

Principles and Specification for Mnemonic Ethiopic Keyboards

Abstract

Ethiopic language input methods are necessary when an input device does not natively support Ethiopic script. This document describes principles for devising Ethiopic input methods based on well established linguistic and mnemonic rules. Specifications are given for QWERTY based input devices.

Status of this document

This is an advanced draft document, feedback is welcomed: keyboards@ethiopic.org

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1. Introduction

1.1 Purpose of this document

This document defines the principles behind the Ethiopic input methods provided by The Ge'ez Frontier Foundation. These principles have been developed and refined over time to their present state of maturity. The principles are intended to be language and hardware device independent and sound enough that independent parties could implement them for a target device and arrive at approximately, if not identically, the same result.

The principles defined here are best practices for symbol mappings between Ethiopic script and some other target script for the purpose of text entry. The principles then are applicable to input devices where a character key is present in some form to map onto. The principles are not intended for devices that utilize other kinds of text entry, such as a handwriting recognition system (e.g. "Graffiti" for PDAs).

The principles have been developed with hardware keyboards as the primary devices for implementation. The principles remain valid as new constraints of key availability and geometry are imposed upon the traditional keyboard in modern devices. The QWERTY keyboard will be used in an example implementation.

1.2 Background on Ethiopic Keyboards

Over the last twenty years a few software vendors have introduced a physical Ethiopic keyboard which with all but one recent exception was modeled after the Ethiopic typewriter. While innovative these hardware devices also required proprietary software to operate, were prohibitively expensive, and ultimately did not prevail in the market place. Ethiopic script today does not benefit from specialized keyboard hardware designed specifically for it. Ethiopic script then will be entered via mappings some keyboard device designed for the users of another script and language (e.g. an English, French, Arabic keyboard). This is achieved by mapping the Ethiopic characters to the symbols of the keyboard device. The mappings in turn are either positional based on the geometry of the Ethiopic typewriter, or phonetically based on the correspondence in the relationship of the letter sounds with functional mappings of punctuation. This specification focuses on the later approach.

At the present time no government institute, or private standards body, recognizes or endorses a specification for an Ethiopic input method. Attempts have been made in recent years but for various reasons no success has yet been met. This status may change in the near future. As the Ethiopic input methods found today typically vary by roughly 10-15% in their mappings, it can be expected that when a recognized standard arrives that it will not be significantly different from an existing input methods, nor identical. Thus any Ethiopic input method support now would be subject to later revision when a standard becomes available.

2. Governing Principles

Mnemonic mappings attempt to apply the innate cognitive associations that individuals collectively share between the symbols of too scripts. It is the goal of the mnemonic driven approach that an input method be natural and intuitive enough such that a user already familiar with a given input device will be able to use it to type in an Ethiopic language with minimal or no instruction and produce a document with minimal symbol defects.

2.1 Script vs Language

Seemingly intuitive, the notion of an “Ethiopic keyboard” is a fallacy in practice. “Ethiopic” connotes a single script but when we consider its use by numerous languages the reason becomes clear. As with other scripts like Latin, Arabic, Cyrillic, etc, in use by multiple languages, the speakers of a given language will use some subset of the script and may have no exposure to the letters and symbols in use by other languages which use a different subset. Accordingly a single unifying input method (and keyboard hardware) is undesirable to the users of any specific language employing the script. Such an input method would lead to slower rates of entry (keying) and lower quality documents as unintended entries (typos) are made of out-of-language letter symbols.

While present, the adverse impact on languages using Ethiopic script under Unicode 3.0 has not been detrimental to writing. With the introduction of an additional 116 symbols under Unicode 4.1 the impact that a unified Ethiopic keyboard would have would be much more pronounced. It is a goal of this specification that the input methods defined will minimize the opportunity for spelling and symbol errors to occur. Accordingly, input methods defined herein are restricted in scope to only those symbols in the inventory of a given a given language community.

A language neutral input method is however specified as a convenience in those rare instances when out-of-language or archaic symbols are desired by a user. A unified Ethiopic keyboard for these special cases is desirable to users over either a character-picker utility or versus having to install numerous input methods that would cover all Ethiopic languages to then have access to all Ethiopic symbols.

2.2 General Principles

A few guiding general principles are applied to all input methods specified.

Principle of Standards Conformance: All character specified in a mapping must an encoded character under the Unicode standard. The non-letter symbols of [QSAE ES 781:2002](#) must also available in an Ethiopic input method (excluding the Zaima (tonal) marks and archaic punctuation required only for [Ge'ez](#)).

Principle of Linguistic Scoping: Input methods are specified on a per-language basis where the character repertoire of the target language is first identified and will be in keeping with the repertoire applied in school systems and corpus.

Principle of Utility: All native punctuation of the underlying keyboard device must remain available without a return toggle to the native input method. This principle also helps support conformance to

the ES 781:2002 standard for Ethiopic punctuation. Ethiopic script is much more frequently mixed with non-Ethiopic punctuation and numbers than with letters.

Principle of Ergonomics: While adhering to mnemonic principles keystrokes are kept to a minimum to the extent possible. Homophonic redundancy is common in Ethiopic orthographies and when such cases occur letter frequency will direct mappings whereby the most frequently occurring homophonic symbol will have the fewest keystrokes to render.

Principle of Productivity: The input method should minimize the mechanical and cognitive effort exerted in the keying of a document while also keeping symbol errors to a minimum. The Principles of Linguistic Scoping and Ergonomics directly support the Principle of Productivity.

2.3 Mnemonic Principles

Mnemonic principles are defined that lead to intuitive results requiring little or no education on the part of the user. It is assumed that the user is familiar with the script that the target device natively supports and that the Ethiopic character set is being mapped onto.

Principle of Character Class Continuity:

Letters are mapped to letters.

Numbers are mapped to numbers.

Punctuation is mapped to punctuation.

Principle of Phonological Continuity: Letters are mapped between scripts in accordance with transliteration and transcription norms whereby a phonemic correspondence is maintained (give reference). When the target keyboard device is designed for a script where letter case is present, the vowel component of a syllograph (the “V” of a “CV” pattern) is mapped to the target script case-independently. That is, the vowel component is mapped to the both the uppercase and lowercase forms of the vowel in the target script.

Principle of Continuity of Quantity: Numbers are mapped between scripts with respect to their value.

Principle of Continuity of Function: Punctuation is mapped between scripts with respect to their functional role in a body of text.

Principle of Graphical Continuity: When a functional equivalent does not exist for punctuation on the target keyboard device, the punctuation should be mapped on a graphical basis. Either by similarity in shape between the punctuation glyphs in whole or constituent parts. A strong preference exists that some Ethiopic punctuation be mapped graphically and not functionally.

Principle of Kinesthetic-Visual Feedback: For every keystroke some visual event will occur on screen related to the Ethiopic character composition at the cursor. This principle also means that the input method shall not employ dead keys.

3. Ethiopic Symbol Mapping

This section presents an overview of language-neutral symbol mappings. Punctuation and numeral mappings are usually language independent though some preferences will change between languages. The letter mappings are less universally and will depend on the phonemic inventory of a specific language

3.1 Letters

3.1.1 Consonant Components

The [Principle of Phonological Continuity](#) is most directly applicable to the mapping between the letters of a keyboard and the syllographs of Ethiopic script. For consonant bases of a syllograph (the “C” in a “CV” pattern) this presents few difficulties when we allow mappings to upper and lower case Latin letters independently. Case independent mappings are specified here for the consonant bases of Ethiopic letters in keeping with the norms of transcription and transliteration. Challenges that do emerge for the consonant bases stem from the phonological redundancy of some Ethiopic syllographs as used in some (but not all) languages, and the lack of a phonologically corresponding Latin letter to map onto. The solutions employed for these occurrences are described in brief here.

Lack of Phonological Correspondence: The Ethiopic syllabary features a number of ejective phonemes (e.g. ቀ, አ, ኢ, etc.) not found in western languages and thus not available on Latin based keyboards. Where ejectives occur in Ethiopic languages non-ejective phonemes will also be found. In these case the non-ejective form will be mapped to the lowercase Latin key and the ejective form to the corresponding uppercase Latin key.

In other cases phonemes a single Ethiopic letters are represented by two letters in a language using Latin, for example “ቸ” and “ሽ” in Ethiopic would be “ch” and “sh” respectively. In these instances the additional keystroke required of the terminal “h” is avoided by dropping it which is in keeping with the [Principle of Ergonomics](#) and the [Principle of Productivity](#). Thus the mapping to “c” only for “ቸ” and to the otherwise unused “x” for “ሽ” thereby avoiding a special case additional keystroke and the complications presented by a consonant cluster.

Phonological Redundancy: Most notably in Amharic, phonological redundancy occurs for phonemes in “h” (ሀ, ሐ, ኀ, ኸ), “s” (ሠ, ሰ), “a” (አ, ፀ) and “s” (ጸ, ፀ). In most cases the redundancies are handled by mapping the Ethiopic homophonic group to the same Latin letter, but requiring that the less frequently occurring letter be entered by a double-strike of the target key. For example “ኸ” is entered by a single strike to the “s” key, if the next character struck is another “s”, then “ኸ” is replaced by the less frequent “፸”. This does not present a complication with word formation as sequences like “ኸኸ” are not know to occur or at best are exceedingly rare. The four Amharic syllographs in “h” pose an added problem but is handled by mapping the “ሐ” to uppercase “H” and the “ኸ” to uppercase “K” which both borrow from the mappings used in Tigrinya and similar languages where the phonemes are indeed different and takes advantage of the fact that uppercase Latin “H” and “K” are unencumbered in the Amharic mappings.

3.1.2 Vowels Components

The Ethiopic orders of an syllabic family each exhibit the same consonant base (“C” in a “CV” pattern) with a changing vowel component (the “V” in a “CV” pattern). The exception being the 6th order syllograph which represents a true consonant (“C” only) but in some circumstances may also carry a light vowel component (“i” in IPA). The sixth order is also the most frequently occurring of all orders thus in keeping with both the [Principle of Phonological Continuity](#) [Principle of Ergonomics](#) its entry does not require a vowel to follow and is the form shown when a consonant key is struck.

The remaining Ethiopic orders are entered via vowel assignments in keeping with the norms of transliteration and transcription (which is turn follow the [Principle of Phonological Continuity](#)). The vowel component assignments are made case independent for both simplicity and to avoid problems found to occur when some vowel assignments are uppercase only and when followed by an uppercase consonant and the shift key is not released in time. Avoiding these shift-slip conditions helps keep mechanical typographic errors to a minimum and supports the [Principle of Productivity](#).

The Ethiopic “መ family” is the only member of the syllabary to realize the full set of 14 syllographic orders. Its keyed entry under QWERTY based hardware is presented here for illustration as the syllabic composition archetype. Note that the regular expressions syntax “[ABC]” employed in the tables is to be read as “one of: A or B or C”. One or more bracket expression in the form “[mM][iI][eE]” indicates the valid composition sequences of: “mie”, “Mie”, “mIe”, “Mie”, “miE”, “MiE”, “mIE” and “MIE”. The expected, and most probable, sequence is formed from the initial elements in a bracket expression sequence, e.g. “mie”, the remaining expansions are not ordered.

	IPA	+ə	+u	+i	+a	+e		+o	+ɔ	+ ^w ə	+ ^w u	+ ^w i	+ ^w a	+ ^w e	+ya
IPA	KEY	[eE]	[uU]	[iI]	[aA]	[iI][eE]		[oO]	[oO][aA]	[uU][eE]	[uU][uU]	[uU][iI]	[uU][aA]	[uU][iI][eE]	Y[aA]
m	[mM]	መ	ሙ	ሚ	ማ	ሜ	ም	ዎ	ዖ	ሙ	ሞ	ሚ	ሚ	ሜ	ሚ

Due to the phonemic proximity of the seventh and ninth orders in many languages, coupled with the frequency of open ring diacritical symbol in the seventh form (e.g. ሎ), the seventh and ninth orders are often used interchangeably. Similarly this occurs with the second and tenth forms where the distinction between the diacritical symbols may be more difficult to discern. These interchanges are known to occur only for members of the classic Ge’ez character set, accordingly an input method rule is provided to help make it easier to enter the “other-o” and “other-u” forms as per:

	+ [uu]	+ [uU][uU]		+ [oO]	+ [oO][oO]
ቅ	ቂ	ቂ	ቅ	ቆ	ቆ
ኅ	ኄ	ኄ	ኅ	ኆ	ኆ
ክ	ከ	ከ	ክ	ኮ	ኮ
ግ	ገ	ገ	ግ	ገ	ገ

3.1.3 Lone Vowels

The input of the glottal (አ, ኡ, ኢ, ኣ, ኤ, ኦ, ኦ) and pharyngeal (ዐ, ዑ, ዒ, ዓ, ዔ, ዕ, ዖ) vowel syllographs invariably are the key mappings most likely to differ between any two Ethiopic input method conventions. This is due in large part to the wider range of vowel conceptualization of the “vowel-like” characters and from attempts to balance input convenience with consistency. In this specification three conventions are supported to aid users who will likely have had some prior keying experience and will hold expectations for one or more of the conventions.

Lone Vowels as Vowels: Single keystroke composition of all glottal syllables is highly desirable by experienced typist. Accordingly, this convention will take mapping precedence over the other two supported conventions. The pharyngeal counterparts are then entered by a double strike of the same vowel key. The following table presents the input for the regular vowels:

IPA	KEYS	VOWEL	IPA	KEYS	VOWEL
u	[uU]	ኡ	ʁu	[uU][uU]	ዑ
i	[iI]	ኢ	ʁi	[iI][iI]	ዒ
e	[iI][eE]	ኣ	ʁe	[iI][iI][eE]	ዓ
ɪ	[eE]	ኤ	ʁɪ	[eE][eE]	ዕ
o	[oO]	ኦ	ʁo	[oO][oO]	ዖ

Lone Vowels as Syllables: Under this convention the lone vowel syllables are treated like any other syllograph and will be entered identically whereby the 6th order appears with the initial keystroke (“e” ⇒ “ኣ”) and are the basis for composing all other orders. In contrast to this norm of the regular syllographs, many users have the expectation that the vowels should be composed starting from the 1st order (“a” ⇒ “ኡ”) and so this convention is supported as a third tier means of entry. As a consequence of accommodating a three tiered system where single and double keystroke entry takes precedence over the others, a few mapping collisions occur that cause irregularity in the input of the other tiers (highlighted below). This is unavoidable but considered only a minor penalty.

	IPA	+ə	+u	+i	+a	+e	+ɪ	+o
IPA	KEY	+[eE]	+[uU]	+[iI]	+[aA]	+[iI][eE]		+[oO]
ʔ	[eE]	ዐ	ኡ	ኢ	ኣ	ኤ	ኦ	ኦ
ʔ	a	ኡ	ኡ	ኢ	ዒ	ኤ	ኣ	ኣ
ʁ	[eE][eE]	ዐ	ዑ	ዒ	ዓ	ዔ	ዕ	ዖ
ʁ	A	ዐ	ዑ	ዒ	ዓ	ዔ	ዐ	ዖ

Amharic Input of Glottal Short-A with the “a” Key: The homophonic equivalence of the first and sixth orders of the Ethiopic lone vowels, both in the pharyngeal and glottal, are a complication for mnemonic input methods. This becomes a further complication in the case of Amharic and related languages where the pharyngeal phoneme is lost and the Aynu-A lone vowels take on the glottal phoneme. The short-A phoneme is then shared by exactly four syllographs. Input of these syllographs all apply the Latin “a” key and will be entered following repeated strikes of the key in frequency order as found in corpus.

IPA	KEYS	VOWEL
a	[aA]	አ
a	[aA][aA]	ኅ
a	[aA][aA][aA]	ዐ
a	[aA][aA][aA][aA]	ከ

Eritrean Input of Glottal and Pharyngeal Short-A with the “a” Key: Under modern writing practices in Eritrea the 4th order syllographs are strictly used when homophonic equivalence is found with the 1st. Accordingly the input sequence from repeated strikes of the Latin “a” key changes order:

IPA	KEYS	VOWEL
a	[aA]	አ
ፍa	[aA][aA]	ኅ
ፍa	[aA][aA][aA]	ዐ
a	[aA][aA][aA][aA]	ከ

Composition of the Irregular Lone Vowels in “ə” and “ɔ”: In the languages that use the irregular lone vowel, “ኧ”, and the Dizi, Me’en, Mursi & Suri vowel “ኧ”, they will be composed as follows:

IPA	KEYS	VOWEL
ɪ	[aA][eE]	ኧ
ɔ	[oO][aA]	ኧ

When ኧ occurs, ኧ is composed with [aA][eE][eE].

Lone Vowel after Consonant Rule: A special condition occurs where lone consonant syllograph (the sixth order) is followed by a lone vowel syllograph. To assure that two syllographs will occur in the orthographic sequence, (<C><V>), and do not compose into a single syllograph (<CV>), the apostrophe symbol is used to terminate the composition of the consonant syllograph. As a rule of this input method specification, the apostrophe will always terminate a character composition that is underway. Apostrophe itself may then be input with a double-strike of the key.

3.2 Punctuation

Punctuation use in Ethiopic writing practice find a modern and classical use. Some Western punctuation have become common in modern writing practices as well. As per the [Principle of Character Class Continuity](#) keyboard punctuation is mapped to Ethiopic punctuation. These mappings will be glyph based or functional based depending on which associations has been found to be stronger. Punctuation mappings apply to all Ethiopic language input methods unless otherwise specified.

Entry of Modern Punctuation: Input mappings are defined for all While Ethiopic Combining Gemination Mark is not a punctuation symbol, punctuation is specified for its entry (for lack of a character class analog in QWERTY keyboards to map to), thus its listing here.

PUNCTUATION	KEYS	NOTE
:	:	As per the Principle of Graphical Continuity .
::	::	As per the Principle of Graphical Continuity .
፣	,	As per the Principle of Continuity of Function . The Ethiopian Writer's Association recommends ፣ as the default comma.
፥	,,	As per the Principle of Continuity of Function . The ecclesiastical comma will be the default in the Ge'ez keyboard.
,	,,,	ASCII comma as per the Principle of Utility .
፤	;	As per the Principle of Continuity of Function .
;	::	ASCII semicolon as per the Principle of Utility .
:-	:-	As per the Principle of Graphical Continuity .
:	:::	ASCII colon as per the Principle of Utility .
—	—	Low line (aka “Underscore”) is the selected symbol mapping due to the availability of the symbol and its virtual non-use in Ethiopic writing.
—	—	Two ASCII low lines as per the Principle of Utility .
'	"	Two ASCII apostrophes as per the Principle of Utility .

Entry of Archaic Punctuation: Input mappings for punctuation no longer in modern use are defined for the [Ge'ez](#) and [“Unified Ethiopic”](#) input methods only. Continual strikes of the colon key will render additional multi-dot symbols. The mappings of “:+”, “:##” and “:?” are applied for transliteration conventions.

PUNCTUATION	KEYS	NOTE
፥	፥	Applied for continuity with transliteration.
፥	፥ ፥፥	As per the Principle of Graphical Continuity . This mapping also represent key-strike continuity from similar dot based Ethiopic Full Stop (፥).
፥	፥+ ፥፥፥	As per the Principle of Graphical Continuity . This mapping also represent key-strike continuity from similar dot based Ethiopic Paragraph Separator (፥).
:	፥፥፥፥	ASCII colon sign as per the Principle of Utility .
፥	፥? ?	As per the Principle of Continuity of Function .
?	??	ASCII question mark as per the Principle of Utility .

Entry of Latin Punctuation Used in Ethiopic Writing: Input mappings are defined for Latin punctuation from [ES 781](#) that are frequent in Ethiopic writing but not easily available on a regular QWERTY keyboard.

PUNCTUATION	KEYS	NOTE
<	<	As per the Principle of Graphical Continuity .
«	<<	As per the Principle of Graphical Continuity .
<	<<<	ASCII less-than sign as per the Principle of Utility .
>	>	As per the Principle of Graphical Continuity .
»	>>	As per the Principle of Graphical Continuity .
>	>>>	ASCII greater-than sign as per the Principle of Utility .
!	!	As per the Principle of Graphical Continuity under context.

A Note on “Smart Quotes”: The guillemets (left and right pointing single and double angle quotation marks) are the default style for Ethiopic quotation. The guillemets could be provided by mappings onto Latin apostrophe and quotation mark where “smart quoting” is applied. If this implementation approach is chosen, the apostrophe and quotation symbols should then be provided through a double-strike of their respective keys in keeping with the [Principle of Utility](#) and ES 781.

A Note on Punctuation Following Numbers: The Latin script comma is used an order delimiter in numeric sequences as is Latin colon in time representations. A common typographical error is to use Ethiopic comma in a numeric sequence and Ethiopic Wordspace in a time representation. An auto-correct feature may be applied here when these symbols are found bounded on both sides by numeric symbols.

3.3 Numerals

The Ethiopic numeral system introduces additional complexity to an input method as a consequence of its non-digital basis. The Ethiopic numeral system is in a family of letter based numeral systems along with the Coptic and Roman systems which it resembles. Three levels of support for the numeral system are specified here. An input method implementation may then provide the highest level that an underlying software framework is capable of supporting.

Under modern writing practices the westernized Arabic digits, 0-9, are the default numeral system used in math, commerce and in general. Accordingly, the western digits will be the default for an Ethiopic input method and the Ethiopic numerals will be entered by a context change marker followed by the appropriate value given in the native numeral system of the keyboard device. For a QWERTY keyboard the context change marker is apostrophe and is chosen for its easy to type position and rare use in Ethiopic practices.

The Ethiopic numeral system is the default numeral system for the [Ge'ez](#) and [“Unified Ethiopic”](#) input methods where the context marker then indicates a change to western numeral entry.

Minimal Support Level: At the minimal support level only direct mappings from western digits onto a single Ethiopic numeral character is required. The mapping from value 1,000 onto Ethiopic “፲፩” shown in the table below is optional at the minimal level because it is a multi character Ethiopic numeric sequence. It is recommended however to help provide continuity in the orders of ten up to the numeral system radix.

VALUE	1	2	3	4	5	6	7	8	9
KEYS	'1	'2	'3	'4	'5	'6	'7	'8	'9
NUMERAL	፩	፪	፫	፬	፭	፮	፯	፰	፱
VALUE	10	20	30	40	50	60	70	80	90
KEYS	'10	'20	'30	'40	'50	'60	'70	'80	'90
NUMERAL	፳	፴	፵	፶	፷	፸	፹	፺	፻

NUMERAL	፩	፪	፫	፬	፭	፮	፯	፰	፱	፳
----------------	---	---	---	---	---	---	---	---	---	---

Maximal Support Level At the maximal support level mapped key entry would be replaced with algorithmic determination of the Ethiopic numeric sequence from the value of the western sequence that has been keyed (Ref: <http://ethiopic.org/Numerals/>). Here no upper bound is specified for the numeric value that must be supported. Individual implementers may make a decision based on the buffer sizes for holding an Ethiopic sequence or other practical criteria.

3.4 Tonal Marks

The Ethiopic Tonal Marks, as the symbols are identified in the Unicode standard, are understood better as non-neumatic, ekphonic annotation marks. No precedence exists for their mechanical input in publishing system -either hardware (e.g. typewriter) or software based. The method for keyed input specified here employs the underscore symbol “_” which is otherwise unused in Ethiopic writing practices, followed by a digit key corresponding to the sort order of the symbol (the mapping is not based on value but position of the digits in the standard layout starting with “1” and ending with “0”). For input method frameworks that support it, it is recommended that an over-the-spot menu be used to present the symbols to the typist for selection.

Mappings for the Ethiopic Tonal Marks are only applicable to the [Ge'ez](#) and [“Unified Ethiopic”](#) input methods.

KEYS	_1	_2	_3	_4	_5	_6	_7	_8	_9	_0
SYMBOL	.	፡	።	፣	፤	፥	፦	፧	፨	፩

No strong mnemonic correspondence has been found for the symbols and the keys available on computer keyboards. The abbreviation of the symbol names may provide a suitable mnemonic that would be preferable to the numeral based entry specified here. Such a system is being evaluated presently and is complicated by variation in the symbol names that has been found to occur. This specification will be updated later if a consensus mnemonic convention is reached.

Appendix A: The QSAE ES 781:2002 Ethiopic Standard

The ES 781:2002 Definition for Ethiopic

1	2	3	4	5	6	7	8	9	10
ሀ	ሁ	ሂ	ሃ		ሄ	ህ	ሆ	ሇ	
ለ	ሉ	ሊ	ላ	ሏ	ሎ	ሐ	ሑ	ሒ	
ሐ	ሑ	ሒ	ሓ	ሔ	ሕ	ሖ	ሗ		
መ	ሙ	ሚ	ማ		ሚ	ም	ሞ	ሟ	
ሙ		ሚ	ሚ		ሚ	ም			ሚ
ሠ	ሡ	ሢ	ሣ	ሤ	ሥ	ሦ			
ረ	ሩ	ሪ	ራ	ራ	ራ	ራ	ራ	ራ	ራ
ሰ	ሱ	ሲ	ሳ	ሴ	ስ	ሶ	ሷ	ሸ	
ሸ	ሹ	ሺ	ሻ	ሼ	ሽ	ሾ	ሿ		
ቸ	ቹ	ቺ	ቻ		ቼ	ች	ቾ		
ቀ	ቁ	ቂ	ቃ		ቄ	ቅ	ቆ	ቇ	
ቈ		቉	ቊ		ቋ	ቌ			
ቍ	቎	቏	ቐ		ቑ	ቒ	ቓ		
ቔ		ቕ	ቖ		቗	ቘ			
቙	ቚ	ቛ	ቜ		ቝ	቞	቟		
በ	ቡ	ቢ	ባ		ቤ	ብ	ቦ	ቧ	
ቨ		ቩ	ቪ		ቫ	ቬ			
ሸ	ሹ	ሺ	ሻ	ሼ	ሽ	ሾ	ሿ		
ተ	ቱ	ቲ	ታ	ታ	ቲ	ታ	ታ	ታ	
ቸ	ቹ	ቺ	ቻ	ቻ	ቺ	ቻ	ቻ	ቻ	
ቸ	ቹ	ቺ	ቻ		ቼ	ች	ቾ		

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ገ	ጉ	ጊ	ጋ		ጌ	ግ	ግ	ግ	
ጎ		ጎ	ጎ		ጎ	ጎ			
ነ	ኑ	ኒ	ና	ና	ኔ	ን	ና	ና	
ኘ	ኙ	ኘ	ኘ	ኘ	ኘ	ኘ	ኘ	ኘ	
አ	አ	አ	አ		አ	አ	አ	አ	አ
ከ	ከ	ከ	ካ		ከ	ከ	ከ	ከ	
ኰ		ኰ	ኳ		ኰ	ኰ			
ሸ	ሸ	ሸ	ሸ		ሸ	ሸ	ሸ		
ኸ	ኸ	ኸ	ኸ		ኸ	ኸ	ኸ		
ኸጐ		ኸጐ	ኸጐ		ኸጐ	ኸጐ			
ኸጎ	ኸጎ	ኸጎ	ኸጎ		ኸጎ	ኸጎ	ኸጎ		
ወ	ወ	ወ	ወ		ወ	ወ	ወ	ወ	
ዐ	ዐ	ዐ	ዐ		ዐ	ዐ	ዐ		
ዘ	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ	
ዠ	ዠ	ዠ	ዠ	ዠ	ዠ	ዠ	ዠ		
ዡ	ዡ	ዡ	ዡ		ዡ	ዡ	ዡ		
የ	የ	የ	የ		የ	የ	የ	የ	
ደ	ደ	ደ	ደ	ደ	ደ	ደ	ደ	ደ	
ደ	ደ	ደ	ደ	ደ	ደ	ደ	ደ	ደ	
ጀ	ጀ	ጀ	ጀ	ጀ	ጀ	ጀ	ጀ	ጀ	
ገ	ገ	ገ	ገ		ገ	ገ	ገ	ገ	
ጎ		ጎ	ጎ		ጎ	ጎ			
ኘ	ኘ	ኘ	ኘ		ኘ	ኘ	ኘ		

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ኸ		ኹ	ኺ		ኻ	ኼ			
ኽ	ኾ	኿	ኾ		ኻ	ኼ	ኽ		
ጠ	ጡ	ጢ	ጣ	ጤ	ጥ	ጦ	ጧ	ጨ	
ጪ	ጫ	ጬ	ጭ	ጮ	ጯ	ጰ	ጱ	ጲ	
ጳ	ጴ	ጵ	ጶ		ጷ	ጸ	ጹ	ጺ	
ጻ	ጼ	ጽ	ጾ	ጿ	ሀ	ሁ	ሂ		
ሀ	ሁ	ሂ	ሃ		ሄ	ህ	ሆ	ሇ	
ለ	ሉ	ሊ	ላ		ል	ሎ	ሏ		
ሐ		ሑ	ሒ		ሓ	ሔ			ሕ
ተ	ቱ	ቲ	ታ		ቤ	ብ	ቦ	ቧ	
ቤ		ብ	ቦ		ቦ	ቧ			
፩	፪	፫	፬	፭	፮	፯	፰	፱	፲
፳	፴	፵	፶	፷	፸	፹	፺	፻	፼
0	1	2	3	4	5	6	7	8	9
#	:	?	;	፻	:-	÷	!	!	.
‘	’	«	»	“	”	/	()	[
]	{	}	<	=	>	\	#	%	&
*	-	+	±	×	÷	∴	∴	∴	—
.	ጋ	፻	፻	ጋ	ጋ	ጋ	ጋ	ጋ	ጋ
“	፻	፻							

Appendix B: Amharic Input Method for a QWERTY Keyboard Layout

Applicable Language-Regions	: am-ET
Default Numeral System	: keyboard native
Ethiopic Tonal Marks	: No
Archaic Punctuation	: No
Keyman Implementation	: gff-amh-7.kmn / gff-amh-7.kmx
Last Update	: 2008-11-10 (Gregorian)

Notes: ጸ is a special case for the Amharic and Sebatbeit languages.

	IPA	+ə	+u	+i	+a	+e		+o	+ɔ	+ ^w ə	+ ^w u	+ ^w i	+ ^w a	+ ^w e
IPA	KEY	[eE]	[uU]	[ii]	[aA]	[ii][eE]		[oO]	[oO][aA]	[uU][eE]	[uU][uU]	[uU][ii]	[uU][aA]	[uU][ii][eE]
h	h	ሀ	ሁ	ሂ	ሃ	ሄ	ህ	ሆ		ኸ	ኹ	ኺ	ኻ	ኼ
l	[IL]	ለ	ሉ	ሊ	ላ	ሌ	ል	ሎ					ሰ	
h	H	ሐ	ሑ	ሒ	ሓ	ሔ	ሕ	ሖ					ሸ	
m	[mM]	መ	ሙ	ሚ	ማ	ሜ	ም	ሞ					ሚ	
s	ss	ሠ	ሡ	ሢ	ሣ	ሤ	ሥ	ሦ					ሢ	
r	[rR]	ረ	ሩ	ሪ	ራ	ራ	ር	ሮ					ረ	
s	s	ሰ	ሱ	ሲ	ሳ	ሴ	ስ	ሶ					ሰ	
ʃ	[xX]	ሸ	ሹ	ሺ	ሻ	ሼ	ሽ	ሾ					ሸ	
k'	[qQ]	ቀ	ቁ	ቂ	ቃ	ቄ	ቅ	ቆ		ቈ	቉	ቊ	ቋ	ቌ
b	[bB]	በ	ቡ	ቢ	ባ	ቤ	ብ	ቦ					ቢ	
v	[vV]	ቨ	ቩ	ቪ	ቫ	ቬ	ቭ	ቮ					ቪ	
t	t	ተ	ቱ	ቲ	ታ	ቴ	ት	ቶ					ተ	
ʃ	c	ቸ	ቹ	ቺ	ቻ	ቼ	ች	ቾ					ቸ	
h	hh	ኸ	ኹ	ኺ	ኻ	ኼ	ኽ	ኾ		ኸ	ኹ	ኺ	ኻ	ኼ
n	n	ነ	ኑ	ኒ	ና	ኔ	ኑ	ኖ					ና	
ɲ	N	ኸ	ኹ	ኺ	ኻ	ኼ	ኽ	ኾ					ኸ	
ʔ	a	አ	አ	አ	አ	አ	አ	አ						
k	k	ከ	ከ	ከ	ካ	ኬ	ክ	ኮ		ከ	ከ	ከ	ካ	ኬ

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h	K	ኸ	ኹ	ኺ	ኻ	ኼ	ኽ	ኾ						
w	[wW]	ወ	ዑ	ዒ	ዓ	ዔ	ዕ	ዖ						
?	A	ዐ	ዑ	ዒ	ዓ	ዔ	ዕ	ዖ						
z	z	ዘ	ዙ	ዚ	ዛ	ዞ	ዟ	ዠ					ዡ	
3	Z	ዸ	ዹ	ዺ	ዻ	ዼ	ዽ	ዾ					ዿ	
y	[yY]	የ	ዮ	ዿ	ዺ	ዻ	ዼ	ዽ						
d	[dD]	ደ	ዱ	ዲ	ዳ	ዴ	ድ	ዶ					ዷ	
፩	[jJ]	ጃ	ጄ	ጅ	ጆ	ጇ	ገ	ገ					ጉ	
g	[gG]	ገ	ጉ	ጊ	ጋ	ጌ	ግ	ገ		ጐ	጑	ጒ	ጓ	ጔ
፫	T	ጠ	ጡ	ጢ	ጣ	ጤ	ጥ	ጦ					ጧ	
፭	C	ጨ	ጨ	ጨ	ጨ	ጨ	ጨ	ጨ					ጨ	
p'	P	ጸ	ጹ	ጺ	ጻ	ጼ	ጽ	ጾ					ጿ	
s'	S	ጸ	ጹ	ጺ	ጻ	ጼ	ጽ	ጾ					ጿ	
s'	SS	ፀ	ፁ	ፂ	ፃ	ፄ	ፅ	ፆ						
f	[fF]	ፈ	ፉ	ፊ	ፋ	ፅ	ፆ	ፇ					ፈ	
p	p	ፐ	ፑ	ፒ	ፓ	ፔ	ፕ	ፖ					ፐ	
ə	ae	አ												

Appendix C: Awngi, Blin, Qimant, Xamtanga Input Method for a QWERTY Keyboard Layout

Applicable Language-Regions	: awn-ET, byn-ER, ahq-ET, xan-ET
Default Numeral System	: keyboard native
Ethiopic Tonal Marks	: No
Archaic Punctuation	: No
Keyman Implementation	: gff-awn-7.kmn / gff-awn-7.kmx gff-byn-7.kmn / gff-byn-7.kmx
Last Update	: 2008-11-10 (Gregorian)

Notes:

- Under agreement by cultural ambassadors the Awngi, Blin and Xamtanga use a common syllbary.
- Blin however will use [Eritrean rules](#) for glottal and pharyngeal lone vowels and [Eritrean style punctuation use](#).

	IPA	+ə	+u	+i	+a	+e		+o	+ɔ	+ ^w ə	+ ^w u	+ ^w i	+ ^w a	+ ^w e
IPA	KEY	[eE][uU]	[iI]	[aA]	[iI][eE]		[oO]	[oO][aA]	[uU][eE]	[uU][uU]	[uU][iI]	[uU][aA]	[uU][iI][eE]	
h	h	ሀ	ሁ	ሂ	ሃ	ሄ	ህ	ሆ						
l	[IL]	ለ	ሉ	ሊ	ላ	ሌ	ል	ሎ					ሊ	
h	H	ሐ	ሑ	ሒ	ሓ	ሔ	ሕ	ሖ					ሐ	
m	[mM]	መ	ሙ	ሚ	ማ	ሜ	ም	ሞ					ሚ	
s	s	ሰ	ሱ	ሲ	ሳ	ሴ	ስ	ሶ					ሰ	
r	[rR]	ረ	ሩ	ሪ	ራ	ራ	ሮ	ሮ					ረ	
ʃ	[xX]	ሸ	ሹ	ሺ	ሻ	ሼ	ሽ	ሾ					ሸ	
k'	q	ቀ	ቁ	ቂ	ቃ	ቄ	ቅ	ቆ		ቈ	቉	ቊ	ቋ	ቌ
ɣ	Q	ቆ	ቇ	ቈ	቉	ቊ	ቋ	ቌ		ቆ	ቇ	ቈ	቉	ቊ
b	[bB]	በ	ቡ	ቢ	ባ	ቤ	ብ	ቦ					በ	
t	t	ተ	ቱ	ቲ	ታ	ቲ	ቲ	ቲ					ተ	
n	n	ነ	ኑ	ኒ	ና	ኔ	ን	ኖ					ነ	
ʔ	a	አ	አ	አ	አ	አ	አ	አ						
k	k	ከ	ከ	ከ	ከ	ከ	ከ	ከ		ከ	ከ	ከ	ከ	ከ
x	K	ኸ	ኸ	ኸ	ኸ	ኸ	ኸ	ኸ		ኸ	ኸ	ኸ	ኸ	ኸ

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w	[wW]	ወ	ዉ	ዐ	ዑ	ዒ	ዓ	ዔ	ዕ						
ፍ	A	ዐ	ዑ	ዒ	ዓ	ዔ	ዕ	ዖ	዗						
y	[yY]	የ	ዩ	ዪ	ያ	ዬ	ዮ	ዿ							
d	[dD]	ደ	ደ	ደ	ደ	ደ	ደ	ደ					ደ		
ፄ	[jJ]	ጀ	ጀ	ጀ	ጀ	ጀ	ጀ	ጀ					ጀ		
g	g	ገ	ገ	ገ	ገ	ገ	ገ	ገ		ገ	ገ	ገ	ገ	ገ	ገ
ገ	G	ገ	ገ	ገ	ገ	ገ	ገ	ገ		ገ	ገ	ገ	ገ	ገ	ገ
ጥ	T	ጠ	ጠ	ጠ	ጠ	ጠ	ጠ	ጠ					ጠ		
፳	C	ጨ	ጨ	ጨ	ጨ	ጨ	ጨ	ጨ					ጨ		
f	[fF]	ፈ	ፈ	ፈ	ፈ	ፈ	ፈ	ፈ					ፈ		
፳	c	ቸ	ቸ	ቸ	ቸ	ቸ	ቸ	ቸ					ቸ		
ጎ	N	ኘ	ኘ	ኘ	ኘ	ኘ	ኘ	ኘ					ኘ		
z	z	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ					ዘ		
3	Z	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ					ዘ		
ፍ	S	ጸ	ጸ	ጸ	ጸ	ጸ	ጸ	ጸ					ጸ		
p'	P	ጸ	ጸ	ጸ	ጸ	ጸ	ጸ	ጸ					ጸ		
p	p	ፐ	ፐ	ፐ	ፐ	ፐ	ፐ	ፐ					ፐ		
v	[vV]	ቨ	ቨ	ቨ	ቨ	ቨ	ቨ	ቨ					ቨ		

Appendix D: Bench Input Method for a QWERTY Keyboard Layout

Applicable Language-Regions	: bcq-ET
Default Numeral System	: keyboard native
Ethiopic Tonal Marks	: No
Archaic Punctuation	: No
Keyman Implementation	: gff-bcq-7.kmn / gff-bcq-7.kmx
Last Update	: 2008-11-10 (Gregorian)

Notes:

- Note that in Bench (aka Benchnon, Gimira) the first order letters do not occur except in “**ሀ**” and “**አ**”.
- The ecclesiastical comma, “**፥**”, is used in Bench as a tonal marker. Thus the unused “[fF]” are applied for input of “**፥**”. The Bench tonal marker glyph is subject to change at a future time which may also lead to revision of its keyed entry.
- Bench does not apply the labiovelar forms in orthography.

	IPA	+ə	+u	+i	+a	+e		+o	+ɔ	+ ^w ə	+ ^w u	+ ^w i	+ ^w a	+ ^w e
IPA	KEY	[eE]	[uU]	[iI]	[aA]	[iI][eE]		[oO]	[oO][aA]	[uU][eE]	[uU][uU]	[uU][iI]	[uU][aA]	[uU][iI][eE]
h	h	ሀ	ሁ	ሂ	ሃ	ሄ		ህ	ሆ					
l	[lL]		ሉ	ሊ	ላ	ሌ		ል	ሎ					
h	H		ሐ	ሑ	ሐ	ሑ		ሕ	ሖ					
m	[mM]		ሙ	ሚ	ማ	ሜ		ም	ሞ					
s	ss		ሠ	ሢ	ሣ	ሤ		ሥ	ሦ					
r	[rR]		ሩ	ሪ	ራ	ራ		ሮ	ሮ					
s	s		ሰ	ሱ	ሰ	ሱ		ሰ	ሱ					
ʃ	[xX]		ሸ	ሹ	ሸ	ሹ		ሸ	ሹ					
ʃ	[xX][xX]		ሸ	ሹ	ሸ	ሹ		ሸ	ሹ					
k'	[qQ]		ቁ	ቁ	ቃ	ቁ		ቅ	ቆ					
b	[bBvV]		ቡ	ቢ	ባ	ቤ		ብ	ቦ					
t	t		ቱ	ቲ	ታ	ቲ		ቶ	ቷ					
ʧ	c		ቸ	ቹ	ቻ	ቸ		ቾ	ቿ					

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ረ	cc		ቸ	ቸ	ቸ	ቸ	ቸ	ቸ						
n	[nN]		ነ	ነ	ና	ኔ	ን	ኖ						
?	a	አ	አ	አ	አ	ኤ	አ	አ						
k	[kK]		ከ	ከ	ካ	ኬ	ከ	ኮ						
w	[wW]		ወ	ወ	ወ	ወ	ወ	ወ						
z	z		ዘ	ዘ	ዛ	ዜ	ዘ	ዛ						
3	Z		ዝ	ዝ	ዛ	ዜ	ዝ	ዛ						
3	ZZ		ዝ	ዝ	ዛ	ዜ	ዝ	ዛ						
y	[yY]		የ	የ	ያ	ዩ	ይ	ዮ						
d	[dD]		ዳ	ዳ	ዳ	ዳ	ዳ	ዳ						
፩	[jJ]		ጃ	ጃ	ጃ	ጃ	ጃ	ጃ						
g	[gG]		ገ	ገ	ገ	ገ	ገ	ገ						
t	T		ጠ	ጠ	ጠ	ጠ	ጠ	ጠ						
ረ	C		ጠ	ጠ	ጠ	ጠ	ጠ	ጠ						
ረ	CC		ጠ	ጠ	ጠ	ጠ	ጠ	ጠ						
p'	P		ጸ	ጸ	ጸ	ጸ	ጸ	ጸ						
s'	S		ጸ	ጸ	ጸ	ጸ	ጸ	ጸ						
p	p		ፑ	ፑ	ፑ	ፑ	ፑ	ፑ						

Appendix E: Dizi, Me'en, Mursi, Suri Input Method for a QWERTY Keyboard Layout

Applicable Language-Regions	: <i>mym-ET, muz-ET, suq-ET, mdx-ET</i>
Default Numeral System	: keyboard native
Ethiopic Tonal Marks	: No
Archaic Punctuation	: No
Keyman Implementation	: gff-mym-7.kmn / gff-mym-7.kmx
Last Update	: 2008-11-10 (Gregorian)

Notes:

- Note that in Me'en (and its companions) “,” is the more frequent comma and thus the default for the “,” keystroke.
- Only the sixth order, “ፊ” of the Aynu-A family (“ፐ”) is in use.
- The mapping of “[fF]” for the “ኀ” family is a convenience mapping. The mapping avoids having the “F” key becoming a dead key, the phonetic proximity of “ፍ” to “ግ” corresponds well with the proximity of the “F” key adjacent to the “G” key.
- Like Bench, Me'en does not apply the labiovelar forms in orthography.

	IPA	+ə	+u	+i	+a	+e		+o	+ɔ	+ ^w ə	+ ^w u	+ ^w i	+ ^w a	+ ^w e
IPA	KEY	[eE]	[uU]	[iI]	[aA]	[iI][eE]		[oO]	[oO][aA]	[uU][eE]	[uU][uU]	[uU][iI]	[uU][aA]	[uU][iI][eE]
h	[hH]	ሀ	ሁ	ሂ	ሃ	ሄ		ሀ	ሁ	ሂ				
l	[lL]	ለ	ሉ	ሊ	ላ	ሌ		ለ	ሉ	ሊ				
m	[mM]	መ	ሙ	ሚ	ማ	ሜ		ሞ	ሟ	ሚ				
r	[rR]	ረ	ሩ	ሪ	ራ	ራ		ረ	ሩ	ሪ				
s	s	ሰ	ሱ	ሲ	ሳ	ሴ		ሰ	ሱ	ሲ				
ʃ	[xX]	ሸ	ሹ	ሺ	ሻ	ሼ		ሸ	ሹ	ሺ				
k'	[qQ]	ቀ	ቁ	ቂ	ቃ	ቄ		ቀ	ቁ	ቂ				
b	[bB]	በ	ቡ	ቢ	ባ	ቤ		በ	ቡ	ቢ				
t	t	ተ	ቱ	ቲ	ታ	ቴ		ተ	ቱ	ቲ				
tʃ	c	ቸ	ቹ	ቺ	ቻ	ቼ		ቸ	ቹ	ቺ				
ŋ	[fF],hh	ኀ	ኁ	ኂ	ኃ	ኄ		ኀ	ኁ	ኂ				
n	n	ነ	ኑ	ኒ	ና	ኔ		ነ	ኑ	ኒ				
ɲ	N	ኘ	ኙ	ኚ	ኛ	ኜ		ኘ	ኙ	ኚ				

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ʔ	[aA]	አ	አ	አ	አ	ኤ	እ	ኦ	ኦ					
k	[kK]	ከ	ከ	ከ	ካ	ኬ	ክ	ኮ	ኮ					
w	[wW]	ወ	ወ	ወ	ወ	ዌ	ወ	ዐ	ዐ					
z	[zZ]	ዘ	ዘ	ዘ	ዛ	ዜ	ዝ	ዞ	ዞ					
y	[yY]	የ	የ	የ	ያ	ዬ	ይ	ዮ	ዮ					
d	d	ደ	ደ	ደ	ዳ	ዴ	ድ	ዶ	ዶ					
ፊ	D	ደ	ደ	ደ	ዳ	ዴ	ድ	ዶ	ዶ					
ፄ	[jJ]	ጅ	ጅ	ጅ	ጆ	ጇ	ገ	ገ	ገ					
g	[gG]	ገ	ገ	ገ	ገ	ጊ	ግ	ግ	ግ					
t	T	ጠ	ጠ	ጠ	ጠ	ጡ	ጥ	ጦ	ጦ					
፸	C	ጨ	ጨ	ጨ	ጨ	ጨ	ጨ	ጨ	ጨ					
p'	P	ጸ	ጸ	ጸ	ጸ	ጹ	ጽ	ጽ	ጽ					
p	p	ፐ	ፐ	ፐ	ፐ	ፑ	ፑ	ፑ	ፑ					
s'	S	ሰ	ሰ	ሰ	ሰ	ሱ	ሰ	ሰ	ሰ					
ʕ	ee						ዕ							

Appendix F: Ge'ez Input Method for a QWERTY Keyboard Layout

Applicable Language-Regions	: gez-ET, gez-ER
Default Numeral System	: Ethiopic
Ethiopic Tonal Marks	: Yes
Archaic Punctuation	: Yes
Keyman Implementation	: gff-gez-7.kmn / gff-gez-7.kmx
Last Update	: 2008-11-10 (Gregorian)

Notes:

- The input of “x” is added for the “ኧ” family in agreement with classic Ge’ez phonology and modern transliteration conventions.
- The input of “D” is added for the “ፀ” family in agreement with classic Ge’ez phonology.

	IPA	+ə	+u	+i	+a	+e		+o	+ɔ	+ ^w ə	+ ^w u	+ ^w i	+ ^w a	+ ^w e
IPA	KEY	[eE]	[uU]	[iI]	[aA]	[il][eE]		[oO]	[oO][aA]	[uU][eE]	[uU][uU]	[uU][iI]	[uU][aA]	[uU][il][eE]
h	h	ሀ	ሁ	ሂ	ሃ	ሄ	ህ	ሆ		ኧ	ከ	ኩ	ኰ	ኲ
l	[lL]	ለ	ሉ	ሊ	ላ	ሌ	ል	ሎ					ሏ	
ḥ	H	ሐ	ሑ	ሒ	ሓ	ሔ	ሐ	ሑ					ሔ	
m	[mM]	መ	ሙ	ሚ	ማ	ሜ	ም	ሞ					ሚ	
s	ss	ሠ	ሡ	ሢ	ሣ	ሤ	ሥ	ሦ					ሢ	
r	[rR]	ረ	ሩ	ሪ	ራ	ሪ	ሮ	ሮ					ራ	
s	s	ሰ	ሱ	ሲ	ሳ	ሴ	ሰ	ሱ					ሲ	
k'	[qQ]	ቀ	ቁ	ቂ	ቃ	ቄ	ቅ	ቆ		ቇ	ቈ	቉	ቊ	ቋ
b	[bB]	በ	ቡ	ቢ	ባ	ቤ	ብ	ቦ					ቢ	
t	t	ተ	ቱ	ቲ	ታ	ቴ	ት	ቶ					ቲ	
x	[xX], hh	ኧ	ከ	ኩ	ኰ	ኲ	ኧ	ከ		ኧ	ከ	ኩ	ኰ	ኲ
n	[nN]	ነ	ኑ	ኒ	ና	ኔ	ን	ኖ					ኒ	
ʔ	a	አ	አ	አ	አ	አ	አ	አ						
k	[kK]	ከ	ከ	ከ	ከ	ከ	ከ	ከ		ከ	ከ	ከ	ከ	ከ
w	[wW]	ወ	ወ	ወ	ወ	ወ	ወ	ወ						
ʕ	A	ዐ	ዐ	ዐ	ዐ	ዐ	ዐ	ዐ						

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z	[zZ]	ዘ	ዘ፡	ዘ።	ዛ	ዜ	ዝ	ዞ					ዟ	
y	[yY]	የ	የ፡	የ።	ያ	ዬ	ይ	ዮ						
d	d	ደ	ደ፡	ደ።	ዳ	ደፊ	ድ	ዶ					ደ፣	
g	[gG]	ገ	ገ፡	ገ።	ገ፣	ገ፤	ግ	ጎ		ገ፥	ገ፦	ገ፧	ገ፨	ገ፩
t	T	ጠ	ጠ፡	ጠ።	ጠ፣	ጠ፤	ጠ፥	ጠ፦					ጠ፧	
p'	P	አ	አ፡	አ።	አ፣	አ፤	አ፥	አ፦					አ፧	
s'	S	አ	አ፡	አ።	አ፣	አ፤	አ፥	አ፦					አ፧	
d'	D,SS	ፀ	ፀ፡	ፀ።	ፀ፣	ፀ፤	ፀ፥	ፀ፦						
f	[fF]	ፈ	ፈ፡	ፈ።	ፈ፣	ፈ፤	ፍ	ፎ					ፈ፧	
p	p	ፐ	ፐ፡	ፐ።	ፐ፣	ፐ፤	ፐ፥	ፐ፦					ፐ፧	

Appendix G: Harari Input Method for a QWERTY Keyboard Layout

Applicable Language-Regions	: har-ET
Default Numeral System	: keyboard native
Ethiopic Tonal Marks	: No
Archaic Punctuation	: No
Keyman Implementation	: gff-har-7.kmn / gff-har-7.kmx
Last Update	: 2009-01-13 (Gregorian)

	IPA	+ə	+u	+i	+a	+e		+o	+ɔ	+wə	+wu	+wi	+wa	+we
IPA	KEY	[eE]	[uU]	[ii]	[aA]	[il][eE]		[oO]	[oO][aA]	[uU][eE]	[uU][uU]	[uU][ii]	[uU][aA]	[uU][il][eE]
h	[hH]	ሐ	ሑ	ሒ	ሓ	ሔ	ሕ	ሖ						
l	[lL]	ለ	ሉ	ሊ	ላ	ሌ	ሎ	ሐ						
m	[mM]	መ	ሙ	ሚ	ማ	ሜ	ም	ሞ						
r	[rR]	ረ	ሩ	ሪ	ራ	ራ	ሮ	ሮ						
s	[sS]	ሰ	ሱ	ሲ	ሳ	ሴ	ስ	ሶ						
ʃ	[xX]	ሸ	ሹ	ሺ	ሻ	ሼ	ሽ	ሾ						
k'	[qQ]	ቀ	ቁ	ቂ	ቃ	ቄ	ቅ	ቆ						
b	[bBvV]	በ	ቡ	ቢ	ባ	ቤ	ብ	ቦ						
t	t	ተ	ቱ	ቲ	ታ	ቲ	ቲ	ቲ						
ʧ	c	ቸ	ቹ	ቺ	ቻ	ቼ	ች	ች						
n	n	ነ	ኑ	ኒ	ና	ኔ	ን	ኖ						
ɲ	N	ኘ	ኙ	ኚ	ና	ኔ	ን	ኖ						
ʔ	[aA]	አ	ሉ	ሊ	ላ	ሌ	እ	አ						
k	k	ከ	ከ	ከ	ካ	ከ	ከ	ከ						
x	K	ኸ	ኹ	ኺ	ኻ	ኼ	ኽ	ኾ						
w	[wW]	ወ	ወ	ወ	ወ	ወ	ወ	ወ						
z	[zZ]	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ						
y	[yY]	የ	የ	የ	የ	የ	የ	የ						

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d	[dD]	ደ	ደፊ	ደፊ	ደፊ	ደፊ	ደፊ	ደፊ						
ጃ	[jJ]	ጃ	ጃፊ	ጃፊ	ጃፊ	ጃፊ	ጃፊ	ጃፊ						
g	[gG]	ገ	ገፊ	ገፊ	ገፊ	ገፊ	ገፊ	ገፊ						
ጥ	T	ጠ	ጠፊ	ጠፊ	ጠፊ	ጠፊ	ጠፊ	ጠፊ						
ከ	C	ጠፍ	ጠፍፊ	ጠፍፊ	ጠፍፊ	ጠፍፊ	ጠፍፊ	ጠፍፊ						
f	[fF]	ፈ	ፈፊ	ፈፊ	ፈፊ	ፈፊ	ፈፊ	ፈፊ						

Appendix H: Sebatbeit Input Method for a QWERTY Keyboard Layout

Applicable Language-Regions	: sgw-ET
Default Numeral System	: keyboard native
Ethiopic Tonal Marks	: No
Archaic Punctuation	: No
Keyman Implementation	: gff-sgw-7.kmn / gff-sgw-7.kmx
Last Update	: 2008-11-10 (Gregorian)

Notes:

- “ከ” is not included in the Sebatbeit orthography, “ከ” takes “ከ’s” places in the syllabary table.
- “ኸ” takes “ከ’s” place in the Sebatbeit syllabary table.
- “ኸ” is keyed with either “[aA][eE]” or “[eE][eE]” which presents no conflicts as the “o” family is not used in Sebatbeit.
- The “ኸ” family is used in place of the “ሀ” and “ሁ” families in Sebatbeit orthography.
- As with Me’en, the “ሀ” family is used exclusively for “s” and the “ኸ” family is dropped. The “ሀ” series is keyed with a single strike of “S”.

	IPA	+ə	+u	+i	+a	+e		+o	+ɔ	+ ^w ə	+ ^w u	+ ^w i	+ ^w a	+ ^w e
IPA	KEY	[eE]	[uU]	[iI]	[aA]	[il][eE]		[oO]	[oO][aA]	[uU][eE]	[uU][uU]	[uU][iI]	[uU][aA]	[uU][il][eE]
h	[hH]	ኸ	ኸ	ኸ	ኸ	ኸ	ኸ	ኸ		ኸ	ኸ	ኸ	ኸ	ኸ
x ^y	KY	ኸ	ኸ	ኸ	ኸ	ኸ	ኸ	ኸ						
l	[lL]	ሀ	ሀ	ሀ	ሀ	ሀ	ሀ	ሀ					ሀ	
m	[mM]	መ	መ	መ	መ	መ	መ	መ		መ	መ	መ	መ	መ
r	[rR]	ረ	ረ	ረ	ረ	ረ	ረ	ረ					ረ	
s	s	ሰ	ሰ	ሰ	ሰ	ሰ	ሰ	ሰ					ሰ	
ʃ	[xX]	ሸ	ሸ	ሸ	ሸ	ሸ	ሸ	ሸ					ሸ	
k ^ʷ	[qQ]	ቀ	ቀ	ቀ	ቀ	ቀ	ቀ	ቀ		ቀ	ቀ	ቀ	ቀ	ቀ
k ^y	[qQ]Y	ቀ	ቀ	ቀ	ቀ	ቀ	ቀ	ቀ						
b	[bB]	በ	በ	በ	በ	በ	በ	በ		በ	በ	በ	በ	በ
t	t	ተ	ተ	ተ	ተ	ተ	ተ	ተ					ተ	
ʧ	c	ቸ	ቸ	ቸ	ቸ	ቸ	ቸ	ቸ					ቸ	

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n	n	ነ	ኑ	ኒ	ና	ኔ	ን	ኖ					ኗ	
ጎ	N	ኘ	ኙ	ኚ	ኛ	ኜ	ኝ	ኞ					ኟ	
ሀ	[aA]	አ	አ	አ	አ	አ	አ	አ						
k	[kK]	ከ	ከ	ከ	ከ	ከ	ከ	ከ		ከ	ከ	ከ	ከ	ከ
kʸ	kY	ከ	ከ	ከ	ከ	ከ	ከ	ከ						
w	[wW]	ወ	ወ	ወ	ወ	ወ	ወ	ወ						
z	z	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ					ዘ	
ጌ	Z	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ					ዘ	
y	[yY]	የ	የ	የ	የ	የ	የ	የ						
d	[dD]	ደ	ደ	ደ	ደ	ደ	ደ	ደ					ደ	
ጃ	[jJ]	ጃ	ጃ	ጃ	ጃ	ጃ	ጃ	ጃ					ጃ	
g	[gG]	ገ	ገ	ገ	ገ	ገ	ገ	ገ		ገ	ገ	ገ	ገ	ገ
gʸ	[gG]Y	ገ	ገ	ገ	ገ	ገ	ገ	ገ						
t	T	ጠ	ጠ	ጠ	ጠ	ጠ	ጠ	ጠ					ጠ	
ሸ	C	ጠ	ጠ	ጠ	ጠ	ጠ	ጠ	ጠ					ጠ	
pʸ	P	ጸ	ጸ	ጸ	ጸ	ጸ	ጸ	ጸ					ጸ	
sʸ	S	ሰ	ሰ	ሰ	ሰ	ሰ	ሰ	ሰ						
f	[fF]	ፈ	ፈ	ፈ	ፈ	ፈ	ፈ	ፈ		ፈ	ፈ	ፈ	ፈ	ፈ
p	p	ፐ	ፐ	ፐ	ፐ	ፐ	ፐ	ፐ		ፐ	ፐ	ፐ	ፐ	ፐ

Appendix I: Silt'e Input Method for a QWERTY Keyboard Layout

Applicable Language-Regions	: xst-ET
Default Numeral System	: keyboard native
Ethiopic Tonal Marks	: No
Archaic Punctuation	: No
Keyman Implementation	: gff-xst-7.kmn / gff-xst-7.kmx
Last Update	: 2009-01-13 (Gregorian)

	IPA	+ə	+u	+i	+a	+e		+o	+ɔ	+ ^w ə	+ ^w u	+ ^w i	+ ^w a	+ ^w e
IPA	KEY	[eE]	[uU]	[ii]	[aA]	[ii][eE]		[oO]	[oO][aA]	[uU][eE]	[uU][uU]	[uU][ii]	[uU][aA]	[uU][ii][eE]
h	[hH]	ሀ	ሁ	ሂ	ሃ	ሄ	ህ	ሆ						
l	[lL]	ለ	ሉ	ሊ	ላ	ሌ	ል	ሎ						
m	[mM]	መ	ሙ	ሚ	ማ	ሜ	ም	ሞ						
r	[rR]	ረ	ሩ	ሪ	ራ	ሬ	ር	ሮ						
s	[sS]	ሰ	ሱ	ሲ	ሳ	ሴ	ስ	ሶ						
ʃ	[xX]	ሸ	ሹ	ሺ	ሻ	ሼ	ሽ	ሾ						
k'	[qQ]	ቀ	ቁ	ቂ	ቃ	ቄ	ቅ	ቆ						
b	[bBvV pP]	በ	ቡ	ቢ	ባ	ቤ	ብ	ቦ						
t	t	ተ	ቱ	ቲ	ታ	ቲ	ት	ቶ						
ʃ	c	ቸ	ቹ	ቺ	ቻ	ቼ	ች	ቾ						
n	n	ነ	ኑ	ኒ	ና	ኔ	ን	ኖ						
ɲ	N	ኘ	ኙ	ኚ	ኛ	ኜ	ኝ	ኞ						
ʔ	[aA]	አ	አ	አ	አ	አ	አ	አ						
k	[kK]	ከ	ከ	ከ	ካ	ከ	ከ	ከ						
w	[wW]	ወ	ወ	ወ	ወ	ወ	ወ	ወ						
z	z	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ						
ʒ	Z	ዠ	ዠ	ዠ	ዠ	ዠ	ዠ	ዠ						
y	[yY]	የ	የ	የ	የ	የ	የ	የ						

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d	[dD]	ደ	ደፊ	ደፊ	ደፊ	ደፊ	ደፊ	ደፊ						
ጃ	[jJ]	ጃ	ጃፊ	ጃፊ	ጃፊ	ጃፊ	ጃፊ	ጃፊ						
g	[gG]	ገ	ገፊ	ገፊ	ገፊ	ገፊ	ገፊ	ገፊ						
ጥ	T	ጠ	ጠፊ	ጠፊ	ጠፊ	ጠፊ	ጠፊ	ጠፊ						
ኸ	C	ጠፊ	ጠፊፊ	ጠፊፊ	ጠፊፊ	ጠፊፊ	ጠፊፊ	ጠፊፊ						
p'	P	ደ	ደፊ	ደፊ	ደፊ	ደፊ	ደፊ	ደፊ						
f	[fF]	ፈ	ፈፊ	ፈፊ	ፈፊ	ፈፊ	ፈፊ	ፈፊ						
p	p	ፕ	ፕፊ	ፕፊ	ፕፊ	ፕፊ	ፕፊ	ፕፊ						

Appendix J: Tigrinya (Eritrean) Input Method for a QWERTY Keyboard Layout

Applicable Language-Regions	: ti-ER
Default Numeral System	: keyboard native
Ethiopic Tonal Marks	: No
Archaic Punctuation	: No
Keyman Implementation	: gff-tir-ER-7.kmn / gff-tir-ER-7.kmx
Last Update	: 2008-11-10 (Gregorian)

Notes:

- Eritrean orthography drops homophonically redundant symbols that Ethiopian Tigrinya maintains.
- [Eritrean rules](#) for glottal and pharyngeal lone vowels are used here.
- The archaic question mark (፤) is still in common use.
- Under Eritrean punctuation conventions Ethiopic Wordspace (፡) is used as a comma, Ethiopic Comma (፣) as a semicolon and the Ethiopic Colon (፥) is unused. The punctuation input is thus updated accordingly:

PUNCTUATION	KEYS	NOTE
፡	፡	Unchanged. As per the Principle of Graphical Continuity .
፣	,	As per the Principle of Continuity of Function . The Ethiopian Writer's Association recommends ፣ as the default comma.
,	፡፡	ASCII comma as per the Principle of Utility .
፤	፤	As per the Principle of Continuity of Function .
፥	??	As per the Principle of Continuity of Function .

	IPA	+ə	+u	+i	+a	+e		+o	+ɔ	+ ^w ə	+ ^w u	+ ^w i	+ ^w a	+ ^w e	
IPA	KEY	[eE]	[uU]	[iI]	[aA]	[il][eE]		[oO]	[oO]	[aA]	[uU][eE]	[uU][uU]	[uU][iI]	[uU][aA]	[uU][il][eE]
h	h	ሀ	ሁ	ሂ	ሃ	ሄ	ህ	ሆ							
l	[lL]	ለ	ሉ	ሊ	ላ	ሌ	ል	ሎ						ሏ	
h	H	ሐ	ሑ	ሒ	ሓ	ሔ	ሕ	ሖ						ሗ	
m	[mM]	መ	ሙ	ሚ	ማ	ሜ	ሞ	ሟ						ሠ	
r	[rR]	ረ	ሩ	ሪ	ራ	ራ	ሮ	ሮ						ሯ	

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s	s	ሰ	ሱ	ሲ	ሳ	ሴ	ስ	ሶ					ሷ	
ʃ	[xX]	ሸ	ሹ	ሺ	ሻ	ሼ	ሽ	ሾ					ሿ	
k'	q	ቀ	ቁ	ቂ	ቃ	ቄ	ቅ	ቆ		ቇ	ቈ	቉	ቊ	ቋ
κ	Q	ቐ	ቑ	ቒ	ቃ	ቄ	ቅ	ቆ		ቇ	ቈ	቉	ቊ	ቋ
b	[bB]	በ	ቡ	ቢ	ባ	ቤ	ብ	ቦ					ቧ	
v	[vV]	ቨ	ቩ	ቪ	ቫ	ቬ	ቭ	ቮ					ቯ	
t	t	ተ	ቱ	ቲ	ታ	ቲ	ት	ቶ					ቷ	
ʧ	c	ቸ	ቹ	ቺ	ቻ	ቼ	ች	ቾ					ቿ	
n	n	ነ	ኑ	ኒ	ና	ኑ	ን	ኖ					ኘ	
ɲ	N	ኘ	ኙ	ኚ	ኛ	ኜ	ኝ	ኞ					ኟ	
ʔ	a	አ	አ	አ	አ	አ	አ	አ						
k	k	ከ	ከ	ከ	ከ	ከ	ከ	ከ		ከ	ከ	ከ	ከ	ከ
x	K	ኸ	ኸ	ኸ	ኸ	ኸ	ኸ	ኸ		ኸ	ኸ	ኸ	ኸ	ኸ
w	[wW]	ወ	ወ	ወ	ወ	ወ	ወ	ወ						
ʕ	A	ዐ	ዐ	ዐ	ዐ	ዐ	ዐ	ዐ						
z	z	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ	ዘ					ዘ	
ʒ	Z	ዝ	ዝ	ዝ	ዝ	ዝ	ዝ	ዝ					ዝ	
y	[yY]	የ	የ	የ	የ	የ	የ	የ						
d	[dD]	ደ	ደ	ደ	ደ	ደ	ደ	ደ					ደ	
ፄ	[jJ]	ጆ	ጆ	ጆ	ጆ	ጆ	ጆ	ጆ					ጆ	
g	[gG]	ገ	ገ	ገ	ገ	ገ	ገ	ገ		ገ	ገ	ገ	ገ	ገ
ʈ	T	ጠ	ጠ	ጠ	ጠ	ጠ	ጠ	ጠ					ጠ	
ʧʰ	C	ጠ	ጠ	ጠ	ጠ	ጠ	ጠ	ጠ					ጠ	
p'	P	ጸ	ጸ	ጸ	ጸ	ጸ	ጸ	ጸ					ጸ	
s'	S	ጸ	ጸ	ጸ	ጸ	ጸ	ጸ	ጸ					ጸ	
f	[fF]	ፈ	ፈ	ፈ	ፈ	ፈ	ፈ	ፈ					ፈ	
p	p	ፐ	ፐ	ፐ	ፐ	ፐ	ፐ	ፐ					ፐ	

Appendix K: Tigrinya (Ethiopia) Input Method for a QWERTY Keyboard Layout

Applicable Language-Regions	: ti-ET
Default Numeral System	: keyboard native
Ethiopic Tonal Marks	: No
Archaic Punctuation	: No
Keyman Implementation	: gff-tir-ET-7.kmn / gff-tir-ET-7.kmx
Last Update	: 2008-11-10 (Gregorian)

	IPA	+ə	+u	+i	+a	+e		+o	+ɔ	+wə	+wu	+wi	+wa	+we
IPA	KEY	[eE]	[uU]	[iI]	[aA]	[il][eE]		[oO]	[oO][aA]	[uU][eE]	[uU][uU]	[uU][iI]	[uU][aA]	[uU][il][eE]
h	h	ሀ	ሁ	ሂ	ሃ	ሄ	ህ	ሆ		ኸ	ኹ	ኺ	ኻ	ኼ
l	[lL]	ለ	ሉ	ሊ	ላ	ሌ	ል	ሎ					ሰ	
ḥ	H	ሐ	ሑ	ሒ	ሓ	ሔ	ሕ	ሖ					ሠ	
m	[mM]	መ	ሙ	ሚ	ማ	ሜ	ም	ሞ					ሚ	
s	ss	ሠ	ሡ	ሢ	ሣ	ሤ	ሥ	ሦ					ሧ	
r	[rR]	ረ	ሩ	ሪ	ራ	ራ	ሮ	ሮ					ረ	
s	s	ሰ	ሱ	ሲ	ሳ	ሴ	ስ	ሶ					ሰ	
ʃ	[xX]	ሸ	ሹ	ሺ	ሻ	ሼ	ሽ	ሾ					ሸ	
k'	q	ቀ	ቁ	ቂ	ቃ	ቄ	ቅ	ቆ		ቈ	቉	ቊ	ቋ	ቌ
κ	Q	ቐ	ቑ	ቒ	ቃ	ቄ	ቅ	ቆ		ቈ	቉	ቊ	ቋ	ቌ
b	[bB]	በ	ቡ	ቢ	ባ	ቤ	ብ	ቦ					ቦ	
v	[vV]	ቨ	ቩ	ቪ	ቫ	ቬ	ቭ	ቮ					ቨ	
t	t	ተ	ቱ	ቲ	ታ	ቴ	ት	ቶ					ተ	
ʃ	c	ቸ	ቹ	ቺ	ቻ	ቼ	ች	ቾ					ቸ	
h	hh	ኸ	ኹ	ኺ	ኻ	ኼ	ኽ	ኾ		ኸ	ኹ	ኺ	ኻ	ኼ
n	n	ነ	ኑ	ኒ	ና	ኔ	ን	ኖ					ና	
p	N	ኸ	ኹ	ኺ	ኻ	ኼ	ኽ	ኾ					ኸ	
ʔ	a	አ	አ	አ	አ	አ	አ	አ						
k	k	ከ	ከ	ከ	ከ	ከ	ከ	ከ		ከ	ከ	ከ	ከ	ከ

Principles for Specification for Mnemonic Ethiopic Keyboards

x	K	ኸ	ኹ	ኺ	ኻ	ኼ	ኽ	ኾ		ኸ።	ኸ፣	ኸ፡	ኸ፤	ኸ፥
w	[wW]	ወ	ዑ	ዒ	ዓ	ዔ	ዕ	ዖ						
ʌ	A	ዐ	ዑ	ዒ	ዓ	ዔ	ዕ	ዖ						
z	Z	ዘ	ዙ	ዚ	ዛ	ዞ	ዟ	ዠ					ዘ	
3	Z	ዠ	ዡ	ዢ	ዣ	ዤ	ዥ	ዦ					ዣ	
y	[yY]	የ	ዮ	ዿ	ዾ	ዿ	ዾ	ዿ						
d	[dD]	ደ	ዳ	ዴ	ድ	ዶ	ዷ	ዸ					ድ	
ፊ	[J]	ጅ	ጆ	ጇ	ገ	ገ።	ገ፣	ገ፡					ገ፤	
g	[gG]	ገ	ጉ	ጊ	ጋ	ጌ	ግ	ገ		ገ።	ገ፣	ገ፡	ገ፤	ገ፥
t	T	ጠ	ጡ	ጢ	ጣ	ጤ	ጥ	ጦ					ጣ	
ፍ	C	ጨ	ጨ።	ጨ፣	ጨ፡	ጨ፤	ጨ፥	ጨ፥					ጨ፥	
p'	P	ጸ	ጹ	ጺ	ጻ	ጼ	ጽ	ጾ					ጸ	
s'	S	ጸ	ጹ	ጺ	ጻ	ጼ	ጽ	ጾ					ጸ	
s'	SS	ፀ	ፁ	ፂ	ፃ	ፄ	ፅ	ፆ						
f	[fF]	ፈ	ፉ	ፊ	ፋ	ፅ	ፆ	ፇ					ፉ	
p	p	ፐ	ፑ	ፒ	ፓ	ፔ	ፕ	ፖ					ፐ	

Appendix L: Ethiopic (Language Neutral) Input Method for a QWERTY Keyboard Layout

Applicable Language-Regions :	*
Default Numeral System	: Ethiopic
Ethiopic Tonal Marks	: Yes
Archaic Punctuation	: Yes
Keyman Implementation	: gff-ethiopic-7.kmn / gff-ethiopic-7.kmx
Last Update	: 2008-11-10 (Gregorian)

	IPA	+ə	+u	+i	+a	+e		+o	+ɔ	+wə	+wu	+wi	+wa	+we	+ya
IPA	KEY	[eE]	[uU]	[iI]	[aA]	[iI][eE]		[oO]	[oO][aA]	[uU][eE]	[uU][uU]	[uU][iI]	[uU][aA]	[uU][iI][eE]	Y[aA]
h	h	ሀ	ሁ	ሂ	ሃ	ሄ	ህ	ሆ	ሇ	ለ	ሉ	ሐ	ሑ	ሒ	
l	[lL]	ለ	ሉ	ሊ	ላ	ሌ	ል	ሎ	ሎ				ሲ		
ḥ	H	ሐ	ሑ	ሒ	ሓ	ሔ	ሕ	ሖ					ሲ		
m	[mM]	መ	ሙ	ሚ	ማ	ሜ	ም	ሞ	ሟ	ሙ	ሚ	ሚ	ሚ	ሚ	ሚ
s	ss	ሠ	ሡ	ሢ	ሣ	ሤ	ሥ	ሦ					ሢ		
r	[rR]	ረ	ሩ	ሪ	ራ	ራ	ሮ	ሮ	ሮ				ረ		ረ
s	s	ሰ	ሱ	ሲ	ሳ	ሴ	ስ	ሶ	ሷ				ሲ		
ʃ	[xX]	ሸ	ሹ	ሺ	ሻ	ሼ	ሽ	ሾ	ሿ				ሺ		
ʃ	[xX][xX]	ሸ	ሹ	ሺ	ሻ	ሼ	ሽ	ሾ							
k'	q	ቀ	ቁ	ቂ	ቃ	ቄ	ቅ	ቆ	ቇ	ቈ	቉	ቊ	ቋ	ቌ	ቍ
κ	Q	ቀ	ቁ	ቂ	ቃ	ቄ	ቅ	ቆ		ቈ	቉	ቊ	ቋ	ቌ	ቍ
k ^y	qY	ቀ	ቁ	ቂ	ቃ	ቄ	ቅ	ቆ							
b	[bB]	በ	ቡ	ቢ	ባ	ቤ	ብ	ቦ	ቧ	ቨ	ቩ	ቪ	ቫ	ቬ	ቭ
v	[vV]	ቨ	ቩ	ቪ	ቫ	ቬ	ቭ	ቮ					ቪ		
t	t	ተ	ቱ	ቲ	ታ	ቴ	ት	ቶ	ቷ				ቲ		
ʧ	c	ቸ	ቹ	ቺ	ቻ	ቼ	ች	ቾ	ቿ				ቺ		
ʧ	cc	ቸ	ቹ	ቺ	ቻ	ቼ	ች	ቾ							
ŋ	hh	ኀ	ኁ	ኂ	ኃ	ኄ	ኅ	ኆ	ኇ	ኈ	኉	ኊ	ኋ	ኌ	
n	n	ነ	ኑ	ኒ	ና	ኑ	ኑ	ኑ	ኑ				ና		

Principles for Specification for Mnemonic Ethiopic Keyboards

n	N	ኘ	ኙ	ኚ	ኛ	ኜ	ኝ	ኞ	ኟ				ጀ		
?	a	አ	አ.	አ.	አ	ኤ	እ	ኦ							
k	[kK]	ከ	ከ.	ከ.	ካ	ኬ	ክ	ኮ	ኰ	ኰ	ኰ	ኰ	ካ	ካ	
kʸ	kY	ኸ	ኸ.	ኸ.	ኹ	ኼ	ኽ	ኾ							
xʸ	KY	ኸ	ኸ.	ኸ.	ኹ	ኼ	ኽ	ኾ							
w	[wW]	ወ	ወ.	ወ.	ዐ	ዐ	ዐ	ዐ							
ʋ	A	ዐ	ዐ.	ዐ.	ዑ	ዑ	ዑ	ዑ							
z	z	ዘ	ዘ.	ዘ.	ዛ	ዘ	ዘ	ዘ					ዘ		
3	Z	ዘ	ዘ.	ዘ.	ዛ	ዘ	ዘ	ዘ					ዘ		
፩	ZZ	ዘ	ዘ.	ዘ.	ዛ	ዘ	ዘ	ዘ							
y	[yY]	የ	የ.	የ.	ያ	የ	የ	የ							
d	d	ደ	ደ.	ደ.	ዳ	ደ	ደ	ደ					ደ		
dʳ	D	ደ	ደ.	ደ.	ዳ	ደ	ደ	ደ					ደ		
፩	[J]	ጀ	ጀ.	ጀ.	ጅ	ጀ	ጀ	ጀ					ጀ		
g	g	ገ	ገ.	ገ.	ጋ	ገ	ገ	ገ	ገ	ገ	ገ	ገ	ገ	ገ	
ገ	G	ገ	ገ.	ገ.	ጋ	ገ	ገ	ገ	ገ	ገ	ገ	ገ	ገ	ገ	
gʸ	gY	ገ	ገ.	ገ.	ጋ	ገ	ገ	ገ							
t	T	ጠ	ጠ.	ጠ.	ጣ	ጠ	ጠ	ጠ					ጠ		
፳	C	ጨ	ጨ.	ጨ.	ጮ	ጨ	ጨ	ጨ					ጨ		
፳	CC	ጨ	ጨ.	ጨ.	ጮ	ጨ	ጨ	ጨ							
pʳ	P	ጸ	ጸ.	ጸ.	ጹ	ጸ	ጸ	ጸ					ጸ		
sʳ	S	ጸ	ጸ.	ጸ.	ጹ	ጸ	ጸ	ጸ					ጸ		
sʳ	SS	ፀ	ፀ.	ፀ.	ፑ	ፀ	ፀ	ፀ							
F	[fF]	ፈ	ፈ.	ፈ.	ፋ	ፈ	ፈ	ፈ	ፈ	ፈ	ፈ	ፈ	ፈ	ፈ	ፈ
P	p	ፐ	ፐ.	ፐ.	ፑ	ፐ	ፐ	ፐ	ፐ	ፐ	ፐ	ፐ	ፐ	ፐ	
ə	ae	አ													

Appendix M: Extension to Non-QWERTY Keyboards

Due to its prevalence and niche as a "lowest common denominator" of keyboard devices, the [QWERTY keyboard](#) has been used as basis for examples and the reference implementation in this document. The mnemonic principles applied to specify the QWERTY mappings may be readily extended to other keyboard layouts. The IPA grounding of the letter mappings also serve as a basis for the mapping to non-Latin keyboards (e.g. Greek, Arabic, Hebrew, Korean). IPA based mappings will be met with varying degrees of accuracy and approximations are to be expected, mappings should be practical if imperfect phonologically.

Non-exhaustive additional mappings recommended for Latin based keyboards are given in the following tables.

Extended Latin Mapping of Consonant Bases

IPA	LATIN	ETHIOPIC
ʧ	Ç	ጭ
ʧ	ç	ጭ
ɖ	Ð	ጭ
d	ð	ጭ
y	[Ýý]	ጭ
s'	ß	ጭ
s'	ßß	ጭ
ɲ	[Ññ]	ጭ

Extended Latin Vowel Normalization: Extended Latin Vowels should be normalized into their Basic Latin (ASCII) counterpart for use in entering the vowel component of an Ethiopic syllable. Though not indicated in the following table, Extended Latin vowels with well established “Long-A” (“ay” as in “day”) phonemes, such as “Æ”, may be applied alone to compose the Ethiopic 5th order. This additional mapping complements, and does not replace, the two character “IE” composition which should remain for compatibility with other keyboard layouts.

IPA	LATIN	NORMALIZATION
ə	[ÄäËÉÊËëèéêë]	E
u	[ÛÚÛÜùúûü]	U
i	[ıııİİİ]	I
a	[àáâãäÀÁÂÃÄ]	A
e	[æÆ]	<IE>
o	[ÒÓÔÕÖØòóôõöø]	O