ name     = blg-default ]
```

- Computer Modern Roman (cmr)

```
⟨cmr⟩    [ name     = cmr-default ]
```

- EB Garamond

```
⟨ebg⟩    [ name     = EBGaramond-default ]
```

- Minion[20] (pmnx, pmnj)

```
⟨pmn⟩    [ name     = pmnj-default ]
```

- Palatino (ppl, pplx, pplj)

```
⟨ppl⟩    [ name     = ppl-default ]
```

- Times (ptm, ptmx, ptmj)

```
⟨ptm⟩    [ name     = ptm-default ]
```

- URW Garamond (ugm)

```
⟨ugm⟩    [ name     = ugm-default ]
⟨m-t|cmr|pmn⟩    { }
⟨bch|blg|ebg|ugm⟩    { encoding = OT1,
⟨ppl|ptm⟩    { encoding = {OT1,OT4},
⟨bch⟩      family   = bch }
⟨blg⟩      family   = blg }
⟨ebg⟩      family   = {EBGaramond-LF,EBGaramond-OsF,EBGaramond-TLF,EBGaramond-TOsF} }
⟨ppl⟩      family   = {ppl,pplx,pplj} }
⟨ptm⟩      family   = {ptm,ptmx,ptmj} }
⟨ugm⟩      family   = ugm }
   {
⟨m-t|bch|blg|cmr|ebg|pmn|ppl|ptm⟩      A = {50,50},
⟨ugm⟩      A = {50,100},
⟨ebg|ptm⟩    \AE = {50,  },
⟨ugm⟩    \AE = {150,50},
⟨ugm⟩      B = {  ,50},
⟨bch|ebg|pmn|ugm⟩      C = {50,  },
```

[20] Contributed by *Harald Harders* and *Karl Karlsson*.

```
⟨bch|ebg|pmn⟩     D = {  ,50},
⟨ugm⟩     D = {  ,70},
⟨ugm⟩     E = {  ,50},
⟨m-t|bch|cmr|ebg|pmn|ptm⟩     F = {  ,50},
⟨ugm⟩     F = {  ,70},
⟨bch|ebg|pmn⟩     G = {50,  },
⟨ugm⟩     G = {50,50},
⟨blg⟩     I = {150,150},
⟨m-t|cmr|ebg|pmn|ppl|ptm|ugm⟩     J = {50,  },
⟨bch|blg⟩     J = {100,  },
⟨!blg⟩     K = {  ,50},
⟨blg⟩     K = {50,  },
⟨m-t|bch|cmr|ebg|pmn|ppl⟩     L = {  ,50},
⟨blg⟩     L = {  ,150},
⟨ptm⟩     L = {  ,80},
⟨ugm⟩     L = {  ,120},
⟨bch|ebg|pmn|ugm⟩     O = {50,50},
⟨ebg⟩   \OE = {50,  },
⟨ugm⟩   \OE = {50,50},
⟨blg⟩     P = {  ,100},
⟨ugm⟩     P = {  ,50},
⟨bch|ebg|pmn⟩     Q = {50,70},
⟨ugm⟩     Q = {50,50},
⟨bch⟩     R = {  ,50},
⟨ugm⟩     R = {  ,70},
⟨m-t|bch|cmr|ebg|pmn|ppl|ptm⟩     T = {50,50},
⟨blg⟩     T = {100,100},
⟨ugm⟩     T = {70,70},
⟨m-t|bch|cmr|ebg|pmn|ppl|ptm⟩     V = {50,50},
⟨blg|ugm⟩     V = {70,70},
⟨m-t|bch|cmr|ebg|pmn|ppl|ptm⟩     W = {50,50},
⟨ugm⟩     W = {70,70},
⟨m-t|bch|cmr|ebg|pmn|ppl|ptm⟩     X = {50,50},
⟨ugm⟩     X = {50,70},
⟨m-t|bch|cmr|ebg|pmn|ppl⟩     Y = {50,50},
⟨blg|ptm|ugm⟩     Y = {80,80},
⟨ugm⟩     Z = {50,50},
⟨blg⟩     f = {150,100},
⟨blg⟩     i = {150,150},
⟨blg⟩     j = {100,100},
⟨m-t|bch|cmr|ebg|pmn|ppl|ptm⟩     k = {  ,50},
⟨ugm⟩     k = {  ,70},
⟨blg⟩     l = {150,150},
⟨pmn⟩     l = {  ,-50},
⟨ebg|ppl⟩     p = {50,50},
⟨ugm⟩     p = {  ,50},
⟨ebg|ppl⟩     q = {50,  },
⟨!blg⟩     r = {  ,50},
⟨blg⟩     r = {100, 80},
⟨cmr|ebg|pmn⟩     t = {  ,70},
⟨bch⟩     t = {  ,50},
⟨blg⟩     t = {150, 80},
⟨ugm⟩     t = {  ,100},
⟨m-t|bch|cmr|ebg|pmn|ppl|ptm⟩     v = {50,50},
⟨blg⟩     v = {100,100},
⟨ugm⟩     v = {50,70},
⟨m-t|bch|cmr|ebg|pmn|ppl|ptm⟩     w = {50,50},
⟨ugm⟩     w = {50,70},
⟨!blg⟩     x = {50,50},
⟨blg⟩     x = {100,100},
⟨m-t|bch|ebg|pmn⟩     y = {  ,50},
⟨blg⟩     y = { 50,100},
⟨cmr|ppl|ptm⟩     y = {50,70},
⟨ugm⟩     y = {  ,70},

⟨cmr⟩     0 = {  ,50},
⟨m-t⟩     1 = {50,50},
⟨bch|blg|ebg|ptm|ugm⟩     1 = {150,150},
⟨cmr⟩     1 = {100,200},
⟨pmn⟩     1 = {  ,50},
⟨ppl⟩     1 = {100,100},
⟨bch|cmr|ebg|ugm⟩     2 = {50,50},
⟨blg⟩     2 = {  ,100},
⟨bch|pmn⟩     3 = {50,  },
⟨cmr|ebg|ugm⟩     3 = {50,50},
⟨blg⟩     3 = {100,  },
⟨m-t|ebg⟩     4 = {50,50},
⟨bch⟩     4 = {100,50},
⟨blg⟩     4 = {100,  },
⟨cmr|ugm⟩     4 = {70,70},
⟨pmn⟩     4 = {50,  },
⟨ptm⟩     4 = {70,  },
⟨cmr⟩     5 = {  ,50},
⟨ebg⟩     5 = {50,50},
⟨bch⟩     6 = {50,  },
⟨cmr⟩     6 = {  ,50},
⟨ebg⟩     6 = {50,50},
⟨m-t⟩     7 = {50,50},
⟨bch|ebg|pmn|ugm⟩     7 = {50,80},
⟨blg⟩     7 = {100,100},
⟨cmr|ptm⟩     7 = {50,100},
⟨ppl⟩     7 = {  ,50},
⟨cmr⟩     8 = {  ,50},
⟨bch|ebg⟩     9 = {50,50},
⟨cmr⟩     9 = {  ,50},
⟨m-t|cmr|ebg|pmn|ppl|ptm|ugm⟩     . = { ,700},
⟨bch⟩     . = { ,600},
⟨blg⟩     . = {400,500},
⟨!blg⟩    {,}= { ,500},
⟨blg⟩    {,}= {300,400},
⟨m-t|cmr|ebg|pmn|ppl|ptm|ugm⟩     : = { ,500},
⟨bch⟩     : = { ,400},
⟨blg⟩     : = {300,400},
⟨m-t|bch|ebg|pmn|ptm⟩     ; = { ,300},
⟨blg⟩     ; = {200,300},
⟨cmr|ppl⟩     ; = { ,500},
⟨ugm⟩     ; = { ,400},
⟨!blg⟩     ! = { ,100},
⟨blg⟩     ! = {200,200},
⟨m-t|ebg|pmn|ptm⟩     ? = { ,100},
⟨bch|cmr|ppl|ugm⟩     ? = { ,200},
⟨blg⟩     ? = {150,150},
⟨pmn⟩     " = {300,300},
⟨m-t|bch|cmr|ebg|pmn|ppl⟩     @ = {50,50},
⟨ptm⟩     @ = {100,100},
⟨m-t|bch|blg|cmr|ebg|pmn|ppl|ptm⟩     ~ = {200,250},
⟨ugm⟩     ~ = {300,350},
⟨ebg|ppl|ptm⟩     & = {50,100},
⟨ugm⟩     & = {  ,100},
⟨m-t|cmr|ebg|pmn⟩    \% = {50,50},
⟨bch⟩    \% = {  ,50},
⟨ppl|ptm⟩    \% = {100,100},
⟨ugm⟩    \% = {50,100},
⟨blg⟩    \# = {100,100},
⟨m-t|ppl|ptm|ugm⟩     * = {200,200},
⟨bch|pmn⟩     * = {200,300},
⟨blg⟩     * = {150,200},
⟨cmr|ebg⟩     * = {300,300},
⟨m-t|cmr|ppl|ptm⟩     + = {250,250},
⟨bch⟩     + = {150,250},
⟨ebg⟩     + = {300,300},
⟨blg|pmn⟩      + = {150,200},
⟨ugm⟩      + = {250,300},
⟨blg|ugm⟩     {=}= {200,200},
⟨m-t|ebg|pmn|ptm⟩      ( = {100,   },     ) = {   ,200},
⟨bch|ugm⟩      ( = {200,   },     ) = {   ,200},
⟨cmr|blg⟩      ( = {300,   },     ) = {   ,300},
⟨ppl⟩      ( = {100,   },     ) = {   ,300},
⟨bch|pmn⟩      [ = {100,   },     ] = {   ,100},
⟨blg⟩      [ = {300,100},     ] = {   ,300},

⟨m-t|ebg|pmn|ptm⟩      / = {100,200},
⟨bch⟩      / = { ,200},
⟨blg⟩      / = {300,300},
⟨cmr|ppl⟩      / = {200,300},
⟨ugm⟩      / = {100,300},
⟨m-t|ptm⟩      - = {500,500},
⟨bch|cmr|ppl⟩      - = {400,500},
⟨blg⟩      - = {300,400},
⟨ebg⟩      - = {300,500},
⟨pmn⟩      - = {200,400},
⟨ugm⟩      - = {500,600},
⟨blg⟩      < = {200,100},     > = {100,200},
⟨blg⟩      _ = {150,250},
⟨blg⟩      | = {250,250},
⟨m-t|pmn⟩      \textendash       = {200,200},   \textemdash        = {150,150},
⟨bch⟩      \textendash       = {200,300},   \textemdash        = {150,250},
⟨cmr⟩      \textendash       = {400,300},   \textemdash        = {300,200},
⟨ebg|ppl|ptm⟩      \textendash       = {300,300},   \textemdash        = {200,200},
⟨ugm⟩      \textendash       = {250,300},   \textemdash        = {250,250},
```

Why settings for left *and* right quotes? Because in some languages they might be used like that (see the csquotes package for examples).

```
⟨m-t|bch|pmn⟩      \textquoteleft    = {300,400},   \textquoteright    = {300,400},
⟨blg⟩      \textquoteleft    = {400,600},   \textquoteright    = {400,600},
⟨cmr⟩      \textquoteleft    = {500,700},   \textquoteright    = {500,600},
⟨ebg|ppl⟩      \textquoteleft    = {500,700},   \textquoteright    = {500,700},
⟨ptm⟩      \textquoteleft    = {500,500},   \textquoteright    = {300,500},
⟨ugm⟩      \textquoteleft    = {300,600},   \textquoteright    = {300,600},
⟨m-t|bch|pmn⟩      \textquotedblleft = {300,300},   \textquotedblright = {300,300}
⟨blg⟩      \textquotedblright = {300,400}
⟨cmr⟩      \textquotedblleft = {500,300},   \textquotedblright = {200,600}
⟨ebg|ppl|ptm⟩      \textquotedblleft = {300,400},   \textquotedblright = {300,400}
⟨ugm⟩      \textquotedblleft = {400,400},   \textquotedblright = {400,400}
   }

```

Greek uppercase letters are in OT1 encoding only.

```
⟨*m-t|cmr|pmn⟩
\SetProtrusion
⟨m-t⟩   [ name     = OT1-default,
⟨cmr⟩   [ name     = cmr-OT1,
⟨pmn⟩   [ name     = pmnj-OT1,
⟨m-t⟩     load     = default ]
⟨cmr⟩     load     = cmr-default ]
⟨pmn⟩     load     = pmnj-default ]
⟨m-t⟩   { encoding = OT1 }
⟨cmr⟩   { encoding = {OT1,OT4},
⟨pmn⟩   { encoding = OT1,
⟨cmr⟩     family   = cmr  }
⟨pmn⟩     family   = pmnj }
   {
⟨m-t|cmr⟩      \AE = {50,   },
⟨pmn⟩      \OE = {50,  }
⟨*cmr⟩
     "00 = {   ,150}, % \Gamma
     "01 = {100,100}, % \Delta
     "02 = { 50, 50}, % \Theta
     "03 = {100,100}, % \Lambda
     "06 = { 50, 50}, % \Sigma
     "07 = {100,100}, % \Upsilon
     "08 = { 50, 50}, % \Phi
     "09 = { 50, 50}  % \Psi
```

Remaining slots can be found in the source file.

```
⟨/cmr⟩
   }

⟨/m-t|cmr|pmn⟩
```

T1 and LY1 encodings contain some more characters. The default list will be loaded first. For XƎTEX (EU1) and LuaTEX (EU2) we simply use the T1 list as default (for now).

```
\SetProtrusion
⟨m-t⟩   [ name     = T1-default,
⟨bch⟩   [ name     = bch-T1,
⟨blg⟩   [ name     = blg-T1,
⟨cmr⟩   [ name     = cmr-T1,
⟨ebg⟩   [ name     = EBGaramond-T1,
⟨pmn⟩   [ name     = pmnj-T1,
⟨ppl⟩   [ name     = ppl-T1,
⟨ptm⟩   [ name     = ptm-T1,
⟨ugm⟩   [ name     = ugm-T1,
⟨m-t⟩     load     = default     ]
⟨bch⟩     load     = bch-default ]
⟨blg⟩     load     = blg-default ]
⟨cmr⟩     load     = cmr-default ]
⟨ebg⟩     load     = EBGaramond-default ]
⟨pmn⟩     load     = pmnj-default ]
⟨ppl⟩     load     = ppl-default ]
⟨ptm⟩     load     = ptm-default ]
⟨ugm⟩     load     = ugm-default ]
⟨m-t⟩   { encoding = {T1,LY1,EU1,EU2,TU} }
⟨bch|cmr|ebg|pmn|ppl⟩   { encoding = {T1,LY1},
⟨blg|ptm|ugm⟩   { encoding = {T1},
⟨bch⟩     family   = bch }
⟨blg⟩     family   = blg }
⟨cmr⟩     family   = cmr }
⟨ebg⟩     family   = {EBGaramond-LF,EBGaramond-TLF,EBGaramond-OsF,EBGaramond-TOsF} }
⟨pmn⟩     family   = pmnj }
⟨ppl⟩     family   = {ppl,pplx,pplj} }
⟨ptm⟩     family   = {ptm,ptmx,ptmj} }
⟨ugm⟩     family   = ugm }
   {
⟨m-t|cmr⟩     \AE = {50,  },
⟨bch|pmn⟩     \OE = {50,  },
⟨pmn⟩     \TH = {  ,50},
⟨blg⟩     \v L = {   ,250},
⟨blg⟩     \v d = {   ,250},
⟨blg⟩     \v l = {   ,250},
⟨blg⟩     \v t = {   ,250},
⟨blg⟩     127 =  {300,400},
⟨blg⟩     156 =  {100,   }, % IJ
⟨blg⟩     188 =  { 80, 80}, % ij
⟨m-t|bch|ebg|pmn|ppl|ptm⟩       _ = {100,100},
⟨cmr⟩       _ = {200,200},
⟨ugm⟩       _ = {100,200},
⟨m-t|ebg|pmn|ptm⟩     \textbackslash    = {100,200},
⟨bch⟩     \textbackslash    = {150,200},
⟨blg⟩     \textbackslash    = {250,300},
⟨cmr|ppl⟩     \textbackslash    = {200,300},
⟨ugm⟩      \textbackslash    = {100,300},
⟨ugm⟩      \textbar          = {200,200},
⟨blg⟩      \textendash       = {300,300},   \textemdash        = {150,150},
⟨blg⟩      \textquotedbl     = {300,400},   \textquotedblleft  = {300,400},
⟨cmr⟩      \textquotedbl     = {300,300},   \textquotedblleft  = {200,600},
```

The EC fonts do something weird: they insert an implicit kern between quote and boundary character. Therefore, we must override the settings from OT1.

```
⟨m-t|cmr|ebg|ppl|ptm|ugm⟩     \quotesinglbase   = {400,400},   \quotedblbase      = {400,400},
⟨blg⟩      \quotesinglbase   = {400,400},   \quotedblbase      = {300,400},
⟨bch|pmn⟩     \quotesinglbase   = {400,400},   \quotedblbase      = {300,300},
⟨m-t|bch|pmn⟩     \guilsinglleft    = {400,300},   \guilsinglright    = {300,400},
⟨blg⟩      \guilsinglleft    = {300,500},   \guilsinglright    = {300,500},
⟨cmr|ebg|ppl|ptm⟩     \guilsinglleft    = {400,400},   \guilsinglright    = {300,500},
⟨ugm⟩      \guilsinglleft    = {400,400},   \guilsinglright    = {300,600},
⟨m-t⟩      \guillemotleft    = {200,200},   \guillemotright    = {200,200},
⟨cmr⟩      \guillemotleft    = {300,200},   \guillemotright    = {100,400},
⟨bch|pmn⟩     \guillemotleft    = {200,200},   \guillemotright    = {150,300},
⟨blg|ebg|ppl|ptm⟩     \guillemotleft    = {300,300},   \guillemotright    = {200,400},
⟨ugm⟩      \guillemotleft    = {300,400},   \guillemotright    = {300,400},
⟨m-t|bch|cmr|ebg|pmn|ppl|ugm⟩     \textexclamdown   = {100,   },   \textquestiondown  = {100,   },
⟨blg⟩      \textexclamdown   = {200,   },   \textquestiondown  = {100,   },
⟨ptm⟩      \textexclamdown   = {200,   },   \textquestiondown  = {200,   },
⟨m-t|cmr|ebg|ppl|ptm|ugm⟩     \textbraceleft    = {400,200},   \textbraceright    = {200,400},
⟨bch|blg|pmn⟩     \textbraceleft    = {200,   },   \textbraceright    = {   ,300},
⟨m-t|bch|cmr|ebg|ppl|ptm|ugm⟩     \textless         = {200,100},   \textgreater       = {100,200}
⟨pmn⟩      \textless         = {100,   },   \textgreater       = {   ,100},
⟨pmn⟩      \textvisiblespace = {100,100} % not in LY1

   }

```

The `lmodern` fonts used to restore the original settings from OT1 fonts. Now, they require even other settings, though.

```
⟨*cmr⟩
\SetProtrusion
   [ name     = lmr-T1,
     load     = cmr-T1   ]
   { encoding = {T1,LY1},
     family   = lmr      }
   {
     \textquotedblleft  = {300,400},  \textquotedblright = {300,400}
   }

⟨/cmr⟩
```

Settings for the T2A encoding (generic, Computer Modern Roman, and Minion).[21]

```
⟨*m-t|cmr|pmn⟩
\SetProtrusion
⟨m-t⟩    [ name     = T2A-default,
⟨cmr⟩    [ name     = cmr-T2A,
⟨pmn⟩    [ name     = pmnj-T2A,
⟨m-t⟩      load     = default     ]
⟨cmr⟩      load     = cmr-default ]
⟨pmn⟩      load     = pmnj-default ]
   { encoding = T2A,
⟨m-t⟩    }
⟨cmr⟩      family   = cmr }
⟨pmn⟩      family   = pmnj }
   {
     \CYRA = {50,50},
     \CYRG = {  ,50},
     \CYRK = {  ,50},
```

[21] Contributed by *Karl Karlsson*.

```
     \CYRT = {50,50},
     \CYRH = {50,50},
     \CYRU = {50,50},
⟨pmn⟩     \CYRS = {50,  },
⟨pmn⟩     \CYRO = {50,50},
     \cyrk = {  ,50},
     \cyrg = {  ,50},
     \cyrh = {50,50},
⟨m-t|pmn⟩     \cyru = {50,50},
⟨cmr⟩     \cyru = {50,70},
⟨m-t⟩        _  = {100,100},
⟨cmr⟩        _  = {200,200},
⟨m-t⟩     \textbackslash    = {100,200},   \quotedblbase      = {400,400},
⟨cmr⟩     \textbackslash    = {200,300},   \quotedblbase      = {400,400},
⟨pmn⟩     \textbackslash    = {100,200},   \quotedblbase      = {300,300},
⟨cmr⟩     \textquotedbl     = {300,300},   \textquotedblleft  = {200,600},
⟨m-t⟩     \guillemotleft    = {200,200},   \guillemotright    = {200,200},
⟨cmr⟩     \guillemotleft    = {300,200},   \guillemotright    = {100,400},
⟨pmn⟩     \guillemotleft    = {200,200},   \guillemotright    = {150,300},
⟨m-t|cmr⟩     \textbraceleft    = {400,200},   \textbraceright    = {200,400},
⟨pmn⟩     \textbraceleft    = {200,   },   \textbraceright    = {   ,300},
⟨m-t|cmr⟩     \textless         = {200,100},   \textgreater       = {100,200}
⟨pmn⟩     \textless         = {100,   },   \textgreater       = {   ,100}
   }

⟨/m-t|cmr|pmn⟩
```

Settings for the QX encoding (generic and Times).[22] It also includes some glyphs otherwise in TS1.

```
⟨*m-t|ptm⟩
\SetProtrusion
⟨m-t⟩   [ name     = QX-default,
⟨ptm⟩   [ name     = ptm-QX,
⟨m-t⟩     load     = default ]
⟨ptm⟩     load     = ptm-default ]
⟨m-t⟩   { encoding = QX }
⟨ptm⟩   { encoding = QX,
⟨ptm⟩     family   = {ptm,ptmx,ptmj} }
   {
     \AE = {50,  },
⟨ptm⟩      *  = {200,200},
     {=} = {100,100},
     \textunderscore   = {100,100},
     \textbackslash    = {100,200},
     \quotedblbase     = {400,400},
⟨m-t⟩     \guillemotleft    = {200,200},   \guillemotright    = {200,200},
⟨ptm⟩     \guillemotleft    = {300,300},   \guillemotright    = {200,400},
     \textexclamdown   = {100,   },   \textquestiondown  = {100,   },
⟨m-t⟩     \textbraceleft    = {400,200},   \textbraceright    = {200,400},
⟨ptm⟩     \textbraceleft    = {200,200},   \textbraceright    = {200,300},
     \textless         = {200,100},   \textgreater       = {100,200},
     \textminus        = {200,200},   \textdegree        = {300,300},
⟨m-t⟩     \copyright        = {100,100},   \textregistered    = {100,100}
⟨ptm⟩     \copyright        = {100,150},   \textregistered    = {100,150},
⟨ptm⟩     \textxgeq         = {   ,100},   \textxleq          = {100,   },
⟨ptm⟩     \textalpha        = {   , 50},   \textDelta         = { 70, 70},
⟨ptm⟩     \textpi           = { 50, 80},   \textSigma         = {   , 70},
⟨ptm⟩     \textmu           = {   , 80},   \texteuro          = { 50, 50},
⟨ptm⟩     \textellipsis     = {150,200},   \textasciitilde    = { 80, 80},
⟨ptm⟩     \textapprox       = { 50, 50},   \textinfty         = {100,100},
⟨ptm⟩     \textdagger       = {150,150},   \textdaggerdbl     = {100,100},
⟨ptm⟩     \textdiv          = { 50,150},   \textsection       = { 80, 80},
⟨ptm⟩     \texttimes        = {100,150},   \textpm            = { 50, 80},
```

[22] Contributed by *Maciej Eder*.

```
⟨ptm⟩     \textbullet       = {150,150},   \textperiodcentered = {300,300},
⟨ptm⟩     \textquotesingle  = {500,500},   \textquotedbl      = {300,300},
⟨ptm⟩     \textperthousand  = {    ,50}
   }

⟨/m-t|ptm⟩
```

T5 is based on OT1; it shares some but not all extra characters of T1. All accented characters are already taken care of by the inheritance list.

```
⟨*cmr|bch⟩
\SetProtrusion
⟨cmr⟩    [ name     = cmr-T5,
⟨cmr⟩      load     = cmr-default ]
⟨bch⟩    [ name     = bch-T5,
⟨bch⟩      load     = bch-default ]
   { encoding = T5,
⟨cmr⟩      family   = cmr }
⟨bch⟩      family   = bch }
   {
⟨bch⟩     _ = {100,100},
⟨bch⟩     \textbackslash    = {150,200},
⟨cmr⟩     \textbackslash    = {200,300},
⟨cmr⟩     \textquotedblleft = {200,600},
⟨cmr⟩     \textquotedbl     = {300,300},
⟨bch⟩     \quotesinglbase   = {400,400},   \quotedblbase      = {300,300},
⟨cmr⟩     \quotesinglbase   = {400,400},   \quotedblbase      = {400,400},
⟨bch⟩     \guilsinglleft    = {400,300},   \guilsinglright    = {300,400},
⟨cmr⟩     \guilsinglleft    = {400,400},   \guilsinglright    = {300,500},
⟨bch⟩     \guillemotleft    = {200,200},   \guillemotright    = {150,300},
⟨cmr⟩     \guillemotleft    = {300,200},   \guillemotright    = {100,400},
⟨bch⟩     \textbraceleft    = {200,   },   \textbraceright    = {   ,300},
⟨cmr⟩     \textbraceleft    = {400,200},   \textbraceright    = {200,400},
     \textless         = {200,100},   \textgreater       = {100,200}
   }

⟨/cmr|bch⟩
```

Minion with lining numbers.

```
⟨*pmn⟩
\SetProtrusion
   [ name     = pmnx-OT1,
     load     = pmnj-default ]
   { encoding = OT1,
     family   = pmnx }
   {
     1 = {230,180}
   }

\SetProtrusion
   [ name     = pmnx-T1,
     load     = pmnj-T1  ]
   { encoding = {T1,LY1},
     family   = pmnx     }
   {
     1 = {230,180}
   }

\SetProtrusion
   [ name     = pmnx-T2A,
     load     = pmnj-T2A  ]
   { encoding = {T2A},
     family   = pmnx     }
   {
     1 = {230,180}
   }
```

```

⟨/pmn⟩
```

Times is the default font for LY1, therefore we provide settings for the additional characters in this encoding, too.

```
⟨*ptm⟩
 \SetProtrusion
   [ name     = ptm-LY1,
     load     = ptm-T1 ]
   { encoding = LY1,
     family   = {ptm,ptmx,ptmj} }
   {
     _                        = {100,100},
     \texttrademark           = {100,100},
     \textregistered          = {100,100},
     \textcopyright           = {100,100},
     \textdegree              = {300,300},
     \textminus               = {200,200},
     \textellipsis            = {150,200},
%    \texteuro                = {   ,   }, % ?
     \textcent                = {100,100},
     \textquotesingle         = {500,500},
     \textflorin              = { 50, 70},
     \textdagger              = {150,150},
     \textdaggerdbl           = {100,100},
     \textperthousand         = {   , 50},
     \textbullet              = {150,150},
     \textonesuperior         = {100,100},
     \texttwosuperior         = { 50, 50},
     \textthreesuperior       = { 50, 50},
     \textperiodcentered      = {300,300},
     \textplusminus           = { 50, 80},
     \textmultiply            = {100,100},
     \textdivide              = { 50,150}
```

Remaining slots in the source file.

```
   }

⟨/ptm⟩
```

15.8.2 Italics

To find default settings for italic is difficult, since the character shapes and their behaviour at the beginning or end of line may be wildly different for different fonts. In the generic settings we therefore omit the letters, and only set up the punctuation characters.

The italic glyphs of Computer Modern Roman feature a lot of side bearing, therefore almost all of them have to protrude.[23]

```
\SetProtrusion
⟨m-t⟩    [ name     = OT1-it   ]
⟨bch⟩    [ name     = bch-it   ]
⟨blg⟩    [ name     = blg-it,
⟨blg⟩      load     = blg-default ]
⟨cmr⟩    [ name     = cmr-it   ]
⟨ebg⟩    [ name     = EBGaramond-it   ]
⟨pmn⟩    [ name     = pmnj-it  ]
⟨ppl⟩    [ name     = ppl-it   ]
⟨ptm⟩    [ name     = ptm-it   ]
⟨ugm⟩    [ name     = ugm-it   ]
⟨m-t|bch|blg|ebg|ugm⟩   { encoding = OT1,
```

[23] Settings contributed by *Hendrik Vogt*.

```
⟨ppl|ptm⟩   { encoding = {OT1,OT4},
⟨bch⟩     family   = bch,
⟨blg⟩     family   = blg,
⟨ebg⟩     family   = {EBGaramond-LF,EBGaramond-TLF,EBGaramond-OsF,EBGaramond-TOsF},
⟨ppl⟩     family   = {ppl,pplx,pplj},
⟨ptm⟩     family   = {ptm,ptmx,ptmj},
⟨ugm⟩     family   = ugm,
⟨m-t|bch|ebg|ppl|ptm⟩     shape    = {it,sl}  }
⟨blg|ugm⟩     shape    = it  }
⟨cmr|pmn⟩   { }
   {
⟨cmr⟩     A = {100,100},
⟨ptm⟩     A = {100,50},
⟨ebg|pmn⟩     A = {50,  },
⟨ugm⟩     A = {  ,150},
⟨ppl⟩     A = {50,50},
⟨ptm⟩   \AE = {100,  },
⟨ebg|ppl⟩   \AE = {50,  },
⟨cmr⟩     B = {83,-40},
⟨ebg|ppl|ptm⟩     B = {50,  },
⟨pmn⟩     B = {20,-50},
⟨bch|ppl|ptm|ugm⟩     C = {50,  },
⟨cmr⟩     C = {165,-75},
⟨ebg⟩     C = {100, },
⟨pmn⟩     C = {50,-50},
⟨cmr⟩     D = {75, -28},
⟨ebg|ppl|ptm⟩     D = {50,50},
⟨pmn⟩     D = {20,  },
⟨cmr⟩     E = {80,-55},
⟨ebg|ppl|ptm⟩     E = {50,  },
⟨pmn⟩     E = {20,-50},
⟨cmr⟩     F = {85,-80},
⟨ebg|ptm⟩     F = {100, },
⟨pmn⟩     F = {10,  },
⟨ppl⟩     F = {50,  },
⟨bch|ppl|ptm|ugm⟩     G = {50,  },
⟨cmr⟩     G = {153,-15},
⟨ebg⟩     G = {100, },
⟨pmn⟩     G = {50,-50},
⟨cmr⟩     H = {73,-60},
⟨ebg|ppl|ptm⟩     H = {50,  },
⟨cmr⟩     I = {140,-120},
⟨ebg|ptm⟩     I = {50,  },
⟨pmn⟩     I = {20,-50},
⟨cmr⟩     J = {135,-80},
⟨ebg⟩     J = {50,  },
⟨pmn⟩     J = {20,  },
⟨ptm⟩     J = {100, },
⟨cmr⟩     K = {70,-30},
⟨ebg|ppl|ptm⟩     K = {50,  },
⟨pmn⟩     K = {20,  },
⟨cmr⟩     L = {87, 40},
⟨ebg|ppl|ptm⟩     L = {50,  },
⟨pmn⟩     L = {20,50},
⟨ugm⟩     L = {  ,100},
⟨cmr⟩     M = {67,-45},
⟨pmn⟩     M = {  ,-30},
⟨ptm⟩     M = {50,  },
⟨cmr⟩     N = {75,-55},
⟨pmn⟩     N = {  ,-30},
⟨ptm⟩     N = {50,  },
⟨bch|pmn|ppl|ptm⟩     O = {50,  },
⟨cmr⟩     O = {150,-30},
⟨ebg⟩     O = {100, },
⟨ugm⟩     O = {70,50},
⟨ppl|ptm⟩   \OE = {50,  },
⟨ebg⟩   \OE = {100, },
⟨cmr⟩     P = {82,-50},
⟨ebg|ppl|ptm⟩     P = {50,  },
⟨pmn⟩     P = {20,-50},
⟨bch|pmn|ppl|ptm⟩     Q = {50,  },
⟨cmr⟩     Q = {150,-30},
⟨ebg⟩     Q = {100, },
⟨ugm⟩     Q = {70,50},
⟨cmr⟩     R = {75, 15},
⟨ebg|ppl|ptm⟩     R = {50,  },
⟨pmn⟩     R = {20,  },
⟨bch|ebg|ppl|ptm⟩     S = {50,  },
⟨cmr⟩     S = {90,-65},
⟨pmn⟩     S = {20,-30},
⟨bch|ebg|ppl|ptm⟩     $ = {50,  },
⟨cmr⟩     $ = {100,-20},
⟨pmn⟩     $ = {20,-30},
⟨bch|pmn|ugm⟩     T = {70,  },
⟨cmr⟩     T = {220,-85},
⟨ebg|ppl|ptm⟩     T = {100, },
⟨cmr⟩     U = {230,-55},
⟨ebg|ppl|ptm⟩     U = {50,  },
⟨pmn⟩     U = {50,-50},
⟨cmr⟩     V = {260,-60},
⟨ebg|pmn|ugm⟩     V = {100, },
⟨ppl|ptm⟩     V = {100,50},
⟨cmr⟩     W = {185,-55},
⟨ebg|pmn|ugm⟩     W = {100, },
⟨ppl⟩     W = {50,  },
⟨ptm⟩     W = {100,50},
⟨cmr⟩     X = {70,-30},
⟨ppl|ptm⟩     X = {50,  },
⟨cmr⟩     Y = {250,-60},
⟨pmn⟩     Y = {50,  },
⟨ppl⟩     Y = {100,50},
⟨ptm⟩     Y = {100, },
⟨cmr⟩     Z = {90,-60},
⟨pmn⟩     Z = {  ,-50},
⟨cmr⟩     a = {150,-10},
⟨cmr⟩     b = {170,   },
⟨cmr⟩     c = {173,-10},
⟨cmr⟩     d = {150,-55},
⟨pmn⟩     d = {  ,-50},
⟨cmr⟩     e = {180, },
⟨cmr⟩     f = {  ,-250},
⟨ebg|pmn⟩     f = { ,-100},
⟨cmr⟩     g = {150,-10},
⟨cmr⟩     h = {100, },
⟨cmr⟩     i = {210, },
⟨pmn⟩     i = {  ,-30},
⟨cmr⟩     j = {  ,-40},
⟨pmn⟩     j = {  ,-30},
⟨cmr⟩     k = {110,-50},
⟨cmr⟩     l = {240,-110},
⟨pmn⟩     l = {  ,-100},
⟨cmr⟩     m = {80, },
⟨cmr⟩     n = {115, },
⟨bch⟩     o = {50,50},
⟨cmr⟩     o = {155, },
⟨bch⟩     p = {  ,50},
⟨pmn⟩     p = {-50,  },
⟨bch⟩     q = {50,  },
⟨cmr⟩     q = {170,-40},
⟨cmr⟩     r = {155,-40},
⟨pmn⟩      r = {  ,50},
⟨cmr⟩      s = {130, },
⟨bch⟩      t = {  ,50},
⟨cmr⟩      t = {230,-10},
⟨cmr⟩      u = {120, },
⟨cmr⟩      v = {140,-25},
⟨pmn|ugm⟩      v = {50,  },
⟨bch⟩      w = {  ,50},
⟨cmr⟩      w = {98,-20},
⟨pmn|ugm⟩      w = {50,  },
⟨cmr⟩      x = {65,-40},
⟨bch⟩      y = {  ,50},
⟨cmr⟩      y = {130,-20},
⟨cmr⟩      z = {110,-80},
⟨cmr⟩      0 = {170,-85},
⟨bch|ptm⟩      1 = {150,100},
⟨cmr⟩      1 = {230,110},
⟨ebg⟩      1 = {150, },
⟨pmn⟩      1 = {50,  },
⟨ppl⟩      1 = {100, },
⟨ugm⟩      1 = {150,150},
⟨cmr⟩      2 = {130,-70},
⟨ebg|ppl|ptm⟩      2 = {50,  },
⟨pmn⟩      2 = {-50,  },
⟨bch⟩      3 = {50,  },
⟨cmr⟩      3 = {140,-70},
⟨pmn⟩      3 = {-100, },
⟨ptm⟩      3 = {100,50},
⟨bch⟩      4 = {100, },
⟨cmr⟩      4 = {130,80},
⟨ebg⟩      4 = {150, },
⟨ppl|ptm⟩      4 = {50,  },
⟨cmr⟩      5 = {160, },
⟨ptm⟩      5 = {50,  },
⟨bch⟩      6 = {50,  },
⟨cmr⟩      6 = {175,-30},
⟨bch|ebg|ptm⟩      7 = {100, },
⟨cmr⟩      7 = {250,-150},
⟨pmn⟩      7 = {20,  },
⟨ppl⟩      7 = {50,  },
⟨cmr⟩      8 = {130,-40},
⟨cmr⟩      9 = {155,-80},
⟨m-t|cmr|ebg|pmn|ppl⟩      . = { ,500},
⟨blg⟩      . = {400,600},
⟨bch|ptm|ugm⟩      . = { ,700},
⟨blg⟩     {,}= {300,500},
⟨m-t|ebg|pmn|ppl⟩     {,}= { ,500},
⟨cmr⟩     {,}= { ,450},
⟨bch|ugm⟩     {,}= { ,600},
⟨ptm⟩     {,}= { ,700},
⟨m-t|cmr|ebg|ppl⟩      : = { ,300},
⟨bch|ugm⟩      : = { ,400},
⟨pmn⟩      : = { ,200},
⟨ptm⟩      : = { ,500},
⟨m-t|cmr|ebg|ppl⟩      ; = { ,300},
⟨bch|ugm⟩      ; = { ,400},
⟨pmn⟩      ; = { ,200},
⟨ptm⟩      ; = { ,500},
⟨ptm⟩      ! = { ,100},
⟨bch⟩      ? = { ,200},
⟨ptm⟩      ? = { ,100},
⟨ppl⟩      ? = { ,300},
⟨pmn⟩      " = {400,200},
⟨m-t|ebg|pmn|ppl|ptm⟩      & = {50,50},
⟨bch⟩      & = {  ,80},
⟨cmr⟩     & = {130,30},
⟨ugm⟩     & = {50,100},
⟨m-t|ebg|pmn⟩    \% = {100, },
⟨cmr⟩    \% = {180,50},
⟨bch⟩    \% = {50,50},
⟨ppl|ptm⟩    \% = {100,100},
⟨ugm⟩    \% = {100,50},
⟨m-t|pmn|ppl⟩     * = {200,200},
⟨bch⟩     * = {300,200},
⟨cmr⟩     * = {380,20},
⟨ebg⟩     * = {500,100},
⟨ptm|ugm⟩     * = {400,200},
⟨m-t|pmn|ppl⟩     + = {150,200},
⟨cmr⟩     + = {180,200},
⟨bch|ugm⟩     + = {250,250},
⟨ebg|ptm⟩     + = {250,200},
⟨m-t|ebg|pmn|ppl⟩     @ = {50,50},
⟨bch⟩     @ = {80,50},
⟨cmr⟩     @ = {180,10},
⟨ptm⟩     @ = {150,150},
⟨m-t|bch|ugm⟩     ~ = {150,150},
⟨cmr|ebg|pmn|ppl|ptm⟩     ~ = {200,150},
⟨ugm⟩    {=}= {200,200},
⟨m-t|bch|ebg|pmn|ppl|ptm|ugm⟩     ( = {200, },    ) = {  ,200},
⟨cmr⟩     ( = {300, },    ) = {  ,70},
⟨m-t|ebg|ppl|ptm|ugm⟩     / = {100,200},
⟨cmr⟩     / = {100,100},
⟨bch⟩     / = {  ,150},
⟨pmn⟩     / = {100,150},
⟨m-t⟩     - = {300,300},
⟨bch|ebg⟩     - = {300,400},
⟨pmn⟩     - = {200,300},
⟨cmr⟩     - = {500,300},
⟨ppl⟩     - = {300,500},
⟨ptm⟩     - = {500,500},
⟨ugm⟩     - = {400,700},
⟨blg⟩     _ = {0,300},
⟨m-t|pmn⟩     \textendash      = {200,200},   \textemdash       = {150,150},
⟨bch⟩     \textendash      = {200,300},   \textemdash       = {150,200},
⟨cmr⟩     \textendash      = {500,300},   \textemdash       = {400,170},
⟨ebg|ppl|ptm|ugm⟩     \textendash      = {300,300},   \textemdash       = {200,200},
⟨m-t|bch|pmn|ugm⟩     \textquoteleft    = {400,200},   \textquoteright    = {400,200},
⟨blg⟩     \textquoteleft     = {400,400},    \textquoteright    = {400,400},
⟨cmr⟩     \textquoteleft    = {800,200},   \textquoteright    = {800,-20},
⟨ebg⟩     \textquoteleft    = {800,200},   \textquoteright    = {800,200},
⟨ppl⟩     \textquoteleft    = {700,400},   \textquoteright    = {700,400},
⟨ptm⟩     \textquoteleft    = {800,500},   \textquoteright    = {800,500},
⟨m-t|bch|pmn⟩     \textquotedblleft = {400,200},   \textquotedblright = {400,200}
⟨blg⟩     \textquotedblright = {300,300}
⟨cmr⟩     \textquotedblleft = {540,100},   \textquotedblright = {500,100}
⟨ebg⟩     \textquotedblleft = {700,200},   \textquotedblright = {700,200}
⟨ppl⟩     \textquotedblleft = {500,300},   \textquotedblright = {500,300}
⟨ptm⟩     \textquotedblleft = {700,400},   \textquotedblright = {700,400}
⟨ugm⟩     \textquotedblleft = {600,200},   \textquotedblright = {600,200}
   }

⟨*cmr|pmn⟩
\SetProtrusion
⟨cmr⟩   [ name     = cmr-it-OT1,
⟨pmn⟩   [ name     = pmnj-it-OT1,
⟨cmr⟩     load     = cmr-it   ]
⟨pmn⟩     load     = pmnj-it  ]
⟨cmr⟩   { encoding = {OT1,OT4},
⟨pmn⟩   { encoding = OT1,
⟨cmr⟩     family   = cmr,
⟨pmn⟩      family   = pmnj,
⟨cmr⟩      shape    = it       }
⟨pmn⟩      shape    = {it,sl}  }
   {
⟨cmr⟩      \AE = {100,   },
⟨pmn⟩      \AE = {   ,-50},
⟨cmr⟩      \OE = {100,   },
⟨pmn⟩      \OE = {50,   }
⟨*cmr⟩
     "00 = {200,150}, % \Gamma
     "01 = {150,100}, % \Delta
     "02 = {150, 50}, % \Theta
     "03 = {150, 50}, % \Lambda
     "04 = {100,100}, % \Xi
     "05 = {100,100}, % \Pi
     "06 = {100, 50}, % \Sigma
     "07 = {200,150}, % \Upsilon
     "08 = {150, 50}, % \Phi
     "09 = {150,100}, % \Psi
     "0A = { 50, 50}  % \Omega
⟨/cmr⟩
   }

⟨/cmr|pmn⟩
\SetProtrusion
⟨m-t⟩    [ name     = T1-it-default,
⟨bch⟩    [ name     = bch-it-T1,
⟨blg⟩    [ name     = blg-it-T1,
⟨cmr⟩    [ name     = cmr-it-T1,
⟨ebg⟩    [ name     = EBGaramond-it-T1,
⟨pmn⟩    [ name     = pmnj-it-T1,
⟨ppl⟩    [ name     = ppl-it-T1,
⟨ptm⟩    [ name     = ptm-it-T1,
⟨ugm⟩    [ name     = ugm-it-T1,
⟨m-t⟩      load     = OT1-it   ]
⟨bch⟩      load     = bch-it   ]
⟨blg⟩      load     = blg-T1   ]
⟨cmr⟩      load     = cmr-it   ]
⟨pmn⟩      load     = pmnj-it  ]
⟨ebg⟩      load     = EBGaramond-it   ]
⟨ppl⟩      load     = ppl-it   ]
⟨ptm⟩      load     = ptm-it   ]
⟨ugm⟩      load     = ugm-it   ]
⟨m-t|bch|cmr|ebg|pmn|ppl⟩   { encoding = {T1,LY1},
⟨blg|ptm|ugm⟩   { encoding = T1,
⟨bch⟩      family   = bch,
⟨blg⟩      family   = blg,
⟨cmr⟩      family   = cmr,
⟨pmn⟩      family   = pmnj,
⟨ebg⟩      family   = {EBGaramond-LF,EBGaramond-TLF,EBGaramond-OsF,EBGaramond-TOsF},
⟨ppl⟩      family   = {ppl,pplx,pplj},
⟨ptm⟩      family   = {ptm,ptmx,ptmj},
⟨ugm⟩      family   = ugm,
⟨m-t|bch|ebg|pmn|ppl|ptm⟩     shape    = {it,sl}  }
⟨blg|cmr|ugm⟩     shape    = it       }
   {
⟨m-t|bch|pmn⟩      _ = {   ,100},
⟨blg⟩      _ = {0,300},
⟨cmr|ugm⟩      _ = {100,200},
⟨ebg|ppl|ptm⟩      _ = {100,100},
⟨blg⟩      . = {400,600},
⟨blg⟩     {,}= {300,500},
⟨cmr⟩      \AE = {100,   },
⟨pmn⟩      \AE = {   ,-50},
⟨bch|pmn⟩      \OE = { 50,   },
⟨cmr⟩     \OE = {100,   },
⟨pmn⟩     031 = { ,-100}, % ffl
⟨cmr|ptm⟩     156 = {100, },  % IJ
⟨ebg⟩     156 = {50,  },  % IJ
⟨pmn⟩     156 = {20,  },  % IJ
⟨pmn⟩     188 = {  ,-30}, % ij
⟨pmn⟩   \v t = { ,100},
⟨m-t|ebg|ppl|ptm⟩     \textbackslash    = {100,200},
⟨cmr|ugm⟩     \textbackslash    = {300,300},
⟨bch⟩     \textbackslash    = {150,150},
⟨pmn⟩     \textbackslash    = {100,150},
⟨ugm⟩     \textbar          = {200,200},
⟨cmr⟩     \textquotedblleft = {500,300},
⟨blg⟩    \textquoteleft     = {400,400},    \textquoteright    = {400,400},
⟨blg⟩    \textquotedbl      = {300,300},    \textquotedblleft  = {300,300},
⟨blg⟩    \textquotedblright = {300,300},    \quotedblbase      = {200,600},
⟨m-t|ptm⟩     \quotesinglbase   = {300,700},   \quotedblbase      = {400,500},
⟨cmr⟩     \quotesinglbase   = {300,700},   \quotedblbase      = {200,600},
⟨bch|pmn⟩     \quotesinglbase   = {200,500},   \quotedblbase      = {150,500},
⟨ebg|ppl⟩     \quotesinglbase   = {500,500},   \quotedblbase      = {400,400},
⟨ugm⟩     \quotesinglbase   = {300,700},   \quotedblbase      = {300,500},
⟨m-t|ppl|ptm⟩     \guilsinglleft    = {400,400},   \guilsinglright    = {300,500},
⟨bch|pmn⟩     \guilsinglleft    = {300,400},   \guilsinglright    = {200,500},
⟨cmr⟩     \guilsinglleft    = {500,300},   \guilsinglright    = {400,400},
⟨ebg⟩     \guilsinglleft    = {500,400},   \guilsinglright    = {300,500},
⟨ugm⟩     \guilsinglleft    = {400,400},   \guilsinglright    = {300,600},
⟨m-t|ppl⟩     \guillemotleft    = {300,300},   \guillemotright    = {300,300},
⟨bch|pmn⟩     \guillemotleft    = {200,300},   \guillemotright    = {150,400},
⟨cmr⟩     \guillemotleft    = {400,100},   \guillemotright    = {200,300},
⟨ebg⟩     \guillemotleft    = {300,300},   \guillemotright    = {200,400},
⟨ptm⟩     \guillemotleft    = {300,400},   \guillemotright    = {200,400},
⟨ugm⟩     \guillemotleft    = {300,400},   \guillemotright    = {300,400},
⟨m-t|ebg|ppl|ugm⟩     \textexclamdown   = {100,   },   \textquestiondown  = {200,   },
⟨cmr|ptm⟩     \textexclamdown   = {200,   },   \textquestiondown  = {200,   },
⟨pmn⟩     \textexclamdown   = {-50,   },   \textquestiondown  = {-50,   },
⟨m-t|ppl|ugm⟩     \textbraceleft    = {200,100},   \textbraceright    = {200,200},
⟨bch|pmn⟩     \textbraceleft    = {200,   },   \textbraceright    = {   ,200},
⟨cmr|ebg|ptm⟩     \textbraceleft    = {400,100},   \textbraceright    = {200,200},
⟨bch|pmn⟩     \textless         = {100,   },   \textgreater       = {   ,100},
⟨cmr|ebg|ppl|ptm⟩     \textless         = {300,100},   \textgreater       = {200,100}
⟨pmn⟩     \textvisiblespace = {100,100}
  }

⟨*m-t|cmr|pmn⟩
\SetProtrusion
⟨m-t⟩   [ name     = T2A-it-default,
⟨cmr⟩   [ name     = cmr-it-T2A,
⟨pmn⟩   [ name     = pmnj-it-T2A,
⟨m-t⟩     load     = OT1-it   ]
⟨cmr⟩     load     = cmr-it   ]
⟨pmn⟩     load     = pmnj-it  ]
    { encoding = T2A,
⟨cmr⟩     family   = cmr,
⟨pmn⟩     family   = pmnj,
⟨m-t|pmn⟩     shape    = {it,sl}  }
⟨cmr⟩     shape    = it       }
    {
⟨cmr⟩     \CYRA = {100,50},
⟨pmn⟩     \CYRA = {50,  },
⟨cmr⟩     \CYRB = {50,  },
⟨cmr⟩     \CYRV = {50,  },
⟨pmn⟩     \CYRV = {20,-50},
⟨cmr⟩     \CYRG = {100, },
⟨pmn⟩     \CYRG = {10,  },
⟨cmr⟩     \CYRD = {50,  },
⟨cmr⟩       \CYRE = {50,  },
⟨pmn⟩       \CYRE = {20,-50},
⟨cmr⟩       \CYRZH = {50,  },
⟨cmr⟩       \CYRZ = {50,  },
⟨pmn⟩       \CYRZ = {20,-50},
⟨cmr⟩       \CYRI = {50,  },
⟨pmn⟩       \CYRI = {  ,-30},
⟨cmr⟩       \CYRISHRT = {50,  },
⟨cmr⟩       \CYRK = {50,  },
⟨pmn⟩       \CYRK = {20,  },
⟨cmr⟩       \CYRL = {50,  },
⟨cmr⟩       \CYRM = {50,  },
⟨pmn⟩       \CYRM = {  ,-30},
⟨cmr⟩       \CYRN = {50,  },
⟨cmr⟩       \CYRO = {100, },
⟨pmn⟩       \CYRO = {50,  },
⟨cmr⟩       \CYRP = {50,  },
⟨cmr⟩       \CYRR = {50,  },
⟨pmn⟩       \CYRR = {20,-50},
⟨cmr⟩       \CYRS = {100, },
⟨pmn⟩       \CYRS = {50,  },
⟨cmr⟩       \CYRT = {100, },
⟨pmn⟩       \CYRT = {70,  },
⟨cmr⟩       \CYRU = {100, },
⟨pmn⟩       \CYRU = {50,  },
⟨cmr⟩       \CYRF = {100, },
⟨cmr⟩       \CYRH = {50,  },
⟨cmr⟩       \CYRC = {50,  },
⟨cmr⟩       \CYRCH = {100, },
⟨cmr⟩       \CYRSH = {50,  },
⟨cmr⟩       \CYRSHCH = {50,  },
⟨cmr⟩       \CYRHRDSN = {100, },
⟨cmr⟩       \CYRERY = {50,  },
⟨cmr⟩       \CYRSFTSN = {50,  },
⟨cmr⟩       \CYREREV = {50,  },
⟨cmr⟩       \CYRYU = {50,  },
⟨cmr⟩       \CYRYA = {50,  },
⟨pmn⟩       \CYRYA = {  ,20},
⟨pmn⟩       \cyrr = {-50,  },
⟨m-t|pmn⟩        _ = {  ,100},
⟨cmr⟩        _ = {100,200},
⟨pmn⟩        031 = { ,-100}, % ffl
⟨pmn⟩       \v t = { ,100},
⟨m-t⟩       \textbackslash    = {100,200},   \quotedblbase      = {400,500},
⟨cmr⟩       \textbackslash    = {300,300},   \quotedblbase      = {200,600},
⟨pmn⟩       \textbackslash    = {100,150},   \quotedblbase      = {150,500},
⟨m-t⟩       \guillemotleft    = {300,300},   \guillemotright    = {300,300},
⟨cmr⟩       \guillemotleft    = {400,100},   \guillemotright    = {200,300},
⟨pmn⟩       \guillemotleft    = {200,300},   \guillemotright    = {150,400},
⟨m-t⟩       \textbraceleft    = {200,100},   \textbraceright    = {200,200},
⟨cmr⟩       \textbraceleft    = {400,100},   \textbraceright    = {200,200},
⟨pmn⟩       \textbraceleft    = {200,   },   \textbraceright    = {   ,200},
⟨cmr⟩       \textquotedblleft = {500,300},
⟨cmr⟩       \textless         = {300,100},   \textgreater       = {200,100}
⟨pmn⟩       \textless         = {100,   },   \textgreater       = {   ,100}
  }

⟨/m-t|cmr|pmn⟩
⟨*m-t|ptm⟩
\SetProtrusion
⟨m-t⟩     [ name     = QX-it-default,
⟨ptm⟩     [ name     = ptm-it-QX,
⟨m-t⟩       load     = OT1-it ]
⟨ptm⟩       load     = ptm-it ]
   { encoding = {QX},
⟨ptm⟩    family   = {ptm,ptmx,ptmj},
     shape    = {it,sl}  }
   {
⟨ptm⟩    009 = {  , 50}, % fk
     {=} = {100,100},
⟨m-t⟩    \textunderscore   = {100,100},
⟨ptm⟩    \textunderscore   = {100,150},
     \textbackslash    = {100,200},
     \quotedblbase     = {300,400},
⟨m-t⟩    \guillemotleft    = {300,300},   \guillemotright    = {300,300},
⟨ptm⟩    \guillemotleft    = {200,400},   \guillemotright    = {200,400},
     \textexclamdown   = {200,   },   \textquestiondown  = {200,   },
     \textbraceleft    = {200,100},   \textbraceright    = {200,200},
     \textless         = {100,100},   \textgreater       = {100,100},
     \textminus        = {200,200},   \textdegree        = {300,150},
⟨m-t⟩    \copyright        = {100,100},   \textregistered    = {100,100}
⟨ptm⟩    \textregistered   = {100,150},   \copyright         = {100,150},
⟨ptm⟩    \textDelta        = { 70,   },   \textdelta         = {   , 50},
⟨ptm⟩    \textpi           = { 50, 80},   \textmu            = {   , 80},
⟨ptm⟩    \texteuro         = {200,   },   \textellipsis      = {100,200},
⟨ptm⟩    \textquoteleft    = {500,400},   \textquoteright    = {500,400},
⟨ptm⟩    \textquotedblleft = {500,300},   \textquotedblright = {400,400},
⟨ptm⟩    \textapprox       = { 50, 50},   \textinfty         = {100,100},
⟨ptm⟩    \textdagger       = {150,150},   \textdaggerdbl     = {100,100},
⟨ptm⟩    \textdiv          = {150,150},   \textasciitilde    = { 80, 80},
⟨ptm⟩    \texttimes        = {100,150},   \textpm            = { 50, 80},
⟨ptm⟩    \textbullet       = {300,100},   \textperiodcentered = {300,300},
⟨ptm⟩    \textquotesingle  = {500,500},   \textquotedbl      = {300,300},
⟨ptm⟩    \textperthousand  = {    ,50}
   }

⟨/m-t|ptm⟩
⟨*cmr|bch⟩
\SetProtrusion
⟨cmr⟩  [ name = cmr-it-T5,
⟨cmr⟩    load = cmr-it ]
⟨bch⟩  [ name = bch-it-T5,
⟨bch⟩    load = bch-it ]
   { encoding = T5,
⟨bch⟩    family   = bch,
⟨cmr⟩    family   = cmr,
     shape    = it }
   {
⟨bch⟩     _ = {  ,100},
⟨cmr⟩     _ = {100,200},
⟨bch⟩    \textbackslash    = {150,150},
⟨cmr⟩    \textbackslash    = {300,300},
⟨bch⟩    \quotesinglbase   = {200,500},   \quotedblbase      = {150,500},
⟨cmr⟩    \quotesinglbase   = {300,700},   \quotedblbase      = {200,600},
⟨bch⟩    \guilsinglleft    = {300,400},   \guilsinglright    = {200,500},
⟨cmr⟩    \guilsinglleft    = {500,300},   \guilsinglright    = {400,400},
⟨bch⟩    \guillemotleft    = {200,300},   \guillemotright    = {150,400},
⟨cmr⟩    \guillemotleft    = {400,100},   \guillemotright    = {200,300},
⟨bch⟩    \textbraceleft    = {200,   },   \textbraceright    = {   ,200},
⟨cmr⟩    \textbraceleft    = {400,100},   \textbraceright    = {200,200},
⟨bch⟩    \textless         = {100,   },   \textgreater       = {   ,100}
⟨cmr⟩    \textless         = {300,100},   \textgreater       = {200,100}
  }

⟨/cmr|bch⟩
```

Slanted is very similar to italic.

```
⟨*cmr⟩
\SetProtrusion
   [ name     = cmr-sl,
     load     = cmr-it-OT1 ]
   { encoding = {OT1,OT4},
     family   = cmr,
     shape    = sl  }
   {
      L = {  ,50},
      f = { ,-50},
      - = {300, },
     \textendash = {400,  },  \textemdash = {300,  }
   }

\SetProtrusion
   [ name     = cmr-sl-T1,
     load     = cmr-it-T1 ]
   { encoding = {T1,LY1},
     family   = cmr,
     shape    = sl  }
   {
      L = {  ,50},
      f = { ,-50},
      - = {300, },
     \textendash = {400,  },  \textemdash = {300,  }
   }

\SetProtrusion
   [ name     = cmr-sl-T2A,
     load     = cmr-it-T2A ]
   { encoding = T2A,
     family   = cmr,
     shape    = sl  }
   {
      L = {  ,50},
      f = { ,-50},
      - = {300, },
     \textendash = {400,  },  \textemdash = {300,  }
   }

\SetProtrusion
   [ name     = cmr-sl-T5,
     load     = cmr-it-T5 ]
   { encoding = T5,
     family   = cmr,
     shape    = sl  }
   {
      L = {  ,50},
      f = { ,-50},
      - = {300, },
     \textendash = {400,  },  \textemdash = {300,  }
   }

\SetProtrusion
   [ name     = lmr-it-T1,
     load     = cmr-it-T1 ]
   { encoding = {T1,LY1},
     family   = lmr,
     shape    = {it,sl} }
   {
     \textquotedblleft  = { ,200},  \textquotedblright = { ,200},
     \quotesinglbase    = { ,400},  \quotedblbase      = { ,500}
   }

```

Oldstyle numerals are slightly different.

```
\SetProtrusion
   [ name = cmr(oldstyle)-it,
     load = cmr-it-T1 ]
   { encoding = T1,
     family   = {hfor,cmor},
     shape    = {it,sl}  }
   {
     1 = {250, 50},
     2 = {150,-100},
     3 = {100,-50},
     4 = {150,150},
     6 = {200,   },
     7 = {200, 50},
     8 = {150,-50},
     9 = {100, 50}
   }

⟨/cmr⟩
⟨*pmn⟩
\SetProtrusion
   [ name     = pmnx-it,
     load     = pmnj-it ]
   { encoding = OT1,
     family   = pmnx,
     shape    = {it,sl} }
   {
     1 = {100,150}
   }

\SetProtrusion
   [ name     = pmnx-it-T1,
     load     = pmnj-it-T1 ]
   { encoding = {T1,LY1},
     family   = pmnx,
     shape    = {it,sl} }
   {
     1 = {100,150}
   }

\SetProtrusion
   [ name     = pmnx-it-T2A,
     load     = pmnj-it-T2A ]
   { encoding = {T2A},
     family   = pmnx,
     shape    = {it,sl} }
   {
     1 = {100,150}
   }

⟨/pmn⟩
⟨*ptm⟩
\SetProtrusion
   [ name     = ptm-it-LY1,
     load     = ptm-it-T1   ]
   { encoding = {LY1},
     family   = {ptm,ptmx,ptmj},
     shape    = {it,sl}  }
   {
     _                          = {100,100},
     \texttrademark            = {100,100},
     \textregistered           = {100,100},
     \textcopyright            = {100,100},
     \textdegree               = {300,100},
     \textminus                = {200,200},
     \textellipsis             = {100,200},
%    \texteuro                 = {   ,   }, % ?
     \textcent                 = {100,100},
     \textquotesingle          = {500,   },
     \textflorin               = {100, 70},
     \textdagger               = {150,150},
     \textdaggerdbl            = {100,100},
     \textbullet               = {150,150},
     \textonesuperior          = {150,100},
     \texttwosuperior          = {150, 50},
     \textthreesuperior        = {150, 50},
     \textparagraph            = {100,   },
     \textperiodcentered       = {500,300},
     \textonequarter           = { 50,   },
     \textonehalf              = { 50,   },
     \textplusminus            = {100,100},
     \textmultiply             = {150,150},
     \textdivide               = {150,150}
   }

⟨/ptm⟩
```

15.8.3 Small caps

Small caps should inherit the values from their big brothers. Since values are relative to character width, we don't need to adjust them any further (but we have to reset some characters).

```
⟨*!(blg|ugm)⟩
\SetProtrusion
⟨m-t⟩  [ name     = OT1-sc,
⟨bch⟩  [ name     = bch-sc,
⟨cmr⟩  [ name     = cmr-sc-OT1,
⟨ebg⟩  [ name     = EBGaramond-sc,
⟨pmn⟩  [ name     = pmnj-sc,
⟨ppl⟩  [ name     = ppl-sc,
⟨ptm⟩  [ name     = ptm-sc,
⟨m-t⟩    load     = default ]
⟨bch⟩    load     = bch-default ]
⟨cmr⟩    load     = cmr-OT1 ]
⟨ebg⟩    load     = EBGaramond-default ]
⟨pmn⟩    load     = pmnj-default ]
⟨ppl⟩    load     = ppl-default ]
⟨ptm⟩    load     = ptm-default ]
⟨m-t|bch|ebg|pmn⟩  { encoding = OT1,
⟨cmr|ppl|ptm⟩  { encoding = {OT1,OT4},
⟨bch⟩    family   = bch,
⟨cmr⟩    family   = cmr,
⟨ebg⟩    family   = {EBGaramond-LF,EBGaramond-TLF,EBGaramond-OsF,EBGaramond-TOsF},
⟨pmn⟩    family   = pmnj,
⟨ppl⟩    family   = {ppl,pplx,pplj},
⟨ptm⟩    family   = {ptm,ptmx,ptmj},
     shape    = sc }
   {
     a = {50,50},
⟨cmr|ebg|ppl|ptm⟩  \ae = {50,  },
⟨bch|pmn⟩    c = {50,  },
⟨bch|ebg|pmn⟩    d = {  ,50},
⟨m-t|bch|cmr|ebg|pmn|ptm⟩    f = {  ,50},
⟨bch|ebg|pmn⟩    g = {50,  },
⟨m-t|cmr|ebg|pmn|ppl|ptm⟩    j = {50,  },
⟨bch⟩    j = {100,  },
⟨m-t|bch|cmr|ebg|pmn|ppl⟩    l = {  ,50},
⟨ptm⟩    l = {  ,80},
⟨m-t|bch|cmr|ebg|pmn|ppl⟩  013 = {  ,50}, % fl
⟨ptm⟩  013 = {  ,80}, % fl
⟨bch|ebg|pmn⟩    o = {50,50},
⟨ebg|pmn⟩   \oe = {50,  },
⟨ppl⟩     p = { 0, 0},
⟨bch|ebg|pmn⟩     q = {50,70},
⟨ppl⟩     q = { 0,  },
⟨m-t|cmr|ebg|pmn|ppl|ptm⟩     r = {  , 0},
      t = {50,50},
⟨m-t|bch|cmr|ebg|pmn|ppl⟩     y = {50,50}
⟨ptm⟩     y = {80,80}
    }

\SetProtrusion
⟨m-t⟩   [ name     = T1-sc,
⟨bch⟩   [ name     = bch-sc-T1,
⟨cmr⟩   [ name     = cmr-sc-T1,
⟨ebg⟩   [ name     = EBGaramond-sc-T1,
⟨pmn⟩   [ name     = pmnj-sc-T1,
⟨ppl⟩   [ name     = ppl-sc-T1,
⟨ptm⟩   [ name     = ptm-sc-T1,
⟨m-t⟩     load     = T1-default ]
⟨bch⟩     load     = bch-T1     ]
⟨cmr⟩     load     = cmr-T1     ]
⟨ebg⟩     load     = EBGaramond-T1     ]
⟨pmn⟩     load     = pmnj-T1    ]
⟨ppl⟩     load     = ppl-T1     ]
⟨ptm⟩     load     = ptm-T1     ]
    { encoding = {T1,LY1},
⟨bch⟩     family   = bch,
⟨cmr⟩     family   = cmr,
⟨ebg⟩     family   = {EBGaramond-LF,EBGaramond-TLF,EBGaramond-OsF,EBGaramond-TOsF},
⟨pmn⟩     family   = pmnj,
⟨ppl⟩     family   = {ppl,pplx,pplj},
⟨ptm⟩     family   = {ptm,ptmx,ptmj},
      shape    = sc }
    {
      a = {50,50},
⟨cmr|ebg|ppl|ptm⟩   \ae = {50,  },
⟨bch|pmn⟩     c = {50,  },
⟨bch|ebg|pmn⟩     d = {  ,50},
⟨m-t|bch|cmr|ebg|pmn|ptm⟩     f = {  ,50},
⟨bch|ebg|pmn⟩     g = {50,  },
⟨m-t|cmr|ebg|pmn|ppl|ptm⟩     j = {50,  },
⟨bch⟩     j = {100,  },
⟨m-t|bch|cmr|ebg|pmn|ppl⟩     l = {  ,50},
⟨ptm⟩     l = {  ,80},
⟨m-t|bch|cmr|ebg|pmn|ppl⟩   029 = {  ,50}, % fl
⟨ptm⟩   029 = {  ,80}, % fl
⟨bch|ebg|pmn⟩     o = {50,50},
⟨bch|ebg|pmn⟩   \oe = {50,  },
⟨ppl⟩     p = { 0, 0},
⟨bch|ebg|pmn⟩     q = {50,70},
⟨ppl⟩     q = { 0,  },
⟨m-t|cmr|ebg|pmn|ppl|ptm⟩     r = {  , 0},
      t = {50,50},
⟨m-t|bch|cmr|ebg|pmn|ppl⟩     y = {50,50}
⟨ptm⟩     y = {80,80}
    }

⟨/!(blg|ugm)⟩
⟨*m-t|cmr⟩
\SetProtrusion
⟨m-t⟩   [ name     = T2A-sc,
⟨cmr⟩   [ name     = cmr-sc-T2A,
⟨m-t⟩     load     = T2A-default ]
⟨cmr⟩     load     = cmr-T2A     ]
    { encoding = T2A,
⟨cmr⟩     family   = cmr,
      shape    = sc }
    {
      \cyra = {50,50},
      \cyrg = {  ,50},
      \cyrt = {50,50},
      \cyry = {  ,50}
    }

⟨/m-t|cmr⟩
⟨*m-t⟩
\SetProtrusion
    [ name     = QX-sc,
      load     = QX-default ]
    { encoding = QX,
      shape    = sc  }
    {
      a = {50,50},
      f = {  ,50},
      j = {50,  },
      l = {  ,50},
    013 = {  ,50}, % fl
      r = {  , 0},
      t = {50,50},
      y = {50,50}
    }

⟨/m-t⟩
⟨*cmr|bch⟩
\SetProtrusion
⟨bch⟩   [ name     = bch-sc-T5,
⟨bch⟩     load     = bch-T5 ]
⟨cmr⟩   [ name     = cmr-sc-T5,
⟨cmr⟩     load     = cmr-T5 ]
    { encoding = T5,
⟨bch⟩     family   = bch,
⟨cmr⟩     family   = cmr,
      shape    = sc }
    {
      a = {50,50},
⟨bch⟩     c = {50,  },
⟨bch⟩     d = {  ,50},
      f = {  ,50},
⟨bch⟩     g = {50,  },
⟨bch⟩     j = {100, },
⟨cmr⟩     j = {50,  },
      l = {  ,50},
⟨bch⟩     o = {50,50},
⟨bch⟩     q = { 0,  },
⟨cmr⟩     r = {  , 0},
      t = {50,50},
      y = {50,50}
    }

⟨/cmr|bch⟩
⟨*pmn⟩
\SetProtrusion
    [ name     = pmnx-sc,
      load     = pmnj-sc ]
    { encoding = OT1,
      family   = pmnx,
      shape    = sc }
    {
      1 = {230,180}
    }
```

```

\SetProtrusion
   [ name     = pmnx-sc-T1,
     load     = pmnj-sc-T1 ]
   { encoding = {T1,LY1},
     family   = pmnx,
     shape    = sc }
   {
     1 = {230,180}
   }

```

15.8.4 Italic small caps

Minion provides real small caps in italics. The `slantsc` package calls them `scit`, Philipp Lehman's `fontinstallationguide` suggests `si`.

```
\SetProtrusion
   [ name     = pmnj-scit,
     load     = pmnj-it   ]
   { encoding = OT1,
     family   = pmnj,
     shape    = {scit,si} }
   {
     a = {50,  },
   \ae = {  ,-50},
     b = {20,-50},
     c = {50,-50},
     d = {20, 0},
     e = {20,-50},
     f = {10, 0},
   012 = {10,-50}, % fi
   013 = {10,-50}, % fl
   014 = {10,-50}, % ffi
   015 = {10,-50}, % ffl
     g = {50,-50},
     i = {20,-50},
     j = {20, 0},
     k = {20,  },
     l = {20,50},
     m = {  ,-30},
     n = {  ,-30},
     o = {50,  },
   \oe = {50,-50},
     p = {20,-50},
     q = {50,  },
     r = {20, 0},
     s = {20,-30},
     t = {70,  },
     u = {50,-50},
     v = {100,  },
     w = {100,  },
     y = {50,  },
     z = {  ,-50}
   }

\SetProtrusion
   [ name     = pmnj-scit-T1,
     load     = pmnj-it-T1   ]
   { encoding = {T1,LY1},
     family   = pmnj,
     shape    = {scit,si}    }
   {
     a = {50,  },
   \ae = {  ,-50},
     b = {20,-50},
     c = {50,-50},
     d = {20, 0},
     e = {20,-50},
     f = {10, 0},
   028 = {10,-50}, % fi
   029 = {10,-50}, % fl
   030 = {10,-50}, % ffi
   031 = {10,-50}, % ffl
     g = {50,-50},
     i = {20,-50},
   188 = {20, 0},  % ij
     j = {20, 0},
     k = {20,  },
     l = {20,50},
     m = {  ,-30},
     n = {  ,-30},
     o = {50,  },
   \oe = {50,-50},
     p = {20,-50},
     q = {50,  },
     r = {20, 0},
     s = {20,-30},
     t = {70,  },
     u = {50,-50},
     v = {100,  },
     w = {100,  },
     y = {50,  },
     z = {  ,-50}
   }

\SetProtrusion
   [ name     = pmnx-scit,
     load     = pmnj-scit ]
   { encoding = OT1,
     family   = pmnx,
     shape    = {scit,si} }
   {
     1 = {100,150}
   }

\SetProtrusion
   [ name     = pmnx-scit-T1,
     load     = pmnj-scit-T1 ]
   { encoding = {T1,LY1},
     family   = pmnx,
     shape    = {scit,si}    }
   {
     1 = {100,150}
   }

⟨/pmn⟩
```

15.8.5 Text companion

Finally the TS1 encoding. Still quite incomplete for Times and especially Palatino. Anybody?

```
\SetProtrusion
⟨m-t⟩  [ name     = textcomp ]
⟨bch⟩  [ name     = bch-textcomp ]
⟨blg⟩  [ name     = blg-textcomp ]
⟨cmr⟩  [ name     = cmr-textcomp ]
⟨ebg⟩  [ name     = EBGaramond-textcomp ]
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```

```
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⟨!m-t⟩   { encoding = TS1,
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⟨blg⟩     family   = blg }
⟨cmr⟩     family   = cmr }
⟨ebg⟩     family   = {EBGaramond-LF,EBGaramond-TLF,EBGaramond-OsF,EBGaramond-TOsF} }
⟨pmn⟩     family   = {pmnx,pmnj} }
⟨ppl⟩     family   = {ppl,pplx,pplj} }
⟨ptm⟩     family   = {ptm,ptmx,ptmj} }
⟨ugm⟩     family   = ugm }
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⟨blg⟩     \textquotestraightdblbase = {300,400},
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⟨blg|ugm⟩     \textminus                = {250,300},
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⟨blg⟩     \textrbrackdbl            = {   ,200},
⟨pmn⟩     \textasciigrave           = {200,500},
⟨bch|blg|cmr|ebg|pmn⟩     \texttildelow             = {200,250},
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⟨ptm⟩     \texttwosuperior          = { 50, 50},
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⟨ebg|pmn⟩     \textthreesuperior        = {200,200},
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⟨blg⟩     \textperiodcentered       = {400,500},
⟨ptm⟩     \textperiodcentered       = {300,300},
⟨ugm⟩     \textperiodcentered       = {200,500},
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⟨blg|cmr⟩     \textordmasculine         = {100,200},
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⟨bch⟩     \texttimes                = {200,200},
⟨blg|ptm⟩     \texttimes                = {100,100},
⟨cmr⟩     \texttimes                = {150,250},
⟨ebg⟩     \texttimes                = {100,150},
⟨pmn⟩     \texttimes                = { 70,100},
⟨ugm⟩     \texttimes                = {200,300},
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⟨ugm⟩     \textdiv                  = {200,300},
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⟨ugm⟩     \textsection              = {   ,100},
⟨ugm⟩     \textonehalf              = { 50,100},
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```

Remaining slots in the source file.

```
   }

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⟨ebg⟩     family   = {EBGaramond-LF,EBGaramond-TLF,EBGaramond-OsF,EBGaramond-TOsF},
⟨pmn⟩     family   = {pmnx,pmnj},
⟨ugm⟩     family   = ugm,
⟨!ugm⟩     shape    = {it,sl} }
⟨ugm⟩     shape    = it }
   {
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     \texttwelveudash          = {200,200},
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⟨ebg⟩     \textquotesingle          = {800,100},
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⟨ebg⟩     \textasteriskcentered     = {500,100},
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⟨ebg⟩     \textoneoldstyle          = {100,   },
⟨pmn⟩     \textoneoldstyle          = { 50,   },
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⟨cmr⟩     \textthreeoldstyle        = {100, 50},
⟨pmn⟩     \textthreeoldstyle        = {-100,  },
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⟨ebg⟩     \textfouroldstyle         = { 50,100},
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⟨pmn⟩     \textsevenoldstyle        = { 20,   },
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⟨cmr⟩     \textrangle               = {   ,400},
⟨cmr|ebg⟩     \textminus                = {300,300},
⟨pmn⟩     \textminus                = {200,200},
⟨ugm⟩     \textminus                = {250,300},
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⟨ebg|pmn⟩     \textrbrackdbl            = {   ,100},
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⟨pmn⟩     \textacutedbl             = {200,300},
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⟨pmn⟩     \textdaggerdbl            = { 80, 50},
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⟨ebg⟩     \textbullet               = {300,   },
⟨pmn⟩     \textbullet               = { 30, 70},
⟨ugm⟩     \textbullet               = { 50,100},
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⟨ebg⟩     \textcelsius              = {200,   },
⟨pmn⟩     \textcelsius              = { 50,-50},
⟨ebg⟩     \textflorin               = {100,   },
⟨pmn⟩     \textflorin               = { 50,100},
⟨ugm⟩     \textflorin               = {   ,100},
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⟨ebg⟩     \textcolonmonetary        = {100,   },
⟨pmn⟩     \textcolonmonetary        = { 50,-50},
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⟨pmn⟩     \texttrademark            = { 50,100},
⟨ugm⟩     \texttrademark            = {150, 50},
⟨ugm⟩     \textcent                 = { 50,   },
⟨ugm⟩     \textsterling             = {   , 50},
⟨ugm⟩     \textbrokenbar            = {200,300},
⟨pmn⟩     \textasciidieresis        = {300,200},
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⟨pmn|ugm⟩     \textlnot                 = {200,   },
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⟨ebg⟩     \textregistered           = {200,100},
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⟨pmn⟩     \textdegree               = {150,150},
⟨ugm⟩     \textdegree               = {300,200},
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⟨ebg⟩     \textpm                   = {200,150},
⟨pmn|ugm⟩     \textpm                   = {150,200},
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⟨ebg⟩     \textonesuperior          = {300,100},
⟨pmn⟩     \textonesuperior          = {200,100},
⟨ugm⟩     \textonesuperior          = {300,300},
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⟨ebg⟩     \texttwosuperior          = {300,   },
⟨pmn⟩     \texttwosuperior          = {200,100},
⟨ugm⟩     \texttwosuperior          = {300,200},
⟨cmr⟩     \textthreesuperior        = {400,   },
⟨ebg⟩     \textthreesuperior        = {300,   },
⟨pmn⟩     \textthreesuperior        = {200,100},
⟨ugm⟩     \textthreesuperior        = {300,200},
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⟨pmn⟩     \textparagraph            = {   ,100},
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⟨ebg|pmn|ugm⟩     \textperiodcentered       = {300,400},
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⟨pmn⟩     \textordmasculine         = {200,200},
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⟨ebg⟩     \texteuro                 = {100,   },
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⟨cmr⟩     \texttimes                = {200,200},
⟨ebg⟩     \texttimes                = {200,100},
⟨pmn⟩     \texttimes                = { 70,100},
⟨ugm⟩     \texttimes                = {200,300},
⟨cmr|ebg⟩     \textdiv                  = {200,200}
⟨pmn⟩     \textdiv                  = {150,200}
⟨ugm⟩     \textdiv                  = {200,300},
⟨ugm⟩     \textsection              = {   ,200},
⟨ugm⟩     \textonehalf              = { 50,100},
⟨ugm⟩     \textonequarter           = { 50,100},
⟨ugm⟩     \textthreequarters        = { 50,100},
⟨ugm⟩     \textsurd                 = {   ,100}
   }

⟨/cmr|ebg|pmn|ugm⟩
```

15.8.6 Computer Modern math

Now to the math symbols for Computer Modern Roman. Definitions have been extracted from `fontmath.ltx`. I did not spend too much time fiddling with these settings, so they can surely be improved.

The math font '`operators`' (also used for the `\mathrm` and `\mathbf` alphabets) is `OT1/cmr`, which we've already set up above. It's declared as:

```
\DeclareSymbolFont{operators}   {OT1}{cmr}{m} {n}
\SetSymbolFont{operators}{bold}{OT1}{cmr}{bx}{n}
```

`\mathit` (`OT1/cmr/m/it`) is also already set up.

There are (for the moment) no settings for `\mathsf` and `\mathtt`.

Math font '`letters`' (also used as `\mathnormal`) is declared as:

```
\DeclareSymbolFont{letters}    {OML}{cmm}{m}{it}
\SetSymbolFont{letters}  {bold}{OML}{cmm}{b}{it}
```

```
⟨*cmr⟩
\SetProtrusion
   [ name     = cmr-math-letters ]
   { encoding = OML,
     family   = cmm,
     series   = {m,b},
     shape    = it    }
```

```
{
    A = {100, 50}, % \mathnormal
    B = { 50,   },
    C = { 50,   },
    D = { 50, 50},
    E = { 50,   },
    F = {100, 50},
    G = { 50, 50},
    H = { 50, 50},
    I = { 50, 50},
    J = {150, 50},
    K = { 50,100},
    L = { 50, 50},
    M = { 50,   },
    N = { 50,   },
    O = { 50,   },
    P = { 50,   },
    Q = { 50, 50},
    R = { 50,   },
    S = { 50,   },
    T = { 50,100},
    U = { 50, 50},
    V = {100,100},
    W = { 50,100},
    X = { 50,100},
    Y = {100,100},
    f = {100,100},
    h = {   ,100},
    i = {   , 50},
    j = {   , 50},
    k = {   , 50},
    r = {   , 50},
    v = {   , 50},
    w = {   , 50},
    x = {   , 50},
  "0B = { 50,100}, % \alpha
  "0C = { 50, 50}, % \beta
  "0D = {200,150}, % \gamma
  "0E = { 50, 50}, % \delta
  "0F = { 50, 50}, % \epsilon
  "10 = { 50,150}, % \zeta
  "12 = { 50,   }, % \theta
  "13 = {   ,100}, % \iota
  "14 = {   ,100}, % \kappa
  "15 = {100, 50}, % \lambda
  "16 = {   , 50}, % \mu
  "17 = {   , 50}, % \nu
  "18 = {   , 50}, % \xi
  "19 = { 50,100}, % \pi
  "1A = { 50, 50}, % \rho
  "1B = {   ,150}, % \sigma
  "1C = { 50,150}, % \tau
  "1D = { 50, 50}, % \upsilon
  "1F = { 50,100}, % \chi
  "20 = { 50, 50}, % \psi
  "21 = {   , 50}, % \omega
  "22 = {   , 50}, % \varepsilon
  "23 = {   , 50}, % \vartheta
  "24 = {   , 50}, % \varpi
  "25 = {100,   }, % \varrho
  "26 = {100,100}, % \varsigma
  "27 = { 50, 50}, % \varphi
  "28 = {100,100}, % \leftharpoonup
  "29 = {100,100}, % \leftharpoondown
  "2A = {100,100}, % \rightharpoonup
```

```
    "2B = {100,100}, % \rightharpoondown
    "2C = {300,200}, % \lhook
    "2D = {200,300}, % \rhook
    "2E = {   ,100}, % \triangleright
    "2F = {100,   }, % \triangleleft
    "3A = {   ,500}, % ., \ldotp
    "3B = {   ,500}, % ,
    "3C = {200,100}, % <
    "3D = {300,400}, % /
    "3E = {100,200}, % >
    "3F = {200,200}, % \star
    "5B = {   ,100}, % \flat
    "5E = {200,200}, % \smile
    "5F = {200,200}, % \frown
    "7C = {100,   }, % \jmath
    "7D = {   ,100}  % \wp
```

Remaining slots in the source file.

```
  }

```

Math font ‘symbols’ (also used for the \mathcal alphabet) is declared as:

```
\DeclareSymbolFont{symbols}    {OMS}{cmsy}{m}{n}
\SetSymbolFont{symbols}  {bold}{OMS}{cmsy}{b}{n}
```

```
\SetProtrusion
  [ name     = cmr-math-symbols ]
  { encoding = OMS,
    family   = cmsy,
    series   = {m,b},
    shape    = n  }
  {
      A = {150, 50}, % \mathcal
      C = {   ,100},
      D = {   , 50},
      F = { 50,150},
      I = {   ,100},
      J = {100,150},
      K = {   ,100},
      L = {100,   },
      M = { 50, 50},
      N = { 50,100},
      P = {   , 50},
      Q = { 50,   },
      R = {   , 50},
      T = { 50,150},
      V = { 50, 50},
      W = {   , 50},
      X = {100,100},
      Y = {100,   },
      Z = {100,150},
    "00 = {300,300}, % -
    "01 = {   ,700}, % \cdot, \cdotp
    "02 = {150,250}, % \times
    "03 = {150,250}, % *, \ast
    "04 = {200,300}, % \div
    "05 = {150,250}, % \diamond
    "06 = {200,200}, % \pm
    "07 = {200,200}, % \mp
    "08 = {100,100}, % \oplus
    "09 = {100,100}, % \ominus
    "0A = {100,100}, % \otimes
    "0B = {100,100}, % \oslash
    "0C = {100,100}, % \odot
    "0D = {100,100}, % \bigcirc
    "0E = {100,100}, % \circ
    "0F = {100,100}, % \bullet
    "10 = {100,100}, % \asymp
    "11 = {100,100}, % \equiv
    "12 = {200,100}, % \subseteq
    "13 = {100,200}, % \supseteq
    "14 = {200,100}, % \leq
    "15 = {100,200}, % \geq
    "16 = {200,100}, % \preceq
    "17 = {100,200}, % \succeq
    "18 = {200,200}, % \sim
    "19 = {150,150}, % \approx
    "1A = {200,100}, % \subset
    "1B = {100,200}, % \supset
    "1C = {200,100}, % \ll
    "1D = {100,200}, % \gg
    "1E = {300,100}, % \prec
    "1F = {100,300}, % \succ
    "20 = {100,200}, % \leftarrow
    "21 = {200,100}, % \rightarrow
    "22 = {100,100}, % \uparrow
    "23 = {100,100}, % \downarrow
    "24 = {100,100}, % \leftrightarrow
    "25 = {100,100}, % \nearrow
    "26 = {100,100}, % \searrow
    "27 = {100,100}, % \simeq
    "28 = {100,100}, % \Leftarrow
    "29 = {100,100}, % \Rightarrow
    "2A = {100,100}, % \Uparrow
    "2B = {100,100}, % \Downarrow
    "2C = {100,100}, % \Leftrightarrow
    "2D = {100,100}, % \nwarrow
    "2E = {100,100}, % \swarrow
    "2F = {   ,100}, % \propto
    "30 = {   ,400}, % \prime
    "31 = {100,100}, % \infty
    "32 = {150,100}, % \in
    "33 = {100,150}, % \ni
    "34 = {100,100}, % \triangle, \bigtriangleup
    "35 = {100,100}, % \bigtriangledown
    "38 = {   ,100}, % \forall
    "39 = {100,   }, % \exists
    "3A = {200,   }, % \neg
    "3E = {200,200}, % \top
    "3F = {200,200}, % \bot, \perp
    "5E = {100,200}, % \wedge
    "5F = {100,200}, % \vee
    "60 = {   ,300}, % \vdash
    "61 = {300,   }, % \dashv
    "62 = {100,100}, % \lfloor
    "63 = {100,100}, % \rfloor
    "64 = {100,100}, % \lceil
    "65 = {100,100}, % \rceil
    "66 = {150,   }, % \lbrace
    "67 = {   ,150}, % \rbrace
    "68 = {400,   }, % \langle
    "69 = {   ,400}, % \rangle
    "6C = {100,100}, % \updownarrow
    "6D = {100,100}, % \Updownarrow
    "6E = {100,300}, % \, \backslash, \setminus
    "72 = {100,100}, % \nabla
    "79 = {200,200}, % \dagger
    "7A = {100,100}, % \ddagger
    "7B = {100,   }, % \mathparagraph
    "7C = {100,100}, % \clubsuit
    "7D = {100,100}, % \diamondsuit
    "7E = {100,100}, % \heartsuit
    "7F = {100,100}  % \spadesuit
```

Remaining slots in the source file.

```
  }

```

We don’t bother about ‘largesymbols’, since it will only be used in display math, where protrusion doesn’t work anyway. It’s declared as:

```
\DeclareSymbolFont{largesymbols}{OMX}{cmex}{m}{n}
```

```
⟨/cmr⟩
⟨/cfg-t⟩
```

15.8.7 AMS symbols

Settings for the AMS math fonts (amssymb).

```
⟨*cfg-u⟩
```

Symbol font ‘a’.

```
⟨*msa⟩
\SetProtrusion
  [ name     = AMS-a ]
  { encoding = U,
    family   = msa  }
  {
    "05  =  {150,250},  % \centerdot
    "06  =  {100,100},  % \lozenge
    "07  =  { 50, 50},  % \blacklozenge
    "08  =  { 50, 50},  % \circlearrowright
    "09  =  { 50, 50},  % \circlearrowleft
    "0A  =  {100,100},  % \rightleftharpoons
    "0B  =  {100,100},  % \leftrightharpoons
    "0D  =  {-50,200},  % \Vdash
    "0E  =  {-50,200},  % \Vvdash
    "0F  =  {-70,150},  % \vDash
    "10  =  {100,150},  % \twoheadrightarrow
    "11  =  {100,150},  % \twoheadleftarrow
    "12  =  { 50,100},  % \leftleftarrows
    "13  =  { 50, 80},  % \rightrightarrows
    "14  =  {120,120},  % \upuparrows
    "15  =  {120,120},  % \downdownarrows
    "16  =  {200,200},  % \upharpoonright
    "17  =  {200,200},  % \downharpoonright
    "18  =  {200,200},  % \upharpoonleft
    "19  =  {200,200},  % \downharpoonleft
    "1A  =  { 80,100},  % \rightarrowtail
    "1B  =  { 80,100},  % \leftarrowtail
    "1C  =  { 50, 50},  % \leftrightarrows
    "1D  =  { 50, 50},  % \rightleftarrows
    "1E  =  {250,   },  % \Lsh
    "1F  =  {   ,250},  % \Rsh
    "20  =  {100,100},  % \rightsquigarrow
    "21  =  {100,100},  % \leftrightsquigarrow
    "22  =  {100, 50},  % \looparrowleft
    "23  =  { 50,100},  % \looparrowright
    "24  =  { 50, 80},  % \circeq
    "25  =  {   ,100},  % \succsim
    "26  =  {   ,100},  % \gtrsim
    "27  =  {   ,100},  % \gtrapprox
    "28  =  {150, 50},  % \multimap
    "2B  =  {100,150},  % \doteqdot
    "2C  =  {100,150},  % \triangleq
    "2D  =  {100, 50},  % \precsim
    "2E  =  {100, 50},  % \lesssim
    "2F  =  { 50, 50},  % \lessapprox
    "30  =  {100, 50},  % \eqslantless
    "31  =  { 50, 50},  % \eqslantgtr
    "32  =  {100, 50},  % \curlyeqprec
    "33  =  { 50,100},  % \curlyeqsucc
    "34  =  {100, 50},  % \preccurlyeq
    "36  =  { 50,   },  % \leqslant
    "38  =  {   , 50},  % \backprime
    "39  =  {250,250},  % \dabar@ : the dash bar in \dash(left,right)arrow
    "3C  =  { 50,100},  % \succcurlyeq
    "3E  =  {   , 50},  % \geqslant
    "40  =  {   , 50},  % \sqsubset
    "41  =  { 50,   },  % \sqsupset
    "42  =  {   ,150},  % \vartriangleright, \rhd
    "43  =  {150,   },  % \vartriangleleft, \lhd
    "44  =  {   ,100},  % \trianglerighteq, \unrhd
    "45  =  {100,   },  % \trianglelefteq, \unlhd
    "46  =  {100,100},  % \bigstar
    "48  =  { 50, 50},  % \blacktriangledown
    "49  =  {   ,100},  % \blacktriangleright
    "4A  =  {100,   },  % \blacktriangleleft
    "4B  =  {   ,150},  % \dashrightarrow (the arrow)
    "4C  =  {150,   },  % \dashleftarrow
    "4D  =  { 50, 50},  % \vartriangle
    "4E  =  { 50, 50},  % \blacktriangle
    "4F  =  { 50, 50},  % \triangledown
    "50  =  { 50, 50},  % \eqcirc
    "56  =  {   ,150},  % \Rrightarrow
    "57  =  {150,   },  % \Lleftarrow
    "58  =  {100,300},  % \checkmark
    "5C  =  { 50, 50},  % \angle
    "5D  =  { 50, 50},  % \measuredangle
    "5E  =  { 50, 50},  % \sphericalangle
    "5F  =  {   , 50},  % \varpropto
    "60  =  {100,100},  % \smallsmile
    "61  =  {100,100},  % \smallfrown
    "62  =  { 50,   },  % \Subset
    "63  =  {   , 50},  % \Supset
    "66  =  {150,150},  % \curlywedge
    "67  =  {150,150},  % \curlyvee
    "68  =  { 50,150},  % \leftthreetimes
    "69  =  {100, 50},  % \rightthreetimes
    "6C  =  { 50, 50},  % \bumpeq
    "6D  =  { 50, 50},  % \Bumpeq
    "6E  =  {100,   },  % \lll
    "6F  =  {   ,100},  % \ggg
    "70  =  { 50,100},  % \ulcorner
    "71  =  {100, 50},  % \urcorner
    "75  =  {150,200},  % \dotplus
    "76  =  { 50,100},  % \backsim
    "78  =  { 50,100},  % \llcorner
    "79  =  {100, 50},  % \lrcorner
    "7C  =  {100,100},  % \intercal
    "7D  =  { 50, 50},  % \circledcirc
    "7E  =  { 50, 50},  % \circledast
    "7F  =  { 50, 50}   % \circleddash
```

Remaining slots in the source file.

```
  }

⟨/msa⟩
```

Symbol font ‘b’.

```
⟨*msb⟩
\SetProtrusion
   [ name     = AMS-b ]
   { encoding = U,
     family   = msb  }
   {
       A  =  { 50, 50},  % \mathbb
       C  =  { 50, 50},
       G  =  {   , 50},
       L  =  {   , 50},
       P  =  {   , 50},
       R  =  {   , 50},
       T  =  {   , 50},
       V  =  { 50, 50},
       X  =  { 50, 50},
       Y  =  { 50, 50},
     "00  =  { 50, 50},  % \lvertneqq
     "01  =  { 50, 50},  % \gvertneqq
     "02  =  { 50, 50},  % \nleq
     "03  =  { 50, 50},  % \ngeq
     "04  =  {100, 50},  % \nless
     "05  =  { 50,150},  % \ngtr
     "06  =  {100, 50},  % \nprec
     "07  =  { 50,150},  % \nsucc
     "08  =  { 50, 50},  % \lneqq
     "09  =  { 50, 50},  % \gneqq
     "0A  =  {100,100},  % \nleqslant
     "0B  =  {100,100},  % \ngeqslant
     "0C  =  {100, 50},  % \lneq
     "0D  =  { 50,100},  % \gneq
     "0E  =  {100, 50},  % \npreceq
     "0F  =  { 50,100},  % \nsucceq
     "10  =  { 50,   },  % \precnsim
     "11  =  { 50, 50},  % \succnsim
     "12  =  { 50, 50},  % \lnsim
     "13  =  { 50, 50},  % \gnsim
     "14  =  { 50, 50},  % \nleqq
     "15  =  { 50, 50},  % \ngeqq
     "16  =  { 50, 50},  % \precneqq
     "17  =  { 50, 50},  % \succneqq
     "18  =  { 50, 50},  % \precnapprox
     "19  =  { 50, 50},  % \succnapprox
     "1A  =  { 50, 50},  % \lnapprox
     "1B  =  { 50, 50},  % \gnapprox
     "1C  =  {150,200},  % \nsim
     "1D  =  { 50, 50},  % \ncong
     "1E  =  {100,150},  % \diagup
     "1F  =  {100,150},  % \diagdown
     "20  =  {100, 50},  % \varsubsetneq
     "21  =  { 50,100},  % \varsupsetneq
     "22  =  {100, 50},  % \nsubseteqq
     "23  =  { 50,100},  % \nsupseteqq
     "24  =  {100, 50},  % \subsetneqq
     "25  =  { 50,100},  % \supsetneqq
     "26  =  {100, 50},  % \varsubsetneqq
     "27  =  { 50,100},  % \varsupsetneqq
     "28  =  {100, 50},  % \subsetneq
     "29  =  { 50,100},  % \supsetneq
     "2A  =  {100, 50},  % \nsubseteq
     "2B  =  { 50,100},  % \nsupseteq
     "2C  =  { 50,100},  % \nparallel
     "2D  =  {100,150},  % \nmid
     "2E  =  {150,150},  % \nshortmid
     "2F  =  {100,100},  % \nshortparallel
     "30  =  {   ,150},  % \nvdash
     "31  =  {   ,150},  % \nVdash
     "32  =  {   ,100},  % \nvDash
     "33  =  {   ,100},  % \nVDash
     "34  =  {   ,100},  % \ntrianglerighteq
     "35  =  {100,   },  % \ntrianglelefteq
     "36  =  {100,   },  % \ntriangleleft
     "37  =  {   ,100},  % \ntriangleright
     "38  =  {100,200},  % \nleftarrow
     "39  =  {100,200},  % \nrightarrow
     "3A  =  {100,100},  % \nLeftarrow
     "3B  =  { 50,100},  % \nRightarrow
     "3C  =  {100,100},  % \nLeftrightarrow
     "3D  =  {100,200},  % \nleftrightarrow
     "3E  =  { 50, 50},  % \divideontimes
     "3F  =  { 50, 50},  % \varnothing
     "60  =  {200,   },  % \Finv
     "61  =  {   , 50},  % \Game
     "68  =  {100,100},  % \eqsim
     "69  =  { 50,   },  % \beth
     "6A  =  { 50,   },  % \gimel
     "6B  =  {150,   },  % \daleth
     "6C  =  {200,   },  % \lessdot
     "6D  =  {   ,200},  % \gtrdot
     "6E  =  {100,200},  % \ltimes
     "6F  =  {150,100},  % \rtimes
     "70  =  { 50,100},  % \shortmid
     "71  =  { 50, 50},  % \shortparallel
     "72  =  {200,300},  % \smallsetminus
     "73  =  {100,200},  % \thicksim
     "74  =  { 50,100},  % \thickapprox
     "75  =  { 50, 50},  % \approxeq
     "76  =  { 50,100},  % \succapprox
     "77  =  { 50, 50},  % \precapprox
     "78  =  {100,100},  % \curvearrowleft
     "79  =  { 50,150},  % \curvearrowright
     "7A  =  { 50,200},  % \digamma
     "7B  =  {100, 50},  % \varkappa
     "7F  =  {200,   }   % \backepsilon
```

Remaining slots in the source file.

```
   }

⟨/msb⟩
```

15.8.8 Euler

Euler Roman font (package `euler`).

```
⟨*eur⟩
\SetProtrusion
   [ name     = euler ]
   { encoding = U,
     family   = eur  }
   {
     "01  =  {100,100},
     "03  =  {100,150},
     "06  =  {   ,100},
     "07  =  {100,150},
     "08  =  {100,100},
     "0A  =  {100,100},
     "0B  =  {   , 50},
     "0C  =  {   ,100},
     "0D  =  {100,100},
     "0E  =  {   ,100},
     "0F  =  {100,100},
     "10  =  {100,100},
     "13  =  {   ,100},
     "14  =  {   ,100},
     "15  =  {   , 50},
     "16  =  {   , 50},
     "17  =  { 50,100},
     "18  =  { 50,100},
     "1A  =  {   , 50},
     "1B  =  {   , 50},
     "1C  =  { 50,100},
     "1D  =  { 50,100},
     "1E  =  { 50,100},
     "1F  =  { 50,100},
     "20  =  {   , 50},
     "21  =  {   , 50},
     "22  =  { 50,100},
     "24  =  {   , 50},
     "27  =  { 50,100},
       1  =  {100,100},
       7  =  { 50,100},
     "3A  =  {300,500},
     "3B  =  {200,400},
     "3C  =  {200,100},
     "3D  =  {200,200},
     "3E  =  {100,200},
       A  =  {   ,100},
       D  =  {   , 50},
       J  =  { 50,   },
       K  =  {   , 50},
       L  =  {   , 50},
       Q  =  {   , 50},
       T  =  { 50,   },
       X  =  { 50, 50},
       Y  =  { 50,   },
       h  =  {   , 50},
       k  =  {   , 50}
   }

```

Extended by the eulervm package.

```
\SetProtrusion
   [ name     = euler-vm,
     load     = euler ]
   { encoding = U,
     family   = zeur  }
   {
     "28  =  {100,200},
     "29  =  {100,200},
     "2A  =  {100,150},
     "2B  =  {100,150},
     "2C  =  {200,300},
     "2D  =  {200,300},
     "2E  =  {   ,100},
     "2F  =  {100,   },
     "3F  =  {150,150},
     "5B  =  {   ,100},
     "5E  =  {100,100},
     "5F  =  {100,100},
     "80  =  {   , 50},
     "81  =  {200,250},
     "82  =  {100,200}
   }

⟨/eur⟩
```

Euler Script font (eucal).

```
⟨*eus⟩
\SetProtrusion
   [ name     = euscript ]
   { encoding = U,
     family   = eus  }
   {
       A  =  {100,100},
       B  =  { 50,100},
       C  =  { 50, 50},
       D  =  { 50,100},
       E  =  { 50,100},
       F  =  { 50,   },
       G  =  { 50,   },
       H  =  {   ,100},
       K  =  {   , 50},
       L  =  {   ,150},
       M  =  {   , 50},
       N  =  {   , 50},
       O  =  { 50, 50},
       P  =  { 50, 50},
       T  =  {   ,100},
       U  =  {   , 50},
       V  =  { 50, 50},
       W  =  { 50, 50},
       X  =  { 50, 50},
       Y  =  { 50,   },
       Z  =  { 50,100},
     "00  =  {250,250},
     "18  =  {200,200},
     "3A  =  {200,150},
     "40  =  {   ,100},
     "5E  =  {100,100},
     "5F  =  {100,100},
     "66  =  { 50,   },
     "67  =  {   , 50},
     "6E  =  {200,200}
   }

\SetProtrusion
   [ name     = euscript-vm,
     load     = euscript ]
   { encoding = U,
     family   = zeus  }
   {
     "01  =  {600,600},
     "02  =  {200,200},
     "03  =  {200,200},
     "04  =  {200,200},
     "05  =  {150,150},
     "06  =  {200,200},
     "07  =  {200,200},
     "08  =  {100,100},
     "09  =  {100,100},
     "0A  =  {100,100},
     "0B  =  {100,100},
     "0C  =  {100,100},
     "0D  =  {100,100},
     "0E  =  {150,150},
     "0F  =  {100,100},
     "10  =  {150,150},
     "11  =  {100,100},
     "12  =  {150,100},
     "13  =  {100,150},
     "14  =  {150,100},
     "15  =  {100,150},
     "16  =  {200,100},
     "17  =  {100,200},
     "19  =  {150,150},
     "1A  =  {150,100},
     "1B  =  {100,150},
     "1C  =  {100,100},
     "1D  =  {100,100},
     "1E  =  {250,100},
     "1F  =  {100,250},
     "20  =  {150,200},
     "21  =  {150,200},
     "22  =  {150,150},
     "23  =  {150,150},
     "24  =  {100,200},
     "25  =  {150,150},
     "26  =  {150,150},
     "27  =  {100,100},
     "28  =  {100,100},
     "29  =  {100,150},
     "2A  =  {100,100},
     "2B  =  {100,100},
     "2C  =  {100,100},
     "2D  =  {150,150},
     "2E  =  {150,150},
     "2F  =  {100,100},
     "30  =  {100,100},
     "31  =  {100,100},
     "32  =  {100,100},
     "33  =  {100,100},
     "34  =  {100,100},
     "35  =  {100,100},
     "3E  =  {150,150},
     "3F  =  {150,150},
     "60  =  {   ,200},
     "61  =  {200,   },
     "62  =  {100,100},
     "63  =  {100,100},
     "64  =  {100,100},
     "65  =  {100,100},
     "68  =  {300,   },
     "69  =  {   ,300},
     "6C  =  {100,100},
     "6D  =  {100,100},
     "6F  =  {100,100},
     "72  =  {100,100},
     "73  =  {200,100},
     "76  =  {   ,100},
     "77  =  {100,   },
     "78  =  { 50, 50},
     "79  =  {100,100},
     "7A  =  {100,100},
     "7D  =  {150,150},
     "7E  =  {100,100},
     "A8  =  {100,100},
     "A9  =  {100,100},
     "AB  =  {200,200},
     "BA  =  {   ,200},
     "BB  =  {   ,200},
     "BD  =  {200,200},
     "DE  =  {200,200}
   }

 ⟨/eus⟩
```

Euler Fraktur font (eufrak).

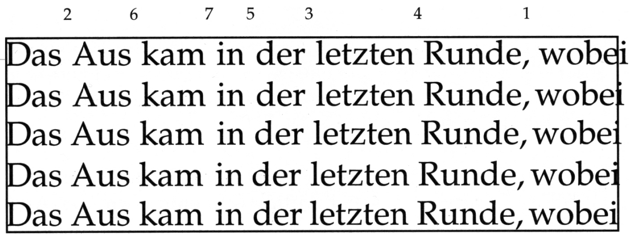
```
⟨*euf⟩
\SetProtrusion
   [ name     = mathfrak ]
   { encoding = U,
     family   = euf  }
   {
       A  =  {   , 50},
       B  =  {   , 50},
       C  =  { 50, 50},
       D  =  {   , 80},
       E  =  { 50,   },
       G  =  {   , 50},
       L  =  {   , 80},
       O  =  {   , 50},
       T  =  {   , 80},
       X  =  { 80, 50},
       Z  =  { 80, 50},
       b  =  {   , 50},
       c  =  {   , 50},
       k  =  {   , 50},
       p  =  {   , 50},
       q  =  { 50,   },
       v  =  {   , 50},
       w  =  {   , 50},
       x  =  {   , 50},
       1  =  {100,100},
       2  =  { 80, 80},
       3  =  { 80, 50},
       4  =  { 80, 50},
       7  =  { 50, 50},
     "12  =  {500,500},
     "13  =  {500,500},
       !  =  {   ,200},
       '  =  {200,300},
       (  =  {200,   },
       )  =  {   ,200},
       *  =  {200,200},
       +  =  {200,250},
       -  =  {200,200},
      {,} =  {300,300},
       .  =  {400,400},
      {=} =  {200,200},
       :  =  {   ,200},
       ;  =  {   ,200},
       ]  =  {   ,200}
   }

⟨/euf⟩
⟨/cfg-u⟩
```

15.8.9 Euro symbols

Settings for various Euro symbols (Adobe Euro fonts (packages eurosans, europs), ITC Euro fonts (package euroitc) and marvosym[24]). The euroitc settings are hidden in the package itself (14.3.7) for 'free software' compliance reasons. (Not quite sure whether this is what Karl really had in mind . . .)

```
⟨*cfg-e⟩
\SetProtrusion
⟨zpeu⟩   { encoding = U,
⟨mvs⟩   { encoding = {OT1,U},
```

[24] Of course, there are many more symbols in this font. Feel free to contribute protrusion settings!



Das Aus kam in der letzten Runde, wobei
Das Aus kam in der letzten Runde, wobei
Das Aus kam in der letzten Runde, wobei
Das Aus kam in der letzten Runde, wobei
Das Aus kam in der letzten Runde, wobei

Figure 1:

Example of interword spacing (from: M. Siemoneit, *Typographisches Gestalten*, Frankfurt/M. 1989). The numbers indicate the preference for shrinking the interword space.

```
⟨zpeu⟩     family   = zpeu }
⟨mvs⟩      family   = mvs }
   {
⟨zpeu⟩     E = {50, }
⟨mvs⟩      164 = {50,50},   % \EUR
⟨mvs⟩      068 = {50,-100}  % \EURdig
   }

⟨*zpeu⟩
\SetProtrusion
   { encoding = U,
     family   = zpeu,
     shape    = it* }
   {
     E = {100,-50}
   }

\SetProtrusion
   { encoding = U,
     family   = {zpeus,eurosans} }
   {
     E = {100,50}
   }

\SetProtrusion
   { encoding = U,
     family   = {zpeus,eurosans},
     shape    = it* }
   {
     E = {200, }
   }

⟨/zpeu⟩
⟨/cfg-e⟩
```

15.9 Interword spacing

Default unit is space.

```
⟨*m-t|cmr⟩
%%% ----------------------------------------------------------------------
%%% INTERWORD SPACING

⟨/m-t|cmr⟩
⟨*m-t⟩
\SetExtraSpacing
   [ name = default ]
   { encoding = {OT1,T1,LY1,OT4,QX,T5} }
   {
```

These settings are only a first approximation. The following reasoning is from a mail from *Ulrich Dirr*, who also provided the sample in figure 1. I do not claim to have coped with the task.

‘The idea is – analog to the tables for expansion and protrusion – to have tables for optical reduction/expansion of spaces in dependence of the actual character so that the distance between words is optically equal.

When reducing distances the (weighting) order is:

- after commas

```
      {,} = { ,-500,500},
```

- in front of capitals which have optical more room on their left side, e.g., ‘A’, ‘J’, ‘T’, ‘V’, ‘W’, and ‘Y’ [this is not yet possible – RS]
- in front of capitals which have circle/oval shapes on their left side, e.g., ‘C’, ‘G’, ‘O’, and ‘Q’ [ditto – RS]
- after ‘r’ (because of the bigger optical room on the righthand side)

```
       r  = { ,-300,300},
```

- [before or] after lowercase characters with ascenders

```
       b  = { ,-200,200},
       d  = { ,-200,200},
       f  = { ,-200,200},
       h  = { ,-200,200},
       k  = { ,-200,200},
       l  = { ,-200,200},
       t  = { ,-200,200},
```

- [before or] after lowercase characters with x-height plus descender with additional optical space, e.g., ‘v’, or ‘w’

```
       c  = { ,-100,100},
       p  = { ,-100,100},
       v  = { ,-100,100},
       w  = { ,-100,100},
       z  = { ,-100,100},
       x  = { ,-100,100},
       y  = { ,-100,100},
```

- [before or] after lowercase characters with x-height plus descender without additional optical space

```
       i  = { , 50, -50},
       m  = { , 50, -50},
       n  = { , 50, -50},
       u  = { , 50, -50},
```

- after colon and semicolon

```
       :  = { ,200,-200},
       ;  = { ,200,-200},
```

- after punctuation which ends a sentence, e.g., period, exclamation mark, question mark

```
       .  = { ,250,-250},
       !  = { ,250,-250},
       ?  = { ,250,-250}
```

The order has to be reversed when enlarging is needed.’

```
  }

⟨/m-t⟩
```

Questions are:

- Is the result really better?
- Is it overdone? (Try with a `factor` < 1000.)
- Should the first parameter also be used? (Probably.)
- What about quotation marks, parentheses etc.?

Furthermore, there seems to be a pdfTEX bug with spacing in combination with a non-zero `\spaceskip` (reported by *Axel Berger*):

```
\parfillskip0pt
\rightskip0pt plus 1em
\spaceskip\fontdimen2\font
 test test\par
\pdfadjustinterwordglue2
\stbscode\font`t=-50
 test test
\bye
```

Some more characters in T2A.[25]

```
⟨*cmr⟩
\SetExtraSpacing
   [ name     = T2A,
     load     = default ]
   { encoding = T2A,
     family   = cmr }
   {
      \cyrg  = { ,-300,300},
      \cyrb  = { ,-200,200},
      \cyrk  = { ,-200,200},
      \cyrs  = { ,-100,100},
      \cyrr  = { ,-100,100},
      \cyrh  = { ,-100,100},
      \cyru  = { ,-100,100},
      \cyrt  = { , 50, -50},
      \cyrp  = { , 50, -50},
      \cyri  = { , 50, -50},
      \cyrishrt  = { , 50, -50},
   }

```

15.9.1 Nonfrenchspacing

The following settings simulate `\nonfrenchspacing` (since space factors will be ignored when spacing adjustment is in effect). They may be used for English contexts.

From the TEXbook:

> ‘If the space factor f is different from 1000, the interword glue is computed as follows: Take the normal space glue for the current font, and add the extra space if $f \geq 2000$. [. . .] Then the stretch component is multiplied by $f/1000$, while the shrink component is multiplied by $1000/f$.’

The ‘extra space’ (`\fontdimen 7`) for Computer Modern Roman is a third of `\fontdimen 2`, i.e., 333.

```
\SetExtraSpacing
   [ name     = nonfrench-cmr,
     load     = default,
     context  = nonfrench ]
   { encoding = {OT1,T1,LY1,OT4,QX,T5},
```

[25] Contributed by *Karl Karlsson*.

```
     family   = cmr }
   {
```

latex.ltx has:

```
\def\nonfrenchspacing{
  \sfcode`\. 3000
  \sfcode`\? 3000
  \sfcode`\! 3000
```

```
     . = {333,2000,-667},
     ? = {333,2000,-667},
     ! = {333,2000,-667},
```

```
  \sfcode`\: 2000
```

```
     : = {333,1000,-500},
```

```
  \sfcode`\; 1500
```

```
     ; = {   , 500,-333},
```

```
  \sfcode`\, 1250
```

```
    {,}= {   , 250,-200}
```

```
}
```

```
   }

⟨/cmr⟩
```

fontinst, however, which is also used to create the psnfss font metrics, sets \fontdimen 7 to 240 by default. Therefore, the fallback settings use this value for the first component.

```
⟨*m-t⟩
\SetExtraSpacing
   [ name     = nonfrench-default,
     load     = default,
     context  = nonfrench ]
   { encoding = {OT1,T1,LY1,OT4,QX,T5} }
   {
     . = {240,2000,-667},
     ? = {240,2000,-667},
     ! = {240,2000,-667},
     : = {240,1000,-500},
     ; = {   , 500,-333},
    {,}= {   , 250,-200}
   }

```

Empty settings to prevent spurious warnings.

```
\SetExtraSpacing
   [ name = empty ]
   { encoding = {TS1} }
   { }

```

15.10 Additional kerning

Default unit is 1 em.

```
%%% -----------------------------------------------------------------------
%%% ADDITIONAL KERNING

```

A dummy list to be loaded when no context is active.

```
\SetExtraKerning
   [ name = empty ]
   { encoding = {OT1,T1,T2A,LY1,OT4,QX,T5,TS1} }
   { }

```

15.10.1 French

The ratio of `\fontdimen` 2 to `\fontdimen` 6 varies for different fonts, so that either the kerning of the colon (which should be a space, i.e., `\fontdimen` 2) or that of the other punctuation characters (TEX's `\thinspace`, i.e., one sixth of `\fontdimen` 6) may be inaccurate, depending on which `unit` we choose (`space` or `1em`). For Times, for example, a thin space would be 665. I don't know whether French typography really wants a thin space, or rather (as it happens to turn out with CMR) half a space. (Wikipedia[26] claims it should be a quarter of an em, which seems too much to me; then again, it also says that this *was* a thin space in French typography.)

```
\SetExtraKerning
   [ name     = french-default,
     context  = french,
     unit     = space   ]
   { encoding = {OT1,T1,LY1} }
   {
     :  = {1000,}, % = \fontdimen2
     ;  = {500, }, % ~ \thinspace
     !  = {500, },
     ?  = {500, }
   }

```

These settings have the disadvantage that a word following a left guillemet will not be hyphenated. This might be fixed in pdfTEX.

```
\SetExtraKerning
   [ name     = french-guillemets,
     context  = french-guillemets,
     load     = french-default,
     unit     = space   ]
   { encoding = {T1,LY1} }
   {
    \guillemotleft  = { ,800}, % = 0.8\fontdimen2
    \guillemotright = {800, }
   }

\SetExtraKerning
   [ name     = french-guillemets-OT1,
     context  = french-guillemets,
     load     = french-default,
     unit     = space   ]
   { encoding = OT1     }
   { }

```

15.10.2 Turkish

```
\SetExtraKerning
   [ name     = turkish,
     context  = turkish ]
   { encoding = {OT1,T1,LY1} }
```

[26] http://fr.wikipedia.org/wiki/Espace_typographique, 5 July 2007.

```
   {
     :  = {167, }, % = \thinspace
     !  = {167, },
    {=} = {167, }
   }

⟨/m-t⟩
⟨/config⟩
```

16 OpenType configuration files

These are the configuration files for the following OpenType fonts:[27]

- Latin Modern Roman
- Charis SIL[28]
- Palatino[29]

The settings are typeset in the respective font.

16.1 Character inheritance

OpenType fonts may differ considerably in how complete their arsenal of glyphs is. Therefore, each font family should have their own inheritance settings.

```

%%% -----------------------------------------------------------------------
%%% INHERITANCE

%% for xetex (EU1) and luatex (EU2), resp. both (TU)
⟨*LatinModernRoman⟩
\DeclareCharacterInheritance
   { encoding = {EU1,EU2,TU},
     family   = Latin Modern Roman }

  { A = {À,Á,Â,Ã,Ä,Å,Ā,Ă,Ą,Ǻ,Ȁ,Ạ,Ả,Ấ,Ầ,Ẩ,Ẫ,Ậ,Ắ,Ằ,Ẳ,Ặ,
        A},  % Greek
    Æ = {Ǽ},
    B = {Ƀ,
        B},  % Greek
    C = {Ç,Ć,Ĉ,Ċ,Č},
    D = {Đ,Ď,Ð,Ḍ,Ḏ},
    E = {È,É,Ê,Ë,Ē,Ĕ,Ė,Ę,Ě,Ȅ,Ẹ,Ẻ,Ẽ,Ề,Ế,Ễ,Ể,Ệ,
        E},  % Greek
    G = {Ĝ,Ğ,Ġ,Ģ,Ǧ,Ǵ},
    H = {Ĥ,Ħ,Ḥ,Ḧ,Ḫ,
        H},  % Greek
    I = {Ì,Í,Î,Ï,Ĩ,Ī,Ĭ,Į,İ,Ȉ,Ỉ,Ị,
        I},  % Greek
    J = {Ĵ},
    K = {Ķ,
        K},  % Greek
    L = {Ĺ,Ļ,Ł,Ḷ}, % Ľ,Ŀ,Ḹ
    M = {M},  % Greek
    N = {Ñ,Ń,Ņ,Ň,Ṅ,Ṇ,
        N},  % Greek
    O = {Ò,Ó,Ô,Õ,Ö,Ø,Ō,Ŏ,Ő,Ọ,Ơ,Ǫ,Ǿ,Ȍ,Ỏ,Ố,Ồ,Ổ,Ỗ,Ộ,Ớ,Ờ,Ỡ,Ở,Ợ,
        O},  % Greek
    P = {P},  % Greek
    R = {Ŕ,Ŗ,Ř,Ȑ,Ṛ,Ṙ,Ṝ},
    S = {Ś,Ŝ,Ş,Š,Ș,Ṣ},
    T = {Ţ,Ť,Ț,Ṭ,Ṯ,
        T},  % Greek
    U = {Ù,Ú,Û,Ü,Ũ,Ū,Ŭ,Ů,Ű,Ų,Ư,Ȕ,Ụ,Ủ,Ứ,Ừ,Ử,Ữ,Ự},
    W = {Ŵ,Ẁ,Ẃ,Ẅ},
    X = {X},  % Greek
    Y = {Ý,Ŷ,Ÿ,Ỵ,Ỷ,Ỹ},
```

[27] This is file microtype-utf.dtx.

[28] Available at http://software.sil.org/charis.

[29] These settings have been contributed by *Loren B. Davis*.

```
     Z = {Ź,Ż,Ž,Ẓ,
          Ζ},  % Greek
     a = {à,á,â,ã,ä,å,ā,ă,ą,ǻ,ȁ,ạ,ả,ấ,ầ,ẩ,ẫ,ậ,ắ,ằ,ẳ,ẵ},
     æ = {ǽ},
     c = {ç,ć,ĉ,ċ,č},
     d = {đ,ḍ,ḏ},
     e = {è,é,ê,ë,ē,ĕ,ė,ę,ě,ȅ,ẹ,ẻ,ẽ,ế,ề,ể,ễ,ệ},
    f = {ﬀ}, % Unicode 64256, glyph name in Latin Modern: /f_f ; in New Computer Modern: /ﬀ
     g = {ĝ,ğ,ġ,ģ,ǧ,ǵ},
     h = {ĥ,ħ,ḥ,ḧ,ḫ},
     i = {ì,í,î,ï,ĩ,ī,ĭ,į,ı,ȉ,ỉ,ị},
     j = {ĵ},
     k = {ķ},
     l = {ĺ,ļ,ł,ḷ,ḹ}, % ľ,ŀ
     n = {ñ,ń,ņ,ň,ṅ,ṇ},
     o = {ò,ó,ô,õ,ö,ø,ō,ŏ,ő,ọ,ơ,ǫ,ǿ,ȍ,ỏ,ố,ồ,ổ,ỗ,ộ,ớ,ờ,ỡ,ở,ợ},
     r = {ŕ,ŗ,ř,ȑ,ṛ,ṙ,ṝ},
     s = {ś,ŝ,ş,š,ṣ,ș},
     t = {ţ,ț,ṭ,ṯ,ẗ}, % ť
     u = {ù,ú,û,ü,ũ,ū,ŭ,ů,ű,ų,ư,ȕ,ụ,ủ,ứ,ừ,ử,ữ,ự},
     w = {ŵ,ẁ,ẃ,ẅ},
     y = {ý,ŷ,ÿ,ỳ,ỵ,ỷ,ỹ},
     z = {ź,ż,ž,ẓ},
   }
⟨/LatinModernRoman⟩
⟨*CharisSIL⟩
\DeclareCharacterInheritance
   { encoding = {EU1,EU2,TU},
     family   = Charis SIL }

  { A = {À,Á,Â,Ã,Ä,Å,Ā,Ă,Ą,Ǎ,Ǟ,Ǡ,Ȧ,Ǻ,Ȁ,Ȃ,Ḁ,Ạ,Ả,Ấ,Ầ,Ẩ,Ẫ,Ậ,Ắ,Ằ,Ẳ,Ẵ,Ặ,Ꜳ,
        А,Ӑ,Ӓ}, % Cyrillic
    Æ = {Ǣ,
        Ӕ́,Ӕ}, % Cyrillic
    B = {Ḃ,Ḅ,Ḇ,
        В}, % Cyr
    C = {Ç,Ć,Ĉ,Ḉ,Ċ,Č,
        С,Ҫ}, % Cyr
    D = {Ď,Ḋ,Ḍ,Ḏ,Ḑ,Ḓ,Đ},
    E = {È,É,Ê,Ë,Ē,Ĕ,Ė,Ę,Ě,Ȅ,Ȩ,Ȇ,Ḕ,Ḗ,Ḙ,Ḛ,Ḝ,Ẹ,Ẻ,Ẽ,Ế,Ề,Ể,Ễ,Ệ,
        Е,Ѐ,Ё,Ё̆}, % Cyr
    F = {Ḟ},
    G = {Ĝ,Ğ,Ġ,Ģ,Ǧ,Ǵ,Ḡ,G},
    H = {Ĥ,Ȟ,Ḣ,Ḥ,Ḧ,Ḩ,Ḫ,
        Н,Ң,Ҥ,Ӈ,Ӊ}, % Cyr
    I = {Ì,Í,Î,Ȉ,Ï,Į,Ĩ,Ị,Ī,İ,Ǐ,Ỉ,Ȋ,Ĭ,Ḭ,Ï,
        І,Ї,Ӏ,Ӏ}, % Cyr
    J = {Ĵ,
        Ј}, % Cyr
    K = {Ķ,Ǩ,Ḱ,Ḳ,Ḵ,
        К,Ќ,Қ,Ҟ,Ҝ,Ҡ,Ӄ,Ԟ}, % Cyr
    L = {Ĺ,Ļ,Ľ,Ḷ,Ḹ,Ḻ,Ḽ}, % Ŀ
    M = {Ḿ,Ṁ,Ṃ,
        М,Ӎ}, % Cyr
    N = {Ñ,Ń,Ņ,Ň,Ǹ,Ṅ,Ṇ,Ṉ,Ṋ,
        И,Й,Ѝ,Ҋ,Ӣ,Ӥ}, % Cyr
    O = {Ò,Ó,Ô,Õ,Ö,Ō,Ŏ,Ő,Ǒ,Ǫ,Ǭ,Ȍ,Ȏ,Ȫ,Ȭ,Ȯ,Ȱ,Ṍ,Ṏ,Ṑ,Ṓ,Ọ,Ỏ,Ố,Ồ,Ổ,Ỗ,Ộ,Ớ,Ờ,Ở,Ỡ,Ơ,
        О,Ө,Ӧ,Ѳ,Ӫ, % Cyr
        Θ}, % Greek
    P = {Ṕ,Ṗ,
        Р,Ҏ},  % Cyr
    Q = {Ԛ}, % Cyr
    R = {Ŕ,Ŗ,Ř,Ȑ,Ȓ,Ṙ,Ṛ,Ṝ,Ṟ},
    S = {Ś,Ŝ,Ş,Š,Ș,Ṡ,Ṣ,Ṥ,Ṧ,Ṩ,
     Ѕ}, % Cyr
T = {Ţ,Ť,Ț,Ṫ,Ṭ,Ṯ,Ṱ,
     Т,Ҭ}, % Cyr
U = {Ù,Ú,Û,Ü,Ũ,Ū,Ŭ,Ů,Ű,Ų,Ǔ,Ǖ,Ǘ,Ǚ,Ǜ,Ȕ,Ȗ,Ṳ,Ṵ,Ṷ,Ṹ,Ṻ,Ụ,Ủ,Ứ,Ừ,Ử,Ữ,Ự},
V = {Ṽ,Ṿ},
W = {Ŵ,Ẁ,Ẃ,Ẅ,Ẇ,Ẉ,
     Ԝ}, % Cyr
X = {Ẋ,Ẍ,
     Х,Ҳ,Ӽ,Ӿ},  % Cyr
Y = {Ý,Ŷ,Ÿ,Ȳ,Ẏ,Ỳ,Ỵ,Ỷ,Ỹ,
     Ү,Ұ}, % Cyr
Z = {Ź,Ż,Ž,Ẑ,Ẓ,Ẕ},
a = {à,á,â,ã,ä,å,ā,ă,ą,ǎ,ǟ,ǡ,ȧ,ǻ,ȁ,ȃ,ḁ,ạ,ả,ầ,ấ,ẩ,ẫ,ậ,ắ,ằ,ẳ,ẵ,ặ, % aʾ
     а,ӑ,ӓ}, % Cyr
æ = {ǽ,
     ӕ}, % Cyr
b = {ḃ,ḅ,ḇ},
c = {ç,ć,ĉ,ċ,č,ḉ,
     с,ҫ}, % Cyr
d = {ď,ḋ,ḍ,ḏ,ḑ,ḓ},
e = {è,é,ê,ë,ē,ĕ,ė,ę,ě,ȅ,ȩ,ȇ,ḕ,ḗ,ḙ,ḛ,ḝ,ẹ,ẻ,ẽ,ề,ế,ể,ễ,ệ,
     е,ѐ,ё,ӗ}, % Cyr
f = {ḟ,ff}, % /f_f
g = {ĝ,ğ,ġ,ģ,ǧ,ǵ,ḡ},
h = {ĥ,ȟ,ḣ,ḥ,ḧ,ḩ,ḫ,ẖ,
     ћ,һ}, % Cyr
i = {ı,ì,í,î,ȉ,ǐ,ï,į,ī,ị,ĩ,ḭ,ḯ,ỉ,ȋ,ĭ,
     і,ї}, % Cyr
j = {ĵ,ǰ,
     ј}, % Cyr
k = {ķ,ǩ,ḱ,ḳ,ḵ},
l = {ĺ,ļ,ḻ,ḷ,ḹ,ḽ}, % ľ,ŀ
m = {ḿ,ṁ,ṃ},
n = {ñ,ń,ņ,ň,ǹ,ṅ,ṇ,ṉ,ṋ}, % ŉ
o = {ò,ó,ô,õ,ö,ō,ŏ,ő,ǒ,ǫ,ǭ,ȍ,ȏ,ȫ,ȭ,ȯ,ȱ,ṍ,ṏ,ṑ,ṓ,ọ,ỏ,ồ,ố,ổ,ỗ,ộ,ớ,ờ,ở,ỡ,ợ,
     о,ө,ӧ,ө,ӫ}, % Cyr
p = {ṕ,ṗ,
     р,ҏ}, % Cyr
q = {ԛ}, % Cyr
r = {ŕ,ŗ,ř,ȑ,ȓ,ṙ,ṛ,ṝ,ṟ},
s = {ś,ŝ,ş,š,ș,ṡ,ṣ,ṥ,ṧ,ṩ,
     ѕ}, % Cyr
t = {ţ,ț,ṫ,ṭ,ṯ,ṱ,ẗ}, % ť
u = {ù,ú,û,ü,ũ,ū,ŭ,ů,ű,ų,ǔ,ǖ,ǘ,ǚ,ǜ,ȕ,ȗ,ṳ,ṵ,ṷ,ṹ,ṻ,ụ,ủ,ứ,ừ,ử,ữ,ự},
v = {ṽ,ṿ},
w = {ŵ,ẁ,ẃ,ẅ,ẇ,ẉ,ẘ,
     ԝ},  % Cyr
x = {ẋ,ẍ,
     х,ҳ}, % Cyr
y = {ý,ÿ,ŷ,ȳ,ẏ,ẙ,ỳ,ỵ,ỷ,ỹ,
     у,ў,ӯ,ӱ,ӳ}, % Cyr
z = {ź,ż,ž,ẑ,ẓ,ẕ},
% Cyrillic
Г = {Ѓ,Ґ,Ғ,Ӷ,Ӻ},
Ж = {Җ,Ӝ,Ӂ},
З = {Ӟ,Ҙ},
Л = {Ӆ},
П = {Ԥ},
У = {Ў,Ӯ,Ӱ,Ӳ},
Ч = {Ҷ,Ҹ,Ӌ,Ӵ},
Ы = {Ӹ},
Ә = {Ӛ},
Ҽ = {Ҿ},
г = {ѓ,ґ,ғ,ӷ,ӻ},
   ж = {җ,ӂ,ӝ},
   з = {ҙ,ӟ},
   и = {й,ѝ,ҋ,ӣ,ӥ},
   к = {ќ,қ,ҝ,ҟ,ҡ,ӄ,ԟ},
   л = {ӆ},
   м = {ӎ},
   н = {ң,ҥ,ӈ,ӊ},
   п = {ԥ},
   т = {ҭ},
   х = {ҳ,ӿ},
   ч = {ҷ,ҹ,ӌ,ӵ},
   ш = {щ},
   ы = {ӹ},
   э = {ӭ},
   ҽ = {ҿ},
   ә = {ӛ},
   ү = {ұ},
   Γ = {Γ}, % Greek
   Π = {Π}, % Greek
  }

  % missing: tipa, math, symbols, ...
⟨/CharisSIL⟩
⟨*Palatino⟩
\DeclareCharacterInheritance
   { encoding = {EU1,EU2,TU},
     family = {Palatino} }
```

Unfortunately, I don't have a Palatino variant containing all of the following glyphs. The settings are typeset in TEX Gyre Pagella; missing glyphs, printed in red, are taken from Charis SIL; glyphs missing even in Charis SIL appear as '�'. To see the real settings, consult mt-Palatino.cfg.

```
 { A = {À,Á,Â,Ã,Ä,Ā,Ă,Ą,Ǎ,Ǟ,Ǡ,Ȧ,Ǻ,Ȁ,Ȃ,Ḁ,Ạ,Ả,Ấ,Ầ,Ẩ,Ẫ,Ậ,Ắ,Ằ,Ẳ,Ẵ,Ặ,Ꜳ},
   B = {Ḃ,Ḅ,Ḇ},
   C = {Ç,Ć,Ĉ,Ḉ,Ċ,Č},
   D = {Ď,Ḋ,Ḍ,Ḏ,Ḑ,Ḓ},
   E = {È,É,Ê,Ë,Ē,Ĕ,Ė,Ę,Ě,Ȅ,Ȩ,Ȇ,Ḕ,Ḗ,Ḙ,Ḛ,Ḝ,Ẹ,Ẻ,Ẽ,Ế,Ề,Ể,Ễ,Ệ},
   F = {Ḟ},
   G = {Ĝ,Ğ,Ġ,Ģ,Ǧ,Ǵ,Ḡ},
   H = {Ĥ,Ȟ,Ḣ,Ḥ,Ḧ,Ḩ,Ḫ},
   I = {Ì,Í,Î,Ȉ,Ï,Į,Ĩ,Ị,Ī,İ,Ǐ,Ỉ,Ȋ,Ĭ,Ḭ,Ḯ},
   J = {Ĵ},
   K = {Ķ,Ǩ,Ḱ,Ḳ,Ḵ},
   L = {Ĺ,Ļ,Ľ,Ḷ,Ḹ,Ḻ,Ḽ,Ỻ,Ŀ,Ł}, % L·
   M = {Ḿ,Ṁ,Ṃ},
   N = {Ñ,Ń,Ņ,Ň,Ǹ,Ṅ,Ṇ,Ṉ,Ṋ},
   O = {Ò,Ó,Ô,Õ,Ö,Ō,Ŏ,Ő,Ǒ,Ǫ,Ǭ,Ȍ,Ȏ,Ȫ,Ȭ,Ȯ,Ȱ,Ṍ,Ṏ,Ṑ,Ṓ,Ọ,Ỏ,Ố,Ồ,Ổ,Ỗ,Ộ,Ớ,Ờ,Ở,Ỡ,Ợ},
   P = {Ṕ,Ṗ},
   R = {Ŕ,Ŗ,Ř,Ȑ,Ȓ,Ṙ,Ṛ,Ṝ,Ṟ},
   S = {Ś,Ŝ,Ş,Š,Ș,Ṡ,Ṣ,Ṥ,Ṧ,Ṩ},
   T = {Ţ,Ť,Ț,Ṫ,Ṭ,Ṯ,Ṱ},
   U = {Ù,Ú,Û,Ü,Ũ,Ū,Ŭ,Ů,Ű,Ų,Ǔ,Ǖ,Ǘ,Ǚ,Ǜ,Ȕ,Ȗ,Ṳ,Ṵ,Ṷ,Ṹ,Ṻ,Ụ,Ủ,Ứ,Ừ,Ử,Ữ,Ự},
   V = {Ṽ,Ṿ},
   W = {Ŵ,Ẁ,Ẃ,Ẅ,Ẇ,Ẉ},
   X = {Ẋ,Ẍ},
   Y = {Ý,Ŷ,Ÿ,Ȳ,Ẏ,Ỳ,Ỵ,Ỷ,Ỹ},
   Z = {Ź,Ż,Ž,Ẑ,Ẓ,Ẕ},
   a = {à,á,â,ã,ä,å,ā,ă,ą,ǎ,ǟ,ǡ,ȧ,ǻ,ȁ,ȃ,ḁ,ạ,ả,ầ,ấ,ẩ,ẫ,ậ,ắ,ằ,ẳ,ẵ,ặ}, % aᵓ
   b = {ḃ,ḅ,ḇ},
   c = {ç,ć,ĉ,ċ,č,ḉ},
   d = {ď,ḋ,ḍ,ḏ,ḑ,ḓ},
   e = {è,é,ê,ë,ē,ĕ,ė,ę,ě,ȅ,ȩ,ȇ,ḕ,ḗ,ḙ,ḛ,ḝ,ẹ,ẻ,ẽ,ề,ế,ể,ễ,ệ},
   f = {ḟ,ff},
   g = {ĝ,ğ,ġ,ģ,ǧ,ǵ,ḡ},
   h = {ĥ,ȟ,ḣ,ḥ,ḧ,ḩ,ḫ,ẖ},
   i = {ı,ì,í,î,ȉ,ĭ,ï,į,ī,ị,ĩ,ḭ,ḯ,ỉ,ȋ,ǐ},
   j = {ĵ,ǰ},
   k = {ķ,ǩ,ḱ,ḳ,ḵ},
   l = {ĺ,ļ,ḻ,ḷ,ḹ,ḽ}, % ľ,ŀ
   m = {ḿ,ṁ,ṃ},
   n = {ñ,ń,ņ,ň,ǹ,ṅ,ṇ,ṉ,ṋ}, % ŉ
   o = {ò,ó,ô,õ,ö,ō,ŏ,ő,ǒ,ǫ,ǭ,ȍ,ȏ,ȫ,ȭ,ȯ,ȱ,ṍ,ṏ,ṑ,ṓ,ọ,ỏ,ồ,ố,ổ,ỗ,ộ,ớ,ờ,ở,ỡ,ợ},
   p = {ṕ,ṗ},
   r = {ŕ,ŗ,ř,ȑ,ȓ,ṙ,ṛ,ṝ,ṟ},
   s = {ś,ŝ,ş,š,ș,ṡ,ṣ,ṥ,ṧ,ṩ},
   t = {ţ,ț,ṫ,ṭ,ṯ,ṱ,ẗ}, % ť
   u = {ù,ú,û,ü,ũ,ū,ŭ,ů,ű,ų,ǔ,ǖ,ǘ,ǚ,ǜ,ȕ,ȗ,ṳ,ṵ,ṷ,ṹ,ṻ,ụ,ủ,ứ,ừ,ử,ữ,ự},
   v = {ṽ,ṿ},
   w = {ŵ,ẁ,ẃ,ẅ,ẇ,ẉ,ẘ},
   x = {ẋ,ẍ},
   y = {ý,ÿ,ŷ,ȳ,ẏ,ẙ,ỳ,ỵ,ỷ,ỹ},
   z = {ź,ż,ž,ẑ,ẓ,ẕ},
 }
⟨/Palatino⟩
```

Less characters in the Lato font . . .

```
⟨*Lato⟩
\DeclareCharacterInheritance
   { encoding = {TU,EU1,EU2},
     family   = {Lato} }
 { A = {À,Á,Â,Ã,Ä,Å,Ą},
   a = {à,á,â,ã,ä,å,ą},
   C = {Ć,Ç},
   c = {ć,ç},
   D = {Đ},
   E = {È,É,Ê,Ë,Ę},
   e = {è,é,ê,ë,ę},
   I = {Ì,Í,Î,Ï},
   i = {ì,í,î,ï,ı},
   L = {Ł},
   l = {ł},
   N = {Ń,Ñ},
   n = {ń,ñ},
   O = {Ø,Ò,Ó,Ô,Õ,Ö},
   o = {ø,ò,ó,ô,õ,ö},
   S = {Ś,Š},
   s = {ś,š},
   U = {Ù,Ú,Û,Ü},
   u = {ù,ú,û,ü},
   Y = {Ý,Ÿ},
   y = {ý,ÿ},
   Z = {Ź,Ż,Ž},
   z = {ź,ż,ž}
 }
⟨/Lato⟩
```

. . . and even less in the self-professedly awesone Font Awesome font.

```
⟨*FontAwesome⟩
\DeclareCharacterInheritance
  { encoding = {TU,EU1,EU2},
    family   = {FontAwesome} }
  { }
⟨/FontAwesome⟩
```

16.2 Character protrusion

```

%%% ----------------------------------------------------------------------
%%% PROTRUSION

⟨*LatinModernRoman⟩
\SetProtrusion
   [ name     = LMR-default ]
   { encoding = {EU1,EU2,TU},
     family   = Latin Modern Roman }
   {
    A = {50,50},
    Æ = {50,  },
    F = {  ,50},
    J = {50,  },
    K = {  ,50},
    L = {  ,50},
    T = {50,50},
    V = {50,50},
    W = {50,50},
    X = {50,50},
    Y = {50,50},
    k = {  ,50},
    r = {  ,50},
    t = {  ,70},
    v = {50,50},
    w = {50,50},
    x = {50,50},
    y = {50,70},
    0 = {  ,50},
    1 = {100,200},
    2 = {50,50},
    3 = {50,50},
    4 = {70,70},
    5 = {  ,50},
    6 = {  ,50},
    7 = {50,100},
    8 = {  ,50},
    9 = {  ,50},
    . = { ,700},
   {,}= { ,500},
    : = { ,500},
    ; = { ,500},
    ! = { ,100},
    ? = { ,200},
    @ = {50,50},
    ~ = {200,250},
   \% = {50,50},
    * = {300,300},
    + = {250,250},
    - = {400,500}, % /hyphen
    – = {400,300}, % /endash
    — = {300,200}, % /emdash
    _ = {200,200}, % /underscore
    / = {200,300},
   /backslash  = {200,300},
    ' = {300,400}, % /quotesingle
    ‘ = {500,700}, ’ = {500,600},
    “ = {500,300}, ” = {200,600},
    ‚ = {400,400}, „ = {400,400},
    ‹ = {400,400}, › = {300,500},
    « = {300,200}, » = {100,400},
    ¡ = {100,  }, ¿ = {100,  },
    ( = {300,  }, ) = {  ,300},
    <  = {200,100}, > = {100,200},
   /braceleft = {400,200}, /braceright = {200,400},
   /angleleft = {400,   }, /angleright = {   ,400},
    † = {100,100},
    ‡ = { 80, 80},
    • = {200,200},
    · = {400,450}, % / periodcentered
    ℃ = { 80, 50},
    ₡ = {   , 50},
    ° = {400,400},
    ™ = {100,200},
    © = {100,100},
    ® = {100,100},
    ª = {100,200},
    º = {100,200},
    ¹ = {200,250},
    ² = { 50,100},
    ³ = { 50,100},
    ¬ = {200,   },
    − = {300,300},
    ± = {150,200},
    × = {150,250},
    ÷ = {150,250},
    € = {100,   },
   /one.oldstyle   = {100,100},
   /two.oldstyle   = { 50, 50},
   /three.oldstyle = { 30, 80},
   /four.oldstyle  = { 50, 50},
   /seven.oldstyle = { 50, 80},
    Γ = {   ,180}, % /Gamma
    Δ = {100,100}, % /Delta
    Θ = { 50, 50}, % /Theta
    Λ = {100,100}, % /Lambda
%    Ξ = {,},       % /Xi
%    Π = {,},       % /Pi
    Σ = { 50, 50}, % /Sigma
    ϒ = {100,100}, % /Upsilon
    Φ = { 50, 50}, % /Phi
    Ψ = { 50, 50}, % /Psi
%    Ω = {,},       % /Omega
   }

\SetProtrusion
   [ name     = LMR-it ]
   { encoding = {EU1,EU2,TU},
     family   = Latin Modern Roman,
     shape    = {it,sl}      }
   {
    A = {125,100},
    Æ = {125,-55},
    B = {90,-40},
    C = {145,-75},
    D = {75, -28},
    E = {80,-55},
    F = {85,-80},
    G = {153,-15},
    H = {73,-60},
    I = {140,-120},
    Ĳ = {140,-80},
    J = {135,-80},
    K = {70,-30},
    L = {87, 40},
    M = {67,-45},
    N = {75,-55},
    O = {150,-30},
    Œ = {150,-55},
    P = {82,-50},
    Q = {150,-30},
    R = {75, 15},
    S = {90,-65},
    $ = {100,-20},
    T = {220,-85},
    U = {230,-55},
    V = {260,-60},
    W = {185,-55},
    X = {70,-30},
    Y = {250,-60},
    Z = {90,-60},
    a = {150,-10},
    b = {170,   },
    c = {173,-10},
    d = {150,-55},
    e = {180, },
    f = {   ,-250},
    g = {150,-10},
    h = {100, },
    i = {210, },
    ij = {210,-40},
    j = {   ,-40},
    k = {110,-50},
    l = {240,-110},
    m = {80, },
    n = {115, },
    o = {155, },
    q = {170,-40},
    r = {155,-40},
    s = {130, },
    t = {230,-10},
    u = {120, },
    v = {140,-25},
    w = {98,-20},
    x = {65,-40},
    y = {130,-20},
    z = {110,-80},
    0 = {170,-85},
    1 = {230,110},
    2 = {130,-70},
    3 = {140,-70},
    4 = {130,80},
    5 = {160, },
    6 = {175,-30},
    7 = {250,-150},
    8 = {130,-40},
    9 = {155,-80},
    . = { ,500},
   {,}= { ,450},
    : = { ,300},
    ; = { ,300},
    & = {130,30},
   \% = {180,50},
    * = {380,20},
    + = {180,200},
    @ = {180,10},
    ~ = {200,150},
    ( = {300, },     ) = {   ,70},
    / = {100,100},
    - = {500,300}, % /hyphen
    – = {500,300}, % /endash
    — = {400,170}, % /emdash
    _ = {100,200}, % /underscore
```

```
    ' = {300,400}, % /quotesingle
    " = {500,300},
    ‘ = {800,200},  ’ = {800,-20},
    “ = {540,100},  ” = {500,100},
    , = {300,700},  „ = {200,600},
    ‹ = {500,300},  › = {400,400},
    « = {400,100},  » = {200,300},
    ¡ = {200,  },  ¿ = {200,  },
    < = {300,100},  > = {200,100},
   /backslash   = {300,300},
   /braceleft   = {400,100},   /braceright    = {200,200},
    † = {200, 80},
    ‡ = {120, 80},
    • = {220,100},
    · = {550,300}, % / periodcentered
    ℃ = {170,  },
    ₵ = {100, 50},
    ¶ = {200,  },
    ° = {500,300},
    ™ = {200, 70},
    © = { 50, 70},
    ® = { 50, 70},
    ª = {140,100},
    º = {140,100},
    ¹ = {400,150},
    ² = {250, 80},
    ³ = {250, 80},
    ¬ = {250, 80},
    − = {300,200},
    ± = {150,170},
    × = {200,200},
    ÷ = {200,200},
    € = {150,  },
   /one.oldstyle   = {100,100},
   /two.oldstyle   = {100, 80},
   /three.oldstyle = { 80, 50},
   /four.oldstyle  = { 80, 80},
   /five.oldstyle  = { 50,  },
   /six.oldstyle   = { 50,  },
   /seven.oldstyle = { 80, 80},
   /eight.oldstyle = { 50,  },
    Γ = {100,120}, % /Gamma
    Δ = {120,100}, % /Delta
    Θ = {120, 50}, % /Theta
    Λ = {130,100}, % /Lambda
    Ξ = {100,},    % /Xi
    Π = {100,},    % /Pi
    Σ = {100, 50}, % /Sigma
    ϒ = {180,100}, % /Upsilon
    Φ = {130, 70}, % /Phi
    Ψ = {130, 50}, % /Psi
    Ω = { 50,},    % /Omega
   }
⟨/LatinModernRoman⟩
⟨*CharisSIL⟩
\SetProtrusion
   [ name     = Charis-default ]
   { encoding = {EU1,EU2,TU},
     family   = Charis SIL }
   {
   A = {50,50},
   Æ = {50,50},
   C = {50, },
   D = { ,50},
   F = { ,50},
   G = {50, },
   J = {100, },
   K = { ,50},
   L = { ,50},
   L· = { ,100},
   O = {50,50},
   Œ = {50, },
   P = { ,50},
   Q = {50,70},
   R = { ,50},
   ẞ = { ,40}, % capital sharp s
   T = {50,50},
   V = {50,50},
   W = {50,50},
   X = {50,50},
   Y = {50,50},
   k = { ,50},
   l· = { ,150},
   r = { ,50},
   t = { ,50},
   v = {50,50},
   w = {50,50},
   x = {50,50},
   y = { ,50},
   1 = {150,150},
   2 = {50,50},
   3 = {50, },
   4 = {100,50},
   6 = {50, },
   7 = {50,80},
   9 = {50,50},
   . = { ,600},
  {,}= { ,500},
   : = { ,400},
   ; = { ,300},
   ! = { ,100},
   ? = { ,200},
   @ = {50,50},
   ~ = {200,250},
  \% = { ,50},
   * = {300,300},
   + = {200,250},
   / = { ,200},
  /backslash = {150,200},
   | = {200,200},
   - = {400,500}, % hyphen
   – = {200,300}, % endash
   — = {150,250}, % emdash
   — = {200,200}, % Horizontal Bar = \texttwelveudash
   – = {150,150}, % Figure Dash = \textthreequartersemdash
   _ = {100,100},
  {=} = {100,100},
   ‘ = {300,400}, ’ = {300,400},
   “ = {300,300}, ” = {300,300},
   , = {400,400}, „ = {300,300},
   ‹ = {400,300}, › = {300,400},
   « = {200,200}, » = {150,300},
   ¡ = {100,  }, ¿ = {100,  },
   ( = {200,  }, ) = {  ,200},
   < = {200,150}, > = {100,200},
   [ = {100,  }, ] = {  ,100},
  /braceleft = {200,  }, /braceright = {  ,300},
   † = { 80, 80},
   ‡ = {100,100},
   • = {200,200},
   ° = {150,200},
   ™ = {150,150},
   ¢ = { 50,   },
   £ = { 50,   },
   ¦ = {200,200},
   © = {100,100},
   ® = {100,100},
   ª = {100,200},
   º = {200,200},
   ¬ = {200, 50},
   µ = {   ,100},
   ¶ = {   ,100},
   · = {300,400},
   ¹ = {200,300},
   ² = {100,200},
   ³ = {100,200},
   € = {100,   },
   ± = {150,200},
   × = {200,200},
   ÷ = {250,250},
  /minus = {200,200},
   − = {200,200},
  % Cyrillic
   Б = {  ,50},
   Г = {  ,130},
   Ж = {50,50},
   З = {30,50},
   Л = {50,  },
   У = {50,50},
   Ф = {50,50},
   Ч = {100, },
   Ъ = {  ,50},
   Ь = {  ,50},
   Э = {50,50},
   Ю = {  ,40},
   Я = {50,  },
   Ѵ = {50,50},
   Ҽ = {50,  },
   Ђ = {50,100},
   Є = {50,  },
   Љ = {50,50},
   Њ = {  ,50},
   Ћ = {50,50},
   Ԅ = {100,100},
   Ԇ = {50,50},
   Ѣ = {  ,50},
   Ҍ = {  ,50},
   Ԉ = {50,80},
   Ԋ = {  ,80},
   Ԏ = {50,50},
   Ԓ = {50,  },
   Ԕ = {50,40},
   Ԟ = {  ,50},
   Ԙ = {50,  },
   Ԡ = {  ,50},
   Ԣ = {  ,50},
   Ԃ = {  ,100},
   б = {50,50},
   г = {  ,70},
   к = {  ,50},
   л = {50,  },
   т = {50,50},
   ф = {50,50},
   ч = {50,  },
   ъ = {  ,50},
   ь = {  ,50},
   э = {  ,50},
   я = {50,  },
   љ = {50,  },
   њ = {  ,50},
   ѣ = {  ,50},
   ѵ = {50,50},
   ҽ = {50,  },
   ҍ = {  ,50},
   ү = {50,50},
   ҕ = {  ,50},
   ԥ = {  ,50},
   ԃ = {  ,100},
   ԅ = {100,100},
   ԇ = {50,50},
   ԉ = {50,70},
   ԋ = {  ,70},
   ӕ = {50,30},
   ԓ = {  ,50},
   ӈ = {  ,50},
   %    Д П Ц Ш Щ Ы Ҕ Ԥ Ꙍ Ә Ҵ Ꚏ Ӭ Ӡ Ԑ ԁ
   %    в д ж з и м н п ц ш ы ю ђ є ћ ꚏ ә ԑ ꙍ ҵ ӡ ԁ ԍ ԏ ј ԕ ԗ
  % Greek
   Δ = {50,50},
   Ψ = {50,50},
   γ = {70,70},
   λ = {40,70},
   π = {40,50},
   ρ = {  ,50},
   σ = {  ,50},
   χ = {50,50},
}

\SetProtrusion
   [ name     = Charis-it   ]
   { encoding = {EU1,EU2,TU},
     family   = Charis SIL,
     shape    = {it,sl}  }
   {
   C = {50,  },
   G = {50,  },
   J = {50,  },
   L = {50,50},
   O = {50,  },
   Œ = {50,  },
   Q = {50,  },
   S = {50,  },
   $ = {50,  },
   T = {70,  },
   o = {50,50},
   p = {  ,50},
   q = {50,  },
   t = {  ,50},
   w = {  ,50},
   y = {  ,50},
   1 = {150,100},
   3 = {50,  },
   4 = {100, },
   6 = {50,  },
   7 = {100, },
   . = { ,700},
  {,}= { ,600},
   : = { ,400},
   ; = { ,400},
   ? = { ,150},
   & = {  ,80},
  \% = {50,50},
   * = {300,200},
   + = {250,250},
   @ = {80,50},
   ~ = {150,150},
   / = {  ,150},
  /backslash = {150,150},
   - = {300,400}, % hyphen
   – = {200,300}, % endash
   — = {150,200}, % emdash
   _ = {  ,100},
  {=} = {200,200},
   ± = {150,200},
   × = {250,250},
   ÷ = {250,250},
   ° = {150,200},
   · = {300,400},
   ‘ = {400,200},  ’ = {400,200},
   “ = {300,200},  ” = {400,200},
   , = {200,500},  „ = {150,500},
   ‹ = {300,400},  › = {200,500},
   « = {200,300},  » = {150,400},
   ( = {200,   },  ) = {   ,200},
   < = {200,200},  > = {200,200},
  /braceleft = {300,   }, /braceright = {   ,200},
 % Cyrillic
   Ж = {50,30},
   Л = {50,  },
   У = {50,30},
   Ф = {50,  },
   Ч = {100, },
   Ъ = {  ,50},
   Ь = {  ,50},
   Э = {50,50},
   Я = {50,  },
   Ѵ = {50,50},
   Љ = {50,50},
   Ԅ = {140,100},
   Ԇ = {70,50},
   Ԉ = {50,80},
   Ԋ = {  ,80},
   Ԏ = {50,50},
   г = {50,50},
   д = {50,30},
   м = {50,  },
   ф = {50,  },
   ч = {50,  },
   ъ = {  ,50},
   ь = {  ,50},
   э = {  ,50},
   я = {50,  },
   љ = {50,50},
   њ = {  ,50},
   ѵ = {50,50},
   ѣ = {  ,50},
   ԅ = {140,100},
   ԇ = {70,50},
   ԉ = {50,70},
   ԋ = {  ,70},
  % Greek
   Γ = {  ,130},
   Δ = {50,50},
   Ψ = {50,50},
   γ = {70,70},
   λ = {40,70},
   π = {40,50},
   ρ = { ,50},
   σ = { ,50},
   χ = {50,50},
   }
```

The small caps glyph names in Charis SIL have changed with version 5.0 of the font. We try to get the names right both with LuaTEX (where we can simply query the font version) and with XƎTEX (where we check for glyph name).

```

 % quick and dirty -- maybe we'll promote this to a
 % regular key some time
\define@key{MT@pr@c}{command}{\csname #1\endcsname}

 % glyph names have changed with version 5.0 of Charis SIL:
 % before: /a.SC, /b.SC, ...
 % after:  /a.sc, /b.sc, ...
\ifx\MT@lua\@undefined
  \gdef\MT@get@CHARIS@SC{
    % test whether glyph "a.sc" exists
    \ifnum\numexpr\XeTeXglyphindex "a.sc"\relax > 0
      \gdef\MT@CHARIS@SC{sc}%
    \else
      \gdef\MT@CHARIS@SC{SC}%
    \fi
  }
\else
  \gdef\MT@get@CHARIS@SC{
    \gdef\MT@CHARIS@SC{\MT@lua{
      % check font version
% --  why doesn't this work?:
%     f = font.getfont(font.current());
%     i = fontloader.info(f.filename);
%     if (tonumber(i.version) < 5) then;
      if (tonumber(fontloader.info(font.getfont(font.current()).filename).version) < 5) then;
        tex.print("SC");
      else;
        tex.print("sc");
      end
    }}
  }
\fi

\SetProtrusion
    [ name     = Charis-sc,
      load     = Charis-default,
      command  = {MT@get@CHARIS@SC} ]
    { encoding = {EU1,EU2,TU},
      family   = Charis SIL,
      shape    = {sc}  }
    {
   % ᴀ = {100,100}, % etc., doesn't work with \textsc
    /a.\MT@CHARIS@SC = {100,100},
    /c.\MT@CHARIS@SC = {50, },
    /d.\MT@CHARIS@SC = { ,50},
    /f.\MT@CHARIS@SC = { ,50},
    /g.\MT@CHARIS@SC = {50, },
    /j.\MT@CHARIS@SC = {100, },
    /k.\MT@CHARIS@SC = { ,50},
    /l.\MT@CHARIS@SC = { ,50},
   /f_l.\MT@CHARIS@SC = { ,50},
    /o.\MT@CHARIS@SC = {50,50},
   /oe.\MT@CHARIS@SC = {50, },
    /q.\MT@CHARIS@SC  = {50,70},
    /r.\MT@CHARIS@SC  = {  ,50},
    /t.\MT@CHARIS@SC  = {50,100},
    /v.\MT@CHARIS@SC  = {50,50},
    /w.\MT@CHARIS@SC  = {50,50},
    /x.\MT@CHARIS@SC  = {50,50},
    /y.\MT@CHARIS@SC  = {50,50}
    }
⟨/CharisSIL⟩
⟨*Palatino⟩
\SetProtrusion
    [ name     = palatino-default ]
    { encoding = {EU1,EU2,TU},
      family   = {Palatino} }
    {
    A = {50,50},
   D = {  ,50},
   J = {50,  },
   K = {  ,50},
   L = {  ,50},
   O = {25,  },
   T = {50,50},
   V = {50,50},
   W = {50,50},
   X = {50,50},
   Y = {50,50},
   b = {  ,25},
   d = {25,30},
   f = {  ,50},
   g = {  ,100},
   k = {  ,50},
   p = {  ,50},
   q = {50,  },
   r = {  ,50},
   t = {  ,50}, � = { ,50}, � = {  ,50},
   v = {75,50},
   w = {50,50},
   x = {50,50},
   y = {50,70},
   1 = {100,50},
   2 = {25,50},
   4 = {50,  },
   6 = {50,  },
   9 = {25,  },
   Æ = {100, },
   Œ = {25,  },
   . = { ,700},     ‥ = { ,350},   … = {,150},
  {,}= { ,500},
   : = { ,500},
   ; = { ,500},
    ! = { ,100},     ‼ = { ,100},
   ? = { ,200},     ‽ = { ,200},
   @ = {50,50},
   ~ = {200,250},
   & = {50,100},
  \% = {100,100},
   * = {200,200},
    + = {250,250},
    ( = {100,   },    ) = {   ,300},
    / = {200,300},
    - = {400,500},
    \textendash      = {300,300},  \textemdash      = {200,200},
    \textquoteleft   = {500,700},  \textquoteright  = {500,700},
    \textquotedblleft = {300,400},  \textquotedblright = {300,400},
    \textbackslash   = {200,300},
    \quotesinglbase   = {400,400},  \quotedblbase     = {400,400},
    \guilsinglleft    = {400,400},  \guilsinglright   = {300,500},
    \guillemotleft    = {300,300},  \guillemotright   = {200,400},
    \textexclamdown   = {100,   },  \textquestiondown = {100,   },
    \textbraceleft    = {400,200},  \textbraceright   = {200,400},
    \textless         = {200,100},  \textgreater      = {100,200},
    ≤                 = {200,100},  ≥                 = {100,200},
    \textminus                 = {300,300},
    \texttrademark             = {200,200},
    \textcopyright             = {200,200},
    \textregistered            = {200,200},
    \textdegree                = {300,300},
    ¦              = {450,500},   ¬              = {250,150},
    ⌐              = {150,250},
    ·                    = {850, 700},
    ¶                    = {100,0},
    ×                    = {150, 300},
    ª              = {300,300},  º               = {300,300},
    ⁰ = {200,400},
    ¹ = {400,350},        ² = {200,300},         ³ = {250,400},
    ⁴ = {250,350},        ⁵ = {200,300},         ⁶ = {250,400},
    ⁷ = {200,450},        ⁸ = {250,400},         ⁹ = {200,350},
    ₀ = {200,400},
    ₁ = {400,250},        ₂ = {200,300},         ₃ = {250,400},
    ₄ = {250,350},        ₅ = {200,300},         ₆ = {250,400},
    ₇ = {200,450},        ₈ = {250,400},         ₉ = {200,350},
    ± = {150,100},                               ÷ = {300,300},
    þ = {  ,25},
    ₊ = {300,450},        ₋ = {300,450},
    ⁺ = {300,450},        ⁻ = {300,450},
    †              = {200,250},   ‡              = {200,250},
    π = {50,  },
    ſ = {  ,50},
    № = {100,150},
    \textservicemark           = {100,200},
    - = {400,500},        - = {400,500},         − = {200,300},
    – = {205,305},        — = {200,300},         — = {50,150},
    • = {125,200},
%    /a.sc = {50,50},
    }

\SetProtrusion
    [ name     = palatino-it   ]
    { encoding = {EU1,EU2,TU},
      family   = {Palatino},
      shape    = {it,sl}  }
    {
    A = {50,50},
    Æ = {50,  },
    B = {50,  },
    C = {50,  },
    D = {50,50},
    E = {50,  },
    F = {50,  },
    G = {50,  },
    H = {50,  },
    K = {50,  },
    L = {50,  },
    O = {50,  },
    Œ = {50,  },
    P = {50,  },
    Q = {50,  },
    R = {50,  },
    S = {50,  },
    $ = {50,  },
    T = {100, },
    U = {50,  },
    V = {100,50},
    W = {50,  },
    X = {50,  },
    Y = {100,50},
    b = {  ,50},
    c = {25,  },
    g = {75,  },
    i = {25,  },
    m = {  ,50},
    n = {  ,50},
    p = {  ,25},
    q = {25,  },
    x = {  ,50},
    1 = {100, },
    2 = {50,  },
    4 = {50,  },
    7 = {50,  },
    . = { ,500},      ‥ = { ,350},    … = { ,200},
   {,}= { ,500},
    : = { ,300},
    ; = { ,300},
    ? = { ,300},      ‽ = { ,300},
    & = {50,50},
   \% = {100,100},
    * = {200,200},
    + = {150,200},
    @ = {50,50},
    ~ = {200,150},
    ( = {200, },    ) = {  ,200},
    / = {100,200},
    - = {300,500},
    \textendash       = {300,300},  \textemdash        = {200,200},
    \textquoteleft    = {700,400},  \textquoteright    = {700,400},
    \textquotedblleft = {500,300},  \textquotedblright = {500,300},
    _ = {100,100},
    \textbackslash    = {100,200},
    \quotesinglbase   = {500,500},  \quotedblbase      = {400,400},
    \guilsinglleft    = {400,400},  \guilsinglright    = {300,500},
    \guillemotleft    = {300,300},  \guillemotright    = {300,300},
    \textexclamdown   = {100,   },  \textquestiondown  = {200,   },
    \textbraceleft    = {200,100},  \textbraceright    = {200,200},
    \textless         = {300,100},  \textgreater       = {200,100},
    ≤                 = {200,100},  ≥                  = {100,200},
    ¦                 = {450,500},  ¬                  = {250,150},
    ·                 = {850, 700},
    ¶                 = {100,0},
    ×                 = {150, 300},
    ª = {300,250},        ° = {300,300},        º = {300,250},
    ⁰ = {300,200},
    ¹ = {300,150},        ² = {350,200},        ³ = {250,150},
    ⁴ = {350,100},        ⁵ = {300, 50},        ⁶ = {400,100},
    ⁷ = {400, 50},        ⁸ = {250, 50},        ⁹ = {300, 50},
    ₀ = {300,300},
    ₁ = {300,350},        ₂ = {300,150},        ₃ = {250,250},
    ₄ = {400,200},        ₅ = {300,100},        ₆ = {450,200},
    ₇ = {450,150},        ₈ = {400,250},        ₉ = {400,200},
    ± = {150,100},                              ÷ = {300,300},
    þ = { 50,   },
    †             = {250,200},  ‡               = {250,200},
    ₊ = {300,450},        ₋ = {300,450},
    ⁺ = {300,450},        ⁻ = {300,450},
    ‐ = {300,500},        ‑ = {300,500},        ‒ = {100,300},
    – = {125,305},        — = {200,300},        ― = {125,150},
    • = {125,200}
    }

  \SetProtrusion
    [ name     = palatino-sc,
      load     = palatino-default ]
    { encoding = {EU1,EU2,TU},
      family   = {Palatino},
      shape    = sc }
    {
    a = {50,50},
    æ = {50, },
    b = { 0, 0},
    d = { 0, 0},
    f = { 0, 0},
    g = { 0, 0},
    j = {50, },
    l = { ,50},
    o = { 0, 0},
    p = { 0, 0},
    q = { 0, },
    r = { , 0},
    t = {50,50},
    y = {50,50},
    fl = { 0,50},
    ffl = { 0,50},
    � = { 0,50},
    � = { 0,50}
    }
  ⟨/Palatino⟩
  ⟨Lato⟩ %% No settings yet.
  ⟨*FontAwesome⟩
  \SetProtrusion
    [ name = empty ]
    { encoding = {TU,EU1,EU2},
      family   = {FontAwesome} }
    { }
  ⟨/FontAwesome⟩
```

17 Auxiliary file for micro fine tuning

This file can be used to test protrusion and expansion settings.

```
⟨*test⟩
\documentclass{article}

%% Here you can specify the font you want to test, using
%% the commands \fontfamily, \fontseries and \fontshape.
%% Make sure to end all lines with a comment character!
\newcommand*\TestFont{%
  \fontfamily{ppl}%
%%  \fontseries{b}%
%%  \fontshape{it}% sc, sl
}

\usepackage{ifthen}
\usepackage[T1]{fontenc}
\usepackage[latin1]{inputenc}
\usepackage[verbose,expansion=alltext,stretch=50]{microtype}

\pagestyle{empty}
\setlength{\parindent}{0pt}
\newcommand*\crulefill{\cleaders\hbox{$\mkern-2mu\smash-\mkern-2mu$}\hfill}
\newcommand*\testprotrusion[2][]{%
  \ifthenelse{\equal{#1}{r}}{}{#2}%
  lorem ipsum dolor sit amet,
    \ifthenelse{\equal{#1}{r}}{\crulefill}{\leftarrowfill} #2
    \ifthenelse{\equal{#1}{l}}{\crulefill}{\rightarrowfill}
  you know the rest%
  \ifthenelse{\equal{#1}{l}}{}{#2}%
  \linebreak
  {\fontencoding{\encodingdefault}%
  \fontseries{\seriesdefault}%
  \fontshape{\shapedefault}%
  \selectfont
  Here is the beginning of a line, \dotfill and here is its end}\linebreak
}
\newcommand*\showTestFont{\expandafter\stripprefix\meaning\TestFont}
\def\stripprefix#1>{}
\newcount\charcount
\begin{document}

\microtypesetup{expansion=false}

{\centering The font in this document is called by:\\
 \texttt{\showTestFont}\par}\bigskip

\TestFont\selectfont
 This line intentionally left empty\linebreak
%% A -- Z
\charcount=65
\loop
  \testprotrusion{\char\charcount}
  \advance\charcount 1
  \ifnum\charcount < 91 \repeat
%% a -- z
\charcount=97
\loop
  \testprotrusion{\char\charcount}
  \advance\charcount 1
  \ifnum\charcount < 123 \repeat
%% 0 -- 9
\charcount=48
\loop
```

```
  \testprotrusion{\char\charcount}
  \advance\charcount 1
  \ifnum\charcount < 58 \repeat
%%
 \testprotrusion[r]{,}
 \testprotrusion[r]{.}
 \testprotrusion[r]{;}
 \testprotrusion[r]{:}
 \testprotrusion[r]{?}
 \testprotrusion[r]{!}
 \testprotrusion[l]{\textexclamdown}
 \testprotrusion[l]{\textquestiondown}
 \testprotrusion[r]{)}
 \testprotrusion[l]{(}
 \testprotrusion{/}
 \testprotrusion{\char`\\}
 \testprotrusion{-}
 \testprotrusion{\textendash}
 \testprotrusion{\textemdash}
 \testprotrusion{\textquoteleft}
 \testprotrusion{\textquoteright}
 \testprotrusion{\textquotedblleft}
 \testprotrusion{\textquotedblright}
 \testprotrusion{\quotesinglbase}
 \testprotrusion{\quotedblbase}
 \testprotrusion{\guilsinglleft}
 \testprotrusion{\guilsinglright}
 \testprotrusion{\guillemotleft}
 \testprotrusion{\guillemotright}

\newpage
The following displays the current font stretched by 5\%,
normal, and shrunk by 5\%:

\bigskip
\newlength{\MTln}
\newcommand*\teststring
  {ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789}
\settowidth{\MTln}{\teststring}
\microtypesetup{expansion=true}

\parbox{1.05\MTln}{\teststring\linebreak\\
                   \teststring}\par\bigskip
\parbox{0.95\MTln}{\teststring}

\end{document}
⟨/test⟩
```

Needless to say that things may always be improved. For suggestions, mail to w.m.l@gmx.net.

A The title logo

This is microtype-logo.dtx. You may treat this file in three different ways:

- compile it by itself
- \input it in the body of a dtx file
- \input it in the preamble: it then provides the command \printlogo, which will do just that

The first two cases require the style file microtype-doc.sty, which can be generated from microtype.ins with:

```
\makefile{microtype-doc.sty}{docsty}
```

```
⟨*logo⟩
```

Here's how the logo on the title page was created.[30] It has nothing to do with microtype, actually, but uses fontinst. It is based on an experiment I posted to the de.comp.text.tex newsgroup.[31] It will show:

- the character
- the TEX box
- the bounding box
- kerns

A.1 Macros

To run this file, TEX needs to find the afm file (either in the TEXINPUTS path, or in the current working directory).

First input fontinst.

```
\input fontinst.sty
```

bbox.sty is an addition to fontinst, which makes dimensions of the bounding boxes available (and was written by Hàn Thế Thành, by the way). These dimensions are specified in the afm file, but not used by TEX, which is why fontinst will discard them otherwise.

```
\input bbox.sty
```

\tempdim Allocate some dimen registers.

```
\newdimen\tempdim
```

\fboxrulei Frame width of the box as TEX sees it.

```
\newdimen\fboxrulei
\fboxrulei=0.1pt
```

\fboxruleii Frame width of the bounding box.

```
\newdimen\fboxruleii
\fboxruleii=0.1pt
```

\kernboxheight Height of the box indicating the kern.

```
\newdimen\kernboxheight
\kernboxheight=5pt
```

\scaletoem An auxiliary macro. Return a dimension relative to the em-width of the font. Requires e-TEX.

```
\setcommand\scaletoem#1{\dimexpr #1 sp*\fontdimen6\font/1000\relax}
```

\showlogo A fontinst incantation whose sole purpose is to produce the logo. Its argument is a string (letters only).

```
\fontinstcc
\def\showlogo#1{%
```

Some fonts do not specify the \fontdimen 6 (width of an em) in the afm file. In this case, use the font size, which is correct in most cases.

```
   \ifdim\fontdimen6\font = 0pt
      \typeout{***~Warning:~no~fontdimen~6~specified~***^^J%
               ***~setting~it~to~\pdffontsize\font \ifnum\pdftexversion < 130 pt\fi~***}
      \fontdimen6\font=\pdffontsize\font \ifnum\pdftexversion < 130 pt\fi\relax
   \fi
  \installfonts
    \input_metrics{}{\logofont,\metrics\printbbs{#1}\relax}
```

[30] Note that the logo module will not be created when installing microtype. Instead, the source file microtype-logo.dtx is included as an attachment in the PDF file. If your PDF reader supports this, you can click here to extract it; alternatively, you may use the pdftk tool.

[31] Message ID: 42aa3687$0$24366$9b4e6d93@newsread2.arcor-online.net

```
  \endinstallfonts
}
\normalcc
```

Layers.

```
\makeatletter
\def\mtl@layer#1#2{\pdfliteral{/OC/#1 BDC}#2\pdfliteral{EMC}}
\ifx\mt@objects\@undefined\let\mt@objects\@empty\fi
\ifx\mt@order  \@undefined\let\mt@order  \@empty\fi
\xdef\mt@order{\mt@order[(Logo)}
\let\mtl@resources\@empty
\def\mtl@register#1{%
  \immediate\pdfobj{<< /Type/OCG /Name(#1) >>}
  \expandafter\xdef\csname mtl@#1\endcsname{\the\pdflastobj\space 0 R }
  \xdef\mt@objects{\mt@objects\csname mtl@#1\endcsname}
  \xdef\mt@order{\mt@order\csname mtl@#1\endcsname}
  \xdef\mtl@resources{\mtl@resources/#1 \csname mtl@#1\endcsname}}
\mtl@register{canvas}
\mtl@register{characters}
\mtl@register{bounding-boxes}
\mtl@register{TeX-boxes}
\xdef\mt@order{\mt@order]}
\global\let\mtl@objects\mt@objects
\def\togglelayer#1#2{%
  \pdfstartlink width \wd\logobox height \ht\logobox depth \dp\logobox
    user{/Subtype/Link
         /BS << /Type/Border/W 0 >> /H/O
         /A << /S/SetOCGState
               /State[/Toggle \csname mtl@#1\endcsname] >>
  }#2\pdfendlink
}
```

\printbbs Preparation.

```
\setcommand\printbbs#1{%
  \setbox0\hbox{#1}%
  \leavevmode
  \kern-\fboxrulei
```

The canvas in the natural width of the text minus protrusion, in color bgcolor.

```
  \mtl@layer{canvas}{%
    \getboundarychars#1\relax
    \tempdim=\dimexpr\wd0 - (\scaletoem{\lpcode\font\firstchar}+
                             \scaletoem{\rpcode\font\lastchar})\relax
    \kern\dimexpr\scaletoem{\lpcode\font\firstchar}\relax
    \lower\dimexpr\dp0+0.05em \relax \vbox{\color{bgcolor}%
          \hrule width  \tempdim
                 height \dimexpr\dp0+\ht0+0.15em\relax}%
    \kern-\tempdim
```

The baseline, in color blcolor.

```
    \vbox{\color{blcolor}%
          \hrule width  \tempdim
                 height \fboxrulei}%
  }%
  \kern-\dimexpr\wd0 -\scaletoem{\rpcode\font\lastchar}\relax
```

The string.

```
  \printbbss #1\relax\relax
}
```

\getboundarychars Get first . . . .

```
\def\getboundarychars#1#2\relax{%
   \def\firstchar{`#1}%
   \getlastchar#1#2\relax
}
```

\getlastchar . . . and last character.

```
\def\getlastchar#1#2{%
```

```
   \ifx\relax#2\relax
      \def\lastchar{`#1}%
   \else
      \expandafter\getlastchar
   \fi #2%
}
```

\printbbss Loop over all characters of the string.

```
\def\printbbss#1#2#3\relax{%
   \ifx\relax#1\relax
   \else
      \ifx\relax#2\relax
         \printbb{#1}{}%
      \else
         \printbb{#1}{#2}%
      \fi
      \expandafter\printbbss
   \fi #2#3\relax
}
```

\printbb Record the kern between the current and the following character, then print the character. `\kerning` is a `fontinst` command.

```
\setcommand\printbb#1#2{%
   \setbox0\hbox{\kerning{#1}{#2}\xdef\thekern{\number\result}}%
   \showboxes{#1}%
```

This could be another application.

```
%       \quad
%      w: \the\scaletoem{\width{#1}},
%      bb: \the\scaletoem{\bbleft{#1}}/%
%          \the\scaletoem{\bbright{#1}},
%          \the\scaletoem{\number\numexpr\width{#1}-\bbright{#1}\relax}
%      h: \height{#1}/\bbtop{#1}, \bbbottom{#1}/\depth{#1}\par
}
```

\showboxes Print the boxes for char ⟨*#1*⟩. This won't work if ⟨*#1*⟩ isn't also the PostScript name of the glyph (e.g., 'comma' ≠ ',').

```
\setcommand\showboxes#1{%
  \leavevmode
  \color{texcolor}%
```

We have to record the width of the glyph.

```
  \setbox0\hbox{{\color{textcolor}#1}}%
  \global\tempdim=\wd0\relax
  \kern-\fboxrulei
```

1. *The TEX box:* Print a frame in color `texcolor`. This frame shows the glyph as TEX sees it.

```
      \mtl@layer{TeX-boxes}{%
        \hbox{%
          \lower\dimexpr \dp0 + \fboxrulei\relax
          \hbox{%
            \vbox{%
              \hrule height\fboxrulei
              \hbox{%
                \vrule width\fboxrulei height \dimexpr\ht0 + 2\fboxrulei\relax
                \phantom{\unhcopy0}%
                \vrule width\fboxrulei
              }%
              \hrule height\fboxrulei}}}%
      }%
```

2. *The character:* Now we step back and print the actual glyph. We hold it back until now, so that it will be printed *on top* of its box.

```
      \kern-\wd0
      \mtl@layer{characters}{\hbox{\box0}}%
```

Step back by the amount that the character's bounding box differs from the TEX box on the left side.

```
      \kern\dimexpr\scaletoem{\bbleft{#1}}-\tempdim-\fboxruleii\relax
```

3. *The bounding box:* will be printed in color `bbcolor`.

```
      \mtl@layer{bounding-boxes}{%
        {\color{bbcolor}%
        \hbox{%
          \lower\dimexpr-\scaletoem{\bbbottom{#1}}+\fboxruleii\relax
          \hbox{%
            \vbox{%
              \hrule height\fboxruleii
              \hbox to \dimexpr\scaletoem{\numexpr
                           \bbright{#1}-\bbleft{#1}\relax}+2\fboxruleii\relax{%
                \vrule height \dimexpr\scaletoem{\numexpr
                                  \bbtop{#1}-\bbbottom{#1}\relax}%
                       width\fboxruleii
                \hfill
                \vrule width\fboxruleii}%
              \hrule height\fboxruleii}}}%
        }%
        \kern-\dimexpr\fboxruleii+\fboxrulei\relax
      }%
```

4. *The kern:* We also print a small box in color `kerncolor` indicating the kerning between the current and the next character; filled for negative kerns, empty for positive kerns.

```
      \kern\scaletoem{\numexpr\width{#1}-\bbright{#1}\relax}%
      \mtl@layer{TeX-boxes}{%
        {\ifnum\thekern<0
           \color{kerncolor}%
           \kern\scaletoem{\thekern}%
           \lower\kernboxheight\hbox{\vrule width -\dimexpr\scaletoem{\thekern}\relax
                                            height \kernboxheight}%
           \kern\scaletoem{\thekern}%
         \else
           \color{texcolor}%
           \ifnum\thekern=0 \else
             \lower\kernboxheight
             \hbox{%
               \vbox{%
    %            \hrule height\fboxrulei
                 \hbox{%
                   \vrule height \kernboxheight width\fboxrulei
                   \kern\dimexpr\scaletoem{\thekern}-2\fboxrulei\relax
                   \vrule width\fboxrulei
                 }%
               \hrule height\fboxrulei}}%
           \fi
         \fi
        }%
      }%
    %  \kern-\fboxrulei
    }
```

```
\newbox\logobox
\def\printlogo{%
  \setbox\logobox=\hbox{\vbox{%
    \MakePercentComment
```

This is the Kepler MM font used in the logo.

```
    \def\logofont{pkpri9e10}
    \transformfont{\logofont}{\reencodefont{8r}{\fromafm{pkpmmri8a10}}}
    \font\thelogofont=\logofont\space at 82pt
```

This would load the italic Palatino font instead.

```
%\def\logofont{pplri}
%\transformfont{\logofont8r}{\reencodefont{8r}{\fromafm{\logofont8a}}}
%\edef\logofont{\logofont8r}
%\font\thelogofont=\logofont\space at 78pt
```

Load the font.

```
    \thelogofont
```

Protrusion values (overdone for didactic reasons).

```
    \lpcode\font`M=96
    \rpcode\font`e=46
```

Now we can generate the logo.

```
    \pdfliteral direct{/SXS gs}%
    \showlogo{Microtype}%
%    \rlap{\normalfont\normalsize\raisebox{55pt}{\footnotemark[1]}}%
%    \kern5pt\\[3\baselineskip]
%  \long\def\@makefntext##1{%
%    \leftskip 0pt
%    \parindent 0pt
%    \everypar{\parindent 0pt}%
%    \leavevmode\hbox to 15pt{\@thefnmark\hss}##1}
%  \footnotetext[1]{This graphic display on a
%    \togglelayer{canvas}{canvas} the \togglelayer{characters}{characters},
%    their \togglelayer{bounding-boxes}{bounding boxes}
%    and \togglelayer{TeX-boxes}{\TeX\ boxes}.}
  }}%
  \edef\logodimens{width \the\wd\logobox height \the\ht\logobox depth \the\dp\logobox}
  \immediate\pdfobj{<</Type/ExtGState /CA 0.6 /ca 0.6 /BM/Normal >>}%
  \immediate\pdfxform
            attr {/Group <</Type/Group /S/Transparency /I true /CS/DeviceRGB >>}
            resources {/Properties <<\mtl@resources>>
                       /ExtGState << /SXS \the\pdflastobj\space 0 R >> }
            \logobox
%  \vskip-2.5\baselineskip
%  \leavevmode
%  \togglelayer{characters}{%
%    \pdfrefxform\pdflastxform
%  }%
   \pdfannot\logodimens{%
       /Subtype/Widget /FT/Btn /T(Logo)
       %/F 4 % why did I say this?
       /AP << /N \the\pdflastxform\space 0 R >>
       /AA << /E << /S/SetOCGState /State[/Toggle \mtl@characters] >>
              /X << /S/SetOCGState /State[/Toggle \mtl@characters] >>
              /D << /S/SetOCGState /State[/Toggle \csname mtl@bounding-boxes\endcsname] >>
              /U << /S/SetOCGState /State[/Toggle \csname mtl@TeX-boxes\endcsname] >>
           >> }%
  \vspace{3\baselineskip}
}
```

Our font.

```
\pdfmapline{+pkpmmri8r10 KeplMM-It_385_575_10_ " TeXBase1Encoding ReEncodeFont " <8r.enc <pkpmmri8a10.pfb}
```

Define colours (thered and thegreen are copied from microtype.dtx).

```
\def\mtdefinecolors{
 \definecolor{thered}{rgb}{0.65,0.04,0.07}
 \definecolor{thegreen}{rgb}{0.06,0.44,0.08}
 \colorlet{texcolor}{thegreen!50}  % TeX boxes
 \colorlet{kerncolor}{texcolor}    % negative kerns
 \colorlet{bbcolor}{thered!50}     % bounding box
 \colorlet{bgcolor}{black!8}       % canvas
 \colorlet{blcolor}{black!50}      % baseline
 \colorlet{textcolor}{black!40}    % text
}
```

Use with microtype.dtx

```
\ifx\documentclass\@twoclasseserror
  \usepackage[xcdraw]{xcolor}
  \mtdefinecolors
\else
```

A.2 Document

Now we can start the document.

```
\documentclass[10pt,a4paper]{ltxdoc}
\providecommand\MakePercentComment{\relax}
\expandafter\def\csname ver@microtype.dtx\endcsname{2999/99/99}
```

Re-use the preamble from `microtype.dtx`.

```
\usepackage{microtype-doc}
\usepackage{attachfile}
\makeatletter
\pdfcatalog{/OCProperties << /OCGs [\mt@objects] /D << /Order [\mt@order] >> >>}
\makeatother
\begin{document}
```

You are currently reading this.

```
\DocInput{microtype-logo.dtx}
\newpage
  And here it is:
\vfill
\begin{center}
  \printlogo \null
\end{center}
\vfill
\expandafter\enddocument
\fi
```

That’s it.

```
⟨/logo⟩
```

B The letterspacing illustration

This is `microtype-lssample.dtx`. You may treat this file in three different ways:

- compile it by itself
- `\input` it in the body of a `dtx` file
- `\input` it in the preamble: it then provides the commands
  - `\lssample`: prints the letterspacing illustration
  - `\anchorarrow`: anchors an arrow for layer ⟨*#1*⟩
  - `\showarrow`: toggles layer ⟨*#1*⟩ or ⟨*#2*⟩, and prints ⟨*#2*⟩

The first two cases require the style file `microtype-doc.sty`, which can be generated from `microtype.ins` with:

```
\makefile{microtype-doc.sty}{docsty}
```

```
\ifx\lssample\undefined
⟨*lssample⟩
```

Upon popular request, here’s how I’ve created the letterspacing illustration.[32]

B.1 Macros

Rule width and image height and depth.

```
\makeatletter
\newdimen\lsamount
\newdimen\lsrule
\lsrule=0.2pt
\def\lsheight{8pt}
\def\lsdepth{12pt}
```

[32] Note that the `lssample` module will not be created when installing `microtype`. Instead, the source file `microtype-lssample.dtx` is included as an attachment in the PDF file. If your PDF reader supports this, you can click here to extract it; alternatively, you may use the `pdftk` tool.

Our font (Adobe Caslon).

```
\def\lsfont{\fontfamily{paca}\selectfont}
```

Loop over all letters in ⟨*#2*⟩, letterspacing them by ⟨*#1*⟩.

```
\def\dols#1#2{\lsamount=#1\relax \dolss#2\enddols}
\def\dolss#1#2\enddols{%
  \ifx\empty#2\empty\divide\lsamount 2\fi
  \ls{#1}%
  \ifx\empty#2\empty\else \dolss#2\enddols \fi
}
```

One `tikz` picture for each letter.

```
\def\ls#1{%
  \begin{tikzpicture}[remember picture,line width=\lsrule]
    \tikzstyle{every node}=[inner sep=0pt]
```

The bounding box.

```
    \mts@layer{stuff}{%
      \node[draw=thegrey,
            fill=theshade,
            outer sep=\lsrule,
            anchor=base,
            font=\lsfont]{\phantom{#1}};
    }
```

The letter.

```
    \node[anchor=base,font=\lsfont](#1){#1};
```

Two auxiliary coordinates.

```
    \path (#1.south west) ++(+.5\lsrule,-.5\lsrule) coordinate (#1L);
    \path (#1.base east)  ++(-.5\lsrule,-\lsdepth)  coordinate (#1R);
    \mts@layer{stuff}{%
```

Now draw the normal character width,

```
      \draw[color=thered!75,
            fill=thered!30,
            outer sep=\lsrule]
            (#1L) rectangle (#1R);
      \ifdim\lsamount>0pt
        \path (#1.base east) ++(+.5\lsamount,-6pt) coordinate (#1_ls);
        \path (#1R) ++(\lsamount+\lsrule,+\lsdepth) coordinate (#1E);
```

and the letter space.

```
        \draw[color=thered,
              fill=thered!50,
              outer sep=\lsrule]
              (#1R) ++(+\lsrule,+0pt) rectangle (#1E);
      \fi
    }
  \end{tikzpicture}%
  \ignorespaces
}
```

Draw the interword space.

```
\def\lssp#1#2#3#4{%
  \begin{tikzpicture}[remember picture,line width=\lsrule,inner sep=0pt]
    \mts@layer{stuff}{%
      \tikzstyle{every draw}=[anchor=bottom]
      \coordinate(#1space) at (#2/2,\lsdepth/2);
      \coordinate(#1stretch) at (#2+#3/2,+0pt);
      \coordinate(#1shrink) at (#2-#4/2,+0pt);
      \draw[color=thegreen,fill=thegreen!50,use as bounding box]
            (0,0) rectangle ++(+#2,+\lsdepth);
      \draw[color=thegreen,fill=thegreen!30]
            (+#2,-\lsrule) rectangle ++(+#3,-4pt+\lsrule);
      \draw[color=thegreen,fill=thegreen!50]
            (+#2,-\lsrule) rectangle ++(-#4,-4pt+\lsrule);
      \draw[->,line width=0.3pt,shorten <=0.5\lsrule,color=thegreen!50]
```

```
            (+#2,-2pt-.5\lsrule) -- ++(+#3,+0pt);
      \draw[->,line width=0.3pt,shorten <=0.5\lsrule,color=thegreen!30]
            (+#2,-2pt-.5\lsrule) -- ++(-#4,+0pt);
    }%
  \end{tikzpicture}%
  \ignorespaces
}
```

Layers.

```
\def\mts@layer#1#2{\pdfliteral page{/OC/#1 BDC}#2\pdfliteral page{EMC}}
\def\mtsx@layer#1#2{\pdfliteral page{/OC/stuff BDC /OC/#1 BDC}#2\pdfliteral page{EMC EMC}}
\ifx\mt@objects\@undefined\let\mt@objects\@empty\fi
\ifx\mt@order  \@undefined\let\mt@order  \@empty\fi
\xdef\mt@order{\mt@order[(Sheep)}
\let\mts@resources\@empty
\def\mts@register#1{%
  \immediate\pdfobj{<< /Type/OCG /Name(#1) >>}
  \expandafter\xdef\csname mts@#1\endcsname{\the\pdflastobj\space 0 R }
  \xdef\mt@objects{\mt@objects\csname mts@#1\endcsname}
  \xdef\mt@order{\mt@order\csname mts@#1\endcsname}
  \xdef\mts@resources{\mts@resources/#1 \csname mts@#1\endcsname}}
\mts@register{stuff}
\mts@register{tracking}
\mts@register{ispace}
\mts@register{ospace}
\mts@register{istretch}
\mts@register{ishrink}
\mts@register{ostretch}
\mts@register{oshrink}
\mts@register{okern}
\mts@register{ligature}
\mts@register{_compatibility}
\xdef\mt@order{\mt@order]}
```

Anchor point for the arrow in the code.

```
\newcommand\anchorarrow[1]{%
  \tikz[remember picture,overlay]\node(#1_c){};}
```

Add an arrow from code to image.

```
\newcommand\add@arrow[5][left]{%
  \tikz[remember picture,overlay,bend angle=14,looseness=0.75,>=latex]{%
    \mtsx@layer{#3}{\draw[->,thick,color=the#2](#4) to[bend #1] (#5);}}%
}
```

Toggle layer.

```
\def\toggle@layer#1#2#3{%
  \pdfstartlink
    user{/Subtype/Link
         /BS << /Type/Border/W 0 >> /H/O
%         /BS << /Type/Border/W 1 /S/D /D[4 1] >>
%         /C[0.7 0.7 0.7] /H/O
         /Contents(Click to Toggle!)
         /A << /S/SetOCGState
                /State[/Toggle \csname mts@#1\endcsname] >> }%
  \rlap{#2}%
  {\fboxsep=0pt \fboxrule=0pt
   \mtsx@layer{stuff}{%
     \rlap{\fcolorbox{white}{white}{\vphantom{kg}\color{the#3}#2}}}%
   \mtsx@layer{#1}{%
     \fcolorbox{white}{the#3!50}{\vphantom{kg}\color{white}#2}}%
  }%
  \pdfendlink
}
\newcommand\showarrow[2][]{%
  \ifx\relax#1\relax\def\@tempa{#2}\else\def\@tempa{#1}\fi
  \toggle@layer{\@tempa}{{\itshape #2}}}
```

The environment for our illustration.

```
\def\ls@sample#1{{%
  \parskip  4pt \parindent 0pt
  \par
  \vskip4pt
  {\leftskip 15pt
   \mt@pseudo@marg{\color{theblue}Click on the image to show the kerns
      and spacings involved. Click on emphasised words in the text below
      to reveal the relation of image and code.\strut}
   \mt@layer{_compatibility}{%
      \mt@place{\rlap{\hskip-\marginparwidth \color{white}%
        \vrule width\dimexpr\hsize+\marginparwidth\relax height\mt@unvdimen}}
      \mt@pseudo@marg{\color{thered}%
        If you had a \acronym{PDF} viewer that understands
        \acronym{PDF}\,{\smaller1.5}, you could hide the arrows selectively.}}
   \vskip-\mt@unvdimen}%
  \vskip-4pt
  \setlength\fboxsep{4pt}%
  \leavevmode
  \pdfstartlink
    user{/Subtype/Link
         /BS << /Type/Border/W 0 >> /H/O
         /A << /S/SetOCGState
               /State[/Toggle \mts@stuff] >> }%
    \fcolorbox{theframe}{theshade}%
      {\fontsize{34}{38}\selectfont #1}%
  \pdfendlink
  \par\medskip
  }%
  \edef\x{\pdfpageresources{/Properties <<\mts@resources>>}}\x
}
```

Now define the illustration to be used in the document.

```
\def\lssample{%
  \ls@sample{%
    \dols{0pt}{Stop}
      \lssp{o}{0.45em}{0.25em}{0.15em}
    \dols{0.16em}{{st}ealing}\hskip-\dimexpr 0.08em+\lsrule\relax
      \lssp{i}{13.82pt}{4.65pt}{2.08pt}
    \dols{0.16em}{sheep}
    \dols{0pt}{!}
  }%
```

Don’t forget to add the arrows.

```
  \vspace{-\baselineskip}
  \add@arrow{red}      {tracking}{lsamount_c.east}{a_ls}
  \add@arrow{red}      {okern}   {okernend_c.east}{p_ls}
  \add@arrow{green}    {ospace}  {ospace_c.east}  {ospace}
  \add@arrow{green}    {ispace}  {ispace_c.center}{ispace}
  \add@arrow{green!75} {istretch}{istretch_c.east}{istretch.north}
  \add@arrow{green!75} {ishrink} {ishrink_c.west} {ishrink.north}
  \add@arrow{green!75} {ostretch}{ostretch_c.east}{ostretch.north}
  \add@arrow{green!75} {oshrink} {oshrink_c.east} {oshrink.north}
  \add@arrow[right]{grey}{ligature}{nolig_c.east} {st.center}
}
\fi
```

This is for use with microtype.dtx

```
\ifx\documentclass\@twoclasseserror
  \usepackage{tikz}
\else
```

B.2 Document

```
\documentclass[10pt,a4paper]{ltxdoc}
\expandafter\def\csname ver@microtype.dtx\endcsname{2999/99/99}
```

Re-use the preamble from `microtype.dtx`.

```
\usepackage{microtype-doc}
\usepackage{attachfile}
\usepackage{tikz}
\makeatletter
\pdfcatalog{/OCProperties << /OCGs [\mt@objects]
                             /D << /Order [\mt@order] /BaseState/OFF >> >> }
\makeatother
\begin{document}
```

You are currently reading this.

```
\DocInput{microtype-lssample.dtx}
```

Now show what we are able to do.

```
\noindent
 Since a picture is worth a thousand words, probably even more if, in our
 case, it depicts a couple of letterspaced words, let's bring one to sum up
 these somewhat confusing options. Suppose you had the following settings
 (which I would in no way recommend; they are only for illustrative purposes):
\begin{verbatim}
\SetTracking
  [ no ligatures  = {"\anchorarrow{nolig}"f},
    spacing       = {60"\anchorarrow{ispace}"0*,"%
                      "-1"\anchorarrow{istretch}"00*, "\anchorarrow{ishrink}"},
    outer spacing = {4"\anchorarrow{ospace}"50,"%
                      "2"\anchorarrow{ostretch}"50,1"\anchorarrow{oshrink}"50},
    outer kerning = {"\anchorarrow{okernbegin}"*,"%
                      \anchorarrow{okernend}"*} ]
  { encoding = * }
  { 1"\anchorarrow{lsamount}"60 }
\end{verbatim}
 and then write:
\begin{verbatim}
Stop \textls{stealing sheep}!
\end{verbatim}
 this is the (typographically dubious) outcome:

 \lssample

\noindent
 While the word `Stop' is not letterspaced, the space between the letters in
 the other two words is expanded by the \showarrow[tracking]{tracking~amount}{red}
 of 160/1000\,em\,=\allowbreak\,0.16\,em.
 The \showarrow[ispace]{inner~space}{green} within the letterspaced text is
 increased by 60\%, while its \showarrow[istretch]{stretch}{green} amount is
 decreased by 10\% and the \showarrow[ishrink]{shrink}{green} amount is left
 untouched.
 The \showarrow[ospace]{outer~space}{green} (of 0.45\,em) immediately before the
 piece of text may \showarrow[ostretch]{stretch}{green} by 0.25\,em and
 \showarrow[oshrink]{shrink}{green} by 0.15\,em.
 Note that there is no outer space after the text, since the exclamation mark
 immediately follows; instead, the default \showarrow[okern]{outer~kern}{red}
 of half the letterspace amount (0.08\,em) is added.
 Furthermore, one \showarrow{ligature}{grey} wasn't broken up, because we
 neglected to specify the `|s|' in the |no ligatures| key.

\expandafter\enddocument
\fi
⟨/lssample⟩
```

C Change history

2004/09/11 Version 1.0

General: Initial version 1

2004/09/21 Version 1.1

General: configuration file names in lowercase (suggested by *Harald Harders*) 87
remove 8-bit characters from the configuration files (suggested by *Harald Harders*) 147
Protrusion: add factors for some more characters 154
settings for Adobe Minion (contributed by *Harald Harders*) 155
\DeclareCharacterInheritance: new command: possibility to specify character inheritance 120
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\MT@find@file: fix: also check whether the file for the base font family has already been loaded 87
\MT@get@basefamily: only remove suffixes ‘x’ or ‘j’ 88
\MT@get@listname@: don’t check for empty attributes list 89
\MT@ifempty: fix: use category code 12 for the percent character (reported by *Tom Kink*) 45
\MT@is@number: numbers may also be specified in hexadecimal or octal (suggested by *Harald Harders*) 94
\MT@pdftex@no: fix: version check (reported by *Harald Harders*) 40
\MT@permute: don’t use sets for empty encoding 121
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\MT@split@codes: fix: allow zero and negative values 63
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2004/10/03 Version 1.2

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add settings for Computer Modern Roman math symbols 183
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\MT@get@basefamily: also remove ‘w’ (swash capitals) 88
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\MT@get@listname@: alternatively check for alias font name 89
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2004/10/27 Version 1.3

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2004/11/12 Version 1.4

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use one instead of five counters 50
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\SetExpansion: fix: specifying extra options does no longer require to give a name, too 113

2004/11/17 Version 1.4a

General: new option: final 128
\MT@cfg@catcodes: fix: reset some more catcodes when reading files (reported by *Michael Hoppe*) 88

2004/11/26 Version 1.4b

General: fix: set catcodes before reading global configuration file (reported by *Christoph Bier*) 130
  optimisation: use less \expandafters and \csnames 44
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\MT@checklist@family: fix: don't try alias family name if encoding failed 61
\MT@get@basefamily: fix: failed for font names of the form abczz (reported by *Georg Verweyen*) 88
\MT@get@slot: don't define \MT@char globally (save stack problem) 91
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2004/12/15 Version 1.5

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2005/01/24 Version 1.6

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