Dutch Type Library

Appendices

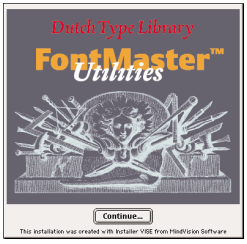
's-Hertogenbosch / Hamburg
Autumn 2004

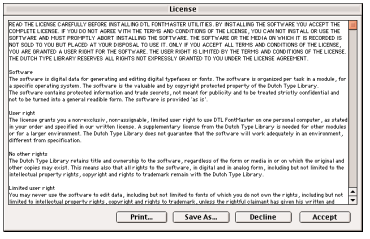
1. Using the Mac OS installer

System requirements: Mac OS 8.6 or higher.
Physical RAM: 64 MB (96 MB or more recommended).
Screen resolution: 800 x 600 or higher.
Free hard disk space: 40 MB.

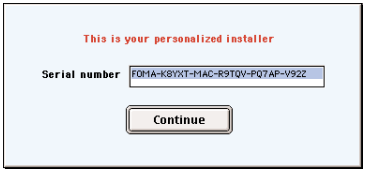
1.1 *Installing DTL FontMaster*

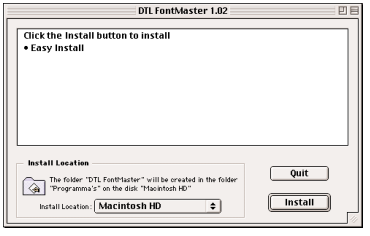
Double click on the installer icon. The installer will start with a splash screen. Click on the *Continue …* button.





You will be notified to read the *License Agreement* (see Appendix II). In case you accept, your personalized serial number will be shown.



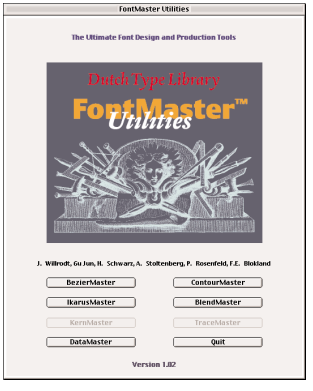


After continuing a new dialog will appear and you have to select the folder where DTL FontMaster will be installed. After clicking the *Install* button the program will unpacked and copied to your hard disk.

By default an alias will be placed in the **Apple** menu. You can easily remove DTL FontMaster by dragging the folder that contains the program files, Microsoft libraries, etcetera to the dustbin.

It is also possible to install the DTL FontMaster modules separately. Therefore the DTL FontMaster BASE file has to be installed first. This contains the Microsoft libraries, the DLL's, etcetera. An up to date BASE file can always be downloaded from the DTL FontMaster web site (http://www.fontmaster.nl). Subsequently the module has to be installed. Take care to select the folder where the BASE file has been installed as the destination folder.

After a succesfull installation DTL FontMaster can be activated from the Apple menu. Grey buttons indicate that the module belonging to the button is not installed.

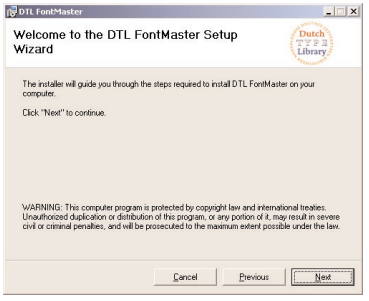


2. Using the Windows installer

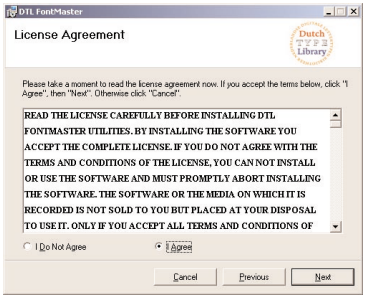
System requirements: Windows: 95/98, ME, NT, 2000, XP.
Physical RAM: 64 MB (96 MB or more recommended).
Screen resolution: SVGA or higher.
Free hard disk space: 25 MB.

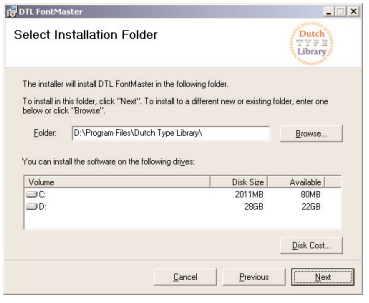
2.1 *Installing DTL FontMaster*

Double click on the installer icon. The installer will start with a splash screen. Click on the *Next* button.

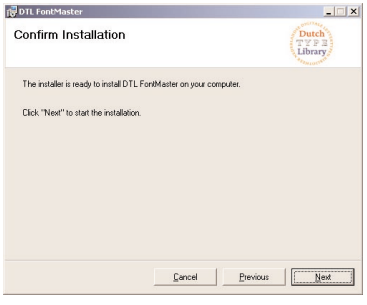


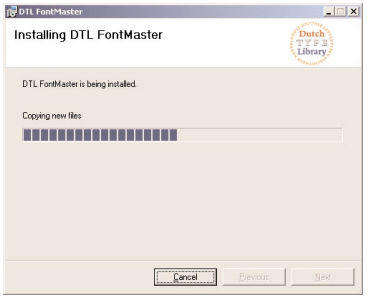
A welcome dialog will be shown; click on the *Next* button.



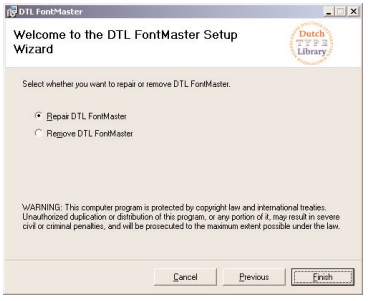


You will be notified to read the *License Agreement* (see Appendix II). In case you agree the *Next* button will be activated, otherwise you have to cancel the installation. In case you agree, a new dialog will appear and you have to select the folder where DTL FontMaster will be installed. After clicking the *Next* button, you must confirm your choice.



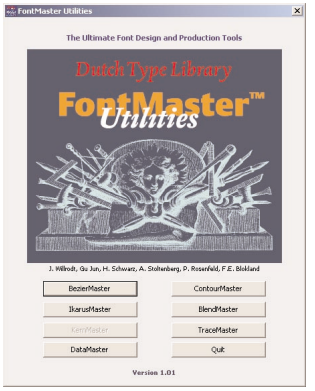


The default directory for installing DTL FontMaster is C:\Program Files\ Dutch Type Library\. After DTL FontMaster has been installed, you will find the program in the Windows **Start** menu under Programs–> Dutch Type Library -> DTL FontMaster. It is not necessary to restart your computer.



In case DTL FontMaster has to be repared or removed, the installer can be used for these purposes also. When you try to install DTL FontMaster on a system where already a copy of the program has been installed, you will be notified to remove the installed copy first.

It is also possible to install the DTL FontMaster modules separately. Therefore the DTL FontMaster BASE file has to be installed first. This contains the Microsoft libraries, the DLL's, etcetera. An up to date BASE file can always be downloaded from the DTL FontMaster web site (http://www.fontmaster.nl). Subsequently the module has to be installed. Take care to select the folder where the BASE file has been installed as the destination folder. The default directory for the installation of the FM modules is C:\Program Files\ Dutch Type Library\. In case the installation was succesfull the appropriate button in the 'central switch board' will be activated.



After a succesfull installation DTL FontMaster can be activated from the Windows Start menu. Grey buttons indicate that the module belonging to the button is not installed.

Appendix II: End User License

Read the license carefully before installing *DTL FontMaster Utilities*. By installing the software you accept the complete license. If you do not agree with the terms and conditions of the license, you can not install or use the software and must promptly abort installing the software. The software or the media on which it is recorded is not sold to you but placed at your disposal to use it. Only if you accept all terms and conditions of the license, you are granted a user right for the software. The user right is limited by the terms and conditions of the license. The Dutch Type Library reserves all rights not expressly granted to you under the license agreement.

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http://www.dutchtypelibrary.com

Appendix III: Character Layout Files

This document describes the format of the Character Layout Files used in DTL FontMaster for conversion of the BE and IK databases into the PostScript Type 1, TrueType and OpenType formats and vice versa. The basic function of these layout files is to renumber the characters from one layout to another one.

1. General structure

–The Character Layout File is an editable ASCII file.
–All Character Layout Files have the extension '**.cha**' appended to the file name.
–Each line in this file can have a length of up to 255 characters.
–Lines starting with a lowercase '**c**' or capital '**C**' are ignored by the DTL FontMaster modules and can be used for comments.
–A special line with the keyword 'Version' is used to denote the version of the format specification (this is not a version number for the file itself). This format specification defines Version 002.000.
–Keywords are case insensitive and can consist out of maximal 16 characters concisting the lowercase letters a–z, the capitals A–Z and the digits 0–9.
–Empty lines in the file are allowed.
–Tabs and Spaces are allowed in all lines and are ignored.
–The conversion information from one numbering system to another one is contained in several columns. The content of each column is characterized by a keyword.
–The entries for the different columns are separated by '**;**'.
–The character information is included in two lines with the keywords '**Starttable**' and '**Endtable**'.
–The keywords for the content of the column have to follow the line with the keyword '**Starttable**'.

NOTE: The version number of the format specicification must be 002.000 in all cases, otherwise the Character Layout File will be not accepted by the FM modules. When the user wants to attach a version number to a proprietary .cha file, this information should be preceded by a 'C' (comment).

2. Proprietary Character Layout Files

Characters are stored by number in a BE and IK database. The database number corresponds with a PostScript name and a Unicode number via the Character Layout Files. By default four .cha files come with DTL FontMaster: beeditor.cha, TTBAS.cha, urwotf.cha, winuni.cha.

It is of course possible that FM users create proprietary encoding systems. If necessary they can use PostScript names that are located in the 'private area' in combination with Private Use Area Unicode codepoints. Normally these characters will be placed at positions in the database that are undefined. This automatically means that also a proprietary Character Layout File has to be created because the default .cha files will not 'recognize' the database numbers and therefore the characters will not be exported when a font is created.

In case a font with a proprietary codepage containing PostScript names and Unicodes in the 'private area' is imported and converted by DTL DataMaster into a BE or IK database, the characters will be automatically placed in undefined character cells. Please note that the import conversion is directly influenced by the selected Character Layout File.

2.1 *Structure*

The structure of a Character Layout File is basically quite simple. The sequence of columns in the .cha file is arbitrary and a column is identified by name. Keywords have to be known to the program in order to know the datatype of the column, i.e integer for QDNum, strings for PSName, etc. A Character Layout File can contain one or more codepages. The beeditor.cha file for instance contains multiple codepages for Western and Eastern European, Greek, Cyrillic, etc. codepages for Mac OS and Windows.

The relation between the keyword and the names of the codepages shown in the Font Administration tool and by DTL DataMaster is hardcoded. It is not possible to define proprietary keywords because these will not be recognized by the programs. It is recommended to use the fixed keywords QDNum and ANNum and UNINum for customized layouts.

2.2 *Keywords*

The list of hardcoded keywords in the Font Administration tool in DTL BezierMaster and DTL IkarusMaster is:
UNINum;URWNum;UNINumUp; Unicode and URW Number, UNINumUp (UpperCase) is not used
ANNumLat1;QDNumLat1; Western European (PC/Mac OS)
ANNumLat2;QDNumLat2; Eastern European (PC/Mac OS)
ANNumGr;QDNumGr; Greek (PC/Mac OS)
ANNumTu;QDNumTu; Turkish (PC/Mac OS)
ANNumCy;QDNumCy; Cyrillic (PC/Mac OS)
ANNumHe;QDNumHe; Hebrew (PC/Mac OS)
ANNumBa; Baltic (PC)
QDNumRo; Romanian (Mac OS)
ANNumSym;QDNumSym; Symbols (PC/Mac OS)
ANNumKazahk;QDNumKazakh; Kazakh (PC/Mac OS)
ANNumUzbek;QDNumUzbek; Uzbek (PC/Mac OS)
PSName

The next page shows more allowed keywords and some extra information about the above listed hardcoded keywords. Other keywords are also possible and will be defined if requested. Please note that not all listed keywords are currently supported by DTL FontMaster.

Keyword	*Interpretation*	*Datatype*	*Range*
URWnum	Number in the URW++ Layout	long	1–65534
URWcomp	URW++ Number for components of composite characters	long	1–65534
PSNum	PostScript Number (for Standard Encoding)	short	1–255
PSName	PostScript Name	charstring	128 ASCII
QDNum	QuickDraw Number (Mac Layout)	short	1–255
ANNum	ANSI Number (Windows)	short	1–255
HPNum	HP Master Symbol List	long	0–65535
IFNum	Intellifont Character Plane Number	long	0–65535
CGNum	Compugraphic Character Code	long	0–65535
ISONum	Number in ISO-Standard Code	long	
UNINum	Number in Unicode	long	0–65535
CharClass	Classification of Character (Upper or Lower Case, digit)	long	
StaClass	Weight of character for calculation of stemsnaps and statistical evaluation	long	
KernClass	Classification of character to calculate kerning values	long	M,V,LR,RL, etcetera
JISNum	JIS Number for Kanji characters	long	0–65535
JEFNum	Fujitsu Numbering (extended JIS)	long	0–65535
KUTENNum	Kuten Numbering for Kanji	long	0–65535
KenjiBangoNum	Fujitsu Database Numbering	long	0–65535
GlyInd	Index in TrueType font	long	0–65535
GBNum	GB Number	long	0–65535
SJISNum	Shift JIS Number	long	0–65535
MSGB	GB Number for Microsoft	long	0–65535
MSB5	B5 Number for Microsoft	long	0–65535
MACGB	GB Number for Mac	long	0–65535
MACB5	B5 Number for Mac	long	0–65535
URWVNum	Character Number for vertical writing	long	0–65535

```
C character mapping file;;
C Multiple code page;;
C FM default for PSType1 and TrueType ;;
C Copyright DTL Germany, 2004;;
C Version 1.1, 12 June 2004;;
Version 002.000;;
Starttable;;
URWNum;UNINum;ANNumLat1;QDNumLat1;ANNumLat2;QDNumLat2;ANNumGr;QDNumGr;ANNumTu;QDNumTu;ANNumCy;QDNumCy;ANNumHe;
QDNumHe;ANNumBa;QDNumRo;ANNumSym;QDNumSym;ANNumKazahk;QDNumKazahk;ANNumUzbek;QDNumUzbek;PSName
101;x0041;065;065;065;065;065;065;065;065;065;065;065;065;065;065;065;65;65;65;65;A
102;x0042;066;066;066;066;066;066;066;066;066;066;066;066;066;066;066;66;66;66;66;B
103;x0043;067;067;067;067;067;067;067;067;067;067;067;067;067;067;067;67;67;67;67;C
104;x0044;068;068;068;068;068;068;068;068;068;068;068;068;068;068;068;68;68;68;68;D
105;x0045;069;069;069;069;069;069;069;069;069;069;069;069;069;069;069;69;69;69;69;E
106;x0046;070;070;070;070;070;070;070;070;070;070;070;070;070;070;070;70;70;70;70;F
107;x0047;071;071;071;071;071;071;071;071;071;071;071;071;071;071;071;71;71;71;71;G
108;x0048;072;072;072;072;072;072;072;072;072;072;072;072;072;072;072;72;72;72;72;H
109;x0049;073;073;073;073;073;073;073;073;073;073;073;073;073;073;073;73;73;73;73;I
110;x004a;074;074;074;074;074;074;074;074;074;074;074;074;074;074;074;74;74;74;74;J
111;x004b;075;075;075;075;075;075;075;075;075;075;075;075;075;075;075;75;75;75;75;K
112;x004c;076;076;076;076;076;076;076;076;076;076;076;076;076;076;076;76;76;76;76;L
113;x004d;077;077;077;077;077;077;077;077;077;077;077;077;077;077;077;77;77;77;77;M
114;x004e;078;078;078;078;078;078;078;078;078;078;078;078;078;078;078;78;78;78;78;N
115;x004f;079;079;079;079;079;079;079;079;079;079;079;079;079;079;079;79;79;79;79;O
116;x0050;080;080;080;080;080;080;080;080;080;080;080;080;080;080;080;80;80;80;80;P
117;x0051;081;081;081;081;081;081;081;081;081;081;081;081;081;081;081;81;81;81;81;Q
118;x0052;082;082;082;082;082;082;082;082;082;082;082;082;082;082;082;82;82;82;82;R
119;x0053;083;083;083;083;083;083;083;083;083;083;083;083;083;083;083;83;83;83;83;S
120;x0054;084;084;084;084;084;084;084;084;084;084;084;084;084;084;084;84;84;84;84;T
121;x0055;085;085;085;085;085;085;085;085;085;085;085;085;085;085;085;85;85;85;85;U
122;x0056;086;086;086;086;086;086;086;086;086;086;086;086;086;086;086;86;86;86;86;V
123;x0057;087;087;087;087;087;087;087;087;087;087;087;087;087;087;087;87;87;87;87;W
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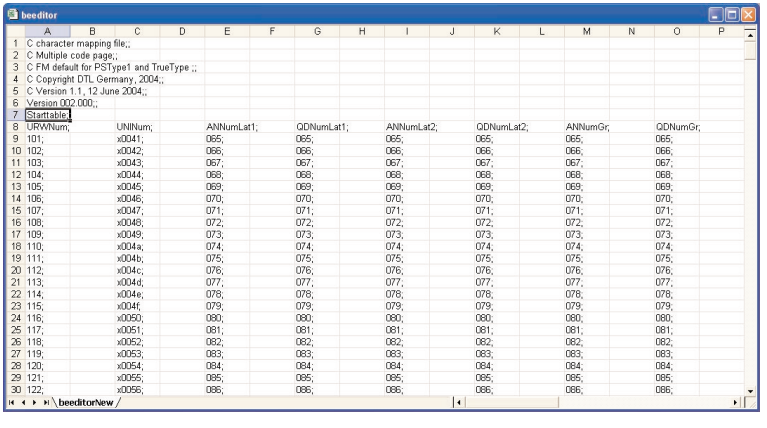
Part of a Character Layout File.

To make editing of the Character Layout Files easy, Microsoft Excell files are used. These are included in the installer and can be found in the 'Dutch Type Library' directory.



Microsoft Excel document.

Appendix IV: UFM File Format

Keywords

In the following table the keywords are listed with the type of the entry and their influence in the production.

II	= code in II-FINF section
Type:	i = numerical value
	s = text
	s2 = Japanese twobyte (SJIS) text
RC (on Mac)	generation of FOND, SFNT or NFNT resource
+	entry is interpreted by DTL FontMaster module
–	entry is ignored by DTL FontMaster module

	Program DM			*Conversions to*					
Keyword	**II**	**Typ**	**Calculation**	**UFM**	**TI**	**AFM**	**PFM**	**TT**	**RC**
AccentOffset	28	i	Y-min of 701 minus Y-min of 751	+	–	–	–	–	–
Ascender	16	i	304 / Header	+	–	+	+	–	–
AscenderHHEA	265	i	Default [13]	+	–	–	–	+	–
Bodysize	71	i	Header	+	+	+	+	+	–
CapHeight	30	i	Header / 108	+	+	+	+	–	–
Comment	17	s	Input by hand	–	+	+	–	–	–
Copyright	18	s	Input by hand / Default [2]	+	+	+	+	+	–
Descender	29	i	316 / Header	+	–	+	+	–	–
DescenderHHEA	266	i	Default [4]	+	–	–	–	+	–
DoubleLower-UnderlineOffset	138	i	Y-max of lower stroke of 1155	+	–	–	+	–	–
DoubleLower-UnderlineWidth	140	i	Y-thickness of lower stroke of 1155	+	–	–	+	–	–
DoubleUpper-UnderlineOffset	137	i	Y-max of 1155	+	–	–	+	–	–
DoubleUpper-UnderlineWidth	139	i	Y-thickness of upper stroke of 1155	+	–	–	+	–	–
ExternalLeading	144	i	Default [7]	*	–	–	+	–	–
FaceName	128	s	input by hand	*	–	–	+	–	+
FamilyClass	257	i	Default [3]	+	–	–	–	+	–
FamilyName	19	s	input by hand	*	+	+	–	–	–
FigureSize	34	i	Y-max of 510 minus baseline undershoot of 510	+	+	–	–	–	–
FirstCharIndex	281	i	input by hand / Default first Unicode character in font	+	–	–	–	+	–
FondAscender	68	i	Default [1]	+	–	–	–	–	+
FondDescender	70	i	Default [4]	+	–	–	–	–	+
FondID	64	i	input by hand / Listing	*	–	–	–	–	+
FondLeading	69	i	20% of Bodysize (SBS)	+	–	–	–	–	+

	Program DM			*Conversions to*					
Keyword	**II**	**Typ**	**Calculation**	**UFM**	**TI**	**AFM**	**PFM**	**TT**	**RC**
FondName	65	s	input by hand	*	–	–	–	–	+
FontFamilyName	269	s	input by hand	*	–	–	–	+	–
FontName	20	s	input by hand	*	+	+	+	+	+
FsType	277	i	input by hand / Default [6]	+	–	–	–	+	–
FullName	21	s	input by hand	*	+	+	–	–	–
Identifier	32	s	input by hand	–	+	–	–	–	–
InternalLeading	143	i	Default [7]	+	–	–	+	–	–
IsFixedPitch	22	s	input by hand	*	+	+	+	+	–
JPNCopyright	271	s2	input by hand	–	–	–	–	+	–
JPNFontFamilyName	273	s2	input by hand	–	–	–	–	+	–
JPNSubfamilyName	274	s2	input by hand	–	–	–	–	+	–
JPNTrueTypeID	272	s2	input by hand	–	–	–	–	+	–
JPNVersion	275	s2	input by hand	–	–	–	–	+	–
LineGap HHEA	267	i	Default [7]	+	–	–	–	+	–
LowestRecPpem	276	i	input by hand / Default [6]	+	–	–	–	+	–
MacFileName	66	s	input by hand	*	–	–	–	–	+
MacStyle	67	i	input by hand	*	–	–	+	+	+
Notice	23	s	input by hand / Default [2]	+	+	+	–	–	–
Panose	258	s	Default [5]	+	–	–	–	+	–
PCWeight	129	i	input by hand	*	–	–	+	+	–
PitchAndFamily	130	s	Default [6]	+	–	–	+	–	–
Slant	145	i	Header	+	+	–	+	–	–
StrikeOutOffset	141	i	Y-min of 1426	+	–	–	+	+	–
StrikeOutWidth	142	i	Y-thickness of 1426	+	–	–	+	+	–
SubfamilyName	270	s	input by hand	*	–	–	–	+	–
SubScript	132	i	Default [7]	+	–	–	+	+	–
SubScriptSize	134	i	Y-max of 596 minus baseline undershoot of 596	+	–	–	+	+	–
SubScriptxSize	263	i	Width of 596	+	–	–	–	+	–
SuperScript	131	i	Y-min of 584 minus baseline undershoot of 596	+	–	–	+	+	–
SuperScriptSize	133	i	Y-max of 596 minus baseline undershoot of 596	+	–	–	+	+	–
SuperScriptxSize	264	i	Width of 584	+	–	–	–	+	–
TrueTypeID	268	s	Default [8]	+	–	–	–	+	–
TypoAscender	261	i	Default [12]	+	–	–	–	+	–
TypeDescender	262	i	Default [4]	+	–	–	–	+	–
TypoLineGap	260	i	Default [7]	+	–	–	–	+	–
UnderlineOffset	135	i	Y-max of 1154	+	–	–	+	–	–
UnderlinePosition	24	i	Y-center of 1154	+	+	+	–	+	–
UnderlineThickness	25	i	Y-thickness of 1154	+	+	+	–	+	–
UnderlineWidth	136	i	Y-min of 1154 minus Y-max of 1154	+	–	–	+	–	–

	Program DM			*Conversions to*					
Keyword	**II**	**Typ**	**Calculation**	**UFM**	**TI**	**AFM**	**PFM**	**TT**	**RC**
UniqueID	33	i	input by hand	*	+	–	–	–	+
VendID	259	s	input by hand / Default [9]	+	–	–	–	+	–
Version	26	s	input by hand / Default [10]	+	+	+	–	+	–
Weight	27	s	input by hand	*	+	+	–	–	–
WidthClass	256	i	Default [11]	+	–	–	–	+	–
WinAscent	278	i	input by hand, IK units / Default Y-max ANSI	+	–	–	–	+	–
WinDescent	279	i	input by hand, IK units / Default Y-min ANSI	+	–	–	–	+	–
xavgCharWidth	280	i	input by hand, IK units / Default average width	+	–	–	–	+	–
xHeight	31	i	Header / 326	+	+	+	+	–	–

1 Header: Cap height (CAH)
2 URW Software, Copyright YEAR by URW
3 0 0
4 Header: Distance baseline - lower body line (BAL)
5 0 0 0 0 0 0 0 0 0 0
6 Dontcare
7 0
8 VendID: FontName: YEAR
9 URW
10 001.005
11 5
12 12000
13 Bodysize (Header, SBS) * 1.2 minus Descender (Header, BAL)

Other font vendors should be aware that the defaults 2, 8, 9 and 10 may not match their production. Some font depending defaults like 4, 5, 6 and 11 may be altered by hand.

Example of an UFM file

```
StartFontMetrics
/UniqueID get 5060740 eq exch/FontType get 1 eq and}{pop false}ifelse
{save true}{false}ifelse}{false}ifelse
20 dict begin
/FontInfo 16 dict dup begin
  /version (001.000
TTName 9 3 1 0x409 "Frank E. Blokland"; #Windows
TTName 9 1 0 0 "Frank E. Blokland"; #Macintosh
TTName 11 3 1 0x409 "http://www.dutchtypelibrary.com"; #Windows
TTName 11 1 0 0 "http://www.fontmaster.nl"; #Macintosh
TTName 14 3 1 0x409 "http://www.dutchtypelibrary.com"; #Windows
TTName 14 1 0 0 "http://www.fontmaster.nl"; #Macintosh
Copyright Dutch Type Library, 2001. All rights reserved
Notice Generated on 08-04-2001/  File# D019C16T
Version 002.00E
FamilyName DTLDocumentaST
FontName DTLDocumentaST-Bold
FullName DTL Documenta ST Bold
UniqueID 5060740
Weight Bold
IsFixedPitch false
Ascender 766
Descender -234
UnderlinePosition -133
UnderlineThickness 20
Bodysize 1000
CapHeight 683
FigureSize 515
XHeight 486
AccentOffset 133
MacFileName DTLDocSTBol
FondName DTL Documenta ST Bold
FondID 13740
MacStyle 1
FondAscender 766
FondDescender -234
FondLeading 0
FaceName DTL Documenta ST
PCWeight 6
PitchAndFamily Dontcare
SubScript 0
SubScriptSize 600
SubscriptXSize 667
SuperScript 400
SuperScriptSize 600
SuperscriptXSize 667
UnderlineOffset -123
UnderlineWidth 20
DoubleUpperUnderlineOffset 106
DoubleUpperUnderlineWidth 53
DoubleLowerUnderlineOffset -340
DoubleLowerUnderlineWidth 67
StrikeOutOffset 267
StrikeOutWidth 53
InternalLeading 0
ExternalLeading 0
```

```
Slant 0
FontFamilyName DTLDocumentaST
SubfamilyName Bold
TrueTypeID D019C16T
WidthClass 5
FamilyClass 0 0
Panose 0 0 0 0 0 0 0 0 0 0
VendID DTL
TypoAscender 766
TypoDescender -234
TypoLineGap 0
AscenderHHEA 950
DescenderHHEA -250
LineGapHHEA 0
WinAscent 766
WinDescent 234
FirstCharIndex 0
EndFontMetrics
```

The following pages show the usage of the keywords in the UFM files.

Ascender

Format	AFM
Structure	Global font information
Element	Ascender
Comment	Top of lower case d

Format	PFM
Structure	EXTTEXTMETRIC
Element	etmLowerCaseAscent
Comment	Distance that the ascender of lowercase letters extends above the baseline

Ascender HHEA

Format	TTF
Structure	'hhea' table
Element	Ascender
Comment	Distance from baseline of highest ascender, typographic Ascent (Apple)

Bodysize

Format	All
Structure	None
Element	None
Comment	Used to scale the UFM entries to the target grid

CapHeight

Format	AFM
Structure	Global font information
Element	CapHeight
Comment	Top of upper case H

Format	PFM
Structure	EXTTEXTMETRIC
Element	etmCapHeight
Comment	The height of uppercase characters

Format	PFM
Structure	PFMHEADER
Element	dfAscent, CapHeight, dfInternalLeading
Comment	Specifies the distance from the top of a character definition cell to the baseline of the typographical font. It is useful for aligning the baseline of fonts of different height
Format	TI
Structure	Private dictionary
Element	BlueValues
Comment	Cap-height alignment

Comment

Format	AFM

Format TI
Structure Private dictionary
Element BlueValues
Comment Cap-height alignment

Format AFM **Comment**
Structure Global font information
Element Comment
Comment Arbitrary text, may be present in an AFM file

Format AFM **Copyright**
Structure Global font information
Element Comment
Comment Text regarding the copyright

Format PFM
Structure PFMHEADER
Element dfCopyright(60)
Comment as AFM

Format TI
Structure FontInfo dictionary
Element Copyright
Comment as AFM

Format TTF
Structure 'name' table
Element Name ID 0
Comment as AFM

Format AFM **Descender**
Structure Global font information
Element Descender
Comment Bottom of lower case p

Format PFM
Structure EXTTEXTMETRIC
Element etmLowerCaseDescent
Comment Distance of lower case descender extending below baseline

Format TTF **Descender HHEA**
Structure 'hhea' table
Element Decender
Comment Distance from baseline of lowest descender, typographic descent (Apple)

DoubleLowerUnderline-Offset

Format PFM
Structure EXTTEXTMETRIC
Element etmDoubleLowerUnderlineOffset
Comment Offset downward from the baseline where the top of the lower double underline should appear

DoubleLowerUnderline-Width

Format PFM
Structure EXTTEXTMETRIC
Element etmDoubleLowerUnderlineWidth
Comment Thickness of the lower double underline bar

DoubleUpperUnderline-Offset

Format PFM
Structure EXTTEXTMETRIC
Element etmDoubleUpperUnderlineOffset
Comment Offset downward from the baseline where the top of the upper double underline should appear

DoubleUpperUnderline-Width

Format PFM
Structure EXTTEXTMETRIC
Element etmDoubleUpperUnderlineWidth
Comment Thickness of the upper double underline bar

ExternalLeading

Format PFM
Structure PFMHEADER
Element dfExternalLeading
Comment Amount of extra leading that the designer requests the application to add between rows

FaceName

Format PFM
Structure PFMHEADER
Element dfFace(pointer)
Comment Microsoft Windows font Name. Up to four fonts may build up a family having the same FaceName. These fonts must make up two pairs with the same dfWeight, but different to the entry of the other pair. The two fonts having the same dfWeight must differ in the dfItalic byte

Format Mac font suitcase
Structure FOND resource
Element Resource Name
Comment Name of the FOND seen in the menu if the resource does contain a family of several fonts

FamilyClass

Format TTF
Structure 'OS2' table
Element sFamilyClass
Comment First number in UFM describes IBM Font-Family class, the second one the IBM Subfamily class. This parameter is intended for use in selecting an alternate font when the present one is not available

FamilyName

Format AFM
Structure Global font information
Element FamilyName
Comment Name of the 'font family' to which the font belongs

Format TI
Structure FontInfo dictionary
Element FamilyName
Comment Human-readable name for a group of fonts that are stylistic variants of the same design. All fonts that are members of such a group should have exactly the same FamilyName. It should be suitable for use in a font selection menu

FigureSize

Format TI
Structure Private dictionary
Element BlueValues
Comment figure-size alignment

FirstCharIndex

Format TTF
Structure 'OS2' table
Element usFirstCharIndex
Comment Minimum Unicode index (char.code) in this font according to the cmap subtable for platform ID 3 and encoding ID 0 or 1. Should be 0x0020 for most fonts supporting Win-ANSI or other char.sets

FondAscender

Format Mac font suitcase
Structure FOND resource
Element ffAscent
Comment Makes up the baseline-to-baseline distance together with FondDescender and FondLeading on a Mac

FondDescender

Format Mac font suitcase
Structure FOND resource
Element ffDescent
Comment Makes up the baseline-to-baseline distance together with FondAscender and FondLeading on a Mac

Format	Mac font suitcase	**FondID**
Structure	FOND resource	
Element	ffFamID	
Comment	FOND Family ID	
Format	Mac font suitcase	
Structure	NFNT resource	
Element	Resource ID	
Comment	Together with the UniqueID a NFNT Resource ID is calculated	
Format	Mac font suitcase	
Structure	SFNT resource	
Element	Resource ID	
Comment	Together with the UniqueID a SFNT Resource ID is calculated	
Format	Mac font suitcase	**FondLeading**
Structure	FOND resource	
Element	ffLeading	
Comment	Makes up the baseline-to-baseline distance together with FondAscender and FondDescender on a Mac. Some applications assume this value to be equal to zero	
Format	Mac font suitcase	**FondName**
Structure	FOND resource	
Element	Resource Name	
Comment	Name of the FOND seen in the menu if the resource contains only one font	
Format	TTF	**FontFamilyName**
Structure	'name' table	
Element	NameID 1	
Comment	The name the user sees in the font-menu	
Format	TTF	
Structure	'name' table	
Element	NameID 4	
Comment	First part of FullFontName	
Format	AFM	**FontName**
Structure	Global font information	
Element	Font Name	
Comment	Name of the font program as presented to the PostScript language *findfont* operator	

FontName

Format TI
Structure FontInfo dictionary
Element FontName
Comment Font's name, passed to the PostScript *define* font operator by program TO. Should be unique. Can be a condensation of the FullName by removing spaces. It is customary to limit it's length to less than 40 characters.

Format TTF
Structure 'name' table
Element NameID 6
Comment PostScript name for the font separated to base- and suffix names. Each suffix starts with an uppercase letter after an hyphen has occured in the Name

FullName

Format AFM
Structure Global font information
Element FullName
Comment Full text name of the font

Format TI
Structure FontInfo dictionary
Element FullName
Comment Unique, human-readable name for an individual font. Typically, it begins with the FamilyName and continues with various style descriptors separated by spaces

FsType

Format TTF
Structure 'OS2' table
Element fsType
Comment Indicates font embedding licensing rights for the font. Makes temporary loading of a font possible by an embedding-aware application. This licensing rights are granted by the vendor of the font

Internal Leading

Format PFM
Structure PFMHEADER
Element dfinternalLeading
Comment Amount of leading inside the bounds set by the dfPixHeight member. Accent marks may occur in this area

Format PFM
Structure PFMHEADER
Element dfAscent, CapHeight, dfInternalLeading
Comment see **CapHeight**

IsFixedPitch

Format AFM
Structure Writing direction metrics; mono/proportionally
Element IsFixedPitch
Comment If true, this indicates that the font program is a monospaced font. A value false indicates a proportionally spaced font

Format TI
Structure FontInfor dictionary
Element IsFixedPitch
Comment As AFM

Format PFM
Structure PFMHEADER
Element dfPitchandFamily
Comment As AFM. If true, the low order 4 bits are set to 0x00, else 0x01

Format TTF
Structure 'post' table
Element IsFixedPitch
Comment As AFM. False is interpreted as 0, true is interpreted as 1

LineGapHHEA

Format TTF
Structure 'hhea' table
Element LineGap
Comment Typographic line gap (Apple)

LowestRecPpem

Format TTF
Structure 'head' table
Element LowestRecPPEM
Comment Smallest readable size in pixels

MacFileName

Format Mac font suitcase
Structure Mac file system
Element Filename of the suitcase: FileName.scr or FileName.tt
Comment Filename seen in the folder if FOND contains NFNT

MacStyle

Format Mac font suitcase
Structure FOND resource
Element Font Style
Comment Determines the style under which the font appears in the menu. It is:
0 Regular or single font
1 Bold in the family
2 Italic in the family
3 Bold Italic in the family

Format PFM
Structure PFMHEADER
Element dfItalic
Comment If MacStyle equals 2 or 3, dfItalic is set to 1 so that the font is recognized as Italic

Format TTF
Structure 'head' table
Element macStyle
Comment as FOND

Format TTF
Structure 'OS2' table
Element fsSelection
Comment MacStyle 0 –> fsSelection 64
MacStyle 1 –> fsSelection 32
MacStyle 2 –> fsSelection 1
MacStyle 3 –> fsSelection 33

Notice

Format AFM
Structure Global font information
Element Notice
Comment Font name trademark or copyright notice

Format TI
Structure FontInfo dictionary
Element As AFM
Comment As AFM

Panose

Format TTF
Structure 'OS2' table
Element Panose
Comment 10 numbers to describe the visual characteristics of a font

PCWeight

Format PFM
Structure PFMHEADER
Element dfWeight
Comment Weight of the characters on a scale from 1–1000. The value of the UFM is taken times 100. It means:
1 thin
2 extra light
3 light
4 normal
5 medium

Format	6 semi bold
Structure	7 bold
Element	8 extra bold
Comment	9 heavy

Format	TTF
Structure	'OS2' table
Element	usWeightClass
Comment	As PFM

Format	PFM
Structure	PFMHEADER
Element	dfPitchAndFamily
Comment	Indicates, in a general way, the look of a font. There are: – Dontcare – Roman – Swiss – Modern – Script – Decorative

PitchAndFamily

Format	AFM
Structure	Global font information
Element	ItalicAngle
Comment	Angle in degrees counter-clockwise from the vertical of dominat vertical strokes of the font

Format	PFM
Structure	EXTTEXTMETRIC
Element	etmSlant = –Slant
Comment	Angle in in tenth of degrees clockwise from the upright version of the font

Format	TI
Structure	FontInfo dictionairy
Element	As AFM
Comment	As AFM

Format	PFM
Structure	EXTTEXTMETRIC
Element	etmStrikeOutOffset = StrikeOutOffset + StrikeOutWidth
Comment	Offset upward from the baseline where the top of a strike-out bar should appear

StrikeOutOffset

Format TTF
Structure 'OS2' table
Element yStrikeoutPosition
Comment Position of the bottom of the strike-out relative to the baseline

Format PFM **StrikeOutWidth**
Structure EXTTEXTMETRIC
Element etmStrikeOutWidth
Comment Thickness of the strike-out bar

Format TTF
Structure 'OS2' table
Element yStrikeoutSize
Comment as PFM

Format TTF **SubfamilyName**
Structure 'name' table
Element NameID 2
Comment Address only style and weight

Format TTF
Structure 'name' table
Element NameID 4
Comment If not equal to Regular, second part of FullFontName

Format PFM **SubScript**
Structure EXTTEXTMETRIC
Element etmSubScript
Comment Recommend vertical offset of subscript characters from baseline

Format TTF
Structure 'OS2' table
Element ySubscriptYOffset
Comment As PFM

Format PFM **SubScriptSize**
Structure EXTTEXTMETRIC
Element etmSubScriptSize
Comment Recommend vertical size of subscript characters

Format TTF
Structure 'OS2' table

Element	ySubscriptYSize
Comment	As PFM

Format	TTF	**SubscriptXSize**
Structure	'OS2' table	
Element	ySubscriptXoffset	
Comment	Recommended horizontal size of subscript characters	

	PFM
Format	EXTTEXTMETRIC
Structure	etmSuperScript
Element	Recommended vertical offset of superscript characters from
Comment	the baseline

Format	TTF
Structure	'OS2' table
Element	ySuperscripttYoffset
Comment	As PFM

Format	PFM	**SuperScriptSize**
Structure	EXTTEXTMETRIC	
Element	etmSuperScriptSize	
Comment	Recommended vertical size of superscript characters	

Format	TTF
Structure	'OS2' table
Element	ySuperscripttYSize
Comment	As PFM

Format	TTF	**SuperScriptXSize**
Structure	'OS2' table	
Element	ySuperscripttXSize	
Comment	Recommended horizontal size of superscript characters	

Format	TTF	**TrueTypeID**
Structure	'name' table	
Element	NameID 3	
Comment	Unique identifier that applications can store to identify the font beeing used	

Format	TTF	**TypoAscender**
Structure	'OS2' table	
Element	sTypoAscender	
Comment	New typographic ascender. One good source is the Ascender	

TypoDescender

Format TTF
Structure 'OS2' table
Element sTypoDescender
Comment New typographic descender. One good source is the Descender value from an AFM file

TypoLineGap

Format TTF
Structure 'OS2' table
Element sTypoLineGap
Comment New typographic line gap. Typical values average 7–10% of units per em

UnderlineOffset

Format PFM
Structure EXTTEXTMETRIC
Element etmUnderlineOffset
Comment Offset downward from the baseline where the top of a single bar should appear

UnderlinePosition

Format AFM
Structure Global font information
Element UnderlinePosition
Comment Recommended distance from the baseline for centering underlining strokes. This is the y coordinate of the center of the stroke

Format TI
Structure FontInfo dictionairy
Element Underline position
Comment As AFM

Format TTF
Structure 'post' table
Element Underline Position
Comment As AFM

UnderlineThickness

Format AFM
Structure writing direction metrics
Element UnderlineThickness
Comment Recommend stroke width for underlining

Format TI
Structure FontInfo dictionary
Element UnderlineThickness
Comment As AFM

Format TTF
Structure 'post' table
Element UnderlineThickness
Comment As AFM

UnderlineWidth

Format PFM
Structure EXTTEXTMETRIC
Element etmUnderlineWidth
Comment Thickness of the underline bar

UniqueID

Format TI
Structure Private dictionary
Element UniqueID
Comment Integer in the range from 0 to 16777215 that uniquely identifies the font. The numbers from 4000000 to 4999999 form an open range and may be used in a controlled environment. To distribute a font widely a UniqueID should be obtained from Adobe Systems Inc.

Format Mac font suitcase
Structure NFNT Resource
Element Resource ID
Comment Togethet with the FondID a nfnt Resource ID is calculated

VendID

Format TTF
Structure 'OS2' table
Element achVendID(4)
Comment Four character identifier for vendor of given font

Version

Format AFM
Structure Global font information
Element Version
Comment Font program version identifier

Format TI
Structure FontInfo dictionairy
Element version
Comment As AFM

Format TTF
Structure 'head' table
Element fontRevision
Comment Version number

Format TTF
Structure 'name' table
Element NameID 5
Comment Release and version information from the font vendor

Weight

Format AFM
Structure Global font information
Element Weight
Comment Weight of the font. E.g. Bold

Format TI
Structure FontInfo dictionary
Element Weight
Comment Human readable name for the weight or 'boldness' attribute of a font

WidthClass

Format TTF
Structure 'OS2' table
Element usWidthClass
Comment Relative change from the normal width to height ratio by a fontdesigner for the glyphs in a font. It means:

1 Ultra-Condensed
2 Extra-Condensed
3 Condensed
4 Semi-Condensed
5 Medium (normal)
6 Semi-Expanded
7 Expanded
8 Extra-Expanded
9 Ultra-Expanded

WinAscent

Format TTF
Structure 'OS2' table
Element usWinAscent
Comment Ascender metric for windows, yMax for all characters in the Windows ANSI set. For platform 3 encoding 0 fonts same as yMax

WinDescent

Format TTF
Structure 'OS2' table
Element usWinDescent
Comment Descender metric for Windows, –yMin for all characters in the Windows ANSI set. For platform 3 encoding 0 fonts same as –yMin

XavrCharWidth

Format TTF
Structure 'OS2' table
Element xAvgCharWidth
Comment Average of the width of all of the 26 lowercase letters a through z. If any of the 26 lowercase letters are not present, this parameter should equal the weighted average of all glyphs. For non-UGL (platform 3, encoding 0) fonts, use the unweighted average.

XHeight

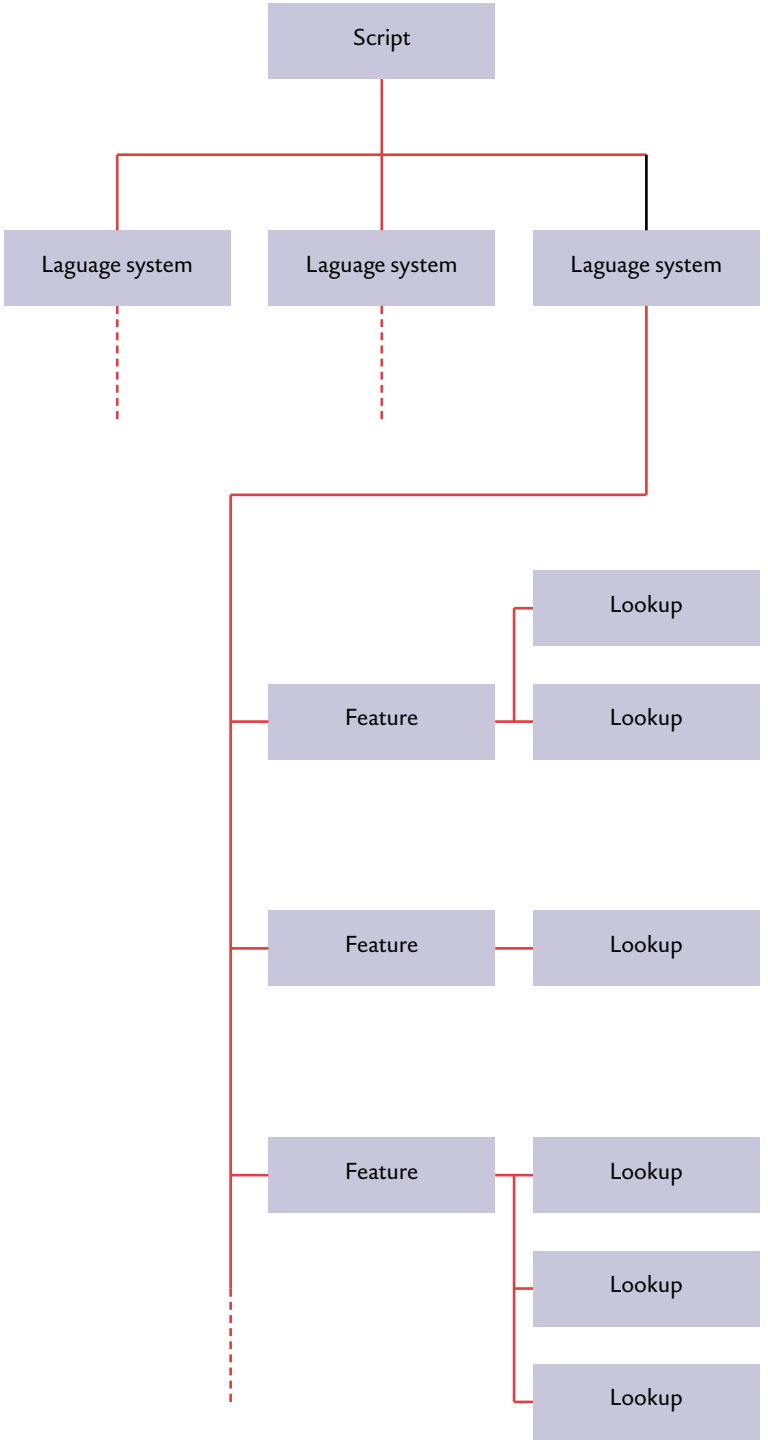
Format AFM
Structure Global font information
Element XHeight
Comment Top of lower case x

Format PFM
Structure EXTTEXTMETRIC
Element etmXHeight
Comment Height of lower case letters in the font

Format TI
Structure Private dictionary
Element BlueValues
Comment x-height alignment

The OpenType Layout Model

OpenType layout data is organized by script, language system, typographic feature and lookup.



Contents

1. A short history of font technology

Before 1980 Proprietary and hardware dependent font formats (bitmap, vector).

1974–1978 Ikarus outline font format (open format, machine independent, font data base format).

Mid 1980s Scalable font formats (outline + hints).
– URW VS, BS.
– Type 1 (based on Bezier and URW-like hints).
– F3, Bitstreams Speedo and others …

Late 1980s Development of TrueType by Apple (Unicode based, instructions, flexible and expandable).
– Implementation on the Macintosh in 1990.
– Implementation in Windows 3.1 in 1991.

1991 Opening of Type 1 Format (Adobe) (1- Byte font format).
To font format for 2-Byte fonts.

1993 CID font format for CJK (2-Byte).
– Took 5–6 years to appear on the market.

1994 TrueType GX (advanced Layout features).
– Failed on the market.

1995 TTO (multilingual support, Layout features for Arabic).
TTC (TrueType Collection Files).

1996 SFNT-Wrapped CID Fonts (Adobe, Mac platform).

1997 OpenType specification.

Increasing complexity

1.1 *Conclusion*

– Font technology has been rapidly developed during the last 20 years.
– Font technology has become a very important part in the computerized world.
– Parallel to globalization, fonts have been been extended to complex scripts like Arabic, Indic, Thai etc. and to large character sets for China, Japan and Korea.
– Fonts are becoming more and more complex, which puts more pressure on the font developer and designer.
– The evolution of the font formats also allows the use of fine typographic features.

2. What is OpenType ?

Open Type is more than a simple font format, it is an architecture with building blocks:
– OpenType fonts.
– Operating System support.
– Application support.
– Printer support.

OpenType fonts have four essential ingredients:
– Outline description (Bezier, quadratic splines …).
– Hinting information for screen optimization (hints, instructions).
– Character mapping tables.
– Features (for glyph substitution and positioning).

OpenType fonts come in two flavours:
– Type 1 outlines, hints (.otf)
– TrueType outlines, instructions (.ttf)

There is no standard as to what an OpenType font must contain (this might be difficult for the customer and but also for marketing):
– 256 – >50000 glyphs.
– hundreds of features or none.

2.1 *OS Support*

OpenType fonts should work on different platforms (Windows, Mac OS, Linux). Windows 2000 and XP support both OTF flavours natively and support many features (not all) through its Uniscribe API and the OTLS (OpenType Layout Services Library). Mac OS 9.2 and OS X support for both OTF flavours is limited. Glyph access and rendering is supported but there is no OS support for layout features. Apple supports instead its own Apple Advanced Technology (AAT) technology, which is a renamed version of GX. This means that fonts which should work on both platforms must support both OpenType layout tables as well as the AAT tables. Linux should support OpenType through Freetype.

2.2 *Applications*

Applications are using the outlines, hints and feature tables. Adobe has implemented the feature font support into the applications such as InDesign, PhotoShop, etcetera. These programs are platform independent, and OS independent).

3. The structure of OpenType fonts

OpenType fonts have a common table structure like TTFs (also called SFNT on the Macintosh). OpenType Fonts may use Type 1-like outlines and hints or TrueType-like outlines and hints. The reason for that was probably that neither Microsoft nor Adobe wanted to throw away the considerable amount of work which had been done on the Type 1 and TrueType architectures.

Advantages of Type 1-like outlines (CFF table):
– Simple hinting structure, intelligence in the rasterizer.
– Thousands of existing Type 1 fonts can be converted without quality loss.
– Bezier outlines are familiar to (type) designers.

Advantages of TrueType outlines (GLYF table):
– Powerful instructions for suberb screen quality.
– Quadratic spline outlines.

Other information is stored in common tables, such as:
– cmap for the mapping of glyphs –> Unicode code points.
– head, hhea for header information.
– OS/2 for general font information.
– Gasp for greyscaling.

Essential for OpenType are the following tables:
– GPOS *glyph positioning*
– GSUB *glyph substitution*
– GDEF *glyph definition*
– BASE *baseline table for different scripts*
– JSTF *justification*
– DSIG *digital signature*

The main difference with simple TrueType fonts is the presence of some of the above listed tables which allow access to glyphs which have no direct Unicode codepoint. For complex scripts, i.e. writing systems that require some degree of character reordering and/or glyph processing to display, print or edit text (such as Arabic or Indic) Open Type tables are absolutely necessary.

Using this technology permits the font developer to implement:
– OpenType Layout fonts allow a rich mapping between characters and glyphs, which supports ligatures, positional forms, alternates, and other substitutions.
– OpenType Layout fonts include information to support features for two-dimensional positioning and glyph attachment.
– OpenType Layout fonts contain explicit script and language information,

	TrueType (TTF)	Apples TTF (AAT/GX)	OpenType (TTF)	OpenType (OTF)	SFNT-CID (Adobe)
Required	head, hhea, hmtx name OS/2 maxp post cmap	head, hhea, hmtx name OS/2 maxp post cmap	head, hhea, hmtx name OS/2 maxp post cmap **DSIG**	head, hhea, hmtx name OS/2 maxp post cmap	cmap name post
Outline	glyf, loca cvt, fpgm, prep	glyf, loca cvt, fpgm, prep	glyf, loca cvt, fpgm, prep	CFF	CID
Optional	gasp hdmx kern LTSH PCLT VDMX vhea vmtx	gasp hdmx kern vhea vmtx	gasp hdmx kern LTSH PCLT VDMX vhea vmtx	gasp kern vhea vmtx VORG	
Bitmap	EBDT EBLC EBSC	bdat bloc	EBDT EBLC EBSC		bdat bloc
OTF			BASE (baseline data) GDEF (glyph definition) GPOS (glyph positioning) GSUB (glyph substitution) JSTF (Justification)	BASE (baseline data) GDEF (glyph definition) GPOS (glyph positioning) GSUB (glyph substitution) JSTF (Justification)	
AAT		mort, feat, bsln, prop opdb, trak, just … fvar, gvar, Zapf …			faet mort
Adobe					ALMX BBOX FNAM, HFMX, VFMX

The TrueType Font File (Apple's specification AAT)

acnt	*accent attachment table*	hhea	*horizontal header table*
avar	*axis variation table*	hmtx	*horizontal metrics table*
bdat	*bitmap data table*	**hsty**	*horizontal style table*
bhed	*bitmap font header table*	**just**	*justification table*
bloc	*bitmap location table*	kern	*kerning table*
bsln	*baseline table*	**lcar**	*ligature caret table*
cmap	*character code mapping table*	loca	*glyph location table*
		maxp	*maximum profile table*
cvar	*CVT variation table*	**mort**	*metamorphosis table*
cvt	*control value table*	**morx**	*extended metamorphosis table*
EBSC	*embedded bitmap scaling control table*	name	*name table*
fdsc	*font descriptor table*	opbd	*optical bounds table*
feat	*layout feature table*	OS/2	*compatibility table*
fmtx	*font metrics table*	post	*glyph name PostScript compatibility table*
fpgm	*font program table*		
fvar	*font variation table*	prep	*control value program table*
gasp	*gridfitting and scanconversion procedure table*	**prop**	*properties table*
glyf	*glyph outline table*	**trak**	*tracking table*
gvar	*glyph variation table*	vhea	*vertical header table*
hdmx	*horizontal device metrics table*	vmtx	*vertical metrics table*
		Zapf	*glyph reference table*
head	*font header table*		

so a textprocessing application can adjust its behavior accordingly.
– OpenType Layout fonts have an open format that allows font developers to define their own typographical features.

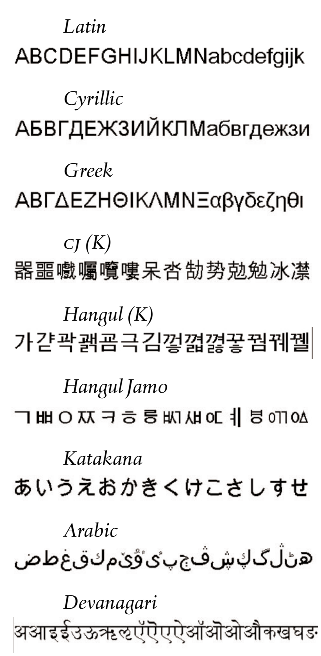
4. The OpenType Layout model

4.1 *Scripts*

Scripts are defined at the top level. A script is a collection of glyphs used to represent one or more languages in writing. For instance, a single script-Latin is used to write English, French, German, and many other languages. In contrast, three scripts –Hiragana, Katakana, and Kanji– are used to write Japanese. With OpenType Layout, multiple scripts may be supported by a single font.

4.2 *Language system*

A language system may modify the functions or appearance of glyphs in a script to represent a particular language. For example, the eszet ligature



OpenType fonts with CFF outlines and AAT support tables.

```
****************************************
*********** Table Directory ************
****************************************
version:      20308.33
numTables:        22
searchRange:     256
entrySelector:     4
rangeShift:       96

tag      offset      length       checksum
-----------------------------------------
BASE        364         456       6962C672
CFF         820     6720412       D234DEBC
DSIG   10240852        5788       EADEC4BC
EBDT    6721232     1636487        32BDCD3
EBLC    8357720       67148       883E371E
GPOS    8424868       14600       DD21703D
GSUB    8439468      185706       7F930AE3
OS/ 2   8625176          96       3814B65D
VORG    8625272         812        2BE8ACA
Zapf    8626084      442236       2736C019
cmap    9068320      276664       E31BA3BF
feat    9344984         340       81CD4A53
head    9345324          54       D3061EC9
hhea    9345380          36        8B5416B
hmtx    9345416       72546       D255AEAD
maxp    9417964           6       4F485000
morx    9417972      739840        496DB24
name   10157812        5060       3F369656
post   10162872          32       FFB80032
prop   10162904        3758       DA5761FF
vhea   10166664          36        74F5311
vmtx   10166700       74152       8EFBA4CC
```

is used in the German language system, but not in French or English. And the Arabic script contains different glyphs for writing the Farsi and Urdu languages. In the absence of language- specific rules, default language system features apply to the entire script.

Another example is the hani script which supports China, Korea and Japan. Here we have different glyphs for the same Unicode codepoint for different language systems as can be seen for example in the MS Arial Unicode font:
Script Tag: hani
Language Tag: ZHT, ZHS, KOR

辯 *Chinese traditional*
辩 *Chinese simplified*
辯 *Japanese*

4.3 *Features*

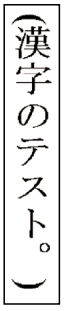
A language system defines features, which are typographic rules for using glyphs to represent a language. The typographic features define the functionality of an OpenType Layout font and are registered in the *OpenType Layout tag registry* at the Microsoft Typography homepage. Font developers can use these features, as well as create their own (if they find an application which uses them!)

Some examples of typographic features are:

– **vert**

This substitutes vertical glyphs in Japanes.

(漢字のテスト。)



The substitution of vertical glyphs in Japanese (MS Mincho).

– **init, medi, fina**

A language system feature for the Arabic script substitutes initial, medial, and final glyph forms based on a glyph's position in a word.

Standalone 'ha'

Initial 'ha'

Medial 'ha'

Final 'ha'

– **liga**

Feature for using ligatures in place of separate glyphs.

Ligature in backing store (left) and ***liga*** *form (right):*

f+i fi

– **clig**

Unlike other ligature features, **clig** specifies the context in which the ligature is recommended. This capability is important in some script designs and for swash ligatures. The **clig** table maps sequences of glyphs to corresponding ligatures in a chained context (GSUB lookup type 8). Fpr example: the ligature glyph 'ft' replaces the sequence f t, except when preceded by an ascending letter.

Ligature in backing store (top) and ***clig*** *form (bottom):*

a+f+t

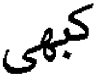
aft

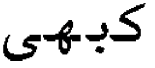
– **kern**

The kern feature is an example of a GPOS feature, i.e. it modifies the positioning of the glyphs. The **kern** feature is used to adjust the amount of space between glyphs, generally to provide optically consistent spacing between glyphs.

– Vertical.
– Horizontal.
– Size dependent kerning (via device tables).
– cross-stream kerning in the Y text direction.
– adjustment of glyph placement independent of the advance adjustment.
– adjustments for pairs of glyphs (GPOS lookup type 2 or 8).
– Support for left and right classes, and/or as individual pairs.

Other examples for GPOS features: Urdu layout requires glyph positioning control, as well as contextual substitution.

Correct: 

Incorrect: 

4.4 *Lookups*

Features are implemented with lookup data that the text processing client uses to substitute and position glyphs. Lookups describe the glyphs affected by an operation, the type of operation to be applied to these glyphs, and the resulting glyph output.

4.5 *GSUB table*

The GSUB table contains substitution lookups that map GIDs to GIDs and associate these mappings with particular OpenType Layout features. The OpenType specification currently supports six different GSUB lookup types:

1. *Single*
   Replaces one glyph with one glyph. (*vert, salt, …*).
2. *Multiple*
   Replaces one glyph with more than one glyph (*ligature decomposition*).
3. *Alternate*
   Replaces one glyph with one of many glyphs(*crcy*).
4. *Ligature*
   Replaces multiple glyphs with one glyph (*liga …*).
5. *Context*
   Replaces one or more glyphs in context (*clig …*).
6. *Chaining context*
   Replaces one or more glyphs in chained context (*Swash alternates*).

4.6 *GPOS table*

The GPOS table contains a powerful set of lookup types to reposition glyphs relative to their normative positions and to each other. Glyph positioning lookups work in two ways: by adjusting glyph positions relative to their metrical space or by linking predefined attachment points on different glyphs.

These two methods are further divided into specific adjustment and attachment lookup types that can be used to control positioning of diacritics relative to single or ligatured characters and even to enable chains of contextual positioning operations. The OpenType specification currently supports eight different GPOS lookup types:

– A *single adjustment* positions one glyph, such as a superscript or subscript.
– A *pair adjustment* positions two glyphs with respect to one another; kerning is an example of pair adjustment.
– A *cursive attachment* describes cursive scripts and other glyphs that are connected with attachment points when rendered.
– A *MarkToBase* attachment positions combining marks with respect to base glyphs, as when positioning vowels, diacritical marks, or tone marks in Arabic, Hebrew and Vietnamese.
– A *MarkToLigature* attachment positions combining marks with respect to ligature glyphs. Because ligatures may have multiple points for attaching marks, the font developer needs to associate each mark with one of the ligature glyph's components.
– A *MarkToMark* attachment positions one mark relative to another, as when positioning tone marks with respect to vowel diacritical marks in Vietnamese, for example.
– *Contextual* positioning describes how to position one or more glyphs in context.
– *Chaining Contextual* positioning describes how to position one or more glyphs in a chained context.

4.7 *Processing of features and lookups*

After choosing which features to use, the client assembles all lookups from the selected features. Multiple lookups may be needed to define the data required for different substitution and positioning actions, as well as to control the sequencing and effects of those actions. To implement features, a client applies the lookups in the order the lookup definitions occur in the *LookupList*. As a result, within the GSUB or GPOS table, lookups from several different features may be interleaved during text processing. A lookup is finished when the client locates a target glyph or glyph context and performs a substitution (if specified) or a positioning (if specified). The substitution (GSUB) lookups always occur before the positioning (GPOS) lookups. The lookup sequencing mechanism in TrueType relies on the font to determine the proper order of text-processing operations.

4.8 *Ordering lookups (within the future tag)*

The order of the lookup within the feature tag is critical. The lookup you define first will take priority. For example: if you have two ligatures TA + AE defined in your lookup table, with the AE listed first, and you type 'TAE', you would only get the AE ligature and not the TA, because the A is already converted into the AE ligature.

Contextual positioning lowered the accent over a vowel glyph that followed an overhanging uppercase glyph.

4.9 *Ordering ligatures and conjuncts* *(within the lookup)*

To ensure that ligatures and conjuncts are formed properly, one has to order substitutions so that the ones with higher priority precede others those with lower priority. It is also important to form the longer lookups before the shorter ones.

When forming ligatures, the lookups need to be encoded as follows:
– The first substitution in a lookup maps the longest string of component characters to the appropriate glyph; the next substitution provides the glyph corresponding to the next longest string of characters; and so forth. This is important because the search process through the lookups terminates with the first match.
– For consonant conjuncts, full form conjuncts must precede half forms.

For the fi & ffi ligatures, feature tag **liga**, if you order f + i –> fi before f + f + i –> ffi the ffi ligature would not be formed, because the search process stopped with the fi. When the 'longer' lookup is listed first, the ffi ligature is formed correctly.

Language dependency of features and lookups:
On the right is a (well-known) example for the language dependent glyph substitution. It shows a small part of the feature file which excludes the fi ligature for the Turkish language; in Turkish it is not allowed to form an fi ligature because the dotless i has a different meaning than the normal dotted i.

```
feature liga {
     sub f f i by ffi;
     sub f i by fi;
  lookup NOFI {
     sub f f l by ffl;
     sub f f by ff;
     sub f l by fl;
     sub f f j by f_ f_ j;
     sub f j by f_ j;
  } NOFI;
  language TUR excludeDFLT;
  lookup NOFI;
} liga;
```

A small part of the feature file which excludes the fi ligature for the Turkish language.

	Feature	Feature function	Layout operation	Required
Language based forms	ccmp	Character composition/ decomposition substitution	GSUB	
Typographical forms	liga	Standard ligature substitution	GSUB	
	clig	Contextual ligature substitution	GSUB	
Positioning features	kern	Pair kerning	GPOS	
	mark	Mark to base positioning	GPOS	x
	mkmk	Mark to mark positioning	GPOS	x

Features for standard scripts (Windows Uniscribe/OTLS). More features are supported by InDesign and other Adobe applications.

5. OpenType production with DTL FontMaster

As can be seen from the previous sections, OpenType is a rich specification which allows thousands of possible combinations of language lookups and features. Its quite obvious that writing a GUI for the OpenType tables is a huge task. The DTL FontMaster approach is trying to make it quite easy to generate an OpenType font.

– The Opentype production is based on Adobe's SDK.
– Currently only the OTF production is supported (via Type 1 and CFF).
– DTL DataMaster automatically generates as many features as possible.
– Advanced users can create their own set of features.
– No fancy graphic user interface.

In DTL DataMaster the OTF production is essentially governed by two files:

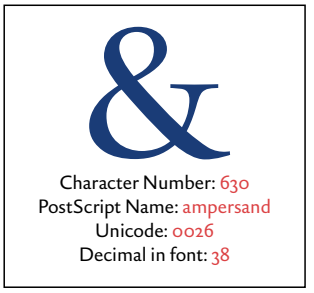
– The Character Layout File, which is described in Appendix III.
– The OpenType Feature File.

Appendix VII: Character Number Listing

A DTL FontMaster database consists of a number of slots in the 16-bit range i.e. from 1 to 65535. The number of each slot, the Character Number, corresponds with a glyph, of which the PostScript name and Unicode number will be attached to it when a font is generated. This is a very elegant system that makes large font productions possible because there is no need to check each character in the database or final codepage for its unique specifications.

The mapping of the character depends on the relation of the number with the used Character Layout File (see Appedix III). The Character Numbers on the following pages relates to the standard Character Layout files, like *beeditor.cha* and *urwotf.cha*, that are delivered with DTL FontMaster and which are located in the same directory as the program files. However, it is possible to make use of any other system for numbering the characters. In that case proprietary Character Layout Files have to be made in order to generate fonts correctly.

In case the Character Number is not specified, it is marked with an asterisk in the overview on the next pages.



The ampersand occupies slot (decimal) 38 in every codepage because it is part of the ASCII set. The Character Number in the DTL FontMaster database is 630. The Unicode number is 0026.

The beeditor.cha file; the supported codepages are easy to recognize.

```
C character mapping file ;;
Version 002.000;;
Starttable;;
UNINum;URWNum;UNINumUp;ANNumLat1;QDNumLat1;ANNumLat2;QDNumLat2;ANNumGr;QDNumGr;ANNumTu;QDNumTu;ANNumCy;QDNumCy;
ANNumHe;QDNumHe;ANNumBa;QDNumRo;ANNumSym;QDNumSym;ANNumKazahk;QDNumKazahk;ANNumUzbek;QDNumUzbek;PSName
x0020;999;x0020;032;032;032;032;032;032;032;032;032;032;032;032;032;032;032;032;32;32;32;32;32;space
x0021;614;x0021;033;033;033;033;033;033;033;033;033;033;033;033;033;033;033;033;33;33;33;33;33;exclam
x0022;636;x0022;034;034;034;034;034;034;034;034;034;034;034;034;034;034;034;034;34;34;34;34;34;quotedbl
x0023;638;x0023;035;035;035;035;035;035;035;035;035;035;035;035;035;035;035;035;35;35;35;35;35;numbersign
x0024;512;x0024;036;036;036;036;036;036;036;036;036;036;036;036;036;036;036;036;36;36;36;36;36;dollar
x0025;698;x0025;037;037;037;037;037;037;037;037;037;037;037;037;037;037;037;037;37;37;37;37;37;percent
x0026;630;x0026;038;038;038;038;038;038;038;038;038;038;038;038;038;038;038;038;38;38;38;38;38;ampersand
x0027;635;x0027;039;039;039;039;039;039;039;039;039;039;039;039;039;039;039;039;39;39;39;39;39;quotesingle
x0028;626;x0028;040;040;040;040;040;040;040;040;040;040;040;040;040;040;040;040;40;40;40;40;40;parenleft
x0029;627;x0029;041;041;041;041;041;041;041;041;041;041;041;041;041;041;041;041;41;41;41;41;41;parenright
x002a;634;x002a;042;042;042;042;042;042;042;042;042;042;042;042;042;042;042;042;42;42;42;42;42;asterisk
x002b;640;x002b;043;043;043;043;043;043;043;043;043;043;043;043;043;043;043;043;43;43;43;43;43;plus
x002c;607;x002c;044;044;044;044;044;044;044;044;044;044;044;044;044;044;044;044;44;44;44;44;44;comma
x002d;623;x002d;045;045;045;045;045;045;045;045;045;045;045;045;045;045;045;045;45;45;45;45;45;hyphen
x002e;601;x002e;046;046;046;046;046;046;046;046;046;046;046;046;046;046;046;046;46;46;46;46;46;period
x002f;622;x002f;047;047;047;047;047;047;047;047;047;047;047;047;047;047;047;047;47;47;47;47;47;slash
x0030;510;x0030;048;048;048;048;048;048;048;048;048;048;048;048;048;048;048;048;48;48;48;48;48;zero
x0031;501;x0031;049;049;049;049;049;049;049;049;049;049;049;049;049;049;049;049;49;49;49;49;49;one
x0032;502;x0032;050;050;050;050;050;050;050;050;050;050;050;050;050;050;050;050;50;50;50;50;50;two
x0033;503;x0033;051;051;051;051;051;051;051;051;051;051;051;051;051;051;051;051;51;51;51;51;51;three
x0034;504;x0034;052;052;052;052;052;052;052;052;052;052;052;052;052;052;052;052;52;52;52;52;52;four
x0035;505;x0035;053;053;053;053;053;053;053;053;053;053;053;053;053;053;053;053;53;53;53;53;53;five
x0036;506;x0036;054;054;054;054;054;054;054;054;054;054;054;054;054;054;054;054;54;54;54;54;54;six
x0037;507;x0037;055;055;055;055;055;055;055;055;055;055;055;055;055;055;055;055;55;55;55;55;55;seven
x0038;508;x0038;056;056;056;056;056;056;056;056;056;056;056;056;056;056;056;056;56;56;56;56;56;eight
x0039;509;x0039;057;057;057;057;057;057;057;057;057;057;057;057;057;057;057;057;57;57;57;57;57;nine
x003a;602;x003a;058;058;058;058;058;058;058;058;058;058;058;058;058;058;058;058;58;58;58;58;58;colon
x003b;608;x003b;059;059;059;059;059;059;059;059;059;059;059;059;059;059;059;059;59;59;59;59;59;semicolon
x003c;1111;x003c;060;060;060;060;060;060;060;060;060;060;060;060;060;060;060;060;60;60;60;60;60;less
x003d;644;x003d;061;061;061;061;061;061;061;061;061;061;061;061;061;061;061;061;61;61;61;61;61;equal
x003e;1112;x003e;062;062;062;062;062;062;062;062;062;062;062;062;062;062;062;062;62;62;62;62;62;greater
x003f;616;x003f;063;063;063;063;063;063;063;063;063;063;063;063;063;063;063;063;63;63;63;63;63;question
```

Character Number; Unicode Number; PostScript Name

101; 0041; A
102; 0042; B
103; 0043; C
104; 0044; D
105; 0045; E
106; 0046; F
107; 0047; G
108; 0048; H
109; 0049; I
110; 004A; J
111; 004B; K
112; 004C; L
113; 004D; M
114; 004E; N
115; 004F; O
116; 0050; P
117; 0051; V
118; 0052; R
119; 0053; S
120; 0054; V
121; 0055; U
122; 0056; V
123; 0057; W
124; 0058; X
125; 0059; Y
126; 005A; Z
127; 00C6; AE
128; 0152; OE
129; 00D8; Oslash
196; 01D1; unio1D1
200; 0132; IJ
201; 00C4; Adieresis
202; 00C1; Aacute
203; 00C0; Agrave
204; 00C2; Acircumflex
205; 01CD; unio1CD
206; 0102; Abreve
207; 00C3; Atilde
208; 00C5; Aring
209; 0104; Aogonek
210; 00C7; Ccedilla
211; 0106; Cacute
212; 010C; Ccaron
213; 010A; Cdotaccent
214; 010E; Dcaron
215; 00D0; Eth
215; 0110; Dcroat
216; 00CB; Edieresis
217; 00C9; Eacute
218; 00C8; Egrave
219; 00CA; Ecircumflex
220; 011A; Ecaron
221; 0116; Edotaccent
222; 0118; Eogonek
223; 01E6; Gcaron
224; 011E; Gbreve
225; 0120; Gdotaccent
226; 00CF; Idieresis
227; 00CD; Iacute
228; 00CC; Igrave
229; 00CE; Icircumflex
230; 0130; Idotaccent
231; 0139; Lacute
232; 013D; Lcaron
233; 014I; Lslash
234; 0143; Nacute
235; 0147; Ncaron
236; 00D1; Ntilde
237; 00D6; Odieresis
238; 00D3; Oacute
239; 00D2; Ograve
240; 00D4; Ocircumflex
241; 00D5; Otilde
242; 0150; Ohungarumlaut
243; 0154; Racute
244; 0158; Rcaron
245; 015A; Sacute
246; 0160; Scaron
248; 015E; Scedilla
249; 0164; Tcaron
251; 00DC; Udieresis
252; 00DA; Uacute
253; 00D9; Ugrave
254; 00DB; Ucircumflex
255; 016E; Uring
256; 0170; Uhungarumlaut
257; 00DD; Yacute
258; 0179; Zacute
259; 017D; Zcaron
260; 017B; Zdotaccent
261; 00DE; Thorn
262; 0100; Amacron
263; 0162; Tcommaaccent
264; 0108; Ccircumflex
265; 0174; Wcircumflex
266; 1E84; Wdieresis
267; 0176; Ycircumflex
268; 0178; Ydieresis
269; 0126; Hbar
272; 0112; Emacron
273; 011C; Gcircumflex
274; 0124; Hcircumflex
275; 012A; Imacron
276; 012E; Iogonek
277; 0134; Jcircumflex
278; 0136; Kcommaaccent
280; 013B; Lcommaaccent
281; 0145; Ncommaaccent
283; 014C; Omacron
285; 0156; Rcommaaccent
286; 015C; Scircumflex
287; 0122; Gcommaaccent
289; 01D3; Ucaron
290; 016A; Umacron
291; 0172; Uogonek
296; 0114; Ebreve
300; 012C; Ibreve
301; 0061; a
302; 0062; b
303; 0063; c
304; 0064; d
305; 0065; e
306; 0066; f
307; 0067; g
308; 0068; h
309; 0069; i
310; 006A; j
311; 006B; k
312; 006C; l

Character Number; Unicode Number; PostScript Name

313; 006D; m
314; 006E; n
315; 006F; o
316; 0070; p
317; 0071; q
318; 0072; r
319; 0073; s
320; 0074; t
321; 0075; u
322; 0076; v
323; 0077; w
324; 0078; x
325; 0079; y
326; 007A; z
327; 00E6; ae
328; 0153; oe
329; 00F8; oslash
330; 00DF; germandbls
331; 0131; dotlessi
333; 0133; ij
336; EA00; ff
337; EA01; fi
338; EA02; fl
341; EA03; ffi
342; EA04; ffl
351; F6E9; asuperior
352; F6EA; bsuperior
354; F6EB; dsuperior
355; F6EC; esuperior
359; F6ED; isuperior
362; F6EE; lsuperior
363; F6EF; msuperior
364; 207F; nsuperior
365; F6F0; osuperior
368; F6F1; rsuperior
369; F6F2; ssuperior
370; F6F3; tsuperior
399; 207D; parenleftsuperior
400; 207E; parenrightsuperior
401; 00E4; adieresis
402; 00E1; aacute
403; 00E0; agrave
404; 00E2; acircumflex
405; 01CE; uni01CE
406; 0103; abreve
407; 00E3; atilde
408; 00E5; aring
409; 0105; aogonek
410; 0107; cacute
411; 010D; ccaron
412; 010B; cdotaccent
413; 00E7; ccedilla
414; 010F; dcaron
415; 0111; dcroat
416; 00EB; edieresis
417; 00E9; eacute
418; 00E8; egrave
419; 00EA; ecircumflex
420; 011B; ecaron
421; 0117; edotaccent
422; 0119; eogonek
423; 01E7; gcaron
424; 011F; gbreve
425; 0121; gdotaccent
426; 00EF; idieresis
427; 00ED; iacute
428; 00EC; igrave
429; 00EE; icircumflex
430; 013A; lacute
431; 013E; lcaron
432; 0142; lslash
433; 0144; nacute
434; 0148; ncaron
435; 00F1; ntilde
436; 00F6; odieresis
437; 00F3; oacute
438; 00F2; ograve
439; 00F4; ocircumflex
440; 00F5; otilde
441; 0151; ohungarumlaut
442; 0155; racute
444; 015B; sacute
445; 015D; scircumflex
446; 0161; scaron
447; EA6E; scommaaccent
448; 0165; tcaron
449; 00FC; udieresis
450; 00FA; uacute
451; 00F9; ugrave
452; 00FB; ucircumflex
453; 016F; uring
454; 0171; uhungarumlaut
455; 00FD; yacute
456; 017A; zacute
457; 017E; zcaron
458; 017C; zdotaccent
459; 00F0; eth
460; 00FE; thorn
461; 00FF; ydieresis
462; 0127; hbar
463; 0163; tcommaaccent
464; 0175; wcircumflex
466; 0101; amacron
467; 0177; ycircumflex
469; 0109; ccircumflex
472; 0113; emacron
473; 011D; gcircumflex
474; 012D; ibreve
475; 012B; imacron
476; 0135; jcircumflex
477; 0137; kcommaaccent
478; 013C; lcommaaccent
481; 0146; ncommaaccent
482; 014D; omacron
483; 0157; rcommaaccent
485; 016D; ubreve
486; 016B; umacron
487; 0173; uogonek
488; 0159; rcaron
489; 015F; scedilla
491; 0123; gcommaaccent
501; 0031; one
502; 0032; two
503; 0033; three
504; 0034; four
505; 0035; five
506; 0036; six
507; 0037; seven
508; 0038; eight

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509; 0039; nine
510; 0030; zero
511; 00A3; sterling
512; 0024; dollar
513; 00A2; cent
514; 0192; florin
515; 20AC; Euro
516; 00A5; yen
518; 20A7; peseta
519; 20A4; lira
523; EA71; peseta1
524; 20A3; franc
527; F6DC; one.fitted
528; F63A; two.fitted
529; F63B; three.fitted
530; F63C; four.fitted
531; F63D; five.fitted
532; F63E; six.fitted
533; F63F; seven.fitted
534; F640; eight.fitted
535; F641; nine.fitted
536; F639; zero.fitted
543; F731; oneoldstyle
544; F732; twooldstyle
545; F733; threeoldstyle
546; F734; fouroldstyle
547; F735; fiveoldstyle
548; F736; sixoldstyle
549; F737; sevenoldstyle
550; F738; eightoldstyle
551; F739; nineoldstyle
552; F730; zerooldstyle
553; • ; one.numerator
554; • ; two.numerator
555; • ; three.numerator
556; • ; four.numerator
557; • ; five.numerator
558; • ; six.numerator
559; • ; seven.numerator
560; • ; eight.numerator
561; • ; nine.numerator
562; • ; zero.numerator
565; • ; one.denominator
566; • ; two.denominator
567; • ; three.denominator
568; • ; four.denominator
569; • ; five.denominator
570; • ; six.denominator
571; • ; seven.denominator
572; • ; eight.denominator
573; • ; nine.denominator
574; • ; zero.denominator
575; 00B9; onesuperior
576; 00B2; twosuperior
577; 00B3; threesuperior
578; 2074; foursuperior
579; 2075; fivesuperior
580; 2076; sixsuperior
581; 2077; sevensuperior
582; 2078; eightsuperior
583; 2079; ninesuperior
584; 2070; zerosuperior
587; 2081; oneinferior
588; 2082; twoinferior
589; 2083; threeinferior
590; 2084; fourinferior
591; 2085; fiveinferior
592; 2086; sixinferior
593; 2087; seveninferior
594; 2088; eightinferior
595; 2089; nineinferior
596; 2080; zeroinferior
597; EAB9; periodsuperior
598; EABA; commasuperior
599; EA90; zeroslash
601; 002E; period
602; 003A; colon
604; 00B7; periodcentered
604; 2219; middot
604; 0387; anoteleia
604; 22C5; dotmath
606; 2026; ellipsis
607; 002C; comma
608; 003B; semicolon
609; 02BC; afii57929
610; 2018; quoteleft
611; 201D; quotedblright
612; 201C; quotedblleft
613; 201E; quotedblbase
614; 0021; exclam
615; 00A1; exclamdown
616; 003F; question
617; 00BF; questiondown
618; 00BB; guillemotright
619; 00AB; guillemotleft
620; 203A; guilsinglright
621; 2039; guilsingleft
622; 002F; slash
623; 002D; hyphen
623; 00AD; sfthyphen
623; 2011; nbhyphen
624; 2012; figuredash
624; 2013; endash
625; 2014; emdash
625; 2015; afii00208
626; 0028; parenleft
627; 0029; parenright
628; 005B; bracketleft
629; 005D; bracketright
630; 0026; ampersand
631; 00A7; section
632; 2020; dagger
633; 2021; daggerdbl
634; 002A; asterisk
635; 0027; quotesingle
636; 0022; quotedbl
637; 0040; at
638; 0023; numbersign
639; 00B0; degree
640; 002B; plus
641; 2212; minus
642; 00D7; multiply
643; 00F7; divide
644; 003D; equal
646; 2101; uni2101
647; 2236; uni2236
648; EA31; uniEA31
649; EA32; uniEA32
650; 2122; trademark

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651; 00B6; paragraph
652; 00A4; currency
653; 201A; quotesinglbase
654; 2019; quoteright
655; 007B; braceleft
656; 007D; braceright
657; 00AA; ordfeminine
658; 00BA; ordmasculine
659; 00B1; plusminus
660; 211E; prescription
662; 00BD; onehalf
663; 2153; onethird
664; 2154; twothirds
665; 00BC; onequarter
666; 00BE; threequarters
673; 215B; oneeighth
674; 215C; threeeighths
675; 215D; fiveeighths
676; 215E; seveneighths
677; 2044; fraction
681; EA72; enonehalf
684; EA73; enonequarter
685; EA74; enthreequarters
698; 0025; percent
699; 2030; perthousand
700; 005C; backslash
701; F6CB; Dieresis
702; • ; Dotaccent
703; • ; Ring
704; • ; Acute
705; F6CE; Grave
706; • ; Circumflex
707; F6CA; Caron
708; • ; Breve
709; • ; Tilde
710; F6CF; Hungarumlaut
711; • ; Cedilla
713; • ; Ogonek
714; F6D0; Macron
718; • ; commaaccent.cap
719; EA67; uniEA67
720; EA68; uniEA68
751; 00A8; dieresis
752; 02D9; dotaccent
753; 02DA; ring
754; 00B4; acute
755; 0060; grave
756; 02C6; circumflex
757; 02C7; caron
758; 02D8; breve
759; 02DC; tilde
760; 02DD; hungarumlaut
761; 00B8; cedilla
763; 02DB; ogonek
764; 02C9; uni02C9
764; 00AF; macron
768; EA69; commaaccent
769; EA3F; uniEA3F
770; EA6A; uniEA6A
784; EA4F; Hochkomma
795; 00A9; copyright
796; 00AE; registered
848; 01FB; aringacute
852; 0125; hcircumflex
855; 0115; ebreve
863; 012F; iogonek
866; 0140; ldot
873; 01D2; uni01D2
874; 014F; obreve
876; 01FF; oslashacute
883; 0129; itilde
886; 0169; utilde
887; 01D4; ucaron
888; EA3B; uniEA3B
903; 013F; Ldot
908; 014E; Obreve
913; EA6D; Scommaaccent
916; 016C; Ubreve
920; 01FA; Aringacute
921; 01FE; Oslashacute
922; 01FC; AEacute
933; 014A; Eng
934; 0166; Tbar
935; 014B; eng
936; 0167; tbar
937; 0138; kgreenlandic
938; 0149; napostrophe
939; 0168; Utilde
940; 01FD; aeacute
942; 0128; Itilde
945; 207B; minussuperior
946; 207A; plussuperior
955; EA35; uniEA35
976; 01D0; uni01D0
978; 01CF; uni01CF
980; 2003; emspace
981; 2002; enspace
984; 200A; hairspace
993; 2009; thinspace
998; 2007; figurespace
999; 0020; space
999; 00A0; nbspace
999; 201B; quotereversed
1001; 263A; smileface
1002; 263B; invsmileface
1003; 2665; heart
1004; 2666; diamond
1005; 2663; club
1006; 2660; spade
1011; 2642; male
1012; 2640; female
1013; 266A; musicalnote
1014; 266C; uni266C
1015; 263C; sun
1016; 2022; bullet
1017; 2218; ring1
1017; 25E6; openbullet
1018; 25D8; invbullet
1019; 25CB; circle
1020; 25D9; invcircle
1021; 25AC; filledrect
1022; 25AE; blackverticalrect
1023; 25A0; filledbox
1024; 25A1; H22073
1025; 25AF; uni25AF
1026; 25B2; triagup
1027; 25B3; uni25B3
1028; 25B8; uni25B8
1029; 25C2; uni25C2

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1030; 25B4; uni25B4
1031; 25BE; uni25BE
1032; 25B9; uni25B9
1033; 25C3; uni25C3
1034; 25BF; uni25BF
1035; 25B5; uni25B5
1036; 2192; arrowright
1037; 2190; arrowleft
1038; 2194; arrowboth
1039; 2191; arrowup
1040; 2193; arrowdown
1041; 2195; arrowupdn
1042; 21A8; arrowupdnbse
1044; 2605; blackstar
1046; 2641; uni2641
1049; 25CA; lozenge
1054; 25BC; triagdn
1059; F003; triagdn
1071; 25CF; H18533
1072; 21B5; carriagereturn
1073; 2329; angleleft
1074; 232A; angleright
1075; 2200; universal
1076; 2135; aleph
1077; 2203; existential
1079; 2111; Ifraktur
1080; 211C; Rfraktur
1081; 220D; suchthat1
1082; 2207; gradient
1085; 2206; Delta/uni2206
1086; 017F; longs
1094; EA51; uniEA51
1095; EA4E; uniEA4E
1098; EA5D; uniEA5D
1099; 21D3; arrowdbldown
1100; 21D1; arrowdblup
1101; 2260; notequal
1102; 2259; uni2259
1103; 2261; equivalence
1104; 221A; radical
1105; 222B; integral
1106; 2320; integraltp
1107; 2321; integralbt
1108; 223C; similar
1109; 2248; approxequal
1110; 2243; asymptoticequal
1111; 003C; less
1112; 003E; greater
1113; 2264; lessequal
1114; 2265; greaterequal
1115; 2319; uni2319
1116; 2310; revlogicalnot
1117; 00AC; logicalnot
1118; 222A; union
1119; 2229; intersection
1120; 2208; element
1121; 22A5; perpendicular
1122; 22C0; logicaland
1123; 22C1; logicalor
1124; 221E; infinity
1125; 221D; proportional
1127; 2245; congruent
1130; 222E; uni222E
1131; 2234; therefore
1132; 2235; uni2235
1133; 220F; product
1134; 2211; summation
1135; 2113; afii61352
1137; 2202; partialdiff
1139; 2297; circlemultiply
1140; 2118; weierstrass
1141; 2284; notsubset
1142; 2220; angle
1143; 2283; propersuperset
1144; 2282; propersubset
1145; 2287; reflexsuperset
1146; 2286; reflexsubset
1147; 2209; notelement
1148; 21D0; arrowdblleft
1149; 21D2; arrowdblright
1150; 21D4; arrowdblboth
1151; 005E; asciicircum
1152; 007C; bar
1153; 00A6; brokenbar
1154; 005F; underscore
1155; 2017; underscoredbl
1156; 203E; radicalex
1157; 2205; emptyset
1158; 203C; exclamdbl
1159; 2225; uni2225
1178; 226B; uni226B
1179; 226A; uni226A
1187; EA21; uniEA21
1188; EA5E; underscorebroken
1195; 2262; uni2262
1201; 2591; ltshade
1202; 2592; shade
1203; 2593; dkshade
1204; 2502; SF110000
1205; 2524; SF090000
1206; 2561; SF190000
1207; 2562; SF200000
1208; 2556; SF210000
1209; 2555; SF220000
1210; 2563; SF230000
1211; 2551; SF240000
1212; 2557; SF250000
1213; 255D; SF260000
1214; 255C; SF270000
1215; 255B; SF280000
1216; 2510; SF030000
1217; 2514; SF020000
1218; 2534; SF070000
1219; 252C; SF060000
1220; 251D; SF080000
1221; 2500; SF100000
1222; 253C; SF050000
1223; 255E; SF360000
1224; 255F; SF370000
1225; 255A; SF380000
1226; 2554; SF390000
1227; 2569; SF400000
1228; 2566; SF410000
1229; 2560; SF420000
1230; 2550; SF430000
1231; 256C; SF440000
1232; 2567; SF450000
1233; 2568; SF460000
1234; 2564; SF470000

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1235; 2565; SF480000
1236; 2559; SF490000
1237; 2558; SF500000
1238; 2552; SF510000
1239; 2553; SF520000
1240; 256B; SF530000
1241; 256B; SF540000
1242; 2518; SF040000
1243; 250C; SF010000
1244; 256D; uni256D
1245; 2570; uni2570
1246; 256E; uni256E
1247; 256F; uni256F
1288; 2311; squarelozenge
1289; 2299; uni2299
1290; 2296; uni2296
1291; 2298; uni2298
1296; 2588; block
1297; 2590; rtblock
1298; 258C; lfblock
1299; 2584; dnblock
1300; 2580; upblock
1318; EA75; vertrect
1330; 2032; minute
1331; 2033; second
1336; 2302; house
1337; 007E; asciitilde
1342; 00B5; mu/uni00B5
1343; EA22; uniEA22
1344; EA23; uniEA23
1345; EA24; uniEA24
1347; EA56; uniEA56
1348; EA55; uniEA55
1349; EA57; uniEA57
1351; EA25; uniEA25
1352; EA26; uniEA26
1353; EA27; uniEA27
1354; EA58; uniEA58
1355; EA59; uniEA59
1356; EA5A; uniEA5A
1357; EA5B; uniEA5B
1359; EA5C; uniEA5C
1369; EA54; uniEA54
1372; EA53; uniEA53
1373; EA52; uniEA52
1412; 2126; Omega/uni2126
1462; 21D5; uni21D5
1463; 22A4; uni22A4
1465; 2285; uni2285
1466; 22A3; uni22A3
1475; 212D; uni212D
1476; 2128; uni2128
1477; 2213; uni2213
1663; 2612; boxwithx
1704; 22A2; uni22A2
1734; 22EF; uni22EF
1735; 22EE; uni22EE
1736; 22FI; uni22FI
1737; 22F0; uni22F0
1756; 21C0; uni21C0
1762; 2196; uni2196
1763; 2198; uni2198
1764; 2197; uni2197
1765; 2199; uni2199
1808; 21C4; uni21C4
1809; 21C6; uni21C6
1900; 2217; asteriskmath
1904; 2237; uni2237
1926; 25C6; uni25C6
1938; 220B; suchthat
1978; 2112; uni2112
1995; 212E; estimated
1998; 210F; uni210F
2009; 25BA; triagrt
2011; 25C4; triaglf
2034; 266B; musicalnotedbl
2035; EA2C; uniEA2C
2036; EA2D; uniEA2D
2037; EA2E; uniEA2E
2038; EA2F; uniEA2F
2039; EA30; uniEA30
2101; 0391; Alpha
2102; 0392; Beta
2103; 0393; Gamma
2104; 0394; Delta
2105; 0395; Epsilon
2106; 0396; Zeta
2107; 0397; Eta
2108; 0398; Theta
2109; 0399; Iota
2110; 039A; Kappa
2111; 039B; Lambda
2112; 039C; Mu
2113; 039D; Nu
2114; 039E; Xi
2115; 039F; Omicron
2116; 03A0; Pi
2117; 03A1; Rho
2118; 03A3; Sigma
2119; 03A4; Tau
2120; 03A5; Upsilon
2121; 03A6; Phi
2122; 03A7; Chi
2123; 03A8; Psi
2124; 03A9; Omega
2134; 03D2; Upsilon1
2301; 03B1; alpha
2302; 03B2; beta
2303; 03B3; gamma
2304; 03B4; delta
2305; 03B5; epsilon
2306; 03B6; zeta
2307; 03B7; eta
2308; 03B8; theta
2309; 03B9; iota
2310; 03BA; kappa
2311; 03BB; lambda
2312; 03BC; mu
2313; 03BD; nu
2314; 03BE; xi
2315; 03BF; omicron
2316; 03C0; pi
2317; 03C1; rho
2318; 03C3; sigma
2319; 03C4; tau
2320; 03C5; upsilon
2321; 03D5; phi1
2322; 03C7; chi
2323; 03C8; psi

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2324; 03C9; omega
2325; 03C2; sigma1
2328; EA3E; uniEA3E
2329; 03D1; theta1
2332; 03C6; phi
2400; 03D6; omega1
2411; 03CA; iotadieresis
2456; 03CB; upsilondieresis
2651; 0384; tonos
2652; 0385; dieresistonos
2701; 0386; Alphatonos
2702; 0388; Epsilontonos
2703; 0389; Etatonos
2704; 038A; Iotatonos
2705; 038C; Omicrontonos
2706; 038F; Omegatonos
2707; 038E; Upsilontonos
2710; 03AA; Iotadieresis
2711; 03AB; Upsilondieresis
2801; 03AC; alphatonos
2802; 03AD; epsilontonos
2803; 03AE; etatonos
2804; 03AF; iotatonos
2805; 03CC; omicrontonos
2806; 03CE; omegatonos
2807; 03CD; upsilontonos
2808; 0390; iotadieresistonos
2809; 03B0; upsilondieresistonos
3101; 0410; afii10017
3102; 0411; afii10018
3103; 0412; afii10019
3104; 0413; afii10020
3105; 0414; afii10021
3106; 0415; afii10022
3107; 0416; afii10024
3108; 0417; afii10025
3109; 0418; afii10026
3110; 041A; afii10028
3111; 041B; afii10029
3112; 041C; afii10030
3113; 041D; afii10031
3114; 041E; afii10032
3115; 041F; afii10033
3116; 0420; afii10034
3117; 0421; afii10035
3118; 0422; afii10036
3119; 0423; afii10037
3120; 0424; afii10038
3121; 0425; afii10039
3122; 0426; afii10040
3123; 0427; afii10041
3124; 0428; afii10042
3125; 0429; afii10043
3126; 042C; afii10046
3127; 042B; afii10045
3128; 042A; afii10044
3129; 042D; afii10047
3130; 042E; afii10048
3131; 042F; afii10049
3132; 0490; afii10050
3133; 0402; afii10051
3134; 0404; afii10053
3135; 0405; afii10054
3136; 0406; afii10055
3136; 04C0; uni04C0
3137; 0408; afii10057
3138; 0409; afii10058
3139; 040A; afii10059
3140; 040B; afii10060
3141; 040F; afii10145
3143; 04E8; C164
3146; 0496; uni0496
3147; 04AE; C176
3148; 04D8; C162
3149; 04BA; C190
3150; 2116; numero
3151; 0492; C173
3155; 04B0; C184
3201; 0401; afii10023
3202; 0419; afii10027
3203; 0403; afii10052
3204; 0407; afii10056
3205; 040C; afii10061
3206; 040E; afii10062
3210; 049C; uni049C
3211; 049A; C187
3212; 04A2; C168
3217; 04B2; uni04B2
3218; 04B8; uni04B8
3301; 0430; afii10065
3302; 0431; afii10066
3303; 0432; afii10067
3304; 0433; afii10068
3305; 0434; afii10069
3306; 0435; afii10070
3307; 0436; afii10072
3308; 0437; afii10073
3309; 0438; afii10074
3310; 043A; afii10076
3311; 043B; afii10077
3312; 043C; afii10078
3313; 043D; afii10079
3314; 043E; afii10080
3315; 043F; afii10081
3316; 0440; afii10082
3317; 0441; afii10083
3318; 0442; afii10084
3319; 0443; afii10085
3320; 0444; afii10086
3321; 0445; afii10087
3322; 0446; afii10088
3323; 0449; afii10091
3324; 044A; afii10092
3325; 044B; afii10093
3326; 044C; afii10094
3327; 044D; afii10095
3328; 044E; afii10096
3329; 044F; afii10097
3330; 0491; afii10098
3331; 0452; afii10099
3332; 0454; afii10101
3333; 0455; afii10102
3334; 0456; afii10103
3335; 0458; afii10105
3336; 0459; afii10106
3337; 045A; afii10107
3338; 045B; afii10108
3339; 045F; afii10193
3341; 04E9; C163

Character Number; Unicode Number; PostScript Name

3345; 0447; afii10089
3346; 0448; afii10090
3347; 0497; uni0497
3348; 04AF; c175
3349; 04D9; c161
3350; 04BB; c189
3351; 0493; c172
3355; 04B1; c181
3401; 0451; afii10071
3402; 0439; afii10075
3403; 0453; afii10100
3404; 0457; afii10104
3405; 045C; afii10109
3406; 045E; afii10110
3410; 049D; uni049D
3411; 049B; c186
3412; 04A3; c166
3417; 04B3; uni04B3
3418; 04B9; uni04B9
4230; • ; Idotaccentsmall
4266; • ; Wdieresis.small
4301; • ; Asmall
4302; • ; Bsmall
4303; • ; Csmall
4304; • ; Dsmall
4305; • ; Esmall
4306; • ; Fsmall
4307; • ; Gsmall
4308; • ; Hsmall
4309; • ; Ismall
4310; • ; Jsmall
4311; • ; Ksmall
4312; • ; Lsmall
4313; • ; Msmall
4314; • ; Nsmall
4315; • ; Osmall
4316; • ; Psmall
4317; • ; Qsmall
4318; • ; Rsmall
4319; • ; Ssmall
4320; • ; Tsmall
4321; • ; Usmall
4322; • ; Vsmall
4323; • ; Wsmall
4324; • ; Xsmall
4325; • ; Ysmall
4326; • ; Zsmall
4327; • ; AEsmall
4328; • ; OEsmall
4329; • ; Oslashsmall
4401; • ; Adieresissmall
4402; • ; Aacutesmall
4403; • ; Agravesmall
4404; • ; Acircumflexsmall
4406; • ; Abreve.small
4407; • ; Atildesmall
4408; • ; Aringsmall
4409; • ; Aogoneksmall
4410; • ; Cacute.small
4411; • ; Ccaron.small
4412; • ; Cdotaccent.small
4413; • ; Ccedillasmall
4414; • ; Dcaron.small
4415; • ; Dcroat.small
4416; • ; Edieresissmall
4417; • ; Eacutesmall
4418; • ; Egravesmall
4419; • ; Ecircumflexsmall
4420; • ; Ecaron.small
4421; • ; Edotaccent.small
4422; • ; Eogonek.small
4423; • ; Gcaron.small
4424; • ; Gbreve.small
4425; • ; Gdotaccent.small
4426; • ; Idieresissmall
4427; • ; Iacutesmall
4428; • ; Igravesmall
4429; • ; Icircumflexsmall
4430; • ; Lacute.small
4431; • ; Lcaron.small
4432; • ; Lslash.small
4433; • ; Nacute.small
4434; • ; Ncaron.small
4435; • ; Ntildesmall
4436; • ; Odieresissmall
4437; • ; Oacutesmall
4438; • ; Ogravesmall
4439; • ; Ocircumflexsmall
4440; • ; Otildesmall
4441; • ; Ohungarumlautsmall
4442; • ; Racute.small
4444; • ; Sacute.small
4445; • ; Scircumflex.small
4446; • ; Scaronsmall
4447; • ; Scommaaccent.small
4448; • ; Tcaron.small
4449; • ; Udieresissmall
4450; • ; Uacutesmall
4451; • ; Ugravesmall
4452; • ; Ucircumflexsmall
4453; • ; Uring.small
4454; • ; Uhungarumlaut.small
4455; • ; Yacutesmall
4456; • ; Zacute.small
4457; • ; Zcaronsmall
4458; • ; Zdotaccent.small
4459; • ; Ethsmall
4460; • ; Thornsmall
4461; • ; Ydieresissmall
4462; • ; Hbar.small
4463; • ; Tcommaaccent.small
4464; • ; Wcircumflex.small
4466; • ; Amacron.small
4467; • ; Ycircumflex.small
4469; • ; Ccircumflex.small
4472; • ; Emacron.small
4473; • ; Gcircumflex.small
4474; • ; Ibreve.small
4475; • ; Imacron.small
4476; • ; Jcircumflex.small
4477; • ; Kcommaaccent.small
4478; • ; Lcommaaccent.small
4481; • ; Ncommaaccent.small
4482; • ; Omacron.small
4483; • ; Rcommaaccent.small
4485; • ; Ubreve.small
4486; • ; Umacron.small
4487; • ; Uogonek.small
4488; • ; Rcaron.small

Character Number; Unicode Number; PostScript Name

4489; • ; Scedilla.small
4491; • ; Gcommaaccent.small
4501; • ; one.small
4502; • ; two.small
4503; • ; three.small
4504; • ; four.small
4505; • ; five.small
4506; • ; six.small
4507; • ; seven.small
4508; • ; eight.small
4509; • ; nine.small
4510; • ; zero.small
4511; • ; sterling.small
4512; • ; dollar.small
4513; • ; cent.small
4514; • ; florin.small
4515; • ; Euro.small
4516; • ; yen.small
4543; F644; one.taboldstyle
4544; F645; two.taboldstyle
4545; F646; three.taboldstyle
4546; F647; four.taboldstyle
4547; F648; five.taboldstyle
4548; F649; six.taboldstyle
4549; F64A; seven.taboldstyle
4550; F64B; eight.taboldstyle
4551; F64C; nine.taboldstyle
4552; F643; zero.taboldstyle
4553; • ; sterling.taboldstyle
4554; • ; dollar.taboldstyle
4555; • ; cent.taboldstyle
4556; • ; florin.taboldstyle
4557; • ; Euro.taboldstyle
4558; • ; yen.taboldstyle
4614; • ; exclamsmall
4615; • ; exclamdownsmall
4616; • ; questionsmall
4617; • ; questiondownsmall
4630; • ; ampersandsmall
4698; • ; percent.small
4699; • ; perthousand.small
4751; • ; Dieresissmall
4752; • ; Dotaccentsmall
4753; • ; Ringsmall
4754; • ; Acutesmall
4755; • ; Gravesmall
4756; • ; Circumflexsmall
4757; • ; Caronsmall
4758; • ; Brevesmall
4759; • ; Tildesmall
4760; • ; Hungarumlautsmall
4761; • ; Cedillasmall
4763; • ; Ogoneksmall
4764; • ; Macronsmall
4768; • ; commaaccent.small
4848; • ; Aringacute.small
4852; • ; Hcircumflex.small
4855; • ; Ebreve.small
4863; • ; Iogonek.small
4866; • ; Ldot.small
4874; • ; Obreve.small
4876; • ; Oslashacute.small
4883; • ; Itilde.small
4886; • ; Utilde.small
4887; • ; Ucaron.small
4936; • ; Tbar.small
4940; • ; AEacute.small
5101; • ; A.titling
5102; • ; B.titling
5103; • ; C.titling
5104; • ; D.titling
5105; • ; E.titling
5106; • ; F.titling
5107; • ; G.titling
5108; • ; H.titling
5109; • ; I.titling
5110; • ; J.titling
5111; • ; K.titling
5112; • ; L.titling
5113; • ; M.titling
5114; • ; N.titling
5115; • ; O.titling
5116; • ; P.titling
5117; • ; Q.titling
5118; • ; R.titling
5119; • ; S.titling
5120; • ; T.titling
5121; • ; U.titling
5122; • ; V.titling
5123; • ; W.titling
5124; • ; X.titling
5125; • ; Y.titling
5126; • ; Z.titling
5127; • ; AE.titling
5128; • ; OE.titling
5129; • ; Oslash.titling
5201; • ; Adieresis.titling
5202; • ; Aacute.titling
5203; • ; Agrave.titling
5204; • ; Acircumflex.titling
5206; • ; Abreve.titling
5207; • ; Atilde.titling
5208; • ; Aring.titling
5209; • ; Aogonek.titling
5210; • ; Ccedilla.titling
5211; • ; Cacute.titling
5212; • ; Ccaron.titling
5214; • ; Dcaron.titling
5215; • ; Dcroat.titling
5215; • ; Eth.titling
5216; • ; Edieresis.titling
5217; • ; Eacute.titling
5218; • ; Egrave.titling
5219; • ; Ecircumflex.titling
5220; • ; Ecaron.titling
5221; • ; Edotaccent.titling
5222; • ; Eogonek.titling
5224; • ; Gbreve.titling
5226; • ; Idieresis.titling
5227; • ; Iacute.titling
5228; • ; Igrave.titling
5229; • ; Icircumflex.titling
5230; • ; Idotaccent.titling
5231; • ; Lacute.titling
5232; • ; Lcaron.titling
5233; • ; Lslash.titling
5234; • ; Nacute.titling
5235; • ; Ncaron.titling
5236; • ; Ntilde.titling

Character Number; Unicode Number; PostScript Name

5237; • ; Odieresis.titling
5238; • ; Oacute.titling
5239; • ; Ograve.titling
5240; • ; Ocircumflex.titling
5241; • ; Otilde.titling
5242; • ; Ohungarumlaut.titling
5243; • ; Racute.titling
5244; • ; Rcaron.titling
5245; • ; Sacute.titling
5246; • ; Scaron.titling
5248; • ; Scedilla.titling
5249; • ; Tcaron.titling
5251; • ; Udieresis.titling
5252; • ; Uacute.titling
5253; • ; Ugrave.titling
5254; • ; Ucircumflex.titling
5255; • ; Uring.titling
5256; • ; Uhungarumlaut.titling
5257; • ; Yacute.titling
5258; • ; Zacute.titling
5259; • ; Zcaron.titling
5260; • ; Zdotaccent.titling
5261; • ; Thorn.titling
5262; • ; Amacron.titling
5263; • ; Tcommaaccent.titling
5268; • ; Ydieresis.titling
5272; • ; Emacron.titling
5275; • ; Imacron.titling
5276; • ; Iogonek.titling
5278; • ; Kcommaaccent.titling
5280; • ; Lcommaaccent.titling
5281; • ; Ncommaaccent.titling
5283; • ; Omacron.titling
5285; • ; Rcommaaccent.titling
5287; • ; Gcommaaccent.titling
5290; • ; Umacron.titling
5291; • ; Uogonek.titling
5501; • ; one.titling
5502; • ; two.titling
5503; • ; three.titling
5504; • ; four.titling
5505; • ; five.titling
5506; • ; six.titling
5507; • ; seven.titling
5508; • ; eight.titling
5509; • ; nine.titling
5510; • ; zero.titling
5511; • ; sterling.titling
5512; • ; dollar.titling
5513; • ; cent.titling
5514; • ; florin.titling
5515; • ; Euro.titling
5516; • ; yen.titling
5575; • ; onesuperior.titling
5576; • ; twosuperior.titling
5577; • ; threesuperior.titling
5601; • ; period.titling
5602; • ; colon.titling
5604; • ; periodcentered.titling
5606; • ; ellipsis.titling
5607; • ; comma.titling
5608; • ; semicolon.titling
5610; • ; quoteleft.titling
5611; • ; quotedblright.titling
5612; • ; quotedblleft.titling
5613; • ; quotedblbase.titling
5614; • ; exclam.titling
5615; • ; exclamdown.titling
5616; • ; question.titling
5617; • ; questiondown.titling
5618; • ; guillemotright.titling
5619; • ; guillemotleft.titling
5620; • ; guilsinglright.titling
5621; • ; guilsinglleft.titling
5622; • ; slash.titling
5623; • ; hyphen.titling
5626; • ; parenleft.titling
5627; • ; parenright.titling
5628; • ; bracketleft.titling
5629; • ; bracketright.titling
5630; • ; ampersand.titling
5634; • ; asterisk.titling
5635; • ; quotesingle.titling
5636; • ; quotedbl.titling
5650; • ; trademark.titling
5701; • ; dieresis.titling
5702; • ; dotaccent.titling
5703; • ; ring.titling
5704; • ; acute.titling
5705; • ; grave.titling
5706; • ; circumflex.titling
5707; • ; caron.titling
5708; • ; breve.titling
5709; • ; tilde.titling
5710; • ; hungarumlaut.titling
5711; • ; cedilla.titling
5713; • ; ogonek.titling
5718; • ; commaaccent.titling
5795; • ; copyright.titling
5796; • ; registered.titling
7504; EA37; uniEA37
7505; EA3C; uniEA3C
7507; 25AA; H18543
7508; 25AB; H18551
7509; EA6F; uniEA6F
7510; EA3D; uniEA3D
7512; 2423; uni2423
7520; 221F; orthogonal
7523; EABD; zerodot
7524; EA20; uniEA20
7601; 1E80; Wgrave
7602; 1E82; Wacute
7603; 1EF2; Ygrave
7604; 1E81; wgrave
7605; 1E83; wacute
7606; 1E85; wdieresis
7608; 1EF3; ygrave
9051; EA6B; uniEA6B
9251; EA6C; uniEA6C
9255; EA38; uniEA38
9256; EA39; uniEA39
9601; 20A2; uni20A2
9731; 2117; uni2117
9732; EA3A; uniEA3A
9733; 2105; afii61248
10190; 2024; onedotenleader

Standard character mapping for DTL FontMaster Character Layout Files.

ª	º	A	B	C	D	E	F	G	H	I	J	K	L
1	2	101	102	103	104	105	106	107	108	109	110	111	112
M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
113	114	115	116	117	118	119	120	121	122	123	124	125	126
Æ	Œ	Ø	IJ	Ä	Á	À	Â		Ă	Ã	Å	Ą	Ç
127	128	129	200	201	202	203	204	205	206	207	208	209	210
Ć	Č		Ď	Đ	Ë	É	È	Ê	Ě	Ė	Ę		Ğ
211	212	213	214	215	216	217	218	219	220	221	222	223	224
	Ï	Í	Ì	Î	İ	Ĺ	Ľ	Ł	Ń	Ň	Ñ	Ö	Ó
225	226	227	228	229	230	231	232	233	234	235	236	237	238
Ò	Ô	Õ	Ő	Ŕ	Ř	Ś	Š		Ş	Ť		Ü	Ú
239	240	241	242	243	244	245	246	247	248	249	250	251	252
Ù	Û	Ů	Ű	Ý	Ź	Ž	Ż	Þ	Ā	Ţ			
253	254	255	256	257	258	259	260	261	262	263	264	265	266
Ÿ					Ē			Ī	Į		Ķ		Ļ
267	268	269	270	271	272	273	274	275	276	277	278	279	280
Ņ		Ō		Ŗ		Ģ			Ū	Ų			
281	282	283	284	285	286	287	288	289	290	291	292	293	294
						a	b	c	d	e	f	g	h
295	296	297	298	299	300	301	302	303	304	305	306	307	308
i	j	k	l	m	n	o	p	q	r	s	t	u	v
309	310	311	312	313	314	315	316	317	318	319	320	321	322
w	x	y	z	æ	œ	ø	ß			ij			ff
323	324	325	326	327	328	329	330	331	332	333	334	335	336

Standard character mapping for DTL FontMaster Character Layout Files.

fi	fl		ffi	ffi	ffl	fft	*	*	*	*	*	*	*
337	338	339	340	341	342	343	344	345	346	347	348	349	350
*	*	*	*	*	*	*	*	*	*	*	*	*	*
351	352	353	354	355	356	357	358	359	360	361	362	363	364
*	*	*	*	*	*	*	*	*	*	*	*	a	e
365	366	367	368	369	370	371	372	373	374	375	376	377	378
l	m	n	o	r	s	t	*	*	-	*	*	*	*
379	380	381	382	383	384	385	386	387	388	389	390	391	392
*	*	*	*	*	*	(	)	ä	á	à	â		ă
393	394	395	396	397	398	399	400	401	402	403	404	405	406
ã	å	ą	ć	č		ç	ď	ð	ë	é	è	ê	ě
407	408	409	410	411	412	413	414	415	416	417	418	419	420
ė	ę		ğ		ï	í	ì	î	Í	ľ	ł	ń	ň
421	422	423	424	425	426	427	428	429	430	431	432	433	434
ñ	ö	ó	ò	ô	õ	ő	ŕ	*	ś		š		ť
435	436	437	438	439	440	441	442	443	444	445	446	447	448
ü	ú	ù	û	ů	ű	ý	ź	ž	ż	ð	þ	ÿ	
449	450	451	452	453	454	455	456	457	458	459	460	461	462
ţ			ā						ē			ī	
463	464	465	466	467	468	469	470	471	472	473	474	475	476
ķ	ļ			ņ	ō	ŗ			ū	ų	ř	ş	
477	478	479	480	481	482	483	484	485	486	487	488	489	490
ģ					*	*	*	*	*	1	2	3	4
491	492	493	494	495	496	497	498	499	500	501	502	503	504

Standard character mapping for DTL FontMaster Character Layout Files.

5	6	7	8	9	0	£	$	¢	ƒ	€	¥	Pt	Pts
505	506	507	508	509	510	511	512	513	514	515	516	517	518
	*	*	*	₱	Fr	*	*	1	2	3	4	5	6
519	520	521	522	523	524	525	526	527	528	529	530	531	532
7	8	9	0	£	$	¢	ƒ	*	¥	1	2	3	4
533	534	535	536	537	538	539	540	541	542	543	544	545	546
5	6	7	8	9	o	1	2	3	4	5	6	7	8
547	548	549	550	551	552	553	554	555	556	557	558	559	560
9	0	.	,	1	2	3	4	5	6	7	8	9	0
561	562	563	564	565	566	567	568	569	570	571	572	573	574
1	2	3	4	5	6	7	8	9	0	$	¢	1	2
575	576	577	578	579	580	581	582	583	584	585	586	587	588
3	4	5	6	7	8	9	0	·	’				
589	590	591	592	593	594	595	596	597	598	599	600	601	602
			…	,	;	’	‘	”	“	„	!	¡	?
603	604	605	606	607	608	609	610	611	612	613	614	615	616
¿			›	‹	/	-	–	—	(	)	[	]	&
617	618	619	620	621	622	623	624	625	626	627	628	629	630
§	†	‡	*	'	"	@	#	°	+		×	÷	=
631	632	633	634	635	636	637	638	639	640	641	642	643	644
	A/S		©	®	TM	¶	¤	,	’	{	}	a	o
645	646	647	648	649	650	651	652	653	654	655	656	657	658
		1/1	1/2	1/3	2/3	1/4	3/4	1/5	2/5	3/5	4/5	1/6	5/6
659	660	661	662	663	664	665	666	667	668	669	670	671	672

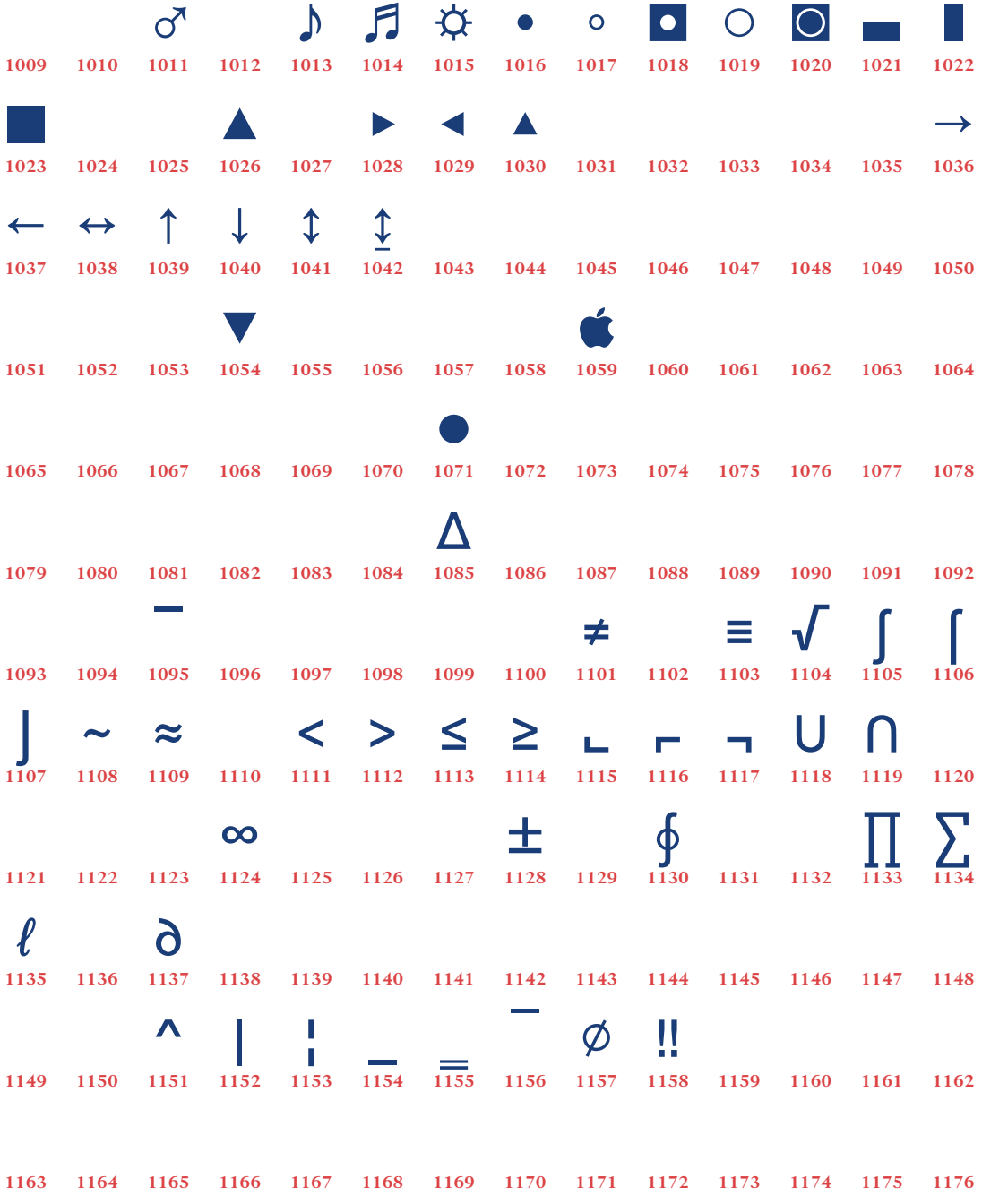
Standard character mapping for DTL FontMaster Character Layout Files.

⅛	⅜	⅝	⅞		⁰/₀	⁰/₀₀	¹/₁	¹/₂	¹/₃	²/₃	¼	¾	⅕
673	674	675	676	677	678	679	680	681	682	683	684	685	686
⅖	⅗	⅘	⅙	⅚	⅛	⅜	⅝	⅞			%	‰	⁄
687	688	689	690	691	692	693	694	695	696	697	698	699	700
¨	˙	˚	´	`	ˆ	ˇ	˘	˜	″				‾
701	702	703	704	705	706	707	708	709	710	› 711	712	‹ 713	714
715	716	717	718	719	720	721	722	723	724	725	726	727	728
729	730	731	732	733	734	735	736	737	738	739	740	741	742
743	744	745	746	747	748	749	750	751	752	753	754	755	756
757	758	759	760	761	762	763	764	765	766	767	768	769	770
771	772	773	774	775	776	777	778	779	780	781	782	783	784
785	786	787	788	789	790	791	792	793	794	© 795	® 796	797	798
799	800	801	802	803	804	805	806	807	808	809	810	811	812
813	814	815	816	817	818	819	820	821	822	823	824	825	826
827	828	829	830	831	832	833	834	835	836	837	838	839	840

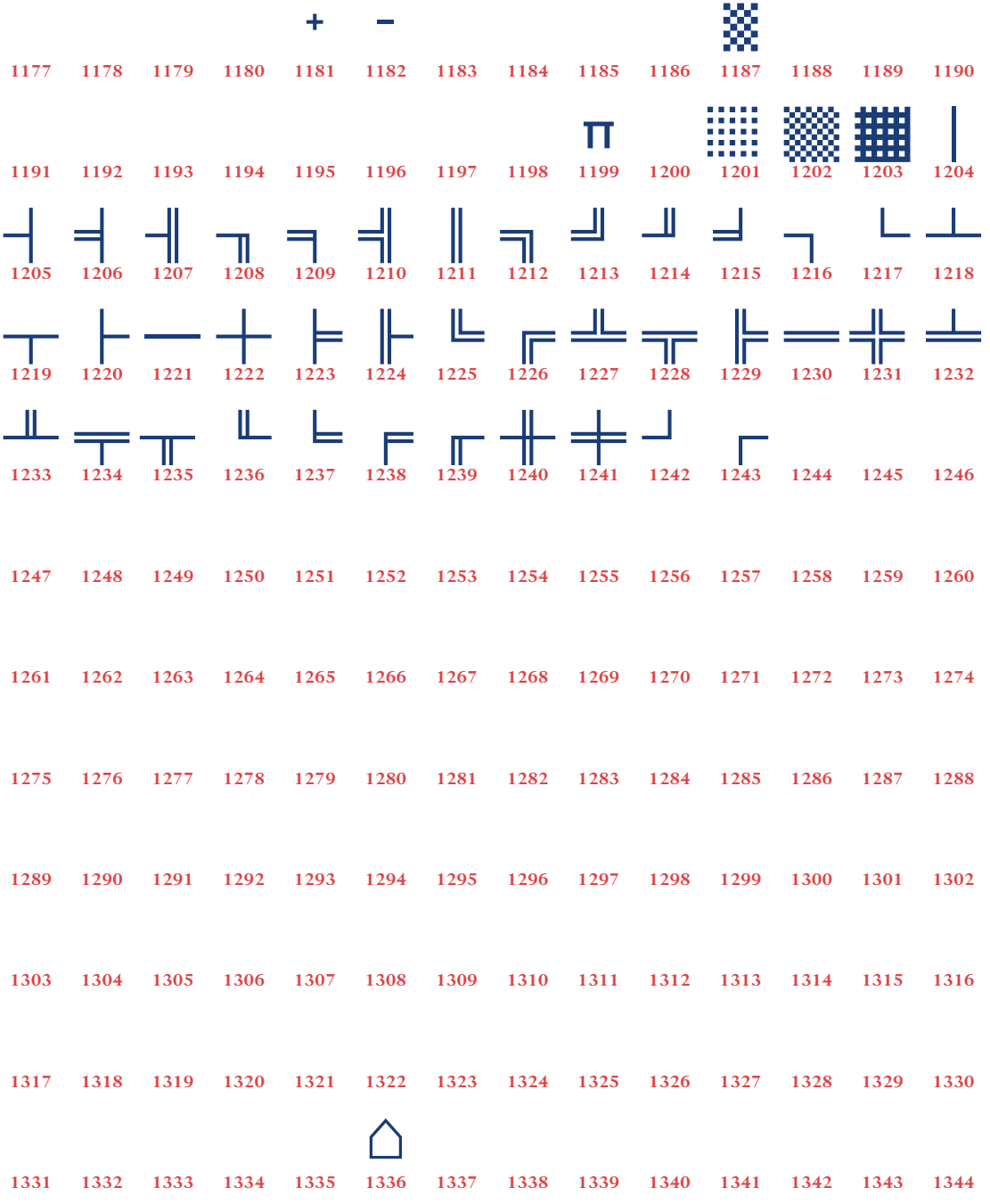
Standard character mapping for DTL FontMaster Character Layout Files.

841	842	843	844	845	846	847	848	849	850	851	852	853	854
855	856	857	858	859	860	861	862	863	864	865	866	867	868
869	870	871	872	873	874	875	876	877	878	879	880	881	882
883	884	885	886	887	888	889	890	891	892	893	894	895	896
897	898	899	900	901	902	903	904	905	906	907	908	909	910
911	912	913	914	915	916	917	918	919	920	921	922	923	924
925	926	927	928	929	930	931	932	933	934	935	936	937	938
939	940	941	942	943	944	945	946	947	948	949	950	951	952
953	954	955	956	957	958	959	960	961	962	963	964	965	966
967	968	969	970	971	972	973	974	975	976	977	978	979	980
981	982	983	984	985	986	987	988	989	990	991	992	993	994
													
995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008

Standard character mapping for DTL FontMaster Character Layout Files.



Standard character mapping for DTL FontMaster Character Layout Files.



Standard character mapping for DTL FontMaster Character Layout Files.

1345	1346	1347	1348	1349	1350	1351	1352	1353	1354	1355	1356	1357	1358
1359	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369	1370	1371	1372
1373	1374	1375	1376	1377	1378	1379	1380	1381	1382	1383	1384	1385	1386
1387	1388	1389	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399	1400
1401	1402	1403	1404	1405	1406	1407	1408	1409	1410	1411	1412	1413	1414
1415	1416	1417	1418	1419	1420	1421	1422	1423	1424	1425	1426	1427	1428
1429	1430	1431	1432	1433	1434	1435	1436	1437	1438	1439	1440	1441	1442
1443	1444	1445	1446	1447	1448	1449	1450	1451	1452	1453	1454	1455	1456
1457	1458	1459	1460	1461	1462	1463	1464	1465	1466	1467	1468	1469	1470
1471	1472	1473	1474	1475	1476	1477	1478	1479	1480	1481	1482	1483	1484
1485	1486	1487	1488	1489	1490	1491	1492	1493	1494	1495	1496	1497	1498
1499	1500	1501	1502	1503	1504	1505	1506	1507	1508	1509	1510	1511	1512

Standard character mapping for DTL FontMaster Character Layout Files.

2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072
2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086
2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
Α	Β	Γ	Δ	Ε	Ζ	Η	Θ	Ι	Κ	Λ	Μ	Ν	Ξ
2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114
Ο	Π	Ρ	Σ	Τ	Υ	Φ	Χ	Ψ	Ω				
2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128
2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142
2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156
2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170
2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184

Standard character mapping for DTL FontMaster Character Layout Files.

2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198
2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212
2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226
2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240
2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254
2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268
2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282
2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296
2297	2298	2299	2300	α 2301	β 2302	γ 2303	δ 2304	ε 2305	ζ 2306	η 2307	ϑ 2308	ι 2309	κ 2310
λ 2311	μ 2312	ν 2313	ξ 2314	ο 2315	π 2316	ρ 2317	σ 2318	τ 2319	υ 2320	2321	χ 2322	ψ 2323	ω 2324
ς 2325	2326	2327	2328	2329	2330	2331	φ 2332	2333	2334	2335	2336	2337	2338
2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352

Appendix IX: Font Family IDs

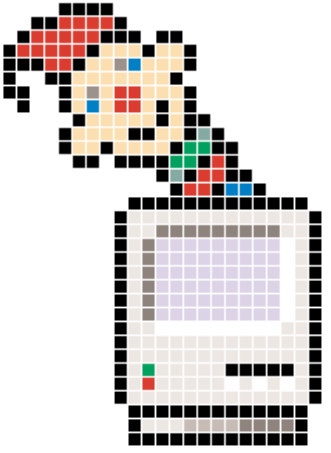
Each script inteface system that can run on the Macintosh has a range of font family IDs assigned to it. The position in the font menu of an application is determined by the ID.

Script	*Script ID*	*Font Family IDs*
System Reserved	All	0 – 1
Roman	0	2 – 16382
System Reserved	0	16383
Japanese	1	16384 – 16895
Chinese	2	16896 – 17407
Korean	3	17408 – 17919
Arabic	4	17920 – 18431
Hebrew	5	18432 – 18943
Greek	6	18944 – 19455
Russian	7	19456 – 19967
Reserved	8	19968 – 20479
Devanagari	9	20480 – 20991
Gurmukhi	10	20992 – 21503
Gujarati	11	21504 – 22015
Oriya	12	22016 – 22527
Bengali	13	22528 – 23039
Tamil	14	23040 – 23551
Telugu	15	23552 – 24063
Kannada	16	24064 – 24575
Malayalam	17	24576 – 25087
Sinhalese	18	25088 – 25599
Burmese	19	25600 – 26111
Cambodian	20	26112 – 26623
Thai	21	26624 – 27135
Laotian	22	27136 – 27647
Georgian	23	27648 – 18159
Armenian	24	28160 – 28671
Maldivian	25	28672 – 29183
Tibetan	26	29184 – 29695
Mongolian	27	29696 – 30207
Ethiopian	28	30208 – 30719
Non-Cyrillic Slavic	29	30720 – 31231
Vietnamese	30	31232 – 31743
Sindhi	31	31744 – 32255
Uninterpreted Symbols	32	32256 – 32767

DTL IconDropper is a 'drag & drop' programme for the Power Macintosh that makes it very easy to change the icons, filetype and creator of PostScript Type 1 fonts. This can be done in batch by simply dropping multiple PS Type 1 fonts on DTL IconDropper.

1. *Preparations*

Place a template file that is named «t1_icons.temp» in the directory where the programme is located. This file must contain all resources which have to be present in the final PS Type 1 font. Usually these are BNDL, FREF, ICN# and the signature resource with the same name as the creator of the file. Maybe, you will also add icl4, icl8, ics4, ics8 and ics#. Please note that there must be no POST resources in the template! Filetype and creator of the template file have to be set appropriately. As a basis the supplied 't1_icons.temp' file can be used for customizing in ResEdit.



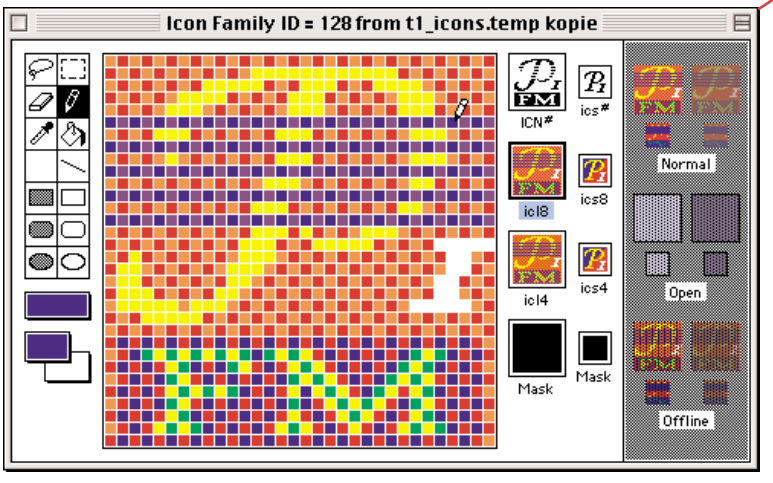
ResEdit can be used to customize the 't1_icons.temp' file or any other font file that will be used as a basis.

2. *Using the programme*

Select all the PS Type 1 fonts which you want to change and drag them onto the DTL IconDropper programme. The programme will open all files and remove all resources with exception of the POST resources. Successively it will copy all resources from the template file to the PostScript Type 1 fonts. Finally it will change filetype and creator to those of the template file.

3. *Troubleshooting*

In case you get a blank icon after changing the creator, the problem is probably solved by rebuilding the desktop.



The PostScript Type 1 icons can be edited in ResEdit.

1. Windows and Mac OS

1.1 *Invalid or missing Character Layout File*

Sometimes a DTL FontMaster module will notify you that the Character Layout File 'beeditor.cha' is invalid or missing. Probably because there is a wrong preference file on your system. In this case just click 'OK' and start the programme. Then you can locate the Character Layout File 'beeditor.cha' in the directory where you installed DTL FontMaster (for instance in: C:\Program Files\Dutch Type Library\DTL FontMaster [version#]\). You have to do this once; next time the programme will locate the 'beeditor.cha' automatically.

1.2 *Corrupted preference file*

In case a module of DTL FontMaster under Windows or Mac OS has difficulties to locate a file, the preference file is probably corrupted and has to be removed.

1.3 *UFM file compatibility problem*

UFM files which are generated on the Mac are not always recognized on the PC. This is quite a tricky problem because DTL DataMaster will generate a new UFM file that will overwrite the original UFM file when the 'Advanced' section is opened from the 'Export Fonts' dialog and the 'OK' button is pushed here. This way all the information in the original UFM file will be lost. The problem is simply to solve by opening the original UFM file in WordPad and to save it as a text file; DTL DataMaster will recognize it then.

1.4 *Improper font behaviour*

Fonts generated with DTL DataMaster must contain a space because otherwise the fonts will behave improperly. This means that also fonts that contain only one or more logos must have a space defined. The nbspace is automatically generated by the programme based on the width of the space.

1.5 *Error during TrueType generation*

In case an error occurs during the generation of a TrueType font ('return code from MakeFondts DLL is 1'), this might be caused by the formatting of the AFM file which is used for adding the kerning info. A simple solution for this is to copy the content of the AFM file and to paste it in SimpleText on the Mac or in WordPad on the PC and to save it as a text file.

1.6 *Unable to import AFM file*

Converting a PostScript Type 1 font to a BE or IK database in DTL DataMaster sometimes results in the following message: 'warning: unable to copy AFM file'. This problem is easy to solve by just copying the original AFM file to the same directory where the newly generated BE or IK file is situated. Take care to rename the AFM file according to the name of the BE or IK file while retaining the .afm extension.

2. Windows

2.1 *Installer is not recognized*

In case the Windows Installer is not recognized by your 95/98 or NT system, you need to install the 'Installer for Windows Installer' first. There are two versions available: one for Windows 95/98 and one for Windows NT. These are supplied on the CD version of the DTL FontMaster Utilities also. Alternatively you can download the 'Installer for Windows Installer' from the Microsoft web site. All other Windows systems will recognize the (.msi) Windows Installer automatically.

2.2 *Opening a font database from CD*

Opening the fmdemo.be and .ik font files directly from the demo CD will result in an empty database; you have to copy the fonts to your harddisk first. The most recent installer places the fmdemo.be and .ik files also in the same directory as the DTL FontMaster program files.

2.3 *Opening a font database from CD*

Importing a font directly from the fonts directory in the Windows system using DTL DataMaster is not possible; you have to copy the font file to a different location on your harddisk first.

3. Mac OS

3.1 *Unable to start a FM module*

In case you start on the Macintosh a FM module from the 'central switch board' and nothing happens, you have run out of memory. Close all other programs and try again.

3.2 *Slow or improper Print Preview*

In case the Print Preview function of DTL BezierMaster or DTL IkarusMaster of the Mac OS version of DTL FontMaster is very slow or does not work at all, allocate more memory for the program in the info file.

GENERAL PERMANENT
D_19_13T.BE
D_19_33T.BE
GENERAL OPTIMIZED
D_19_13T.BE
D_19_33T.BE
OPENTYPE
DO19X13T.BE
DO19X33T.BE
DP19X13T.BE
DP19X33T.BE
DX19X13T.BE
DX19X33T.BE
DO19013T.UFM
DO19033T.AFM
DO19013T.PAR
DO19C13T.UFM
DO19013T.AFM
DO19C13T.PAR
DO19813T.UFM
DO19813T.AFM
DO19813T.PAR
DO19033T.UFM
DO19033T.AFM
DO19033T.PAR
et cetera
WEST
DO19013T.BE
DO19033T.BE
DO19C13T.BE
DO19C33T.BE
DO19813T.BE
DO19833T.BE
DO19013T.UFM
DO19013T.AFM
DO19013T.PAR
DO19C13T.UFM
DO19013T.AFM
DO19C13T.PAR
DO19813T.UFM
DO19813T.AFM
DO19813T.PAR
DO19033T.UFM
DO19033T.AFM
DO19033T.PAR
et cetera
EAST
DE19013T.BE
DE19033T.BE
DE19C13T.BE
DE19C33T.BE
DE19813T.BE
DE19833T.BE
DE19013T.UFM
DE19013T.AFM
DE19013T.PAR
DE19C13T.UFM
DE19013T.AFM
DE19C13T.PAR
DE19813T.UFM
DE19813T.AFM
DE19813T.PAR
DE19033T.UFM
DE19033T.AFM
DE19033T.PAR
et cetera
TURKISH
DT19013T.BE
DT19033T.BE
DT19C13T.BE
DT19C33T.BE
DT19813T.BE
DT19833T.BE
DT19013T.UFM
DT19013T.AFM
DT19013T.PAR
DT19C13T.UFM
DT19013T.AFM
DT19C13T.PAR
DT19813T.UFM
DT19813T.AFM
DT19813T.PAR
DT19033T.UFM
DT19033T.AFM
DT19033T.PAR
et cetera
CYRILLIC
DC19013T.BE
DC19033T.BE
DC19C13T.BE
DC19C33T.BE
DC19813T.BE
DC19833T.BE
DC19013T.UFM
DC19013T.AFM
DC19013T.PAR
DC19C13T.UFM
DC19013T.AFM
DC19C13T.PAR
DC19813T.UFM
DC19813T.AFM
DC19813T.PAR
DC19033T.UFM
DC19033T.AFM
DC19033T.PAR
et cetera
GREEK
DG19013T.BE
DG19033T.BE
DG19C13T.BE
DG19C33T.BE
DG19813T.BE
DG19833T.BE
DG19013T.UFM
DG19013T.AFM
DG19013T.PAR
DG19C13T.UFM
DG19013T.AFM
DG19C13T.PAR
DG19813T.UFM
DG19813T.AFM
DG19813T.PAR
DG19033T.UFM
DG19033T.AFM

All the files generated by the FM modules are platform-independent. At the Dutch Type Library the font production files are centralized on a server and can be reached from any Mac or PC in the network. Because of the fact that the FM data is platform-independent, no conversion has to be done to enable editing of the files under Mac OS or Windows.

The font data consist of five files: the collection of glyphs stored in the BE or IK format, the UFM file that contains the naming, copyright, ID and some conversion information, the AFM and FEA files, and the PAR file. Normally a UFM file is made once and (almost) never changed again. As many of the supporting files of FM, also the UFM file is a simple text file which can be altered directly using a text editor. The PAR file contains path information to the kerning data, which can be stored anywhere.

The BE/IK, UFM and PAR files have to be located in the same directory and are automatically 'connected' by name. If a BE or IK database is selected in DTL DataMaster the font naming (and ID info) is taken from the UFM file with the same name. This system is quite versatile.

At DTL the databases are stored in an old fashion way with an eight character code. The database of DTL Caspari Regular for instance is named C_94_13T. The underscores are replaced with respectively the character that indicates the code page and what we call the 'Standard' (0) and 'Special' (C) info. The last character indicates text (T), display (D) or Poster (P). C_94 is the code for DTL Caspari and 13 means Regular (33 is Italic, 14 is Medium, 34 is Medium Italic, etc.). As a result C094013T means Regular with Western European lay-out and tabular figures, and CE94C13T is the code for Eastern European with old style figures. CP94X13T is the code for the OpenType Pro font.

All glyphs of one weight/style are stored in one 'master' database. Copies of these masters, which are checked and corrected first with DTL ContourMaster, are together with the appropriate UFM and PAR files stored in different directories for Western- and Eastern European, Cyrillic, Greek, etc. This makes batch generation in DTL DataMaster very easy.

The databases for for instance Western- and Eastern European, Cyrillic and Greek are stored respectively as C094013T, CE94013T, CC94013T and CG94013T. The second zero is replaced by a C in case of the versions with the old style figures. The appropiate UFM and PAR files should have the same naming as the corresponding databases to secure automatic connection to these databases.

The only thing that has to be taken care of when a (series of) font(s) has to be generated, is the selection of the appropriate Character Layout file (.cha) that contains the required code page.

Please note that the generation of Mac fonts is only possible with the Mac OS version of DTL DataMaster. In mixed environments it is enough to have the editors for both platforms but only the Mac version of DTL DataMaster for generating different font formats.

Fontographer versus DTL FontMaster

Designers who used to work with Fontographer in the past may perhaps sometimes find it difficult to locate the same functions in DTL FontMaster. Here is a short list of functions with the shortcuts in Fontographer versions 3.5 and 4.x for Mac OS and version 3.5 for Windows.

Fontographer uses three different names to label the relation between the Bezier Control points (BCPs) and the Anchor points: Curve, Corner and Tangent point.

The Curve point is what is called a Smooth Anchor point in DTL FontMaster and both BCPs are placed on a virtual line that intersects the anchor point; moving one of the BCPs will influence the position of the other BCP automatically. The shortcut for this point is in Fontographer 3.5 <Command> + 5 on the Mac and <Ctrl> + 5 on the PC and <Command> + 8 in Fontographer 4.x on the Mac.

The corner point in Fontographer is called Anchor point in DTL FontMaster. The BCPs of such a point can be moved completely independent from each other. The shortcuts in Fontographer 3.5 for Mac OS and Windows are respectively <Command> + 4 and <Ctrl> + 4 and <Command> + 9 for Fontographer 4.x on the Mac.

To force tangent continuity between adjacent sections in Fontographer a so called Tangent point is used. In DTL FontMaster a Smooth Anchor point is used for this purpose and in case the adjacent section is a straight line, tangent continuity will be forced automatically. The shortcuts are <Command> + 3 and <Ctrl> + 3 in Fontographer 3.5 respectively on the Mac and in Windows. In Fontographer 4.x on the Mac <Command> + 0 is used.

Changing points in DTL FontMaster is very easy: just press the <Ctrl> key and mouse-click on the point. This works on both Mac and PC. Bezier Control points can be removed by simply selecting these and subsequently pressing the <backspace> key. To lock the direction of the Bezier Control point, for which the combination <Alt> + <Shift> is used in Fontographer, just select the point in DTL FontMaster and subsequently press the <Shift> key and, while keeping this key pressed, move the Bezier Control point with the mouse.

In Fontographer 3.5 the contour can be altered only by moving the BCPs. In Fontographer 4.x the contour itself can be moved also. In DTL FontMaster the default setting is that only the BCPs can be moved. By selecting the Shift Outline tool from the Function Tool Bar only the contour can be moved.

In DTL FontMaster the contour is filled by <Command> + F on the Mac and <Ctrl> + F under Windows. The display of the points can be turned on and off by using <Command> + M (Mac) and <Ctrl> + M (Windows).