

## Keyboard Commands & Responses

### Commands System Issues to Keyboard (via 8042 port 60h)

ED Set/Reset Mode Indicators, keyboard responds with ACK then waits for a following option byte. When the option byte is received the keyboard again ACK's and then sets the LED's accordingly. Scanning is resumed if scanning was enabled. If another command is received instead of the option byte (high bit set on) this command is terminated. Hardware defaults to these indicators turned off.

```
|7-3|2|1|0| Keyboard Status Indicator Option Byte
|  |  | `--- Scroll-Lock indicator  (0=off, 1=on)
|  |  `---- Num-Lock indicator   (0=off, 1=on)
|  `----- Caps-Lock indicator  (0=off, 1=on)
`----- reserved (must be zero)
```

EE Diagnostic Echo, keyboard echoes the EE byte back to the system without an acknowledgement.

F0 PS/2 Select/Read Alternate Scan Code Sets, instructs keyboard to use one of the three make/break scan code sets. Keyboard responds by clearing the output buffer/typematic key and then transmits an ACK. The system must follow up by sending an option byte which will again be ACK'ed by the keyboard:

```
00 return byte indicating scan code set in use
01 select scan code set 1  (used on PC & XT)
02 select scan code set 2
03 select scan code set 3
```

F2 PS/2 Read Keyboard ID, keyboard responds with an ACK and a two byte keyboard ID of 83AB.

F3 Set Typematic Rate/Delay, keyboard responds with ACK and waits for rate/delay byte. Upon receipt of the rate/delay byte the keyboard responds with an ACK, then sets the new typematic values and scanning continues if scanning was enabled.

```
|7|6|5|4|3|2|1|0| Typematic Rate/Delay Option Byte
| | | | -+ -+ -+ -+ -+ typematic rate indicator (see INT 16,3)
| | | | | `----- A in period formula (see below)
| | | | `----- B is period formula (see below)
| `----- typematic delay
`----- always zero
```

delay = (rate+1) \* 250 (in milliseconds)

rate = (8+A) \* (2\*\*B) \* 4.17 (in seconds, ñ 20%)

Defaults to 10.9 characters per second and a 500ms delay. If a command byte (byte with high bit set) is received instead of an option byte this command is cancelled.

- F4 Enable Keyboard, cause the keyboard to clear its output buffer and last typematic key and then respond with an ACK. The keyboard then begins scanning.
- F5 Default w/Disable, resets keyboard to power-on condition by clearing the output buffer, resetting typematic rate/delay, resetting last typematic key and setting default key types. The keyboard responds with an ACK and waits for the next instruction.
- F6 Set Default, resets to power-on condition by clearing the output buffer, resetting typematic rate/delay and last typematic key and sets default key types. The keyboard responds with an ACK and continues scanning.
- F7 PS/2 Set All Keys to Typematic, keyboard responds by sending an ACK, clearing its output buffer and setting the key type to Typematic. Scanning continues if scanning was enabled. This command may be sent while using any Scan Code Set but only has effect when Scan Code Set 3 is in use.
- F8 PS/2 Set All Keys to Make/Break, keyboard responds by sending an ACK, clearing its output buffer and setting the key type to Make/Break. Scanning continues if scanning was enabled. This command may be sent while using any Scan Code Set but only has effect when Scan Code Set 3 is in use.
- F9 PS/2 Set All Keys to Make, keyboard responds by sending an ACK, clearing its output buffer and setting the key type to Make. Scanning continues if scanning was enabled. This command may be sent while using any Scan Code Set but only has effect when Scan Code Set 3 is in use.
- FA PS/2 Set All Keys to Typematic Make/Break, keyboard responds by sending an ACK, clearing its output buffer and setting the key type to Typematic Make/Break. Scanning continues if scanning was enabled. This command may be sent while using any Scan Code Set but only has effect when Scan Code Set 3 is in use.
- FB PS/2 Set Key Type to Typematic, keyboard responds by sending an ACK, clearing its output buffer and then waiting for the key ID (make code from Scan Code Set 3). The specified key type is then set to typematic. This command may be sent while using any Scan Code Set but only has effect when Scan Code Set 3 is in use.
- FC PS/2 Set Key Type to Make/Break, keyboard responds by sending an ACK, clearing its output buffer and then waiting for the key ID (make code from Scan Code Set 3). The specified key type is then set to Make/Break. This command may be sent while using any Scan Code Set but only has effect when Scan Code Set 3 is in use.
- FD PS/2 Set Key Type to Make, keyboard responds by sending an ACK, clearing its output buffer and then waiting for the key ID (make code from Scan Code Set 3). The specified key type is then set to Make. This command may be sent while using any Scan Code Set but only has effect when Scan Code Set 3 is in use.
- FE Resend, should be sent when a transmission error is detected from the keyboard
- FF Reset, Keyboard sends ACK and waits for system to receive it

then begins a program reset and Basic Assurance Test (BAT).  
Keyboard returns a one byte completion code then sets default  
Scan Code Set 2.

## Keyboard Responses to System (via 8042 port 60h)

00 Key Detection Error or Overrun Error for Scan Code Set 1,  
replaces last key in the keyboard buffer if the buffer is full.  
AA BAT Completion Code, keyboard sends this to indicate the keyboard  
test was successful.  
EE Echo Response, response to the Echo command.  
F0 Break Code Prefix in Scan Code Sets 2 and 3.  
FA Acknowledge, keyboard sends this whenever a valid command or  
data byte is received (except on Echo and Resend commands).  
FC BAT Failure Code, keyboard sends this to indicate the keyboard  
test failed and stops scanning until a response or reset is sent.  
FE Resend, keyboard request resend of data when data sent to it is  
invalid or arrives with invalid parity.  
FF Key Detection Error or Overrun Error for Scan Code Set 2 or 3,  
replaces last key in the keyboard buffer if the buffer is full.  
id Keyboard ID Response, keyboard sends a two byte ID after ACK'ing  
the Read ID command. The byte stream contains 83AB in LSB, MSB  
order. The keyboard then resumes scanning.

- command F7 through FD are NOP's on the AT and are ACK'ed but not  
acted upon
- see [8042](#) [MAKE CODES](#) [BREAK CODES](#) [INT 16,3](#)