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Information technology — Future keyboards and other input devices and entry methods

*Technologies de l'information — Claviers futurs, autres dispositifs
d'entrée associés et méthodes d'entrée liées*

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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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 35, *User interfaces*.

This fourth edition cancels and replaces the third edition (ISO/IEC TR 15440:2005), which has been technically revised.

This corrected version of ISO 15440:2016 incorporates the following corrections.

Korean and Chinese characters used throughout Annex A have been replaced with the correct symbols.

Introduction

This Technical Report, supported by the history of information technology keyboards during the last three decades, lists current and anticipated problem areas as seen by users and tries to pave the way to foreseen work items in JTC 1 for solving issues of the user interface with keyboards, other input devices and input methods.

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Information technology — Future keyboards and other input devices and entry methods

1 Scope

This Technical Report (TR) covers the following:

- different input requirements catering for national and international practices and support of cultural and linguistic diversity;
- recognition of requirements regarding comfort of use (for any user, including children, elderly and disabled people) and improved user productivity related to inputting data;
- enhancements of keyboards and related input devices and methods required for new emerging phenomena such as Internet, multimedia, virtual reality;
- virtual input requirements;
- labelling issues (soft [LCD] and hard, permanent and temporary labels), function symbols and icons.

This Technical Report does not cover implications of biometric input (fingerprint-based, iris-pattern-based, face-shape-based, etc.) devices for access and security.

This Technical Report is aimed at both the users and manufacturers and intends to present the user requirements regarding keyboards and associated devices and methods, at the time of publication of this technical report.

2 Terms and definitions

For the purposes of this document, the terms and definitions in ISO/IEC 9995-1 apply.

3 Benefits and disadvantages of current keyboards and data entry devices on the market

- Most existing desktop and laptop keyboards on the market are following ISO/IEC 9995-1 and ISO/IEC 9995-2. This helps for education and training.
- The situation on portable computers is less clear, as confusion very often exists between function and alphanumeric keys; some dedicated keys like the portable Fn key are either not “seen” by software or are used in different fashions between different manufacturers’ equipment. Different cursor and editing functions are interfering with character data entry. Because of the reduced size of the keyboard, row A in particular is really confusing, function keys varying locations from model to model and not being really well-thought out (for example, the Insert key is sometimes placed immediately next to the Delete key, which is extremely error-prone for the user); blind or visually impaired persons have specific problems, particularly with portable computers: the variation in the placement of the different keys due to the lack of strictly defined international standards for common functions. Because of this, no clues exist to help them finding the location of these functions. Even if the functions are not universal, a survey of the different functions should be made among the devices available on the market and reserving a relative location to each one in an international standard would be desirable.
- Most keyboards misinterpret some parts of ISO/IEC 9995. For example, the decimal separator is not used as a function but rather as an alphanumeric key [this creates problems in countries in which the decimal separator is multiple (this function should not depend from output representation)];

another case in point is the function terminology that is multiple and does not always respect ISO/IEC 9995-7.

- New, much more programmable keyboard interfaces are now becoming available, such as programmed keyboards displayed on a touch screen or displayed on some surface and recognized via a camera. Standards for layouting such keyboards, including code assignment to each key, are now available in ISO/IEC 24757, but actual use is limited. Guidance on using such mechanisms should be produced.

4 Comfort of use and productivity considerations

4.1 General comfort of use and productivity

- No major improvement in the comfort of use has been done since 1995 except some innovative, albeit sometimes very specific platform-oriented tools for multimedia and Internet usage working with very specific drivers.
- Standardisation of placement and functionality of common functions would appear to be possible as technology is stabilising.

EXAMPLE Print Screen function could be selectable at the platform-level as either an application-dependent function or as a “hard-wired” feature that prints the screen independently of the application running under a given operating system.

- Placement and functionality of functions such as Select Level 3 and Group Select remain to be fixed (American keyboards typically do not have a Level 3 select function, for example, and Group Select, when available, is done in different fashions due to lack of guidance in the first edition of ISO/IEC 9995).
- One important drawback of current keyboards is that no software can be made “aware” of the actual geometric layout as it is seen by the user, nor of the actual engraving seen by the user; if standard (de-facto or de-jure, even OEM) keyboards were registered and assigned a worldwide-fixed number, then the keyboard could identify itself (i.e. the actual engraving and geometry) to the software on request and then the software could better display actual mapping to other character sets than those engraved on the keyboard in addition to these. This is of particular importance in a more and more global, multilingual environment. Such a scheme would not necessitate a change in the actual “scan-code” technology used today. The use of ISO/IEC 24757 allows negotiating information on actual engraving of the keyboard.
- Comfort of use is highly dependent of the actual work done by a specific user; reassigning keys allows improvement of user productivity; this is possible only if the software is aware of the actual placement of keys of which it “sees” the “scan codes”; keyboards should ideally be designed according to human ergonomics and this is rarely the case. As an example, the common square keyboard is not ergonomically designed according to the function of normal hands/arms.
- Reassignment of actual “scan codes” of the physical keyboard by software would be desirable (so far, such reassignment is very difficult at the keyboard-driver level if at all possible) for example, to allow the use of a 7-8-9 layout on a 1-2-3 numeric keypad. Currently, hard-wired “scan codes” can be interpreted differently by software but that advantage becomes, at the same time, a problem if all “keyboard-scan-code-aware” programs do not all use the same interpretation of these “scan codes”. Such a reassignment would greatly improve software compatibility while serving the end-user and innovative application needs.
- an NP is desirable to standardise the minimum set of keyboard software-driven functions that should be made available by an operating system (and optionally, by an application), standardising placement of the involved function keys at the same time. Functionality could include email, web access, and turning audio on and off.

- ISO/IEC/TR 30109 has been approved to facilitate, among other things, a better match between the user's needs for functionality including national characters and input methods and the available keyboard hardware, e.g. at an Internet café or a hotel in a foreign country.
- Function of the "Capitals Lock"/"Shift Lock" key.

While ISO/IEC 9995-2 expresses that a key providing one of the functions Capitals lock (usually called "Caps Lock"), Level 2 lock (i.e. "Shift lock"), or Generalized lock (which is not specified further) needs to be present, the exact function of this key is not standardized in the ISO/IEC 9995 series. Common implementations show the inheritance from the mechanical typewriter, where such keys in fact were acting by mechanical engagement and mechanical release by pressing of either the lock key again or the Shift key. As, unlike on mechanical typewriters, the actuation of the lock key provides no special tactile or audible feedback for the touch typist (like the spring force or the special sound of the engaging mechanism), it is likely to be recognized only after long sequences of subsequent keys have been entered and misinterpreted.

A solution could be standardized which, in addition to avoid the effect of an inadvertent hitting of the lock key, has the advantage that the actuation has a unique function independent of any state (unlike a solution where the lock key switches between lock-on and lock-off, thus being dependent from the current lock state). This is the following:

- Shift + Lock (simultaneously pressed) switch to the state "Shift Lock";
- "Level 3 Select" (i.e. AltGr) + Lock (simultaneously pressed) switch to the state "Caps Lock";
- Lock pressed alone switches off any "Shift Lock" or "Caps Lock" state.

Thus, any inadvertent pressing of the lock key, while neither "Shift Lock" nor "Caps Lock" is on, has no effect.

The function of the "Num Lock" key can be standardized analogously.

4.2 Ergonomic keypad labelling for keyboards with a secondary group

The current ISO/IEC 9995-1 requires for layouts with more than one group that on the keytops, the characters of the (up to) three levels of each group are displayed in a column. While this is a clean solution from a systematic view, it has the ergonomic disadvantage that the height on every character, including the whitespace separating it from other characters or the keytop border, can be a third of the total keytop height at maximum. This applies even for layouts where only four characters are to be displayed, which is the case if the second group does not employ the third level, and employs the second level only for capital letters with the paired lowercase letters at the first level, thus the second level does not need to be displayed on the keytop also.

The T2 layout in the new German keyboard standard DIN 2137-01:2012-06 was designed deliberately to accommodate these requirements.

If there is a way to display in two rows and two columns, the characters could be displayed considerably larger. This is a real advantage especially for elderly people with age-related long-sightedness who are not touch-typists.

In consequence, when there are only two groups displayed and support for only one level of group 2 is required, a future standard should allow the labelling as follows, provided that all levels of group 1 use the same colour or the same shade of gray in column 2 and column 1, and that the level of group 2 displayed uses a different colour or shade of gray:

- Group 1, Level 1: lower left corner of the keytop (colour A or shade of gray A);
- Group 1, Level 2: upper left corner of the keytop (colour A or shade of gray A);
- Group 1, Level 3: lower right corner of the keytop (colour A or shade of gray A);