

**Draft** Unicode Technical Report #56

**UNICODE® CUNEIFORM SIGN LISTS**

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**Summary**

This document outlines the need for ancillary data in the use of the Sumero-Akkadian Cuneiform script, and describes how the Oracc **Global** Sign List provides that data.

**Status**

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## 1 Introduction

The Unicode Standard formally establishes the character identity of cuneiform signs by means of their names and representative glyphs in the code charts; see D2 in *Section 3.3, Semantics*, in [Unicode]. However, while the identity of abstract characters is well-established in the cuneiform script, the abstract characters are not usually referred to by standardized names, and the glyphic ranges of the abstract characters are vast and overlapping.

In practice, implementations of the script require an association of sequences of code points with entries in the classical sign lists that establish abstract character identity, and with the sign values which provide the usual names of these signs. Similar reliance on ancillary data may be found in other large scripts; see for instance Unicode Standard Annex #38, “Unicode Han Database (Unihan)” [UAX38].


This document briefly discusses the approach to the complexities of cuneiform sign identity taken by the encoding; it then describes the sign list maintained by the Open Richly Annotated Cuneiform Project (Oracc) which provides the ancillary data necessary to the effective use of the encoded script.

## 2 Principles of Cuneiform Encoding

### 2.1 Cuneiform Signs


Assyriologists have published many *sign lists*, that is, classifications of the repertoire of cuneiform signs; these are numbered lists of signs, each illustrated with its glyphic range in the area and time period of interest, and often associated with a representative glyph from the Neo-Assyrian period and with the phonetic and logographic values of the sign. The sign lists play a similar role to the *sources* used in the CJKV or Tangut encodings.

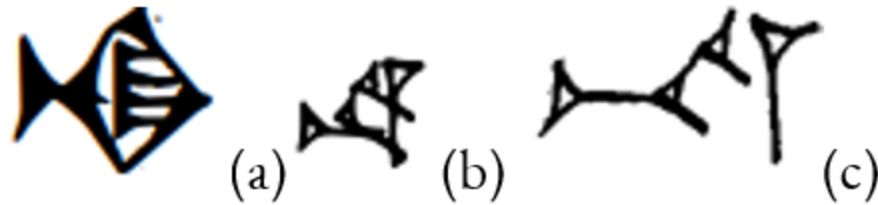
Examples of such sign lists include [aBZL], [BAU], [ELLeS], [HZL] [KWU], [LAK], [MÉA], [MZL], [aBZL], [PTACE], [RÉC], [RSP], [ŠL], and [ZATU]. Notably, [ŠL] and [MÉA] use the same numbering; however, the other sign lists have different numbering schemes.

The glyphic range of a sign is stylistic, encompassing for instance variation between lapidary inscriptions and cursive on clay tablets, regional variation, and variation between time periods; see This is illustrated in Figure 1, which shows glyphs given in [MÉA] for the sign NA  in three styles:

- Old Babylonian lapidary (a)
- Old Babylonian cursive (b)
- Neo-Assyrian (c)

Distinct glyphs for the same sign are not used contrastively, nor do they co-occur in texts that use a consistent style. In particular, for a given sign, the various phonetic and logographic values are not distinguished by contrasting glyphs.

**Figure 1. Glyphs for the sign NA  in (a) Old Babylonian lapidary style (b) Old Babylonian cursive style (c) Neo-Assyrian style, as shown in [MEA].**














These signs are the abstract characters of the cuneiform script. See also point 5 in [ICE]. This approach makes it possible to encode texts known from multiple copies (so-called *composite texts*) that use different styles but consistent spellings, or to use encoded text to refer to the signs diachronically, as in dictionaries or sign lists covering broad timespans.

### 2.1.1 Transliteration

Texts are often published in transliterated form; the scheme for transliteration (and for the notation of sign values) originates with Thureau-Dangin's [Syllabaire]. It uses numeric subscripts to distinguish homophones; the numbering of homophones is kept consistent across sign lists.



Note that accents can be used interchangeably with numbers (ú for  $u_2$ , ù for  $u_3$ ), and additional information about the interpretation of signs is conveyed by capitalization and styling; a discussion of the specifics of assyriological transliteration is out of scope for this document.

Thanks to this numbering, a transliteration uniquely determines the sequence of signs of the original text. For example, the transliterations *ib-bu- $u_2$*  and *ib-bu-u* of distinct spellings of Akkadian *ibbû* “they named” are unambiguously transliterations of the sequences of signs    and   , respectively. Note that while they share the phonetic value /u/, the signs  $U_2$   and  $U$   are not stylistic variants of each other: they have distinct sets of values and meanings; for instance,  means “grass” and  means the number 10, meanings that are not shared with the other sign.

This relation between transliteration and abstract characters means that encoded cuneiform texts can be automatically generated from transliterated corpora. The reverse is not true; for instance, the sign  might be transliterated *aš*, *ina*, or *dil*, depending on context.

A machine-readable format for cuneiform transliteration exists to facilitate such automatic processing of transliterated corpora. See [ATF].

## 2.2 Sequences

Some signs can be analysed in all styles as a sequence of other signs written one after the other, and some sequences of signs have special values unrelated to their components; for instance, the sign  $GEME_2$   is always written like the sign  $SAL$   followed by the sign

KUR 𒆳, even as these signs change across styles; the sign DIRI 𒄠𒄠 is always written as SI 𒄠 followed by A 𒀭.

Such signs are not separately encoded; the corresponding sequences should be used to represent these abstract characters. See also items 2 and 5 in [Principles], and *Complex and Compound Signs* in *Section 11.1, Sumero-Akkadian*, of [Unicode].














## 2.3 Mergers and Splits

Some signs have distinct glyphs in the styles of earlier periods, but identical glyphs in those of later periods; such occurrences are called *mergers*. Conversely, some signs have identical glyphs in the styles of earlier periods, distinct glyphs in those of later periods; such occurrences are called *splits*.

When encoding texts written in styles where the glyphs of merged or split signs are identical, the character corresponding to the correct sign value should be used, so that the encoding of a text is independent of the style in which it is written.

Figure 2 illustrates splits and mergers affecting four signs; note that a sign can be affected both by a split and a merger, as is the case of TI<sub>2</sub> 𒄠, which splits from DIN 𒄠 and merges with HI 𒄠. The source of the hand copy shown is given in each cell of the table.

**Figure 2. Mergers and splits of 𒀭, 𒄠, 𒄠, and 𒄠.**  
The source of the hand copy shown is listed in each cell.

	Early Dynastic IIIa	Ur III	Old Assyrian	Middle Assyrian
● ŠAR <sub>2</sub>	 [P010576]	 [P142296]		 [P281820]
◇ HI	 [P225950]	 [P142296]	 [P360975]	 [P282017]
𒄠 TI <sub>2</sub>		 [P142296]	 [P360975]	 [P282017]
𒄠 DIN	 [P225950]	 [P103303]		 [P282017]

This diachronic approach to the encoding means that characters newly encoded to represent a contrast present in some styles may need to be supported in fonts where that contrast is absent. For instance, after the sign 𒄠 MEŠ was encoded in Unicode Version 7.0 to represent the contrast with the sequence me-eš in Neo-Assyrian styles, as illustrated in *Section 2.3.1, Mergers and Splits of Sequences*, fonts for Old Babylonian styles had to be updated to support newly encoded Akkadian texts, even though the plural marker MEŠ looks identical to the sequence of syllables me-eš in Old Babylonian.

See also item 11 in [Principles], as well as *Mergers and Splits* in Section 11.1, *Sumerian-Akkadian*, of [Unicode].

### 2.3.1 Mergers and Splits of Sequences

A special case of mergers and splits is that of signs that look like sequences of other signs in some styles, but have a different appearance (and are sometimes even used contrastively with the corresponding sequence) in other styles. In such cases, they are not considered as sequences as described in Section 2.2, *Sequences*, and are separately encoded.

For example, the sign MEŠ 𐎠𐎵 (an Akkadian plural marker) originally looks like the sequence of syllables *me-eš* 𐎠𐎵, but their appearance diverges in Neo-Assyrian styles, as shown in Figure 3. This is a split.

**Note:** As in the single-character case, the term *split* refers to the divergence of the visual representations of two fixed character sequences, here 𐎠𐎵 and 𐎠𐎵. That term does not refer to the phenomenon of a sign becoming a sequence of signs; indeed 𐎠𐎵 instead arose by two pre-existing signs coalescing into one.

Figure 3. The sequence *me-eš* 𐎠𐎵 and the sign MEŠ 𐎠𐎵 on a the Neo-Assyrian prism; photograph from [P422664].







As an example of a merger, the sign 𐎠𐎵, whose Sumerian readings include šeš<sub>2</sub> “to anoint” and šeš “to weep”, initially looks distinct from the sequence of unrelated signs SIKI.LAM 𐎠𐎵, the first of which means “hair” and the latter a kind of tree; this is the case in the reference glyphs. However, in later styles, the sign ŠEŠ<sub>2</sub> 𐎠𐎵 has the same appearance as the sequence SIKI.LAM 𐎠𐎵.

**Note:** The term *merger* refers to the convergence of the visual representations of two fixed character sequences, here 𐎠𐎵 and 𐎠𐎵. As far as the scribes were concerned, the sign 𐎠𐎵 had broken up into a sequence of signs.

While the diachronic character identity used for the cuneiform encoding generally matches the understanding scribes had of character identity in their own script, there are discrepancies as scribes were not aware of mergers long past, let alone future splits. For example, some lexical texts describe explicitly the sign ŠEŠ<sub>2</sub> 𐎠𐎵 as being made up of the sequence 𐎠𐎵, see [P467315.r.i.22].

## 2.4 Representative Glyphs

As mentioned in Section 2.1, *Cuneiform Signs*, sign lists typically use a Neo-Assyrian style for their reference glyphs, even when illustrating a different style.

However, because many signs are merged in the Neo-Assyrian style, this was an impractical choice for the reference glyphs in the code charts; instead these reference glyphs are primarily in an Ur III style, where most signs are distinct; where a sign is unattested in the Ur III period, or where signs appear identical in the Ur III period, a different style was chosen for the sake of distinctiveness of the reference glyphs. For example, the reference glyph for ŠAR<sub>2</sub>  is in an Early Dynastic style, because that sign merges with HI  by the Ur III period; the reference glyph for TI<sub>2</sub>  is in a style that is Old Assyrian or newer, because it has not yet split from DIN  in the Ur III period.

See also item 7 in [Principles], as well as *Fonts* in Section 11.1, *Sumero-Akkadian*, of [Unicode]

## 2.5 Sign Names









The names of the signs are generally based on a structural analysis of the signs, rather than on the common sign values; thus  is described as GUD×KUR (×, meaning  inscribed inside , rather than AM. Note that this structural analysis may not be evident in all styles; see Figure 4.

Figure 4. Neo-Assyrian glyphs for AM , GUD , and KUR  from [MÉA].











In some styles, the sign may even have a different structure from the one described by the name, as shown in Figure 5, where U+1224B  CUNEIFORM SIGN NE SHESHIG (left) instead appears like NE×PAP . For comparison, the appearance of the sign NE  on the same artifact is shown on the right.

Figure 5. Left: The signs BIL<sub>2</sub>  and NE  on the stele of Hammurapi [P249253]. Right: the sign NE  on the same stele. In that style, BIL<sub>2</sub> appears as NE×PAP.



See also item 8 in [Principles].

## 2.6 Discretionary Ligatures

On occasion, some sequences of signs may be combined in a ligature, as This is illustrated in Figure 6, where the signs  and  are ligated on the inscription on the left, but not on the inscription on the right. Such ligatures are not usually distinguished in transliteration from the corresponding sequences, so that both inscriptions would be transliterated <sup>o</sup>suen or <sup>o</sup>EN.ZU; they and do not carry distinct semantics. They are not

separately encoded; it is left to the font to display these if desired, possibly based on the presence of a zero-width joiner; see *Cursive Connection and Ligatures* in *Section 23.2, Layout Controls*, of [Unicode], and item 2 in [Principles]. When one needs to convey the ligature in transliteration, a plus sign is used, thus <sup>d</sup>EN.ZU for the ligated example in Figure 6.

**Figure 6. The name of the god Sîn, , transliterated <sup>d</sup>suen or <sup>d</sup>EN.ZU. Left:  <sup>d</sup>EN is ligated; right: no ligature is used.**





### 3 The Oracc **Global** Sign List

The Oracc **Global** Sign List [OGSL] (formerly Oracc Global Sign List, OGSL) associates signs with their encoding, with their values, and with their numbers in various sign lists; it can therefore be used to automatically produce encoded versions of transliterated texts as described in *Section 2.1.1, Transliteration*, to build input methods based on transliteration, and to look up the glyphic range of a sign in various styles.




The Oracc **Global** Sign List is available as the machine-readable file <https://github.com/oracc/ogsl/blob/master/00lib/ogsl.asl>. A specification of the structure of that file may be found at [ASL].

The Oracc **Global** Sign List treats the Unicode encoding as a sign list, and establishes a concordance with the other sign lists. However, while multiple OGSL signs may share the same number in the classical sign lists, a code point corresponds to at most one OGSL sign. This is a consequence of the principles described in *Section 2.3, Mergers and Splits*.

For example, the signs  BALAG and  DUB<sub>2</sub> both correspond to sign number 565 in [MZL] because they merge after the Ur III period, but they are encoded separately as they are distinct in earlier styles.

Not all signs in the OGSL correspond to a Unicode code point. Some signs are encoded as sequences, as described in *Section 2.2, Sequences*; the OGSL documents the appropriate sequence. Other signs have no documented encoding. Some of them may be candidates for encoding; however, as the OGSL is a working dataset, others may eventually be found to be misreadings, to be duplicates or variants of already-encoded signs, or to otherwise be unencodable.

Indeed, some signs in the OGSL, including some that are encoded in Unicode, are marked as deprecated, because they are the result of errors in the classification of cuneiform signs.

Some of these errors occurred as part of the encoding process. For example, the sign DUB×EŠ<sub>2</sub>  does not exist; sign number 243 in [MZL] is named DUB×ŠĖ, but that was misread during encoding as DUB×ŠĖ (with a spurious grave accent ). The grave accent is equivalent to subscript 3), where  $\check{s}e_3$  and  $e\check{s}_2$  are values of the same sign , so the misreading DUB×ŠĖ was encoded as DUB×EŠ<sub>2</sub>.

Others are errors in earlier scholarship that were spotted after encoding. For example, the sign DUB×ŠE 𒅗, which represents sign number 243 in [MZL], does not exist; it was listed in [MZL] based on a misreading of actual tablets in [gaz<sub>3</sub>]; ~~it~~ the sign appearing on these tablets should have been read GUM×ŠE 𒅗.

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## Modifications

### Revision 2

- Advanced from Proposed Draft to Draft Unicode Technical Report.
- Addressed feedback from the Editorial Committee.
- Added an example of a sign-sequence merger and a note on scribal understanding of character identity.
- Updated the references to OGSL to reflect its renaming to OSL.
- Added a reference to PTACE.

### Revision 1

- Initial version following proposal [L2/23-071](#) to the UTC.
- [L2/23-186](#): Added a section on discretionary ligatures.
- [L2/23-229](#):
  - Rewrote Section 3 to reflect changes to the OGSL and its documentation.
  - Clarified that glyphs may exhibit structures different from the ones described by the name.
  - Clarified implications for fonts and input methods.
  - Added some rationale for the encoding model and elaborated on the analogy with other large scripts.