

Proposed 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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Please submit corrigenda and other comments with the online reporting form [[Feedback](#)]. Related information that is useful in understanding this document is found in the [References](#). For the latest version of the Unicode Standard see [[Unicode](#)]. For a list of current Unicode Technical Reports see [[Reports](#)]. For more information about versions of the Unicode Standard, see [[Versions](#)].

Contents

- 1 [Introduction](#)
- 2 [Principles of Cuneiform Encoding](#)
 - 2.1 [Cuneiform Signs](#)

2.1.1	Transliteration
2.2	Sequences
2.3	Mergers and Splits
2.3.1	Mergers and Splits of Sequences
2.4	Representative Glyphs
2.5	Sign Names
2.6	Discretionary Ligatures
3	The Oracc Global Sign List
3.1	Structure
	References
	Acknowledgements
	Modifications

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 répertoire 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.

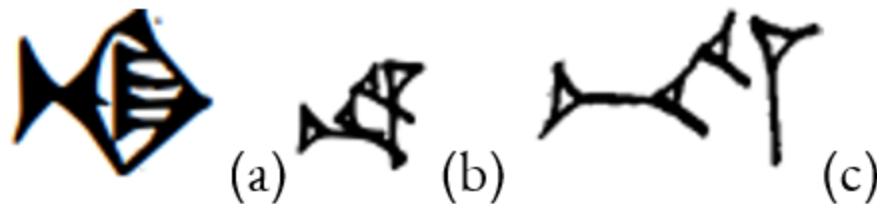
Review note: The preceding sentence was added after UTC #176. It has not yet been reviewed by the UTC, but is included for public review.

Examples of such sign lists include [BAU], [ELLes], [HZL] [KWU], [LAK], [MÉA], [MZL], [aBZL], [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 Figure 1. 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 [MÉA].



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.


Review note: The preceding sentence was added after UTC #176. It has not yet been reviewed by the UTC, but is included for public review.

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 (\acute{u} for u_2 , \grave{u} 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-u₂* 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 GEME₂ 𒂗𒀭 is always written like the sign SAL 𒂗 followed by the sign KUR 𒀭, even as these signs change across styles; the sign DIRI 𒄩𒀭 is always written as SI 𒄩 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].











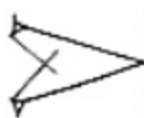


2.3 Mergers and Splits

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 TI₂ 𒄩, which splits from DIN 𒄩 and merges with HI 𒄩.

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

	Early Dynastic IIIa	Ur III	Old Assyrian	Middle Assyrian
● ŠAR ₂	 [P010576]	 [P142296]		 [P281820]
◇ HI	 [P225950]	 [P142296]	 [P360975]	 [P282017]
𒄩 TI ₂		 [P142296]	 [P360975]	 [P282017]
𒄩 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 𒂗 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.

Review note: The preceding paragraph was added after UTC #176. It has not yet been reviewed by the UTC, but is included for public review.

See also item 11 in [Principles], as well as *Mergers and Splits* in Section 11.1, *Sumero-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 𐎶𐎵 (an Akkadian plural marker) originally looks like the sequence of syllables *me-eš* 𐎶𐎵, but their appearance diverges in Neo-Assyrian styles, as shown in Figure 3.

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



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 ŠAR₂ 𒊕 is in an Early Dynastic style, because that sign merges with 𒊕 by the Ur III period; the reference glyph for TI₂ 𒄀 is in a style that is Old Assyrian or newer, because it has not yet split from DIN 𒄀 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 𒄀 is described as GUD×KUR (𒄀×𒄀, meaning 𒄀 inscribed inside 𒄀), 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 𐎠𐎵, GUD 𐎠𐎺, and KUR 𐎠𐎶 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 𐎠𐎶 CUNEIFORM SIGN NE SHESHIG instead appears like NE×PAP 𐎠𐎶×𐎶.

Figure 5. Left: the sign BIL₂ 𐎠𐎶 on the stele of Hammurapi [P249253]. Right: the sign NE 𐎠𐎶 on the same stele. In that style, BIL₂ appears as NE×PAP.



Review note: The preceding paragraph and figure were added after UTC #176. They have not yet been reviewed by the UTC, but are included for public review.

See also item 8 in [\[Principles\]](#).

2.6 Discretionary Ligatures

On occasion, some sequences of signs may be combined in a ligature, as illustrated in [Figure 6](#). Such ligatures are not usually distinguished in transliteration from the corresponding sequences, 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 ^dEN.ZU for the ligated example in Figure 6.

Figure 6. The name of the god Sîn, 𐎶𐎵𐎶, transliterated ^dsuen or ^dEN.ZU. Left: 𐎶𐎵𐎶 ^dEN is ligated; right: no ligature is used.



3 The Oracc Global Sign List

Review note: This section was rewritten after UTC #176; as requested at UTC #175, it no longer attempts to specify the OGSL format, and instead refers to


documentation recently published by the OGSL project. The changes have not yet been reviewed by the UTC, but are included for public review.

The 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.





3.1 Structure

The Oracc Global Sign List is available as the machine-readable file <https://github.com/oracc/ogsl/blob/master/00lib/ogsl.asl>. A complete specification of the structure of that file the OGSL is outside the scope of this document; we merely describe how these associations are represented. Information on additional data stored in the OGSL, such as notes or deprecated values, may be found at [GASL].

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  DUB₂ 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×EŠ₂  does not exist; sign number 243 in [MZL] is named DUB×ŠE, but that was misread during encoding as DUB×ŠĖ (with a spurious grave accent, equivalent to subscript 3), where šē₃ and eš₂ are values of the same sign . Others are errors in earlier scholarship that were spotted after encoding. For example, the sign DUB×ŠE , which represents sign number 243 in [MZL], does not exist; it was listed in [MZL] based on a misreading of actual tablets in [gaz₃]; it should have been read GUM×ŠE .

This file consists of a sequence of sign and non-sign records.

Comments are indicated by the character U+0023 NUMBER SIGN (#); all characters from the number sign to the end of the line are ignored.

Lines of ogsl.asl are separated into fields by sequences of spaces or horizontal tabulations.

Example: The following line consists of the fields @sign and |GUD×KUR|.

```
@sign |GUD×KUR|
```

3.2 Signs and forms A sign record begins with a line whose first field is @sign; the second field is the name of the sign according to the conventions described in Section 2.5, [Sign names](#). It ends with the line @end sign.

Example: The following line marks the beginning of the sign record for 𒀭𒀪𒀭.

```
@sign |GUD×KUR|
```

A sign record may contain form records. Forms are variants of the signs; a form record begins with a line whose first field is @form, whose second field is the identifier of the form, which starts with U+007E TILDE (~), and whose third field is the name of the form, according to the same conventions as sign names. The form record is terminated by the line @end form, or by the beginning of an other form record or the end of the sign record.

Example: The following line within the sign |A.EDIN.LAL| marks the beginning of its form ~b.

```
@form ~b |A.EDIN.A.LAL|
```

A sign or a form record may have a line whose first field is @ucode. The second field then represents the encoding for that sign or form. The code points are in hexadecimal, prefixed by the letter x, and separated by U+002E FULL STOP (.).

Examples:

Within the record for sign |GUD×KUR|, its encoding is given as follows, where U+12120 is 𒀭𒀪𒀭.

```
@ucode x12120
```

Within the record for form |A.EDIN.A.LAL|, its encoding is given as follows, representing the sequence 𒀭𒀪𒀭𒀭𒀪𒀭.

```
@ucode x12000.x12094.x12000.x121F2
```

A sign or form may have lines whose first field is @list. The second field of such a line consists of a prefix identifying a sign list, followed by the number of that sign in that sign list.

Example: the sign record for 𒀭𒀪𒀭 has the following @list lines, indicating that it is sign number 124 in [LAK] and sign number 309 in [MZL].

```
@list LAK124
@list MZL309
```

A sign or form may have lines whose first field is @v. The last field of such a line is a value of the sign.

Examples: The sign record for 𒀭𒀪𒀭 has the following line, which indicates that it has the value am.

```
@v am
```


The sign record for 𒄫 has the following line, which indicates that it has the value bir₃; the second field indicates that the value is only used in Elamite:

```
@v-%elx-bir3
```

The file ogsl.asl also contains non-signs; these are identical to signs except that they start with @nosign rather than @sign. These represent signs that do not exist, but were mistakenly catalogued in earlier sign lists or mistakenly encoded. Notes provide additional context.

Examples:

The character DUB×EŠ₂ 𒄫𒄫 was mistakenly encoded due to a misreading of MZL243 DUB×ŠE as DUB×ŠĒ (where šè and eš₂ are values of the same sign 𒄫).

The character DUB×ŠE 𒄫 in turn, which represents MZL243, does not exist; it was listed in [MZL] based on a misreading of GUM×ŠE 𒄫 in [gaz₃].

References

- [ATF] Steve Tinney & Eleanor Robson. “Working with ATF to edit texts”. *Oracc: The Open Richly Annotated Cuneiform Corpus*.
<http://oracc.museum.upenn.edu/doc/help/editinginatf/index.html>
- [BAU] Eric Burrows, *Archaic Texts* (Ur Excavations Texts 2; London 1935)
- [ELLes] Pietro Mander, “Lista dei segni dei testi lessicali di Ebla”, in *Materiali epigrafici di Ebla* 3, pp. 285-382. 1981.
- [gaz₃] Miguel Civil, “Bloc-notes: sa-gaz_x(DUB×ŠE)--ak.”, in *Revue d’Assyriologie et d’archéologie orientale* 60, p. 92. 1966.
- [GASL] Steve Tinney. “ASL/OGSL File Format”. *Oracc Global Sign List*. The OGSL Project, 2023.
<https://build-oracc.museum.upenn.edu/ogsl/aslogslfileformat/index.html>

Review note: The above link needs to be updated to oracc.org rather than build-oracc.museum.upenn.edu once the OGSL is rebuilt.
- [HZL] Christel Rüster & Erich Neu, *Hethitisches Zeichenlexikon* (Harrassowitz Verlag 1989)
- [KWU] Nikolaus Schneider, *Die Keilschriftzeichen der Wirtschaftsurkunden von Ur III* (Rome 1935)
- [LAK] Anton Deimel, *Liste der archaischen Keilschriftzeichen von Fara* (Wissenschaftliche Veröffentlichungen der Deutschen Orient-Gesellschaft 40; Berlin 1922)
- [MÉA] René Labat, *Manuel d’épigraphie akkadienne* (6th ed. Paris 1988)
- [MZL] Rykle Borger, *Mesopotamisches Zeichenlexikon* (Alter Orient und Altes Testament 305; Ugarit-Verlag 2003)
- [ICE] Dean A. Snyder. “Cuneiform: From Clay Tablet to Computer”. UTC document [L2/00-398](#).
- [aBZL] Catherine Mittermayer. *Altbabylonische Zeichenliste der sumerisch-literarische Texte*. 2006.

- [OGSL] Niek Veldhuis, Steve Tinney, et al. "Oracc Global Sign List". *Oracc: The Open Richly Annotated Cuneiform Corpus*.
<http://oracc.museum.upenn.edu/ogsl/>
- [P010576] "CDLI Lexical 000014, Ex. 013 & 000027, Ex. 14 Artifact Entry." 2001. Cuneiform Digital Library Initiative (CDLI). December 4, 2001.
<https://cdli.ucla.edu/P010576>
- [P103303] "AUCT 1, 458 Artifact Entry." 2001. Cuneiform Digital Library Initiative (CDLI). December 20, 2001.
<https://cdli.ucla.edu/P103303>
- [P142296] "YOS 04, 232 Artifact Entry." (2001) 2023. Cuneiform Digital Library Initiative (CDLI). February 1, 2023.
<https://cdli.ucla.edu/P142296>
- [P225950] "CDLI Lexical 000010, Ex. 014 Artifact Entry." 2003. Cuneiform Digital Library Initiative (CDLI). August 19, 2003.
<https://cdli.ucla.edu/P225950>
- [P226934] "RIME 3/2.01.04.22, Ex. 01 Artifact Entry." (2003) 2023. Cuneiform Digital Library Initiative (CDLI). June 14, 2023.
<https://cdli.ucla.edu/P226934>
- [P232275] "RIME 3/1.01.07, St B Witness Artifact Entry." (2003) 2023. Cuneiform Digital Library Initiative (CDLI). June 14, 2023.
<https://cdli.ucla.edu/P232275>
- [P249253] "RIME 4.03.06.Add21, Ex. 01 Artifact Entry." (2004) 2023. Cuneiform Digital Library Initiative (CDLI). June 15, 2023.
<https://cdli.ucla.edu/P249253>
- [P281820] "BAM 3, 314 Artifact Entry." 2005. Cuneiform Digital Library Initiative (CDLI). November 11, 2005.
<https://cdli.ucla.edu/P281820>
- [P282017] "KAJ 002 Artifact Entry." 2005. Cuneiform Digital Library Initiative (CDLI). November 11, 2005.
<https://cdli.ucla.edu/P282017>
- [P360975] "AAA 1/3, 01 Artifact Entry." 2007. Cuneiform Digital Library Initiative (CDLI). February 13, 2007.
<https://cdli.ucla.edu/P360975>
- [P422664] "RINAP 5/1 Ashurbanipal 010, Ex. 001 Artifact Entry." (2011) 2023. Cuneiform Digital Library Initiative (CDLI). February 1, 2023.
<https://cdli.ucla.edu/P422664>
- [Principles] Michael Everson & Karljürgen Feuerherm. "Basic principles for the encoding of Sumero-Akkadian Cuneiform".
UTC document [L2/03-162](#).
- [RÉC] François Thureau-Dangin, *Recherches sur l'origine de l'écriture cunéiforme* (Paris 1898)
- [RSP] Yvonne Rosengarten, *Répertoire commenté des signes présargoniques sumériens de Lagash* (Paris 1967)
- [ŠL] Anton Deimel, *Šumerisches Lexikon* (Rome 1925/1950)
- [Syllabaire] François Thureau-Dangin, *Le Syllabaire Accadien* (Paris 1926)

- [Unicode] *The Unicode Standard*
Latest version:
<https://www.unicode.org/versions/latest/>
- [UAX38] *Unicode Standard Annex #38: Unicode Han Database (UniHan)*
Latest version:
<https://www.unicode.org/reports/tr38/>
- [ZATU] Margret W. Green and Hans J. Nissen, *Zeichenliste der Archaischen Texte aus Uruk* (Archaische Texte aus Uruk 2; Berlin 1987)

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Modifications

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.