



Instituto Tecnológico De Estudios Superiores de Monterrey

Laboratorio de Sistemas Digitales Avanzados

Teclado PS/2

Héctor Javier Pequeño A01246364

Prof. Emilio Caballero

Links Github:

Código Fuente PS/2:

<https://github.com/HectorPequeno06/HectorPequeno06/blob/master/Keyboard/Keyboard.vhdl>

Código Test Bench PS/2:

[https://github.com/HectorPequeno06/HectorPequeno06/blob/master/Keyboard/Keyboard\\_Tb.vhdl](https://github.com/HectorPequeno06/HectorPequeno06/blob/master/Keyboard/Keyboard_Tb.vhdl)

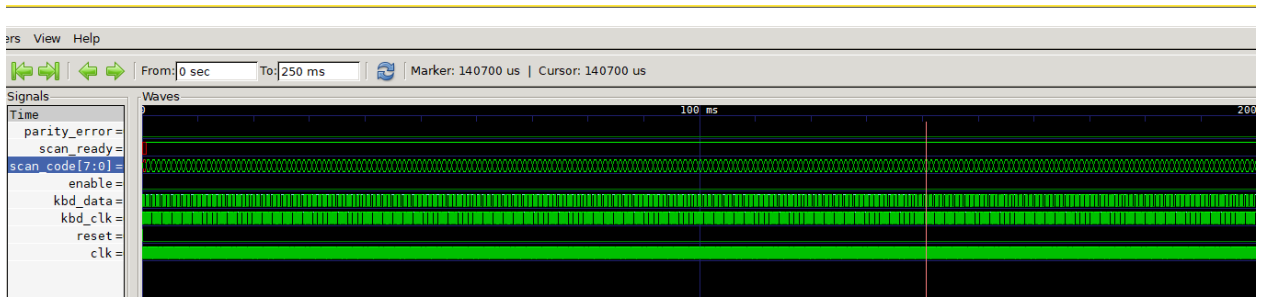
## Teclado PS/2 Código Fuente:

```
File Edit Selection View Go Run Terminal Help
Keyboard.vhdl X Keyboard_Tb.vhdl
LabSistemasAvanzados > HectorPequeno06 > Keyboard > Keyboard.vhdl
5
6  entity keyboard is
7      port(
8          kbd_clk, kbd_data, clk : in std_logic;
9          reset, enable : in std_logic;
10         scan_code : out std_logic_vector(7 downto 0);
11         scan_ready : out std_logic;
12         Error_paridad: out std_logic
13     );
14 end entity;
15
16 architecture arch of keyboard is
17
18     signal filter : std_logic_vector(7 downto 0) := "00000000";
19     signal kbd_clk_filtered : std_logic := '0';
20     signal read_char : std_logic := '0';
21     signal ready_set : std_logic := '0';
22     signal Estado: integer range 0 to 10:=0; --VARIABLE DE ESTADOS
23     signal shiftin : std_logic_vector(8 downto 0) := "000000000";
24     signal bit_paridad: std_logic:= '1'; --Variable de Bit de paridad
25     signal paridad_helper: std_logic;-- Asistencia oara calcular Bit de paridad
26
27 begin
28     clk_filter : process
29     begin
30         wait until clk'event and clk = '1';
31         filter(6 downto 0) <= filter(7 downto 1);
32         filter(7) <= kbd_clk;
33         if filter = x"FF" then
34             kbd_clk_filtered <= '1';
35         elsif filter = x"00" then
36             kbd_clk_filtered <= '0';
37         end if;
38     end process;
39     -- Lectura de la información serial del dispositivo
40     process
41     begin
42         wait until (kbd_clk_filtered'event and kbd_clk_filtered = '0');
43         if reset = '1' then
44             Estado <= 1;
45             read_char <= '0';
46             Error_paridad <= '0';
47             paridad_helper <= '0';
48         else
49             if kbd_data = '0' and read_char = '0' then
50                 read_char <= '1';
51                 ready_set <= '0';
52             else
53                 if read_char = '1' then
54                     if Estado < 9 then
55                         Estado <= Estado + 1;
56                     else
57                         Estado <= 0;
58                     end if;
59                     read_char <= '0';
60                     ready_set <= '1';
61                     scan_code <= shiftin;
62                     shiftin <= shiftin(7 downto 0) & bit_paridad;
63                     bit_paridad <= paridad_helper;
64                     paridad_helper <= bit_paridad;
65                 end if;
66             end if;
67         end if;
68     end process;
69 end arch;
```

## Teclado PS/2 código Test Bench:

```
e Edit Selection View Go Run Terminal Help Keyboard
Keyboard.vhdl Keyboard_Tb.vhdl X
LabSistemasAvanzados > HectorPequeno06 > Keyboard > Keyboard_Tb.vhdl
1  library ieee;
2  use ieee.std_logic_1164.all;
3  use ieee.numeric_std.all;
4  use ieee.std_logic_textio.all;
5
6  library std;
7  use std.textio.all;
8
9
10 entity keyboard_tb is
11     constant period : time := 40 ns ; -- Señal de reloj de 25MHz
12     constant bit_period : time := 60 us ; -- Keyboard clock ~ 16.7 Khz max
13 end entity;
14
15 architecture arch of keyboard_tb is
16     component keyboard is
17     port(
18         kbd_clk, kbd_data, clk : in std_logic;
19         reset, enable : in std_logic;
20         scan_code : out std_logic_vector(7 downto 0);
21         scan_ready : out std_logic;
22         Error_paridad: out std_logic--señal para el error de paridad
23     );
24     end component;
25
26     signal clk : std_logic := '0';
27     signal reset : std_logic;
28     signal kbd_clk : std_logic := '1';
29     signal kbd_data : std_logic := 'H';
30     signal enable : std_logic := '0';
31     signal scan_ready : std_logic;
32     signal scan_code : std_logic_vector(7 downto 0);
33     signal parity_error: std_logic:='0';
34     type codes_types is array (natural range <>) of std_logic_vector (7 downto 0);
35     constant codes : codes_types := (x"15", x"1D");
36
37     begin
38
39     UUT : keyboard port map (kbd_clk, kbd_data, clk, reset, enable, scan_code, scan_ready );
40
41     -- Señal de reloj del sistema
42     clk <= not clk after (period / 2);
43     reset <= '1', '0' after period;
44
45     process
46         procedure send_code( sc : std_logic_vector(7 downto 0) ) is
47         begin
48             kbd_clk <= 'H';
49             kbd_data <= 'H';
```

## Simulación PS/2



Resultados de la consola:

Scan Code : 00010101

```
Microsoft Windows [Versión 10.0.18363.900]
(c) 2019 Microsoft Corporation. Todos los derechos reservados.

C:\Users\Héctor Pequeño>cd C:\Users\Héctor Pequeño\Desktop\LabSistemasAvanzados\HectorPequeno06\Keyboard

C:\Users\Héctor Pequeño\Desktop\LabSistemasAvanzados\HectorPequeno06\Keyboard>ghdl -a Keyboard.vhdl

C:\Users\Héctor Pequeño\Desktop\LabSistemasAvanzados\HectorPequeno06\Keyboard>ghdl -e Keyboard

C:\Users\Héctor Pequeño\Desktop\LabSistemasAvanzados\HectorPequeno06\Keyboard>ghdl -a --ieee=synopsys Keyboard_Tb.vhdl

C:\Users\Héctor Pequeño\Desktop\LabSistemasAvanzados\HectorPequeno06\Keyboard>ghdl -e --ieee=synopsys Keyboard_Tb

C:\Users\Héctor Pequeño\Desktop\LabSistemasAvanzados\HectorPequeno06\Keyboard>ghdl -r --ieee=synopsys Keyboard_Tb --wave
=KeyboardGhw.ghw --stop-time=250ms
Scan code : 00010101
.\keyboard_tb.exe:info: simulation stopped by --stop-time @250ms

C:\Users\Héctor Pequeño\Desktop\LabSistemasAvanzados\HectorPequeno06\Keyboard>
```