

Proposal for Encoding Western Music Symbols in ISO/IEC 10646

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While nearly all of the symbols used to display music are technically "glyphs", they are nevertheless used world-wide in a more-or-less standard manner by a very large user group and their usefulness would be improved if they were encoded in a compact way, that is, as character codes. The symbols frequently occur in running text and may be treated as simple spacing characters with no special properties, with a few exceptions which are described below. Examples of contexts for the use of music characters include, but are not limited to, theoretical works, pedagogical texts, terminological dictionaries, bibliographic databases, thematic catalogs, and databases of musical data. The adoption of a standard group of character names would facilitate future pseudo-textual musical encoding systems that offer efficient storage and high parsability and portability.

Even though page layout and formatting are beyond the scope of ISO/IEC 10646, the proposed characters could be used within higher-level protocols, i.e. music description languages and file formats for the representation of musical data and musical scores.

Character Set Description

The proposed Western Musical Symbols character set consists of 220 characters. These are drawn primarily from Common Music Notation (CMN) and its antecedents, mensural notation and plainchant (or Gregorian) notation. In addition, commonly recognized additions to the CMN repertoire, such as quarter-tone accidentals, cluster noteheads, and shape-note noteheads have also been included. Symbols were compiled from several sources:

- Read, Gardner. Music Notation.
- Heussenstamm, George. Norton Manual of Music Notation.
- Rastall, Richard. Notation of Western Music.
- Stone, Kurt. Music Notation in the Twentieth Century.
- Gradual Sacrosanctae Romanae ...
- a wide range of musical scores from the 16th-20th centuries
- existing music fonts

Not part of the Western Musical Symbols character set are "graphical score" elements, which are pictographs usually created for a specific repertoire (sometimes even a single piece) and characters which have some specialized meaning in music but are found in other character sets, i.e. numbers for time signatures and figured basses or letters for section labels and Roman numeral harmonic analysis, etc.

Several characters resemble ones available in other sets. For example, the SHARP character looks somewhat like the octothorpe, FLAT resembles the lowercase 'b', REPEAT DOTS look like a colon, UP BOW seems to be a letter 'V', etc. While repeated usage of the ASCII 'lookalikes' in the absence of genuine music characters has conditioned our acceptance of them, careful examination reveals that the similarities are only superficial. Character sizes, baselines, line widths and other visual characteristics of the music characters are subtly different from their more common 'lookalikes'. Furthermore, their function and meaning are radically different, enough to consider them separate characters.

Because of the complexities of layout and of pitch representation in general, the encoding of musical pitch is intentionally outside the scope of this proposal. In addition to character data, considerable structure, including detailed specification of vertical and horizontal relationships between graphical elements, is required to properly represent musical scores. This character encoding provides a common set of elements for interchange and processing. The characters encoded here, in conjunction with all the other facilities of the character encoding (including alphabets and so forth), can be used for the transfer, storage, and other representation of all sorts of common musical data. In that sense, this set forms a complete basis for the specification of all musical parameters, with the conspicuous exception of pitch encoding itself. Encoding of pitch, and layout of resulting musical structure, involves not only specifications for the vertical relationship between multiple notes simultaneously, but in multiple staves, between instrumental parts, and so forth. These musical features are expected to be handled entirely in higher-level protocols making use of the proposed graphical elements. Lack of pitch encoding is thus not to be viewed as a shortcoming of the proposal, but as a necessary feature of the encoding.

Three characters (SHARP, FLAT, and NATURAL) which occur frequently in music notation are already encoded in Unicode as symbols elsewhere. To assist implementations, it is proposed that reserved codepoints be left in the music

notation block and cross-referenced back to the real symbols. In addition, the existing characters U+2669 (QUARTER NOTE), U+266A (EIGHTH NOTE) and the beamed note symbols U+266B and U+266C are to be interpreted strictly as Miscellaneous Symbols or dingbats, not as representing actual musical notes. They could be cross-referenced to this Western Musical Notation block.

It is essential to correct musical interpretation that a distinction be maintained in musical contexts between the augmentation dot (a combining, but spacing character) and the staccato dot, which is a non-spacing character. Furthermore, a distinction must be maintained between the staccato dot and the regular combining dot-above (U+0307), since both may occur in the same context (overdots on vocal texts near staccato dots on notes) and they require different glyphs (the staccato dot generally being heavier at a comparable font size than a combining dot-above).

Most Western Music Notation symbols can be thought of as simple spacing characters when used in-line within texts and examples, even though they behave in a more complex manner in full musical layout. Some characters are meant only to be combined with others to produce combined character sequences, representing musical notes and their particular articulations. A complete list of the character properties and combining priorities is given below.

Character Names List

0001 xx00 RESERVED X --> U+266F MUSIC SHARP SIGN
 0001 xx01 RESERVED X --> U+266D MUSIC FLAT SIGN
 0001 xx02 RESERVED X --> U+266E MUSIC NATURAL SIGN
 0001 xx03 WESTERN MUSICAL SYMBOL DOUBLE SHARP
 0001 xx04 WESTERN MUSICAL SYMBOL DOUBLE FLAT
 0001 xx05 WESTERN MUSICAL SYMBOL FLAT UP
 0001 xx06 WESTERN MUSICAL SYMBOL FLAT DOWN
 0001 xx07 WESTERN MUSICAL SYMBOL NATURAL UP
 0001 xx08 WESTERN MUSICAL SYMBOL NATURAL DOWN
 0001 xx09 WESTERN MUSICAL SYMBOL SHARP UP
 0001 xx0A WESTERN MUSICAL SYMBOL SHARP DOWN
 0001 xx0B WESTERN MUSICAL SYMBOL QUARTER TONE SHARP
 0001 xx0C WESTERN MUSICAL SYMBOL QUARTER TONE FLAT
 0001 xx0D WESTERN MUSICAL SYMBOL HAUPTSTIMME
 0001 xx0E WESTERN MUSICAL SYMBOL NEBENSTIMME
 0001 xx0F WESTERN MUSICAL SYMBOL DEGREE SLASH
 0001 xx10 WESTERN MUSICAL SYMBOL ACCENT
 0001 xx11 WESTERN MUSICAL SYMBOL STACCATO
 0001 xx12 WESTERN MUSICAL SYMBOL TENUTO
 0001 xx13 WESTERN MUSICAL SYMBOL STACCATISSIMO
 0001 xx14 WESTERN MUSICAL SYMBOL MARCATO
 0001 xx15 WESTERN MUSICAL SYMBOL MARCATO-STACCATO
 0001 xx16 WESTERN MUSICAL SYMBOL ACCENT-STACCATO
 0001 xx17 WESTERN MUSICAL SYMBOL LOURE
 0001 xx18 WESTERN MUSICAL SYMBOL ARPEGGIATO UP
 0001 xx19 WESTERN MUSICAL SYMBOL ARPEGGIATO DOWN
 0001 xx1A WESTERN MUSICAL SYMBOL DOIT
 0001 xx1B WESTERN MUSICAL SYMBOL RIP
 0001 xx1C WESTERN MUSICAL SYMBOL FLIP
 0001 xx1D WESTERN MUSICAL SYMBOL SMEAR
 0001 xx1E WESTERN MUSICAL SYMBOL BEND
 0001 xx1F WESTERN MUSICAL SYMBOL DOUBLE TONGUE
 0001 xx20 WESTERN MUSICAL SYMBOL TRIPLE TONGUE
 0001 xx21 WESTERN MUSICAL SYMBOL RINFORZANDO
 0001 xx22 WESTERN MUSICAL SYMBOL SUBITO
 0001 xx23 WESTERN MUSICAL SYMBOL Z
 0001 xx24 WESTERN MUSICAL SYMBOL SINGLE BARLINE
 0001 xx25 WESTERN MUSICAL SYMBOL DOUBLE BARLINE
 0001 xx26 WESTERN MUSICAL SYMBOL FINAL BARLINE

0001 xx27 WESTERN MUSICAL SYMBOL REVERSE FINAL BARLINE
0001 xx28 WESTERN MUSICAL SYMBOL DASHED BARLINE
0001 xx29 WESTERN MUSICAL SYMBOL SHORT BARLINE
0001 xx2A WESTERN MUSICAL SYMBOL LEFT REPEAT SIGN
0001 xx2B WESTERN MUSICAL SYMBOL RIGHT REPEAT SIGN
0001 xx2C WESTERN MUSICAL SYMBOL REPEAT DOTS
0001 xx2D WESTERN MUSICAL SYMBOL DAL SEGNO
0001 xx2E WESTERN MUSICAL SYMBOL DA CAPO
0001 xx2F WESTERN MUSICAL SYMBOL SEGNO
0001 xx30 WESTERN MUSICAL SYMBOL CODA
0001 xx31 WESTERN MUSICAL SYMBOL REPEATED FIGURE ONE
0001 xx32 WESTERN MUSICAL SYMBOL REPEATED FIGURE TWO
0001 xx33 WESTERN MUSICAL SYMBOL REPEATED FIGURE THREE
0001 xx34 WESTERN MUSICAL SYMBOL FERMATA
0001 xx35 WESTERN MUSICAL SYMBOL FERMATA UNDER
0001 xx36 WESTERN MUSICAL SYMBOL BREATH MARK
0001 xx37 WESTERN MUSICAL SYMBOL CAESURA
0001 xx38 WESTERN MUSICAL SYMBOL BRACE
0001 xx39 WESTERN MUSICAL SYMBOL BRACKET
0001 xx3A WESTERN MUSICAL SYMBOL G CLEF
0001 xx3B WESTERN MUSICAL SYMBOL G CLEF OTTAVA ALTA
0001 xx3C WESTERN MUSICAL SYMBOL G CLEF OTTAVA BASSA
0001 xx3D WESTERN MUSICAL SYMBOL C CLEF
0001 xx3E WESTERN MUSICAL SYMBOL OLD C CLEF
0001 xx3F WESTERN MUSICAL SYMBOL F CLEF
0001 xx40 WESTERN MUSICAL SYMBOL F CLEF OTTAVA ALTA
0001 xx41 WESTERN MUSICAL SYMBOL F CLEF OTTAVA BASSA
0001 xx42 WESTERN MUSICAL SYMBOL DRUM CLEF ONE
0001 xx43 WESTERN MUSICAL SYMBOL DRUM CLEF TWO
0001 xx44 WESTERN MUSICAL SYMBOL PIANO
0001 xx45 WESTERN MUSICAL SYMBOL MEZZO
0001 xx46 WESTERN MUSICAL SYMBOL FORTE
0001 xx47 WESTERN MUSICAL SYMBOL CRESCENDO
0001 xx48 WESTERN MUSICAL SYMBOL DECRESCENDO
0001 xx49 WESTERN MUSICAL SYMBOL GREGORIAN C CLEF
0001 xx4A WESTERN MUSICAL SYMBOL GREGORIAN F CLEF
0001 xx4B WESTERN MUSICAL SYMBOL SQUARE B
0001 xx4C WESTERN MUSICAL SYMBOL VIRGA
0001 xx4D WESTERN MUSICAL SYMBOL PODATUS
0001 xx4E WESTERN MUSICAL SYMBOL CLIVIS
0001 xx4F WESTERN MUSICAL SYMBOL SCANDICUS
0001 xx50 WESTERN MUSICAL SYMBOL CLIMACUS
0001 xx51 WESTERN MUSICAL SYMBOL TORCULUS
0001 xx52 WESTERN MUSICAL SYMBOL PORRECTUS
0001 xx53 WESTERN MUSICAL SYMBOL PORRECTUS FLEXUS
0001 xx54 WESTERN MUSICAL SYMBOL SCANDICUS FLEXUS
0001 xx55 WESTERN MUSICAL SYMBOL TORCULUS RESUPINUS
0001 xx56 WESTERN MUSICAL SYMBOL PES SUBPUNCTIS
0001 xx57 WESTERN MUSICAL SYMBOL DOWN BOW
0001 xx58 WESTERN MUSICAL SYMBOL UP BOW
0001 xx59 WESTERN MUSICAL SYMBOL HARMONIC
0001 xx5A WESTERN MUSICAL SYMBOL SNAP PIZZICATO
0001 xx5B WESTERN MUSICAL SYMBOL PEDAL MARK
0001 xx5C WESTERN MUSICAL SYMBOL PEDAL UP MARK
0001 xx5D WESTERN MUSICAL SYMBOL HALF PEDAL MARK
0001 xx5E WESTERN MUSICAL SYMBOL GLISSANDO UP
0001 xx5F WESTERN MUSICAL SYMBOL GLISSANDO DOWN

0001 xx60	WESTERN MUSICAL SYMBOL WITH FINGERNAILS
0001 xx61	WESTERN MUSICAL SYMBOL DAMP
0001 xx62	WESTERN MUSICAL SYMBOL DAMP ALL
0001 xx63	WESTERN MUSICAL SYMBOL MAXIMA
0001 xx64	WESTERN MUSICAL SYMBOL LONGA
0001 xx65	WESTERN MUSICAL SYMBOL BREVIS
0001 xx66	WESTERN MUSICAL SYMBOL SEMIBREVIS WHITE
0001 xx67	WESTERN MUSICAL SYMBOL SEMIBREVIS BLACK
0001 xx68	WESTERN MUSICAL SYMBOL MINIMA
0001 xx69	WESTERN MUSICAL SYMBOL MINIMA BLACK
0001 xx6A	WESTERN MUSICAL SYMBOL SEMIMINIMA WHITE
0001 xx6B	WESTERN MUSICAL SYMBOL SEMIMINIMA BLACK
0001 xx6C	WESTERN MUSICAL SYMBOL FUSA WHITE
0001 xx6D	WESTERN MUSICAL SYMBOL FUSA BLACK
0001 xx6E	WESTERN MUSICAL SYMBOL LONGA PERFECTA REST
0001 xx6F	WESTERN MUSICAL SYMBOL LONGA IMPERFECTA REST
0001 xx70	WESTERN MUSICAL SYMBOL BREVIS REST
0001 xx71	WESTERN MUSICAL SYMBOL SEMIBREVIS REST
0001 xx72	WESTERN MUSICAL SYMBOL MINIMA REST
0001 xx73	WESTERN MUSICAL SYMBOL SEMIMINIMA REST
0001 xx74	WESTERN MUSICAL SYMBOL TEMPUS PERFECTUM CUM PROLATIONE PERFECTA
0001 xx75	WESTERN MUSICAL SYMBOL TEMPUS PERFECTUM CUM PROLATIONE IMPERFECTA
0001 xx76	WESTERN MUSICAL SYMBOL TEMPUS PERFECTUM CUM PROLATIONE PERFECTA DIMINUTION ONE
0001 xx77	WESTERN MUSICAL SYMBOL TEMPUS IMPERFECTUM CUM PROLATIONE PERFECTA
0001 xx78	WESTERN MUSICAL SYMBOL TEMPUS IMPERFECTUM CUM PROLATIONE IMPERFECTA
0001 xx79	WESTERN MUSICAL SYMBOL TEMPUS IMPERFECTUM CUM PROLATIONE IMPERFECTA DIMINUTION ONE
0001 xx7A	WESTERN MUSICAL SYMBOL TEMPUS IMPERFECTUM CUM PROLATIONE IMPERFECTA DIMINUTION TWO
0001 xx7B	WESTERN MUSICAL SYMBOL TEMPUS IMPERFECTUM CUM PROLATIONE IMPERFECTA DIMINUTION THREE
0001 xx7C	WESTERN MUSICAL SYMBOL CROIX
0001 xx7D	WESTERN MUSICAL SYMBOL X NOTEHEAD
0001 xx7E	WESTERN MUSICAL SYMBOL PLUS NOTEHEAD
0001 xx7F	WESTERN MUSICAL SYMBOL CIRCLE X NOTEHEAD
0001 xx80	WESTERN MUSICAL SYMBOL SQUARE NOTEHEAD WHITE
0001 xx81	WESTERN MUSICAL SYMBOL SQUARE NOTEHEAD BLACK
0001 xx82	WESTERN MUSICAL SYMBOL TRIANGLE NOTEHEAD UP WHITE
0001 xx83	WESTERN MUSICAL SYMBOL TRIANGLE NOTEHEAD UP BLACK
0001 xx84	WESTERN MUSICAL SYMBOL TRIANGLE NOTEHEAD LEFT WHITE
0001 xx85	WESTERN MUSICAL SYMBOL TRIANGLE NOTEHEAD LEFT BLACK
0001 xx86	WESTERN MUSICAL SYMBOL TRIANGLE NOTEHEAD RIGHT WHITE
0001 xx87	WESTERN MUSICAL SYMBOL TRIANGLE NOTEHEAD RIGHT BLACK
0001 xx88	WESTERN MUSICAL SYMBOL TRIANGLE NOTEHEAD DOWN WHITE
0001 xx89	WESTERN MUSICAL SYMBOL TRIANGLE NOTEHEAD DOWN BLACK
0001 xx8A	WESTERN MUSICAL SYMBOL TRIANGLE NOTEHEAD UP RIGHT WHITE
0001 xx8B	WESTERN MUSICAL SYMBOL TRIANGLE NOTEHEAD UP RIGHT BLACK
0001 xx8C	WESTERN MUSICAL SYMBOL MOON NOTEHEAD WHITE
0001 xx8D	WESTERN MUSICAL SYMBOL MOON NOTEHEAD BLACK
0001 xx8E	WESTERN MUSICAL SYMBOL TRIANGLE-ROUND NOTEHEAD DOWN WHITE
0001 xx8F	WESTERN MUSICAL SYMBOL TRIANGLE-ROUND NOTEHEAD DOWN BLACK
0001 xx90	WESTERN MUSICAL SYMBOL PARENTHESIS NOTEHEAD
0001 xx91	WESTERN MUSICAL SYMBOL VOID NOTEHEAD
0001 xx92	WESTERN MUSICAL SYMBOL NULL NOTEHEAD
0001 xx93	WESTERN MUSICAL SYMBOL NOTEHEAD BLACK
0001 xx94	WESTERN MUSICAL SYMBOL CLUSTER NOTEHEAD WHITE
0001 xx95	WESTERN MUSICAL SYMBOL CLUSTER NOTEHEAD BLACK

0001 xx96 WESTERN MUSICAL SYMBOL STEM
0001 xx97 WESTERN MUSICAL SYMBOL SPRECHGESANG STEM
0001 xx98 WESTERN MUSICAL SYMBOL TREMOLO STEM ONE
0001 xx99 WESTERN MUSICAL SYMBOL TREMOLO STEM TWO
0001 xx9A WESTERN MUSICAL SYMBOL TREMOLO STEM THREE
0001 xx9B WESTERN MUSICAL SYMBOL FINGERED TREMOLO
0001 xx9C WESTERN MUSICAL SYMBOL BREVE
0001 xx9D WESTERN MUSICAL SYMBOL WHOLE NOTE
0001 xx9E WESTERN MUSICAL SYMBOL HALF NOTE
0001 xx9F WESTERN MUSICAL SYMBOL QUARTER NOTE
0001 xxA0 WESTERN MUSICAL SYMBOL EIGHTH NOTE
0001 xxA1 WESTERN MUSICAL SYMBOL SIXTEENTH NOTE
0001 xxA2 WESTERN MUSICAL SYMBOL THIRTY-SECOND NOTE
0001 xxA3 WESTERN MUSICAL SYMBOL SIXTY-FOURTH NOTE
0001 xxA4 WESTERN MUSICAL SYMBOL ONE HUNDRED TWENTY-EIGHTH NOTE
0001 xxA5 WESTERN MUSICAL SYMBOL AUGMENTATION DOT
0001 xxA6 WESTERN MUSICAL SYMBOL TIE-START
0001 xxA7 WESTERN MUSICAL SYMBOL TIE-END
0001 xxA8 WESTERN MUSICAL SYMBOL BEAM-START
0001 xxA9 WESTERN MUSICAL SYMBOL BEAM-END
0001 xxAA WESTERN MUSICAL SYMBOL SLUR-START
0001 xxAB WESTERN MUSICAL SYMBOL SLUR-END
0001 xxAC WESTERN MUSICAL SYMBOL PHRASE-START
0001 xxAD WESTERN MUSICAL SYMBOL PHRASE-END
0001 xxAE WESTERN MUSICAL SYMBOL OTTAVA ALTA
0001 xxAF WESTERN MUSICAL SYMBOL OTTAVA BASSA
0001 xxB0 WESTERN MUSICAL SYMBOL QUINDICESIMA ALTA
0001 xxB1 WESTERN MUSICAL SYMBOL QUINDICESIMA BASSA
0001 xxB2 WESTERN MUSICAL SYMBOL GRACE NOTE SLASH
0001 xxB3 WESTERN MUSICAL SYMBOL GRACE NOTE NO SLASH
0001 xxB4 WESTERN MUSICAL SYMBOL TR
0001 xxB5 WESTERN MUSICAL SYMBOL TURN
0001 xxB6 WESTERN MUSICAL SYMBOL INVERTED TURN
0001 xxB7 WESTERN MUSICAL SYMBOL TURN SLASH
0001 xxB8 WESTERN MUSICAL SYMBOL TURN UP
0001 xxB9 WESTERN MUSICAL SYMBOL ORNAMENT STROKE ONE
0001 xxBA WESTERN MUSICAL SYMBOL ORNAMENT STROKE TWO
0001 xxBB WESTERN MUSICAL SYMBOL ORNAMENT STROKE THREE
0001 xxBC WESTERN MUSICAL SYMBOL ORNAMENT STROKE FOUR
0001 xxBD WESTERN MUSICAL SYMBOL ORNAMENT STROKE FIVE
0001 xxBE WESTERN MUSICAL SYMBOL ORNAMENT STROKE SIX
0001 xxBF WESTERN MUSICAL SYMBOL ORNAMENT STROKE SEVEN
0001 xxC0 WESTERN MUSICAL SYMBOL ORNAMENT STROKE EIGHT
0001 xxC1 WESTERN MUSICAL SYMBOL ORNAMENT STROKE NINE
0001 xxC2 WESTERN MUSICAL SYMBOL ORNAMENT STROKE TEN
0001 xxC3 WESTERN MUSICAL SYMBOL ORNAMENT STROKE ELEVEN
0001 xxC4 WESTERN MUSICAL SYMBOL MULTI REST
0001 xxC5 WESTERN MUSICAL SYMBOL WHOLE REST
0001 xxC6 WESTERN MUSICAL SYMBOL HALF REST
0001 xxC7 WESTERN MUSICAL SYMBOL QUARTER REST
0001 xxC8 WESTERN MUSICAL SYMBOL EIGHTH REST
0001 xxC9 WESTERN MUSICAL SYMBOL SIXTEENTH REST
0001 xxCA WESTERN MUSICAL SYMBOL THIRTY-SECOND REST
0001 xxCB WESTERN MUSICAL SYMBOL SIXTY-FOURTH REST
0001 xxCC WESTERN MUSICAL SYMBOL ONE HUNDRED TWENTY-EIGHTH REST
0001 xxCD WESTERN MUSICAL SYMBOL ONE-LINE STAFF
0001 xxCE WESTERN MUSICAL SYMBOL TWO-LINE STAFF

0001 xx99 WESTERN MUSICAL SYMBOL TREMOLO STEM TWO (1)
 0001 xx9A WESTERN MUSICAL SYMBOL TREMOLO STEM THREE (1)
 0001 xxD3 WESTERN MUSICAL SYMBOL STEM PLUS FLAG ONE (1)
 0001 xxD4 WESTERN MUSICAL SYMBOL STEM PLUS FLAG TWO (1)
 0001 xxD5 WESTERN MUSICAL SYMBOL STEM PLUS FLAG THREE (1)
 0001 xxD6 WESTERN MUSICAL SYMBOL STEM PLUS FLAG FOUR (1)
 0001 xxD7 WESTERN MUSICAL SYMBOL STEM PLUS FLAG FIVE (1)

*Specifying the priority of the augmentation dot as lower than that of the stems assures that it comes canonically after the stem.

Spacing marks:
 ALL THE REST

User Community

Estimating the size of the user community is very difficult. As some indication, however, of the amount of output containing some reference to music (and therefore, potential usage of the proposed character set) the following statistics are offered. Books In Print contains 17,869 entries with the subject heading "music", slightly more than the number of entries with the subject heading "mathematics" (17,388), and nearly double the number for the heading "computer" (only 9775). *Repertoire International de Litterature Musicale (RILM)* indexed approximately 3500 different journals between 1989 and 1993 covering the field of music in whole or in part. These figures indicate the pervasiveness of music-related writing in our society and the wide range of potential uses of a music character set from popular magazines to scholarly treatises.

There is an historical interest in music data transmission and storage which began with the increased availability of computers in the 1950s. Over the years, several encoding methods have been proposed, i.e. Bauer-Mengelberg's Digital Alternative Representation of Musical Scores (DARMS) and Brook's Plaine & Easie Code, but these individual efforts have all suffered from the lack of a common nomenclature and method for coding even the most basic elements of music. Adoption of this character set as a standard would help alleviate this problem.

Processing

It is anticipated that music characters will be input, processed and displayed in a manner similar to mathematical symbols. Collation of the character set is unnecessary. There is no intrinsic order of symbols. When embedded in text most of the symbols are simple spacing characters with no special properties. There are a few characters with control functions which are described below.

Input of the characters may be accomplished in ways similar to those used for Chinese, Japanese, and Korean. Input can be from an alphanumeric keyboard using character entities, e.g. &treble; or ♭, or assisted with software which allows keyboard mapping, e.g. ALT-G for treble clef. In addition, input methods utilizing pointing devices or piano keyboards could be developed similar to those in existing musical layout systems. For example, using a graphical user interface (GUI), the user could choose symbols from a palette-style menu.

The setting of vocal texts is beyond the scope of this proposal; however, there are no known bi-directional implications of Western Musical Notation. When combined with right-to-left texts, in Hebrew or Arabic for example, the music notation is still written left-to-right as usual, the words being divided into syllables and placed under or above the notes in the same fashion as Latin scripts. The individual words or syllables corresponding to each note, however, are written in the dominant direction of the script.

Extensive ligature-like beams are used frequently in music notation between groups of notes having short values. The practice is widespread and very regular, and is amenable to algorithmic handling. The control characters BEAM-START and BEAM-END can be used to indicate the extents of beam groupings and these are easily parsed. In some exceptional cases, beams are left-unclosed on one end. This can be indicated with a "null note" (0001 xx92 WESTERN MUSICAL SYMBOL NULL NOTEHEAD) character if no stem is to appear at the end of the beam.

Similarly, control codes have been provided for other connecting structures. The characters TIE-START, TIE-END, SLUR-START, SLUR-END, PHRASE-START, and PHRASE-END indicate the extent of these features. Like beaming, these features are easily handled in an algorithmic fashion.

These pairs of characters modify the layout and grouping of notes and phrases in full music notation. When musical examples are written or rendered in plain text without special software, the start/end control characters may be rendered as brackets or left uninterpreted. More sophisticated in-line software may interpret them, to the extent possible, in their actual control capacity, rendering slurs, beams, and so forth as appropriate.

For maximum flexibility, the character set includes both pre-composed note values and primitives from which complete notes may be constructed. Due to their ubiquity, the pre-composed versions are provided mainly for convenience. In addition to coding ease, their use will also reduce data size. The following table illustrates these canonical equivalents.

1. WESTERN MUSICAL SYMBOL HALF NOTE	= WESTERN MUSICAL SYMBOL VOID NOTEHEAD + WESTERN MUSICAL SYMBOL STEM
2. WESTERN MUSICAL SYMBOL QUARTER NOTE	= WESTERN MUSICAL SYMBOL NOTEHEAD BLACK + WESTERN MUSICAL SYMBOL STEM
3. WESTERN MUSICAL SYMBOL EIGHTH NOTE	= WESTERN MUSICAL SYMBOL NOTEHEAD BLACK + WESTERN MUSICAL SYMBOL STEM PLUS FLAG ONE
4. WESTERN MUSICAL SYMBOL SIXTEENTH NOTE	= WESTERN MUSICAL SYMBOL NOTEHEAD BLACK + WESTERN MUSICAL SYMBOL STEM PLUS FLAG TWO
5. WESTERN MUSICAL SYMBOL THIRTY-SECOND NOTE	= WESTERN MUSICAL SYMBOL NOTEHEAD BLACK + WESTERN MUSICAL SYMBOL STEM PLUS FLAG THREE
6. WESTERN MUSICAL SYMBOL SIXTY-FOURTH NOTE	= WESTERN MUSICAL SYMBOL NOTEHEAD BLACK + WESTERN MUSICAL SYMBOL STEM PLUS FLAG FOUR
7. WESTERN MUSICAL SYMBOL ON HUNDRED TWENTY-EIGHTH NOTE	= WESTERN MUSICAL SYMBOL NOTEHEAD BLACK + WESTERN MUSICAL SYMBOL STEM PLUS FLAG FIVE

Coding convenience notwithstanding, notes built up from alternative noteheads, stems and flags, and articulation symbols are necessary for complete implementations and complex scores. Examples of their use include American shape-note and modern percussion notations. For example,

1. WESTERN MUSICAL SYMBOL SQUARE NOTEHEAD BLACK + WESTERN MUSICAL SYMBOL STEM
2. WESTERN MUSICAL SYMBOL X NOTEHEAD + WESTERN MUSICAL SYMBOL STEM

Augmentation dots and articulation symbols may be appended to either the pre-composed or built-up notes. For example,


















1. WESTERN MUSICAL SYMBOL EIGHTH NOTE + WESTERN MUSICAL SYMBOL AUGMENTATION DOT	= WESTERN MUSICAL SYMBOL NOTEHEAD BLACK + WESTERN MUSICAL SYMBOL STEM PLUS FLAG ONE + WESTERN MUSICAL SYMBOL AUGMENTATION DOT
2. WESTERN MUSICAL SYMBOL QUARTER NOTE + WESTERN MUSICAL SYMBOL STACCATO	= WESTERN MUSICAL SYMBOL NOTEHEAD BLACK + WESTERN MUSICAL SYMBOL STEM + WESTERN MUSICAL SYMBOL STACCATO

In addition, augmentation dots and articulation symbols may be repeated as necessary to build a complete note symbol. For example,

WESTERN MUSICAL SYMBOL EIGHTH NOTE + WESTERN MUSICAL SYMBOL AUGMENTATION DOT + WESTERN MUSICAL SYMBOL AUGMENTATION DOT + WESTERN MUSICAL SYMBOL ACCENT

Ornamentation chart

Included below is a list of common 18th-century ornaments and the combining sequences of characters from which they can be generated. Click on the image for a high-resolution version (87k)

	TR + SMEAR + SMEAR + SMEAR
	ORNAMENT STROKE TWO + ORNAMENT STROKE THREE
	ORNAMENT STROKE TWO + ORNAMENT STROKE THREE + ORNAMENT STROKE SIX
	ORNAMENT STROKE TWO + ORNAMENT STROKE SIX + ORNAMENT STROKE TWO + ORNAMENT STROKE THREE
	ORNAMENT STROKE TWO + ORNAMENT STROKE TWO + ORNAMENT STROKE THREE + ORNAMENT STROKE SIX
	ORNAMENT STROKE TWO + ORNAMENT STROKE THREE + ORNAMENT STROKE NINE
	ORNAMENT STROKE SEVEN + ORNAMENT STROKE TWO + ORNAMENT STROKE TWO + ORNAMENT STROKE THREE
	ORNAMENT STROKE EIGHT + ORNAMENT STROKE TWO + ORNAMENT STROKE TWO + ORNAMENT STROKE THREE
	} ORNAMENT STROKE TWO + ORNAMENT STROKE TWO + ORNAMENT STROKE THREE + ORNAMENT STROKE FIVE
	
	ORNAMENT STROKE SEVEN + ORNAMENT STROKE TWO + ORNAMENT STROKE TWO + ORNAMENT STROKE THREE + ORNAMENT STROKE SIX
	ORNAMENT STROKE SEVEN + ORNAMENT STROKE TWO + ORNAMENT STROKE TWO + ORNAMENT STROKE THREE + ORNAMENT STROKE FIVE
	ORNAMENT STROKE EIGHT + ORNAMENT STROKE TWO + ORNAMENT STROKE TWO + ORNAMENT STROKE THREE + ORNAMENT STROKE SIX
	ORNAMENT STROKE ONE + ORNAMENT STROKE TWO + ORNAMENT STROKE TWO + ORNAMENT STROKE THREE
	SMEAR + ORNAMENT STROKE SIX
	ORNAMENT STROKE ONE + ORNAMENT STROKE TWO + ORNAMENT STROKE TWO + ORNAMENT STROKE THREE + ORNAMENT STROKE FOUR
	ORNAMENT STROKE TWO + ORNAMENT STROKE THREE + ORNAMENT STROKE FOUR

Examples

The following examples demonstrate some current uses of music characters in textual materials. Often, music characters are not included because of the difficulty of integrating them into the text. When they are included, they are frequently drawn in by hand after setting the other text, i.e. the Balaban example. Music characters are also used extensively in creating data tables set apart from the text and single-line rhythmic examples either in the text or set apart from it, i.e. the Kennedy and Otunan examples.

Introduction of a standardized group of characters would undoubtedly change current practices in both number and kind.

From Balaban, ed. *Understanding Music with AI*, p. 128:

QUESTION: (context PAK111AZ) (key-sign Bb Eb Ab) (meter 4/4). Being a bouom up description, the music structure ALLEMANDE is yet unknown.

The rhythmic pattern $\text{♩} \text{♩} \text{♩}$ can be denoted as follows:
 THREE_16 ::= $[p_1, \frac{1}{16}] - [p_2, \frac{1}{16}] - [p_3, \frac{1}{16}]$ with no associated attributes information.

Note that p_1, p_2, p_3 are three different variables. The rhythmic pattern $\text{♩} \text{♩} \text{♩} \text{♩}$ can be denoted by FIVE_16 ::= $[p_1, \frac{1}{16}] - [p_2, \frac{1}{16}] - [p_3, \frac{1}{16}] - [p_4, \frac{1}{16}] - [p_5, \frac{1}{16}]$ with no associated attributes information. The two rhythmic patterns can be combined together

to form: RHYTHM1 ::= (THREE_16 - FIVE_16) @ ($\frac{1}{16}$) which denotes the pattern $\text{♩} \text{♩} \text{♩} \text{♩} \text{♩}$ starting at time point $-\frac{1}{16}$.

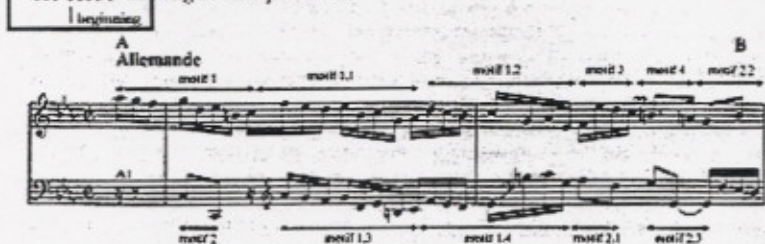


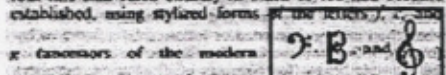
Figure 12. The First Phrase of the Allemande, from Bach's Second Piano Partita.

From the *Encyclopedia Britannica*, v. 24, p. 531:

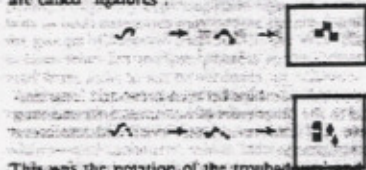
Eventually, precision of pitch was further achieved by using horizontal scratched lines as a grid on which to space the neumes, so that degrees of the scale fell alternately on a line or in a space, and by colouring one line red to signify the pitch F and possibly another yellow to signify C—or by placing a letter F or C at the beginning of the appropriate line. Together, the two devices fixed the relative pitches of all notes by indicating where the semitones of the scale occurred (that is, immediately below the marked lines: E=F or B=C). In the 11th century two signs from a quite different system of notation (alphabetical notation; see below) were incorporated as accidentals before the pitch "B": b, the ancestor of \flat ; and the ancestor of i and l, and also of the German "h," which refers to \sharp . These two signs were progressively applied to other pitches in the following centuries. By the 13th century a four-line staff ruled entirely in black or red had become established, using stylized forms of the letters f, c, and g. For polyphonic music a five-line staff became standard by the 14th century, but keyboard music in some countries used six- or seven-line staves as late as the mid-17th century.

During the 12th century, in northern and northeastern France the thin, curved lines of neumes were drawn more thickly at the points corresponding to the separate notes within them. In time, a firmly rectilinear notation of heavy horizontal pen strokes, diamond-shaped dots, and hairline vertical strokes emerged, whose groups of notes are called "ligatures".

This was the notation of the troubadours and trouvères' songs; also of plainchant from the 13th century to the present day. It was also used in 12th-century polyphony



Adoption of the five-line staff

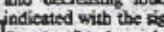



This was the notation of the troubadours and trouvères' songs; also of plainchant from the 13th century to the present day. It was also used in 12th-century polyphony

From the *New Harvard Dictionary of Music*, p. 212:





212 CRAB CANON / CRITICISM

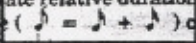
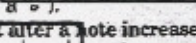
Crab canon. See Canon 1, 3.
 Crab motion. *Retrograde.
 Cracovienne [Fr.]. **Krakowiac*.
 Creation, The [Ger. *Die Schöpfung*]. An oratorio by Haydn for soloists, chorus, and orchestra. Hob. XXI:2 (1796-98). It is a setting of a poem compiled by an unknown Mr. Lidley (Lindley?) from Milton's *Paradise Lost*, the whole project having been suggested to Haydn by the concert manager Johann Peter Salomon during the composer's second stay in London (1794-95). Upon Haydn's return to Vienna, the text was translated into German by Baron Gottfried van Swieten as *Die Schöpfung*. The work was first performed in Vienna in 1798 and in this translation.
 Creation Mass. Popular name for Haydn's Mass in E \flat major Hob. XXII:13 (1801), so called because a theme from his oratorio *The Creation* appears in the "Qui tollis."
 Creatures of Prometheus. See *Geschöpfe des Prometheus*.
 Crécelle [Fr.]. *Cog rattle.
 Credo [Lat., I believe; Eng. Creed]. The third item of the *Ordinary of the Roman Catholic *Mass, except on certain feasts when it is omitted. Its text is the Nicene *Creed, first used in association with the Eucharist in the East in the 5th century. In the 6th century it was prescribed for the Mozarabic Mass, and it was taken up in Gaul in the Carolingian period. It was

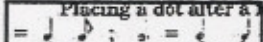
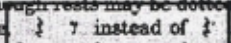

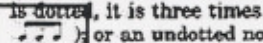
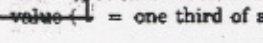
vult salvus esse" (Whoever wants to be saved), used at the Office of Prime in the Roman rite and at Morning Prayer on some occasions in the Anglican rite.
 Crebulum [Lat.]. *Jew's harp.
 Cresona. An organ reed stop with cylindrical resonators, usually half-length, probably based on the French **Cronorne*; used in England from ca. 1680.
 Crescendo, decrescendo [It., growing, decreasing; abbr. *cresc.*, *decresc.*, *decr.*]. As *performance marks, increasing and decreasing loudness, respectively; sometimes indicated with the sign  and . See also *Diminuendo*.
 Crescendo pedal. In electric or pneumatic-action organs, a device for bringing on each of the stops and couplers, from the softest to the loudest.
 Crescent. *Turkish crescent.
 Cretic meter. In the music of ancient *Greece, paeonic or quintuple meter.
 Criticism. The elucidation and interpretation, based on the experience of an informed listener, of a work or performance. Its fundamental aim is the illumination of the individual work or performance as heard rather than the discovery of structural or other features common to many works. In this respect it sometimes stands in contrast to *analysis, though the two are not rigidly separable, and criticism inevitably makes use of some of the methods most often associated with analysis. Criticism focuses its energies on

From Ottman, *Elementary Harmony*, 2nd. ed., p. 11:

Basics III

Thirty-Second Note		1/32	Thirty-Second Rest	
Sixty-Fourth Note		1/64	Sixty-Fourth Rest	









These notes do not indicate any specific duration of sound, rather their fractional names indicate relative durations: Any note value is twice as long as the next smaller value () or half as long as the next higher value ().

Placing a dot after a note increases its value by one half, for example,  and so on. (The curved line is a tie; tied notes are performed as a single note value.) Although rests may be dotted, it is common practice to use two signs, for example,  instead of . When a note is dotted, it is three times longer than the next lower undotted value (); or an undotted note is one third the length of the next higher dotted value ().

From Kennedy, *Oxford Dictionary of Music*, p. 494:

NÄNIE 494

NAMES OF THE NOTES AND REST VALUES
 ENGLISH, ITALIAN, FRENCH, GERMAN, AND AMERICAN

	English	Italian	French	German	American
	breve	breve	carré (square) or brève	Doppelrakt-note (double measure note)	double whole-note
	semibreve	semibreve	rond (round)	Ganze Takt-note (whole measure note)	whole-note
	minims	minima or bianca (white)	blanche (white)	Halbe (half) or Halbnote or Halbe Taktnote	half-note
	crotchet	sceminima or nera (black)	noir (black)	Viertel (quarter)	quarter-note
	quaver	croma	croche (hook)	Achtel (eighth)	eighth-note
	semi-quaver	semi-croma	double-croche (double-hook)	Sechzehntel (sixteenth)	sixteenth-note
	demisemi-quaver	biscroma	triple-croche (triple-hook)	Zwölfdreissigstel (thirty-second)	thirty-second note
	hemidemi-semiquaver	semi-biscroma	quadruple-croche (quadruple-hook)	Vierund-sechzigstel (sixty-fourth)	sixty-fourth note

(The word 'Rest' is in It. Pausa; Fr. Silence, or Paus; Ger. Pause.)

Nänie (Ger., from Lat. Naevius, 'dingers') Ode by Brahms, Op. 82, for ch. and orch., comp. 1880-1, to text by Schiller.

Nazino, Giovanni Bernardino (b Valeriano, c.1560- d Rome, 1623). It. composer-lyricist

brother G. B. Nazino and Palestrina. Wrote madrigals, motets, canzonets, etc. Regarded as one of greatest contrapuntists of his time.

Napoleon, Ode to (Schoenberg). See Ode to

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ISO/IEC JTC 1/SC 2/WG 2

PROPOSAL SUMMARY FORM TO ACCOMPANY SUBMISSIONS FOR ADDITIONS TO THE REPERTOIRE OF ISO/IEC 10646

Please fill Sections A, B and C below. Section D will be filled by SC 2/WG 2.

For instructions and guidance for filling in the form please see the document "Principles and Procedures for Allocation of New Characters and Scripts" (<http://www.dkuug.dk/JTC1/SC2/WG2/prot>)

A. Administrative

1. Title: Proposal for Encoding Western Music Symbols in ISO/IEC 10646

2. Requester's name: Perry Roland

3. Requester type (Member body/Liaison/Individual contribution): Individual contribution

4. Submission date: February, 1998

5. Requester's reference (if applicable):

6. (Choose one of the following:)

This is a complete proposal: ; or,

More information will be provided later: This is a complete proposal.

B. Technical - General

1. (Choose one of the following:)

a. This proposal is for a new script (set of characters):

Proposed name of script: Western Musical Symbols

b. The proposal is for addition of character(s) to an existing block:

Name of the existing block:

2. Number of characters in proposal: 220

3. Proposed category (see section II, Character Categories): Category "A"

4. Proposed Level of Implementation (see clause 15, ISO/IEC 10646-1): Level 2

Is a rationale provided for the choice? No.

If Yes, reference:

5. Is a repertoire including character names provided? Yes.

- a. If YES, are the names in accordance with the 'character naming guidelines' in Annex K of ISO/IEC 10646-1? Yes.
 - b. Are the character shapes attached in a reviewable form? Yes.
-

6. Who will provide the appropriate computerized font (ordered preference: True Type, PostScript or 96x96 bit-mapped format) for publishing the standard? Perry Roland

If available now, identify source(s) for the font (include address, e-mail, ftp-site, etc.) and indicate the tools used:

7. References:

- a. Are references (to other character sets, dictionaries, descriptive texts etc.) provided? Yes.
 - b. Are published examples (such as samples from newspapers, magazines, or other sources) of use of proposed characters attached? Yes.
-

8. Special encoding issues:

Does the proposal address other aspects of character data processing (if applicable) such as input, presentation, sorting, searching, indexing, transliteration etc. (if yes, please enclose information): Yes.

C. Technical - Justification

1. Has this proposal for addition of character(s) been submitted before? No.

If YES, explain.

2. Has contact been made to members of the user community (for example: National Body, user groups of the script or characters, other experts, etc.)? Yes.

If YES, with whom? Contact has been made with members of the Music Library Association, the American Musicological Society, and faculty members and library staff at the University of Virginia.
If YES, available relevant documents?

3. Information on the user community for the proposed characters (for example: size, demographics, information technology use, or publishing use) is included? Yes.
Reference:

4. The context of use for the proposed characters (type of use; common or rare): common
Reference:

5. Are the proposed characters in current use by the user community? Yes.
If YES, where? World-wide.
Reference:

6. After giving due considerations to the principles in N 1352 must the proposed characters be entirely in the BMP? No. This script is not appropriate for encoding in the BMP.
If YES, is a rationale provided?
If YES, reference:

7. Should the proposed characters be kept together in a contiguous range (rather than being scattered)? Yes.

8. Can any of the proposed characters be considered a presentation form of an existing character or character sequence? No.
If YES, is a rationale for its inclusion provided?
If YES, reference:

9. Can any of the proposed character(s) be considered to be similar (in appearance or function) to an existing character?

If YES, is a rationale for its inclusion provided? Yes.

If YES, reference:

10. Does the proposal include use of combining characters and/or use of composite sequences (see clause 4.11 and 4.13 in ISO/IEC 10646-1)? Yes.

If YES, is a rationale for such use provided? Yes.

If YES, reference:

Is a list of composite sequences and their corresponding glyph images (graphic symbols) provided? No.

If YES, reference:

11. Does the proposal contain characters with any special properties such as control function or similar semantics? Yes.

If YES, describe in detail (include attachment if necessary)

D. SC 2/WG 2 Administrative (To be completed by SC 2/WG 2)

1. Relevant SC 2/WG 2 document numbers:

2. Status (list of meeting number and corresponding action or disposition):

3. Additional contact to user communities, liaison organizations etc:

4. Assigned category and assigned priority/time frame: