Additional Variation Selectors for Rotations of Ancient Egyptian Hieroglyphic Texts

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Executive Summary
This document requests the addition of 44 new sequences for Ancient Egyptian hieroglyphs to be included in StandardizedVariants.txt in Unicode version 17.0.

Background documents

- L2/22-012R is an earlier proposal for the registration of rotations for Ancient Egyptian hieroglyphs

- L2/21-248 is an earlier proposal that defined the usage of VS1–VS3 for Ancient Egyptian hieroglyphs and suggested to reserve VS4–VS7 for non-90° rotations.

- L2/24-177 is an earlier proposal that included the usage of VS4 and VS7 for Ancient Egyptian hieroglyphs.

- L2/22-012 is the earlier proposal, for which this proposal is a follow-up/update.

Introduction

In Unicode v5.2 certain rotated variants of hieroglyphs were introduced that do not justify a separate codepoint because these rotated variants have the same function as the unrotated base characters, e.g. U+133DC EGYPTIAN HIEROGLYPH Y001A (vertical form of Y1) (𓏜) as a variant of the more common U+133DB EGYPTIAN HIEROGLYPH Y001 (papyrus rolled up, tied, and sealed) (𓏛).

At the same time, there is a clear demand from Egyptologists to encode these very common cases of rotations in hieroglyphic strings.

In general, it was decided to implement non-meaningful rotations of Ancient Egyptian hieroglyphs in Unicode via Variation Selectors (see L2/21-248).

Use of Variation Selectors in the Newly Requested Variation Sequences

Variation Selectors VS1–VS3 have already been defined to represent cases of 90°, 180° and 270° clockwise (if LTR) rotation of hieroglyphs. In accordance with the original proposal L2/21-248, we requested additional VSes for 'odd' angles in the four quarters. The proposal L2/24-177 requested VS4

(FE03) and VS7 (FE06) for rotations between 15° and 75° and 285° and 345°, respectively. This proposal requests the usage of VS5 (FE04) and VS6 (FE05) to be used in cases of rotations between 105° and 165° and 195° and 255°, respectively.

Variation selectors	Code	Usage (LTR)	State
VS1	FE00	90° (clockwise)	v15.1
VS2	FE01	180° (clockwise)	v15.1
VS3	FE02	270° (clockwise)	v15.1
VS4	FE03	15–75° (clockwise)	v16.0
VS5	FE04	105–165° (clockwise)	**New**
VS6	FE05	195–255° (clockwise)	**New**
VS7	FE06	285–345° (clockwise)	v16.0

Table 1 | Usage of variation selectors

Newly Proposed Sequences

The proposed variants are rotations of hieroglyphs found in digital hieroglyphic text databases encoded in Manuel de Codage/JSesh or Manuel de Codage/WinGlpyh from the *Thesaurus Linguae Aegyptiae* database (BBAW Berlin, Daniel A. Werning; https://thesaurus-linguae-aegyptiae.de), **Pyramid Text** encoding project (Frank Kammerzell, Daniel A. Werning), *Karnak Project* database (Sébastien Biston-Moulin; http://sith.huma-num.fr/), **Athribis project** encodings (Christian Leitz, Carolina Teotino), **Kom Ombo project** encodings (Françoise Labrique, Sven Eicke), and data tables by Michel Suignard.

Lists of candidates for possible rotations were discussed in a larger group with Peter Dils, Jorke Grotenhuis, Svenja Gülden, Stéphane Polis, Mark-Jan Nederhof (and Daniel A. Werning). Certain candidates in discussion were held back for further investigation.

The tables below enumerates the 44 newly proposed cases of VS.

Code point *)	UniPUA font	Image (*JSesh*)	Rotation **)	VS	Rotated (*JSesh*)	Occurrences in DBs
13012	𓀒	𓀒	30°	FE03	𓀒	≥10
130B8	𓂸	𓂸	25°	FE03	𓂸	≥40
130BA	𓂺	𓂺	25°	FE03	𓂺	1
1310F	𓄏	𓄏	30°	FE03	𓄏	≥40
13BE8	𓯨	𓯨	90° = 270°	FE00	𓯨	≥30
13BE9	𓯩	𓯩	90° = 270°	FE00	𓯩	<5
13BEA	𓯪	𓯪	90° = 270°	FE00	𓯪	(systematic add.)
1312F	𓄯	𓄯	40° (not yet vertical)	FE03	𓄯	≥50
1312F	𓄯	𓄯	325° (horizontal)	FE06	𓄯	n.d.
13139	𓄹	𓄹	45° (vertical)	FE03	𓄹	≥20
13139	𓄹	𓄹	135°	FE04	𓄹	(systematic add.)
13139	𓄹	𓄹	225°	FE05	𓄹	≥5
13139	𓄹	𓄹	315° (horizontal)	FE06	𓄹	1
13184	𓆄	𓆄	25°	FE03	𓆄	≥5
13184	𓆄	𓆄	335°	FE06	𓆄	≥10

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Code point *)	UniPUA font	Image (*JSesh*)	Rotation **)	VS	Rotated (*JSesh*)	Occurrences in DBs
1319C			45°	FE03		≥5
1319D			30°	FE03		<5
1319F			30°	FE03		≥5
131B1			45°	FE03		<5
131DB			20°	FE03		≥5
131DB			340°	FE06		≥5
131EE			330°	FE06		≥5
13205			30° (not yet vertical)	FE03		≥50
13205			330° (horizontal)	FE06		≥500
1328B			180°	FE01		1
13296			45° = 135° = 225° = 315°	FE03		≥20
132A4			315°	FE06		≥5
132E9			300°	FE06		1
1332B			340° (horizontal)	FE06		<5
13370			320°	FE06		1
13371			315°	FE06		1
133E4			90° = 270°	FE00		1
133EE			90° = 270°	FE00		n.d.
1340D			135° = 315°	FE04		≥100
13419			15°	FE03		<5
13419			345°	FE06		≥5
13F1F			180°	FE01		(systematic add.)
13F72			90° = 270°	FE00		<5
14274			180°	FE01		<5
14274			270°	FE02		≥5
14274			250° (vertical)	FE05		≥40
14274			340° (horizontal)	FE06		<5

Table 2 | Overview of variant rotations (n.d. = no quantitative data at hand)

*) Unicode *codepoints in italics* are new codepoints proposed for Unicode v16 (based on L2/23-181R2).

**) Note that 'odd' angles are recommendations to the font designers. Deviations from these recommendations up to +/- 10° are usually acceptable.

Description of rotations in StandardizedVariants.txt Code

We anticipate that the exact angle of the basic glyphs which the rotated variants are based on may slightly vary in actual fonts, e.g., the exact angles of 1312F ( ), 1319D ( ), 13205 ( ), 1332B ( ), 13BE8 ( ), or 14274 ( ). To prevent that two specific cases of rotation end up close to vertical after the rotation, namely 1312F FE03 ( ), and 13205 FE03 ( ), an extra hint "[but not yet vertical]" was added to the description. For a similar reason hints "[vertical]" and "[horizontal]" point to the actually intended appearance.

Changes to StandardizedVariants.txt Code

Additions

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13012 FE03; rotated approximately 30 degrees; # EGYPTIAN HIEROGLYPH A015
130B8 FE03; rotated approximately 25 degrees; # EGYPTIAN HIEROGLYPH D052
130BA FE03; rotated approximately 25 degrees; # EGYPTIAN HIEROGLYPH D053
1310F FE03; rotated approximately 30 degrees; # EGYPTIAN HIEROGLYPH F016
1312F FE03; rotated approximately 40 degrees [but not yet vertical]; # EGYPTIAN HIEROGLYPH F044
1312F FE06; rotated approximately 325 degrees [horizontal]; # EGYPTIAN HIEROGLYPH F044
13139 FE03; rotated approximately 45 degrees [vertical]; # EGYPTIAN HIEROGLYPH F051
13139 FE04; rotated approximately 135 degrees [horizontal]; # EGYPTIAN HIEROGLYPH F051
13139 FE05; rotated approximately 225 degrees [vertical]; # EGYPTIAN HIEROGLYPH F051
13139 FE06; rotated approximately 315 degrees [horizontal]; # EGYPTIAN HIEROGLYPH F051
13184 FE03; rotated approximately 25 degrees; # EGYPTIAN HIEROGLYPH H006
13184 FE06; rotated approximately 335 degrees; # EGYPTIAN HIEROGLYPH H006
1319C FE03; rotated approximately 45 degrees; # EGYPTIAN HIEROGLYPH K002
1319D FE03; rotated approximately 30 degrees; # EGYPTIAN HIEROGLYPH K003
1319F FE03; rotated approximately 30 degrees; # EGYPTIAN HIEROGLYPH K005
131B1 FE03; rotated approximately 45 degrees; # EGYPTIAN HIEROGLYPH M003
131DB FE03; rotated approximately 20 degrees; # EGYPTIAN HIEROGLYPH M029
131DB FE06; rotated approximately 340 degrees; # EGYPTIAN HIEROGLYPH M029
131EE FE06; rotated approximately 330 degrees; # EGYPTIAN HIEROGLYPH M044
13205 FE03; rotated approximately 30 degrees [but not yet vertical]; # EGYPTIAN HIEROGLYPH N021
13205 FE06; rotated approximately 330 degrees [horizontal]; # EGYPTIAN HIEROGLYPH N021
1328B FE01; rotated 180 degrees; # EGYPTIAN HIEROGLYPH O038
13296 FE03; rotated 45 degrees [= 135, 225, 315 degrees]; # EGYPTIAN HIEROGLYPH O049
132A4 FE06; rotated approximately 315 degrees; # EGYPTIAN HIEROGLYPH P008
132E9 FE06; rotated approximately 300 degrees; # EGYPTIAN HIEROGLYPH S020
1332B FE06; rotated approximately 340 degrees [horizontal]; # EGYPTIAN HIEROGLYPH T031
13370 FE06; rotated approximately 320 degrees; # EGYPTIAN HIEROGLYPH V005
13371 FE06; rotated approximately 315 degrees; # EGYPTIAN HIEROGLYPH V006
133E4 FE00; rotated 90 degrees [= 270 degrees]; # EGYPTIAN HIEROGLYPH Z001
133EE FE00; rotated 90 degrees [= 270 degrees]; # EGYPTIAN HIEROGLYPH Z004A
1340D FE04; rotated approximately 135 degrees [= 315 degrees]; # EGYPTIAN HIEROGLYPH AA001
13419 FE03; rotated approximately 15 degrees; # EGYPTIAN HIEROGLYPH AA011
13419 FE06; rotated approximately 345 degrees; # EGYPTIAN HIEROGLYPH AA011
13BE8 FE00; rotated 90 degrees [= 270 degrees]; # EGYPTIAN HIEROGLYPH U+13BE8
13BE9 FE00; rotated 90 degrees [= 270 degrees]; # EGYPTIAN HIEROGLYPH U+13BE9
13BEA FE00; rotated 90 degrees [= 270 degrees]; # EGYPTIAN HIEROGLYPH U+13BEA
13F1F FE01; rotated 180 degrees; # EGYPTIAN HIEROGLYPH U+13F1F
13F72 FE00; rotated 90 degrees [= 270 degrees]; # EGYPTIAN HIEROGLYPH U+13F72
14274 FE01; rotated 180 degrees; # EGYPTIAN HIEROGLYPH U+14274
14274 FE02; rotated 270 degrees; # EGYPTIAN HIEROGLYPH U+14274
14274 FE05; rotated approximately 250 degrees [vertical]; # EGYPTIAN HIEROGLYPH U+14274
14274 FE06; rotated approximately 340 degrees [horizontal]; # EGYPTIAN HIEROGLYPH U+14274
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Selected Evidence for New Rotation Variants

Code point	VS code	Rotation (approx.)	Rotated form	Comment / Selected evidence
13012	FE03	30°		https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBd03jXPjmp0DWpEHPFMMylVs, https://thesaurus-linguae-aegyptiae.de/sentence/token/ICICcPMSBCaENEEQr2YfabP5RiM, https://thesaurus-linguae-aegyptiae.de/sentence/token/ICMAiTugmc8MHUfuhCEWQGWWtTg, https://thesaurus-linguae-aegyptiae.de/sentence/token/ICMAifz8UHiwSUNCt1jSy3uSOS8, https://thesaurus-linguae-aegyptiae.de/sentence/token/ICMCNi3WFF5wWE4dp3ZjESqDX7Y, and more.
130B8	FE03	25°		*Hieroglyphica* atomic D52A; https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBdQSI7EK2ekDKi9HUC2cLU7w, https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBdzBuKw2WQEU9hHhFbSxHj5E.
130BA	FE03	25°		*Hieroglyphica* atomic D53A; cf. http://thotsignlist.org/mysign?id=2326; cf. 130B8 FE003.

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Code point	VS code	Rotation (approx.)	Rotated form	Comment / Selected evidence
1310F	FE03	30°		http://sith.huma-num.fr/karnak/4294#l10, http://sith.huma-num.fr/karnak/5326#l8; https://thotsignlist.org/mysign?id=2961.
1312F	FE03	40°		https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBd57T6ry5e0oyliohzutEFcc, https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBdxbSCbrASUMJtjKiXyAlWiY, https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBdz8TLxDE1Ujugw0S8jiLdnY, https://thesaurus-linguae-aegyptiae.de/sentence/token/ICEDSHPX8dTN0UeIm03EIC47bL0, and more.
1312F	FE06	325°		https://thotsignlist.org/mysign?id=3092.
13139	FE03	45°		https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBdwfOKWGVjkdDqcKWJI2MB20; http://thotsignlist.org/mytkclass?id=3106&cl=02.
13139	FE04	135°		(Systematic.)
13139	FE05	225°		*Hieroglyphica* atomic F51D (mirrored); http://thotsignlist.org/mytkclass?id=3106&cl=04.
13139	FE06	315°		*Hieroglyphica* atomic F51F; https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBd6j2AKhUxEozowG7N8QauHI, http://thotsignlist.org/mytkclass?id=3106&cl=00.
13184	FE03	25°		https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBd3ZI2ab84k2dqOY8v4Mevw8, https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBd9KrqxwdZ0Puv3IoplZ9Q4o, https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBdxkcdeSSQEaemwWkTO85ZXw.
13184	FE06	335°		*Hieroglyphica* atomic H6B.
1319C	FE03	45°		In TLA, Karnak, and Athribis data; http://sith.huma-num.fr/karnak/3783#l5.
1319D	FE03	30°		https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBd7BmtXNB80zRgpE2ijKhPWU; https://thotsignlist.org/mysign?id=3751; in overlap (*Hieroglyphica* atomic P81).
1319F	FE03	30°		http://sith.huma-num.fr/karnak/4209#l1, http://sith.huma-num.fr/karnak/3962#l5, http://sith.huma-num.fr/karnak/3921#l2; https://thotsignlist.org/mysign?id=3755.
131B1	FE03	45°		*Hieroglyphica* atomic M3D (similar); https://thesaurus-linguae-aegyptiae.de/sentence/token/ICABVQghVj6AMUrbpzKP5jSJ4cI, https://thesaurus-linguae-aegyptiae.de/sentence/token/ICECedRxHFsbwkulp6pQ6bKT768.
131DB	FE03	20°		Cf. https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBd9QdY1aLyE30rxknjJD2P5E.
131DB	FE06	340°		Cf. https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBdQlCgPuoxUGvrTHGLFgTIro, https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBdQlCgPuoxUGvrTHGLFgTIro.
131EE	FE06	330°		Cf. https://thesaurus-linguae-aegyptiae.de/sentence/token/ICEClvQ3vMyV20tOjDrwwqQiz3E.
13205	FE03	30°		https://thotsignlist.org/mysign?id=4213; verified by D.Werning: e.g., Luxor/KV11
13205	FE06	330°		https://thotsignlist.org/mysign?id=4213; verified by D.Werning: Karnak; cf. also https://thesaurus-linguae-aegyptiae.de/sentence/token/ICEDSJJXUt7CVUo2myqCTgQWblY.
1328B	FE01	180°		*Hieroglyphica* atomic O38B.
13296	FE03	45°		https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBd0RZ0FTog0ParteStpyDuuo, https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBd0WyxRZT8UtBsPVbFhQSlHY, and many more.
132A4	FE06	315°		Cf. 132A6, *14092*.
132E9	FE06	300°		Verified by J. Grotenhuis: Pyramid Texts; https://thotsignlist.org/mysign?id=5637.
1332B	FE06	340°		https://thesaurus-linguae-aegyptiae.de/sentence/token/IBgCCNvoizbkMkBQliYSN0shQr4.
13370	FE06	320°		*Hieroglyphica* atomic V5A; https://thesaurus-linguae-aegyptiae.de/sentence/token/IBgANxGv4of1z0OMm0qs85U7sXI, https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBdwESSHkQq0AltXaZLcEdC1o.
13371	FE06	315°		*Hieroglyphica* atomic V6A; https://thesaurus-linguae-aegyptiae.de/sentence/token/ICAAKZQt3WqWlk4IoHjQsjWAmTk.

Code point	VS code	Rotation (approx.)	Rotated form	Comment / Selected evidence
133E4	FE00	90°	—	*Hieroglyphica* atomic Z1A; ideogram stroke; not to be confused with numerical 133FA FE02; https://thesaurus-linguae-aegyptiae.de/sentence/token/ICECMkZ8rFQv00Qjl99thaFHlmI.
133EE	FE00	90°	=	Dual; not to be confused with numerical 133FB FE02; cf. *Hieroglyphica* atomic Z4B; cf. https://thotsignlist.org/mysign?id=6813.
1340D	FE04	135°	⊘	*Hieroglyphica* standard shape for Aa1 (AA001); verified by D.Werning: e.g., Luxor/KV11; https://thotsignlist.org/mysign?id=931.
13419	FE03	15°	◣	In corner insertion into ⌒; verified by D.Werning: e.g., Luxor/KV11; http://thotsignlist.org/mytkclass?id=6197&cl=01.
13419	FE06	345°	◢	In corner insertion into ⌒; Verified by D.Werning.
13BE8	FE00	90°	✶	Cf. *Hieroglyphica* atomic F37J (quite similar); https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBd6Bq0o1fLkx5ormldaQ5mGk, https://thesaurus-linguae-aegyptiae.de/sentence/token/IBkCIUOVuNheokUouuycFdfSwPg.
13BE9	FE00	90°	✶	*Hieroglyphica* atomic F37E (similar); https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBd5TJ6jslV0PcqEAhEwjSktI, https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBdWVFRVugfkc5pdenhVFd9Es, https://thesaurus-linguae-aegyptiae.de/sentence/token/IBUBd7XTSIS8IUnEt0oWBkgudhM.
13BEA	FE00	90°	✶	*Hieroglyphica* atomic F37A (similar).
13F1F	FE01	180°	°₀°	In center insertion into ⛾ (*Hieroglyphica* atomic V106A).
13F72	FE00	90°	▭	https://thesaurus-linguae-aegyptiae.de/sentence/token/IBkBSGZwwqqlQEBzjfYhqNc5DC4, https://thesaurus-linguae-aegyptiae.de/sentence/token/ICMBUaXZQW299kGepa3gSHRsDQ8, https://thesaurus-linguae-aegyptiae.de/sentence/token/ICMBUikn7axzRUlksZlTRs9kKW0; cf. also 13285 FE02.
14274	FE01	180°	◺	In overlap 𓌪 (*Hieroglyphica* atomic D57A).
14274	FE05	250°	↾	In overlap 𓌶 (*Hieroglyphica* atomic U44).
14274	FE02	270°	╱	https://thesaurus-linguae-aegyptiae.de/sentence/token/ICECVyWO651t80Pfov0NJwyVQBc, https://thesaurus-linguae-aegyptiae.de/sentence/token/ICECWOcG5WHkQkW9jIrTQUtM8BU; in overlaps: https://thotsignlist.org/mysign?id=6201.
14274	FE06	340°	╼	*Hieroglyphica* atomic T30B; https://thesaurus-linguae-aegyptiae.de/sentence/token/IBgAdfD5USTb9EzEreYX5HQajjw.

Table 3 | Selected evidence for rotations in databases and images

*Hieroglyphic*a = N. Grimal, J. Hallof, D. van der Plas, *Hieroglyphica: Sign List*, PIREI 1, Utrecht / Paris, 2000