# Cereon

Cereon KIS1 reference manual

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Revision history

| Date | Comment |
|---|---|
| 25 May 2007 | Initial draft. |
| 5 May 2015 | Documented Swiss German layout. |

# 1 Contents

# 2 Introduction

This manual is a definitive specification of the Cereon KIS1 architecture and operation.

## 2.1 Features overview

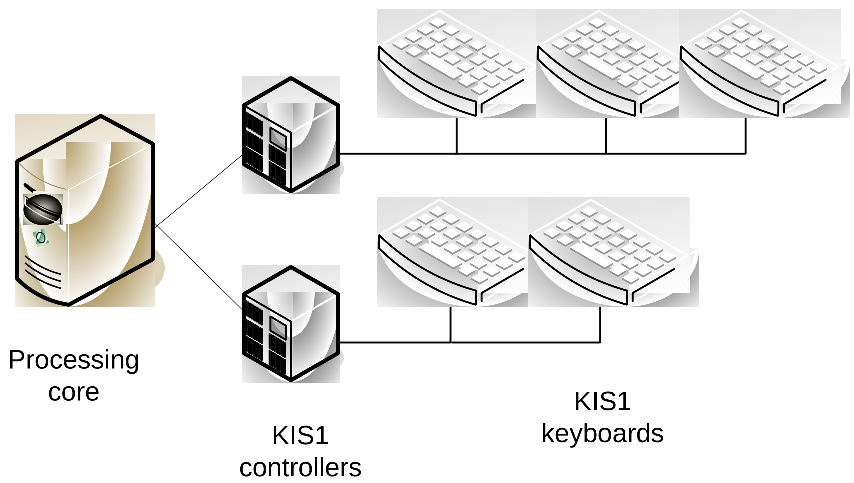
The Cereon KIS1 (Keyboard Input System, version 1, henceforth referred to as simply KIS1) architecture defines a set of hardware components used for providing keyboard input facilities for workstation and server Cereon configurations. It is characterised by:

- Support for a large number of concurrent input sources.
- Ultra-low-bandwidth interface, which allows a large number of keyboard input devices to be connected to the same computer.
- Controller sharing, which allows a single controller to manage a large number of keyboard input devices.
- Automatic recognition of keyboard layouts, which allows for automatic driver configuration.

All of these features are natural consequences of the main KIS1 design goal of supporting massively multi-user system configurations geared towards development and office activities.

## 2.2 Architecture overview

The following diagram presents a general overview of the KIS1 architecture:




Individual components of the KIS1 are explained in the following sections:

### 2.2.1 Processing core

This is a main processing core of a computer system, which contains main processor(s), memory, and other system components.

### 2.2.2 KIS1 controllers

Depending on the specific model and configuration of the computer where the KIS1 subsystem is used, KIS1 controllers can be bundled with the main processing core, connected as external devices or even bundled with KIS1 keyboards. In either case, there is no logical difference in the functions performed by KIS1 controllers – the said functions being receiving input from the keyboard units and forwarding this input to the main processing core, as well as receiving keyboard control commands sent by the main processing core and using these commands to adjust the state of the keyboards attached to the controller.

Depending on the model, a single KIS1 controller can manage from 1 to 256 independent KIS1 keyboards. Similarly, particular computer systems can be equipped with any number of KIS1 controllers.

### 2.2.3 KIS1 keyboard

A KIS-compatible keyboard is a peripheral device that provides actual data input facilities. The keyboard is managed by the KIS1 controller to which it is connected and uses that same controller to notify the main processing core of all input.

Note that the main processing core has no means of communicating with KIS1 keyboards directly – all communications are between the main processing core and the KIS1 controllers.

As providing a single keyboard as an input device without any means of input feedback is error-prone, most configuration will complement each keyboard with some sort of visualisation device, which will act as an input feedback mechanism by echoing all keyboard input, such as a VDS1 display (or some other similar device, such as a typewriter or a “smart” terminal).

## 2.3 Programming overview

As far as the main processing core is concerned, each KIS1 controller connected to the main processing core is represented by a set of registers. Writing to these registers sends commands to the KIS1 controller; similarly, reading from these registers allows the main processing core to examine the status of the KIS1 controller.

The exact means by which KIS1 controller registers are made available to the main processing core can vary from system to system. For example:

- On a system with memory-mapped I/O, registers of a particular KIS1 controller can be mapped at predefined memory addresses within the I/O memory address space.
- On a system with non-memory-mapped I/O, registers of a particular KIS1 controller can be mapped onto a predefined set of I/O ports.

The above list is not exhaustive (for example, some system may allocate a separate coprocessor for KIS1 subsystem and map KIS1 controller registers to that coprocessor’s registers, etc.) However, regardless of how KIS1 registers are presented to the main processing core, the same set of KIS1 registers is always defined for a KIS1 controller.

In the remainder of this manual, all information about programming KIS1 controllers will be given in terms of these logical KIS1 controller registers. In order to apply this documentation to a particular computer system, the programmer shall consult that computer system's documentation in order to understand how KIS1 registers are accessed by the main processing core.

# 3 Programming the KIS1

This chapter describes the programmer's interface to a KIS1 subsystem.

## 3.1 The KIS1 controller basics

A single KIS1 controller is capable of managing from 1 to 256 KIS1 keyboards. Depending on the model of the KIS1 controller in question, the maximum supported number of keyboards can vary.

Compartments within a single KIS1 controller are identified by 8-bit numbers in range [0..255]. At any given time, one of the keyboards within a KIS1 controller is selected as "current".

### 3.1.1 Controller registers

Registers of a KIS1 controller are subdivided into:

- Public registers, which are used for communication between the main processing core and the KIS1 controller, and
- Private registers, which are not directly accessible to the main processing core, but must be manipulated using commands sent to the public registers.

For example, to change the LED state of a specific keyboard the program must write a new value to the private `DEVICE_STATE` register of that keyboard. Since that private register is not directly accessible by the main processing core, the goal is achieved by selecting the keyboard in question as the "current" within the controller, then writing to the `DEVICE_STATE` controller public register.

## 3.2 Public controller registers

This section describes public registers of a KIS1 controller. These registers are used for communications between the KIS1 controller and the main processing core.

### 3.2.1 STATE

The `STATE` register of a KIS1 controller is a 8-bit read-only register that reflects the current state of the controller. Any attempts of the main processing core to change the value of this register are ignored.

Individual bits within the `STATE` register have the following meaning:

| Bit | Mask | Meaning |
|---|---|---|
| `ON` | `0x01` | 1 if the KIS1 controller is operational, 0 otherwise. |
| `BUSY` | `0x02` | 1 if the controller is busy, 0 if it is idle.<br>An attempt to read any of the controller's public registers (except for `STATE`) while the controller is busy may result in an unpredictable value; similarly, an attempt to write to any of the |

| | | |
|---|---|---|
| | | controller's public registers while the controller is busy is ignored. Typically, writing to any of the controller's public registers will cause the controller to become busy for some time in order to handle the state change. |
| INPUT_READY | 0x04 | 1 if a pending input is ready on some of the keyboard(s) attached to the controller; 0 if there is no pending input. |
| - | 0xFE | Unused bits; read as unpredictable. |

### 3.2.2 CURRENT_DEVICE

The CURRENT_DEVICE register of a KIS1 controller is a 8-bit read/write register that contains the ID [0..255] of the keyboard selected as "current". Writing a new value to this register either causes the corresponding keyboard to become current or is ignored if the specified keyboard does not exist. To determine whether an attempt to write to this register was successful, its value shall be read after it is written and compared to the value written – if the two match, the write was successful.

### 3.2.3 INTERRUPT_MASK

The INTERRUPT_MASK register of a KIS1 controller's compartment is a 8-bit read/write register used by the KIS1 controller to determine which state change events cause I/O interrupts to be sent to the main processing core. Individual bits within this register have the following meaning:

| Bit | Mask | Meaning |
|---|---|---|
| BUSY_OFF | 0x01 | When this bit is 1, a BUSY_OFF I/O interrupt occurs each time the BUSY bit of the STATE register changes from 1 to 0. |
| INPUT_READY_ON | 0x02 | When this bit is 1, an INPUT_READY_ON I/O interrupt occurs each time the INPUT_READY bit of the STATE register changes from 0 to 1. |
| - | 0xFC | Reserved for future use. |

When a new value is written into the INTERRUPT_MASK register, it takes effect from the moment the controller finishes handling the write (i.e. when the BUSY flag of the STATE register becomes 0 after the write).

### 3.2.4 INPUT_SOURCE

The INPUT_SOURCE register of a KIS1 controller is a 8-bit read-only register. Whenever the INPUT_READY bit of STATE is 1 and BUSY bit is 0, the INPUT_SOURCE register contains the ID [0..255] of the keyboard where an input is pending. An attempt to read this register when the INPUT_READY bit of STATE is 0 or BUSY bit is 1 results in an unpredictable value.

### 3.2.5 DEVICE_STATE

The `DEVICE_STATE` register of a KIS1 controller is a 8-bit read/write register that is mapped onto the `DEVICE_STATE` private register of the “current” keyboard. Changing the current keyboard (by writing a new value into the `CURRENT_DEVICE` register) changes the mapping correspondingly.

### 3.2.6 DATA_IN

The `DATA_IN` register of a KIS1 controller is a 8-bit read-only register that is mapped onto the `DATA_IN` private register of the “current” keyboard. Changing the current keyboard (by writing a new value into the `CURRENT_DEVICE` register) changes the mapping correspondingly. Any attempt to write to this register is ignored.

### 3.2.7 LAYOUT

The `LAYOUT` register of a KIS1 controller is a 8-bit read-only register that is mapped onto the `LAYOUT` private register of the “current” keyboard. Changing the current keyboard (by writing a new value into the `CURRENT_DEVICE` register) changes the mapping correspondingly. Any attempt to write to this register is ignored.

## 3.3 Keyboard registers

A KIS1 – compatible keyboard is a keyboard input device that, as far as the KIS1 controller is concerned, is represented by a set of registers, which are used to issue commands to the keyboard and receive input.

### 3.3.1 DEVICE_STATE

The `DEVICE_STATE` register of a KIS1 keyboard is a 8-bit read/write register that contains the current state of that keyboard. Individual bits within the register have the following meaning:

| Bit | Mask | Meaning |
|---|---|---|
| `ACTIVE` | `0x01` | 1 if this keyboard is active (i.e. will sent input to the main processing core via the KIS1 controller), 0 if it is inactive. |
| `NUM_LOCK` | `0x02` | 1 if the “Num Lock” LED is turned on, 0 if it is off. |
| `CAPS_LOCK` | `0x04` | 1 if the “Caps Lock” LED is turned on, 0 if it is off. |
| `SCROLL_LOCK` | `0x08` | 1 if the “Scroll Lock” LED is turned on, 0 if it is off. |
| - | `0x70` | Reserved for future use. |
| `INPUT_READY` | `0x80` | 1 if the keyboard is currently waiting for a pending input to be handled by the main processing core, 0 if not. |

### 3.3.2 DATA_IN

The `DATA_IN` register of a KIS1 keyboard is a 8-bit read-only register that contains the byte a keyboard is trying to send to the main processing core whenever the `INPUT_READY` bit of the keyboard's `DEVICE_STATE` is 1. Reading from this register when the `INPUT_READY` bit of the keyboard's `DEVICE_STATE` is 0 produces an unpredictable value.

When a keyboard provides a byte of input to the main processing core, this byte contains:

- 0 in the upper bit (mask `0x80`) if a key was pressed; 1 if a key was released.
- The scan code of the key that was pressed or released in the lower 7 bits (mask `0x7F`).

Appendix B to this document defines scan codes for keyboards of various layouts.

### 3.3.3 LAYOUT

The `LAYOUT` register of a KIS1 keyboard is a 8-bit read-only register whose value encodes the keyboard's layout. The presence of this register allows automatic recognition of keyboard layouts by OS keyboard drivers.

Currently, the following keyboard layout codes are defined:

| Code | Occurs when… |
|---|---|
| `0x00` | Unknown; this is used by older keyboards that do not provide automatic layout information. |
| `0x01` | Bulgarian |
| `0x02` | Czech |
| `0x03` | Danish |
| `0x04` | German |
| `0x05` | Greek |
| `0x06` | US |
| `0x07` | Spanish |
| `0x08` | Finnish |
| `0x09` | French |
| `0x0A` | Hungarian |
| `0x0B` | Icelandic |
| `0x0C` | Italian |
| `0x0D` | Dutch |
| `0x0E` | Norwegian |
| `0x0F` | Polish (Programmers) |

| | |
|---|---|
| 0x10 | Portuguese (Brazilian ABNT) |
| 0x11 | Romanian |
| 0x12 | Russian |
| 0x13 | Croatian |
| 0x14 | Slovak |
| 0x15 | Albanian |
| 0x16 | Swedish |
| 0x17 | Turkish Q |
| 0x18 | Ukrainian |
| 0x19 | Belarusian |
| 0x1A | Slovenian |
| 0x1B | Estonian |
| 0x1C | Latvian |
| 0x1D | Lithuanian IBM |
| 0x1E | Azeri Latin |
| 0x1F | FYRO Macedonian |
| 0x20 | Faeroese |
| 0x21 | Maltese 47-key |
| 0x22 | Norwegian with Sami |
| 0x23 | Kazakh |
| 0x24 | Kyrgyz Cyrillic |
| 0x25 | Tatar |
| 0x26 | Bengali |
| 0x27 | Malayalam |
| 0x28 | Mongolian Cyrillic |
| 0x29 | United Kingdom Extended |
| 0x2A | Maori |
| 0x2B | Swiss German |
| 0x2C | United Kingdom |
| 0x2D | Latin American |
| 0x2E | Belgian French |
| 0x2F | Belgian (Period) |
| 0x30 | Portuguese |
| 0x31 | Serbian (Latin) |

| | |
|---|---|
| 0x32 | Azeri Cyrillic |
| 0x33 | Swedish with Sami |
| 0x34 | Uzbek Cyrillic |
| 0x35 | Canadian French (Legacy) |
| 0x36 | Serbian (Cyrillic) |
| 0x37 | Canadian French |
| 0x38 | Swiss French |
| 0x39 | Bosnian |
| 0x3A | Irish |
| 0x3B | Bulgarian (Latin) |
| 0x3C | Czech (QWERTY) |
| 0x3D | German (IBM) |
| 0x3E | Greek (220) |
| 0x3F | United States-Dvorak |
| 0x40 | Spanish Variation |
| 0x41 | Hungarian 101-key |
| 0x42 | Italian (142) |
| 0x43 | Polish (214) |
| 0x44 | Portuguese (Brazilian ABNT2) |
| 0x45 | Russian (Typewriter) |
| 0x46 | Slovak (QWERTY) |
| 0x47 | Turkish F |
| 0x48 | Latvian (QWERTY) |
| 0x49 | Lithuanian |
| 0x4A | Maltese 48-key |
| 0x4B | Sami Extended Norway |
| 0x4C | Bengali (Inscript) |
| 0x4D | Belgian (Comma) |
| 0x4E | Finnish with Sami |
| 0x4F | Canadian Multilingual Standard |
| 0x50 | Gaelic |
| 0x51 | Czech Programmers |
| 0x52 | Greek (319) |
| 0x53 | United States-International |

| | |
|---|---|
| 0x54 | Sami Extended Finland-Sweden |
| 0x55 | Greek (220) Latin |
| 0x56 | United States-Dvorak for left hand |
| 0x57 | Greek (319) Latin |
| 0x58 | United States-Dvorak for right hand |
| 0x59 | Greek Latin |
| 0x5A | Greek Polytonic |
| 0x5B..0xFF | Reserved for future use. |

## 3.4 Interrupts

The following table summarizes I/O interrupts that can be raised by a VDS1 controller:

| Name | Code | Occurs when… |
|---|---|---|
| BUSY_OFF | 0x01 | The BUSY_OFF I/O bit of the INTERRUPT_MASK register is 1 and the BUSY bit of the STATE register changes from 1 to 0. |
| INPUT_READY_ON | 0x02 | The INPUT_READY_ON I/O bit of the INTERRUPT_MASK register is 1 and the INPUT_READY bit of the STATE register changes from 0 to 1. |

### 3.4.1 Pending interrupts

A situation may occur when a KIS1 controller is ready to issue an I/O interrupt before the previous I/O interrupt issued by the same KIS1 controller has been processed by the main processing core.

In this situation, the interrupt remains pending within the I/O controller. As soon as the previous interrupt has been processed, the pending interrupt is issued.

Interrupts in an I/O controller are pending in the order in which they occurred; however, only one pending interrupt of each type can exist at any given moment.

## 3.5 Obtaining keyboard input

To obtain the keyboard input, the main processor code shall perform the following steps:

1. Wait until the INPUT_READY bit of the KIS1 controller's STATE register becomes 1. This can be done by polling or by enabling the INPUT_READY interrupt and waiting until it occurs.

2. Wait until BUSY bit of the KIS1 controller's STATE register becomes 0, signalling that keyboard input is ready for acquisition. This can be done by polling or by enabling the BUSY_OFF interrupt and waiting until it occurs.
3. Read the INPUT_SOURCE and DATA_IN registers of the KIS1 controller, thus obtaining the keyboard ID and an input event.
4. Writing the value read from INPUT_SOURCE register to the CURRENT_DEVICE register. This selects the keyboard whose input is being handled as "current".
5. Wait until BUSY bit of the KIS1 controller's STATE register becomes 0, signalling that keyboard selection has finished. This can be done by polling or by enabling the BUSY_OFF interrupt and waiting until it occurs.
6. At this point, the INPUT_READY bit of the DEVICE_STATE register is guaranteed to be 1. Write a new value to the DEVICE_STATE register with the INPUT_READY bit set to 0; this will a) signal to the current keyboard that a single input byte has been handled and keyboard shall resume waiting for more input and b) set the INPUT_READY bit of the KIS1 controller's STATE register to become 0.
7. Wait until BUSY bit of the KIS1 controller's STATE register becomes 0, signalling that keyboard state change has been effected. This can be done by polling or by enabling the BUSY_OFF interrupt and waiting until it occurs.

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# 5 Appendix B: Key scan codes

This appendix documents the scan codes assigned to keys in various keyboard layouts.

## 5.1 Bulgarian

TODO

## 5.2 Czech

TODO

## 5.3 Danish

TODO

## 5.4 German

TODO

## 5.5 Greek

TODO

## 5.6 US

TODO

## 5.7 Spanish

TODO

## 5.8 Finnish

TODO

## 5.9 French

TODO

## 5.10 Hungarian

TODO

## 5.11 Icelandic

TODO

## 5.12 Italian

TODO

## 5.13 Dutch

TODO

## 5.14 Norwegian

TODO

## 5.15 Polish (Programmers)

TODO

## 5.16 Portuguese (Brazilian ABNT)

TODO

## 5.17 Romanian

TODO

## 5.18 Russian

TODO

## 5.19 Croatian

TODO

## 5.20 Slovak

TODO

## 5.21 Albanian

TODO

## 5.22 Swedish

TODO

## 5.23 Turkish Q

TODO

## 5.24 Ukrainian

TODO

## 5.25 Belarusian

TODO

## 5.26 Slovenian

TODO

## 5.27 Estonian

TODO

## 5.28 Latvian

TODO

## 5.29 Lithuanian IBM

TODO

## 5.30 Azeri Latin

TODO

## 5.31 FYRO Macedonian

TODO

## 5.32 Faeroese

TODO

## 5.33 Maltese 47-key

TODO

## 5.34 Norwegian with Sami

TODO

## 5.35 Kazakh

TODO

## 5.36 Kyrgyz Cyrillic

TODO

## 5.37 Tatar

TODO

## 5.38 Bengali

TODO

## 5.39 Malayalam

TODO

## 5.40 Mongolian Cyrillic

TODO

## 5.41 United Kingdom Extended

| Key | Code | Key | Code | Key | Code | Key | Code |
|---|---|---|---|---|---|---|---|
| Esc | 0 | F1 | 1 | F2 | 2 | F3 | 3 |
| F4 | 4 | F5 | 5 | F6 | 6 | F7 | 7 |
| F8 | 8 | F9 | 9 | F10 | 10 | ¬`¦ | 11 |
| 1! | 12 | 2” | 13 | 3£ | 14 | 4$€ | 15 |

<table>
<tr><td>5%</td><td>16</td><td>6^</td><td>17</td><td>7&</td><td>18</td><td>8*</td><td>19</td></tr>
<tr><td>9(</td><td>20</td><td>0)</td><td>21</td><td>-_</td><td>22</td><td>=+</td><td>23</td></tr>
<tr><td>BkSpc</td><td>24</td><td>Tab</td><td>25</td><td>Q</td><td>26</td><td>W</td><td>27</td></tr>
<tr><td>E</td><td>28</td><td>R</td><td>29</td><td>T</td><td>30</td><td>Y</td><td>31</td></tr>
<tr><td>U</td><td>32</td><td>I</td><td>33</td><td>O</td><td>34</td><td>P</td><td>35</td></tr>
<tr><td>[{</td><td>36</td><td>]}</td><td>37</td><td>Enter</td><td>38</td><td>Caps</td><td>39</td></tr>
<tr><td>A</td><td>40</td><td>S</td><td>41</td><td>D</td><td>42</td><td>F</td><td>43</td></tr>
<tr><td>G</td><td>44</td><td>H</td><td>45</td><td>J</td><td>46</td><td>K</td><td>47</td></tr>
<tr><td>L</td><td>48</td><td>;:</td><td>49</td><td>‘@</td><td>50</td><td>#~</td><td>51</td></tr>
<tr><td>LShift</td><td>52</td><td>\|</td><td>53</td><td>Z</td><td>54</td><td>X</td><td>55</td></tr>
<tr><td>C</td><td>56</td><td>V</td><td>57</td><td>B</td><td>58</td><td>N</td><td>59</td></tr>
<tr><td>M</td><td>60</td><td>,<</td><td>61</td><td>.></td><td>62</td><td>/?</td><td>63</td></tr>
<tr><td>LCtrl</td><td>64</td><td>Alt</td><td>65</td><td>Space</td><td>66</td><td>AltGr</td><td>67</td></tr>
<tr><td>RCtrl</td><td>68</td><td>PrtSc</td><td>69</td><td>ScrlLck</td><td>70</td><td>Break</td><td>71</td></tr>
<tr><td>Ins</td><td>72</td><td>Del</td><td>73</td><td>Home</td><td>74</td><td>End</td><td>75</td></tr>
<tr><td>PgUp</td><td>76</td><td>PgDn</td><td>77</td><td>Left</td><td>78</td><td>Right</td><td>79</td></tr>
<tr><td>Up</td><td>80</td><td>Down</td><td>81</td><td>NumLk</td><td>82</td><td>Pad /</td><td>83</td></tr>
<tr><td>Pad *</td><td>84</td><td>Pad +</td><td>85</td><td>Pad -</td><td>86</td><td>PadEnter</td><td>87</td></tr>
<tr><td>Pad 0</td><td>88</td><td>Pad 1</td><td>89</td><td>Pad 2</td><td>90</td><td>Pad 3</td><td>91</td></tr>
<tr><td>Pad 4</td><td>92</td><td>Pad 5</td><td>93</td><td>Pad 6</td><td>94</td><td>Pad 7</td><td>95</td></tr>
<tr><td>Pad 8</td><td>96</td><td>Pad 9</td><td>97</td><td>Pad .</td><td>98</td><td>RShift</td><td>99</td></tr>
<tr><td>F11</td><td>100</td><td>F12</td><td>101</td><td>LWin</td><td>102</td><td>RWin</td><td>103</td></tr>
<tr><td>Menu</td><td>104</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

## 5.42 Maori

TODO

## 5.43 Swiss German

<table>
<tr><th>Key</th><th>Code</th><th>Key</th><th>Code</th><th>Key</th><th>Code</th><th>Key</th><th>Code</th></tr>
<tr><td>Esc</td><td>0</td><td>F1</td><td>1</td><td>F2</td><td>2</td><td>F3</td><td>3</td></tr>
<tr><td>F4</td><td>4</td><td>F5</td><td>5</td><td>F6</td><td>6</td><td>F7</td><td>7</td></tr>
<tr><td>F8</td><td>8</td><td>F9</td><td>9</td><td>F10</td><td>10</td><td>§°</td><td>11</td></tr>
<tr><td>1+¦</td><td>12</td><td>2”@</td><td>13</td><td>3*#</td><td>14</td><td>4ç</td><td>15</td></tr>
<tr><td>5%</td><td>16</td><td>6&¬</td><td>17</td><td>7/|</td><td>18</td><td>8(¢</td><td>19</td></tr>
<tr><td>9)</td><td>20</td><td>0=</td><td>21</td><td>‘?´</td><td>22</td><td>^`~</td><td>23</td></tr>
</table>

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BkSpc | 24 | Tab | 25 | Q | 26 | W | 27 |
| E | 28 | R | 29 | T | 30 | Z | 31 |
| U | 32 | I | 33 | O | 34 | P | 35 |
| üè[ | 36 | ¨!] | 37 | Enter | 38 | Caps | 39 |
| A | 40 | S | 41 | D | 42 | F | 43 |
| G | 44 | H | 45 | J | 46 | K | 47 |
| L | 48 | öé | 49 | äà{ | 50 | $£} | 51 |
| LShift | 52 | <>\ | 53 | Y | 54 | X | 55 |
| C | 56 | V | 57 | B | 58 | N | 59 |
| M | 60 | ,; | 61 | .: | 62 | -_ | 63 |
| LCtrl | 64 | Alt | 65 | Space | 66 | AltGr | 67 |
| RCtrl | 68 | PrtSc | 69 | ScrlLck | 70 | Break | 71 |
| Ins | 72 | Del | 73 | Home | 74 | End | 75 |
| PgUp | 76 | PgDn | 77 | Left | 78 | Right | 79 |
| Up | 80 | Down | 81 | NumLk | 82 | Pad / | 83 |
| Pad * | 84 | Pad + | 85 | Pad - | 86 | PadEnter | 87 |
| Pad 0 | 88 | Pad 1 | 89 | Pad 2 | 90 | Pad 3 | 91 |
| Pad 4 | 92 | Pad 5 | 93 | Pad 6 | 94 | Pad 7 | 95 |
| Pad 8 | 96 | Pad 9 | 97 | Pad . | 98 | RShift | 99 |
| F11 | 100 | F12 | 101 | LWin | 102 | RWin | 103 |
| Menu | 104 | | | | | | |

## 5.44 United Kingdom

| Key | Code | Key | Code | Key | Code | Key | Code |
|---|---|---|---|---|---|---|---|
| Esc | 0 | F1 | 1 | F2 | 2 | F3 | 3 |
| F4 | 4 | F5 | 5 | F6 | 6 | F7 | 7 |
| F8 | 8 | F9 | 9 | F10 | 10 | ¬`¦ | 11 |
| 1! | 12 | 2” | 13 | 3£ | 14 | 4$€ | 15 |
| 5% | 16 | 6^ | 17 | 7& | 18 | 8* | 19 |
| 9( | 20 | 0) | 21 | -_ | 22 | =+ | 23 |
| BkSpc | 24 | Tab | 25 | Q | 26 | W | 27 |
| E | 28 | R | 29 | T | 30 | Y | 31 |
| U | 32 | I | 33 | O | 34 | P | 35 |
| [{ | 36 | ]} | 37 | Enter | 38 | Caps | 39 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | 40 | S | 41 | D | 42 | F | 43 |
| G | 44 | H | 45 | J | 46 | K | 47 |
| L | 48 | ;: | 49 | ‘@ | 50 | #~ | 51 |
| Shift | 52 | \\| | 53 | Z | 54 | X | 55 |
| C | 56 | V | 57 | B | 58 | N | 59 |
| M | 60 | ,< | 61 | .> | 62 | /? | 63 |
| LCtrl | 64 | Alt | 65 | Space | 66 | AltGr | 67 |
| RCtrl | 68 | PrtSc | 69 | ScrlLck | 70 | Break | 71 |
| Ins | 72 | Del | 73 | Home | 74 | End | 75 |
| PgUp | 76 | PgDn | 77 | Left | 78 | Right | 79 |
| Up | 80 | Down | 81 | NumLk | 82 | Pad / | 83 |
| Pad * | 84 | Pad + | 85 | Pad - | 86 | PadEnter | 87 |
| Pad 0 | 88 | Pad 1 | 89 | Pad 2 | 90 | Pad 3 | 91 |
| Pad 4 | 92 | Pad 5 | 93 | Pad 6 | 94 | Pad 7 | 95 |
| Pad 8 | 96 | Pad 9 | 97 | Pad . | 98 | | |

## 5.45 Latin American

TODO

## 5.46 Belgian French

TODO

## 5.47 Belgian (Period)

TODO

## 5.48 Portuguese

TODO

## 5.49 Serbian (Latin)

TODO

## 5.50 Azeri Cyrillic

TODO

## 5.51 Swedish with Sami

TODO

## 5.52 Uzbek Cyrillic

TODO

## 5.53 Canadian French (Legacy)

TODO

## 5.54 Serbian (Cyrillic)

TODO

## 5.55 Canadian French

TODO

## 5.56 Swiss French

TODO

## 5.57 Bosnian

TODO

## 5.58 Irish

TODO

## 5.59 Bulgarian (Latin)

TODO

## 5.60 Czech (QWERTY)

TODO

## 5.61 German (IBM)

TODO

## 5.62 Greek (220)

TODO

## 5.63 United States-Dvorak

TODO

## 5.64 Spanish Variation

TODO

## 5.65 Hungarian 101-key

TODO

## 5.66 Italian (142)

TODO

## 5.67 Polish (214)

TODO

## 5.68 Portuguese (Brazilian ABNT2)

TODO

## 5.69 Russian (Typewriter)

TODO

## 5.70 Slovak (QWERTY)

TODO

## 5.71 Turkish F

TODO

## 5.72 Latvian (QWERTY)

TODO

## 5.73 Lithuanian

TODO

## 5.74 Maltese 48-key

TODO

## 5.75 Sami Extended Norway

TODO

## 5.76 Bengali (Inscript)

TODO

## 5.77 Belgian (Comma)

TODO

## 5.78 Finnish with Sami

TODO

## 5.79 Canadian Multilingual Standard

TODO

## 5.80 Gaelic

TODO

## 5.81 Czech Programmers

TODO

## 5.82 Greek (319)

TODO

## 5.83 United States-International

TODO

## 5.84 Sami Extended Finland-Sweden

TODO

## 5.85 Greek (220) Latin

TODO

## 5.86 United States-Dvorak for left hand

TODO

## 5.87 Greek (319) Latin

TODO

## 5.88 United States-Dvorak for right hand

TODO

## 5.89 Greek Latin

TODO

## 5.90 Greek Polytonic

TODO