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## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

This standard was prepared by ISO-TC / JTC1 / SC22 / WG3, the working group for the Programming Language APL.

## **Introduction**

APL is a programming language that has used special characters to represent various functions.. The Universal Character Set includes all the special characters that are known to be used in every APL. The repertoire given here is a list of all those APL characters together with an identification of where they are positioned in the Universal Character Set.

The use of IS 10646 has gives APL the opportunity to specify the locations of these characters, primarily for the purposes of workspace interchange. This standard is intended to assist users of APL in moving APL characters from one workspace to another or from one APL implementation of APL to another, in a way that is consistent with ISO 10646.

# Programming Language APL – Part 2: APL Character Repertoire

## 1 Scope

This international standard is intended to assist in the communication of APL characters between APL applications.

Any application conforming to this standard shall use the table presented in this standard.

## 2 Conformance

## 3 Normative reference(s)

This document refers to

ISO 8485 Standard for Programming Language APL

ISO 13751 Standard for Programming Language Extended APL

ISO 10646 Universal Character Set

## 4 Term(s) and definition(s)

For the purposes of this international standard, the following definitions shall apply.

Definitions:

**character:** any character listed in IS 10646.

**APL character** Any character listed in the table of Annex 1.

Because the APL characters included all the characters

## 5 Symbols (and abbreviated terms)

None

## 6 Clause

6.1 APL programs running on the same or different computers may have reason to interact by exchanging information involving **APL characters**. The table that is the subject of this international standard provides the basis for conforming communication, on the assumption that the two programs both understand the notion of character in the sense of ISO 10646.

6.2 The APL programs do not have to be running on hardware running the same operating system.

6.3 The APL programs do not have to be same implementation of APL.

6.4 The precise channel of communication is not specified.

**Annex A**  
(normative)

**APL Character Repertoire**

**A.1 The Table of APL Characters**

## APL Language Character Set

This document designates a correspondance between all non-alphabetic symbols used by the APL Language and the character standard IS 10646 (UCS-2), otherwise known as Unicode.

The APL language uses two types of symbols: alphabetic and non-alphabetic. An implementation of APL must support both a set of non-alphabetic characters (to be designated in the APL language standard) and a set of alphabetic characters for identifier designation.

The alphabetic characters may be any set of alphabetic characters, although the usual set has been the twenty six English Roman characters in two cases; traditionally these cases have been represented as Italic-uppercase and Italic-uppercase-underbarred. Since the alphabetic characters are not specified as part of the standard, they will not be discussed further here.

The APL standard designates a set of functional symbols, digits, and punctuation marks which is sufficient for the language facilities that it defines. Existing implementations, however, use many symbols not used by the standard. When the IS 10646 standard was being prepared, the APL standards group compiled as complete a list of these symbols as possible; this document is one of the final results of that effort.

Due to the change of direction which resulted in the merge of the draft 10646 document with Unicode, many of the APL symbols were removed from what became Unicode 1.1 because they were considered to be duplicates of other symbols. This has resulted in a character standard which does not always provide a clear designation for a particular APL glyph; indeed in a few cases there is no really good choice.

Nevertheless, it is very important that all APL implementations use the same UCS-2 codepoints for their APL symbols, at least for any communication of data.

This document designates a UCS-2 / Unicode codepoint for every known non-alphabetic APL glyph. Any APL implementation which converts APL programs or character data to a UCS-2 or Unicode representation should use this mapping.



Glyph	UCS-2 Assignment	Character Name
-	U+2212	APL Functional Symbol 'Minus'
	U+2223	APL Functional Symbol 'Stile'
=	U+003D	APL Functional Symbol 'Equal'
+	U+002B	APL Functional Symbol 'Plus'
×	U+00D7	APL Functional Symbol 'Multiply'
÷	U+00F7	APL Functional Symbol 'Divide'
≡	U+2261	APL Functional Symbol 'Same'
⊥	U+2336	APL Functional Symbol 'I-beam'
□	U+25AF	APL Functional Symbol 'Quad' (See Note 3)
▣	U+2337	APL Functional Symbol 'Squish Quad' (See Note 3)
◇	U+22C4	APL Functional Symbol 'Diamond'
⊞	U+2338	APL Functional Symbol 'Quad Equal'
⊞	U+2339	APL Functional Symbol 'Quad Divide'
⊞	U+233A	APL Functional Symbol 'Quad Diamond'
⊞	U+233B	APL Functional Symbol 'Quad Jot'
⊞	U+233C	APL Functional Symbol 'Quad Circle'
◦	U+2218	APL Functional Symbol 'Jot'
○	U+25CB	APL Functional Symbol 'Circle'
⊖	U+2296	APL Functional Symbol 'Circle Bar'
⊖	U+233D	APL Functional Symbol 'Circle Stile'
⊙	U+233E	APL Functional Symbol 'Circle Jot'
/	U+002F	APL Functional Symbol 'Slash'
\	U+005C	APL Functional Symbol 'Back Slash'
┌	U+22A2	APL Functional Symbol 'Right Tack' (See Note 1)
└	U+22A3	APL Functional Symbol 'Left Tack' (See Note 1)
≠	U+233F	APL Functional Symbol 'Slash Bar'
↖	U+2340	APL Functional Symbol 'Back Slash Bar'
<	U+003C	APL Functional Symbol 'Less Than'
>	U+003E	APL Functional Symbol 'Greater Than'
[	U+005B	APL Functional Symbol 'Left Bracket'
]	U+005D	APL Functional Symbol 'Right Bracket'
≤	U+2264	APL Functional Symbol 'Less Than or Equal'
≥	U+2265	APL Functional Symbol 'Greater Than or Equal'

Glyph	UCS-2 Assignment	Character Name
⚡	U+2341	APL Functional Symbol 'Quad Slash'
⚡	U+2342	APL Functional Symbol 'Quad Backslash'
⚡	U+2343	APL Functional Symbol 'Quad Less Than'
⚡	U+2344	APL Functional Symbol 'Quad Greater Than'
←	U+2190	APL Functional Symbol 'Left Arrow'
→	U+2192	APL Functional Symbol 'Right Arrow'
↵	U+2345	APL Functional Symbol 'Left Vane'
↶	U+2346	APL Functional Symbol 'Right Vane'
⚡	U+2347	APL Functional Symbol 'Quad Left Arrow'
⚡	U+2348	APL Functional Symbol 'Quad Right Arrow'
⌞	U+2282	APL Functional Symbol 'Left Shoe'
⌟	U+2283	APL Functional Symbol 'Right Shoe'
(	U+0028	APL Functional Symbol 'Left Parenthesis'
)	U+0029	APL Functional Symbol 'Right Parenthesis'
{	U+007B	APL Functional Symbol 'Left Brace'
}	U+007D	APL Functional Symbol 'Right Brace'
⌞	U+2286	APL Functional Symbol 'Left Shoe Underbar'
⌟	U+2287	APL Functional Symbol 'Right Shoe Underbar'
⊘	U+2205	APL Functional Symbol 'Circle Slash'
⊘	U+2349	APL Functional Symbol 'Circle Back Slash'
¯	U+00AF	APL Functional Symbol 'Overbar'
⌞	U+230A	APL Functional Symbol 'Down Stile'
^	U+2227	APL Functional Symbol 'Up Caret'
⊥	U+22A5	APL Functional Symbol 'Up Tack'
⊥	U+234A	APL Functional Symbol 'Up Tack Underbar'
Δ	U+2206	APL Functional Symbol 'Delta'
⌞	U+234B	APL Functional Symbol 'Delta Stile'
⚡	U+234C	APL Functional Symbol 'Quad Down Caret'
⚡	U+234D	APL Functional Symbol 'Quad Delta'
⌞	U+2229	APL Functional Symbol 'Up Shoe'
⊥	U+234E	APL Functional Symbol 'Up Tack Jot'
↑	U+2191	APL Functional Symbol 'Up Arrow'
↶	U+234F	APL Functional Symbol 'Up Vane'

Glyph	UCS-2 Assignment	Character Name
⌈	U+2350	APL Functional Symbol 'Quad Up Arrow'
—	U+005F	APL Functional Symbol 'Underbar'
┘	U+2308	APL Functional Symbol 'Up Stile'
∨	U+2228	APL Functional Symbol 'Down Caret'
┘	U+22A4	APL Functional Symbol 'Down Tack'
⌋	U+2351	APL Functional Symbol 'Down Tack Overbar'
∇	U+2207	APL Functional Symbol 'Del'
∇	U+2352	APL Functional Symbol 'Del Stile'
⌈	U+2353	APL Functional Symbol 'Quad Up Caret'
⌋	U+2354	APL Functional Symbol 'Quad Del'
⌋	U+222A	APL Functional Symbol 'Down Shoe'
⌋	U+2355	APL Functional Symbol 'Down Tack Jot'
↓	U+2193	APL Functional Symbol 'Down Arrow'
↓	U+2356	APL Functional Symbol 'Down Vane'
⌋	U+2357	APL Functional Symbol 'Quad Down Arrow'
.	U+002E	APL Functional Symbol 'Dot'
'	U+0027	APL Functional Symbol 'Quote'
:	U+003A	APL Functional Symbol 'Colon'
'	U+2358	APL Functional Symbol 'Quote Underbar'
△	U+2359	APL Functional Symbol 'Delta Underbar'
◇	U+235A	APL Functional Symbol 'Diamond Underbar'
◊	U+235B	APL Functional Symbol 'Jot Underbar'
○	U+235C	APL Functional Symbol 'Circle Underbar'
⌈	U+235D	APL Functional Symbol 'Up Shoe Jot'
⌋	U+235E	APL Functional Symbol 'Quote Quad'
*	U+22C6	APL Functional Symbol 'Star'
⊗	U+235F	APL Functional Symbol 'Circle Star'
⌋	U+2360	APL Functional Symbol 'Quad Colon'
¨	U+00A8	APL Functional Symbol 'Diaeresis'
¨	U+2235	APL Functional Symbol 'Diaeresis Dot'
⌋	U+2361	APL Functional Symbol 'Down Tack Diaeresis'
∇	U+2362	APL Functional Symbol 'Del Diaeresis'
⌋	U+2363	APL Functional Symbol 'Star Diaeresis'

Glyph	UCS-2 Assignment	Character Name
◌̇	U+2364	APL Functional Symbol 'Jot Diæresis'
◌̈	U+2365	APL Functional Symbol 'Circle Diæresis'
ψ	U+2366	APL Functional Symbol 'Down Shoe Stile'
ϕ	U+2367	APL Functional Symbol 'Left Shoe Stile'
,	U+002C	APL Functional Symbol 'Comma'
;	U+003B	APL Functional Symbol 'Semicolon'
?	U+003F	APL Functional Symbol 'Question'
!	U+0021	APL Functional Symbol 'Quote Dot'
~	U+223C	APL Functional Symbol 'Tilde'
≠	U+2260	APL Functional Symbol 'Not Equal'
≇	U+2262	APL Functional Symbol 'Not Same'
\$	U+0024	APL Functional Symbol 'Dollar Sign'
◌̇̈	U+2368	APL Functional Symbol 'Tilde Diæresis'
◌̈̈	U+2369	APL Functional Symbol 'Greater Than Diæresis'
⸣	U+236A	APL Functional Symbol 'Comma Bar'
⸤	U+236B	APL Functional Symbol 'Del Tilde'
⸥	U+236C	APL Functional Symbol 'Zilde'
⸦	U+236D	APL Functional Symbol 'Stile Tilde'
⸧	U+236E	APL Functional Symbol 'Semicolon Underbar'
⸨	U+236F	APL Functional Symbol 'Quad Not Equal'
⸩	U+2370	APL Functional Symbol 'Quad Question'
⸪	U+2371	APL Functional Symbol 'Down Caret Tilde'
⸫	U+2372	APL Functional Symbol 'Up Caret Tilde'
α	U+237A	APL Functional Symbol 'Alpha'
ε	U+220A	APL Functional Symbol 'Epsilon' (See Note 2)
ι	U+2373	APL Functional Symbol 'Iota'
ρ	U+2374	APL Functional Symbol 'Rho'
ω	U+2375	APL Functional Symbol 'Omega'
ᾱ	U+2376	APL Functional Symbol 'Alpha Underbar'
ε̄	U+2377	APL Functional Symbol 'Epsilon Underbar'
ῑ	U+2378	APL Functional Symbol 'Iota Underbar'
ω̄	U+2379	APL Functional Symbol 'Omega Underbar'

- Note 1: There has been considerable confusion (at least in the APL community) about the names for the "tack" symbols. The names used here are consistent with themselves and with the technical symbols in Row 22 of the character standard. In some versions the names for some APL glyphs are reversed: this confusion will be remedied in a future version of the character standards.
- Note 2: This symbol is one for which a truly good choice does not exist; the symbol chosen seems to match what is used in most systems better than any available alternative.
- Note 3: There are quite a few empty squares in the standard; unfortunately none of them match the traditional APL Quad very well. Since most characters composed with Quad (such as  $\boxplus$ ) appear as APL symbols in the standard, a strict rendering from the standard document will produce somewhat unsatisfactory output. The square chosen was thought likely to cause the least problems, although admittedly it is not as much wider than the Squish Quad symbol as might be desirable.

## Bibliography

- [1] ISO 8485 *International Standard for Programming Language APL, 1984*
- [2] ISO 13751 *International Standard for Programming Language APL, 1997*
- [3] ISO 10646, *International Standard, Universal Character Set, 199x.*