

8.2 Keyboard

PS/2-style keyboards use scan codes to communicate key press data. Each key is assigned a code that is sent whenever the key is pressed. If the key is held down, the scan code will be sent repeatedly about once every 100ms. When a key is released, an F0 key-up code is sent, followed by the scan code of the released key. If a key can be shifted to produce a new character (like a capital letter), then a shift character is sent in addition to the scan code and the host must determine which ASCII character to use. Some keys, called extended keys, send an E0 ahead of the scan code (and they may send more than one scan code). When an extended key is released, an E0 F0 key-up code is sent, followed by the scan code. Scan codes for most keys are shown in Figure 9.

ESC 76	F1 05	F2 06	F3 04	F4 0C	F5 03	F6 0B	F7 83	F8 0A	F9 01	F10 09	F11 78	F12 07	
~ 0E	1! 16	2@ 1E	3# 26	4\$ 25	5% 2E	6^ 36	7& 3D	8* 3E	9(46	0) 45	-_ 4E	=+ 55	BackSpace ← 66
TAB 0D	Q 15	W 1D	E 24	R 2D	T 2C	Y 35	U 3C	I 43	O 44	P 4D	[{ 54]} 5B	\ 5D
Caps Lock 58	A 1C	S 1B	D 23	F 2B	G 34	H 33	J 3B	K 42	L 4B	:: 4C	'' 52	Enter ↵ 5A	
Shift 12	Z 1Z	X 22	C 21	V 2A	B 32	N 31	M 3A	,< 41	>. 49	/? 4A	⬆ 59	Shift 59	
Ctrl 14	Alt 11	Space 29							Alt E0 11	Ctrl E0 14			

Figure 9. Keyboard scan codes.

A host device can also send data to the keyboard. Table 3 shows a list of some common commands a host might send.

The keyboard can send data to the host only when both the data and clock lines are high (or idle). Because the host is the bus master, the keyboard must check to see whether the host is sending data before driving the bus. To facilitate this, the clock line is used as a “clear to send” signal. If the host drives the clock line low, the keyboard must not send any data until the clock is released. The keyboard sends data to the host in 11-bit words that contain a ‘0’ start bit, followed by 8-bits of scan code (LSB first), followed by an odd parity bit, and terminated with a ‘1’ stop bit. The keyboard generates 11 clock transitions (at 20 to 30 KHz) when the data is sent, and data is valid on the falling edge of the clock.

Command	Action
ED	Set Num Lock, Caps Lock, and Scroll Lock LEDs. Keyboard returns FA after receiving ED, then host sends a byte to set LED status: bit 0 sets Scroll Lock, bit 1 sets Num Lock, and bit 2 sets Caps lock. Bits 3 to 7 are ignored.
EE	Echo (test). Keyboard returns EE after receiving EE
F3	Set scan code repeat rate. Keyboard returns F3 on receiving FA, then host sends second byte to set the repeat rate.
FE	Resend. FE directs keyboard to re-send most recent scan code.
FF	Reset. Resets the keyboard.

Table 3. Keyboard commands.