

Universal Multiple-Octet Coded Character Set  
International Organization for Standardization  
Organisation Internationale de Normalisation  
Международная организация по стандартизации

**Doc Type:** Working Group Document  
**Title:** Response to L2/11-126 “Phaistos Disc Errata”  
**Source:** Ireland  
**Status:** National Body Contribution  
**Action:** For consideration by JTC1/SC2/WG2 and UTC  
**Date:** 2011-05-06

**1. Introduction.** In February 2011 Arie ten Cate filed an error report with the Unicode Consortium. The text of the report was as follows:

The characters of the Phaistos Disc are shown in mirror image: left and right exchanged. This is easily seen by comparing the signs with a photograph of the disc (any of the two sides), such as one of the excellent photographs at [http://en.wikipedia.org/wiki/Phaistos\\_Disc](http://en.wikipedia.org/wiki/Phaistos_Disc)

He subsequently followed up with a note:

... one might also look at the sign 101EB (BULLS LEG) within this set. This sign is shown upside down: the hoof must be at the top, not at the bottom, as is easily seen from a photograph of side A of the disc, where it occurs twice. (Only on side A.)

**2. Mirroring of glyphs.** It is true that the characters of the Phaistos Disc are mirrored from the way they appear on the disc itself. This is not an accident: it was done by design. It is a result of the decision taken to encode the characters with left-to-right (LTR) directionality. In N3066R “Proposal for encoding the Phaistos Disc characters in the SMP of the UCS” (2006-04-01), the following was proposed:

**Directionality**

Consensus is that the text of the disc was written from outside to the centre; some overlapping signs suggest this as the order that the stamps were pressed into the clay. Such a reading would be into the faces of the characters, a practice which is also found in Egyptian and Luwian. Because the overwhelming majority of texts which discuss Phaistos characters uses left-to-right scripts (Latin, Greek, Cyrillic), we propose that the Phaistos Disc characters be encoded with left-to-right directionality.

Often illustrations of the Phaistos text are given with right-to-left directionality, as can be seen in some of the Figures below.

The consensus is reflected in the following text by Louis Godart (1995), which cogently expresses the grounds on which we understand the text to have been written from the outside to the centre of the disc, and which accordingly informs us that the directionality of the text is right to left (RTL). Italics in the excerpt below are ours. When Godart says “the text is read anticlockwise”, he means that the disc is rotated anticlockwise by the hands as the eyes remain in a fixed position.

Pernier and many others after him, such as Sir Arthur Evans, expressed the view that in opposition to the spiral, which had been incised anticlockwise, the sets of signs imprinted on the Phaistos disc should be read clockwise, that is from the centre towards the circumference. This proposal was based on the direction in which the human figures faced: the standing female, the running male, the pedestrian male, the human head with or without

plume, the captive, are all represented in profile facing right, which was taken as indicating that the inscription should be read clockwise, following the gaze of the figures represented in it.

According to this suggested reading, the two lines with the five dots, on each face, would be the 'full stops' of two different texts. In other words there would be no relation between the text imprinted on side A and that on side B. The other hypothesis that the signs should be read anticlockwise was proposed by Alessandro Della Sera, who wrote one of the most original studies of the Phaistos disc ever published....

For this reason the argument used by those who support a clockwise direction for the script, based on the direction in which the human figures represented on the disc face, is without foundation. Careful analysis of the arrangement of the imprinted signs yields no evidence to elucidate the issue of the direction in which the inscription should be read.

After this preamble, since the sets of signs are isolated within bands, the direction of reading can theoretically be from left to right (clockwise) or from right to left (anticlockwise). However, Della Seta maintained that the inscription should be read anticlockwise and, consequently, *the entire text of the disc should be read from the periphery to the centre.*

He drew these conclusions from a series of ascertainments dictated by the way in which the scribe worked.

First of all, *it is clear on both sides that the spiral line was incised from the periphery towards the centre.* This has already been said, stressing the validity of Pernier's observations. There are other arguments in favour of this proposal too. The direction in which the spiral was incised is particularly clear on side B, from the irregular shape at which it terminates at the centre. This was dictated by the need to adapt to the course of the preceding section and by the need to fill the entire area that had remained empty. Careful study of the incision of the spiral also reveals in how many stages the line was executed. On side A the first convolution was incised as far as point A. Here we can clearly see where the stylus that incised it stopped and the second convolution started. Because the executor did not know how or did not want to move away gradually from the circumference, on reaching point A he was essentially at the height of the starting point and was thus obliged to rise abruptly in order to give the second zone sufficient height.

From this point the line was incised without visible interruptions as far as point B, whence, starting anew, the final, small section of the spiral was incised in two phases. The line was incised from B to C, where it turns right in order to describe a kind of open semicircle, on the inside of which the last character of side A could be imprinted. Because the line from point A to point B was incised in one go the spiral acquired a more or less regular shape....

The fact that the spiral was incised in different stages is highly significant, since it indicates that the disc's creator did not incise the entire spiral first and then subsequently face the problem of imprinting the characters, but that the two tasks proceeded simultaneously. In other words, the executor incised a section of the spiral, then imprinted a certain number of sets of signs on the inside of the incised groove, after which he incised another section of the spiral, imprinted other sets of signs, and so on. We can confirm that the upper section of the spiral had been incised before the signs below were imprinted because, as the drawings show, the signs frequently cut or alter the upper line, narrowing the groove. This occurs on side A for signs II 1, III 2, XIV 3, XX 3, XXVI 3, 4 and on side B for signs XII 2 and XXII 4. Last, we have the proof that the executor, having imprinted a set of signs, incised the vertical separation line before proceeding to the next sign....

Concerning the order in which the two sides should be read, from the different form of the spiral we are able to determine which of these was covered with signs first and was therefore read first.

As we have said already, there is a regularity in the course of the spiral on Side A which is missing from that on side B. This can be explained from the psychological standpoint, since it is true that a written work executed all in one go is usually more meticulous at the beginning than at the end. As the text progresses tiredness or even greater familiarity with it can result in diminished accuracy.

Last, it is not only the appearance of the spiral but also the imprinting of the signs that differentiates sides A and B. The signs on side B are less deeply impressed than those on side A. This phenomenon could be due not so much to the carelessness of the disc's creator as to his carefulness in impressing the stamps on the surface of side B without damaging the signs previously imprinted on side A.

Furthermore, the end of the text must have been the central sign of side B. On reaching that sign the space available to the creator was still quite ample, which meant he could leave a gap between the signs of the inscription, in contrast to what had happened at the end of the text of side A. It is a fact that in A: XXIX, on account of lack of space, the signs of the plumed head and the shield were accommodated by placing them one above the other, and some millimetres were economized by inverting the two signs next to the hide. It is obvious that if the imprinting of the signs had started from the centre the creator of the disc would not have needed to resort to these solutions, since he would have had enough space in front of him to employ more normal ones. The appearance of set A: XXIX brings to mind the work of someone who has reached the end of his task and not of someone who has just started it.

In contrast, in the last section of the spiral on side B we see that the creator has surplus space, so much that he flouted the rule governing the compilation of the disc, that is the heightwise placement of signs, putting sign 4 of set XXIX, the ship, in horizontal position. In this respect it should be stressed that the arrangement of the spiral and signs at the end of side B, in particular the angulation of the incised line and the horizontality of the ship,

indicates that the executor was fully aware of the number of signs he had still to imprint and of the space these required. This indicates that he was inspired and guided by some prototype in front of him.

Last, from the very imprinting of the signs we can say with certainty that the disc's creator impressed the characters in an anticlockwise direction. In some cases a sign touches or covers part of the adjacent one. *Since the impinging sign is the left one, this proves that the signs were imprinted from right to left, that is from the periphery to the centre.* Let us look at a few examples:

A: XIV 2, 3. The ship has cut part of the left 'arm' of the hide.

A: XVII 3, 4. Hide 3 is cut by hide 4.

A: XXVI 1, 2. The shield cuts the upper corner of the plumed head.

A: XXIX 3, 4. The second hide covers a small edge of the first.

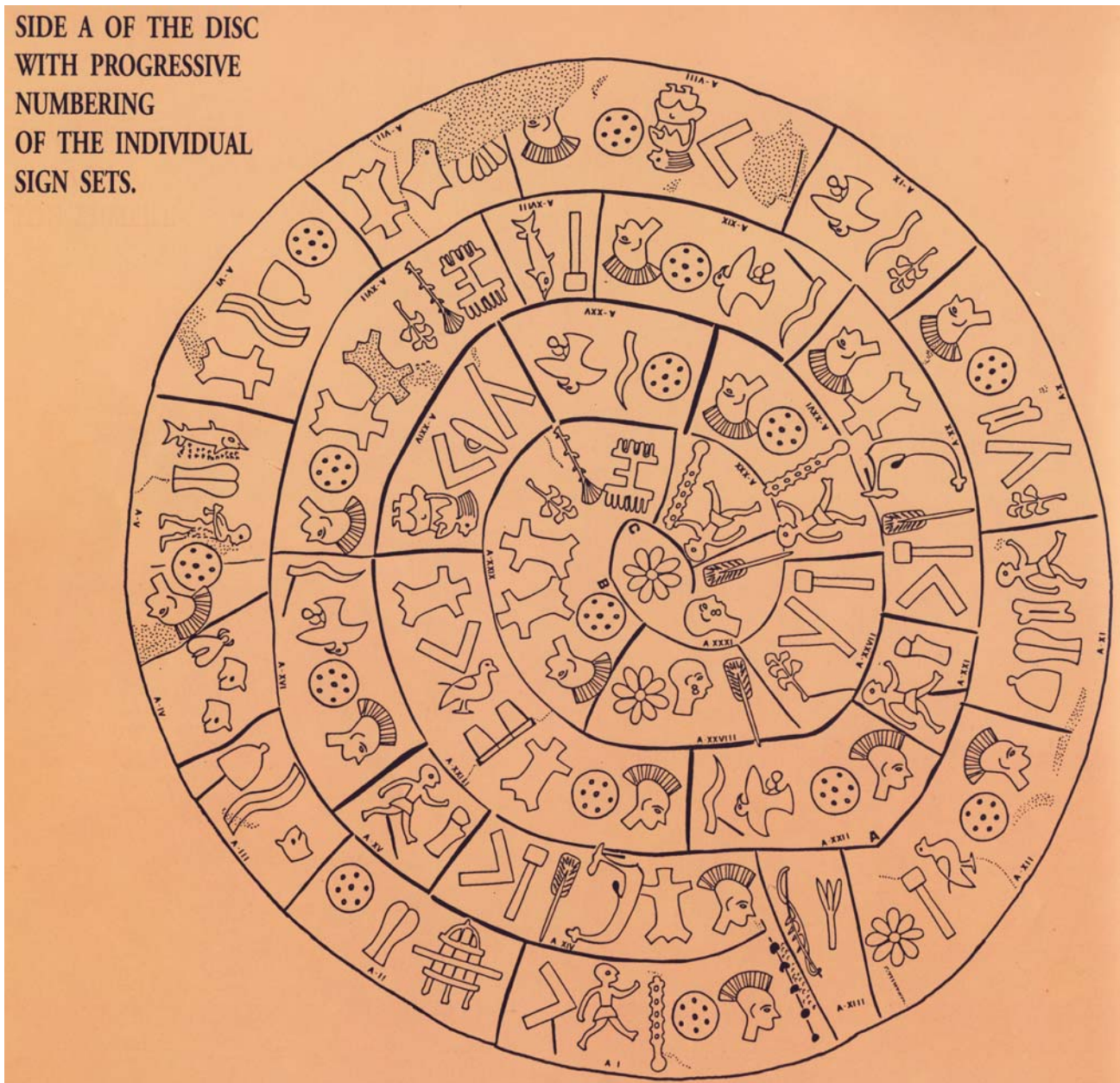
B: XXX 1, 2. The helmet just touches the sign of the wavy band.

The text of the Phaistos disc has right-to-left directionality, because it is read from the outside to the centre. Here is a photograph from Godart's book, where he has flipped the image so that the text reads from left to right:

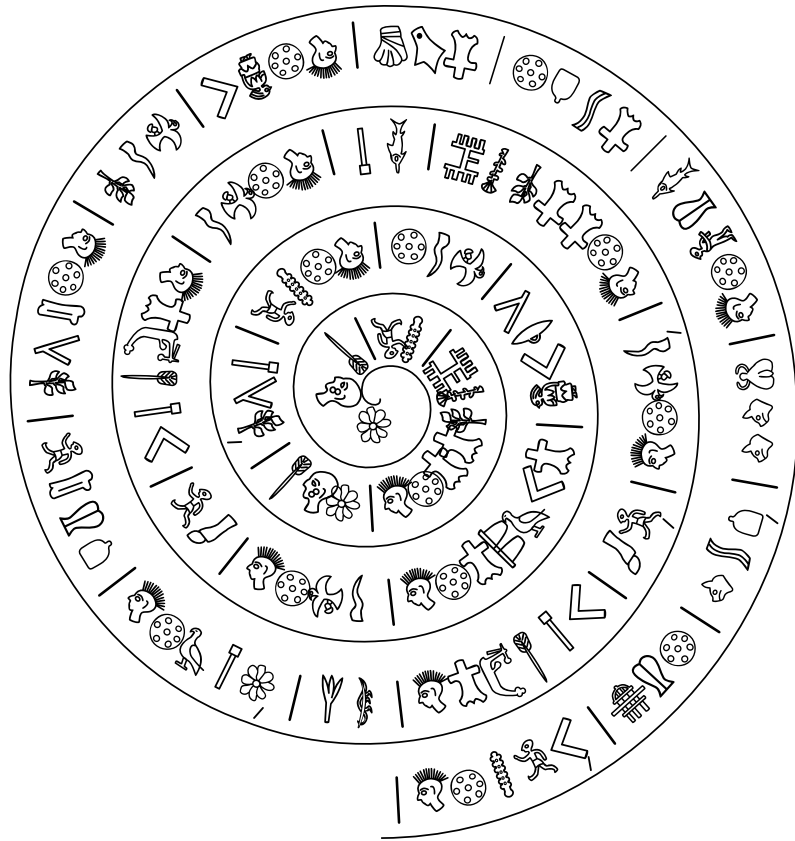


**Figure 1.** Side A of the Phaistos disc, flipped horizontally in Godart 1995 so that the text runs from left to right beginning with the PLUMED HEAD at the six o'clock position.

Here is a drawing from Godart's book, which shows the disc as it looks: the text runs from right to left:



**Figure 2.** Side A of the Phaistos disc as it appears, with the text running from right to left beginning with the PLUMED HEAD at the six o'clock position.



**Figure 3.** A typeset version of the text of Side A of the Phaistos Disc, with LTR directionality.



**Figure 4.** A typeset version of the text of Side A of the Phaistos Disc, with RTL directionality.



directionality, we remain convinced that most people who wish to cite Phaistos Disc characters wish to do so without recourse to special software that correctly implements the bidirectional algorithm. Lead type and Latin-1 or ASCII clone fonts are a different thing from a UCS implementation.

Similarly, the statements by Jean-Pierre Olivier and by Yves Duhoux in N4xxx do not take into account these questions of directionality in processing. It is true that, as Olivier says, “glyphs were generally drawn looking to the right, as printed on the disk itself”. But since the text on the disc has RTL directionality, glyphs should only be drawn that way when the text has RTL directionality. Since the Phaistos Disc characters have LTR directionality, the glyphs in the code chart should reflect that—which is why they are mirrored there vis à vis the disc itself. Yves Duhoux said the following:

Every direction is theoretically possible. In fact, the direction of the signs depends on the direction of the script, and it goes from the exterior to the centre of the disk. The conclusion is that you should invert the direction of your table.

With respect, this is an incomplete analysis. If the text goes from the exterior to the centre of the disk (which it does), then its directionality is clear—right-to-left. If the directionality of the coded characters is left-to-right, then the glyphs of the characters, in fonts and in the code charts, should also be left-to-right. See Figures 3 and 4 above.

Note that Egyptian Hieroglyphs and Old Italic were also encoded with strong LTR directionality even though many source texts for both scripts use RTL directionality. The glyphs in the code chart for both scripts are given as they appear correctly in LTR directionality.

**2. Turning of glyphs.** We do not believe that this a matter of much concern. Certainly Godart was not concerned about it:

Della Seta noted that the position of the signs on the disc is determined by a fixed principle, that is to occupy the least possible space widthwise. Such a canon is implemented in Egyptian hieroglyphic script, sometimes at the expense of correct orthography. This same canon holds for the Phaistos disc, if not at the expense of spelling, at least at that of the natural position of the creatures and objects. Thus the fish is always vertical (A: V 5, XVIII 1. B: V 1, VII 4, XV 2, XVI 5); the bird, instead of standing upright on its legs, is represented sideways (A: XII 3, XXIII 5\_ B: XVI 3); the ram’s head turns its muzzle upwards (B: XXVII 2) and the ship’s stern points downwards (A: XIV 3, XX 3. B: IV 2, IX 4, XII 2, XXII 4) apart from sign B: XXIX 4, where the available space remaining for the scribe permitted him to place the object in its normal position.

The signs themselves, which were, as we have said, imprinted with stamps, are easily inverted. This is the case both times the bull’s leg is rendered (A: XV 1, XXI 1). The inversion is of no significance whatsoever, since inverted signs alternate with regular ones Within sets of identical signs. The case of the stretched hide is a case in point; it is repeated inverted in set A: XXIX while appearing in normal position in set A: XVII. The case of the cat head can also be cited, which appears upside down in set A: III while it is normal in set B: XX, and so on.

The inversion of signs is clearly not dictated by the need to economize space, since it is obvious that a sign such as the flying bird or the cat head requires essentially the same space whether upright or upside down. Thus inversion is undoubtedly due to a mechanical phenomenon associated with the execution with individual stamps.

Having said that, Godart’s chart (Figures 8 and 9 below) inverts the BULLS LEG in comparison with the way that it appears on the Phaistos Disc, but he also rotates also the BOW and the MANACLES and the LID and the SHIP, though in the UCS code chart they conform to the orientation of the disc. It would be consistent to rotate the BULLS LEG. On the other hand, the eagle appears inverted in panel A: XXII compared to its representation in A: XVI, A: XIX, and A: XXV.

**3. Recommendations.** We recommend clarifying the text of the Unicode Standard, to explain the directionality of the script, and why the reference glyphs have the orientation they do; and explain that a














































font intended for RTL use should have glyphs with a different orientation. Ireland would oppose any attempt to change the orientation of the glyphs, as many designers of general purpose Unicode fonts will simply copy the glyphs as shown in the code charts, with the result that people using such fonts to represent the disc text will have the glyphs facing in the *wrong* direction (as in Figure 7), which causes even more troubles. The correct solution to this issue is clarification—*not* change.

We would not strongly oppose inverting the BULLS LEG glyph in the code chart.

**Bibliography**














































Godart, Louis. 1995. *The Phaistos Disc: the enigma of an Aegean script*. Tr. Alexandra Doumas. [s.l.]: Éditions Itanos. ISBN 960-7549-02-3

**TABLE OF THE SIGNS OF THE PHAISTOS DISC**

1 	10 	19 	28 	37 
2 	11 	20 	29 	38 
3 	12 	21 	30 	39 
4 	13 	22 	31 	40 
5 	14 	23 	32 	41 
6 	15 	24 	33 	42 
7 	16 	25 	34 	43 
8 	17 	26 	35 	44 
9 	18 	27 	36 	45 

**Figure 8** Table of Phaistos Disc characters, from Godart 1995.



Signs	Frequency of occurrence	Signs	Frequency of occurrence
 1. Pedestrian	11	 24. Beehive	6
 2. Plumed head	19	 25. Ship	7
 3. Tattooed head	2	 26. Horn	6
 4. Captive	1	 27. Hide	15
 5. Child	1	 28. Bull's leg	2
 6. Woman	4	 29. Cat	11
 7. Helmet	18	 30. Ram	1
 8. Gauntlet	5	 31. Eagle	5
 9. Tiara	2	 32. Dove	3
 10. Arrow	4	 33. Tunny	6
 11. Bow	1	 34. Bee	3
 12. Shield	17	 35. Plane tree	11
 13. Club	6	 36. Vine	4
 14. Manacles	2	 37. Papyrus	4
 15. Mattock	1	 38. Rosette	4
 16. Saw	2	 39. Lily	4
 17. Lid	1	 40. Ox back	6
 18. Boomerang	12	 41. Flute	2
 19. Carpentry plane	3	 42. Grater	1
 20. Dolium	2	 43. Strainer	1
 21. Comb	2	 44. Small axe	1
 22. Sling	5	 45. Wavy band	6
 23. Column	11	Total	241

To these 241 identified signs should be added the fifth sign missing in the gap of A: VIII. Thus the total number of verified signs on the Phaistos disc is 242.

**Figure 9** Sample of the Phaistos Disc character repertoire, from Godart 1995.