Scan Codes Demystified

As a few previous pages discussed keyboards, including the keyboard for the IBM PC, and ways in which I might like to modify and enlarge it, it seemed appropriate to investigate what could be possible, within the framework of the way in which the PC keyboard communicates with the keyboard to which it is attached.

Here are links to three of the many pages I went to which contained useful information on the subject:

http://www.delorie.com/djgpp/doc/rbinter/it/06/0.html

http://www.win.tue.nl/~aeb/linux/kbt/scancodes-1.html

http://www.seasip.info/VintagePC/ibm_1390876.html

https://web.stanford.edu/class/cs140/projects/pintos/specs/kbd/scancodes-7.html

The third of these pages includes one piece of information that had eluded me when I originally created this page; it shows the "official" Scan Code 1 equivalents of the keys on a 122-key Host Connected Keyboard.

Both the international keyboard and the 122-keyboard with 24 function keys for 3270 emulation use include one key more in the main typing area of the keyboard than the normal United States 101-key (or 104-key with Windows keys) keyboard for the PC. One thing I wanted to do in making an enlarged keyboard was to include this key, so that it is available if needed, but put it in an unobtrusive spot. But attempting to do that actually raises a complicated issue; from one point of view, the 105-key keyboard actually has two added keys, and omits the key from the 104-key keyboard with | and \ on it instead of simply moving it to the other side of the keyboard to where the key with the same characters is located on a UK keyboard.

Or so I thought; but the key with ~ and # on it on the UK 102-key keyboard actually does use the same scan code as the key with | and \ on the US 101-key keyboard, yet references still say that key is omitted rather than relabelled on foreign-language keyboards. But they are right; the scan code is the same in scan code sets 1 and 2, but not in scan code set 3, where the U.S. version has scan code 5C, and the international version has scan code 5D, and the USB scan code differs as well.

Because the original keyboards for the IBM Personal Computer AT and its predecessors had some keys that combined functions in a different fashion than is done on the 101-key keyboard, specifically:

```
*               Print Screen
Scroll Lock     Break
System Request
```

the keys on the 101-key keyboard embodying these functions in different combinations do not have simple scan codes (that is, in Scan Code Set 1 and Scan Code Set 2) but instead, for compatibility, cause extra signals to be sent so as to modify the current shift state before sending their make code (and to restore it after sending their break code). This is in addition to the cursor keypad keys which both send the E0 signal to distinguish themselves and extra signals to adjust the Num Lock and shift status as appropriate. The / key in the numeric keypad area was also a late addition, and also has to generate extra scan codes under some circumstances.

The following diagram illustrates the layout of the keyboard on the original IBM Personal Computer, and the IBM Personal Computer XT as well:

For simplicity, and to avoid having to abbreviate the legends on some keys, it does not show that many of the keys had a raised central portion, so that the faces of the larger keys were the same size as those of the smaller ones.

However, I have since exerted myself to produce a more faithful diagram of the appearance of the original keyboard for the IBM Personal Computer:
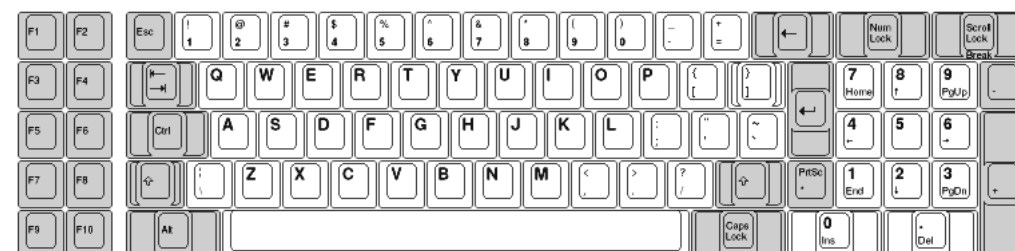
A keyboard with the same arrangement was also used with the IBM System/23 Datamaster computer, an 8085-based successor to the IBM 5110-3 processor used in the IBM 5120 system, which was introduced shortly before the IBM PC was announced, and this keyboard design was also used on the 68000-based CS9000 system from IBM intended for use with laboratory instrumentation.

The positioning of the Enter key and the left shift key were unpopular with many users; these things were corrected in the keyboard for the IBM Personal Computer AT:
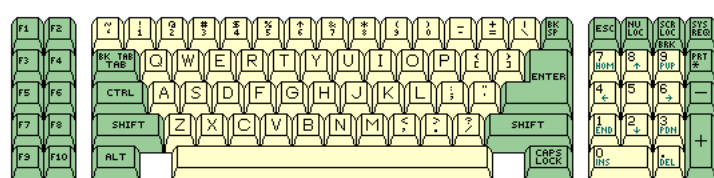
This keyboard, except for the extra System Request key, has exactly the same keys as the original PC keyboard, they are only arranged differently. This keyboard was very popular with computer users, despite the fact that now the Backspace key was hard to reach. So much so that when the 101-key Enhanced Keyboard started to become common, many manufacturers of keyboards compatible with that keyboard produced keyboards with a layout that was modified to follow that of the 84-key AT keyboard more closely.

As with the original PC keyboard, I have now made a more accurate image of its appearance:
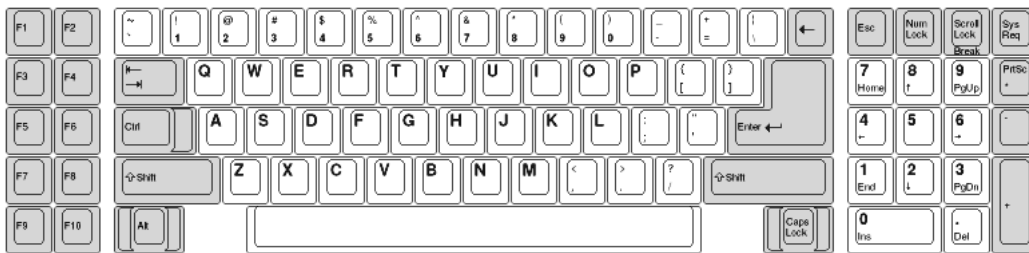
The diagram below shows the arrangement of keys on the 101-key Enhanced Keyboard. As this keyboard arrangement is likely to be very familiar, and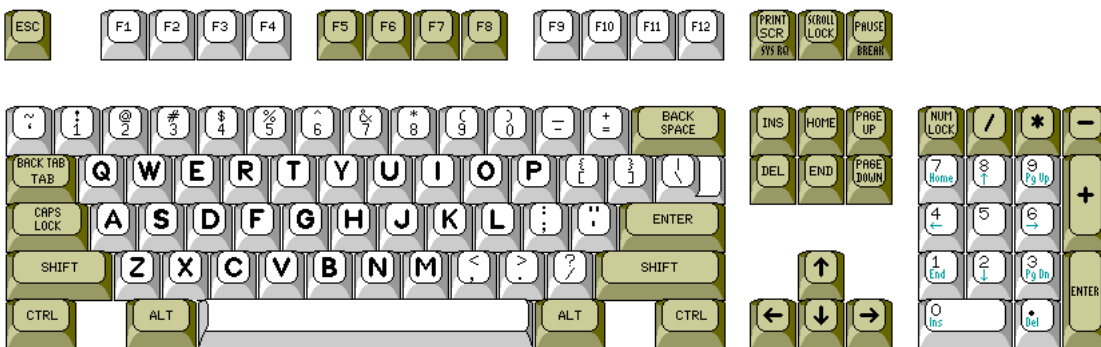 to be at least the basis of the arrangement used on the computer at which you are viewing this web site, even if it is a Macintosh, it may seem hardly necessary to include an image.

This keyboard arrangement was introduced on the IBM RT PC, which was IBM's first RS/6000-based workstation, and which ran IBM's AIX operating system, its licensed implementation of UNIX.

This keyboard design attracted notice, and became the industry standard, after the introduction of IBM's Personal System/2 line of computers, on which it was used; however, before then, it was used on other IBM systems, including the IBM XT 286, some later models of the Personal Computer AT. Prior to the Personal System/2, the Compaq Deskpro 386 offered a keyboard in this style as an option.

This keyboard finally placed both shift keys, the Enter key, and the Backspace key all in the locations familiar to typists. As well, it offered a cursor keypad that was always available, so that one could keep the keyboard in Num Lock mode, and have the numeric keypad available as well. One noted computer columnist criticized the keyboard for having two extra function keys which would be unlikely to be used, due to compatibility concerns; this was, in itself, a valid criticism, but he overlooked the justification for this addition: that IBM's mainframe terminals generally had a set of either 12 or 24 function keys, and thus this change made terminal emulation programs for them more convenient; on older keyboards, the programs could use the other keyboard mappings already used for those keyboards.

But some subtler changes were made that led to scan codes becoming complicated. Since the + and - keys on the numeric keypad didn't become anything else when shifted, the Print Screen function was taken away from the numeric keypad's * key, and given its own key. Since the System Request function introduced on the AT was very rarely used, it was moved to that key. A Pause key was added to the keyboard, and the Break function was moved to that key, and away from the Scroll Lock key, since it seemed to be more closely related to that key.

The PC architecture is designed to cope with different keyboard layouts for different languages, and some programs, like games, access key locations directly so that the physical relationships between keys used for different purposes will remain the same regardless of the language used with the computer on which the game is running.

While the original 101-key keyboards could only be used on newer IBM computers designed to work with them, however, the merits of the new keyboard arrangement were such that there was a great demand for keyboards with this arrangement that would be compatible with older computers. This led to the assignments for Scan Code Set 1 and Scan Code Set 2, associated with the 83-key and 84-key keyboards respectively, for this keyboard becoming complicated, since these scan codes were assigned so that a 101-key keyboard would simulate an 84-key keyboard when the keys with the same function were pressed, regardless of their new location on the new keyboard.

Scan Code Set 1 corresponds to the scan codes of the keyboard of the IBM PC, and to what most computer programs see when they request scan codes from the BIOS, despite that virtually all computers with conventionally-connected keyboards use Scan Code Set 2, which corresponds to the scan codes sent by the keyboard of the IBM Personal Computer AT, as the BIOS translates these. Scan Code Set 3 was designed to be native to the 101-key keyboard; it is used by keyboards connected to the higher-end members of the original IBM PS/2 family which had 386 processors (some low-end machines in the original PS/2 family actually used Scan Code Set 1), and with a few computers running licensed commercial versions of the UNIX operating system (as well, perhaps, as some computers using Linux if they are configured for use with keyboards with a large number of keys that their owners had been fortunate enough to obtain): as it had not been implemented correctly on some 3rd-party keyboards, it has not achieved general acceptance. USB keyboards use their own different set of key codes, which have been defined and standardized by Microsoft.

The keyboard sends both a make code and a break code for most of the keys. For scan code set 1, the break code is hexadecimal 80 XOR the regular scan code; for scan code sets 2 and 3, the break code consists of two bytes, hexadecimal F0 preceding the regular scan code.

This is what the table of the scan codes of the keyboard pictured above might have looked like. It is incomplete, however. The top row shows the scan codes when the key is used with the Fn key.

As noted above, the cursor keys whose functions match those provided by the numeric keypad also generate extra scan codes, representing the "Num Lock" key, if required, for the 101-key keyboard to simulate the 84-key keyboard of the IBM Personal Computer AT; the scan codes for these keys are marked by an asterisk.

As the / key on the numeric keypad was added later, unlike the +, -, and * keys there which have their own scan codes, it has the scan code for the ?/ key preceded by the E0 code which is used to distinguish the left and right Alt and Ctrl keys from each other precisely because it is ignored by older machines; hence, it wiggles out of being shifted to avoid making a question mark on those machines; newer machines are tipped off that it is a different key by the E0, and so they can use a 101-key keyboard for languages where something other than the slash is on the key used for the ? and / in the main typing area.

In addition, the original IBM PC keyboard had the Print Screen function on the same key as the asterisk, and the Break function was on the Scroll Lock key, and the AT keyboard had the System Request function on its own key.

Since different scan codes, not conflicting with those used by the 122-key keyboard, are used for the other extra keyboard functions, such as a key to turn the computer on from the keyboard, keys to access the Internet, keys to change speaker volume, and since the letters of the alphabet still have *some* blank space left on the front of the keys, the Fn key could be used to allow the use of those functions as well, possibly even producing a universal keyboard.

Here is a table of keyboard scan codes, compiled from numerous sources. The first part of the table is in the same order as the set 1 scan codes of the keys. The third column contains some popular added keys for multimedia and Internet keyboards from various keyboards, and some manufacturers may use different scan codes for these functions, although the codes shown here are generally popular ones, and the scan codes for the extra keys on a 122-key keyboard, about which I am not entirely certain.

```
Scan Code              Key     Scan Code                  Key      Scan Code                 Key
  Set    Set   Set  USB          Set    Set   Set  USB             Set     Set   Set  USB
   1      2     3                 1      2     3                     1       2     3

   01     76    08   29  Esc      37     7C            * PrtSc    E0 5E    E0 37           Power
   02     16    16   1E  ! 1      37+    7C+   7E   55 * KP       E0 5F    E0 3F           Sleep
   03     1E    1E   1F  @ 2      37/54+ 7C/84 57   46 PrtSc      E0 63    E0 5E           Wake
   04     26    26   20  # 3      38     11    19   E2 Alt L      E0 20    E0 23        7F Mute
   05     25    25   21  $ 4   E0 38  E0 11    39   E6 Alt R      E0 30    E0 33        80 Volume Up
   06     2E    2E   22  % 5      39     29    29   2C Space      E0 2E    E0 21        81 Volume Down
   07     36    36   23  ^ 6      3A     58    14   39 Caps Lock  E0 17    E0 43        7B Cut
   08     3D    3D   24  & 7      3B     05    07   3A F1         E0 18    E0 44        7C Copy
   09     3E    3E   25  * 8      3C     06    0F   3B F2         E0 0A    E0 46        7D Paste
   0A     46    46   26  ( 9      3D     04    17   3C F3         E0 3B    E0 05        75 Help
   0B     45    45   27  ) 0      3E     0C    1F   3D F4         E0 08    E0 3D        7A Undo
   0C     4E    4E   2D  _ -      3F     03    27   3E F5         E0 07    E0 36           Redo
   0D     55    55   2E  + =      40     0B    2F   3F F6         E0 22    E0 34           Play
   0E     66    66   2A  Back Space 41   83    37   40 F7         E0 24    E0 3B           Stop
   0F     0D    0D   2B  Tab      42     0A    3F   41 F8         E0 10    E0 15           Skip Back
   10     15    15   14  Q        43     01    47   42 F9         E0 19    E0 4D           Skip Fwd
   11     1D    1D   1A  W        44     09    4F   43 F10        E0 2C    E0 1A           Eject
   12     24    24   08  E        45+    77+   76   53 Num Lock   E0 1E    E0 1C           Mail
   13     2D    2D   15  R     45/46+ 77/7E+   62   48 Pause/Bk   E0 32    E0 3A           Web
   14     2C    2C   17  T        46     7E            ScrLk/Bk   E0 3C    E0 06           Music
   15     35    35   1C  Y        46+    7E+   6C   5F Scroll Lock E0 64   E0 08           Pictures
   16     3C    3C   18  U        47     6C    6C   47 7 Home KP  E0 6D    E0 50           Video
   17     43    43   0C  I     E0 47* E0 6C*  6E   4A Home CP
   18     44    44   12  O        48     75    75   60 8 Up KP       5B     1F    08   68 F13
   19     4D    4D   13  P     E0 48* E0 75*  63   52 Up CP          5C     27    10   69 F14
   1A     54    54   2F  { [      49     7D    7D   61 9 PgUp KP      5D     2F    18   6A F15
   1B     5B    5B   30  } ]   E0 49* E0 7D*  6F   4B PgUp CP        63     5E    2C   6B F16
   1C     5A    5A   28  Enter    4A     6B    6B   5C - KP          64     08    2B   6C F17
E0 1C  E0 5A    79   58  Enter KP 4B     6B    6B   5C 4 Left KP     65     10    30   6D F18
   1D     14    11   E0  Ctrl L E0 4B* E0 6B*  61   50 Left CP       66     18    38   6E F19
E0 1D  E0 14    58   E4  Ctrl R   4C     73    73   97 5 KP          67     20    40   6F F20
   1E     1C    1C   04  A        4D     74    74   5E 6 Right KP    68     28    48   70 F21
   1F     1B    1B   16  S     E0 4D* E0 74*  6A   4F Right CP       69     30    50   71 F22
   20     23    23   07  D        4E     79    7C   57 + KP          6A     38    57   72 F23
   21     2B    2B   09  F        4F     69    69   59 1 End KP      6B     40    5F   73 F24
   22     34    34   0A  G     E0 4F* E0 69*  65   4D End CP                           75    Help
   23     33    33   0B  H        50     72    72   5A 2 Down KP  [71]      19    05   9A Attn  SysRq
   24     3B    3B   0D  J     E0 50* E0 72*  60   51 Down CP       76     5F    06   9C Clear
   25     42    42   0F  K        51     7A    7A   5B 3 PgDn KP                       76          Stop
   26     4B    4B   0F  L     E0 51* E0 7A*  6D   4E PgDn CP                          77          Again
   27     4C    4C   33  : ;      52     70    70   62 0 Ins KP      72     39    04   A3 CrSel    Properties
   28     52    52   34  " '   E0 52* E0 70*  67   49 Ins CP                          0C    Pause  ErInp
   29     0E    0E   35  ~ `      53     71    71   63 . Del KP                        78          Undo
   2A     12    12   E1  Shift L E0 53* E0 71*  64   4C Del CP        74     53    03   A4 ExSel  SetUp
   2B     5D    5C   31  | \      54     84            SysRq         6D     50    0E   ErEOF Recrd
   2B     5D    53   53  (INT 2)  56     61    13   64 (INT 1)
   2C     1A    1A   1D  Z        57     78    56   44 F11                             80          Copy
   2D     22    22   1B  X        58     07    5E   45 F12                             83    Print  Ident
   2E     21    21   06  C     E0 5B  E0 1F    8B   E3 Win L         6F     6F    0A   Copy   Test
   2F     2A    2A   19  V     E0 5C  E0 27    8C   E7 Win R
   30     32    32   05  B     E0 5D  E0 2F    8D   65 WinMenu                         81          Paste
   31     31    31   11  N        70     13    87   88 katakana      75     5C    01   Enl    Help
   32     3A    3A   10  M        73     51    51   87 (INT 3)       6C     48    09   Ctrl
   33     41    41   36  < ,      77     62            furigana                        82          Find
   34     49    49   37  > .      79     64    86   8A kanji                           79          Cut
   35     4A    4A   38  ? /      7B     67    85   8B hiragana
   35+    4A+   77   54  / KP     7D     6A    5D   89 (INT 4)    E0 4C    E0 73    62   Rule
   36     59    59   E5  Shift R [7E]    6D    7B      (INT 5)
```

The Microsoft standard for USB keyboards appears to define codes for the extra keys on a Sun keyboard. As some of them are to the left of the main typewriter keyboard in the same way as the extra keys on a 122-key keyboard, they are noted together with those keys in the table above. In one case, the CrSel/Properties key, the key is explicitly given as having both the 122-key and the Sun functions for a key at the same position. (Also, the code A2 stands for a Clear/Again key, even though code 9C is given for the Clear key and code 77 for the Again key.)

Incidentally, the keyboard with my Sony computer has keys for the functions Mail, Web, Music, Video, Pictures, and Help, but instead of being as listed in the table above, they are (as translated to Set 1 form Set 2, of course) E0 11, E0 12, E0 13, E0 14, E0 15, and E0 16, respectively. The key with the moon on it, though, is the standard E0 5F, so it is a sleep key, not a power key.

As the keys are also labelled S1 through S6, assigning them consecutive codes is not without a measure of sense: the keyboard design provides for an overlay on those keys, so presumably they are to be regarded as reassignable.

Notes:

The keypad * key with Set 1 scan code shown as 37+ causes the necessary actions to be taken to make it appear that no shift key is depressed while it is being pressed.

The Print Screen key with Set 1 scan code shown as 37/54+ sends E0 37, with a shift key forced to appear depressed, unless one already is depressed. Typically, if neither shift key is pressed, codes for the left shift key will be sent to achieve this. When a control key is held down, it will also send E0 37, but without modifying apparent shift key status, since ctrl-(PrtSc/*) had an alternative printing function with the 83-key and 84-key keyboards (Behavior in scan code Set 2 is analogous, as the two sets are isomorphic except for a byte translation and the difference in break code handling.). When the Alt key is held down, it behaves as a System Request key, and sends scan code 54, which was assigned as the Scan Code Set 1 equivalent of scan code 84, the Scan Code Set 2 code for the System Request key.

The Num Lock key with Set 1 scan code shown as 45+ (presumably) causes the necessary actions to be taken to make it appear that no control key is depressed while it is being pressed, since on the 83-key and 84-key keyboards, ctrl-Num Lock was used for the Pause function.

The Pause/Break key with Set 1 scan code shown as 45/46+ takes the necessary actions to make it appear that a control key is pressed when no control key is pressed, in which case it sends 45 (with an additional E1 code indicating the key is nonrepeating), and simply sends the code 46 when a control key is pressed. This key also has the property that the Break function does not come with a break code. To avoid problems when the shift state changes, when the control key is not held down, on the 101-key keyboard it will send the make code for the Pause function followed by the break code for the Pause function when the key is pressed, and no codes on release.

The Scroll Lock key with Set 1 scan code shown as 46+ (presumably) causes the necessary actions to be taken to make it appear that no control key is depressed while it is being pressed.

The various cursor pad keys, as marked with an asterisk, in addition to having their scan codes in Set 1 and Set 2 prefixed with E0, take the necessary action to make it appear that the keyboard is not in Num Lock mode, and that no shift key is depressed, when they are pressed. (Alternatively, if the keyboard is in Num Lock mode, *and* a shift key is depressed, it might seem that these keys could get away with taking no special action. This is particularly useful when both shift keys are depressed; similarly, if both shift keys are depressed when not in Num Lock mode, the keys could make it appear that Num Lock mode is in effect instead of unpressing and subsequently restoring both shift keys. This is probably not done by any keyboard manufacturer, because of the danger of incompatibility with software using the keyboard in a nonstandard fashion.)

Note that the INT 5 key for the Japanese keyboard and the Attn/Sys Rq key for the 122-key keyboard are shown with Scan Code Set 1 codes which could not actually be used by a keyboard with Scan Code Set 1, because their break codes conflict with protocol codes used by this keyboard. What is happening here is that keyboards with these keys, although they cannot use Scan Code Set 1, may use Scan Code Set 2, and the codes shown for Scan Code Set 1 are the codes to which the Scan Code Set 2 codes will normally be translated.

International Keys

INT 1 is the key next to the left shift key on an international keyboard. On many international keyboards, it has the characters < and >, but on the United Kingdom keyboard, it has | and \.

INT 2 is the lower key of the two to the right of the Enter key on an international keyboard. Confusingly, it, and not the one with | and \ on it in the UK, has the same scan code in some sets as the U. S. | and \ key; and on the Canadian French keyboard, it is this key that has < and > on it. In the United Kingdom, the characters on this key are ~ and #.

INT 3 is found both on some Brazilian keyboards and on the Japanese keyboard used for a Kanji input method (it has hiragana on the keys, as opposed to the other form of a plain Japanese keyboard with katakana on the keys). On the Japanese keyboard, it has _ and \ on it, and is located next to the right shift key.

INT 4 is also found on the Japanese keyboard. It has | and ¥ on it and is located next to the backspace key.

INT 5 is located on the numeric keypad on some Brazilian keyboards. It has the same Group 3 scan code as the extra key on the numeric keypad of 122-key keyboards when the code assignments used for keyboards used with IBM terminals are followed.

Also, the Korean keyboard has two extra keys, having scan codes F1 and F2, which are unique to that keyboard, rather than being chosen from among the extra keys used on other international keyboards.

This diagram shows how the codes from Scan Code Set 1 appear to be allocated to the keys on a standard 101-key keyboard:

```
 ---    ----------------   ----------------   ----------------   -----------
| 01|   | 3B| 3C| 3D| 3E|  | 3F| 40| 41| 42|  | 43| 44| 57| 58|  |+37|+46|+45|
 ---    ----------------   ----------------   ----------------   -----------


 ------------------------------------------------------   -----------   ---------------
| 29| 02| 03| 04| 05| 06| 07| 08| 09| 0A| 0B| 0C| 0D|  0E|  |*52|*47|*49|  |+45|+35|+37| 4A|
|-----------------------------------------------------|  |-----------|  |---------------|
|  0F| 10| 11| 12| 13| 14| 15| 16| 17| 18| 19| 1A| 1B|  2B|  |*53|*4F|*51|  | 47| 48| 49|   |
|-----------------------------------------------------|   -----------   |-----------| 4E|
|  3A| 1E| 1F| 20| 21| 22| 23| 24| 25| 26| 27| 28|      1C|                | 4B| 4C| 4D|   |
|---------------------------------------------------|       ---          |---------------|
|    2A| 2C| 2D| 2E| 2F| 30| 31| 32| 33| 34| 35|        36|      |*4C|     | 4F| 50| 51|   |
|---------------------------------------------------|       -----------   |-----------|-1C|
|  1D|-5B|   38|                   39|-38|-5C|-5D|  -1D|  |*4B|*50|*4D|   |    52| 53|   |
 ----------------------------------------------------    -----------   ---------------
```

where the keys marked with - are simply prefixed with E0, and keys marked with * are prefixed with E0, but also require sending a Num Lock code before and after if necessary, and the keys marked with + require more complicated special steps. Thus, +35 and +37, the / and * keys on the numeric keypad, use the 35 code of the ?/ key in the alphabetic keyboard and the 37 code of the PrtSc * key on the XT and AT keyboards respectively. The key code itself is prefixed with E0, but in addition, to ensure that / and * are the functions generated, the keys are taken out of any shifts that are present.

The AT keyboard had four keys with the codes and functions:

```
45 Num Lock/Pause
46 Scroll Lock/Break
54 Sys Req
37 */Prt Sc
```

The keys on the 101-key keyboard, though, allocate these functions differently, and so when operating in Scan Code Set 2, the keyboard pretends to be an 84-key AT keyboard, sending scan codes corresponding to the equivalent keys being pressed on that keyboard. A simplified description of what happens, using Scan Code Set 1 codes, is below:

```
Prt Sc/Sys Req  if no control shift, shift, 37, restore; if control shift, unshift, 54, restore
Scroll Lock     unshift, 46, restore
Pause/Break     if no control shift: ctrl, 45, restore; if control shift, 46
Num Lock        unshift, 45, restore
* (keypad)      unshift, E0 37, restore
```

where unshifting can involve removing a control shift as well.

This diagram illustrates the U.S. 101-key keyboard, the international 102-key keyboard, and the Japanese 106-key keyboard: They are shown with my own idiosyncratic color-coding, since that, by dividing the keys up into smaller visually-distinct groups, helps one to follow where the same key moves to from one keyboard to another.
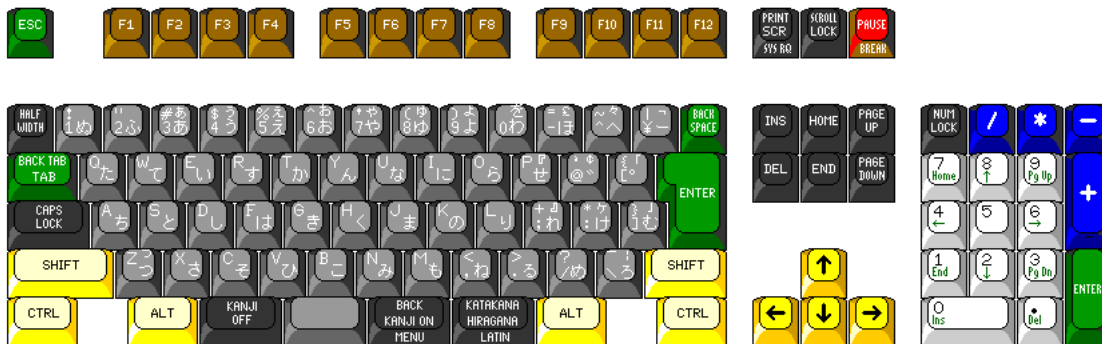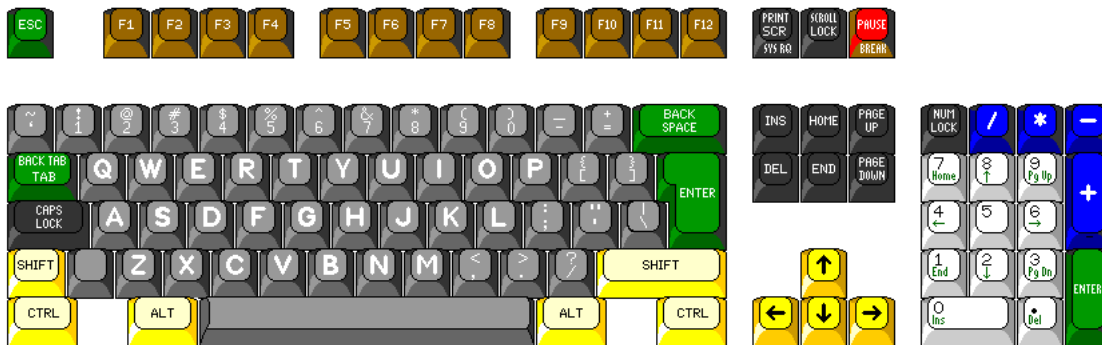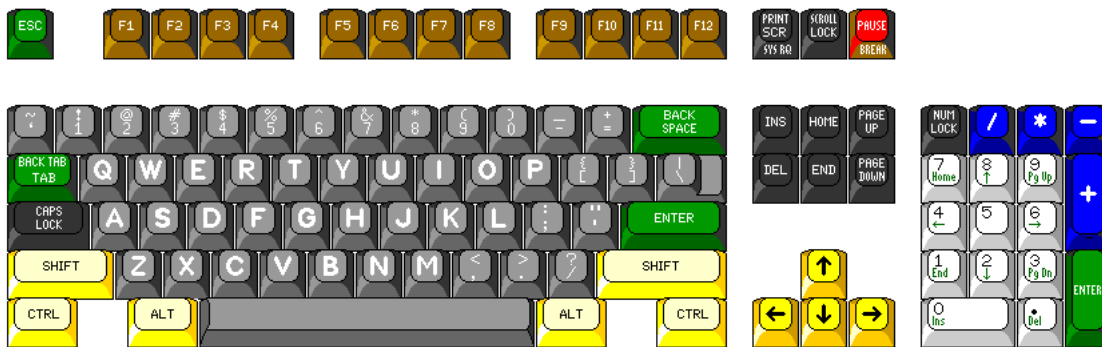
The international keyboard is illustrated with the characters from the U.S. keyboard on its keys, to make it easier to see which key is which. The additional key in the main typing area is left blank.

The allocation of scan codes to its keys is nearly identical to that of the U.S. keyboard, but with one important minor difference:

```
 ---       ---------------  ---------------  ---------------   -----------
| 01|     | 3B| 3C| 3D| 3E| | 3F| 40| 41| 42| | 43| 44| 57| 58| |+37|+46|+45|
 ---       ---------------  ---------------  ---------------   -----------

 ------------------------------------------------------   -----------   ---------------
| 29| 02| 03| 04| 05| 06| 07| 08| 09| 0A| 0B| 0C| 0D|     0E| |*52|*47|*49| |+45|+35|+37| 4A|
|------------------------------------------------------|   |-----------| |---------------|
|   0F| 10| 11| 12| 13| 14| 15| 16| 17| 18| 19| 1A| 1B| |     |*53|*4F|*51| | 47| 48| 49|   |
|-----------------------------------------------------| 1C|  -----------  |-----------| 4E|
|   3A| 1E| 1F| 20| 21| 22| 23| 24| 25| 26| 27| 28|!2B|  |                | 4B| 4C| 4D|   |
|------------------------------------------------------|        ---       |---------------|
|  2A| 56| 2C| 2D| 2E| 2F| 30| 31| 32| 33| 34| 35|      36|     |*4C|      | 4F| 50| 51|   |
|------------------------------------------------------|   -----------  |-----------|-1C|
|   1D|-5B|   38|                       39|-38|-5C|-5D|  -1D| |*4B|*50|*4D| |   52| 53|   |
 ------------------------------------------------------   -----------   ---------------
```

The key with scan code 2B, located next to the Enter key, is the INT 2 key instead of the |\ key of the U.S. keyboard, and so, while it has scan codes 2B in Scan Code Set 1 and 5D in Scan Code Set 2, the same as those on the U.S. keyboard, it has scan code 53 in Scan Code Set 3 instead of 5C. As well, the INT 1 key is present on this keyboard, between the left shift key and the letter Z.

Unlike the image above, this diagram shows the three keys with scan codes E0 5B, E0 5C, and E0 5D, shown as -5B, -5C, and -5D within it, the left Windows key, the right Windows key, and the Windows Menu key.

The Japanese keyboard is a more complicated case, as it has several extra keys.

```
 ---       ---------------  ---------------  ---------------   -----------
| 01|     | 3B| 3C| 3D| 3E| | 3F| 40| 41| 42| | 43| 44| 57| 58| |+37|+46|+45|
 ---       ---------------  ---------------  ---------------   -----------

 ----------------------------------------------------------   -----------   ---------------
| 29| 02| 03| 04| 05| 06| 07| 08| 09| 0A| 0B| 0C| 0D| 7D| 0E| |*52|*47|*49| |+45|+35|+37| 4A|
|----------------------------------------------------------|   |-----------| |---------------|
|   0F| 10| 11| 12| 13| 14| 15| 16| 17| 18| 19| 1A| 1B|     |     |*53|*4F|*51| | 47| 48| 49|   |
|---------------------------------------------------------| 1C|  -----------  |-----------| 4E|
|   3A| 1E| 1F| 20| 21| 22| 23| 24| 25| 26| 27| 28|!2B|  |                    | 4B| 4C| 4D|   |
|----------------------------------------------------------|        ---       |---------------|
|     2A| 2C| 2D| 2E| 2F| 30| 31| 32| 33| 34| 35|      36|     |*4C|      | 4F| 50| 51|   |
|----------------------------------------------------------|   -----------  |-----------|-1C|
|   1D|-5B|   38|   7B|         39|   79|  70|-38|-5C|-5D| -1D| |*4B|*50|*4D| |   52| 53|   |
 ----------------------------------------------------------   -----------   ---------------
```

Given that it has the same position, I presume the key with scan code 2B is INT2 once again.

It has additional keys with scan codes 7B, 79, and 70, the Hiragana, Kanji, and Katakana shift keys respectively, as well as the additional INT 4 key, with scan code 7D, next to the backspace, but is otherwise not that much different from other versions of the PC keybboard.

Again, the diagram above shows the Windows key, unlike the image.

In Scan Code 3, everything is strictly based on position. This was true of the earlier scan codes, but they were based on the positions of keys on earlier forms of the keyboard, and then the codes moved with the keys for newer versions of the keyboard for compatibility. Thus, a single diagram suffices to illustrate the Scan Code 3 equivalents of the keys in all three keyboards, by placing the scan codes of keys added to the basic 101-key keyboard (or the one removed from it in some of the other keyboards in one case) in parentheses, so that it is clear which code belongs to the Space Bar, or the Back Space key, or the Enter key, or the left-hand Shift key.

```
 ---           ---------------   ---------------   ---------------   -----------
| 08|         | 07| 0F| 17| 1F| | 27| 2F| 37| 3F| | 47| 4F| 56| 5E| | 57| 5F| 62|
 ---           ---------------   ---------------   ---------------   -----------

 ----------------------------------------------------------------   -----------   ---------------
| 0E| 16| 1E| 26| 25| 2E| 36| 3D| 3E| 46| 45| 4E| 55|(5D) 66|      | 67| 6E| 7D| | 76| 77| 7E| 84|
|-----------------------------------------------------------------| |-----------| |---------------|
|   0D| 15| 1D| 24| 2D| 2C| 35| 3C| 43| 44| 4D| 54| 5B| (5C)|      | 64| 65| 6D| | 6C| 75| 7D|   |
|-----------------------------------------------------------------| -----------  |-----------|  7C|
|    14| 1C| 1B| 23| 2B| 34| 33| 3B| 42| 4B| 4C| 52|(53)  5A|                     | 6B| 73| 74|   |
|-----------------------------------------------------------------|     ---      |---------------|
| 12 (13)| 1A| 22| 21| 2A| 32| 31| 3A| 41| 49| 4A|(51)    59|      | 63|         | 69| 72| 7A|   |
|-----------------------------------------------------------------| -----------  |-----------|  79|
|   11|     | 19| (85)|   29| (86)|  (87)|  39|    | 58|           | 61| 60| 6A| |     70| 71|   |
 -----       ---------------------------------   -----           -----------  |---------------|
```

Many non-IBM keyboard manufacturers will move the key that is in either the 5C or 53 position to the 5D position, while having it retain its old scan code, because of the popularity of the AT keyboard layout. Scan Code 2, of course, in which this is appropriate, is the one usually used by the PC, and some non-IBM keyboards have been found not to properly support Scan Code 3. Because Scan Code 3 is designed for the modern 101-key keyboard, while the earlier scan code sets were designed for the keyboards on the original PC and AT, some versions of Linux attempt to use Scan Code 3 if possible, which can lead to problems.

One item of IBM documentation online interchanges the positions of the keys with scan codes 13 and 53 from that shown in the diagram above. This appears to be a misprint, as it conflicts with other sources of information.

This illustration of the Host Connected Keyboard can be compared to the chart below it of its scan codes in Scan Code Set 3:


```
          -------------------------------------------------
         | 08| 10| 18| 20| 28| 30| 38| 40| 48| 50| 57| 5F|
         |-------------------------------------------------|
         | 07| 0F| 17| 1F| 27| 2F| 37| 3F| 47| 4F| 56| 5E|
          -------------------------------------------------

 -------   ----------------------------------------------------------   -----------   ---------------
| 05| 06| | 0E| 16| 1E| 26| 25| 2E| 36| 3D| 3E| 46| 45| 4E| 55|    66| | 67| 6E| 7D| | 76| 77| 7E| 84|
|-------| |---------------------------------------------------------|  |-----------| |---------------|
| 04| 0C| | 0D| 15| 1D| 24| 2D| 2C| 35| 3C| 43| 44| 4D| 54| 5B|    |  | 64| 65| 6D| | 6C| 75| 7D| 7C|
|-------| |-------------------------------------------------------- 5A| -----------  |-----------|---|
| 03| 0B| |   14| 1C| 1B| 23| 2B| 34| 33| 3B| 42| 4B| 4C| 52| 53|   |  | 63|        | 6B| 73| 74| 7B|
|-------| |---------------------------------------------------------|  -----------  |---------------|
| 83| 0A| | 12| 13| 1A| 22| 21| 2A| 32| 31| 3A| 41| 49| 4A|     59|  | 61| 62| 6A| | 69| 72| 7A|   |
|-------| |---------------------------------------------------------|  -----------  |-----------|  79|
| 01| 09| |   11|     | 19|                29|  39|    | 58|          | 60|         |     70| 71|   |
 -------   -----       --------------------------   -----           ---           ---------------
```

Note that the keys for PF1 through PF12 have the same scan codes in Scan Code Set 3 as the keys for F1 through F12 on a 101-key keyboard. However, when a Host Connected Keyboard is connected to a PC, it is instead the group of ten keys to the left of the main typing area that behave as function keys F1 through F10, corresponding to their positions on an XT or AT keyboard. How can this be?

The answer is that a Host Connected Keyboard *only* uses Scan Code Set 3. This code is similar, but not identical, to Scan Code Set 2. A regular 101-key keyboard, or any other keyboard intended for normal PC use, will be switched into Scan Code Set 2 mode by the computer.

When a computer can't switch a keyboard from Scan Code Set 3 to Scan Code Set 2, it will just treat the scan codes from the keyboard as if they were in Scan Code Set 2 anyways. Thus, a 122-key keyboard will behave like an 84-key AT keyboard, with its different association of functions like Num Lock, Break, Scroll Lock, Pause, Print Screen... and even the asterisk on the numeric keypad, since the keyboards using Scan Code Set 3 don't engage in the tricks a 101-key keyboard uses in Scan Code Set 2 that allowed those functions to be rearranged on that keyboard.

This only applies if the operating system on the computer, like Microsoft Windows, attempts to switch the keyboard to Scan Code Set 2. Linux implementations typically choose to use Scan Code Set 3, if it is available, by default, and therefore a 122-key keyboard, under Linux, will behave more like a 101-key keyboard instead of like an 84-key keyboard. This, however, brings with it its own set of problems, because some less-expensive keyboards are known to have problems with their Scan Code Set 3 implementations.

In the U.S. keyboard, the key with | and \ on it has scan codes in Group 1, 2, and 3 respectively of 2B, 5D, and 5C.

The key in the illustration of the international keyboard with | and \ on it, next to the Enter key, is the INT 2 key, with scan codes in Group 1, 2, and 3 respectively of 2B, 5D, and 53. Thus, when used with Scan Code 2, as is usually the case on most PC-compatible computers when the PS/2 connector is used, this key is the same key as the | and \ key on the U.S. keyboard, simply moved to a different location. On the IBM PS/2, which uses Scan Code 3, or when a USB keyboard is used, however, they are two different keys. Even then, since software asking the operating system for the scan code of the last key pressed will recieve a Scan Code 1 value, the difference will usually not be significant.

The key between the left-hand Shift key and the letter Z has a new scan code in all sets, so its face is shown blank. Its scan codes in Group 1, 2, and 3 respectively are 56, 61, and 13; this is the INT 1 key.

The Japanese keyboard has several added keys.

Because Scan Code 3 is strictly based on the positions of keys on the 101-key keyboard and its relatives, the Half Width key, used to cause Katakana and Hiragana to take up the same room as ordinary ASCII characters, instead of twice the space, as Kanji (or Chinese characters) do, since it is the same position as the ~ and ` key, 0E. In this case, the same is true of Scan Code 1 and 2, so in the three scan codes respectively, its codes are 29, 0E, and 0E.

The new key with | and the Yen symbol on it, next to the backspace key, has codes 7D, 6A, and 5D respectively in Scan Code 1, 2, and 3. This is the key noted as INT 4 in the table above.

The key in the position of the INT 2 key, next to the lower half of the Enter key, is the INT 2 key, with scan codes 2B, 5D, and 53.

The new key on the left of the right-hand shift key is the INT 3 key, with scan codes 73, 51, and 51 in Scan Code 1, 2, and 3 respectively.

The new key on the left of the space bar, used to turn off translation of entries into Kanji, has scan codes 7B, 67, and 85 respectively.

The first new key on the right of the space bar, used to turn on translation of entries into Kanji, and used with shift and Alt to help select a Kanji character from those found by the computer, has scan codes 79, 64, and 86.

The second key on the right of the space bar is used to select between Hiragana, Katakana, or the Latin alphabet. If Kanji is turned off, this determines what will be typed; if it is on, it determines how the phonetic values of the Japanese language will be entered on the keyboard. Its scan codes are 70, 13, and 87.

Incidentally, the Japanese version of the 122-key keyboard omits the right-hand Alt key, and removes one key from the numeric keypad, so that it has 124 keys rather than 126 keys:
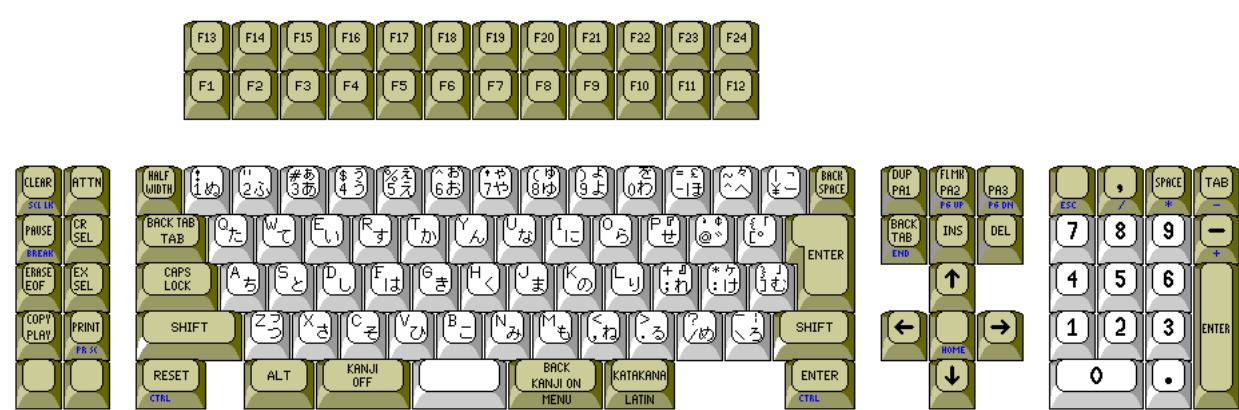
The 122-key Host Connected Keyboard

Some information about the additional keys of the 122-key keyboard is integrated in the table above. The information that relates only to the added keys has been left in that table, since it fits there most efficiently.

For those who are unfamiliar with the 122-key keyboard, the diagram below illustrates the arrangement of its keys:
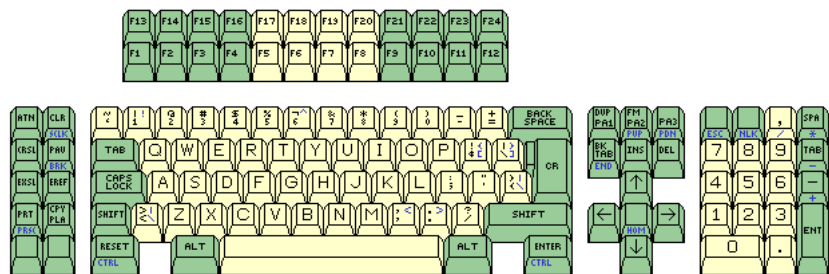
The diagram above shows the Host Connected Keyboard, as offered with the IBM Personal System/2 computers. Previously, a 122-key keyboard with the same arrangement of keys, that of the IBM 3270 Personal Computer, illustrated a significantly different assignment of keys from the IBM PC to positions on the 122-key keyboard:
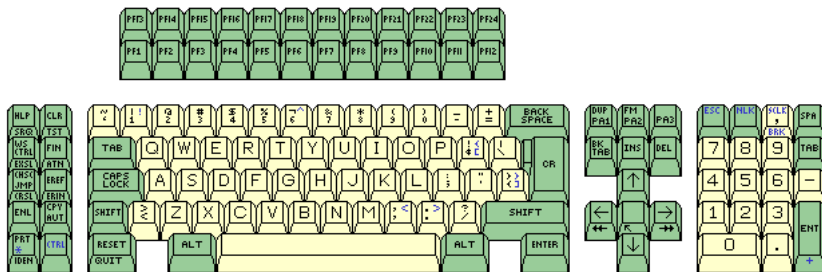
Another version of the 122-key keyboard, purchased by someone at government surplus, formerly used by NASA, and including the APL character set, looked like this:
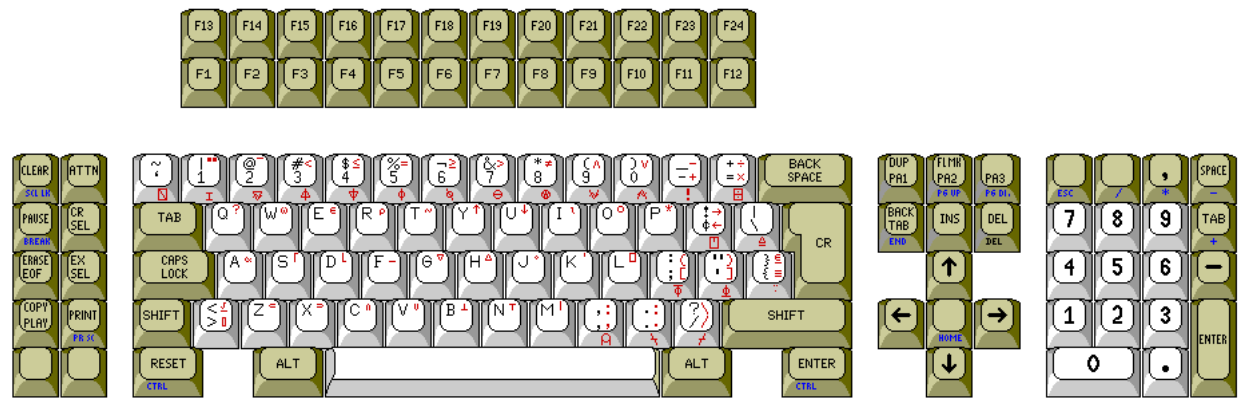
Incidentally, for comparison, here is one of the more popular keyboard arrangements for the original IBM 3277 Display Station, part of the IBM 3270 display subsystem:

The key codes given in the table above are from sources which may refer to different versions of this keyboard style, and is also incomplete for some scan code sets. Where the information is incomplete, it may also be less reliable: I assigned the codes based on the IBM 5250 layout, where the IBM 3270 layout or another different one might have been appropriate. The Set 3 scan codes for the ten keys arranged like the F1 to F10 keys of early IBM keyboards are the same as the Set 2 scan codes for the F1 to F10 keys; this makes me confident that my source for those codes is likely to reflect an arrangement actually used on an IBM keyboard: the entire arrangement of those codes is also given in the table specific to the 122-key keyboard given below. And the USB codes are as officially standardized by Microsoft; but for the ten keys to the left of the main alphabetic area, they may have been standardized for a different keyboard layout.

Thus, while the Scan Code 3 information is relatively trustworthy throughout (but even it is not absolutely certain to reflect any "standard"; it may just be valid for the one 3rd-party keyboard in whose documentation these codes were given) the USB information can only be regarded as reliable for F13-F24; the Scan Code 1 and 2 information is valid for at least some keyboard arrangement for F13-F24, but not necessarily the same one as that for which the Scan Code 3 information is given: it does appear to apply to some keyboard with a 5250 layout, so it is likely to have been assigned to the right key positions, while the case for the USB scan codes is more uncertain.

The Reset and Enter keys have the same scan codes as the left and right Ctrl keys on a conventional keyboard, while the Carrage Return or Field Exit key has the same scan code as the Enter key on a conventional keyboard. There are USB code assignments, not shown here as these 122-key keyboard keys gave rise to no new table entries, which seem to follow the opposite convention, however. The < and > key is INT 1, and the } and { key is INT 2. The keypad tab key is the keypad + key, with all the other keys on the numeric keypad corresponding by position. The extra key, the keypad - key on a 122-key keyboard, is INT 5.

The E0 4C and E0 73 scan codes are a mere surmise on my part, but indicate where the Rule key is located on the 122-key keyboard: in the middle of the cursor key cluster. It would be nice if I could just add E0 to the scan codes for function keys F1 through F10 to get the scan codes for the keys to the left of the main typewriter area, but that can't be true, according to the sources I've seen, more's the pity.

However, because of the existence of several completely incompatible versions of the 122-key keyboard, some of which reassign keys already defined on the 101-key keyboard, it seems appropriate to give the 122-key keyboard its own table in which the different implementations of a 122-key keyboard can be examined in their entirety.

Key 5250		3270 PC		3476	IBM SC3	SC1	SC2	Memorex-Telex SC1	Nokia Equiv
F13	Red	PF13	Red	F13	08	64	08	64	shift F1
F14	Pink	PF14	Pink	F14	10	65	10	65	shift F2
F15	Green	PF15	Green	F15	18*	66	18	66	shift F3
F16	Yellow	PF16	Yellow	F16	20	67	20	67	shift F4
F17	Blue	PF17	Blue	F17	28*	68	28	68	shift F5
F18	Turq	PF18	Turq	F18	30	69	30	69	shift F6
F19	White	PF19	White	F19	38	6A	38	6A	shift F7
F20	ffw1	PF20	Black	F20	40	6B	40	6B	shift F8
F21		PF21	ffw1	F21	48	6C	48	6C	shift F9
F22	CrBnk	PF22		F22	50	6D	50	6D	shift F10
F23	AltCr	PF23	AltCr	F23	57	6E	57	6E	shift F11

```
F24  +Cr          PF24              F24  +Cr           5F  76  5F  76    shift F12
F1   PSA          PF1   PSA         F1                 07  58  07  58    F1
F2   PSB          PF2   PSB         F2                 0F  59  0F  59    F2
F3   ffw2         PF3   PSC         F3                 17  5A  17  5A    F3
F4                PF4   PSD         F4                 1F  5B  1F  5B    F4
F5   box          PF5   PSE         F5                 27  5C  27  5C    F5
F6   ffw3         PF6   PSF         F6                 2F  5D  2F  5D    F6
F7                PF7   ffw3        F7                 37  5E  37  5E    F7
F8                PF8               F8                 3F  5F  3F  5F    F8
F9   inv          PF9   inv         F9    Back         47  60  47  60    F9
F10  bri          PF10  bri         F10   Fwd          4F  61  4F  61    F10
F11  und          PF11  und         F11                58  62  58  62    F11
F12  ffw4         PF12  ffw4        F12                5E  63  5E  63    F12
Attn      SysRq   Help       SysRq  SysRq      Attn    05  3B  05  3B    Esc
Clear             Clear       Test             Clear   06  3C  06  3C    Pause Break
CrSel             WS Ctrl     ExSel                    04  3D  04  3D    ctrl F1
Pause     ErInp   Finish      Attn   ErInp             0C  3E  0C  3E    Scr Lock
ExSel     SetUp   ChgSc Jump  CrSel  Print             03  3F  03  3F    ctrl F2
ErEOF     Recrd   Erase EOF   ErInp  Help       Hex    0E  40  0E  40    Print Screen
Print     Ident   enl         dscrn                    83  41  83  41    ctrl F3
Copy Play Test    Copy  Auto  Pause  Play       Test   0A  42  0A  42    ctrl F5
enl       Help    Print       Ident * Print SetUp      01  43  01  43    ctrl F4
Ctrl                                 Ctrl  Recrd  Pause 09  44  09  44    alt Page Up
~  `                                                   0E  29  0E  29    ~  `
|  1              |  1               !  1              16* 02  16  02    !  1
@  2                                                   1E  03  1E  03    @  2
#  3                                                   26  04  26  04    #  3
$  4                                                   25  05  25  05    $  4
%  5                                                   2E  06  2E  06    %  5
¬  6              ¬  6              ^  6               36  07  36  07    ^  6
&  7                                                   3D  08  3D  08    &  7
*  8                                                   3E  09  3E  09    *  8
(  9                                                   46  0A  46  0A    (  9
)  0                                                   45  0B  45  0B    )  0
_  -                                                   4E  0C  4E  0C    _  -
+  =                                                   55  0D  55  0D    +  =
                                                       5D  2B
Backspace                                              66  0E  66  0E    Backspace
Tab                                                    0D  0F  0D  0F    Tab
Q                                                      15  10  15  10    Q
W                                                      1D  11  1D  11    W
E                                                      24  12  24  12    E
R                                                      2D  13  2D  13    R
T                                                      2C  14  2C  14    T
Y                                                      35  15  35  15    Y
U                                                      3C  16  3C  16    U
I                                                      43  17  43  17    I
O                                                      44  18  44  18    O
P                                                      4D  19  4D  19    P
!  ¢             !  ¢              {  [               54  1A  54  1A    {  [
¦  \                                                   5B  1B  5B  1B    }  ]
                                                       5C  75
Carriage Return   Carriage Return   Field Exit         5A  1C  5A  1C    Enter
Caps Lock         Caps Lock                            14  1D  14  1D    Caps Lock
A                                                      1C  1E  1C  1E    A
S                                                      1B  1F  1B  1F    S
D                                                      23  20  23  20    D
F                                                      2B  21  2B  21    F
G                                                      34  22  34  22    G
H                                                      33  23  33  23    H
J                                                      3B  24  3B  24    J
K                                                      42  25  42  25    K
L                                                      4B  26  4B  26    L
:  ;                                                   4C  27  4C  27    :  ;
"  '                                                   52  28  52  28    "  '
}  {             }  {              }  [               53  74  53  74    INT 2
Shift L           Shift L                              12  2A  12  2A    Shift L
>  <                                                   13  70  13  70    INT 1
Z                                                      1A  2C  1A  2C    Z
X                                                      22  2D  22  2D    X
C                                                      21  2E  21  2E    C
V                                                      2A  2F  2A  2F    V
B                                                      32  30  32  30    B
N                                                      31  31  31  31    N
M                                                      3A  32  3A  32    M
,                 ,                <  ,               41  33  41  33    ,
.                 .                >  .               49  34  49  34    .
?  /                                                   4A  35  4A  35    ?  /
                                                       51  73  51
Shift R           Shift R                              59  36  59  36    Shift R
Reset     Quit    Reset       Quit  Reset      Quit    11  38  11  38    Ctrl L
Alt L             Alt L                                19  71  19  71    Alt L
Space             Space                                29  39  29  39    Space
Alt R             Alt R                                39  72  39  72    Alt R
Enter             Enter                                58  3A  58  3A    Ctrl R
Dup  PA1  ChgSc   Dup         PA1   Back Tab    enl    67  7B  67  7B    Insert
FldMk PA2 ChgSc   Field Mark  PA2   Dup                6E  7F  6E  7F    Home
Jump  PA3         Jump        PA3          Jump        6F  6F  6F  6F    Page Up
Back Tab          Back Tab           Carriage Return   64  79  64  79    Delete
super             super              Insert            65  7A  65  7A    End
del       dmulti  del                Delete            6D  7E  6D  7E    Page Down
Up        Back    Up                 Up Roll Up        63  78  63  78    Up
Left      DblLeft Left        DblLeft Left             61  56  61  56    Left
Rule      Home                Home    Rule      Home   62  77  62  77    ctrl F6
Right     DblRight Right      DblRight Right           6A  7D  6A  7D    Right
Down      Fwd     Down                Down  Roll Down  60  55  60  55    Down
bk1                                  Esc    bk1        76  01  76  01    Num Lock
bk2                                  NumLk  bk2        77  45  77  45    / KP
,  KP             ,  KP              ScrLK  bk3        7E  46  7E  46    * KP
Space KP          Space KP                  bk4        84  54  84  54    - KP
7 KP              7 KP               Home   7 KP       6C  47  6C  47    7 KP
8 KP              8 KP               Up     8 KP       75  48  75  48    8 KP
9 KP              9 KP               PgUp   9 KP       7D  49  7D  49    9 KP
Tab KP            Tab KP             Field -           7C  37  7C  37    Tab
```

```
4 KP            4 KP            Left    4 KP            6B  4B  6B  4B      4 KP
5 KP            5 KP                    5 KP            73  4C  73  4C      5 KP
6 KP            6 KP            Right   6 KP            74  4D  74  4D      6 KP
- KP            - KP                    bk5             7B  4A  7B  4A      + KP
1 KP            1 KP            End     1 KP            69  4F  69  4F      1 KP
2 KP            2 KP            Down    2 KP            72  50  72  50      2 KP
3 KP            3 KP            PgDn    3 KP            7A  51  7A  51      3 KP
Enter KP        Enter KP        + KP    Field +         79  4E  79  4E      Enter KP
                                                        68  7C  68
0 KP            0 KP            Ins     0 KP            70  52  70  52      0 KP
. KP            . KP            Del     . KP            71  53  71  53      . KP
                                                        78  57  78
```

The three codes marked with asterisks were noted as 1B, 2B, and 18 instead of 18, 28, and 16 previously; this was apparently in error.

The Memorex-Telex keyboard, apparently designed before IBM came out with the 101-key keyboard, blithely assigns the scan codes for function keys F1 through F10 to the ten keys to the right of the main typewriter area; thus, F1 through F12 have scan codes 58 through 63. Having a specimen of this keyboard, purchased at a local thrift shop, and having used the following BASIC program

```
    sc%=0
    sp%=0
 10 if sc%=57 then 90
REM exits on space bar, since that's usually easy to find
REM and outputs the correct code
    sc% = inp(96)
    if sc%<>sp% then print hex$(sc%): sp%=sc%
    goto 10
 90 end
```

to plumb its scan codes, I obtained the information about its Scan Code Set 1 codes shown above.

Later, from the third of the web sites noted at the top of this page, I found out that this would be the result of input, originally in Scan Code Set 3, from IBM's own Host Connected keyboard, to a PC as well, so this keyboard was apparently designed to match that keyboard.

Here is a photograph of that keyboard:

Of course, in all likelihood it actually outputs Scan Code Set 3 codes, or possibly Scan Code Set 2 codes, obtainable by translation. Some keys, particularly the keyboard Enter key in the location of the right Ctrl key, do have special handling of their make and break codes, but the special operations of the 101-key keyboard are not present.

The two other popular 122-key keyboards are that made by KeyTronic and that formerly made by IBM and now by Lexmark. (As may be expected, I won't be satisfied until I can exhibit the scan codes for all three now.) As noted, I suspect the Set 3 codes given in the table above correspond to those of IBM's keyboard. The keyboard Enter key actually outputs the sequence FA F0 BA and so I'm assuming that BA is a break code in the table above. The FA code in the sequence appears to be acting as a break code for NumLock, and so it isn't always output.

The Nokia keyboard was described on a web page cited above as one of my sources; since it implements the extra keys by applying shifts to standard keys, it seemed simplest to describe the keyboard in terms of keys rather than scan codes: the scan codes are what a standard 101-key keyboard would send when the named keys are pressed.

A keyboard such as the Nokia makes the extra keys more limited than regular keys, since now they are not distinct in every shift. The Memorex-Telex doesn't assign the codes for keys F1 to F12 to keys F1 to F12, which is an incompatibility difficult to accept; although one cannot but forgive it, since that keyboard was designed before those keys were added to the PC keyboard by IBM. The IBM layout would be the sensible one to regard as the standard, and so I hope soon to learn the complete set of scan codes for it in Scan Code Set 1 or Set 2 that I can add them to this page.

Note that a discussion of Chinese-language keyboards formerly on this page has been moved to a page within the previous section, and some additional discussion of the history of the keyboard of the IBM PC has been moved to the page following that.