Proposal to Include IEC Power Symbols

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Abstract

The international symbol IEC 60417-5009 ⏻ meaning 'power' is not in Unicode. Clearly it would be useful to anyone writing technical or user manuals. Furthermore, for electronically published documentation, it is crucial for this and a few other symbols to be defined because it makes them searchable in plain text. In this proposal we provide a TrueType font named 'IECsymbol' containing the glyphs as specified in three international standards together with the needed character properties for Unicode specification as well as evidence that these characters have been used in running text for thirty years.

1 Introduction

The ⏻, ⏼, ⭘, and ⏽ symbols are defined in IEC 60417 [6], which is also ISO 7000:2012 [7]. IEEE 1621 defines ☾ and refines the definition of ⏻, notably by saying:

> IEC 60417 defines ⏻ for use with a power switch that does not do a total mains disconnect, and hence the device consumes standby power. ⏻ is generally used and understood to mean "power," as on power buttons, indicators, and elsewhere. ⏻, therefore, means "power" with a nonzero power level in the *off* state. Electronic devices shall use ⏻ to be a synonym for "power" on power controls.

[4, §4.3, emphasis in original]. IEEE 1621 standardises current practice for devices with regard to the ⏻ symbol and introduces ☾ for sleep [10, 11].

These characters, particularly ⏻, are needed for technical writing and are not in Unicode. Adding these standardised symbols to Unicode will allow for their semantic identification and use. For the first time they would be searchable in plain text, something not possible with embedded graphics, which is the way the symbols have been displayed to date.

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2 Suitability for Inclusion

These symbols are characters according to the definition in the Glossary, and do not appear in the Archive of Notices of Non-Approval. As of this writing, they are not included in the Unicode Pipeline Table or BETA. These symbols are widely used on electronic equipment and thus their technical documentation (Figures 1–10). Semantically identifying the symbols allows for textual search and programmatic decision making, as well as reducing the use of binary images and single purpose symbol fonts in technical writing. It would benefit technical writers and readers if they were available in Unicode because it would make user manuals and other technical documentation searchable in plain text.

We provide along with our proposal a TrueType font, with no restrictions on its use.

3 Evidence of Use in Running Text

Figures 1–10 show evidence of the use of each of these symbols in running text during the past thirty years.

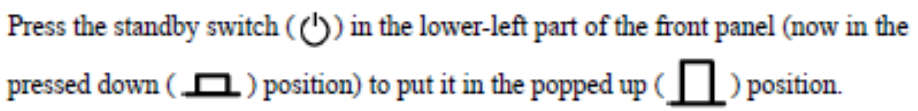


Figure 1: Example of ⏻ usage in running text from 2011, in the installation guide for a network analyser. From [1, Chapter 2, p. 24].

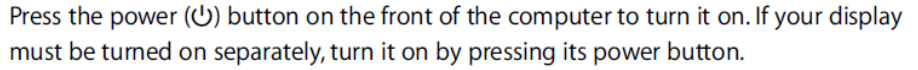


Figure 2: Example of ⏻ usage in running text from 2007, in the user's guide for a computer. From [2, Chapter 1, p. 12].

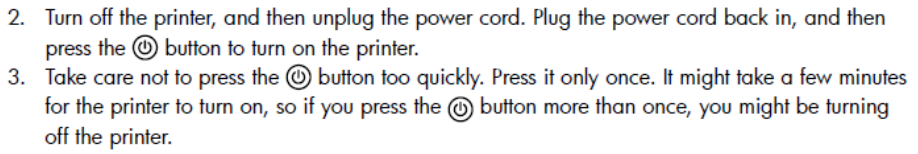


Figure 3: Example of ⏻ usage in running text from 2009, in the setup guide for a printer. From [3, p. 2].

4 Character Properties

Suggested character properties for the proposed symbols are given in Tables 1–5. The names are similar to the names in IEEE 1621-2004. None of the proposed names appear already in the Character Name Index.

Property	**Suggested Value**
Code point	*to be determined*
Name	POWER
General Category	So
Canonical Combining Class	0
Bidirectional Class	ON
Decomposition Type/Decomposition Mapping	
Numeric Type	
Numeric Value	
Bidi Mirrored	N
Unicode 1 Name	
ISO Comment	
Simple Uppercase Mapping	
Simple Lowercase Mapping	
Simple Titlecase Mapping	

Table 1: Suggested character properties for ⏻.

Property	**Suggested Value**
Code point	*to be determined*
Name	POWER OFF
General Category	So
Canonical Combining Class	0
Bidirectional Class	ON
Decomposition Type/Decomposition Mapping	
Numeric Type	
Numeric Value	
Bidi Mirrored	N
Unicode 1 Name	
ISO Comment	
Simple Uppercase Mapping	
Simple Lowercase Mapping	
Simple Titlecase Mapping	

Table 2: Suggested character properties for ⭘.

Property	**Suggested Value**
Code point	*to be determined*
Name	SLEEP
General Category	So
Canonical Combining Class	0
Bidirectional Class	ON
Decomposition Type/Decomposition Mapping	
Numeric Type	
Numeric Value	
Bidi Mirrored	N
Unicode 1 Name	
ISO Comment	
Simple Uppercase Mapping	
Simple Lowercase Mapping	
Simple Titlecase Mapping	

Table 3: Suggested character properties for .

Property	**Suggested Value**
Code point	*to be determined*
Name	POWER ON
General Category	So
Canonical Combining Class	0
Bidirectional Class	ON
Decomposition Type/Decomposition Mapping	
Numeric Type	
Numeric Value	
Bidi Mirrored	N
Unicode 1 Name	
ISO Comment	
Simple Uppercase Mapping	
Simple Lowercase Mapping	
Simple Titlecase Mapping	

Table 4: Suggested character properties for .

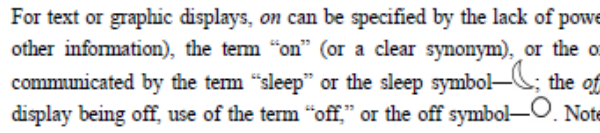
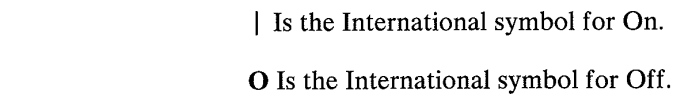

For text or graphic displays, *on* can be specified by the lack of power-state information (and presence of other information), the term "on" (or a clear synonym), or the on symbol— ; *sleep* states can be communicated by the term "sleep" or the sleep symbol— ; the *off* state can be communicated by the display being off, use of the term "off," or the off symbol— . Note that the off symbol should only be

Figure 4: Example of ⏽, ⏾, and ⭘ usage in running text from 2004, in a standards document. From [4, §4.5.2, p. 7].


| Is the International symbol for On.

O Is the International symbol for Off.

Figure 5: Example of ⭘ and ⏽ usage in running text from 1984, in the user manual for a computer. From [5, p. 1-11].

4.1 Collation Order

There is no required collation order, although there is an implied state transition ordering:

> Power states shall be understood to have physical relationships to each other. Specifically, *on* is taken to be above *sleep*, and *sleep* above *off*.

[4, §4.4, emphasis in original]. We suggest ⏻, ⭘, ⏾, ⏽, ⏼. They exhibit no shaping behaviour and have no particular required sorting order (except see the quoted paragraph above). The characters are uncased. There is no special line-breaking behaviour required. These characters are not meant for use in identifiers, although they have been used for such.[1] They are stand-alone symbols. They are not white-space characters and have no numeric values. They are neither combining characters nor punctuation.

5 The *IECsymbol* TrueType Font

The five symbols included in the *IECsymbol* TrueType font are shown in Table 6. Only these symbols exist in the font; if an undefined character, for example 'A' is called for in the font, the result is implementation-defined.[2]

Placement of symbols in the *IECsymbol* TrueType font was chosen thoughtfully so as to be mnemonic: 'P' for power, 'S' for sleep, 'T' for toggling power on or off, and '1' and '0' for power-on and power-off, respectively; these mnemonics 'fail gracefully' in text should the *IECsymbol* font happen to be unavailable.

In text with normal spacing, the ⏻ characters ⭘ look ⏾ like ⏽ this ⏼.[3]

[1] This web site has a collection of more than thirty examples of IEC 60417-5009 used in logo design: ⟨`http://www.logodesignlove.com/logos-using-the-standby-symbol`⟩.

[2] In XeTeX, for example, the result of 'A' in *IECsymbol* is ■. In OpenOffice Writer, the result is the letter 'A' but in a san-serif typeface.

[3] The spacing around ⏽ in the font appears wider because the glyphs are fixed-width.

Property	**Suggested Value**
Code point	*to be determined*
Name	POWER ON-OFF
General Category	So
Canonical Combining Class	0
Bidirectional Class	ON
Decomposition Type/Decomposition Mapping	
Numeric Type	
Numeric Value	
Bidi Mirrored	N
Unicode 1 Name	
ISO Comment	
Simple Uppercase Mapping	
Simple Lowercase Mapping	
Simple Titlecase Mapping	

Table 5: Suggested character properties for ⏼.

Symbol	**Applicable Standard(s)**	**Character To Type**	**Mnemonic**	**Meaning**
⏻	IEC 60417-5009	P	'power'	Power
⭘	IEC 60417-5008	0	'binary zero'	Power Off
⏾	IEEE 1621	S	'sleep'	Sleep
❙	IEC 60417-5007	1	'binary one'	Power On
⏼	IEC 60417-5010	T	'toggle'	Power On-Off

Table 6: All of the available glyphs in the *IECsymbol* TrueType font.

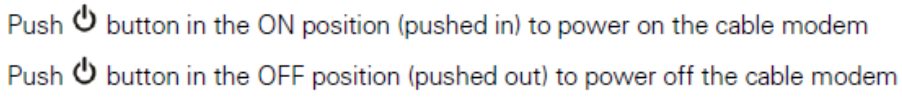


Figure 6: Example of ⏻ usage in running text from 2010, in the installation guide for a cable modem. From [8, p. 7].

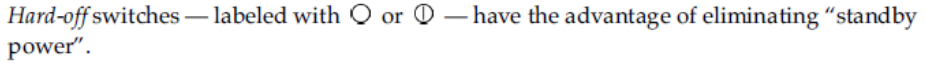


Figure 7: Example of ○ and ⏼ used in running text, in a monograph from 2002. From [9, p. 4] (used by permission).

6 Anticipated Objections

It might be argued that the meaning of ⏻ is disputed between IEC 60417 and IEEE 1621, *i.e.*, that IEC 60417 (as well as ISO 7000:2012) defined ⏻ to mean 'stand-by' and IEEE 1621 changed it to mean 'power'. We counter that the issue is irrelevant to the Unicode Consortium for two reasons: firstly, because the symbol itself is needed by writers, regardless of the fact that 'stand-by' has no consistent definition;[4] and secondly, because IEEE 1621 specifically codifies existing practice; the number of devices using ⏻ to mean 'power' dwarfs the number of devices that use it to mean 'stand-by'. Furthermore,

> No safety issue is introduced by the use of the symbol on a switch that causes the device to go to a *hard-off* state.

[4, §4.3, emphasis in original].

There are, of course, many characters in Unicode already resembling circles (○), or lines (|), or the crescent moon (☾). None of the existing characters, however, has anything semantically to do with the concepts of 'power', 'switch', 'toggle', or 'interrupter'. There are several occurrences of the crescent moon, but none showing the ☾ phase; IEEE 1621 intended the symbol to be different from other Unicode instances of a crescent moon. There are eleven occurrences of the word 'power' in Version 6.3.0 of the Unicode standard (Table 7) but none has anything to do with device control [12].

7 Drawing the Symbols

The proposed characters are not part of any script and the precise form of their drawing is not critical. As IEEE 1621-2004 says:

> In accordance with IEC 80416-3, symbols can be filled, be rotated, have their lines thickened, or be used on digital displays, as long as an ordinary user can recognize the symbol correctly.

[4, §4.3].

[4]The term is routinely used to mean *off*, *sleep*, *on*, and other meanings that do not map to a consistent power state at all.

Section	**Code Point**	**Description**
Telugu fractions and weights	0C78	TELUGU FRACTION DIGIT ZERO FOR ODD POWERS OF FOUR
	0C79	TELUGU FRACTION DIGIT ONE FOR ODD POWERS OF FOUR
	0C7A	TELUGU FRACTION DIGIT TWO FOR ODD POWERS OF FOUR
	0C7B	TELUGU FRACTION DIGIT THREE FOR ODD POWERS OF FOUR
	0C7C	TELUGU FRACTION DIGIT ONE FOR EVEN POWERS OF FOUR
	0C7D	TELUGU FRACTION DIGIT TWO FOR EVEN POWERS OF FOUR
	0C7E	TELUGU FRACTION DIGIT THREE FOR EVEN POWERS OF FOUR
Miscellaneous Symbols	26EE	GEAR WITH HANDLES (= power plant, power substation)
Kangxi Radicals	2F12	KANGXI RADICAL POWER
Yijing Hexagram Symbols	4DE1	HEXAGRAM FOR GREAT POWER
Mathematical Alphanumeric Symbols	1D4AB	MATHEMATICAL SCRIPT CAPITAL P (= power set)

Table 7: All occurrences of 'power' in the Unicode Standard, Version 6.3.0.

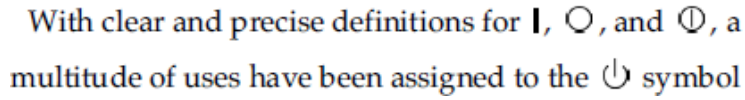


Figure 8: Example of , , , and usage in running text, in a monograph from 2002. From [9, p. 2] (used by permission).

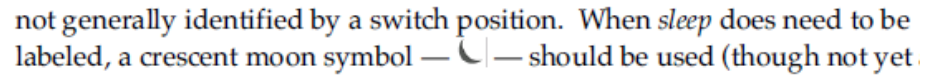


Figure 9: Example of used in running text, in a monograph from 2002. From [9, p. 2] (used by permission).

7.1 Severability

Of all the characters in Table 6, the most needed is . We included the others in this proposal because they form a logical group. If, however, there is any objection to inclusion of , , , or , the one we most need is .

8 Sponsors

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USA

Tel. 510-486-7089

Email: `BNordman@LBL.gov`

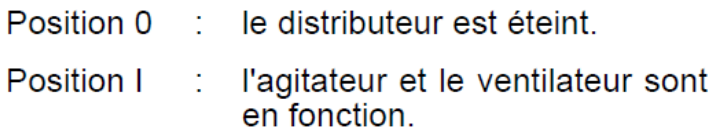

Figure 10: Example of O and I used in running text from 2013, in the operator's manual for a coffee maker. From [13, p. 18].

9 Summary and Conclusion

The ⏻, O, ◡, I, and ⓪ symbols are needed by technical writers to produce manuals in which these important symbols are searchable in plain text. Because they were invented by the standards body to be distinctive, new, and unambiguous, there is no confusion with existing scripts. They have been in use in running text for at least thirty years. The suggested character properties are straightforward. We provide along with this proposal a TrueType font called *IECsymbol* containing the new symbols; the TrueType font is made available with no restrictions.

References

[1] Agilent Technologies. *Agilent E5071C ENA Series RF Network Analyzers Installation Guide*, eighth edition, September 2011.

[2] Apple, Inc. *Mac Pro User's Guide*, 2007.

[3] Hewlett–Packard Development Company, L.P. *HP Photosmart D110 series*, 2009.

[4] IEEE Standards Association. *IEEE Standard for User Interface Elements in Power Control of Electronic Devices Employed in Office/Consumer Environments*, 2004. IEEE Std 1621-2004.

[5] International Business Machines Corporation. *IBM Personal Computer Hardware Reference Library: Guide to Operations*, revised edition, 1984.

[6] International Electrotechnical Commision. *IEC 60417: Graphical symbols for use on equipment*, 2005.

[7] International Organisation for Standardisation. *ISO 7000:2012, Graphical symbols for use on equipment—Registered symbols*, 2012.

[8] Motorola, Inc. *Motorola SURFboard SB6121 DOCSIS 3.0 Cable Modem: Installation Guide*, 2010.

[9] Bruce Nordman. Power switch labeling for medical and other devices. Technical report, Lawrence Berkeley National Laboratory, November 18, 2002.

[10] Bruce Nordman. The power control user interface standard — final report. Technical Report LBNL-52526, California Energy Commission,

Public Interest Energy Research Program, ⟨`http://energy.lbl.gov/ea/controls/publications/pubsindex.html`⟩, 2003.

[11] Bruce Nordman, Alan Meier, and Don Aumann. Toward a standard user interface for power controls. In *Proceedings: 2002 Summer Study on Energy Efficiency in Buildings*. LBNL-49665, 2002.

[12] The Unicode Consortium. The Unicode standard, version 6.3.0, 2013.

[13] Ugolini S.p.A. *Delice 5L carnet d'instructions*, 2013.

ISO/IEC JTC 1/SC 2/WG 2
PROPOSAL SUMMARY FORM TO ACCOMPANY SUBMISSIONS
FOR ADDITIONS TO THE REPERTOIRE OF ISO/IEC 10646[1]
Please fill all the sections A, B and C below.
Please read Principles and Procedures Document (P & P) from http://std.dkuug.dk/JTC1/SC2/WG2/docs/principles.html **for guidelines and details before filling this form.**
Please ensure you are using the latest Form from http://std.dkuug.dk/JTC1/SC2/WG2/docs/summaryform.html **.**
See also http://std.dkuug.dk/JTC1/SC2/WG2/docs/roadmaps.html **for latest *Roadmaps*.**

A. Administrative

1. **Title:** ***Proposal to Include IEC Power Symbols***
2. Requester's name: *Terence Eden, Joe Loughry, and Bruce Nordman*
3. Requester type (Member body/Liaison/Individual contribution): *Individual contribution*
4. Submission date: *01/19/14*
5. Requester's reference (if applicable):
6. Choose one of the following:
   This is a complete proposal: *Yes*
   (or) More information will be provided later:

B. Technical – General

1. Choose one of the following:
   a. This proposal is for a new script (set of characters):
      Proposed name of script:
   b. The proposal is for addition of character(s) to an existing block: *Yes*
      Name of the existing block: *Miscellaneous Technical*
2. Number of characters in proposal: *5*
3. Proposed category (select one from below - see section 2.2 of P&P document):
   A-Contemporary X B.1-Specialized (small collection) B.2-Specialized (large collection)
   C-Major extinct D-Attested extinct E-Minor extinct
   F-Archaic Hieroglyphic or Ideographic G-Obscure or questionable usage symbols
4. Is a repertoire including character names provided? *Yes*
   a. If YES, are the names in accordance with the "character naming guidelines" in Annex L of P&P document?
   b. Are the character shapes attached in a legible form suitable for review? *Yes*
5. Fonts related:
   a. Who will provide the appropriate computerized font to the Project Editor of 10646 for publishing the standard? *Joe Loughry*
   b. Identify the party granting a license for use of the font by the editors (include address, e-mail, ftp-site, etc.): *Joe Loughry (email: joe.loughry@stx.ox.ac.uk)*
6. References:
   a. Are references (to other character sets, dictionaries, descriptive texts etc.) provided? *Yes*
   b. Are published examples of use (such as samples from newspapers, magazines, or other sources) of proposed characters attached? *Yes*
7. 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*

8. Additional Information:

Submitters are invited to provide any additional information about Properties of the proposed Character(s) or Script that will assist in correct understanding of and correct linguistic processing of the proposed character(s) or script. Examples of such properties are: Casing information, Numeric information, Currency information, Display behaviour information such as line breaks, widths etc., Combining behaviour, Spacing behaviour, Directional behaviour, Default Collation behaviour, relevance in Mark Up contexts, Compatibility equivalence and other Unicode normalization related information. See the Unicode standard at http://www.unicode.org for such information on other scripts. Also see Unicode Character Database (http://www.unicode.org/reports/tr44/) and associated Unicode Technical Reports for information needed for consideration by the Unicode Technical Committee for inclusion in the Unicode Standard.

[1] Form number: N4102-F (Original 1994-10-14; Revised 1995-01, 1995-04, 1996-04, 1996-08, 1999-03, 2001-05, 2001-09, 2003-11, 2005-01, 2005-09, 2005-10, 2007-03, 2008-05, 2009-11, 2011-03, 2012-01)

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? *Bruce Nordman*
   If YES, available relevant documents: *IEEE Std 1621-2004*
3. Information on the user community for the proposed characters (for example: size, demographics, information technology use, or publishing use) is included? *Yes*
   Reference: *Proposal document*
4. The context of use for the proposed characters (type of use; common or rare) *common*
   Reference: *Proposal document*
5. Are the proposed characters in current use by the user community? *Yes*
   If YES, where? Reference: *Worldwide; ISO 7000:2012, IEC 60417, IEEE Std 1621-2004*
6. After giving due considerations to the principles in the P&P document must the proposed characters be entirely in the BMP? *Yes*
   If YES, is a rationale provided? *Yes*
   If YES, reference: *Proposal document*
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 characters be encoded using a composed character sequence of either existing characters or other proposed characters? *No*
   If YES, is a rationale for its inclusion provided?
   If YES, reference:
10. Can any of the proposed character(s) be considered to be similar (in appearance or function) to, or could be confused with, an existing character? *Yes*
    If YES, is a rationale for its inclusion provided? *Yes*
    If YES, reference: *Proposal; or http://energy.lbl.gov/ea/controls/publications/P500-03-012F.pdf*
11. Does the proposal include use of combining characters and/or use of composite sequences? *No*
    If YES, is a rationale for such use provided?
    If YES, reference:
    Is a list of composite sequences and their corresponding glyph images (graphic symbols) provided?
    If YES, reference:
12. Does the proposal contain characters with any special properties such as control function or similar semantics? *No*
    If YES, describe in detail (include attachment if necessary)
13. Does the proposal contain any Ideographic compatibility characters? *No*
    If YES, are the equivalent corresponding unified ideographic characters identified?
    If YES, reference: