



**International
Standard**

ISO/IEC 14496-22

**Information technology — Coding of
audio-visual objects —**

**Part 22:
Open font format**

*Technologies de l'information — Codage des objets
audiovisuels —*

Partie 22: Format de police de caractères ouvert

**Fifth edition
2026-07**



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2026

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword.....	viii
Introduction	ix
1 Scope.....	1
2 Normative references	1
3 Terms, definitions and abbreviated terms	1
3.1 Terms and definitions	1
3.2 Abbreviated terms.....	2
4 The Open Font file format	3
4.1 Description	3
4.2 Filenames	3
4.3 Data types	3
4.4 Table version numbers	7
4.5 Top-level OFF organization	8
4.5.1 Table directory	8
4.5.2 Table records.....	9
4.5.3 Calculating checksums.....	10
4.6 Font collections.....	11
4.6.1 The Font Collection overview.....	11
4.6.2 The Font Collection file structure	11
4.6.3 TTC header	12
5 Open font tables.....	14
5.1 Required common tables	14
5.1.1 List of required tables	14
5.1.2 cmap—Character to glyph index mapping table	15
5.1.3 head—Font header.....	32
5.1.4 hhea—Horizontal header	36
5.1.5 hmtx—Horizontal metrics.....	37
5.1.6 maxp—Maximum profile	39
5.1.7 name—Naming table	40
5.1.8 OS/2 — OS/2 and Windows metrics table	55
5.1.9 post—PostScript.....	85
5.1.10 HHEA—Horizontal header.....	89
5.1.11 HMTX—Horizontal metrics	90
5.1.12 MAXP—Maximum Profile, for 24-bit fonts	92
5.2 Tables related to TrueType outlines.....	94
5.2.1 List of TrueType outlines tables	94
5.2.2 cvt—Control value table	94
5.2.3 fpgm—Font program	94
5.2.4 glyf—Glyf data.....	95
5.2.5 loca—Index to location	103
5.2.6 prep—Control value program.....	104
5.2.7 gasp—Grid-fitting and scan-conversion procedure table.....	105
5.2.8 GLYP—Glyph data	107
5.2.9 LOCA—Index to location.....	117
5.3 Tables related to CFF outlines	118

5.3.1	List of CFF outline tables	118
5.3.2	CFF—Compact Font Format table (version 1)	118
5.3.3	CFF2—Compact Font Format (version 2) table	119
5.3.4	CFSH— Compact Font Format supplementary hint table.....	181
5.3.5	VORG—Vertical origin table	182
5.4	SVG—The SVG (Scalable Vector Graphics) table.....	184
5.4.1	Introduction.....	184
5.4.2	SVG table formats.....	184
5.4.3	SVG documents	185
5.4.4	Color and color palettes.....	188
5.4.5	Glyph Identifiers	189
5.4.6	Glyph semantics and text layout processing.....	190
5.4.7	Coordinate Systems and Glyph Metrics	190
5.4.8	Animations	191
5.4.9	SVG glyph examples	192
5.5	Tables related to bitmap glyphs	198
5.5.1	List of bitmap glyph tables	198
5.5.2	EBDT—Embedded bitmap data table	199
5.5.3	EBLC—Embedded bitmap location table.....	203
5.5.4	EBSC—Embedded bitmap scaling table	212
5.5.5	CBDT—Color bitmap data table.....	213
5.5.6	CBLC—Color bitmap location table	216
5.5.7	sbix—Standard bitmap graphics table.....	218
5.6	Optional tables.....	220
5.6.1	DSIG—Digital signature table.....	221
5.6.2	hdmx—Horizontal device metrics.....	224
5.6.3	kern—Kerning	225
5.6.4	LTSH—Linear threshold.....	229
5.6.5	MERG—Merge table	230
5.6.6	meta—Metadata table.....	235
5.6.7	PCLT—PCL 5 table	239
5.6.8	VDMX—Vertical device metrics.....	248
5.6.9	vhea—Vertical header table	251
5.6.10	vmtx—Vertical metric table.....	256
5.6.11	COLR—Color Table.....	257
5.6.12	CPAL—Palette Table	328
5.6.13	VHEA—Vertical header table.....	334
5.6.14	VMTX—Vertical metric table.....	339
5.6.15	DMAP—Delta map table	341
6	Open Font advanced layout tables.....	341
6.1	Open Font advanced layout extensions.....	341
6.1.1	Overview of advanced typographic layout extensions.....	341
6.1.2	OFF Layout terminology	343
6.1.3	Text processing with OFF layout	346
6.1.4	OFF layout and Font variations.....	347
6.2	OFF Layout common table formats.....	348
6.2.1	Overview	348
6.2.2	OFF Layout and Font variations.....	350
6.2.3	Table organization	350
6.2.4	Scripts and languages.....	352

6.2.5	Features and lookups	355
6.2.6	Coverage table	362
6.2.7	Class definition table	364
6.2.8	Common formats for contextual lookup subtables	367
6.2.9	Device and VariationIndex tables	384
6.2.10	Conditions and Condition Sets	387
6.2.11	Feature variations	394
6.2.12	Common table examples	399
6.3	Advanced typographic tables	408
6.3.1	BASE—Baseline table	408
6.3.2	GDEF—The glyph definition table	432
6.3.3	GPOS—The glyph positioning table	448
6.3.4	GSUB—The glyph substitution table	513
6.3.5	JSTF—The justification table	551
6.3.6	MATH—The mathematical typesetting table	565
6.4	Layout tag registry	586
6.4.1	Overview	586
6.4.2	Scripts tags	586
6.4.3	Language tags	593
6.4.4	Feature tags	623
6.4.5	Baseline tags	708
7	OFF font variations	713
7.1	Font variations overview	713
7.1.1	General	713
7.1.2	Terminology	716
7.1.3	Variation space, default instances and adjustment deltas	718
7.1.4	Coordinate scales and normalization	722
7.1.5	Variation data	727
7.1.6	Variation data tables and miscellaneous requirements	737
7.1.7	Algorithm for interpolation of instance values	739
7.1.8	Interpolation example	743
7.1.9	Dynamic generation of static instance fonts	749
7.2	Font variations common table formats	750
7.2.1	Overview	750
7.2.2	Tuple variation store	751
7.2.3	Item variation stores	761
7.2.4	Design-variation axis tag registry	771
7.3	Font variations tables	778
7.3.1	avar—Axis variations table	778
7.3.2	cvar—CVT variations table	783
7.3.3	fvar—Font variations table	785
7.3.4	gvar—Glyph variations table	795
7.3.5	HVAR—Horizontal metrics variations table	807
7.3.6	MVAR—Metrics variations table	809
7.3.7	STAT—Style attributes table	815
7.3.8	VVAR—Vertical metrics variations table	831
7.3.9	GVAR—Glyph variations table	833
7.3.10	VARC—Variable Composite Glyph Descriptions	844
8	Recommendations for OFF fonts	852
8.1	Byte ordering	852

8.2	Mixing outline formats.....	852
8.3	Filenames.....	853
8.4	Table alignment and length.....	853
8.5	Glyph 0: the .notdef glyph.....	853
8.6	'BASE' table.....	854
8.7	'cmap' table	854
8.8	'cvt' table	854
8.9	'fpgm' table.....	855
8.10	'glyf' table.....	855
8.11	'hdmx' table.....	855
8.12	'head' table	855
8.13	'hhea' table	855
8.14	'hmtx' table.....	855
8.15	'kern' table	856
8.16	'loca' table.....	856
8.17	'LTSH' table	856
8.18	'maxp' table.....	856
8.19	'name' table.....	857
8.20	'OS/2' table.....	859
8.21	'post' table	860
8.22	'prep' table	860
8.23	'VDMX' table.....	860
8.24	TrueType Collections	860
9	General recommendations	861
9.1	Optimized table ordering.....	861
9.2	Non-standard (Symbol) fonts	861
9.3	Baseline to baseline distances.....	861
9.4	Style bits	863
9.5	Drop-out control.....	863
9.6	Embedded bitmaps.....	863
9.7	OFF CJK font guidelines.....	863
9.8	Stroke reduction in variable fonts	864
9.9	Families with optical size variants	864
Annex A	(informative) IBM font family classifications.....	865
A.1	General.....	865
A.2	Class ID=0 No Classification.....	865
A.3	Class ID=1 Oldstyle Serifs.....	865
A.4	Class ID=2 Transitional Serifs	867
A.5	Class ID=3 Modern Serifs.....	867
A.6	Class ID=4 Clarendon Serifs.....	868
A.7	Class ID=5 Slab Serifs.....	869
A.8	Class ID=6 (reserved for future use)	870
A.9	Class ID=7 Freeform Serifs.....	871
A.10	Class ID=8 Sans Serifs.....	871
A.11	Class ID=9 Ornaments	873
A.12	Class ID=10 Scripts.....	874
A.13	Class ID=11 (reserved for future use)	875
A.14	Class ID=12 Symbolic.....	875
A.15	Class ID=13 Reserved.....	876
A.16	Class ID=14 Reserved.....	876

Annex B (informative) Earlier versions of OS/2 - OS/2 and Windows metrics	877
B.1 OS/2 - OS/2 and Windows metrics (version 0)	877
B.2 OS/2 - OS/2 and Windows metrics (version 1)	897
B.3 OS/2 - OS/2 and Windows metrics (version 2)	922
B.4 OS/2 - OS/2 and Windows metrics (version 3)	944
B.5 OS/2 - OS/2 and Windows metrics (version 4)	967
Annex C (informative) OFF Mirroring Pairs List.....	992
Annex D (informative) Comparison of 'glyf', 'CFF ' and 'CFF2' tables.....	999
Bibliography	1001

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO and IEC had received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents and <https://patents.iec.ch>. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

This fifth edition cancels and replaces the fourth edition (ISO/IEC 14496-22:2019), which has been technically revised. It also incorporates the Amendments ISO/IEC 14496-22:2019/Amd.1:2020 and ISO/IEC 14496-22:2019/Amd.2:2023.

The main changes compared to the previous edition are as follows:

- new technology clauses were added;
- many existing clauses, subclauses, tables, figures and annexes were editorially revised.

A list of all parts in the ISO/IEC 14496 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

Multimedia applications require a broad range of media-related standards. In addition to the typical audio and video applications, multimedia presentations include scalable 2D graphics and text supporting all languages of the world. Faithful reproduction of scalable multimedia content requires additional components including scalable font technology. The Open Font Format is a widely supported format for font data with a rich set of capabilities for digital typography. It is based on the OpenType®¹ font format, which was originally developed as an extension of the TrueType™² font format, using the same 'sfnt' container structure, and maintaining compatibility for fonts created following the original TrueType specification. But several additional capabilities are also supported, including the following:

- Glyph outline data can use the CFF or CFF version 2 (“CFF2”) formats, as well as the TrueType glyph format.
- Multicolour glyph presentation is supported using embedded colour bitmaps or SVG documents, or using 2D graphic compositions defined in the font using a binary format that combines outline-format glyphs with various graphics operations.
- All Unicode® characters can be supported, including supplementary-plane characters, as well as Unicode variation sequences.
- Advanced Open Font Layout tables provide the advanced typographic capabilities needed for high-quality typography as well as for international text using the wide variety of scripts supported in The Unicode Standard®.
- The mathematical typesetting table allows a font to include data required for layout of complex, math formulas.
- Open Font collection files enable multiple fonts that share common data to be housed within a single file, allowing for de-duplication of data. This is especially useful, for example, for sets of CJK (Chinese, Japanese, Korean) fonts of the same design that share most glyphs in common but that vary with locale-specific glyphs for certain characters.
- Font variations (“variable fonts”) enable glyph outlines or other font data to be variable based on one or more design-axis parameters. Whereas a collection file can contain multiple discrete, static font resources, a variable font can provide continuous variation in design along each of its axes. This can provide great flexibility for content authors and designers while also allowing the font data for an entire font family to be represented in an efficient format.

This specification is intended to be used in conjunction with other specifications described below:

- While various legacy character encoding standards are supported, it is primarily designed for use with The Unicode Standard, which provides the universal encoding for written characters and symbols, as well as specifications for how text in different scripts is to be represented.

¹ OpenType® is the registered trademark of a product supplied by Microsoft. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO or IEC of this product.

² TrueType™ is the trademark of a product supplied by Apple Inc. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO or IEC of this product.

- This specification defines Advanced Open Font Layout tables and low-level glyph substitution and positioning operations needed for high-quality typography and for correct display of Unicode text in various scripts. (See 6.1.1.) The OpenType Layout feature registry defines various features that represent specific typographic capabilities that can be supported in a font, and that are used to activate those capabilities in a given font. Many features expose optional capabilities that authors and typographers can choose to use at their discretion; for example, small cap forms, or kerning. But many other features are used to activate capabilities that are required for correct display of text; for example, required ligatures for Arabic script, or positioning of mark glyphs. Many scripts supported in Unicode have complex structural behaviors that require non-trivial operations, implemented in applications or in text layout and “shaping” libraries, to derive a correct sequence of positioned glyphs for presentation of an underlying Unicode string. The feature registry will include features that can be used in those operations. However, complete specification of shaping algorithms for different scripts is beyond the scope of this specification. Such algorithms can be proprietary, “closed-source” implementations in particular applications; or they can be defined in vendor-specific specifications or in other industry specifications.
- Support for mathematical text involving complex formulas requires a content format to describe text semantics combined with layout and presentation capabilities. This specification defines the font-specific data that would be needed for presentation. In this way, the Open Font Format can be used to implement presentation capabilities for other document format specifications, such as T_EX or MathML. Certain features can be defined in the Advanced Open Font Layout feature tag registry to support math layout operations.
- Text layout involves operations within individual lines of text but also control over arrangement of lines into larger blocks within a page or similar context. This specification defines certain data that is used in block-level layout, such as default line metrics (ascent, descent, leading). Also, certain features can be defined in the Advanced Open Font Layout feature tag registry to support layout of text blocks for either horizontal or vertical layout orientation. Complete specification of block level layout is beyond the scope of this specification, however. It can be used in conjunction with other specifications, such as Unicode Standard Annex #50: Unicode Vertical Text Layout.

Some font capabilities can be subject to tailoring by applications or other higher-level protocols. For example, the TrueType instructions defined in this specification define operations used in rasterization of glyph outlines, but applications can supplement their own algorithms for final rasterization (for example, using over-sampling, or control of sub-pixel display elements) to optimize legibility of glyphs. Also, while the descriptions of features in the Advanced Open Font Layout feature tag registry can specify expected usage, applications may tailor their usage of features subject to other specifications or according to their own needs.

Information technology — Coding of audio-visual objects —

Part 22:

Open font format

1 Scope

This document specifies the Open Font Format (OFF) specification, including the TrueType and Compact Font Format (CFF) outline formats. Many references to both TrueType and PostScript exist throughout this document, as Open Font Format fonts combine the two technologies. The document defines data structures for various font tables and provides the necessary details for developers to build a font rendering and text layout/shaping engines in compliance with this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 10646, Information technology — Universal Coded Character Set (UCS)

ISO/IEC 15948, Information technology — Computer graphics and image processing — Portable Network Graphics: Functional specification ³

IEC 61966-2-1/Amd 1:2003: Multimedia systems and equipment — Colour measurement and management — Part 2-1: Colour management — Default RGB colour space — sRGB.

TrueType Instruction Set, <http://www.microsoft.com/typography/otspec/ttinst.htm>

The Unicode Standard, Version 15.1.0, <http://www.unicode.org/versions/Unicode15.1.0/>

Scalable Vector Graphics (SVG) 1.1 (Second edition), W3C Recommendation, 16 August 2011
<http://www.w3.org/TR/SVG11/>

³ Also available as a W3C Recommendation (Reference [15]).

Bibliography

- [1] [MS-LCID]: Windows Language Code Identifier (LCID) Reference, https://learn.microsoft.com/en-us/openspecs/windows_protocols/ms-lcid/70feba9f-294e-491e-b6eb-56532684c37f
- [2] Apple's TrueType Reference Manual, chapter 6: The 'post' table - <https://developer.apple.com/fonts/TrueType-Reference-Manual/RM06/Chap6post.html>
- [3] Adobe Glyph List Specification - <https://github.com/adobe-type-tools/agl-specification>
- [4] Type 2 Charstring format, <http://partners.adobe.com/public/developer/en/font/5177.Type2.pdf>>
- [5] The Compact Font Format specification, <<http://partners.adobe.com/public/developer/en/font/5176.CFF.pdf>>
- [6] Registered font vendors, <http://www.microsoft.com/typography/links/vendorlist.aspx>
- [7] Apple's TrueType Reference Manual - <https://developer.apple.com/fonts/TrueType-Reference-Manual/>
- [8] TrueType Font Files, Technical Specification V1.66 <http://www.microsoft.com/typography/SpecificationsOverview.mspx>
- [9] OpenType Layout Font Specification <http://www.microsoft.com/typography/otspec/TTOCHAP1.htm>
- [10] Script-specific Development: <http://www.microsoft.com/typography/SpecificationsOverview.mspx>
- [11] Feature Tags: <http://www.microsoft.com/typography/developers/OpenType/featuretags.aspx>
- [12] PKCS#7 signatures: <ftp://ftp.rsa.com/pub/pkcs/ascii/pkcs-7.asc>
- [13] Counter-signatures: <ftp://ftp.rsa.com/pub/pkcs/ascii/pkcs-9.asc>
- [14] PANOSE Classification Metrics Guide: <http://www.panose.com/>
- [15] Portable Network Graphics (PNG) specification: <http://www.w3.org/TR/PNG/>
- [16] Conformance requirements for SVG viewers: <http://www.w3.org/TR/SVG11/conform.html#ConformingSVGViewers>
- [17] SVG Integration: <http://www.w3.org/TR/svg-integration/>
- [18] CSS Custom Properties for Cascading Variables Module Level 1 specification: <http://www.w3.org/TR/css-variables-1/>
- [19] Scalable Vector Graphics (SVG) 2 specification: <http://www.w3.org/TR/SVG2>
- [20] Unicode Character Database file for joining-script properties <http://www.unicode.org/Public/UCD/latest/ucd/ArabicShaping.txt>

- [21] Requirements for Japanese Text Layout (JLREQ): <https://www.w3.org/TR/jlreq/>
- [22] Unicode Character Database (Unicode Annex #44) <http://www.unicode.org/reports/tr44/tr44-18.html>
- [23] Unicode Standard Annex #50: Unicode Vertical Text Layout.
<http://www.unicode.org/reports/tr50/>
- [24] The WOFF2 specification: <http://www.w3.org/TR/WOFF2/>
- [25] IETF BCP 47 specification, "Tags for Identifying Languages".
<https://www.rfc-editor.org/info/bcp47>
- [26] IANA Language Subtag Registry.
<http://www.iana.org/assignments/language-subtag-registry/language-subtag-registry>
- [27] Adobe Technical Note #5902: "PostScript Name Generation for Variation Fonts".
<http://partners.adobe.com/public/developer/en/font/5902.AdobePSNameGeneration.pdf>
- [28] CFF2 changes from CFF 1.0 <https://www.microsoft.com/typography/otspec/cff2.htm#appendixD>
- [29] Example CFF2 Font:
<https://www.microsoft.com/typography/otspec/cff2.htm#appendixA>
- [30] Adobe Technical Note #5015: "Type 1 Font Format Supplement".
http://partners.adobe.com/public/developer/en/font/5015.Type1_Supp.pdf
- [31] RFC 1952: "GZIP file format specification version 4.3".
<https://www.ietf.org/rfc/rfc1952.txt>
- [32] HTML Living Standard, 4.12.5, The canvas element.
<https://html.spec.whatwg.org/multipage/canvas.html#the-canvas-element>
- [33] Compositing and Blending Level 1. W3C Candidate Recommendation, 13 January 2015.
<https://www.w3.org/TR/compositing-1/>
- [34] CSS Color Module Level 4. W3C Working Draft Recommendation, 12 November 2020.
<https://www.w3.org/TR/css-color-4/>
- [35] TrueType Fundamentals.
<http://www.microsoft.com/typography/otspec/TTCH01.htm>
- [36] Instructing TrueType Glyphs.
https://learn.microsoft.com/typography/opentype/spec/tt_instructing_glyphs
- [37] RFC 1951: "DEFLATE Compressed Data Format Specification version 1.3".
<https://www.ietf.org/rfc/rfc1951.txt>
- [38] Notes on alternate letterforms in Arakanese and Mon languages.
<https://www.unicode.org/L2/L2020/20163-arakanese-mon.pdf>

- [39] Requirements for Chinese Text Layout.
<https://www.w3.org/TR/clreq/>
- [40] Requirements for Hangul Text Layout and Typography.
<https://www.w3.org/TR/klreq/>
- [41] Unicode Standard Annex #11, East Asian Width.
<https://www.unicode.org/reports/tr11/tr11-11.html>
- [42] The TrueType Instruction Set.
https://learn.microsoft.com/en-us/typography/opentype/spec/tt_instructions