L2/16-018

Proposal to encode three control characters for Egyptian Hieroglyphs

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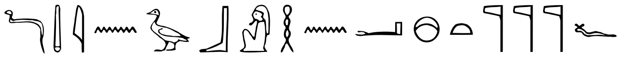
22nd January, 2016

This is a revised proposal that supersedes L2/15-123.

1. Introduction

Egyptian hieroglyphs were added to Unicode in version 5.2 (October 2009) on the basis of the Everson and Richmond *Proposal to encode Egyptian Hieroglyphs in the SMP of the UCS* (L2/07-097; N3237). This basic collection of hieroglyphs is mostly scoped to the *List of Hieroglyphic signs* from Gardiner's *Egyptian Grammar* (Third Edition, 1957). However, at the present time, Egyptian hieroglyphics cannot be displayed in plain text using the quadratic format that is a signature feature integral to the script. Therefore, instead of the standard format,  , non-specialist software such as web browsers or word processors can only express this text in linear form,  . While this is readable it not the way the writing system was used or is intended to be used. This situation has resulted in very limited use of Unicode for Egyptian Hieroglyphs since they became available in 2009.

Egyptian hieroglyphics have been used in typographic form in modern publications since the mid-19th century. For example, the Theinhardt font was designed for Karl Lepsius (1810–1884). A new typeface was designed for Gardiner's *Egyptian Grammar* (First Edition, 1927). A LaserComp version of the Oxford Gardiner font was created in the early 1980s. Since then computer based technology has become the norm for publishing hieroglyphs as text.

The fact that the specialist software is required to render Egyptian hieroglyphic text correctly means that content being produced by specialists is siloed in proprietary software encodings, and thus misses out on the benefits of being encoded in Unicode. The lack of a standard way of encoding Egyptian hieroglyphs in quadrat format effectively blocks the broader adoption of Unicode Egyptian by specialists. This proposal requests the addition of three control characters corresponding to the Manuel de Codage (MdC) control codes '&', '*', and ':' to generate the full range of quadrats required.

Having dedicated control characters for Egyptian hieroglyphics would allow rendering engines to treat quadrat formation as part of the shaping process required for complex scripts. This would allow standardized Egyptian hieroglyphic fonts to be produced using OpenType features to render quadrats.

2. Scope

The scope of this proposal is to broaden the current encoding of Egyptian Hieroglyphs so that the quadrats can be rendered in plain text. This entails modifying the statement in the current wording of the standard, pages 424–425, to:

> **Rendering.** The encoded characters for Egyptian hieroglyphs in the Unicode Standard represent basic text elements, or *signs,* of the writing system and controls for rendering them in quadrats. A higher-level protocol is required to represent effects involving mirroring or rotation of signs within text.

Details of which effects are to be excluded from plain text rendering are given in section 6.

3. Proposed characters

Rendering Egyptian hieroglyphic quadrats requires being able to control the size and position of a character within a quadrat. This can be accomplished using the proposed control characters to identify the types of connections between characters participating in the quadrat. OpenType features can then be used to determine the size and relative position of each character in the quadrat based on context. Ongoing analysis of the corpus of Egyptian Hieroglyphic texts enables OpenType Egyptian hieroglyphic fonts to focus on attested forms rather than having to be designed for completely arbitrary quadrats.

The three control characters being proposed are:

Default glyph	Code point	Character name
+	13430	EGYPTIAN HIEROGLYPHIC SIGN LIGATURE JOINER
*	13431	EGYPTIAN HIEROGLYPHIC SIGN HORIZONTAL JOINER
:	13432	EGYPTIAN HIEROGLYPHIC SIGN VERTICAL JOINER

The proposed code points are provisional. They have been used in this document for the sake of convenience and have been marked in red.

Properties

13430;EGYPTIAN HIEROGLYPHIC SIGN LIGATURE JOINER;Mn;0;NSM;;;;;N;;;;;
13431;EGYPTIAN HIEROGLYPHIC SIGN HORIZONTAL JOINER;Mn;0;NSM;;;;;N;;;;;
13432;EGYPTIAN HIEROGLYPHIC SIGN VERTICAL JOINER;Mn;0;NSM;;;;;N;;;;;

Annotations

13431: = sign separator: juxtaposition (Manuel de Codage)
13432: = sign separator: subordination (Manuel de Codage)

4. Mode of use

EGYPTIAN HIEROGLYPHIC SIGN LIGATURE JOINER

LIGATURE JOINER is the equivalent of MdC '&'. It is placed between hieroglyphs to signal that the sequence forms a ligature. For example, < , LIGATURE JOINER, > signifies the very common phonetic combination . This method is necessary to render clusters that cannot be encoded using HORIZONTAL JOINER and/or VERTICAL JOINER.

It may also be used in combination with HORIZONTAL JOINER and/or VERTICAL JOINER. For example, < , LIGATURE JOINER, , VERTICAL JOINER, > means . LIGATURE JOINER is the highest priority in the order of precedence for the Egyptian Joiners.

Typically, LIGATURE JOINER is used when one glyph is inside the area occupied by another glyph so that the two glyphs cannot be separated by a single horizontal or vertical line. LIGATURE JOINER may also be used so signal a vertical join that has higher precedence than an adjacent HORIZONTAL JOINER (for example, see Section 5, cluster 12).

EGYPTIAN HIEROGLYPHIC SIGN HORIZONTAL JOINER

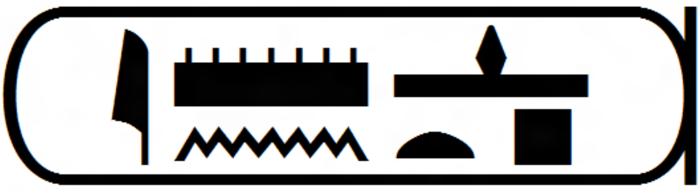
HORIZONTAL JOINER is the equivalent of MdC '*'. It is placed between hieroglyphs signal that the adjacent characters should be rendered side by side in a single quadrat. For example, < , HORIZONTAL JOINER, ,

HORIZONTAL JOINER, ⌉ >. HORIZONTAL JOINER has the second priority in the order of precedence for the Egyptian Joiners.

EGYPTIAN HIEROGLYPHIC SIGN VERTICAL JOINER
VERTICAL JOINER is the equivalent of MdC ':'. It is placed after a hieroglyph indicate that the following hieroglyph(s) renders below the preceding hieroglyph in a quadrat. For example, < 𓂋 , VERTICAL JOINER, 𓈖 > means render as 𓂋𓈖 . VERTICAL JOINER may be used in combination with EGYPTIAN HIEROGLYPHIC SIGN HORIZONTAL JOINER. For example, < 𓀀 , HORIZONTAL JOINER, 𓀁 , VERTICAL JOINER, 𓏥 > means 𓀀𓀁𓏥 . VERTICAL JOINER has the lowest priority in the order of precedence for the Egyptian Joiners.

Quadrat boundaries
Quadrat boundaries exist between any Egyptian Hieroglyphic characters that are not explicitly joined with one of these three joiners. Caret positioning should follow the quadrat boundaries as is usually done in other complex scripts for syllable clusters.

Typeset sample
The following sample of Egyptian Hieroglyphic text was typeset using Unicode code points and analogs to the proposed control characters. The font used standard OpenType features and the Universal Shaping Engine.

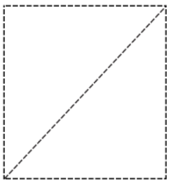


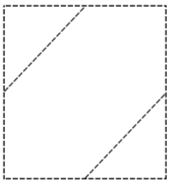
MdC	<1 i-mn:n-R4:t*p 2>
Linear	𓍹 𓇋 𓏠 : 𓈖 𓊵 : 𓏏 * 𓊪 𓍺
Unicode	U+13379 U+131CB U+133E0 U+13432 U+13216 U+132B5 U+13432 U+133CF U+13431 U+132AA U+1337A

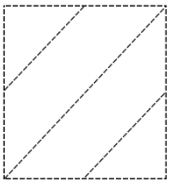
5 Attested quadrat structures

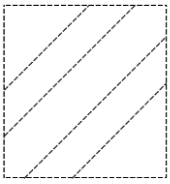
This section presents an analysis of attested quadrat structure types found in the Egyptian Hieroglyphic corpus. Each quadrat structure type shown with a sample from the corpus and encodings in MdC, linear Unicode and Unicode with the proposed joiners. All of the samples can be implemented in OpenType using glyphs substitutions and glyph positioning features and would be compatible with the design of the Universal Shaping Engine.
The intention of this set is to show that the proposed three control characters are sufficient to encode the known set of quadrats based on the most extensive database of the Egyptian hieroglyphic corpus. The precise details of how every known quadrat should be encoded is out of scope for the present proposal, but is planned for a separate publication in the new future. That document will define encoding sequences and thereby specify, for example, when a particular quadrat will use the LIGATION JOINER versus the VERTICAL JOINER.

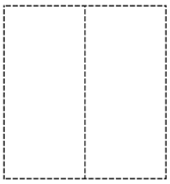
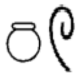
	1. X		
	Sample	Encoding	Value
	𓀀	MdC	A1
		Linear	𓀀
		Unicode	U+13000

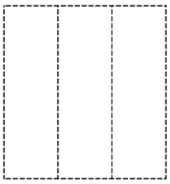
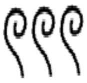
	2. X+X		
	Sample	Encoding	Value
		MdC	I10+A1
		Linear	𓆓 + 𓀀
		Unicode	U+13193 U+13430 U+13000

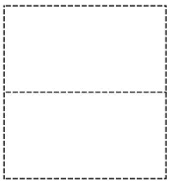
	3. X+X+X		
	Sample	Encoding	Value
		MdC	D21+G36+X1
		Linear	𓂋 + 𓅨 + 𓏏
		Unicode	U+1308B U+13430 U+13168 U+13430 U+133CF

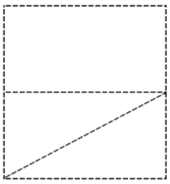
	4. X+X+X+X		
	Sample	Encoding	Value
		MdC	G43+X1+X1+D53
		Linear	𓅱 + 𓏏 + 𓏏 + 𓂺
		Unicode	U+13171 U+13430 U+133CF U+13430 U+133CF U+13430 U+130BA

	5. X+X+X+X+X		
	Sample	Encoding	Value
		MdC	X1+G39+X1+Z1+X1
		Linear	𓏏 + 𓅭 + 𓏏 + 𓏤 + 𓏏
		Unicode	U+133CF U+13430 U+1316D U+13430 U+133CF U+13430 U+133E4 U+13430 U+133CF

	6. X*X		
	Sample	Encoding	Value
		MdC	W24*Z7
		Linear	𓏌 * 𓏲
		Unicode	U+133CC U+13431 U+133F2

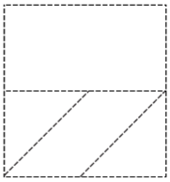
	7. X*X*X		
	Sample	Encoding	Value
		MdC	V1*V1*V1
		Linear	𓍢 * 𓍢 * 𓍢
		Unicode	U+13362 U+13431 U+13362 U+13431 U+13362

	8. X:X		
	Sample	Encoding	Value
		MdC	A1:O1
		Linear	𓀀 : 𓉐
		Unicode	U+13000 U+13432 U+13250



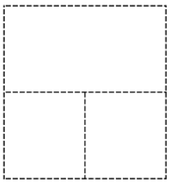
9. X:X+X

Sample	Encoding	Value
	MdC	D36:I10+D46
	Linear	𓂝 : 𓆓 + 𓂧
	Unicode	U+1309D U+13432 U+13193 U+13430 U+130A7



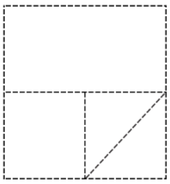
10. X:X+X+X

Sample	Encoding	Value
	MdC	N35:I10+X1+Z1
	Linear	𓈖 : 𓆓 + 𓏏 + 𓏤
	Unicode	U+13216 U+13432 U+13193 U+13430 U+133CF U+13430 U+133E4



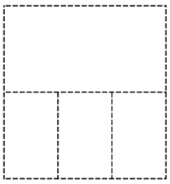
11. X:X*X

Sample	Encoding	Value
	MdC	A15:N23*Z1
	Linear	𓀒 : 𓈇 * 𓏤
	Unicode	U+13012 U+13432 U+13207 U+13431 U+133E4



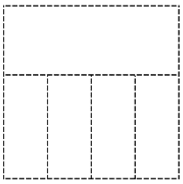
12. X:X*X+X

Sample	Encoding	Value
	MdC	O34:V28*M2+Z7
	Linear	𓊃 : 𓎛 * 𓆰 + 𓏲
	Unicode	U+13283 U+13432 U+1339B U+13431 U+131B0 U+13430 U+133F2



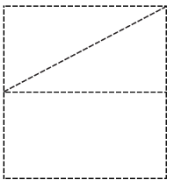
13. X:X*X*X

Sample	Encoding	Value
	MdC	D21:M17*X1*M17
	Linear	𓂋 : 𓇋 * 𓏏 * 𓇋
	Unicode	U+1308B U+13432 U+131CB U+13431 U+133CF U+13431 U+131CB



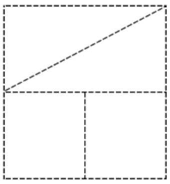
14. X:X*X*X*X

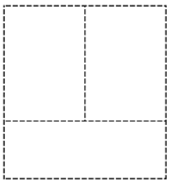
Sample	Encoding	Value
	MdC	D7:N33*N33*N33*N33
	Linear	𓁹 : 𓈒 * 𓈒 * 𓈒 * 𓈒
	Unicode	U+1307C U+13432 U+13212 U+13431 U+13212 U+13431 U+13212 U+13431 U+13212

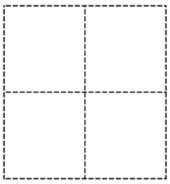


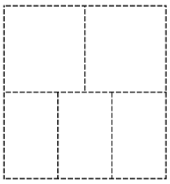
15. X+X:X

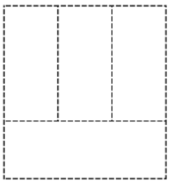
Sample	Encoding	Value
	MdC	D17+X1:N37
	Linear	𓂇 + 𓏏 : 𓈙
	Unicode	U+13087 U+13430 U+133CF U+13432 U+13219

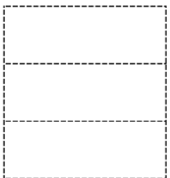
	16. X+X:X*X		
	Sample	Encoding	Value
		MdC	D36+U1:X1*F51
		Linear	𓂝 + 𓌳 : 𓏏 * 𓄹
		Unicode	U+1309D U+13430 U+13333 U+13432 U+133CF U+13431 U+13139

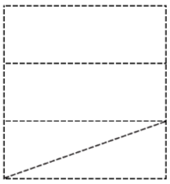
	17. X*X:X		
	Sample	Encoding	Value
		MdC	A1*B1:Z2
		Linear	𓀀 * 𓁐 : 𓏥
		Unicode	U+13000 U+13431 U+13050 U+13432 U+133E5

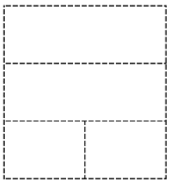
	18. X*X:X*X		
	Sample	Encoding	Value
		MdC	D2*Z1:D36*Z1
		Linear	𓁷 * 𓏤 : 𓂝 * 𓏤
		Unicode	U+13077 U+13431 U+133E4 U+13432 U+1309D U+13431 U+133E4

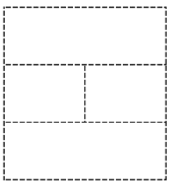
	19. X*X:X*X*X		
	Sample	Encoding	Value
		MdC	D36*Z4:Z7*D21*Z1
		Linear	𓂝 * 𓏭 : 𓏲 * 𓂋 * 𓏤
		Unicode	U+1309D U+13431 U+133ED U+13432 U+133F2 U+13431 U+1308B U+13431 U+133E4

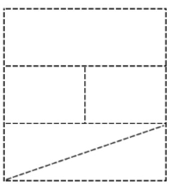
	20. X*X*X:X		
	Sample	Encoding	Value
		MdC	D2*Z1*G7:N35
		Linear	𓁷 * 𓏤 * 𓅆 : 𓈖
		Unicode	U+13077 U+13431 U+133E4 U+13431 U+13146 U+13432 U+13216

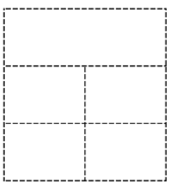
	21. X:X:X		
	Sample	Encoding	Value
		MdC	D2:D21:N1
		Linear	𓁷 : 𓂋 : 𓇯
		Unicode	U+13077 U+13432 U+1308B U+13432 U+131EF

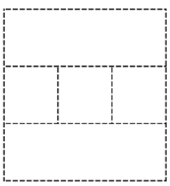
	22. X:X:X+X		
	Sample	Encoding	Value
		MdC	I9:N35:F20+A1
		Linear	𓆑 : 𓈖 : 𓄓 + 𓀀
		Unicode	U+13191 U+13432 U+13216 U+13432 U+13113 U+13430 U+13000

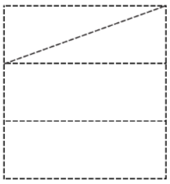
	23. X:X:X*X		
	Sample	Encoding	Value
		MdC	D21:D21:Z7*Z4
		Linear	𓂋 : 𓂋 : 𓏲 * 𓏭
		Unicode	U+1308B U+13432 U+1308B U+13432 U+133F2 U+13431 U+133ED

	24. X:X*X:X		
	Sample	Encoding	Value
		MdC	F4:X1*X1:D36
		Linear	𓄂 : 𓏏 * 𓏏 : 𓂝
		Unicode	U+13102 U+13432 U+133CF U+13431 U+133CF U+13432 U+1309D

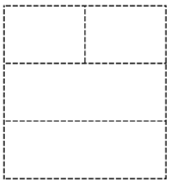
	25. X:X*X:X+X		
	Sample	Encoding	Value
		MdC	N37:R7*R7:Z9+D40
		Linear	𓈙 : 𓊸 * 𓊸 : 𓏴 + 𓂡
		Unicode	U+13219 U+13432 U+132B8 U+13431 U+132B8 U+13432 U+133F4 U+13430 U+130A1

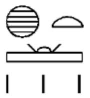
	26. X:X*X:X*X		
	Sample	Encoding	Value
		MdC	T10:X1*Z15B:Z15B*Z15B
		Linear	𓌔 : 𓏏 * III : III * III
		Unicode	U+13314 U+13432 U+133CF U+13431 U+xxxxx U+13432 U+xxxxx U+13431 U+xxxxx *(Z15B not yet encoded)*

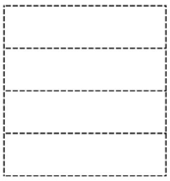
	27. X:X*X*X:X		
	Sample	Encoding	Value
		MdC	D21:X1*Q3*X1:D36
		Linear	𓂋 : 𓏏 * 𓊪 * 𓏏 : 𓂝
		Unicode	U+1308B U+13432 U+133CF U+13431 U+132AA U+13431 U+133CF U+13432 U+1309D

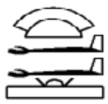


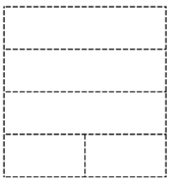
28. X+X:X:X		
Sample	Encoding	Value
	MdC	F4+X1:W24:Z2A
	Linear	𓄂 + 𓏏 : 𓏌 : 𓏦
	Unicode	U+13102 U+13430 U+133CF U+13432 U+133CC U+13432 U+133E6



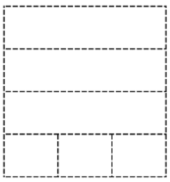
29. X*X:X:X		
Sample	Encoding	Value
	MdC	AA1*X1:Y1:Z2
	Linear	𓐍 * 𓏏 : 𓏛 : 𓏥
	Unicode	U+1340D U+13431 U+133CF U+13432 U+133DB U+13432 U+133E5

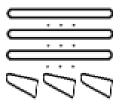


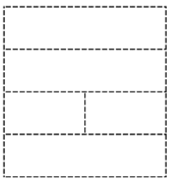
30. X:X:X:X		
Sample	Encoding	Value
	MdC	N28:D36:D36:Y1
	Linear	𓈍 : 𓂝 : 𓂝 : 𓏛
	Unicode	U+1320D U+13432 U+1309D U+13432 U+1309D U+13432 U+133DB



31. X:X:X:X*X		
Sample	Encoding	Value
	MdC	V30:N17:N17:N23*N23
	Linear	𓎟 : 𓇿 : 𓇿 : 𓈇 * 𓈇
	Unicode	U+1339F U+13432 U+131FF U+13432 U+131FF U+13432 U+13207 U+13431 U+13207



32. X:X:X:X*X*X		
Sample	Encoding	Value
	MdC	N16:N16:N16:N21*N21*N21
	Linear	𓇾 : 𓇾 : 𓇾 : 𓈅 * 𓈅 * 𓈅
	Unicode	U+131FE U+13432 U+131FE U+13432 U+131FE U+13432 U+13205 U+13431 U+13205 U+13431 U+13205



33. X:X:X*X:X		
Sample	Encoding	Value
	MdC	D21:F4:X1*Z1:I9
	Linear	𓂋 : 𓄂 : 𓏏 * 𓏤 : 𓆑
	Unicode	U+1308B U+13432 U+13102 U+13432 U+133CF U+13431 U+133E4 U+13432 U+13191

	34. X:X:X:X:X		
	Sample	Encoding	Value
		MdC	Z1:Z1:Z1:Z1:Z1
		Linear	𓏤:𓏤:𓏤:𓏤:𓏤
		Unicode	U+133E4 U+13432 U+133E4 U+13432 U+133E4 U+13432 U+133E4 U+13432 U+133E4

6. Other MdC issues out of scope for plain text that are NOT being proposed

Quadrat boundary sign

Quadrat boundaries occur wherever basic characters have not been explicitly joined using one of the proposed control characters. Therefore no equivalent to MdC '-' or 'space' is required to signal a quadrat boundary. Similarly, the MdC's end of line marker and other layout controls do not require explicit encoding with new characters.

Complex quadrats

MdC supports sub-quadrats using parentheses '(', ')'. E.g., MdC F9*(X1:Z4):D40 means quadrat  . This form can expressed more simply via the three control characters, F9*X1&Z4:D40. An extensive survey of the Egyptian texts indicates there is no need to support parenthetical expressions for quadrats, since parenthetical expressions occurring in MdD can be expressed as sequences using the LIGATURE JOINER character or other mechanisms, such as kerning, see next paragraph.

Vertical writing employed in some styles of Late Egyptian writing may form quadrats differently than is done in normal horizontal writing. A good example is seen in the following illustration of directionality in Hieroglyphic from *Egyptian Grammar* (p. 25):

Note that the complex cluster in this example (1–4) can be produced by kerning two of the horizontal quadrats so that they overlap. Such cases could be accommodated contextual OT features, perhaps including the vert feature. Thus the formation does not need not be defined directly in the quadrat structure.

Mirroring

Egyptian Hieroglyphs have been encoded as strong left-to-right characters based on contemporary practice in popular and scholarly publications. In ancient times Egyptian Hieroglyphs were written left-to-right, right-to-left, and top-to-bottom. When written vertically top-to-bottom, lines could progress from left-to-right or right-to-left. The direction of writing is indicated by the signs, which face away from the direction of writing. Therefore, if embedded within a directional override, Egyptian Hieroglyphs could be mirrored using the OpenType mirroring feature <rtlm>. When an individual sign is mirrored to face the direction of writing in specific context, such as an established royal name, that mirroring could be handled as a contextual alternate within the font's OpenType.

Rotation

Rotation is mostly used for a small number of signs with horizontal and vertical variants, this can be handled in OpenType based on context.

Scaling

MdC notation allows for scaling of hieroglyphs as a mechanism for specific layout implementations. For contemporary systems, scaling can be achieved in OpenType based on glyph contexts should not be defined explicitly in the encoding.

Colouring and shading

MdC has signs to specify text coloration. These properties are out of scope for plain text.

7. A note on Mayan clusters

Based on feedback on the previous draft of this proposal, the authors have considered whether the encoding model proposed here to describe cluster formation for Egyptian Hieroglyphs can also be applied to Mayan hieroglyphic writing. Having a shared model (but not necessarily shared control characters) would facilitate the development of text display solutions for these scripts. Based on our investigations of Mayan writing and in particular, through conversations with Carlos Pallán Gayol, a Mayan specialist at the University of Bonn, we are confident that the model described in this document is directly applicable to Mayan.

Mr. Pallán works on the [Textdatenbank und Wörterbuch des Klassischen Maya]() project at the University of Bonn. This project uses a linear encoding to represent Mayan hieroglyphs in a comprehensive database. While the dictionary focuses on Classical Mayan writing, they have also studied material for related Meso-American writing systems. A review of their linear notation indicates overlap with the signs proposed here for Egyptian. Equivalence at the precedence level has not yet been established and no claim is made that it would be appropriate to share characters between the scripts. Mayan may require at least two additional control signs to indicate truncation and infixation. The following table illustrates some basic cluster types for Mayan. Symbols for the control characters have been normalized here for the purposes of the comparison.

<table>
<tr><th colspan="2">Ligation</th><th colspan="2">Horizontal joining</th><th colspan="2">Vertical joining</th></tr>
<tr><td colspan="2">
MO’ + K’UK’</td><td colspan="2">
CHAK * ki</td><td colspan="2">
wi : WITZ</td></tr>
<tr><th colspan="3">Truncation</th><th colspan="3">Infixation</th></tr>
<tr><td colspan="3"> 
AJAW AJAW [TRUNCATION MODIFIER] :
B’AHLAM</td><td colspan="3">
NAL : WITZ ^ K’AN</td></tr>
</table>

8. Selected references

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9. Acknowledgments

The authors would like to thank Ken Whistler, Debbie Anderson, and Carlos Pallán for their feedback that contributed to this proposal.

ISO/IEC JTC 1/SC 2/WG 2

PROPOSAL SUMMARY FORM TO ACCOMPANY SUBMISSIONS

FOR ADDITIONS TO THE REPERTOIRE OF ISO/IEC 10646[1]

Please fill all the sections A, B and C below.

Please read Principles and Procedures Document (P & P) from http://std.dkuug.dk/JTC1/SC2/WG2/docs/principles.html for guidelines and details before filling this form.

Please ensure you are using the latest Form from http://std.dkuug.dk/JTC1/SC2/WG2/docs/summaryform.html.

See also http://std.dkuug.dk/JTC1/SC2/WG2/docs/roadmaps.html for latest *Roadmaps*.

A. Administrative

1. **Title:** **Proposal to encode three control characters for Egyptian Hieroglyphs**
2. Requester's name: Bob Richmond, Andrew Glass
3. Requester type (Member body/Liaison/Individual contribution): Individual contribution
4. Submission date:
5. Requester's reference (if applicable):
6. Choose one of the following:
   This is a complete proposal: Complete
   (or) More information will be provided later:

B. Technical – General

1. Choose one of the following:
   a. This proposal is for a new script (set of characters):
      Proposed name of script:
   b. The proposal is for addition of character(s) to an existing block: 13000–1342F
      Name of the existing block: Egyptian Hieroglyphs
2. Number of characters in proposal: 3
3. Proposed category (select one from below - see section 2.2 of P&P document):

A-Contemporary		B.1-Specialized (small collection)		B.2-Specialized (large collection)	
C-Major extinct		D-Attested extinct		E-Minor extinct	
F-Archaic Hieroglyphic or Ideographic	F	G-Obscure or questionable usage symbols			

4. Is a repertoire including character names provided? Yes
   a. If YES, are the names in accordance with the “character naming guidelines” in Annex L of P&P document? Yes
   b. Are the character shapes attached in a legible form suitable for review? Yes
5. Fonts related:
   a. Who will provide the appropriate computerized font to the Project Editor of 10646 for publishing the standard?
      Bob Richmond
   b. Identify the party granting a license for use of the font by the editors (include address, e-mail, ftp-site, etc.):
      bobqq at live.co.uk
6. References:
   a. Are references (to other character sets, dictionaries, descriptive texts etc.) provided? Yes
   b. Are published examples of use (such as samples from newspapers, magazines, or other sources) of proposed characters attached? Yes
7. Special encoding issues:
   Does the proposal address other aspects of character data processing (if applicable) such as input, presentation, sorting, searching, indexing, transliteration etc. (if yes please enclose information)? Yes
   Shaping
8. Additional Information:

Submitters are invited to provide any additional information about Properties of the proposed Character(s) or Script that will assist in correct understanding of and correct linguistic processing of the proposed character(s) or script. Examples of such properties are: Casing information, Numeric information, Currency information, Display behaviour information such as line breaks, widths etc., Combining behaviour, Spacing behaviour, Directional behaviour, Default Collation behaviour, relevance in Mark Up contexts, Compatibility equivalence and other Unicode normalization related information. See the Unicode standard at http://www.unicode.org for such information on other scripts. Also see Unicode Character Database (http://www.unicode.org/reports/tr44/) and associated Unicode Technical Reports for information needed for consideration by the Unicode Technical Committee for inclusion in the Unicode Standard.

[1] Form number: N4502-F (Original 1994-10-14; Revised 1995-01, 1995-04, 1996-04, 1996-08, 1999-03, 2001-05, 2001-09, 2003-11, 2005-01, 2005-09, 2005-10, 2007-03, 2008-05, 2009-11, 2011-03, 2012-01)

C. Technical - Justification

1. Has this proposal for addition of character(s) been submitted before?	Yes
If YES explain	This is a revised version that takes into account feedback on previous version (L2/15-123)
2. Has contact been made to members of the user community (for example: National Body, user groups of the script or characters, other experts, etc.)?	Yes
If YES, with whom?	Jaromir Malek, Vincent Razanajao, Mark-Jan Nederhof, Serge Rosmorduc
If YES, available relevant documents:	
3. Information on the user community for the proposed characters (for example: size, demographics, information technology use, or publishing use) is included?	Yes
Reference:	
4. The context of use for the proposed characters (type of use; common or rare)	Rare
Reference:	
5. Are the proposed characters in current use by the user community?	Yes
If YES, where? Reference:	
6. After giving due considerations to the principles in the P&P document must the proposed characters be entirely in the BMP?	No
If YES, is a rationale provided?	
If YES, reference:	
7. Should the proposed characters be kept together in a contiguous range (rather than being scattered)?	Yes
8. Can any of the proposed characters be considered a presentation form of an existing character or character sequence?	No
If YES, is a rationale for its inclusion provided?	
If YES, reference:	
9. Can any of the proposed characters be encoded using a composed character sequence of either existing characters or other proposed characters?	No
If YES, is a rationale for its inclusion provided?	
If YES, reference:	
10. Can any of the proposed character(s) be considered to be similar (in appearance or function) to, or could be confused with, an existing character?	No
If YES, is a rationale for its inclusion provided?	
If YES, reference:	
11. Does the proposal include use of combining characters and/or use of composite sequences?	No
If YES, is a rationale for such use provided?	
If YES, reference:	
Is a list of composite sequences and their corresponding glyph images (graphic symbols) provided?	No
If YES, reference:	
12. Does the proposal contain characters with any special properties such as control function or similar semantics?	Yes
If YES, describe in detail (include attachment if necessary)	See attached
13. Does the proposal contain any Ideographic compatibility characters?	No
If YES, are the equivalent corresponding unified ideographic characters identified?	
If YES, reference:	